UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

2nd Steering Committee Meeting

April 25-26, 2007

Hotel “Oktyabr’skya”, Saint Petersburg, the Russian Federation

REPORT
on the Second Meeting of the Project Steering Committee

Prepared by: the Project Office

Status: approved by Project Steering Committee via electronic communication

Table of Contents

REPORT

Introduction

The 2nd meeting of the Steering Committee for the UNEP/GEF Project "Russian Federation - Support to the National Plan of Action for the Protection of the Arctic Marine Environment" took place in Saint Petersburg from 25 to 26 of April, 2007 in the Hotel "Oktyabrskya". The meeting was chaired by the Executing Agency represented by the Assistant to the Minister of Economic Development and Trade of the Russian Federation Mr. Boris Morgunov.

Meeting started at 10.00 on April 25, 2007. A list of the Project Steering Committee meeting participants is given in **Annex I** to this report**.**

1. Agenda item 1. Opening of the meeting and adoption of the Agenda (STC 2/1)

Mr. Morgunov welcomed participants and proposed to adopt the Agenda of the Project Steering Committee meeting prepared by the Project Office in consultation with both Implementing and Executing Agencies.

The meeting adopted the Agenda.

The agenda of the meeting is attached as **Annex II** to the report.

Project Office prepared package of documents for the 2nd meeting of the Project Steering Committee. List of these documents is given **in Annex III** to this report.

2. Agenda item 2. Progress report on implementation of the Project (STC 2/2)

The Information on progress in implementation of the Project has been prepared by the Project Office for the reporting period and has been circulated to Project Steering Committee members together with all other documents prepared by the Project Office to the 2nd meeting of the Project Steering Committee

Project Manager (hereinafter designated as PM) noticed that the Project is behind the schedule and the main reason for that was a lack of official approvals of the Project IWP and the Budget for the 1st Phase by the Project Steering Committee as well as lack of approved Procedure for disbursement of donor funds accumulated in Trust Funds created by the Partner Agencies as well as problems with contractual issues with UNDP (UNDP postponed the finalisation of consultant contracts and payments for contracts for 5 months from July to November, 2006; PO was not able to rule out the situation). Starting from January of 2007 the PO changed its status and joined the ED NPAF as its department in accordance with an Agreement between Minekonomrazvitiya of Russia and the legal entity ED NPAF. Formalities proposed by the NAPF could not be also resolved during next 3 months,

During the reported period the priority environmental issues of the Russian Arctic as a part of the diagnostic analysis have been identified, key SAP objectives formulated and

work on tasks under SAP objectives is progressing. Project documents for demonstration projects have been prepared. In addition, new pilot and demonstration projects have been proposed. Key lessons learned have been also emphasised. ACOPS provided its comments to the Progress report, which according to the PM have been already partially taken into account in distributed version of the Progress report.

*The meeting approved Progress Report on the Project implementation that is enclosed as **Annex IV**.*

3. Agenda item 3. The Strategic Action Programme for the Protection of the Marine Environment from Pollution in the Arctic Zone of the Russian Federation (SAP-Arctic) – Conceptual notes (STC 2/3).

PM presented conceptual notes of the SAP-Arctic and informed on measures taken to speed up the process of SAP-Arctic development. Issues concerning SAP priorities, Task Team performance, implementation indicators, time frames for SAP approval by federal and regional authorities and other issues have been raised during the discussion. The ExA representative also emphasised the final SAP document has to be adopted not only according to GEF/UNEP standards but also to the standards accepted in the Russian Federation for such kind of documents.

*The meeting approved in general the presented document. A round table with Russian stakeholders from Arctic regions will be held in the nearest future with the purpose to reflect in the SAP specific regional activities. It was decided to extend the SAP-Arctic by consideration of activities associated with offshore oil and gas operations and the increase of marine shipping associated with oil and gas transportation. It was also emphasised that the process of development of necessary costed and targeted measures (system of activities) to achieve formulated long-term objectives should be accelerated in order to start the process of their approval by federal and regional executing authorities as soon as possible and to include activities under the SAP Arctic into a Federal Targeted Programme to get funds for these activities implementation from the national budget. The system of activities for final approval by federal and regional authorities should be prepared by September – October 2007. The approved Conceptual notes are enclosed in **Annex V** to this report.*

4. Agenda item 4. Diagnostic analysis of environmental problems of the Russian Arctic (STC2/3(1))

PM presented major finding of the diagnostic analysis (DA).

The meeting agreed with proposal of the Executing Agency to publish the DA results in Russian and English after their consideration by Russian stakeholders, Project Steering Committee members and working groups of the Arctic Council. Two possibilities of presenting the DA results were considered: (1) as comprehensive report on current state of the environment in the Russian Arctic in limited amount of copies; and (2) as

concise report directed to more broader audience. Other possibilities of circulation of Project results should be also considered (movies, DVD, internet, etc.). A draft DA of the current state of the environment in the Russian Arctic is presented as ***Annex VI*** *to this report. An example Chapters of the DA due to of its size can be downloaded from the Project web-site (http://npa-arctic.ru).*

5. Agenda item 5. Consideration of work progress on PINS-component, PINS Guidelines and similar issues.

PM informed on current state of the work on implementation of PINS component, in particular, work on updating and reviewing the information on hot spots as well as information on preparation of Guidelines for conduction of pre-investment studies. In particular, PM noticed that this project component implementation has been considered at several meetings of Project Supervisory Council. Concept of PINS development was approved by ExA, criteria for hot spots selection and PINS priorities has been considered at the meetings of the WG and Project Supervisory Council. Guidelines for PINS are also close for finalization (ready for 75%).

The meeting has taken into consideration the information on the PINS component implementation.

6. Agenda item 6. Project Documents for DEMO-projects mentioned in the Project Document.

DEMO-projects mentioned in the Project Document: BASES and CLEAN-UP were presented by PM and RAIPON representative Ms. Yana Dordina presented COMAN project. The following decision were taken on prepared documents:

DEMO-BASES: *Steering Committee supported the idea of implementation of this DEMO-project on Franz-Josef Land archipelago. The financial component of this demonstration project should be further elaborated by PO in consultations with Executing and Implementing Agencies within budget of US$ 250K***.** *Steering Committee welcomed participation of NEFCO in this DEMO project. The nearest follow-up actions on this project will be an expedition to FJL archipelago in August-September 2007 to start actual remediation at a pilot territory and to evaluate further actions needed for completion of this project. The approved DEMO-BASES project document is enclosed in* ***Annex VII*** *to this report.*

DEMO-CLEAN-UP: *Meeting approved the Project Document as a pilot project. It was proposed to attract a part of fund required for the implementation of this demo-project from ship-dismantling enterprise "Nerpa" where the demonstration is intended to be implemented. The owners of the proposed technology should present data on possible co-financing of this project to the Project Office at the end of May 2007. Project Office should agree the proposed co-financing with both Executing and Implementing*

*agencies. The approved DEMO-CLEAN-UP project document is enclosed in **Annex VIII** to this report.*

DEMO-COMAN: *Meeting approved the Project Document however comments of the Executing Agency tabled during the meeting should be taken into account in the process of tender documentation preparation. The approved DEMO-COMAN project document with comments of Executing Agency is enclosed in **Annex IX** to this report. Executing Agency expressed a wish that PO should develop a uniform format for new demonstration/pilot project proposals.*

7. Agenda item 7. New DEMO projects

PM presented two new demo-projects prepared in consultations with regional authorities. DEMO-RITEG is devoted to elimination of outdated radio-isotopic thermo-energetical generators in Republic of Sakha (Yakutiya) and Chukchi autonomous okrug and DEMO-FLAIR deals with utilization of associated natural gas at small-scale flares by separating it into fractions and liquifying it in Khanty-Mansiysk autonomous okrug.

The following decision were taken on prepared documents:

DEMO-RITEG: *The meeting agreed in general on this proposed new demo-project. The PO in close cooperation with regional authorities initiated this demo project should prepare the budget of this demo-project in the nearest future (May-June 2007) taking into account budget savings. Final decision on this project should be taken by Executing and Implementing Agencies on a basis of elaborated budget and further technical details. The agreed DEMO-RITEG project document is enclosed in **Annex X** to this report.*

DEMO-FLAIR: *The meeting considered an idea of this proposed new demo-project as very important. The project is of a high priority because directed to solving both environmental and social problem, however there were concerns whether this project is in agreement with the Project Document goals and should GEF funds be used for its implementation. Final decision on this project should be taken by the Project Steering Committee after the project document is reworked by the PO. The submitted DEMO-FLAIR project document is enclosed in **Annex XI** to this report.*

8. Agenda item 8. New small demonstration and pilot projects

PM presented 9 small demonstration and pilot projects:

1. Localisation and removal from a thermokarst crater two radioisotope thermoelectric generators (RITEGs) of GONG type at the Kondratiev navigation beacon site in Ust-Yanski Ulus of Republic of Sakha (Yakutia).
2. Increasing the efficiency of electrostatic precipitators at Arkhangelsk pulp and paper mill

3. Salvation and scrapping of the hunting ship “Teriberka”
4. Complete salvation and utilisation of the 12 remaining ships at the dumping site “Lavna”
5. Complete data base on abandoned vessels in Murmansk Oblast
6. Cleaning of hazardous substances from the bottom sediments of the Kola Fjord. Phase 1. Monitoring of hazardous substances in the bottom sediments of the Kola Fjord.
7. Decontamination of oil sludge and oil contaminated soil in the Kola Fjord.
8. Waste treatment plant for problematic hazardous wastes including oil sludge in Kola district of Murmansk Oblast
9. Removing sunken wood and ship frames from the sea bottom in Tiksi Bay

All these projects were elaborated in cooperation with regional administrations and and approved by them.

The meeting approved the presented project initiatives to be funded by donors and asked the PO to develop further the financial components of these projects in consultations with donors and Executing and Implementing Agencies. Donors are requested to confirm their funds allocated to definite projects. PO together with donors and regional administrations should arrange all necessary preparations to commence implementation of these projects as soon as possible this summer. The agreed project concepts are enclosed in ***Annex XII*** *to this report.*

9. Agenda item 9. New method of distant inventory of potential sources of pollution of environment in the Arctic

Prof. V. Chashchin presented information concerning new method of distant inventory of potential sources of pollution of environment that can be applicable to the Arctic conditions. Computerized thermal analysis based on the IR remote scanning in combination with optical photography is a method selected for identification of local sources of potential persistent contaminants.

The meeting concluded that presented information is in line with goals and objectives of the UNEP/GEF project. This project can be linked partially with an existing BASES demo-project. The project proponent should in a two weeks period present project proposal to the Project Office for further consideration and presentation to the members of the Project Steering Committee as potential new demonstration project.

10. Agenda item 10. Justification for prolongation of the NPA Arctic Phase I project

The meeting approved the presented document and approved proposal of the Project Office agreed with both Implementing and Executing Agencies to prolong Phase I of the

*Project until December 2008. The agreed document is presented in **Annex XIII** to this report.*

11. Agenda item 11. Integrated Work Plan and Budget for 2007 and until the end of Phase I

PM informed that the proposed changes to the existing Integrated Work Plan for Phase I reflect the following:

- extension of the project until December 2008;
- to finalise pre-investment studies during the Project Phase I implementation if it is prolonged till the end of 2008;
- to initiate and to start an implementation of several "ready-to-go" pilot investment projects aimed at Arctic pollution issues with co-financing from EPA and NEFCO;
- to reduce provisioned overcharged expenditures for pre-investment studies and for 3rd project component "Development and implementation of Environmental Protection System (EPS)" (sub-contract with one co-operating organization instead of sub-contracts with the three organizations during the Phase I). To reallocate saved funds to pilot projects;
- to use GEF funds for co-financing the program on the environmentally sound elimination of RITEGs (radioisotope thermoelectric generators) in the Republic of Sakha (Yakutia) and Chukotka region;
- to increase funding of the public awareness on the Russian Arctic environmental issues in the six Arctic regions;
- to hold a Partner Conference in Russia at the beginning of 2008 with the purpose of search of possible co-funding for the Phase II and financing for pre-investment studies fulfilled during Phase I.

To reach the above objectives it is also proposed to reduce considerably financing for the following budget lines: travel on official business, meeting (conferences), and translation costs.

*Following a lengthy discussion and comments the meeting decided to change the presented document and at this stage do not present breakdown of Russian and donor co-financing and indicate only net values for all activities as is in the former IWP. The unspent EPA funds will be allocated for the UNEP/GEF project according to addendum to cooperative agreement between EPA and ACOPS in consultations with Executing and Implementing Agencies and PO. Special Supervisory Council meeting will be devoted to consider and approve breakdown of all donors' funds for 2007 and until the end of Phase I. The approved working plan and budget for 2007 and until the end of Phase I are presented in **Annex XIV** to this report. Budget prepared in format with Russian requirements (with consolidated social tax) is given in Annex XV.*

12. Agenda item 12. Co-financing of the Project.

PM presented a report justifying the Russian input to the Project co-financing for the Phase 1 elaborated by the Project Office in close cooperation with the ExA and on a basis of data provided by ExA. This report was considered and approved at the 3rd Supervisory Council Meeting. At the same time it was impossible to obtain clear picture on disbursement of donor funds, in particular of EPA funds channeled to ACOPS despite of ACOPS was requested several times to prepare such information.

*The meeting approved the information on Russian co-financing of the Project. The approved document is presented in **Annex XVI** to this report. Project Steering Committee Meeting asked Project Office and ACOPS to organize a special meeting to clarify remaining issues on donor co-financing of the Project and to send the report on donor co-financing to the Steering Committee members.*

13. Agenda item 13. Procedure of Co-financing through NEFCO Funds and Relevant Reporting

PM presented a corresponding procedure that was elaborated by the Project Office in close cooperation with NEFCO. This procedure was considered and approved at the 4th Supervisory Council Meeting.

*The meeting approved the presented document. This procedure is presented in **Annex XVII** to this report.*

14. Agenda item 14. Procedure of Approval of Documents via Electronic Communication

Following recommendation of the 4th meeting of the Project Supervisory Council the Project Office prepared simple procedure of approval of documents via electronic communication.

*The meeting approved the presented procedure with minor comments. This procedure is presented in **Annex XVIII** to this report.*

15. Agenda item 15. Other business

No matters were raised under this agenda item.

16. Agenda item 16. Closure

Following an expression of thanks to the participants for their attendance and contribution to the meeting by the chairman Mr. Morgunov in his closing statement, also expressed his thanks to all members of the Project Steering Committee meeting for their active participation and making important decisions that will allow to move Project

forward. In particular, he thanked donor country representatives, colleagues from UNEP for their constructive work during the Project Steering Committee meeting; colleagues from the Russian Federation for their assistance during meeting.

The meeting was closed by the Chairman at 18:00 hours on 26 April, 2007.

Table of Annexes

ANNEX I

LIST OF PARTICIPANTS

Steering Committee meeting

April 25-26, 2007 **"Octyabrskaya" Hotel, Sainte Petersburg, Russia**

ACOPS

Timothy Turner
11 Dartmouth Street
London, SW1H 9BN
Tel: +44 (0) 207 799 3033
Fax: +44 (0) 207 799 2933
Email: trturner@btinternet.com

Anatoly Pichugin
Technical Advisor ACOPS
Tel.: (095) 787-11-77
Email: pichuginaa@fastmail.fm
anatoly.pichugin@tethysconsultants.com

Vitaly Lystsov
Member of Advisory Board on Pollution Control and Prevention
Chairman of Arctic Working Group in the Russian Federation
RRC "Kurchatov Institute"
Kurchatov Sq. 1
123182 Moscow, Russia
Tel.: +007 095 196 7151, (196 63 28)
Fax: +007 095 196 86 79
Email: vitalil@pike.pike.ru

ICELAND

Magnús Jóhannesson
Secretary General
Ministry for the Environment
Skuggasund 1, 150 Reykjavík, Iceland
Tel: +354-545-8600, fax +354-562-4566
www.raduneyti.is / www.government.is
magnus.johannesson@umh.stjr.is

RUSSIA

Boris Morgunov
Assistant of the Minister
Minekonomrazvitia of Russia
1.3, 1-Tverskaya-Jamskaya Str.,
125993, Moscow
Tel.: (095) 209 85 25
Fax: (095) 209 84 58
Email: morgunovba@economy.gov.ru

Boris Melnikov
Senior research scientist
All Russian scientific and coordination centre «Sever» of Minekonomrazvitia of Russia
Tel./Fax: (095) 209 84 58
Email: Melnikov@economy.gov.ru

Pavel Sulyandziga
First vice-president RAIPON
Member (2005-2007), Russia and Regional Representative in United Nations Permanent Forum on

Yana Dordina
Director of RAIPON International fund for development "Batany"
Fax: +7 495 780 8727
Email: raipon@raipon.org

Indigenous People P.O. Box 110
Moscow, Russia 119415
Tel.: +7 095 780 8727
Fax: +7 095 780 8727
Email: psulandziga@mail.ru

Chaschin Valery
S-Petersburg

UNEP

Lev Neretin
UNEP/GEF Project Management Officer
UNEP Moscow Offece
28, Ostozhenka str.
119034 Moscow, Russia
Tel.: +7 (495) 981-3757
Fax: +7 (495) 787 7763
Email: neretin.unep@undp.ru

Sergey Kurdjukov
UNEP/GEF Financial Manager Officer
UNEP Moscow Offece
28, Ostozhenka str.
119034 Moscow, Russia
Tel.: +7 (495) 981-3757
Fax: +7 (495) 787 7763
Email: kurdjukov.unep@undp.ru

USA

William Freeman
Environment Protection Agency
NIS Director
Office of International Affairs
1200 Pennsylvania Avenue, NW (2650R)
Tel. (202) 564-6406
Fax (202) 565-2412
Email: freeman.bill@epa.gov

Albes Gaona
Environment Protection Agency
Russia/NIS Program
Office of International Affairs (MC 2650R)
1200 Pennsylvania Ave, Washington DC 20460
Ph: (202) 564-6253
Fax: (202) 565-2412
Email: gaona.albes@epa.gov

Sandra Duque
Environment Protection Agency
Russia/NIS Program
Office of International Affairs
1200 Pennsylvania Avenue, Washington DC
Email: duque.sandra@epa.gov

NEFCO

Henrik Forsstrom
Senior Adviser
Fabianinkatu 34
PO Box 249 FI-00171
Helsinki, Finland

Tel.: +358 9 180 01, 1800344
Fax: +358 9 630 976
Email: henrik.forsstrom@nefco.fi

PROJECT OFFICE

Ivan Senchenya
NPA-Arctic
Project Manager
19 Leninsky prospect,
Moscow 119991

Tel./fax: +7 095 7304097, 9553114, 9553468; mobile +7 095 7234680
Email: senchenya@npaf.ru, I_Senchenya@mail.ru

Sergey Tambiev
NPA-Arctic
Deputy Project Manager
Tel./Fax: (095) 730-4097, 955-3114
Email: tambiev@npaf.ru

Galina Zaitseva
NPA-Arctic
Project Financial Manager Officer
Tel./Fax: (095) 730-4097, 955-3114
Email: zaitseva@npaf.ru

INTERPRETERS

Julya Surikova

Aleinikov Peter

ANNEX II

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/1

Item 1

Provisional Agenda with Timetable

Prepared by: the Project Office
Status: approved by the Project Steering Committee

Wednesday , April 25, 2007, 10.00 – 18.00

Meeting of the Steering Committee

Conference Hall, Hotel “Oktyabrskaya”, Saint Petersburg

10.00 – 10.05	Opening
10.05 – 10.15	Adoption of Agenda
10.15 – 11.30	Project Progress report
11.30 – 12.00	Coffee-break
12.00 – 13.30	Consideration of conceptual issues of Strategic Action Program
	Consideration of possibility of publishing the diagnostic analysis results
	Consideration of work progress on PINS-component. PINS Guidelines and similar issues.
13.30 – 14.30	Lunch
14.30 – 16.00	Approval of Project Documents for DEMOS-projects mentioned in the Project Document
16.00 – 16.30	Coffee-break
16.30 – 18.00	Consideration of new pilot and demonstration projects

Thursday, April 26, 2007, 10.00 – 18.00

Meeting of the Steering Committee

Conference Hall, Hotel “Oktyabrskaya”, Saint Petersburg

10.00 –10.30	Valery Chashchin “ New method of distant inventory of potential sources of pollution of environment in the Arctic
10.30-11.00	Consideration of new demonstration and pilot projects (continuation)
11.00-11.30	Justification for prolongation of the NPA Arctic Phase I project
11.30-12.00	Coffee-break
12.00-13.00	Integrated Work Plan until the end of Phase I
	Budget for 2007 and until the end of Phase I
13.00-13.30	Co-financing of the Project
13.30 – 14.30	Lunch
14.30 – 15.00	Procedure of Co-financing through NEFCO Funds and Relevant Reporting
15.00 – 16.00	Procedure of Approval of Documents via Electronic Communication
	Discussion and agreeing of decisions of the Steering Committee on considered documents
16.00 – 16.30	Coffee-break
16.30 – 18.00	Any other business
	Closing

ANNEX III

List of Documents prepared to the 2d Steering Committee Meeting

#	Code	Title of the document	Prepared by
1.	STC 2/1	Preliminary Agenda	Project Office
2.	STC 2/2	Progress Report on Project Implementation	Project Office
	STC 2/3	Conceptual issues of Strategic Action Programme	Project Office, TTT-SAP
	STC 2/3(1)	Summary of Diagnostic Analysis	Project Office
4.	STC 2/5(1)	Project Document on military bases	Project Office, WG-BASES
	STC 2/5(2)	Project Document on co-management	Project Office, WG-COMAN
	STC 2/5(3)	Project Document on Brown Algae	Project Office, WG-CLEAN-UP
5.	STC 2/7(1)	RITEGs inventory and disposal in environmentally sound manner (for Republic of Sakha (Yakutiya) and Chukchi autonomous okrug	Project Office
	STC 2/7(2)	Processing of associated gas and Use for Heat Supply in Konda Region of Khanty-Mansiysk AO	Project Office
6.	STC 2/8(1-8)	New small pilot projects	Project Office
7.	STC 2/9	Justification for prolongation of the NPA Arctic Phase I	Project Office, Executing and Implementing Agencies
8.	STC 2/10(1-2)	Integrated Work Plan and Budget until the end of Phase I	Project Office
9.	STC 2/11	Project co-financing	Project Office, PA
10.	STC 2/12	Procedure of Co-financing through NEFCO Funds and Relevant Reporting	NEFCO/Project Office
11.	STC 2/13	Procedure of Approval of Documents via Electronic Communication	Project Office

ANNEX IV

STEERING COMMITTEE

of the UNEP/GEF Project

"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting

St. Petersburg, Russian Federation

April 25 - 26, 2007

STC 2/2

Item 2 of the Agenda

Progress Report on Project Implementation for the Period from November 2005 to April 2007

Prepared by: Project Office
Status: approved by the Project Steering Committee

1. INTRODUCTION

The UNEP/GEF Project NPA-Arctic was signed on 18th of July 2005 and was officially launched in November 2005. Integrated Work Plan was officially adopted in August 2006 only. The main activities of the Project Office (PO) have been carried out within 3 Project components: Strategic Action Programme, Pre-investment studies and Demonstration projects.

2. PROJECT MANAGEMENT

Project Office ensured that all Project activities are carried out in compliance with the Project design and the instructions of the Steering Committee, Executing and Implementing Agencies. Detailed quarterly and half-yearly (i.e., biannual) (by 30 June and 31 December each year) reports have been prepared and submitted to UNEP/DGEF by the Project Office in a timely manner. Progress reports have been also prepared for the Project Supervisory Council meetings that have been held in a form of conference-calls.

Financial reports have been prepared by the Project Office in accordance with normal accounting practices and cleared by the Executing Agency prior to its submission to UNEP. The financial reports have been submitted by the Project Office to UNEP/GEF after the clearance by the Ministry and since December 2006 when new staff in the UNEP/Moscow Office appeared after their clearance. Details of expenditures have been reported on an activity-by-activity basis, in line with Project budget codes as set out in the Project Document, as at 31 March, 30 June, 30 September and 31 December of each year using the format given in Annex XVI (Quarterly Expenditures Report) of the Project Document. Project expenditures for 2005 and 2006 were evaluated by independent auditing company that confirmed that expenditures are in line with Project Document as well as in full compliance with the Russian regulation.

A report on co-financing has been completed and submitted to UNEP/DGEF as of 31 December of each year using the format given in Annex XVIII, however there is no clear understanding of donor co-financing because of absence of relevant information from Partner Agency (ACOPS).

Benchmark for the completion of the Phase I for Project Management Component “Successful establishment of Project implementation structure, including Project Office, Project Steering Committee, and Project Supervisory Council” is fully accomplished.

Among activities performed by the Project Office within Project Management component are the following:

- ***Organization of the different meetings required by Project Document***: Project Steering Committee meeting in November 2005 to launch the Project; Interagency Working Group meeting of Russian stakeholders in March 2006; 4 Supervisory Council meetings in form of teleconference; TT-SAP and WG-SAP meetings; PINS-WG and DEMOS-WG meetings. In addition different meetings

devoted to discussion of potential small pilot project, prepared conceptual documents for DEMOS have been also organised. Packages of documents have been prepared for all the above meetings.

- ***Equipment of the Project Office:*** Project Office is equipped with all necessary office facilities on a basis of tender to supply office equipment carried out together with UNDP.
- ***Tax-free status and bank accounts***: Project has been registered in the Commission for Humanitarian and Technical Assistance under the Government of the Russian Federation and The Certificate of Accepting of the Project as a Grant (technical assistance) has been obtained (tax-free status). Bank accounts (for rouble and dollar currencies) under ED NPAF have been opened.
- ***Selection of consultants and service providers***: seven packages of tender documentations to select consultants for the SAP WG1, WG2, WG3, for WG PINS and for 3 demo projects WGs have been conducted. ToRs for consultants and WGs have been prepared and agreed with both Executing and Implementing Agencies. Project office has been also participated in preparation of ToRs for consultants hired by donor funds.
- ***Increasing awareness on the Project:*** Project website has been worked out, uploaded in internet and has been maintaining and updating on the constant base (http://npa-arctic.ru/). Project staff participated in several international and national meetings, including PAME Working Group of the Arctic Council, on different aspects of environmental issues in the Arctic.
- ***Other activities:*** Two systems for conference calls have been tested and several meetings in form of international teleconference between members of the Steering Committee, Supervisory Council, Executing, Implementing and Partner Agencies have been held.

3. STRATEGIC ACTION PROGRAMME (SAP)

Work on the SAP Project component started in March of 2006 after selection of TT coordinator in February 2006. Formal procedure for evaluation of consultant's reports has not been elaborated in addition to the specified in the Procurement Guidelines and Procedure for Disbursement of Donor Funds from the Trust Funds and Relevant Reporting. Inability of the Project Office to resolve the issue of contracts issuing and payments via UNDP (contracts were not issued by UNDP from July to November) also resulted in delay with this component implementation.

The progress as compared with the original Integrated Work Plan is illustrated in the Table below (proposals for completion of the SAP are also given there):

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
1.1	Proposals and selection of the Task Team (TT) Co-ordinator.	Approval of TT Co-ordinator familiar with the methodology for the preparation of the SAP and familiar with the organisations and individuals that might be involved in the preparation of the SAP. *Output 100 %*	Manager/ ExA	January 2006	February 2006	completed
1.2	Proposals and selection of the TT members.	Selection of TT members to cover all major sectors of the SAP and the NPA-Arctic. *Output 100 %*	Manager/ ExA	January 2006	February 2006	completed
1.3	Preparation of the consultancy contract with TT Co-ordinator.	Signed contract with TT Co-ordinator, including duties, outputs, work plan, timetable and other details. *Output 100 %*	Manager/ ExA	January 2006	February 2006	completed
1.4	Preparation of consultancy contracts with TT members.	Draft contracts including duties, outputs, work plan, timetable and other details discussed with the potential TT members and signed subsequently. *Output 100 %*	Manager	January 2006	March 2006	completed
1.5	Preparation of the working document to be considered at the First Meeting of the TT.	Working document to include the basic SAP concept; objectives; principles; content; outputs; work plan; timetable; role of TT co-ordinator and members, as well as lead organisation; procedure for the national and international review of the draft SAP; procedure for the adoption of the SAP; and basic ideas about the implementation mechanism. The document is also to contain proposals for the terms of reference for the TT. This document is to be considered, amended and adopted by the First Meeting of the TT. *Output 100 %*	TT co-ordinator/ Manager	February 2006	February 2006	completed
1.6	Review of the working document at the First Meeting of the TT.	Report of the meeting to include the basic SAP concept; objectives; principles; content; outputs; work plan; timetable; role of TT co-ordinator and members, as well as lead organisation; procedure for the national and international review of the draft	TT co-ordinator/ Manager	February 15, 2006	February 15, 2006	completed

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
		SAP; procedure for the adoption of the SAP; and basic ideas about the mechanism of the implementation; terms of reference for the TT; tender documentation for selection of the lead co-operating organisation; and decision on the establishment of working groups. *Output 100 %*				
1.7	Preparation of ToR for lead co-operating organisation. Carrying out of the tender and preparation of the contract with the lead co-operating organisation.	ToR is prepared. Signed contract with the tender winner lead co-operating organisation that includes duties, outputs, work plan, timetable and other details in compliance of schedule of payments. *Output 0 %*	TT co-ordinator/ Manager	May 2006	June 2007	It was agreed to use a lead cooperating organisation for preparation and publishing of final SAP and DA documents and for organisation of round-table discussions
1.8	Preparation of ToRs for WGs and their consultants (activities 1.8.1 – 1.8.7 will be carried out by these WGs).	Established WGs for particular topics and with defined tasks, work plan, timetable, outputs and other details. *Output 100 %*	TT co-ordinator/ Manager in coordination with ExA and PA	March –May 2006	WG1 on SEA – March 2006 WG2 – SHA– July 2006 WG3 – FM– January 2007	WG1 – WG3 have been established and functioning;
1.8.1	Development of financial mechanisms of the SAP implementation	Scoping report on mechanisms of financing the activities included into the SAP *Output 70 %*	TT co-ordinator/ Manager in coordination with ExA and PA	September 2006	April 2007	ToR for this activity is issued in Dec 2006, international and national consultants are hired by ACOPS
1.8.2	Regional aspects of SAP	Scoping report on regional SAP sub-programs with recommendations for SAP *Output 40 %*	TT co-ordinator/ Manager in coordination	August 2006	May 2007	Delays with responses from regions.

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
			with ExA and PA			
1.8.3	Strategic environmental assessment of the SAP under development	Report on SEA to support SAP with recommendation on improvement of SAP *Output 80 %*	TT co-ordinator/ Manager in coordination with ExA	August 2006	May 2007	Delays with consultant contract finalization and remunerations as a result of improper UNDP work
1.8.4	Diagnostic analysis of environmental situation in Arctic region	Interpretive reports on environmental problems in Russian Arctic with recommendations for SAP *Output 100 %*	TT co-ordinator/ Manager in coordination with ExA and PA	April 2006	July 2006	Completed; ll be prepared
1.8.5	Causal chain analysis	Report on causal chain analysis with recommendations *Output 80 %*	TT co-ordinator/ Manager in coordination with ExA and PA	June 2006	April 2007	Draft report nearly completed and sent to ACOPS for revision
1.8.6	Stakeholder analysis and development of public involvement	Stakeholder perception survey report and draft public involvement plan *Output 50 %*	TT co-ordinator/ Manager in coordination with ExA and PA	August 2006	June 2007	ToRs are developed and contracts with consultants are signed. Draft reports from federal consultant and 2 regional consultants have been received
1.8.7	Information of stakeholders and communication strategy to public on project results	Report on information of public and stakeholders and communication plan *Output 20 %*	TT co-ordinator/ Manager in coordination with ExA	June 2007	June 2007	ToRs are developed

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
1.9	Preparation of the first draft of the SAP to be reviewed at the Second Meeting of the TT.	The first draft of the SAP prepared in accordance with the conclusions and recommendations elaborated at the First Meeting of the TT. *Output 100 %*	TT co-ordinator/ Manager	May 2006	September 2006	Delay with consultant contract finalization and remunerations as a result of improper UNDP work and inability of the PO to resolve the issue on time
1.10	Review of the first draft of the SAP at the Second Meeting of the TT	Report of the meeting to include detailed comments on the first draft of the SAP that will enable effective amendment of the document; to include the work plan, timetable, and distribution of tasks for the preparation of the second draft of the SAP; and to include a decision to which federal and regional departments and agencies and industrial enterprises the second draft will be sent for comments. *Output 100 %*	TT co-ordinator/ Manager in coordination with ExA	June 2006	February 2007	Delays with consultant contract finalization and remunerations as a result of improper UNDP work and inability of the PO to resolve the issue on time
1.11	Preparation of the second draft of the SAP.	The second draft of the SAP, to include response to comments and suggestions made at the Second Meeting of the TT. This draft will be sent to federal and regional executive authorities, agencies and companies of all forms of ownership for comments. *Output 0 %*	TT co-ordinator/ Manager	June 2006	May 2007	Inability of the PO to resolve the issue on time and management problems with the SAP TT
1.12	Review of the second draft of the SAP by federal and regional executive authorities.	Comments by federal and regional executive authorities that will be taken into account in preparing the third draft of the SAP. *Output 0 %*	TT co-ordinator/ Manager in coordination with ExA	June - July 2006	June 2007	Planned for June 2007
1.13	Preparation of the third draft of the SAP to be reviewed at the Third Meeting of the TT,	The third draft of the SAP, to address comments by federal and regional executive authorities. *Output 0 %*	TT co-ordinator/ Manager	July 2006	July 2007	Planned for July 2007

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
	Moscow.					
1.14	Review of the third draft of the SAP at the Third Meeting of the TT, Moscow.	Report of the meeting to include detailed comments on the third draft; decision to whom in the international community fourth draft will be sent for comments; and detailed procedure of the process of adoption of the SAP by executive authorities of the Russian Federation. *Output 0 %*	TT co-ordinator/ Manager	August 2006	July 2007	Planned for July 2007
1.15	Preparation of the fourth draft of the SAP.	The fourth draft of the SAP, to address comments by the TT. This draft is to be sent to the international partners for comments. *Output 0 %*	TT co-ordinator/ Manager	August 2006	August 2007	Planned for August 2007
1.16	International review of the SAP	Comments by international community on the fourth draft of the SAP. Comments received are addressed *Output 0 %*	TT co-ordinator/ Manager in coordination with ExA and IA	September 2006	September 2007	Planned for September 2007
1.17	Preparation of the fifth draft of the SAP.	The fifth draft of the SAP, to address comments by the international community. This draft will be sent to executive authorities of the Russian Federation for adoption. *Output 0 %*	TT co-ordinator/ Manager	October 2006	November 2007	Planned for November 2007
1.18	Endorsement of the SAP by relevant state authorities after taking into account comments received on a basis of international evaluation	Endorsed SAP, ready for approval. *Output 0 %*	Manager/ExA	December 2006	December 2007 – January 2008	Planned for December 2007 – January 2008
1.19	Adoption of the SAP by the relevant executive authority.	SAP adopted by the relevant executive authority of the Russian Federation. *Output 0 %*	Manager/ExA	January 2007	December 2007	Planned for December2007

4. PRE-INVESTMENT STUDIES (PINS)

The progress as compared with the original Integrated Work Plan is illustrated in the Table below:

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion	Status and description of problems encountered if activity is not completed as scheduled
2.1	Proposals for and selection of the Co-ordinator of the Working Group (WG) for Pre-Investment Studies (PINS) will be prepared.	Approval of the selected WG Co-ordinator familiar with the methodology for the preparation of PINS and familiar with the organisations and individuals that might be involved in the preparation of PINS. *Output 100 %*	Manager/ExA	March 2006	April 2006	completed
2.2	Proposals for and selection of the WG members.	Approval of the selected WG members for development of criteria for the hot spots selection and co-ordination of PINS taking into account environmental, economic, social and political factors. The WG will be composed of 8 Russian and 3 International consultants, and 1 representative from the Executing Agency. *Output 100 %*	Manager/ExA	April 2006	May 2006	completed
2.3	Preparation of the consultancy contract with WG Co-ordinator.	Signed contract with WG Co-ordinator, including duties, outputs, work plan, timetable and other details. *Output 100 %*	Manager/ExA	April 2006	May 2006	completed
2.4	Preparation of consultancy contracts with WG members.	Draft contracts, including duties, outputs, work plan, timetable and other details, to be discussed with the potential consultants and signed subsequently. *Output 100 %*	WG Co-ordinator / Manager	April 2006	May 2006	completed
2.5	Preparation of the working document to be considered at the First Meeting of the WG.	Working document to include the basic concept of PINS; overview of priority environmental hot spots selected during the work on the NPA-Arctic and PDF B GEF Project; objectives and the content of PINS; work plan; timetable; and the role of the co-ordinator of the WG and its members and of the lead cooperating and participating organisations. The document is also to contain proposals for the criteria for the selection of hot spots for which PINS will be prepared and terms of reference for the WG. This document is to be considered, amended and adopted by the First Meeting of the WG. *Output 100 %*	WG Co-ordinator / Manager	April 2006	June 2006	completed
2.6	Review of the working	Report of the meeting to include the basic concept of PINS;	WG Co-	May	July	Selected consultants

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion	Status and description of problems encountered if activity is not completed as scheduled
	document at the First Meeting of the WG, Moscow.	overview of hot spots selected during the work on the NPA-Arctic and PDF B GEF Project; objectives and targets, the content and outputs of PINS; work plan and timetable; the role of the co-ordinator of the WG and its members and of lead cooperating and participating organisations. The Report is also to contain proposals for the criteria for selection of hot spots for which PINS will be prepared and terms of reference for the WG. *Output 90 %*	ordinator / Manager	2006	2006	do not have a proper expertise in this field; Coordinator of the WG resigned; prepared report was criticized by PO, ExA and IA for below-standard quality.
2.7	Update and review of the existing hot spots identified at PDF-B stage	Update (data collection), review and analysis of the situation with hot spots *Output 50 %*	WG co-ordinator / Manager in coordination with PA	June 2006	May 2007	ToR has been prepared and consultants are hired
2.8.	Preparation of Guidelines on conduction of preinvestment studies	Guidelines for conducting the preinvestment studies (methodology and procedures) *Output 90 %*	WG co-ordinator / Manager in coordination with PA	June 2006	April 2007	Delays with consultant contract finalization and issuing the contracts by ACOPS.
2.9	Development of criteria for selection of hot spots for which PINS will be prepared, on the basis of comments given at the First Meeting of the WG.	Criteria for selection of hot spots for which PINS will be prepared, which will include criteria for taking into account environmental, economic, social, and other aspects in the process of selection. *Output 50 %*	WG Co-ordinator / Manager in coordination with PA	July 2006	Februar y 2007	Delays with consultant contract finalization and remunerations as a result of improper UNDP work Inability of the PO to resolve the issue on time and management problems with the PINS WG
2.10	Hot spots screening and selection. Preparation of	On the basis of the work done on analysis of environmental hot	WG Co-ordinator /	Septe mber	May 2007	Not quite adequate understanding by

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion	Status and description of problems encountered if activity is not completed as scheduled
	the list of potential pre-investment studies.	spots in the PDF B GEF Project, the hot spots identified in the NPA-Arctic and submitted by federal and regional authorities, the list of potential pre-investment studies will be prepared. Using the adopted criteria for selection, about 8-10 hot spots will be selected for which PINS will be prepared. Output 50 %	Manager in coordination with PA	2006		consultants of their tasks. Inability of the PO to resolve the issue on time and management problems with the WG PINS
2.11	Preparation of tenders dossiers and ToRs for cooperating organisations. Selection of lead cooperating organisations for the conduction of PINS.	Tender for the selection of three lead cooperating organizations for conducting PINS (for the western, central and eastern parts of the Russian Arctic) will be announced by the Project Office. Terms of reference for lead cooperating organisations will be included in the conditions of the tender. *Output 0 %*	WG Co-ordinator / Manager in coordination with PA	Sep 2006 to Jan 2007	May 2007	Planned for May 2007
2.12	Selection of hot spots for which PINS will be done, at the Second Meeting of the WG.	The Report of the Second Meeting will include selected hot spots and the rationale for the selection. *Output 0 %*	WG Co-ordinator / Manager	August 2006	May 2007	Planned for May 2007
2.13	Concluding the contracts with bid-winners	On the basis of the tender and criteria adopted by the Executing Agency, three lead cooperating organisations are selected. Contracts are concluded that includes schedule of payments. *Output 0 %*	WG Co-ordinator / Manager	September 2006	June 2007	Planned for June 2007
2.14	Preparation of ToRs for sub-groups (SGs) for each PINS and their consultants	ToRs for SGs and consultants for each PIN Study will be prepared. Each SG will consist of the co-ordinator, up to five Russian consultants and one or two international consultants. The SGs will co-operate with lead cooperating organisations and participating organisations, which will be defined by lead cooperating organisations and approved by Project Office. *Output 0 %*	SG Co-ordinator / Manager	September 2006	October 2007	It was decided to avoid creation of the sub-groups under WG

4. ENVIRONMENTAL PROTECTION SYSTEM IMPROVEMENTS (EPS)

This Component will be started after the SAP is close to endorsement

5. DEMONSTRATION PROJECTS (DEMOS)

CLEANUP-DEMO project (Remediation of the Environment through the use of Brown Algae):

On 21st of March PO organised a meeting of nationally and internationally recognised Russian experts with the purpose to get a clear vision of, scientific and economic validation of the projects and its readiness to be accepted as a demonstration project. Meeting participants supported the idea of developing the experimental marine brown algae plantation as a whole. Nevertheless, meeting concluded that the project “as it is” cannot be qualified as a demonstration project. The project can be prepared in its capacity of a pilot project to target minimisation of an anthropogenic stress imposed by “Nerpa” enterprise on Kola Bay marine environment. The enterprise could take a part in the project development and implementation. The meeting also proposed to re-qualify the CLEANUP demo-project into a pilot project what would fit more to its design at the moment. The meeting is invited to take a decision on this subject. Practical implementation of this project can be started in May-June 2007.

COMAN-DEMO project (Indigenous Environmental Co-management)

A field-mission under the COMAN-demo project was finished on November 14, 2006 and draft Proposal for this demonstration Project has been submitted to the Project Office in December 2006. This proposal did not contain in full extent the necessity of reflecting of positive experience existing in several northern regions of the Russian Federation, as it was stipulated by the Project Document. During the last months this document was further elaborated by WG-COMAN and agreed with both Executing and Implementing Agencies. Tender for fulfillment of this DEMO-Project will be announced just after the Project Steering Committee meeting.

BASES-DEMO project (Environmental remediation of two decommissioned military bases)

Franz Josef Land project was proposed as a remediation site for military base. Franz Josef Land Project is supported by the Arctic Council and major international stakeholders. Steering Committee is invited to make decision on Frantz Josef Land Project.

The progress as compared with the original Integrated Work Plan is illustrated in the Table below:

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
4.1	Proposals for and selection of the Co-ordinator of the WG on Contaminant Clean-up (WG CLEANUP).	Approval of the WG Co-ordinator familiar with the methodology for decontamination of marine waters through the use of brown algae as well as of organisations and individuals that might be involved. *Output 100 %*	Manager / ExA	March 2006	March 2006	Completed
4.2	Proposals for and selection of the WG CLEANUP members.	Approval of the WG members to cover various aspects of this demonstration project. *Output 100 %*	Manager / ExA	April 2006	March 2006	Completed
4.3	Preparation of the consultancy contract with the WG CLEANUP Co-ordinator.	Signed contract with the WG Co-ordinator, including duties, outputs, work plan, timetable and other details. *Output 100 %*	Manager / ExA	April 2006	October 2006	Completed Delays with consultant contract issuing
4.4	Preparation of consultancy contracts with the WG CLEANUP members.	Draft contracts, including duties, expected outputs, work plan, timetable and other details, to be discussed with the potential consultants and signed subsequently. *Output 100 %*	WG Co-ordinator / Manager	April 2006	October-November 2006	Completed Delays with consultant contract contracts issuing
4.5	Preparation of the working document to be considered at the First Meeting of the WG CLEANUP.	Working document to include basic concept of the Contaminant Clean-up method; draft terms of reference for the WG, including expected outputs, work plan, timetable and other details; the role of the co-ordinator of the WG and its members; the role of the lead cooperating organisation. This document is to be considered, amended and adopted by the First Meeting of the WG. *Output 100 %*	WG Co-ordinator / Manager in coordination with PA	May 2006	October 2006	Completed Delays with consultant contract finalization and the contracts issuing
4.6	Review of the working document at the First Meeting of the WG CLEANUP, Moscow.	Report of the meeting to include basic concept of Contaminant Clean-up method; terms of reference for the WG, including outputs, work plan, timetable and other details; the role of the co-ordinator of the WG and its members; the role of the lead cooperating organisation. *Output 100 %*	WG Co-ordinator / Manager in coordination with PA	June 2006	March 2007	Not quite adequate understanding by consultants of their tasks.

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
4.7	Preparation of ToR and conduct of the tender and preparation of the contract with the lead cooperating organisation for the development of Contaminant Clean-up demonstration.	ToR for the lead cooperating organization for the development of CLEANUP-DEMOS is prepared. Signed contract with the lead cooperating organisation (which won the tender) to include duties, expected outputs, work plan, timetable and other details. Contract is concluded that includes schedule of payments *Output 50 %*	WG Co-ordinator / Manager in coordination with PA	August 2006	May 2007	Planned for March 2007
4.8	Proposals for and selection of the Co-ordinator of the WG on Indigenous Environmental Co-Management (WG COMAN).	Approval of the WG Co-ordinator familiar with the methodology for the implementation of the Indigenous Environmental Co-Management Project as well as of organisations and individuals that might be involved. *Output 100 %*	Manager /ExA	July 2006	August 2006	Completed
4.9	Proposals for and selection of the WG COMAN members.	Approval of the WG members to cover various aspects of this demonstration project. *Output 100 %*	Manager	August 2006	August 2006	Completed
4.10	Preparation of the contract with the WG COMAN Co-ordinator.	Signed contract with the WG Co-ordinator including duties, expected outputs, work plan, timetable and other details. *Output 100 %*	Manager /ExA	September 2006	November 2006	Completed
4.11	Preparation of contracts with the WG COMAN members.	Draft contracts, including duties, outputs, work plan, timetable and other details, to be discussed with the potential consultants and signed subsequently. *Output 100 %*	WG Co-ordinator / Manager	October 2006	November 2006	Completed
4.12	Proposals for and selection of the Co-ordinator of the WG on the Environment Remediation in the areas of Two Decommissioned	Approval of the WG Co-ordinator familiar with the methodology for the environment remediation in the areas of two decommissioned military bases as well as of organisations and individuals that might be involved. *Output 100%*	Manager /Executing Agency	November 2006	August 2006	Completed

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
	Military Bases (WG BASES).					
4.13	Proposals for and selection of WG the BASES members.	Approval of the WG members to cover various aspects of this demonstration project. *Output 100 %*	ExA/Manager	November 2006	August 2006	Completed
4.14	Preparation of the contract with the WG BASES Co-ordinator.	Signed contract with the WG Co-ordinator, including duties, expected outputs, work plan, timetable and other details. *Output 100 %*	ExA/Manager	November 2006	October 2006	Completed
4.15	Preparation of contracts with the WG BASES members.	Draft contracts, including duties, expected outputs, work plan, timetable and other details, to be discussed with the potential consultants and signed subsequently. *Output 100 %*	WG Co-ordinator / Manager in coordination with PA	November 2006	November 2006	Completed
4.16	Preparation of the working document to be considered at the First Meeting of the WG COMAN.	Working document to include basic concept of the environmental co-management method for extracting companies and indigenous peoples of the North; overview of relevant needs identified during the work on the NPA-Arctic and PDF B GEF Project; draft terms of reference for the WG, including expected outputs, work plan, timetable and other details; the role of the co-ordinator of the WG and its members; the role of the lead cooperating organisation. This document is to be considered, amended and adopted by the First Meeting of the WG. *Output 100 %*	WG Co-ordinator / Manager in coordination with PA	October 2006	December 2006	Completed Draft of the project document for this demo-project has been prepared however requires further improvement
4.17	Preparation of the working document to be considered at the First Meeting of the WG BASES.	Working document to include basic concept of the environmental remediation method for the areas of two decommissioned military bases; overview of relevant needs identified during the work on the NPA-Arctic and PDF B GEF Project; draft terms of reference for the WG, including outputs, work plan, timetable and other details; the role of	WG Co-ordinator / Manager in coordination with PA	October 2006	March 2007	There is a problem with a final selection of a remediation site

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
		the co-ordinator of the WG and its members; the role of the lead cooperating organisation. This document is to be considered, amended and adopted by the First Meeting of the WG. *Output 50 %*				
4.18	Review of the working document at the First Meeting of the WG COMAN, Moscow	Report of the meeting to include basic concept of the environmental co-management method for extracting companies and indigenous peoples of the North; overview of relevant needs identified during the work on the NPA-Arctic and PDF B GEF Project; terms of reference for the WG, including expected outputs, work plan, timetable and other details; the role of the co-ordinator of the WG and its members; the role of the lead cooperating organisation. *Output 100 %*	WG Co-ordinator / Manager in coordination with PA	November 2006	May 2007	Planned for May 2007
4.19	Preparation of ToR and conduct of the tender and preparation of the contract with the lead cooperating organisation for Indigenous Environmental Co-Management	ToR is prepared. Signed contract with the lead cooperating organization (which won the tender) to include ToR, expected outputs, work plan, timetable, schedule of payments for the contract and other details. *Output 50 %*	WG Co-ordinator / Manager in coordination with PA	November 2006	May 2007	Planned for May 2007
4.20	Review of the working document at the First Meeting of the WG BASES, Moscow.	Report of the meeting to include basic concept of the environmental remediation method for the areas of two decommissioned military bases; overview of relevant needs identified during the work on the NPA-Arctic and PDF B GEF Project; draft terms of reference for the WG, including outputs, work plan, timetable and other details; the role of the co-ordinator of the WG and its members; the role of the lead cooperating	WG Co-ordinator / Manager in coordination with PA	November 2006	May 2007	Planned for May 2007 for FJL project

No.	Activity	Output and Output status (estimate in %)	Responsible person / Agency *	Set in IWP target date	Actual date of completion or date to be completed and by whom if different from previous column	Status and description of problems encountered if activity is not completed as scheduled
		organisation. *Output 0 %*				
4.21	Preparation of ToR and conduction of the tender and preparation of the contract with the lead cooperating organisation for the environmental remediation in the areas of two decommissioned military bases	ToR is prepared. Signed contract with the lead cooperating organisation (which won the tender) to include ToR, expected outputs, work plan, timetable, schedule of payments for the contract and other details. *Output 0 %*	WG Co-ordinator / Manager Manager in coordination with PA	December 2006	May-June 2007	Planned for May-June 2007
4.22	Preparation of Progress Report to be considered at the Second Meeting of the WG CLEANUP.	Progress Report to include suggestions for further work. *Output 100 %*	WG Co-ordinator / Manager	January 2007	May 2007	Planned for May 2007
4.23	Review of the Progress Report at the Second Meeting of the WG CLEANUP, Moscow.	Report of the meeting and reviewed Progress Report with suggestions for further work. *Output 0 %*	WG Co-ordinator / Manager	February 2007	September 2007	Planned for September 2007
4.24	Preparation and Review of Progress Report to be considered at the Second Meeting of the WG BASES	Reviewed Progress Report with suggestions for further work *Output 0 %*	WG Co-ordinator / Manager	April 2007	October 2007	Planned for October 2007
4.25	Preparation and Review of Progress Report to be considered at the Second Meeting of the WG COMAN	Reviewed Progress Report with suggestions for further work *Output 0 %*	WG Co-ordinator / Manager	April 2007	October 2007	Planned for October 2007

CONCLUSIONS

During reported period the priority environmental issues of the Russian Arctic have been identified, key SAP goals as well as key tasks have been agreed upon in the SAP TT. In addition new pilot and demonstration projects have been proposed.

On average, there is delay in Project implementation. The main reasons for this delay are:

(i) procedure for disbursement of donors' funds was agreed by August 2006 only,

(ii) mechanism for coordinating activities between PO and ACOPS is absent or inefficient, especially in a part dealing with funds available for Project co-financing.

(iii) difficulties with preparation of Integrated Work Plan for Phase I due to uncertainty with donors' funds for some activity of the Project,

(iv) UNDP postponed the finalisation of consultant contracts and payments for contracts for 5 months from July to November, 2006; PO was not able to rule out the situation, and

(v) Starting from January of 2007 the PO changed its status and joined the ED NPAF as its department in accordance with an Agency Agreement between Minekonomrazvitiya of Russia and the legal entity ED NPAF. Project Office could not resolve formalities proposed by NPAF during next 3 months despite of assistance of both Executing and Implementing Agencies

KEY LESSONS LEARNED

The success of the project depends on level of involvement of top-level stakeholders from governmental institutions at federal and regional level, the implementation of the activities at the regional level as well as on proper channeling contributions from donors and the Russian Federation for the project needs. Bearing this in mind, during the reporting period for the project implementation PO continued to pay a special attention to defining clear procedures of project management mechanisms and administrative procedures. Taking into account that in the project implementation Executing Agency and Partner Agencies involved which have different political importance and possibilities and as result with different approaches to the project implementation, special attention was given to preparation of the most important documents necessary to give impetus to the project implementation, namely, Procedure of Disbursement of Donor Funds from the Trust Funds and Relevant Reporting, Procedure of Co-financing through NEFCO Funds and Relevant Reporting as well as adoption of Integrated Work Plan for Phase I that includes all sources of financing. Special emphasis was also given to establish good working relations with the Arctic regions of the Russian Federation.

The success achieved to date in the implementation of the project is directly related to sustained political commitment at federal and regional levels, ensuring the adequate level of the project ownership, to the broad-based public support, including support of indigenous communities it has received as well as to closer cooperation with existing and planned programmes and projects in Arctic region. The maintenance of this support requires effective dissemination of accurate information about the objectives, achievements and challenges of the project. The broad support is critical for mobilization of domestic resources and obtaining commitments from municipalities, local NGOs and companies of all forms of ownership. However it should be noted that the dissemination of information on project implementation requires further improvement.

Amongst other lessons learned it should be noted the following:

Institutional arrangements, including project governance

- Closer cooperation amongst existing and planned programmes that address the impact of various sources and activities on the Arctic marine and coastal environments is needed. Information on the Project was presented at the Arctic Council ministerial meeting as well as to Senior Arctic Officials and PAME Working Group. Russian NPA-Arctic activity is noted in Salekhard Declaration, SAOs' Report to Ministers, Arctic Marine Strategic Plan and work plan of PAME for 2006-2008. The work of several other Arctic Council Working Groups, first of all ACAP, is very pertinent to the NPA-Arctic and Project Office should consider how these sources of expertise could be best incorporated.

- The compatibility of NPA-Arctic that corresponds to related governmental commitments under the Arctic Council, the GPA, and obligations under different conventions and other pertinent intergovernmental agreements as well as reflection of the national practices needs to be considered by Project Office, and SAP and PINS WGs. Format of the final SAP document as well as the endorsement procedure should accommodate both, national and international practices, TT-SAP of NPA-Arctic GEF project decided to develop SAP document incorporating elements of the Federal Targeted Programme (regional interventions matrix with cost estimates and financial sources) keeping at the same time internationally recognized elements of such documents (e.g., causal chain analysis)

- Key federal and regional bodies' technical support in the process of finalisation of diagnostic analysis of current state of Arctic environmental situation is of very high importance. Regional and federal authorities provided necessary information (copies of latest reports on environmental protection for the regions, other information specifically requested by the Project Office).

- Information on the project should be further disseminated at the widest possible levels through the project web-site as well as mass-media, including regional sources. Formal and informal communication mechanisms for the exchange of information should be further developed.

- The process of screening and selection of hot spots in Arctic regions of the Russian Federation at the PDF-B stage has been performed more than five years ago and information obtained is currently outdated.

- Almost all PDF-B stage documents are available in English only. This resulted in their very limited use by authorities at federal and regional levels.

- There are problems with the information exchange among PO, IA, ExA, ACOPS and NEFCO and day-to-day planning of project activities.

Financial management and co-financing

- Further work is needed for involvement of key stakeholders from Arctic regions and industrial companies to increase their commitments, obtaining necessary information on regional and private co-financing and their involvement in preparation of investment projects.

Follow-up action: To establish closer cooperation with industrial companies of all forms of ownership and invite them to participate in PINS working group.

- There is no clear understanding with donors' funding for the whole project. No information on funds of such donors as Italy and IOC UNESCO is available. Considerable part of Canadian and Italian funds have been spent by ACOPS until beginning of UNEP/GEF project implementation. New donors have not been involved and new funds have not been attracted. This is main task of the ToR for the Partner Agency according to Annex X to the Project Document with regard to donor funds.

Follow up action: To urge ACOPS to fulfill the ToR for Partner Agencies according to Annex X to the Project Document with regard to attract donor funds and to provide a comprehensive report on disbursement of donor funds for the co-financing of the Project.

- Up to August 2006 lack of consensus on disbursement of donor funds from Trust Funds established by Partner Agencies slows the process down;

The following ***advantages*** can be formulated:

- Sustain political commitment at federal and regional level ensuring the adequate level of project ownership;

- Broad public involvement including organization of indigenous people of North;

- Formal and informal communication mechanisms for the exchange of information, which have been developed;
- Institutional procedures and structures have been established for long-term dialogue and for the continuous participation of multiple-stakeholders.
- creation of the Project website what helps in the Project publicity: http://npa-arctic.ru/

The following ***disadvantages or weaknesses*** can be noted:

- Members of interagency working group in Arctic regions as a rule are heads of corresponding environmental agencies or top-level representatives of regional administrations with a rather tight schedule and a lot of duties which caused delays in responses from Arctic regions. Contact persons for day-to day communication can be proposed. Representatives of industrial companies in this group are as a rule the persons who are responsible for environmental issues in their companies and they respond only after getting permission of top managers. This also causes delays in communication.
- Relatively small involvement at this stage of industrial companies of different ownership in the process. ExA invited several large companies to participate in the Project implementation and to hold negotiations on this issue. Positive responses were received. Representatives of three companies were included in Interagency working group. However negotiations on co-financing have not been hold yet. They should be arranged by Project Office together with ExA as it was planned at the stage of PINS implementation. Representatives of companies should be invited to participate in PINS working group ASAP.
- Insufficient capacities of the Project Office staff. Project Office organizes and coordinates all the activities, prepares all ToRs for task teams, working groups, individual consultants, etc. In addition all these documents should be prepared in English and Russian, which require additional resources and time. More active involvement of working groups' Coordinators in preparation of ToRs for consultants and meetings of working groups is needed.

Specific lessons learnt in relation to Project components:

I. SAP

Work on the SAP Project component started at the beginning of the year 2006. During reporting period main problem was connected with hiring international and national consultants financed by donors' funds. The results of activities performed by consultants hired by ACOPS are delivered to the PO after their completion and it was impossible to make any comments to these results. In addition content of the first part of the reports on diagnostic analysis of the current state of environmental situation in the Russian Arctic were not agreed with the Project

Office. Procedure for evaluation of consultant's reports should be additionally elaborated in addition to the specified in the Procurement Guidelines and Procedure for Disbursement of Donor Funds from the Trust Funds and Relevant Reporting.

II. PINS

Main reasons for the delay and problems with the PINS component implementation can be addressed to the improper consultants' fulfillment of their duties and inadequate understanding of the PINS component documentations requirements. Unhealthy pressure of NPAF to the activities of this component consultant reports should be also avoided. In addition, the PINS coordinator Mr. M. Yulkin left the project.

III. EPS

This component has not started yet.

IV. *DEMOS*

The common lessons learnt from DEMOS project preparatory stage that consultants tried to prepare the project concept bearing in mind that the DEMOS project implementation will be implemented by corresponding institution they do represent.

The main lessons learned during the reporting period are common for all project activities:

Project was delayed from schedule due to preparation of 3-month IWP and IWP for Phase I according to the Project Steering Committee decision, vagueness with co-financing funds value and procedure of disbursement. Attempts undertaken by the Project Office to intensify the work during the summer time were totally blocked by UNDP that could not conclude the contracts with consultants in a timely manner. For example, contracts with consultants on DEMOS were issued only in November despite of all necessary documents for contracting these consultants were handed over by PO at the early beginning of July. When PO started to use Project Special Account in the ED NPAF new unpredicted formalities appeared.

There is an unsatisfactory interaction with Partner Agency, mainly ACOPS, which still considers itself as an Executing Agency but not as a Partner Agency with functions described in the Project Document. ACOPS should speed up the process of issuing contracts for international and Russian consultants, which are planned for SAP and PINS activities. Draft reports of activities performed should be delivered to the Project Office in a timely manner for comments.

Taking into account all above as well as on a basis of consultation with Implementing and Executing Agencies the Project Office suggests to consider

possibility to prolong the Phase 1 of the Project implementation for about 1.5 year pending decision of the Project Steering Committee and changes in the IWP. PO considers this reasonable having in view that majority of field activity can be carried out only during time frame from April to October. In addition several new pilot and demonstration projects should be conducted and completed during the extended Phase I to make its output more significant. More detailed justification of necessity of prolongation of Phase I of the Project is given in special document prepared for this Steering Committee meeting.

ANNEX V

STEERING COMMITTEE

of the UNEP/GEF Project

"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting

Saint Petersburg, the Russian Federation

April 25 - 26, 2007

STC 2/3

Item 3 of the Agenda

Draft

STRATEGIC ACTION PROGRAMME

FOR THE PROTECTION OF THE MARINE ENVIRONMENT FROM POLLUTION IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION

Conceptual notes

Prepared by: Project Office
Status: approved by the Project Steering Committee

STRATEGIC ACTION PROGRAMME

FOR THE PROTECTION OF THE MARINE ENVIRONMENT

FROM POLLUTION IN THE ARCTIC ZONE

OF THE RUSSIAN FEDERATION

Conceptual notes

April 2007

Annotation

The Strategic Action Programme for the Protection of the Marine Environment from Pollution in the Arctic Zone of the Russian Federation (SAP-Arctic) has been developed to create necessary conditions and implement measures to prevent, reduce and eliminate the impact of land-based and sea-based pollution in the Russian Arctic to levels permitting sustainable development, taking into account the interests of the human population, including the indigenous peoples of the North. The SAP-Arctic is consistent with the Concept of National Security of the Russian Federation, the Concept of Transition of the Russian Federation to Sustainable Development, the Main Trends of Socio-Economic Development of the Russian Federation for a Long-Term Period, the Environmental Doctrine of the Russian Federation, the Fundamentals of the National Policy of the Russian Federation in the Arctic, the National Plan of Action for the Protection of the Marine Environment from Anthropogenic Pollution in the Arctic Region of the Russian Federation and the Regional Programme of Action to Protect the Arctic Marine Environment from Land-Based Activities.

The long-term objectives of the SAP-Arctic are: (1) prevention and elimination of the pollution of coastal and marine environment as a result of land-based and sea-based activities, including oil and chemical and radioactive pollution; (2) improvement of the quality of drinking water supply; (3) Conserving the biological and landscape diversity and capacity of the renewable natural resources impacted by the man-induced pollution; (4) support and maintaining the enabling conditions for traditional nature uses of indigenous peoples of the North; (5) reducing the level of natural and man-made risks from industrial facilities and utilities as a result of global climate change. The SAP-Arctic includes costed and targeted measures to attain improved environmental protection in the Arctic region of the Russian Federation with target dates of their implementation and expected costs, taking into account the current state of the environment in the Russian Arctic and predicted scale of its pollution.

The SAP-Arctic will be implemented under the Federal Target Program «World Ocean» and other budget and corporate target programmes and projects, taking into account the international obligations of the Russian Federation for the protection of marine environment.

The SAP-Arctic is a contribution of the Russian Federation to Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, to the implementation of the decisions of the Intergovernmental Arctic Council regarding sustainable development and conservation of the Arctic environment and to development of cooperation with all Arctic states to solve the Arctic problems.

Content

INTRODUCTION

The importance of the development of the SAP-Arctic is accounted for by the need to solve the existing problems and preventing the advent of further environmental problems of sustainable development of the Russian Arctic, including:

- The existence of a considerable number of local «hot spots», due to the past and current economic activities where the pollution levels are substantially higher than pollution standards;
- Progressing pollution and degradation of the vulnerable Arctic ecosystems under increasing human impact, including those caused by trans-boundary transfer;
- The extremely slow recovery processes in disturbed Arctic ecosystems;
- Deterioration of the human environment of the arctic inhabitants, including the indigenous peoples of the North;
- High ecological risks in developing resources and areas hard of access, in transport operations and implementation of high-tech and energy-consuming projects;
- An increase in natural and man-made risks and damage under the conditions of the origin and development of hazardous hydrometeorological permafrost-geomorphological, ice and other processes and phenomena associated with climate change,

and also increased attention of the Arctic states to the environmental problems receiving priority attention in the Arctic Council.

The current unfavorable ecological condition of the Russian Arctic is a consequence of large-scale development of production and extraction industries. Since the 1930s, the mining, metallurgical, timber, woodworking, pulp-and-paper and other industries and transport have been rapidly developing. The tremendous development of oil and gas production in western Siberia and planned development on the shelf of the Barents and other Arctic seas result in the threat of transformation of local degradation of the environment into regional. The impact of global climate change in the Russian Arctic aggravates the detrimental effects of the industrial factors.

An increase in production and growth of the Gross Regional Product in almost all the constituent entities of the Russian Arctic in the beginning of 21 century (see Table 1 in Annex 1) calls for urgent measures to address the adverse ecological effects of the past and also to prevent increasing environmental threats. The abatement of the Russian Arctic environment includes measures for nature conservation and encouragement of energy-saving and nature-conservation industries and activities. The incentive measures will receive increasing attention.

Due to its exceptional geopolitical, resource, scientific and cultural importance, the Russia Arctic has to become a strategic subject of the regional development of the Russian Federation.

The SAP-Arctic determines the objectives, targets and the basic measures for the protection of the environment from pollution and the major mechanisms of the implementation of the long-term national environmental policy of the Russian Arctic until 2020.

The development of the SPA-Arctic was based on the requirements that it should (1) satisfy national aspirations for industrial and social development and formation in Russia of civil society; (2) suit its arctic inhabitants, including indigenous peoples; and (3) permit the sustained development of natural resources (4) comply with the obligations under international conventions and other multilateral agreements relating to environmental protection.

The SAP-Arctic has been prepared within the framework of the UNEP)/GEF project «Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment» and is an important phase in implementation of this Programme. The main trends and the plan of SAP-operations are based on the results of diagnostic analysis of environmental problems in the Russian Arctic, taking into account their trans-boundary impact and also consultations with federal, regional and local authorities, business and the public.

SECTION 1: SUBSTANTIATION AND THE PRINCIPLES OF THE SAP-ARCTIC

1.1. Geographical framework and the SAP-Arctic

In compliance with the Fundamentals of the National Policy of the Russian Federation in the Arctic, approved by the Government of the Russian Federation (Protocol No 24 of 14.06.2001) the Arctic Zone of the Russian Federation (hereinafter designated as the AZRF or the Russian Arctic) comprises:

- Entirely or partly, the territories of the Republic of Sakha (Yakutia), Murmansk and Arkhangelsk oblasts, the Krasnoyarsk Krai, Nenets, Yamalo-Nenets , Taimyr (Dolgano-Nenets) and Chukotka Autonomous Okrugs (the southern boundary of the AZRF has been determined by a special decision of the State Committee on the Arctic under the Council of Ministers of the USSR dated April 22, 1989);
- The lands and islands indicated in the Enactment of the Presidium of the Central Executive Committee of the USSR of April 15, 1926. «On the declaration of the USSR territory the lands and islands situated in the Arctic Ocean[*];

[*] Between the meridians 32°04′35″ E (and from 74° N to 81° N between the meridian 35° E, taking into account the accession of the USSR to the Spitsbergen Agreement in 1935 and 168°49′30″ W.

- The inland marine waters adjacent to the above territories, lands and islands of the Russian Federation, the territorial sea, the exclusive economic zone and continental shelf within which Russia has sovereign rights and jurisdiction in conformity with the 1982 UN Convention on the Law of the Sea.

The total area of the Arctic zone of the Russian Federation exceeds 6 million square kilometers, including the area of the Arctic sea space within the territorial sea and the exclusive economic zone of the Russian Federation – over 3 million square kilometers. The Arctic seas of Russia include the Barents, White, Kara, Laptev, East Siberian, Chukchi and Bering seas. The land territory of the Russian Arctic accounts for 18% of the entire country's territory.

The SAP-Arctic primarily covers the Russian Arctic. However, in case the pollution sources impacting substantially the condition of the Arctic marine environment are located beyond it, the SAP-Arctic will cover these facilities and territories. For instance, the SAP-Arctic covers the Republic of Komi and Khanty-Mansi Autonomous Okrug.

1.2. Physical geographical and socio-economic features of the Russian Arctic

The Russian Arctic is little suitable for the comfortable living of the human being and is characterized by harsh natural conditions. Among the distinctive features of the region are:

- Low temperature throughout the year, long polar night and polar day, frequent geomagnetic storms, depleting ozone layer, strong winds and heavy snowstorms, frequent mists, monotony of the landscapes of polar deserts and arctic tundra, permafrost rocks, the ice cover during more than half a year, and also the terrestrial glaciations of a number of insular territories and other natural phenomena;
- Instability of the ecosystems, which are readily destroyed by anthropogenic impact and take a long time to recover;
- The input of the main part of pollution to the Arctic Ocean with the runoff of big rivers (the Norhern Dvina, Pechora, Ob, Yenisei, Lena, Indigirka, Yana, Kolyma, etc.) draining the main part of Eurasia's area, including territories with developed industrial and agrarian infrastructure and as a result of trans-boundary atmospheric transfer;
- Low density and focal distribution pattern of the inhabitants;
- Irregularity of economic development, whereby a considerable portion of the Russian Arctic proved a traditional nature management territory of the indigenous peoples with a focal pattern of intensive industrial development;
- Dependence of economies and life support on the supply of fuel, food and other commodities on complicated transportation patterns, using airways, water transport, including the Northern Sea Route, and also big and middle-sized rivers;

- Monoprofile and resource nature of the economy of Arctic subjects of the Russian Federation, high costs on economic activities and life support of the population;
- Low level of environmental investments by the state and fairly low environmental investments by private companies compared with the environmental damage;
- Climate change, which at the end of last and early current century has been extensively manifested, exerting a detrimental impact to the environment, economy and the people in a number of regions..

The Russian Arctic is home to over 1 million people, out of which 70 thousand are members of 9 indigenous peoples of the North (the Nentsy, Chukchi, Yukagirs, Entsy, Khantu, Mansi, Dolgans, Nganasans, and Saami), normally dwelling in clan villages or migrating.

The Arctic Ocean and its shelf seas represent an area of global significance in terms both of their influence on global oceanic and atmospheric circulation and their unique biological species, which constitute an essential element of global biological diversity. Although the smallest of the major ocean basins of the world, the Arctic Ocean plays a crucial role in the movement of oceanic waters through connections and exchanges with the Atlantic and Pacific Oceans. The Arctic marine environment is home to a wide range of unique species, the best known among them being polar bear, narwhal, walrus and beluga. Over 150 species of fish inhabit arctic and sub-arctic waters. There are also a wide variety of birds. Some of these are unique to the Arctic such as several species of auk and ivory gulls that maintain close contact with ice-covered areas throughout their lives.

1.3. Principles of SAP-Arctic development

The following principles have been considered and taken into account, where appropriate, when developing the SAP-Arctic:

- The principle of sustainable development assuring balanced resolution of social & economic tasks and problems in maintaining favorable environment and natural resource potential for the purposes of meeting the requirements of current and future human generations;
- The **precautionary principle** is directed to prevention of unfavorable environmental and related social and economic consequences of economic activity by environmental impact assessment and strategic impact assessment (involving the assessment of the environmental and social consequences of governmental policies, programmes and plans) in the process of decision making on economic activities. The principle indicates that consequences of decisions or actions which can result in serious or revocable changes for environment and human-being in Russian Arctic, even when there is no conclusive evidence of a causal relationship between the activity and the effects, is responsibility of decision makers
- The **principle "polluter pays"** or **"payment for the use of natural wealth and the reimbursement of a harm inflicted to the environment**" defining that legal entities and natural persons which have

inflicted a damage to the environment by polluting, depleting, damaging, destroying it, by irrational use of natural resources, degrading and destroying natural ecological systems, natural complexes and natural landscapes and another violation of the environmental protection legislation shall compensate it in full under law

- The principle of **preventative action** shall be applied, such that timely action shall be taken to alert the responsible and relevant authorities of likely impacts and to address the actual or potential causes of adverse impacts on the environment, before they occur.
- The principle of ecosystem approach to solution of environmental problems consists of integrated management of land, water and bioresources of the Russian Arctic that promotes conservation and sustainable use in an equitable way.
- The principle of **accessibility of information** consists of information of all concerned on pollution of Arctic environment, which took place in any region of the Russian Arctic.
- The principle of **public participation and transparency** shall be applied, such that all stakeholders, including communities, individuals and concerned organizations shall be given the opportunity to participate, at the appropriate level, in decision-making and management processes that affect the Arctic marine environment

It is assumed that:

- Development planning and environmental planning processes should be integrated to the maximum extent The use of **economic instruments** that foster sustainable development shall be promoted through, *inter alia*, the implementation of economic incentives for introducing best available techniques, clean technologies and environmentally friendly processes.
- **Environmental and health considerations** shall be included into all relevant policies and sectoral plans and programmes in the Russian Arctic, including, *inter alia*, urban planning, industrial development, oil and gas exploitation, fisheries, aquaculture and tourism.

An important feature of SAP-Arctic is comprehensive approach to the reduction of environmental degradation and abatement of environmental situation in the Russian Arctic that provides the greatest net benefit to the Russian Federation, its arctic neighbours and the entire global community. The system of proposed measure should result in maximal effect. It includes identification of priority environmental problems, setting long-term objectives and targets, formulation of definite measures including improvement of legal base, implementation of environmental investment projects, development of monitoring of environment, etc.

SECTION 2. PRIORITY ENVIRONMENTAL PROBLEMS OF THE RUSSIAN ARCTIC

The geographical situation of the Russian Arctic, the vast expanses of land and sea, exceptional natural diversity and extreme nature and climate conditions,

differentiation in terms of economic development, infrastructure and population density – the above factors make it difficult to distinguish priority ecological problems and strategies for the entire region. *Firstly*, even such evident environmental problems as pollution of environment, degradation of the terrestrial ecosystems and depletion of biological resources are region-specific, varying with respect to acuteness and scale. *Secondly*, the traditions of the economic development of some regions of the Arctic remain to be differentiated in terms of demographic, economic and socio-cultural trends, which are fairly conservative even in conditions of new industrial development. *Thirdly*, the developed systems of management and interaction of the Arctic regions with one another and neighbouring regions of Russia and adjacent countries vary in terms of their attitude to centralization of decision-making. In addition, the Arctic regions differ substantially in terms of the involvement of the public, private-public organizations and private companies in solving environmental problems, in regarding economic coordination and competition to ensure mitigation of environmental impact.

Approaches and criteria adopted by GEF and GIWA[1], were used in the process of identification of priority environmental problems of the Russian Arctic. They envisage (1) quantitative assessment and prioritization of environmental problems (Annex 2), (2) identification of immediate, underlying sectoral and root causes, and causal-chain analysis (Annex 3).

As a result of analysis of the current state and prediction of the possible change of environment in the Russian Arctic the following 5 environmental problems have been identified, ranked below in terms of their priority:

1. Pollution of the environment (trans-boundary transfer of pollutants by aquatic and atmospheric flows, oil, chemical and radioactive contamination, accumulation of solid wastes)
2. Change in biodiversity and depletion of biological resources, largely due to contamination of the environment and unauthorized use of biological resources and poaching
3. Deterioration of the human environment of the arctic inhabitants and disruption of traditional nature management conditions and reduction of the resource potential due to industrial pollution and other environmental disturbances
4. Detrimental consequences and threats of global climate change
5. Degradation of lands and infringement of land use conditions

The SAP-Arctic addresses environmental consequences of land-based and sea-based activities although the marine activities under consideration are restricted by development of oil and gas resources of the Arctic shelf, transportation of oil and gas and marine shipping.

[1] *Global International Water Assessment;*

2.1. Pollution of environment

The Arctic is among the regions of Russia, the most sensitive to pollution of environment. The priority pollutions are oil and petroleum products, heavy metals, persistent organic substances) and solid wastes (chemical pollution) and radioactive pollution.

(1) Oil and gas pollution[2]*.* The sources of petroleum hydrocarbons transport into the Russian Arctic are:

- natural siphoning wells in oil-bearing and gas-bearing areas of the coastal Arctic sea shelf zone;
- transport with polluted river waters;
- construction and exploitation of engineering structures on the shelf;
- discharge of oil-containing effluents by industrial enterprises, housing and utilities infrastructure, transport vehicles (sea and river fleet, aviation, cars and trucks) and pipeline transport);
- emergency spills of oil and petroleum products;
- atmospheric transfer of the products of fuel burning, decomposition and evaporation of oil from adjacent industrially-developed regions;
- transfer of pollutants by marine water masses;
- burial of industrial wastes and soil removed in the course of dredging;
- melting of marine and river ice, polluted by petroleum products and other pollutants.

The annual transport of petroleum hydrocarbons in the Russian Arctic is about 1 million tons, including that with river runoff to the Arctic seas, of over 300 thousand tons. Extensive pollution of surface waters has also been revealed beyond the oil and gas fields and even oil and gas provinces, including those of big rivers (Pechora and Ob). There is also evidences that in subterranean waters of the Middle-Ob Gas-Carrying Province (Western Siberia) there are petroleum hydrocarbons, phenols and other pollutants characteristic of oil production in concentrations exceeding MAC. Oil content in subterranean waters of the Timano-Pechora Oil and Gas-Bearing province in some particular areas reaches 268 MAC.

Before the implementation of large-scale projects of the production of hydrocarbons on the Barents and Kara sea shelf, the arrival of crude oil in marine water areas and fresh water bodies and in the coastal areas of the Russian Arctic is only limited and cannot be regarded as a factor for deterioration of the region's environmental condition. An exception is the upstream stretches of the Pechora River, some portion of the Bolshezemelskaya Tundra from Cape Varandei to Khaipudyrskaya bay and the region of Tazovsky Peninsula (the southern part of the Obskaya Bay), where the oil fields are extensively developed.

[2] **«Oil»** implies any persistent oil, in particular, crude oil, black oil, heavy diesel fuel, lubricants and blubber, irrespective of whether they are carried on board the ship as cargo or in fuel tanks of such a ship a (International Convention of Civil Responsibility for Damage Caused by Oil Pollution, 1992 г).

The averaged concentration of petroleum hydrocarbons – the sea waters with petroleum hydrocarbon concentration lower than 50 μg/l are considered as unpolluted – in the Kara Sea is 23.7 μg/l, in the Laptev Sea, 17,1 μg/l (in the Tiksi region, up to 114 μg/l), in the mouth part of the Pechora Sea, about 30 μ/l. In the bottom sediments of the Arctic shelf their concentration attains 5 and more mg/kg. The future threats of the pollution of the marine environment with oil lies is associated with plans for oil production on the continental shelf of the Russian Arctic. The oil production complex in the Russian Arctic regions is formed on the basis of the already discovered fields – Prirazlomnoye, Shtokman, Severo-Medynskoye, Severo-Gulyaveskoye, Varandei-More, Pomorskoye, Doginskoye, etc. and will be developed with development of other promising fields. The main part of resources (over 60%) is accounted for by the seas of the Western Arctic: Barents, Pechora, and Kara. In conformity with the Energy Strategy of the Russian Federation by 2020, it is planned to produce up to 25% of the Russian oil in Arctic. Its transportation by sea in the Atlantic sector will increase with the beginning of the development of the fields by several times, including the White, Barents and Pechora seas, which will happened in the nearest decade.

(2) Chemical pollution with *heavy metals*[3] in the Arctic assumes a global scales due to the low assimilation capacity of its marine and terrestrial ecosystems and biota. Practically everywhere the soils, plants and animals, the snow, sea ice and bottom sediments accumulate increasing concentrations of heavy metals. Over 10 million км^3 (30%) of sewerage arrive in the region's aquatic environment. A number of sections of the water area of the Barents, White, Kara seas and the Laptev Sea have a pollutant concentration exceeding MAC two- to threefold. Due to chemical pollution, over 200 commercially-important northern rivers lost their fishery value. Among the impacted regions with the highest pollution levels are Kola Bay of the Barents Sea, Pechora Sea and the lower reaches of the Pechora Sea, Obskaya Bay, etc.

Persistent organic pollutants (POP). In the Russian Arctic there are no large sources of POPs. Presumably, they arrive in the region's environment via distant transfer with atmospheric flows, rivers and oceanic currents from Asia, Europe and North America. Owing to their exceptional lipophily, the majority of organochlorine compounds are accumulated in the fat tissues of the species members of the food chain, hence, the highest pollutant concentrations are used in the subcutaneous fat and fat tissues of the species on the upper levels of the food chains, e.g. polar bears, whales and seals. The above is of particular concern in the Arctic as the indigenous people consume large amount of wildlife products rich in lipids.

Trans-boundary atmospheric and aquatic transfers of pollutants are of priority importance to the Russian Arctic, primarily due to the fact that the region is rather a recipient to trans-boundary contamination than a donor. Due to troposphere transfer the Russian Arctic is getting an area of global airborn pollution accumulated through the atmospheric emissions from the Western European, North-American and Asian countries. Two large sources of contamination with potential of incorporation in tropospheric trans-boundary transfer are also developed in the

[3] heavy metals are a group of metals with atomic mass over 50 (Pb, Cd, Ni, Cr, Zn, Cu, Hg), which at some particular concentration may exert a toxic effect (GOST R 17.4.3.07-2001 «Nature Conservation. Soils. Requirements to the Properties of Sewer Sludge Used as Fertilizers).

Russian Arctic – on Kola Peninsula and in Norilsk. These regions account for the emission of about 4 million tons of sulfur dioxide, another hundred of thousand of carbon monoxide and nitrogen oxides. The major pollutants in the Russian Arctic involved in bilateral trans-boundary transfer with atmospheric and aquatic flows are sulfates, sulfides and chlorides, phosphates, petroleum products, organochchlorine compounds, etc.

Accumulation of solid wastes of production and consumption in the region occurs due to absence of systems of burial processing, collection and utilization of wastes, including those of mining and processing enterprises, accounting for the bulk of the region's industrial wastes. Each year, the formation of up to 1 billion tons of overburden and solid wastes. Considerable areas of spoil dumps and solid wastes are concentrated in the Murmansk region, in the lower reaches of the Pechora River of the Nenets Okrug, in south of the Yamalo-Nenets Autonomous Okrug, in the Norilsk Industrial District, in Northern Yakutia and around gold mining regions in Chukot Peninsula. Unregulated accumulation of wastes results in permanent contamination of land, groundwater and soils, degradation of natural ecosystems, destruction of traditional habitats of plants and animals, formation of new man-made habitats, where introduced plant species complexes develop.

(3) Radioactive contamination[4] Similar to all other regions of the world, the Russian Arctic has been impacted by global anthropogenic sources of radionuclides that resulted from nuclear energy projects. The major source of radioactive contamination that has been impacting the environment and is to affect it for hundreds and thousands years to come (with decay of long-lived radionuclides) are nuclear tests conducted in the USA, USSR, China, Great Britain and France between 1945 and the 1990s. Of the two USSR nuclear testing grounds (Semipalatinskk and Novaya Zemlya) one was in the Arctic.

Of the 132 nuclear explosions on Novaya Zemlya, 87 were atmospheric, 3 underwater and 42 underground. Their total yield was about 273 Mt. About 12% of radioactive explosion products on Novaya Zemlya fell out near the testing grounds, 10% were found in the concentric circumpolar ring in the latitude of Novaya Zemlya, and 78% in the form of fine-dispersed products have added to the global fund of stratospheric radionuclides, which caused further radionuclide fallouts. An additional source of input of radionclides in the arctic environment was the Chernobyl accident in 1986.

The region has some large potential sources of radioactive contamination associated with the infrastructure of military and civil atomic fleet. The technical navy bases and dockyards are situated throughout the entire Kola Peninsula and in the Severodvinsk at White Sea. Potentially hazardous are the site of spent fuel storage. Some facilities containing spent fuel were sunk in Novaya Zemlya bays and may be hazardous in immediate contact. Another class of potential radiation sources are nuclear power plants. In the Russian Arctic those are Kola and Bilibino power plants. Particularly hazardous are radionuclide thermoelectric generators, which were used in navigation equipment. Their service life has expired. Their careless handling creates mortal irradiation danger. In addition, seized by terrorists such generators may serve as material for creating «dirty bombs». Today the

[4] Contamination of natural environment with radioactive isotopes occurs after nuclear tests and nuclear explosions for peaceful purposes, accidents at nuclear power plants and chemical plants for processing nuclear fuel, burials of radioactive wastes, and also after accidents of atomic navy facilities.

inventory and replacement of the main part of radionuclide thermoelectric generators has been completed in the western part of the Russian Arctic. Their presence is a problem in the Republic of Sakha (Yakutia) and Chukotski Autonomous Okrug.

2.2 Changes in biodiversity, in ecosystems and biological resources

(1) Unregulated use of biological resources and large-scale distribution of poaching is the first priority environmental problem of biodiversity loss in the Russian Arctic. It is associated with uncontrolled harvesting of sea and migratory fish and sea products, poaching of the wild reindeer, fur-bearing mammals and waterfowl. It is thought that poaching in the Arctic is a sector of economy that is comparable and even financially superior sector of harvesting economy serving industrial and small-commodity market (seafood, red fish, fish eggs, antlers and meat of the wild reindeer, spring hunting geese and brants, etc.). Poaching is largely committed by he local inhabitants, who are not involved in modern economy and have very low incomes.

(2) Reduction of biological diversity, reduction of the numbers and transformation of the habitats of rare species in the Arctic is a characteristic feature of the last decades, when global warming and large-scale economic development rendered some of the Arctic regions more accessible, and increasing poverty among the local people and reduction of state-organized supply of the northern territories caused an increased pressure on biological resources. Of particular concern is the number dynamics of the Red-Book Arctic species, including the polar bear, Atlantic walrus, cetaceans, the bighorn sheep.

(3) Loss and man-caused transformation of the Arctic ecosystem for a long time accounted for no more than 1-3 % of the area of polar deserts and tundra. Today, increasing scale of development and fragmentation of the soils and plant cover renders loss of diversity of the ecosystems and their ubiquitous transformation increasingly evident. A characteristic example is found on the northern edge of the forest ecosystems, whose area has been reduced to such an extent that their recovery has become difficult. The diversity and areas of coastal, valley and delta ecosystems – meadows, shrub thickets and valley forests is considerably reduced in some Arctic regions. An increase in the area of disturbed lands was noted in the Nenets and Yamalo-Nenets okrugs. The forest areas have been dwindling in Murmansk Oblast and the Republic of Sakha (Yakutia) and that of shrubs, in Chukotski and Nenets autonomous okrugs. Bird rookeries have been disturbed by human impacts on some islands and coastal areas in the high Arctic. The above primarily applies to the regions of the eastern coast of Novaya Zemlya, where nuclear tests were performed.

(4) Protected areas in the Russian Arctic are particularly characterized by *the low efficiency and representation of territorial biodiversity protection*. The Russian Arctic virtually has no marine reserves, and aquatic protection does not cover typical or unique marine ecosystems. Landscape diversity accounts for less than 50% of protected areas, and terrestrial diversity for 60-65% (the flora, especially, rare species for 20-30%, wildlife for 70-75%). Today, in the Russian Arctic there is a federal network of 14 state reserves and the federal national reserve "Franz Josef Land", totaling over 15 million ha classified as protected areas of the 1st category

according to the Internation Union for the Conservation of Nature (IUCN) classification. The total area of northern, Arctic and Circum-Arctic protected areas is about 30 million ha, which accounts for about 5% of the territory of the Russian Arctic (3% in Kola Peninsula, 5% in Taimyr, 8% on the Putorans, and only 1.5% on Kolyma Upland). The protected area density in the Russian Arctic is irregular, and throughout the entire Arctic territory of Eastern Siberia, there are only 4 operating protected areas and there are plans for establishing several more, although in various regions of non-Russian Arctic protected areas account for at least 20 - 40%.

(5) Biotic contamination through biotic invasions and intentional introduction of alien species is a priority problem due to expansion of economic development and climate warming in the Arctic. Serious concern is nowadays caused by the acclimatization of the Kamchatka crab and Far-Eastern salmon species in the Atlantic sector of the Arctic and also extensive northward expansion of a number of pest plants and synanthropic animals, which primarily settle down in anthropogenic habitats. In all the points of industrial development they form relatively resistant anthropogenic complexes to oust the aboriginal plant and wildlife species.

2.3. Deterioration of the human environment of the arctic inhabitants

(1) Deterioration of the systems of life support of arctic inhabitants, including the system of water supply has become a priority problem due to the high level of water pollution at water intakes, deterioration of the quality of atmospheric air in built-up areas, littering of the area, etc. The most unsatisfactory quality of drinking water is recorded in he Nenets and Yamalo-Nenets autonomous okrugs, where drinking water reveals high levels of pollutants, primarily, petroleum hydrocarbons, whose concentrations reach 10-35 MAC. The most unfavorable situation is in Murmansk Oblast, where self-purification potential has virtually been exhausted. There are constantly high contamination levels in the water bodies of drinking water supply due to discharge of wastewater by metallurgical and mining enterprises.

(2) Disruption of the traditional nature management conditions for indigenous peoples as an environmental problem occurs not only when their lands are allocated for industrial purposes but also as a result of. disruption of the resource potential of the indigenous peoples. A number of northern rivers lose their fishery importance due to pollution, destruction spawning grounds and poaching fish cupture. Development of transport makes the indigenous people’s game grounds accessible to newcomers. There are no mechanisms available of state support of small indigenous business of indigenous peoples. The legislative framework of traditional nature management areas has not been sufficiently developed.

2.4. Global consequences and the threats of climate change

The climate warming in Russian Arctic during the recent decades may strengthen the effect of chemical pollution of the Arctic environment due to melting of the permafrost, activation of slope processes, augmented erosion of the shores. A combination of these factors may bring about disruption of life support and dwelling systems in Arctic built-up areas, the developed social infrastructure and increase in disease incidence of indigenous people and newcomers. The low adaptive capacity of

economic infrastructure of the Russian Arctic to climate change is without a doubt among important and priority environmental and economic problems

Modern warming that started in the second half of the 20th century brought about a rise in mean annual temperature in the second half of the 20th century in the Russian Arctic by 0.2-2.5°C. In this case under conditions of the continental climate of Siberia, a considerable increase in snow reserves occurred, which prevents freezing of the ground. A positive trend in air temperature with climate changes may result in reduction in the permafrost area by the middle of the 21st century by 12-15% and 15—200 km displacement of its boundary in the northeasterly direction. According to simulation estimates, the depth of seasonal melting will on the average increase by 15-25%, and on the Arctic coast in some regions of Western Siberia, by o 50%. The above, in addition to direct impact on the economy infrastructure may bring about augmented thermal erosion of the shores, and increase in the rate of their destruction (nowadays it is up to 10 and over metres per year). Besides, many of the industrial and residential building, trunk pipelines and other facilities in the Russian Arctic are designed for exploitation and within a certain range of environmental change.

The existing baseline ice and hydrometeorological conditions being retained at least until до 2010-2015, it is probable that difficult ice conditions should develop in the Vilkytsky, Shokalsky, Dmitry Laptev, Sannikov and Long straits restricting ice-breaker navigation via Northern Sea Route (NSR). Development of oil and gas fields on the Arctic shelf will increase demand for ice-breaker support and development of regional and local systems of hydrometeorological support of safe transportation of gas and petroleum products. There is high probability of icebergs in the regions of northern marine fields, including the Shtockman, and also intrusion of pack ice into more southerly regions of the sea.

The sharp fluctuation of the basic meteorological parameters, whose recurrence increases with climate warming will be the main causes of vascular diseases and the cataract as well as the incidence of skin cancer disease in the Extreme North.

Some special target programme for adaptation of the economic infrastructure, life support systems and rehabilitation of people in the Russian Arctic is required.

2.5. Degradation of soils and lands, disruption of land use conditions

Fragmentation of soil and plant cover of the Arctic is regarded as one of the most important modern processes of ecosystem degradation, capable, in the long run, of resulting in irreversible consequences. The most hazardous is transition from point to strip-point pattern of the development of the territory of the Russian Arctic to fragmentary and frontal. According to expert estimates large fragmented areas have developed in the lower reaches developed in the lower reaches of the Pechora River in the Nenets Autonomous Okrug, around the city of Vorkuta in the Komi Republic in the south of Yamal Peninsula in Norilsk Industrial region and around gold mining regions of Chukotski AO. Degradation of lands, development of man-made thermokarst and thermal erosion at the present stage are mainly manifested in the points of industrial development and along linear structures (oil- and gas pipelines, railways and highways, power lines, etc.) where the land allocation is

poorly regulated and the norms of special economy regime are not observed. In the Arctic regions, reclamation technologies are unefficient and their regional adaptation patterns have not been developed yet. About 50% of lands disturbed by gas production and 60-70% in oil industry and non-ferrous metallurgy are reclamated by traditional methods. The annual increment of unused disturbed lands is 5-6 thousand ha in oil production industry; 2.5-3 thousand ha in gas production industry, 0.4-0.5 thousand ha in pipeline construction. In total, the transformed lands of the tundra account for 1-3% of the total area of mainland Arctic, however, in the vicinity of copper-nickel integrated plants of Norilsk, Monchegorsk and Pechenga within dozens of kilometers, there is transformation of natural landscapes as a result of emissions of sulphur and nitrogen compounds into the atmosphere.

Considerable foci of land degradation as a result of deforestation, forest and tundra fires have appeared in the forest-tundra and southern tundra. Some of the cutover patches and burns become bogged up. The rate of the restoration of zonal vegetation in the Arctic is considerably lower than in more southerly regions. Transformation of the rangelands of the domestic reindeer, totaling over 334.7 million ha, currently reaches 63%.

SECTION 3. GOALS, OBJECTIVES AND MAIN ACTIVITIES OF SAP-ACRTIC

SAP-Arctic has been developed to create necessary conditions and implement measures to prevent, reduce and eliminate the impact of land-based and sea-based pollution in the Russian Arctic to levels permitting sustainable development, taking into account the interests of the human population, including the indigenous peoples of the North. The SAP-Arctic is consistent with the Concept of National Security of the Russian Federation, the Concept of Transition of the Russian Federation to Sustainable Development, approved by Decree No.440 of the President of the Russian Federation dated 01 April 1996, the Main Trends of Socio-Economic Development of the Russian Federation for a Long-Term Period reviewed and approved at the meeting of the Russian Government on June 28, 2000; the Environmental Doctrine of the Russian Federation approved by Order No.1225-p of the Russian Government on August 31, 2002, the Fundamentals of the National Policy of the Russian Federation in the Arctic approved by the Russian Government (Minutes No.24 dated 14 June 2001), the National Plan of Action for the Protection of the Marine Environment from Anthropogenic Pollution in the Arctic Region of the Russian Federation approved by the Russian Ministry of Economic Development and Trade on September 08, 2001; and the Regional Programme of Action to Protect the Arctic Marine Environment from Land-Based Activities adopted by the Arctic Council in 1998.

SAP-Arctic sets forth the priority goals and objectives for the protection of the marine environment of the Russian Arctic from pollution for 2008-2012 and till 2020, as well as Action Plan for 2008-2012. The priority goals, objectives and activities were developed on the basis of the casual-chain analysis of the state of

Russian Arctic environment and consultations at the federal and regional levels, sociological surveys of the population and other sources.

The long-term goals SAP-Arctic to protect Russian Arctic from pollution include:

1. **Prevention and elimination of the pollution of coastal and marine environment as a result of land-based and sea-based activities, including oil and chemical and radioactive pollution;**
2. **Improvement of the quality of drinking water supply;**
3. **Conserving the biological and landscape diversity and capacity of the renewable natural resources impacted by the man-induced pollution»**
4. **Support and maintaining the enabling conditions for traditional nature uses of indigenous peoples of the North;**
5. **Reducing the level of natural and man-made risks from industrial facilities and utilities as a result of global climate change.**

3.1. Prevention and elimination of the pollution of coastal and marine environment as a result of land-based and sea-based activities, including oil and chemical and radioactive pollution.

The main objectives for preventing and eliminating the pollution of the coastal and marine environments in Russian Arctic for 2008-2012 and till 2020 include:

3.1.1. Establishing the legal framework to improve the quality and protect the environment;

3.1.2. Developing international cooperation in the area of environmental protection between the Arctic countries and strengthening monitoring of the transboundary transport of contaminants in Arctic;

3.1.3. Establishing new forms of public private partnerships involving governments and business to ensure the optimal functioning of the environment protection system;

3.1.4. Developing the strategy and regional plans for the elimination of the environmental pollution in the region, for the conservation of biodiversity, etc. including the regional plans of response to oils spills in the arctic seas;

3.1.5. Creating financial mechanisms for attraction of investments including donor institutions to address environmental problems by developing and implementing environmental investment projects;

3.1.6. Addressing the consequences of the land and coastal pollution of the Arctic region;

3.1.7. Monitoring and assessing the status of the man-induced pollution of the Russian arctic seas;

3.1.8. Expanding the fundamental and applied research in Arctic including the rehabilitation of the representative network of the polar stations;

3.1.9. Expanding the fundamental and applied research in Arctic in the area of: (i) transformation of freeze-and-thaw action; (ii) erosion of the banks of rivers, lakes and seas, (iii) the status of the ecosystems, etc.

3.1.10. Ensuring the legal and institutional framework for public participation to monitor the implementation of management decisions by the government authorities and business;

3.1.11. Raising the level of environmental awareness, training and education of the population to form the mindset to meet the environmental concerns in Arctic.

To achieve the long-term goal 3.1 it is proposed to implement, *inter alia*, the following activities:

- To develop new legal regulatory acts and amendments to the applicable legislation in order to strengthen environmental regulation and provide incentives to the development of energy saving and environmental production capacities and activities;
- To introduce amendments and additions to the Rules of Pollution Abatement in the Coastal Waters of the Seas" adopted in 1984;
- To develop and implement measures to strengthen enforcement of the environmental legislation at all the governance levels;
- To develop and implement measures to improve the operation and interagency coordination of the environmental activities in the Arctic areas;
- To incorporate international experience of integrated coastal management into the system of governance; participating in the development by the Arctic Council of the Guide for Oil and Gas Development Projects in Arctic and in the subsequent implementation of the approved document;
- To develop and implement environmental requirements to the preparation and carrying out of economic activities with due regard to the vulnerability of the Arctic ecosystem including the EIA methodology for the preproject and project activity in Arctic and environmental management systems in accordance with international standard ISO 14001;
- To develop and implement measures for the development of the system of State Environmental Review;
- To implement and support the use of environmentally clean energy sources including by making use of the Kyoto Protocol mechanisms;
- To establish a set of resource saving measures;
- To develop and implement measures for mitigating environmental impacts from the activities of the Russian Armed Forces;
- To implement the set of targets and performance indicators of the quality of the environment in Arctic;
- To elaborate measures for the development of the Arctic subsystem of the Uniform State System of Environmental Monitoring and State Service for the Observation of Environment;

- To establish data base by making use of GIS technologies concerning the status of the environment in Russian Arctic;
- To prepare from time to time forecasts of the arctic seas pollution trends associated with the development of economic activity in Russian Arctic and adjacent areas;
- To develop methods and technologies for the information support concerning the status and potential scenarios of the arctic seas pollution, in particular, the projection of the oil spills spreading;
- To develop scientific and methodological framework for a long-term integrated monitoring of the hydrocarbon fields development on the shelf of the Western Arctic;
- To develop and implement measures to support the regional and trans-regional nongovernmental movements; to involve NGOs to address pollution concerns and participate in environmental control and monitoring.

3.2. Improvement of the quality of drinking water supply

The main objectives to improve the quality of drinking water supply to the population of the Russian Arctic for 2008-2012 and till 2020 include:

3.2.1 To improve the water management system in Arctic;

3.2.2 To ensure the environmentally safe disposal of liquid and solid waste;

3.2.3 To implement environment-friendly technologies and production facilities for the treatment of waste and storm water and sludge disposal;

3.2.4 To establish and develop buffer zones and coastal strips on the water bodies;

3.2.5 To improve monitoring and information exchange concerning the status and quality of the surface and ground waters.

To achieve long-term goal 3.1 it is proposed to implement, *inter alia*, the following activities:

- To implement new progressive technologies for the treatment of waste and natural waters that are user for water supply;
- To carry out design and survey work concerning the status and quality of ground waters and shift the water supply system to the underground sources in the areas with the poor quality of surface waters;
- To develop and implement measures aimed at managing agricultural chemicals;
- To improve the system of early alarm and response in case of emergency pollution of surface and ground waters.

3.3. Conservation the biological and landscape diversity and capacity of the renewable natural resources impacted by the man-induced pollution;

The above goal could be attained by implementing the following objectives for 2008-2012 and till 2020:

3.3.1 Elaborating new legal and economic mechanisms to regulate the use of biological resources in Arctic, to improve the system of charges for the use of mineral and biological resources and to combat poaching;

3.3.2 Developing the territorial and off-shore conservation of biodiversity in Russian Arctic recognizing the influence of the existing and future man-induced impacts;

3.3.3 Developing researches of the biota and ecosystems of Arctic including with international participation;

3.3.4 Building an effective system of monitoring the status of biodiversity and natural ecosystems of Arctic and including it into circumpolar network of monitoring the arctic flora and fauna;

3.3.5 Establishing the seeds stations, nurseries of wild flora and fauna to support ecological restoration and rehabilitation of the disturbed lands, and to carry out re-introduction activities for the restoration of populations of species that disappeared in some areas.

Addressing these objectives requires the following activities:

- To develop and implement a new federal legislation concerning special conditions of nature management and wildlife conservation in Russian Arctic (new bills and amendments to the applicable laws);
- To improve the state system of legal regulation and nature management in the Arctic region and enhance the role of the state in supporting the special conditions of economic activities focusing on regulation by environmental criteria (new sectoral standards, regulations);
- To develop and implement in the wildlife conservation practice new economic incentives and mechanisms of state regulation and partnership with private companies (amendments into the applicable legislation, technical regulations, licensing, encumbrances during public bidding, etc.);
- To improve legal norms and rules regulating the rights and obligations of the permanent and temporary population concerning the use of biological resources, commercial and non-commercial animals and plants; regulation and control over the gathering of collection biological materials including by foreign scientists and tourists;
- To reform the regional and local taxation system with the purpose of increasing the share of resource charges in taxes while reducing the rates of other taxes;
- To improve the system of quoting, licensing and payments to regulate the use of biological resources in Arctic, to enhance fight against poaching;
- To improve the economic and financial mechanisms concerning conservation of biological diversity including insurance and indemnification against adverse environmental impacts and payment for ecosystem services;
- To develop the territorial system of biological conservation, i.e. establishing new federal (reserves, national parks, sanctuaries and natural sites) and regional protected areas (sanctuaries, natural parks, etc.) on the coast of the White and Barents Seas, New Land and other Arctic archipelagoes, the Polar

Urals, Northern Yakutia and Chukotka; establishing the national part "Russian Arctic";

- To develop regionally adapted schemes of the environmental restoration and rehabilitation of the disturbed ecosystems; to conduct large-scale experiments concerning the reclamation of lands, polluted and degraded due to the industrial and transport development, to implement new measures and technologies for the protection of land biota and ecosystems when exploring, extracting, transporting and processing minerals;
- To establish the National Strategy for the Conservation of Rare Species of Russian Arctic and specie strategies for the conservation and recruitment of rare species of Arctic such as whales, seals, white bear, Atlantic walrus, white fish and salmon, waterfowl, sea and birds of prey, etc.
- To establish regional seed stations, wild flora and fauna nurseries to ensure ecological reconstruction of the disturbed lands and reintroduction activities to recruit the populations of species that disappeared in some regions;
- To form an effective government system of monitoring the status of the natural environment, ecosystems and biological diversity in Arctic; to update and expand the objectives of the land field work by incorporating such themes as biological diversity and ecosystem modification;
- To strengthen the government system of training specialists in the area of tundra research, northern areas research and ecology of Arctic at the biological, ecological and geographical departments of universities and teachers' training institutes;
- To develop research of the natural environment, basics of sound nature use and biological diversity of Arctic; to carry out inventory of biota and mapping of ecosystems; to develop the aerospace assessment of the biota and ecosystem status (including in protected areas);
- To develop ecological, research and cognitive tourism in Russian Arctic; to establish the corresponding transport water (marine) and land infrastructure.

3.4. Supporting and maintaining the enabling conditions for traditional nature uses of the Indigenous Peoples of the North;

Under this long-term objective, the focus will be on the facilitation of sound nature use by the executive authorities, extracting companies and indigenous peoples of the North. The above goal could be attained by implementing the following objectives for 2008-2012 and till 2020:

3.4.1. Improving the legal and regulatory framework for the conservation of habitats of the Small-in Numbers Indigenous Peoples of the North, including amendments into the legislation on the areas of traditional nature use;

3.4.2. Implementing the mechanisms of integrated ecosystem management in the areas populated by the Small-in Numbers Indigenous Peoples of the North;

3.4.3. Providing scientific justification to and developing action plans for the adaptation of traditional nature uses of the Small-in Numbers Indigenous Peoples of the North to climate change;

3.4.4. Establishing institutional mechanisms of interaction between the government agencies, extracting companies and Small-in Numbers Indigenous Peoples of the North;

To achieve long-term 3.4 it is proposed to implement, *inter alia*, the following activities:

- To develop proposals for emending the federal and regional legislations concerning sustainable development and traditional nature uses of the Small-in Numbers Indigenous Peoples of the North;
- To develop and implement measures for integrating the concerns of the traditional nature uses in the regional planning;
- To assess ecosystem services and establish the system of reimbursement for such services to finance the environmental enhancement measures in the areas populate by the Small-in Numbers Indigenous Peoples of the North;
- To promote the development of SME by making use of the traditional economic activities of the indigenous peoples without damage to the environment;
- To support the establishment of the institutional mechanisms of interaction between the government agencies, extracting companies and indigenous peoples;
- To develop the environmental monitoring system of the indigenous peoples communities and its integration in the circumpolar system of monitoring within the framework of the Arctic Council;
- To develop and implement measures in awareness and education in the area of integrated ecosystem management and conflict resolution concerning the use of natural resources by the stakeholders in the areas populated by the indigenous peoples;
- To support researches and develop recommendations for the adaptation of the traditional methods of economic activities of the indigenous peoples to the climate change.

3.5. Reducing the level of natural and man-induced risks at the economic and social sites as a result of global climate change.

The above goal could be attained by implementing the following objectives for 2008-2012 and till 2020:

3.5.1. Expanding the fundamental and applied research in Arctic in the area of: (i) transformation of freeze-and-thaw action; (ii) erosion of the banks of rivers, lakes and seas, (iii) the status of the ecosystems, etc; providing scientific, technological and methodological support to mitigating the risks and threats of the natural ecosystem transformation, development of the natural disasters and technological emergencies in Russian Arctic in the context of the climate change;

3.5.2. Mitigating risks and threats to the economic infrastructure due to the emerging climate change;

3.5.3. Establishing the system of preventive measures to protect people and populated areas of Russian Arctic from the technological disasters caused by climate change;

3.5.4. Developing the system of training and education concerning the prevention of and response to adverse environmental consequences due to climate change in Russian Arctic;

To achieve long-term objective 3.5 it is proposed to implement, *inter alia*, the following activities:

- To identify, forecast and assess the risk of adverse consequences in the context of climate change for nature, economy and population; to establish ecological and economic framework for the sustainable development of Russian Arctic;
- To develop criteria and methodology for the assessment of adverse consequences in the context of climate change for nature, economy and population; to establish the system of ecological and social insurance in Russian Arctic;
- To assess and forecast the trends in the status of sea ices and overland glaciers; to conduct glacial monitoring of Russian Arctic;
- To plan safe development of hydrocarbon deposits on the Arctic shelf, safe navigation over the Northern sea route and to develop the prospects of marine transportation in Arctic;
- To assess the risk of small island disappearance; to prepare the forecast of potential changes in the boundaries of the maritime economic zone and to develop measures to prevent its reduction and monitor the change;
- To research the transformation of freeze-and-thaw action, erosion of the banks of rivers, lakes and seas; to identify the degree of the permanent frost transformation; to assess and forecast the risk of thawing of the permafrost ground for natural ecosystems, populated areas and engineering facilities; to prepare proposals to establish the base stations of geoecological monitoring;
- To carry out ecological and economic assessment of risks to the economic infrastructure of the coastal regions of Russian Arctic associated with the change of climate and properties of permafrost;
- To organize geoecological monitoring of the coastal erosion due to the rise in the sea level and reduction in the amount of sea ice; to assess damage to the coastal settlements, ports, economic and transport facilities and to establish a preventive action program to protect Arctic settlements;
- To carry out a large-scale assessment of the status of line, hydrotechnical and other engineering structures and facilities in Arctic; to identify threats and to assess risks; to calculate damage associated with the projection of technological accidents and disasters due to intensified thawing of permafrost; to develop preventive protection measures;
- To develop recommendations for the development and accident-free operation of transport communications (roads, airports, industrial sites with

hard surface) in the context of climate change and permafrost transformation;

- To improve the engineering and glaciological methods for the sustainable transport use of winter roads and mitigation of risks associated with winter transportation over rivers and land; to develop measures for the reduction of risks to the man-induced thawing of permafrost ground at valuable economic facilities and Arctic settlements;
- To develop methodological recommendations for pre-investment preparation of the economic activity projects in Russian Arctic; to calculate a scale-up factor to assess the cost of design, project and operational activities in the industry, transport and utilities;
- To develop the network of observation stations to monitor GHG emissions and sinks in the terrestrial and fresh water ecosystem of Russian Arctic to obtain prompt information on the potential increase in emissions in the context of changing climate and to adjust forecasts and accounting in the international practice;
- To develop measures for the reduction of risks to the agricultural development of Russian Arctic; to forecast degradation of ecosystems and traditional economy in the context of expanded opportunities of agricultural development in the north in case of climate warming;
- To assess risks and develop preventive measures associated with the fragmentation of the vegetation cover of the tundras and development of biotic disasters in Russian Arctic in the context of climate change;
- To work out recommendations for the development of managers and specialists and for raising awareness of the public and other stakeholders concerning prevention of and response to adverse consequences associated with the climate change in Russian Arctic;
- To develop a set of standard curricular, programs, teaching aids and presentation models to assess the impact of climate change in Russian Arctic on the nature, economy and population;
- To provide organizational, methodological and communication support to the development of managers, education, and raising awareness of the public and other stakeholders concerning prevention of and response to adverse consequences associated with the climate change in Russian Arctic.

Section 4. Arrangements for the SAP-Arctic implementation and monitoring

Text will be added after completion of SHA analysis and other WGs work

Section 5. Financing the SAP

Text will be added after completion of work of financing WG

Annexes

Annex 1. Statistical information on region

Table 1. Gross regional product (millions of RUR; until 1998 – billions of RUR).

Region	1995	1996	1997	1998	1999	2000	2001	2002	2003
Murmansk oblast	14358	16436	18191	23652,0	41989,0	57441,0	57325,0	69325,0	81657,0
Arkhangelsk oblast	14263	18306	20908	22889,0	36845,0	49990,0	55548,0	67988,0	82369,0
Nenetsky AO	*	*	*	*	*	12573,0	12658,0	16565,0	25239,0
Republic of Sakha *Yakutiya)	20335	27198	30181	33529,0	61623,0	61185,0	100731,0	114758,0	133143,0
Taimyr AO	*	*	*	*	*	1917,0	2698,0	2760,0	2965,0
Chukotsky AO	1347	2334	2097	2504,0	2958,0	4004,0	7996,0	11432,0	18382,0
Yamalo-Nenetsky AO	*	*	*	*	*	126498	203518	283277	326295
Republic of Komi	19395	20563	25394	29369	46940	64831	85673	93147	113551
Khanty-Mansi AO	*	*	*	*	*	438743.0	538308.1	589493.4	760866.2

Annex 2. Quantitative assessment and prioritization of environmental problems

Integrated matrix of assessment of priority environmental problems of the Russian Arctic. Consequences:: 1- past, accumulated; 2- current; 3- prospective, forecast. Evaluation of consequences: – - no; + - remarkable, tangibledemage; ++ - significant, considerable damage; +++ - catastrophic, significant damage.

Major concerns and their total score	Consequences for environment			Consequences for economy			Consequences for population			Potential transboundary consequences		
	1	2	3	1	2	3	1	2	3	1	2	3
Negative consequences and threats of global climate change (total score – 52)	-	+	+	+	+	++	+	+	+++	-	+	++
Transformation of permafrost (thawing, erosion, etc.), condition of habitat, biodiversity, ecosystems, bioresources (18)	-	+	++	+	++	+++	+	++	+++	-	+	++

Degradation and low adaptive capacity of economy and existing infrastructure (19)	-	+	++	+	++	+++	+	++	+++	-	+	+++
Destruction of life support systems, social infrastructure and increase of incidence rate of indigenous population and newcomers (15)	-	-	+	+	++	+++	+	++	+++	-	+	+
Pollution of environment (total score - 105)	+	++	+++	+	++	+++	++	+++	+++	++	++	+++
Transboundary transfer of pollutants via air and water flows (26)	++	++	+++	+	++	++	+	++	+++	++	+++	+++
Oil pollution as result of exploration, transportation and emergency situations , etc. (22)	+	+	+++	+	++	+++	+	+	+++	+	++	+++
Chemical pollution of environmental media, including PAH, POP, heavy metals, etc. (23)	+	++	+++	+	+	++	++	++	+++	+	++	+++
Radioactive pollution (16)	+	+	++	-	+	+	+	++	++	+	++	++
Accumulation of solid wastes (18)	+	++	++	+	+	++	+	+++	+++	-	+	+
Land degradation and violation of conditions of land use (total score - 34)	+	++	+++	+	+	++	+	+	++	-	+	+
Fragmentation of soil and vegetation cover (13)	+	++	+++	-	+	++	-	+	++	-	-	+
Land degradation, thermokarst anf thermoerosion (12)	+	+	+	+	++	++	-	+	++	-	-	+

Transformation of pasture land for reindeers (9)	+	++	++	-	-	+	-	+	+	-	-	+
Biodiversity, ecosystems and bioresources changes (total score- 103)	++	++	+++	+	+	++	+	++	+++	+	++	+++
Loss and transformation of ecosystems (18)	+	++	+++	+	+	++	+	+	++	-	+	+++
Reduction in biodiversity, number and transformation of habitat of rare species (19)	+	++	+++	+	+	++	+	++	++	-	+	+++
Unsustainable use of bioresources and poaching (32)	++	+++	+++	++	+++	+++	++	+++	+++	++	+++	+++
Accidental biotic invasions and intended introduction of invasive species (15)	-	+	++	-	+	++	-	+	++	+	++	+++
Low efficiency and representativeness of territorial biodiversity conservation (19)	+	++	+++	+	+	++	-	+	++	+	++	+++
Conservation of favorable environment (total score - 66)	-	+	+	+	++	+++	++	+++	+++	-	+	++
Degradation of residential properties, life support systems, including drinking water supply (17)	-	-	+	+	++	+++	++	+++	+++	-	+	+
Violation of traditional nature management of indigenous people (23)	+	++	++	+	++	++	++	++	+++	+	++	+++
Reduction of resource potential of traditional nature use of indigenous people (26)	+	++	+++	+	++	+++	++	+++	+++	+	++	+++

Annex 3. Causal-chain analysis of priority environmental problems

Will be added after finalization of this activity by ACOPS

Annex 4. Interventions and corresponding indicators

Example table

#	Activity	**Performance indicator**	**Priority**	**Timeframes**	**Cost, K$**	**Responsible authorities**
Long-term goal # 1. Prevention and elimination of the pollution of coastal and marine environment as a result of land-based and sea-based activities, including oil and chemical and radioactive pollution						
Target 1. Establishing the legal framework to improve the quality and protect the environment						
1.1	Development of new and amendment of existing legal and regulatory acts • Model law «On status of territories of Arctic zone of the Russian Federation" and • Regulation of the Government of the Russian Federation "On ensuring environmental protection in the Arctic zone of the Russian Federation"	Draft model law Draft regulation	1 1	6 months.	100 100	MNR, MRD, MED&T

ANNEX VI

STEERING COMMITTEE

of the UNEP/GEF Project

“Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment”

2nd Meeting

Saint Petersburg, the Russian Federation

April 25 - 26, 2007

STC 2/3(1)

Item 3 (1) of the Agenda

Draft

SUMMARY

OF DIAGNOSTIC ANALYSIS

Prepared by: Project Office
Status: approved by the Project Steering Committee

Content

I. INTRODUCTION

1.1. Global and Regional Significance of the Arctic Seas and its Associated Freshwater Catchments

Polar regions are the most important areas on the planet that influence and are impacted by the climate change. The Arctic Ocean and its shelf seas represent an area of global significance in terms both of their influence on global oceanic and atmospheric circulation and their unique biological species, which constitute an essential element of global biological diversity. Although the smallest of the major ocean basins of the world, the Arctic Ocean plays a crucial role in the movement of oceanic waters through connections and exchanges with the Atlantic and Pacific Oceans. Its characteristics are influenced by major inflows from the Atlantic Ocean, secondary inflows through the Bering Strait and continental runoff. The Arctic is the major driving force for the deep circulation of the oceans with cold deep water formation on the peripheries of the Arctic Ocean giving rise to the deep western boundary undercurrent which can be regarded as the starting point for Henry Stommel's 'Tour de Force' (or 'oceanic conveyor belt'). Thus, Arctic seas have a profound impact on many large-scale oceanographic processes; they are a zone of deep ocean water formation, and determine to a great extent the global hydrological cycle on our planet as well as atmospheric heat absorption.

The Arctic marine environment is heavily ice-covered throughout most of the year with seasonal fluctuations in ice-cover enabling the recovery of important fisheries resources from its shelf seas, particularly the Barents and Kara Seas. The largest fishery landings are made by Russia and Norway with Barents Sea cod among the most important species. The predominant shelf areas lie along the northern Russian coast and in the Canadian Arctic Archipelago. The Russian landmass occupies 44% of the circumpolar arc - approximately twice that of the next largest country, Canada.

The Arctic marine environment is home to a wide range of unique species, the best known among them being polar bear, narwhal, walrus and beluga. Over 150 species of fish inhabit arctic and sub-arctic waters; important among these are cod and American plaice, which is the most abundant flatfish in the Barents Sea. There are also a wide variety of birds. Some of these are unique to the Arctic such as several species of auk and ivory gulls that maintain close contact with ice-covered areas throughout their lives.

A further important feature of the Arctic is its indigenous inhabitants. As consumers of local resources, they are frequently the most exposed recipients of contaminants from local and distant sources. They are the most vulnerable part of human population in Arctic and most sensitive to environmental changes. With the increased exploitation of natural mineral resources in the Arctic, the existence of the indigenous community is at risk. Arctic indigenous peoples are the most fragile elements of human society in the Arctic and the most susceptible to environmental change and contamination.

The top-priority environmental issues in the Russian Arctic are mainly associated with local hot spots in the areas of intensive work, first and foremost, of oil, gas and mining companies. The contamination levels in these areas significantly exceed the regional ones, degrading or even destroying natural ecosystems, thus seriously damaging the health of local inhabitants and undermining the traditional way of life of the indigenous peoples. Mining work in the Russian Arctic is expected to gather momentum, which threatens to further damage the environment in this region. All this necessitates urgent measures to be taken to address the adverse ecological effects of the past and also to prevent further contamination of the Russian Arctic in the new realities of a market economy.

Occupying just 5% of the area covered by the world's oceans, and just 1.5% of their volume, the Arctic Ocean and its adjacent seas have a pronounced effect on the state of the Earth's climate and play a decisive role in many global processes. Arctic seas regulate the global carbon cycle, because they are an important CO_2 source in the winter and a sink for the flux of CO_2 in the summer. Recent assessments have shown that the Arctic is critically important in atmospheric CO_2 removal, both now and in the future.

1.2. Purpose of the diagnostic analysis

This Diagnostic Analysis (DA) is a scientific and technical assessment, through which the water-related environmental issues concerns and problems of the Arctic region have been identified and quantified, their causes analyzed and their impacts, both environmental and economic, assessed. The diagnostic analysis of the Russian Arctic and its associated catchment areas, is a process that focuses on identifying water-related problems and concerns, their socio-economic root causes, and the sectoral implications of actions needed to mitigate them. The analysis involves an identification of causes and impacts at regional, and global levels and the socio-economic, legal, political and institutional context within which they occur. The identification of the root causes specifies sources, locations, and sectors. The analysis then becomes the basis for a strategic action program, which development is coordinated by SAP-TT.

This DA provides the technical basis for development of the Strategic Action Programme (SAP). The DA is based on extensive previous work. First of all it takes into account all previous assessments performed by the Arctic Council and its working groups, first of all WG AMPA (Arctic Monitoring Assessment Program) and its reports on priority contaminants. The other sources of information are as follows: annual state reports on environmental protection in the Russian Federation; documents on NPA-Arctic; materials of federal and regional bodies of executive power of the Russian Federation; reports, prepared at the PDF-B stage of the Project; AMAP reports of 1997 and 2002 as well as other materials of the Arctic council WGs; NEFCO studies for Barents Sea region; etc.

Much of the work developed in this section therefore is extracted or summarized from vast resource materials available to the NPA-Arctic Project. The existing extent of data

and depth of analysis far exceeds the capabilities of this short DA and therefore it represents a succinct synthesis of this information.

1.3. Process of the DA

The first step in the DA process was to identify the Major Perceived Problems and Issues (MPPI). This step was performed initially at the PDF-B stage of the Project and then revisited during Task-Team meetings. These MPPI then were the basis for the analysis activity, during which time the validity of the MPPI was investigated.

The identified regional concerns and principal issues became the background for the preparation of the outline for this diagnostic analysis, along with the preparation of the DA outline, the substance of the strategic action programme was discussed.

The national reports, the transboundary diagnostic analysis and the strategic action programme are key elements in a project development activity under the Global Environment Facility (GEF) International Waters Portfolio. A project brief was developed in this analytical and participatory process that provided mechanisms for the implementation of actions addressing the major water-related issues in the Russian Arctic.

II. PHYSICAL AND GEOGRAPHICAL CHARACTERISTICS

In compliance with the Fundamentals of the National Policy of the Russian Federation in the Arctic, approved by the Government of the Russian Federation (Protocol No 24 of 14.06.2001) the Arctic Zone of the Russian Federation (hereinafter designated as the AZRF or the Russian Arctic) comprises:

- Entirely or partly, the territories of the Republic of Sakha (Yakutia), Murmansk and Arkhangelsk oblasts, the Krasnoyarsk Krai, Nenets, Yamalo-Nenets , Taimyr (Dolgano-Nenets) and Chukotka Autonomous Okrugs (the southern boundary of the AZRF has been determined by a special decision of the State Committee on the Arctic under the Council of Ministers of the USSR dated April 22, 1989);
- The lands and islands indicated in the Enactment of the Presidium of the Central Executive Committee of the USSR of April 15, 1926. «On the declaration of the USSR territory the lands and islands situated in the Arctic Ocean*;
- The inland marine waters adjacent to the above territories, lands and islands of the Russian Federation, the territorial sea, the exclusive economic zone and continental shelf within which Russia has sovereign rights and jurisdiction in conformity with the 1982 UN Convention on the Law of the Sea.

The total area of the Arctic zone of the Russian Federation exceeds 6 million square kilometers, including the area of the Arctic sea space within the territorial sea and the exclusive economic zone of the Russian Federation – over 3 million square kilometers. The Arctic seas of Russia include the Barents, White, Kara, Laptev, East Siberian,

* Between the meridians 32°04′35″ E (and from 74° N to 81° N between the meridian 35° E, taking into account the accession of the USSR to the Spitsbergen Agreement in 1935 and 168°49′30″ W.

Chukchi and Bering seas. The land territory of the Russian Arctic accounts for 18% of the entire country's territory.

The SAP-Arctic primarily covers the Russian Arctic. However, in case the pollution sources impacting substantially the condition of the Arctic marine environment are located beyond it, the SAP-Arctic will cover these facilities and territories. For instance, the SAP-Arctic covers the Republic of Komi and Khanty-Mansi Autonomous Okrug.

There are some specific features that make the Arctic different from other northern parts of the Russian Federation:

- Too harsh nature and climate conditions (low temperatures throughout the year, the long polar night and the long polar day, seas and river estuaries ice-bound for more than half a year, frequent magnetic storms, the thinning ozone layer, strong winds and blizzards, thick fogs, monotonous landscapes in Arctic deserts and tundra, perennially frozen soils lying close to the surface – permafrost), generally overwhelming for humans;
- The natural environment is very vulnerable, ecosystems are not sustainable enough, and can be damaged easily as a result of human impact, and it takes a very long time for them to recover;
- Sparsely populated, it has just a few densely populated areas, with virtually no transport infrastructure in place. However, there are some major towns, mining industry centers and sea ports in the Russian Arctic, too.
- The Arctic has an important part to play in that how the Northern Hemisphere climate is formed and how environmental equilibrium is maintained on the whole planet.

Common characteristics of the region include low temperatures in summer, a lengthy (at least 7-8 month long) cold winter, dominance of precipitation over evaporation, omnipresent permafrost, high water supply, especially so in the south, high seasonal differences in solar radiation inflow, as the polar day and night alternate. Drift ice covers much of the Arctic sea areas all the year round (around 11 million km^2 in winter and around 8 million km^2 in summer). Severe climate results in low temperatures in the surface seawater layer – close to -2°C throughout the year. The great Siberian rivers (the Northern Dvina, Pechora, Ob, Yenisei, Lena, Indigirka, Kolyma, etc.) discharge into the Arctic basin, draining huge areas, including well-developed ones and thus capable of contributing pollutants both soluble and insoluble.

The Arctic is extremely rich in mineral resources. The amount of fuel available in the region is so vast that it is demand rather than supply that determines how much of it should be extracted. It is estimated that the Russian Federation's Arctic nature wealth contributes about 12% to the global ecosystem balance. Around 80% of Russian natural gas, over 90% of nickel and cobalt, 60% of copper, 96% of platinoids, and 100% of barite are produced in the Arctic. The region accounts for half all forest and fish products made in Russia. Up to 15% of fish harvested in Russia comes from here. Large oil and gas deposits have been discovered on the Arctic sea shelf. Some

estimates put the Arctic shelf potential at around 90 billion tons of equivalent fuel. Twelve very large, even gigantic, hydrocarbon deposits have been found on the shelf of Russian Arctic seas. Vast gas deposits discovered by now in the Barents and Kara seas include the Shtokman (with a capacity of around 3.2 trillion cubic meters), Ludlovskoye, Prirazlomnoye, Rusanovskoye, Leningradskoye, etc. The Barents and Kara seas can therefore be considered a key strategic source of oil and/or gas in the Russian Arctic. There are good chances of discovering more hydrocarbon deposits in some areas on the Pechora Sea shelf, and in Tazov and Ob bays (gubas) in the Kara Sea in the nearest future. The Russian Arctic has a positive saldo in how much it pays to and receives from the Federal level, accounting for almost 60% of hard currency the country gets, and for around 20% of its gross domestic product. The region also has one of the largest transport arteries – the Northern Sea Route (NSR) that renders Russia's geopolitical location in the Arctic very important.

Despite some common natural characteristics found across the region, there are differences noted both going west to east and north to south (Table II.1.1). Some additional statistic information on region in given in Annex 1.

1 **Table II.1.1 General description of the Russian Federation constituent entities that are part of the Russia's Arctic Zone**

RF Constituent Entity	*Area, km^2*	*Population and its density, population/ km^2*	*Geographical Location*	*Climate*	*Mineral Resources*	*Key Industries*	*Agriculture*
Murmansk Oblast	144,900	892,534 /6.2	Located on the Kola Peninsula. Washed by the White and Barents seas.	Sub-Arctic and temperate climatic zone. Temperate cold climate.	Kyanite, apatite-nephelite, copper-nickel, iron and titan-magnetite ores, and construction raw materials	Ferrous and non-ferrous industries; chemicals; foods (fish); construction materials; power generation; machine-building industry (ship-building and repairing)	Livestock (meat and milk production). Reindeer farming, arable farming (feed production)
Arkhangelsk Oblast	410,700	1,294,993 /3.2	North-west of RF. Washed by the White Sea	Arctic climate zone. Atlantic-Arctic climate.	Oil, gas, bauxites, diamonds, limestone, construction materials	Timber, woodworking, pulp and paper, fish and some other industries	Meat and milk livestock, reindeer farming, vegetable growing
Nenets Autonomous Okrug	176,700	41,546 /0.2	North of Russia, Washed by the Barents and Kara seas.	Sub-Arctic climatic zone. Temperate cold climate.	Gas and oil	Fuel and food industries.	Milk livestock, reindeer farming.
Komi Republic	415,900	1,018,674 /2.4	Located in the north-east of the Russian Plain	Temperate climate zone. Temperate continental climate.	Ores, bauxites, rock salt, gypsum, limestone, mineral water.	Oil and gas processing, timber, woodworking, pulp and paper industry.	Livestock farming. Reindeer farming.
Yamal-Nenets Autonomous Okrug	750,300	507,006 /0.7	West Siberian Plain, downstream sections of the Ob River.	Arctic and subarctic climatic zones. Continental climate.	Gas and oil.	Fuel industry	Reindeer, fur-farming, fur hunting.

Taimyr	862,100	39,786 /0.05	Taimyr Peninsula. Principal rivers – Yenisei, Pyasina, Khatanga, and Dudinka	Temperate climate zone. Continental climate.		Mining industry, fisheries	Reindeer herding, fur animal breeding
Republic of Sakha (Yakutia)	3,103,200	949,280 / 0.3	North Asian part of the Russian Federation. Washed by the Laptev and East-Siberian seas. The Novosibirsk Islands are also part of Yakutia.	Subarctic, arctic and temperate continental zones. Continental climate.	Diamonds, gold, mica-phlogopite, hard and brown coal, iron ore, natural gas, tin, tungsten, polymetallic ore, piezocrystal, antimony, mercury, apatites	Production of raw materials and enrichment, non-ferrous metallurgy, coal industry.	Furs, milk and meat, potato and vegetables
Chukotka Autonomous Okrug	737,700	53,824 / 0.1	North-east of RF, Chukchi Peninsula. Washed by the East-Siberian, Chukchi and Bering seas.	Arctic and subarctic climatic zones. Oceanic climate.	Gold, tungsten, tin, coal. The best known deposits: tin – Valkumey, Pyrkakai; coal – Anadyrskoye, Beringovskoye	Mining industry: gold, hard and brown coal. Power generation, fish industry and traditional folk arts are also well developed.	Reindeer herding, fur animal breeding, fur hunting, sea mammal hunting (seal, walrus).

III. SOCIAL AND ECONOMIC CHARACTERISTICS

The Russian Arctic has made and will continue to make a significant contribution to sustainable development in the country, and produce a marked effect on its economy, and both internal and export revenues. Financial and budget government policies and the smooth operation of various industries country-wide very much depend on economic activities in the Arctic region. Many things produced in the Arctic are crucial for sustainable industrial production in the country and have been key export items in Russia's (formerly, the Soviet Union's) export potential throughout the modern history of the state.

The basic structure of the Russian economy was developed during the Soviet era with economic planning as a core instrument. As a consequence of planned public industry development, resource extraction and processing have to a large extent been organized in combinates that are vertically integrated and produce multiple outputs. The extractive industries that are pre-dominant in Arctic Russia have this historic origin, and economic statistics have been compiled in formats associated with that institutional framework.

Simultaneously, the way natural resources are used today seems to be in strong contradiction with the economic and environmental role the Arctic plays in ensuring sustainable development in Russia. For years the region has been considered only as a source of raw materials, and using it in a largely unwise way has resulted in some adverse environmental effects. Raw material extraction and processing industries that produce large amounts of solid, liquid and gaseous wastes used to account for about 70% of all companies operating here.

For many centuries using the Arctic natural wealth concentrated around few relatively well-developed centers of economic activity. Before the beginning of the 20th century reindeer herding, hunting, including that for sea mammals, fisheries, and timber harvesting were key trades in the Arctic. As a wealth of natural resources was discovered here, industries came to Arctic areas. Now the leading economic sector in western part of the Russian Arctic is industrial production, which accounts for over 60% of goods, and 63% of main production assets made in the region. Key industries include fuel production and power generation, as well as smelting, accounting for 40 and 15% of industrial output respectively. The region contains unique stocks and probable reserves of copper-nickel ores, tin, platinum less-common metals, and rare earth elements, as well as large stocks and probable reserves of gold, diamonds, tungsten, mercury, ferrous metals, optical raw materials and ornamental stones. The main mineral resources of the central and eastern parts of the Russian Arctic are located in the following provinces:

- Taimyr-Norilskaya (copper-nickel ores, platinoids);
- Maymecha-Kotuyskaya and Udzhinskaya (phosphorus, iron, niobium, platinoids, diamonds);

- Taimyr-Severozemelskaya (gold, mica, molybdenum, tungsten, chrome, vanadium, polymetals);
- Anabarskaya and Yakutskata (diamonds, iron, rare metals);
- Verkhoyanskaya and Yano-Chukotskaya (tin, gold, mercury, tungsten, copper, molybdenum, silver, platinoids, polymetals).

The continental shelf and archipelagos in the RAZ contain stocks and probable reserves of almost all the categories of stream tin, gold and diamonds, silver, manganese, polymetals, fl uorite and ornamental stones, titanium and zirconium

II.2.1. Population

The population of the Russian Arctic region resides mainly in towns, which have usually grown around either major mineral resource extraction sites or transport roots. The average population density is very small – never over 1 per square kilometer. As ecological capacity of tundra areas is low, they have naturally grown to have a maximum population density of 2 per km^2 (in contrast with 17-18 per km^2 in forest-steppe ones). There are 87.6% of urban residents on average (more that the country-wide average), and urban population is at its highest in Krasnoyarsk Krai (94.7%) and Murmansk Oblast (93.6%). The largest cities and towns include Murmansk (around 500 thousand population), Norilsk (around 200 thousand), and Vorkuta (around 120 thousand). Most (75%) of indigenous peoples reside in the countryside in the region. The Saami people have a relatively high urban population (up to 40%), as do the Nenets (17.1%) and the Chukchi (10%). The traditional patterns in how native low-population peoples populate the Arctic region have been undergoing significant change as new mineral resource deposits are discovered and developed continuously, transport infrastructure is growing, etc. which affect livestock grazing areas and hunting grounds, fish spawning and feeding grounds in rivers, thus undermining native peoples' traditional resources base.

There are 11 indigenous peoples in the Arctic region: the Saami, Nenets, Khanty, Mansi, Nganasans, Dolgans, Evens, Evenks, Chukchi, Eskimos and Yukaghirs. Settlements with residents having their own traditional households provide a natural basis for the Russian State to have presence here, and are proof by themselves as to which country the areas belong to. While the Russian government wants native peoples to be present here on a sustainable basis, Arctic regions continue to fall behind other regions in Russia considerably in terms of both living standards and the quality of life. Many of the settlements that used to supply manpower to mining industry companies or bases of the Ministry of Defense or the Federal Border Guard Service of Russia have been abandoned since the economic activities stopped and there have been no other employment opportunities. Unemployment has become a new challenge, reaching in some areas 10-12%. In 1990 to 1995 there was an ever growing people migration, resulted in the most qualified specialists having left the Arctic. The 1999 population in the Russian Arctic was 98.8% of that in 1994, on an average, including: in the Republic Sakha (Yakutia) – 94.5; Krasnoyarsk Krai – 99.1; Arkhangelsk Oblast – 97.6; Murmansk

Oblast – 98.2; and Chukotka Autonomous Okrug – 90.8%. There was a slight growth of population in Tumen Oblast – 101.7%, including that in the countryside in Yamal-Nenets Autonomous Okrug – 101%.

Growing emigration from the Arctic to European or other regions of Russia, as well as an excess of the number of deaths over that of births have been the key reasons behind the declining population in the Russian Arctic. Over 2000 to 2004, Russian Federation's constituent entities with their parts lying in the Russian Arctic had population reductions (in %) as follows: Murmansk Oblast – 16; Nenets AO – 16; the Republic of Komi – 11; Krasnoyarsk Krai (its polar areas and ones equated to those) – 13; Taimyr AO – 20; the Republic Sakha (Yakutia) – 12; and Chukotka AO – 54 (Table 16). Yamal-Nenets Okrug had a slight absolute population growth (around 1%).

Of special concern is the fact that most of those who left the regions were active able-bodied people. This trend causes the demographic structure to deteriorate, and affects the existing unique qualified labor market. Simultaneously, such population groups as disabled, elderly, unemployed people or large families cannot move elsewhere from the Arctic as they lack funds to afford traveling. A good example is the town of Vorkuta, where the number of elderly and disabled people rose from 35.4 thousand in 1995 to 39.1 thousand in 2002, or almost by 8%, while the total population of the town declined by about 16% over the same period.

However, despite the fact that people tend to leave the Arctic, the population that built up here at the time when the economy developed extensively remains to be relatively excessive. Experts estimate that the 'excessive' population in the region accounts for around 15-20% of the total one.

In recent years issues related to the resettlement and provision of homes to people currently residing in settlements that are due to be closed down as companies and organizations providing jobs to the local populations are about to be shut down have grown in significance. According to authorities in Russian Federation constituent entities that partly or fully belong in the Arctic it is planned to eliminate 120 settlements with a total population of over 50 thousand by 2007. The scale and importance of the problem is well illustrated by the fact that, for example, in Chuckotka AO the number of residents of settlements due to be closed shortly is over 4% of the total population in the okrug, while that in Nenets AO is 7.3%.

Along with people leaving the Arctic, there is an uncontrolled inflow of people attracted by a relatively high pay and social benefits set out in the Russian Federation Law 'On State guaranteed benefits and compensations to persons working and residing in the Arctic areas and ones equated to these'. In 2004 alone over 150 thousand people arrived in Russian Arctic areas, including: Murmansk Oblast – 6.8; Nenets AO – 1.7; Yamal-Nenets AO – 17.8; Norilsk – 73.8; Taimyr AO – 2.1; and Chukotka AO – 1.8 thousand. Over 16% of these came from outside Russia, largely from CIS and Baltic countries.

Most of the Arctic regions have seen positive changes over the last decade, however it is characteristic of them to have contrast situations every so often, and the latter must be reviewed in the context of population migratory processes. The Arctic population decreased by 1.4 million from 1989 to 2002. Notwithstanding somewhat decreased migration from Arctic areas at the beginning of the 21st century, people continue to leave most of the regions.

The most problematic regions in terms of demographic processes, despite some positive trends of late (due to migratory processes), include: Nenets AO (81st place on a list of regions rated using a combined rate of all 5 indices above), Chukotka AO (73). Relatively well-doing in the said respect regions include: Yamal-Nenets AO (1st), Khanty-Mansi AO (4th), Taimyr AO (13th), Republic Sakha (Yakutia) (16th) and Murmansk Oblast (23rd).

II.2.2.2. Industrial production

The outlook for economic development in the region is determined by its natural resource potential and the growing demand for raw materials in both domestic and world markets. The depletion of mineral fields in the mid-latitudes of the country and the associated price increase makes it more and more economic to exploit resources in polar lands and seas. This explains the growing interest on the part of Russian and foreign corporations in the fields found in the central and eastern territories of the region.

The determining factors for economic development of the Russian coast of the Barents Sea region are the exploitation of natural resources. The main branches of industry are the following:

- Mining industry and metallurgy (Karelia, Murmansk Region);
- Forestry, wood-processing, and pulp and paper industry (Karelia, Arkhangelsk Region);
- Oil and gas industry (Arkhangelsk Region, Nenets Autonomous Region);
- Fishery and fish-processing industry (Murmansk Region, Arkhangelsk Region, Nenets Autonomous Region);
- Electric power production (Murmansk Region);
- Production of building materials (Karelia, Murmansk Region).

The Murmansk and Arkhangelsk regions house shipbuilding enterprises, including those strategically important for the entire country. The ports of Murmansk and Arkhangelsk are among the largest ports of Russia.

The Murmansk Region provides:

- 100% of the total Russian production of apatite and nepheline concentrate;
- 8.5% of iron-ore concentrate;
- 17% of copper;

- 45% of nickel;
- 11.5% of fish products;
- 2% of electric power (the share of the branch in the northwest Russia is 20.8%).

The major industrial branches in the Murmansk Region are non-ferrous metallurgy, food industry, chemical industry, and electric power production. The backbone of the Murmansk Region's economy is mining and metallurgy. The leading enterprises in the non-ferrous metallurgy are the Kola Mining Company (which, together with traditional productions like nickel, copper, cobalt, gold and platinum, is developing the production of non-traditional metals) and Kandalaksha Aluminium Plant (one of the two aluminium plants in the Northwest Russia). In the ferrous metallurgy industry, the largest enterprise is the Kovdor Ore Processing Plant producing iron ore concentrate. The apatite ore processing plant in Apatity is the 12th largest chemical enterprise in Northwest Russia. The Murmansk Shipping Company is the only shipping company in Russia able to work in the Arctic all year round. Possessing a unique fleet of nuclear powered icebreakers, it enables yearly navigation along the Northern Sea Rout. The port of Murmansk takes fourth place among 42 Russian ports and is the largest port in Northwest Russia, able to dock ships with dead-weights up to 250 000 tonnes.

The forestry sector is the leading branch for the Arkhangelsk Region. In second place is the electric power production.

The oil industry is the backbone for the Nenets Autonomous Region; 4 million tonnes of oil were extracted in the region in 2000. In general, the Nenets Autonomous Region occupies second place in oil production in Northwest Russia (34.1%). A large volume of construction work in the region is linked to the exploitation of oil deposits. Some estimates for the Nenets AO predict that economic growth will mainly rely on the development of hydrocarbon stocks. Total resources in 75 fields that have already been discovered fields about 2,400 billion tonnes of oil and 1.2 billion km3 of gas. Twenty-six fields are ready for industrial extraction with their proven stocks totaling about 525 million tonnes of oil and 511 000 km3 of gas. The report "Energy strategy for Russia until 2020" of the Russian Federal Council (2002) assumes a growth in oil extraction in the Timano-Pechorsk oil -and gas province (which includes the Nenets AO) from a recent 11 million tonnes to 37 million tonnes by 2010. An estimated 10 milion tonnes is planned for extraction from the continental shelf. The Nenets AO contains 53.8% of the oil, 38.9% of the gas and 12.3% of the condensate in the province.

The Yamalo-Nenets AO has the largest gas fields in the developing world (every fourth cubic metre of all the world's gas is extracted from this area). There are 205 hydrocarbon fields located in the autonomous district, including world's largest, Urengoyskoye, Yamburgskoye, and Zapoliarnoye. Pipeline transportation is well developed and is continuing to be developed, with pipelines such as the "Northern Light" and the "Urengoy-Pomary-Uzhgorod-Western Europe". With the completion of the "Yamal-Europe" pipeline in 2020, the estimated annual supply of Yamal gas to Western Europe could reach 150x1012 m3.

Along the Yamal Peninsula seaside some off shore moorings for loAOing tankers have alreAOy been built. The main one is in Harasavey township. This township is home to a tank port project, with the estimated turnover of condensed gas at about 20.9 million tonnes per year. The river ports of the region, such as Labytnangi, Salekhard and others are available to allow for the sea export of oil and gas. The development in the Yamal-Nenets AO of chromite ores, which are scarce in Russia, is also promising, with the estimated resources at about 700 million tonnes. The same is true for titanium-magnetite ores (32.8 million tonnes), and precious and semi-precious stones.

The outlook for economic development in Taimyr (the Dolgano-Nenets AO) is related to the development of the Norilsk industrial complex, which provides up to 20% of the world's nickel and cobalt, 65-70% of the world's copper and essentially 100% of the world's platinum metals. The northern Krasnoyarsk region, which includes Taimyr, in the Dolgano-Nenets AO, contains oil and gas regions (Yenisei-Khatanga, Anabaro-Khantanga and others) with estimated oil resources of about 3.2 000 billion tonnes and about 14.6 billion km3 of gas and condensate. Gas extracted in this region now mainly supplies the Norilsk metallurgic plant (Gramberg et al. 2000).

The oil and gas potential of the arctic regions of the Republic of Sakha and Chukotka is not well known. The estimated supply in the Bering Sea basin (which adjoins Chukotka) is more than 16 000 billion tonnes of oil equivalent. Among the most promising issues for the development of the Chukotski AO is the extraction of non-ferrous metals: gold (up to 30 tonnes per year), silver, tin, tungsten, and coal (up to 800 000 tonnes per year). In the long-term, development of the oil and gas fields on the continental shelf will also be an option. With the development of extracting industry in nearly the entire Russian Arctic region it is expected a growth of production volume in transporting, services sectors in traditional spheres of living of aborigines.

II.2.2.3. Power Production

The fact that Arctic areas develop unevenly and differ in available fuel resources has resulted in the power supplies sector having become one of the weakest links in the existing industrial infrastructures. Most Arctic areas use decentralized power supplies. Local needs in power are normally met by local power plants that mainly use fuel shipped from elsewhere. Fuel shortages due to reduced supplies to Arctic areas and extremely high prices lead to decreased power generation and soaring electricity prices.

Key deficiencies in the sector also include a far from optimal structure of power generating capacities, low technical level, poor equipment adaptability to heavy operation conditions, unsustainable power supplies (especially as far as decentralized power supply is concerned). The state of repair and technical level of existing power generating sites calls for urgent intervention. Over half coal mining machinery needs replacement, as do 30% of gas pumping stations. Around two thirds of equipment in oil industry is 50% worn out, as is over one third of that in gas industry. About half all main oil pipelines and over 40% of all gas pipelines have been in operation for 20 to 30 or more years.

Since 1991 there have been more power production capacities decommissioned in the energy sector in the Arctic than new ones put into operation.

One of the reasons behind lack of coordination in supplying power to industries and homes is a considerable number of small diesel-fired power stations in use across the Arctic. Their total number is estimated at 5.5-6.0 thousand, with a total consumption of liquid fuel imported from elsewhere of about 700-800 thousand tons. Heat production industry is even more fragmented and poorly coordinated. In some areas, e.g. Chukotka Autonomous Okrug, almost 60% of needs in heating are met by boilers with average capacity of around 2-3 Gcal/h.

II.2.2.4. Agriculture

Agriculture is a largely sideline economic sector and includes animal farming (reindeer, milk cattle, pigs, poultry), vegetable growing (potato, greenhouse vegetables), and feed production. Due to its limited scale, agriculture, less reindeer farming, has no adverse environmental effects over any large areas. Overgrazing, however, affects to some extent up to 30% of the total Russian Arctic and Subarctic area. The pollution of lichens (along with fires and overgrazing) results in an annual loss of 2-3% of winter reindeer feeding grounds, which undermines feed resources available to both wild and domesticated reindeer, thus affecting traditional economies of many native peoples in the Arctic.

Milk and meat livestock and poultry farming, vegetable and potato growing are quite popular in western parts (Murmansk and Arkhangelsk oblasts), while fur animal farming (blue fox, silver fox, mink), fishing, killing of fur (polar fox, sable, squirrel, ermine) and sea wild animals are more common in Central and Eastern parts of the Arctic.

All types of agriculture that used to be one of the most profitable economic sectors are now in a state of crisis. Milk output in 2000 was lower than that in 1991 in all Arctic regions without exception, with the largest decline reported in Taimyr and Chukotka autonomous okrugs.

Sea animal harvesting, despite the fact that the number of animals shot annually is currently insignificant, and fur animal farming are in an acute crisis. There is a decline in fur animal harvesting, too, with main problems in the trade being a depleted stock, worsened economic conditions, lack of incentives offered to hunters, and inefficient management.

Fisheries, as part of agriculture, merit special attention in Arctic regions, since fish products account for more than 20% of animal protein consumed in Russia, and over 45% of that in the Arctic. The situation fisheries had found themselves in by 2000 was not a simple one. On the whole, landings of fish and other sea products remained to be on a decline. Russian Federation-wide, there was an average decrease of 5.4% to the 1999 level, while in Murmansk Oblast – 8.9%. There are lower landings of walleye pollack, crabs of all kinds, and navaga. At the same time, there have been higher landings of salmon, flounder, halibut, rasp, shrimp, as well as species with no limitations placed on their harvesting. The main reasons for lower fish and sea product landings

included: reduced quotas compared to the previous year, worn-out fishing boats and fish processing equipment, and depleted stocks of commercial fish species.

The fishing fleet's service life is at its end: over half all boats have been longer in operation than they should have. Selling boats to private hands has affected overall efficiency, too. It has become increasingly difficult to position boats in a rational way in areas of harvesting, as to coordinate how each of the numerous fishing companies should do the fishing has proven to be virtually impossible.

II.2.2.5. Forest industry

Forest industry is one of the most important uses of nature in northern taiga areas, and covers largely sub-arctic forests and open woodlands. According to the Russian Federation Forest Fund a few years ago the Sub-arctic region had an annual felling area of 0.5 - 1 thousand km^2. Sub-artic forests perform important environmental functions not only region-wide, but also play a part in forming the climate in areas further south, as they prevent cold Arctic winds from reaching there.

II.2.2.6. Arctic indigenous peoples' economies

Eleven native low population peoples are engaged in traditional nature uses (reindeer herding, hunting, fishing, sea animal harvesting) across Russia's Arctic coast, along with another 5 peoples that reside in areas adjacent to the Arctic coast. Traditional nature uses help maintain the whole system of cultural traditions and trade skills and thus perform an ethnicity protection function.

Key problems of native low-population peoples of the Arctic that need to be addressed urgently include first of all those of their traditional economies (reindeer herding, hunting and sea animal harvesting, fishing, etc.) that cannot put up competition to other market players and are in a grave crisis. As companies to process raw materials are not available locally, technical facilities are obsolete, commodity flow networks are underdeveloped and transport costs are high, most locally produced goods do not reach their destination markets, and in consequence often remain uncalled for.

Reindeer herding has become loss-making, while it used to be one of the most profitable trades in the past. The Russian reindeer stock has got no longer breeding capacity as it used to have. At the same time reindeer herding has always been a key trade for native low-population Artic peoples. It is where historically formed skills have been applied to for so long, and it is this form of household economy that helped preserve their unique cultures and grew to become a key, if not the only, source of wherewithal for them. The sector enjoys a significant potential (around 65 thousand tons of reindeer meat in live weight) and can contribute mightily to the food stock available to Arctic regions. In 1990 the total stock of domesticated reindeer was 2,260.3 thousand animals, then it decreased 1.8 times by 2000 to become 1,244.1 thousand, and continued to decline by over 100 thousand a year. The largest drop in the reindeer stock has been seen in the Chukotka (491 thousand in 1990 – 156 thousand in 2000), Taimyr Autonomous Okrug (77 and 43 thousand, respectively in 1990 and 2000), and in the Sakha Republic (Yakutia) (362 and 165 thousand, respectively).

Reindeer breeding in the European part of the Arctic (the Republic of Komi, Murmansk Oblast and Nenets AO) is struggling, too, but the total livestock has decreased here to a less degree (1990 – 392 thousand animals, 2000 – 313 thousand), or by 20%.

Some regions have seen (e.g. Taimyr AO) uncontrolled growth in wild reindeer stocks, which not only results in grazing areas depleting, but also seriously affects domesticated herds. Reindeer herding, as an economic sector, has become permanently loss-making virtually in all Russian Arctic areas (profitability of 42 to 96%). This has resulted in a reduced number of jobs in the sector, especially for native low-population peoples of the Arctic (up to 10 thousand).

It is only in Yamal-Nenets AO where the total livestock of domesticated reindeer has increased (1990 – 491 thousand animals, 2000 – 501 thousand). However, any further growth of the livestock can be a threat to the environment, as grazing areas do not have enough capacity, and are in fact shrinking as a result of parts of them being switched from traditional to other types of use, such as for industries, with environmental problems being another contributing factor.

Fisheries have been degrading, too, albeit being one of the most profitable native peoples' traditional trades in the past. In recent years fish landings in rivers flowing through areas of residence of native peoples have almost halved. The quality of fish supplied to the market is often quite low, and a lot of valued fish go bad never reaching customers. The main reasons include systematic overexploitation, failure to meet environmental standards, and an undeveloped sales network. The pollution of fisheries bodies of water by industrial effluents causes huge damage to traditional fish harvesting.

The situation that has transpired has a lot to do with a low economic efficiency (reliance on governmental subsidies) of traditional economies, difficulty local communities meet with trying to adapt to changed economic realities, lack of trained personnel, as well as lack of favorable conditions and economic prerequisites for sustainable development.

Another matter that should be mentioned in this context is that traditional economies have been affected considerably by the fact that part of their lands has been expropriated to meet the growing needs of mineral resource extraction. Some estimates have it that mining/oil and gas companies have expropriated around 15-18% of traditional use lands by the beginning of 2004.

II.2.2.7. Transport

Virtually all Arctic coast regions are difficult to access by any means of transport. As a result of this difficulty, there are very high costs involved in delivering vital supplies to inhabited areas and production sites, and there is a need for non-stop government support to maintain activity in these places. There is a long history of transport developments in the Arctic, in particular marine and river navigation, as well as from the 1930s onward – those of aviation. Railways and motor roads are largely confined to the European section of the Arctic. Last decades have seen pipeline transport develop rapidly, too.

The Northern Sea Route (NSR) is a very important part of the Russian Artic economic system and a key transport link between the Russian Far East and western parts of the country. The NSR has all key Siberian river transport arteries united in a single transport network. For some Arctic areas (Chukotka, Arctic sea islands, and some settlements on the coast of Taimyr (Dolgano-Nenets) Autonomous Okrug), maritime transport is the only means of cargo carrying and delivering vital supplies to the populations. At the same time most of the maritime transport sector is composed of numerous small transport firms and organizations that pursue their group-wide or private interests. The only exception is the nuclear-powered icebreaker fleet. Essentially, the Government has surrendered its functions as a coordinator of transport services in the macroregion. No action to expand or improve transport infrastructure is currently taken. Most of the 14 sea ports are in need of reconstruction. Piers in most Arctic ports are in a decrepit state, and there is a need for both their capital repair and increasing depths at piers to be able to handle modern ships. Aircraft and helicopter stocks need renovation as the only means of year-round inter- and intra-regional cargo and passenger transport, and a significant portion of sea and river fleets needs to be replaced, too. Also, there are not enough trucks designed to operate in a permafrost-dominated environment that could be used for cargo carrying inside Arctic regions.

The amount of cargo transported along the NSR, now 4 times as small as it used to be, remains to be at a critical low. The huge drop in cargo flows has caused the Arctic transport system to deteriorate dramatically (see Table III.1).

Table III.1. Aggregated NSR cargo carrying parameters in 1985 to 2000.

Year	Cargo carried, ths.t.					Cargo voyages	
	Cabotage	**Transit**	**Export**	**Import**	***TOTAL***	**q-ty**	**Ships, q-ty**
1985	4,734.2	38.1	1,007.5	401.5	***6,181.3***	1115	296
1986	4,964	54.7	1,001.2	434.8	***6,454.7***	1224	296
1987	4,987.1	1.0	1,080.9	509.8	***6,578.8***	1306	331
1988	4,798.4	0.0	1,048.9	447.9	***6,295.2***	1016	296
1989	4,616.1	55.2	1,137.6	14.1	*5,823.0*	928	273
1990	4,182.6	115.1	1,201.0	11.8	*5,510.5*	886	252
1991	3,882.3	176.2	743.6	1.9	*4,804.0*	811	243
1992	3,250.8	202.3	450.8	5.3	*3,909.2*	606	206
1993	2,286.8	208.6	517.3	3.0	*3,015.7*	463	177
1994	1,523.9	140.2	578.9	57.1	*2,300.1*	315	153
1995	1,605.6	100.2	606.0	49.5	*2,361.3*	309	134
1996	1,240.7	18.1	367.6	15.6	*1,642.0*	234	75
1997	1,384.7	0.0	525.0	35.6	*1,945.3*	220	70
1998	927.7	0.0	524.1	6.6	*1,458.4*	152	91
1999	1,018.0	0.0	549.2	13.0	*1,580.2*	155	49
2000	961.9	0.0	622.7	2.4	*1,587.0*	169	52

Undeveloped transport infrastructure, the fact that most types of transport can be used only a limited time during the year, long distances and complicated route patterns have

resulted in transport expenses accounting for 70-80% of the cost of goods produced in the Arctic (while the rest of the country has an average of about 18-20%).

It should be stressed that all industries in Russian Arctic regions, with no exception, have to operate in very hard conditions, linked with harsh climate, remoteness and difficulty of access, as well as with undeveloped transport networks.

A significant growth in both sea and river navigation in this region is expected, given the following factors:

- The coastal eastern arctic zone of Russia includes existing and projected oil and gas, mining and metallurgic enterprises and attracts cargo traffic from other export-oriented companies from the Krasnoyarsk region, Yakutia, the Novosibirsk region and other regions in the Russian Federation that are located in the basins of the main north-south rivers.
- More than 30% of Russian timber, carving wood, cellulose and paper are made in the territories that can be served by the NSR. Sea and river transportation of forest cargo from Igarka, Lesosibirsk and Krasnoyarsk are planned to be restored to former levels (1.2 million tonnes).
- The growth of traffic via the port of Dudinka is expected: magnesite (200 000-350 000 tonnes), aluminium (up to 900 000 tonnes) from Angaro-Yenisei region, and coal from Yakutia and Kemerovo areas (up to 1 million tonnes).

One of the main features of the Russian part of the region is insufficient development of the railway and motor transport infrastructure; the density of the road net decreases both from west to east and from south to north.

II.2.2.8. Protected Natural Areas in the Arctic

The Russian Arctic zone has extensive areas of virgin nature, which are part of world nature heritage, and their international importance continues to grow. The importance is linked with the need to protect biodiversity in the unique Arctic surroundings. Protected natural areas (PNAs) are the only form of nature conservation measures that has been taken quite actively in the Russian Arctic in past decades. There are 405 PNAs of different status in the Arctic now. They have a total area of around 2.5 million sq. km, or 17% of the Arctic total area. Of these, eleven state nature reserves and the Franz-Josef Land Federal Reserve have been granted the status of IUCN Category 1 protected natural heritage areas. They have a total area of 0.15 million sq.km. Over 0.30 million sq.km is the total area that all Russian PNAs classified as north, Artic and near-Arctic have got. Existing and planned PNAs encompass all key typical zonal, mainland, mountainous, river delta and other Arctic landscapes. PNAs often provide opportunities for local populations to pursue traditional nature uses, in recognition of very close links existing between native peoples and Nature. However, as of now it is quite hard to assess whether measures taken to protect Arctic biota and ecosystems through PNAs are sufficient (Table III.2).

Table III.2. Biodiversity conservation in PNA-covered polar desert, tundra and forest-tundra ecosystems*

NN	Protected Area (Nature Reserve)	Area, ths.ha	Data of creation	N° of species:			
				Flora	Birds	Incl. nesting	Mammals
1	Great Arctic	4,169.2	1993	189	124	55	16
2	Gydanski	878.1	1996	180	63	57	15
3	Kandalakshski	70.5	1932	667	240	134	26
4	Koryakski	327.2	1995	226	153	97	28
5	Kronotski Biospheric	1,142.1	1934	810	216	121	32
6	Laplandski Biospheric	278.4	1930	607	180	118	31
7	Magadanski	883.8	1982	727	210	170	41
8	Nenetski	313.4	1997	130			
9	Wrangel Island	2,225.7	1976	376	148	51	8
10	Paswik	14.7	1992	350	122	75	23
11	Putoranski	1,887.3	1988	398	140	92	34
12	Taimyrski Biospheric	1,781.9	1979	429	110	74	21
13	Ust-Lenski	1,433.0	1985	402	109	60	27
14	Franz-Josef Land, Federal Nature Reserve	4,200.0	1994	60	38	17	2

Protected water areas covering offshore and coastal Arctic ecosystems are far less representative as of now, and are developed not quite well yet, although the seas are abundant in bioresources (Table III.3).

Table III.3. Biological diversity in Russian Arctic coastal marine ecosystems

Sea	N° of benthonic invertebrates species	N° of fish and cyclostomes species	N° of algae species
Okhotsk	2,100	276	299
Bering	1,500	297	138
Barents	1,800	144	n/a
White	1,000	51	200
Kara	1,300	54	134
Laptev	500	37	n/a
Chukchi	800	37	70

The sea coasts are intrazonal in character and have features of virtually all Russian Arctic landscape zones – from polar deserts and Arctic tundra to northern taiga (Okhotsk Sea coast). It is here where the largest wetlands of international importance are found, with tens of millions waterfowl flocking at their nesting, stopover or wintering grounds (deltas of the Pechora, Ob, and Lena, the Murmansk Coast, Kanadalaksh Bay, etc.).

The Russian Arctic seas and coasts are a habitat for many rare and endangered plant and animal species listed in the Red Book of Russia: 17 invertebrates, 15 cyclostomes and fish, around 20 birds, 29 species and subspecies of mammals, which is important to remember when planning economic activities in the coastal areas.

A significant part of Russian Arctic coastal and sea ecosystems are under human impacts, mainly those resulting from commercial pressures and oil and gas development projects on the shelf. Endangered species include salmon and cod fish in the Barents and White seas, salmon, herring and invertebrates in the Far East seas (crabs, shrimp, scallops, sea urchins, trepang), as well as sea mammals in the Barents, Okhotsk, Bering and White seas (seals, fur seals, sea-lions, walrus, gray and bowhead whales).

Marine ecosystems as such (water areas) are covered by 6 nature reserves only: Great Arctic (980.9 thousand ha), Komandorski (3,463.3 thousand ha), Koryakski (83.0 thousand ha), Nenetski (181.9 thousand ha), Kandalakshski (49.6 thousand ha) and the Wrangel Island (1,430.0 thousand ha). It is not representative enough as long as marine biodiversity is concerned.

Some proposed offshore and coastal PNAs in the Russian Arctic will include land and water areas in its European section, where hydrocarbon prospecting, extraction and transportation are expected to take place on a large scale (Table III.4).

Table III.4. Some marine PNAs planned to be created in the European section of the Russian Arctic

PNA	PNA category, date of establishment	Planned area, ths.ha	Biota and ecosystem characteristics
Russian Arctic	National Park	5,151.5	Polar deserts and glaciers. Habitat for polar bear, Atlantic walrus, bowhead whale, narwhal, white whale. Huge bird colonies, and some of the most productive fish areas in the world. Historical heritage sites.
Onezhskoye Pomorie	National Park	251.3, including 70.0 of water areas	Northern forest and wetland areas, water areas, waterfowl. Historical and cultural heritage sites.
Bolshezemelski	State nature reserve, regional	328.0	Tundra, Ramsar wetlands, rare waterfowl species
Vaigach	Nature Park, regional, ethno-ecological site	Not determined	Wetlands, tundra, rare waterfowl species, sea bird colonies

Yugorski	Nature park, regional	Not determined	
Haipudyrskaya Guba	State nature reserve	Not determined	
Kolguev Island	Nature-ethnic zone (ethno-ecological site)	Not determined	Tundra, marsh. 80 bird species. Atlantic walrus rookeries. Traditional nature uses. Ramsar wetlands.

IV. ENVIRONMENTAL SITUATION IN THE RUSSIAN ARCTIC

Intense economic activity with prevalence of resource exploration sector has contributed to deterioration of the environment in virtually all economically developed parts of Russian Arctic. The most common environmental problems in this region include air, surface water and ground water pollution, neutralization and utilization of toxic industrial waste, radiation safety, degradation of soils, depletion of vegetation cover and wildlife resources. Hygienic standards of drinking water supplies are violated in 70% of administrative districts of Russian Arctic, while almost 90% of local population drinks low-quality water. Negative anthropogenic stress on the environment is unevenly distributed over the territory of Russian Arctic. Pollution is mostly concentrated in actively developed coastal territories, urban and industrial agglomerations.

Environmental risks and threats emerge in the result of acceleration of economic development of Russian Arctic, changes of economic strategies and tactics, and expanding activities of private companies. Harnessing of environmental risks requires new approaches to environmental regulation.

Narrow and socially-oriented interpretation of legislation that regulates development of North territories often causes disregard of environmental standards, resource and land laws. Unfortunately, this widespread practice continued from several decades of Soviet era to the recent period of economic transition, which resulted in emergence of specific environmental risks and threats, typical for Arctic territories, and less common for other regions of the Russian Federation. Management of such risks often requires innovative regulatory and economic mechanisms. These risks include:

- Excessive and uncontrolled exploitation of land resources, especially during construction of permanent and temporary settlements, industrial facilities and line structures;
- Expansion of pockets of pollution (around industrial sites, settlements and sources of impact air pollution). There are also “ribbons” of chemical pollution along line structures and rivers. There are problems with utilization of household and industrial waste. Industrially developed sites often converge and merge with each other.
- Intensification of pollutant transfer in troposphere. Although transport of air pollutants to Russian Arctic is regulated by inter-governmental agreements, this problem is important for planning of regional environmental policies in Russian Arctic;

- Biota and ecosystems in the areas of intensive technogenic stress lose their potential to restore natural equilibrium after disturbances. Gradual anthropogenic modification of Arctic ecosystems in the result of increase of intensity and frequency of anthropogenic influences (all kinds of pollution, transport disturbances of soil and vegetation cover, fires, poaching, disturbances of wildlife, etc.);
- The north boundary of forested lands gradually shifts down south and to large river valleys in the areas of intensive technogenic stress in Russian Arctic, especially in its European Part and in West Siberia;
- Transformation of river, lake and estuary ecosystems due to intensification of river transport, pollution of water by oil products, and illegal fishing;
- Transformation of sea shelf and coastal ecosystems in Russian Arctic, because of increased sea transport, and offshore oil extraction;
- Other factors.

All these problems are aggravated by monopolistic character of economic development of natural resources of Russian Arctic. Usually, only one resource-extracting company (which is called “budget-forming enterprise”) dominates in regional economy. Similar, but less devastating effects are typical for the regions where several specialized and competing companies develop natural resources. This is why Russian Government should use environmental criteria for regulation of economic expansion in Russian Arctic and adjacent Northern seas. Coordination Councils may act as governmental regulatory agencies, and at the same time establish partnerships between state- and privately owned enterprises. Coordination Councils may regulate industrial zoning, issue licenses for construction of environmentally hazardous enterprises, or create “regional quota market” for allocation of land plots to such hazardous enterprises. Another alternative is establishment of “regional market of environmental remediation measures”, like reclamation of disturbed lands in exchange for quotas for development of virgin lands.

IV.1. Assessment of Environmental Situation in regions of the Russian Arctic

The main sources of environmental pollution in Russian Arctic include mining industries, fossil (hydrocarbon) fuel extraction, seaports, sea transport, and energy sector (Table IV.1).

Table IV.1. Indicators of technogenic stress on the environment in Russian Arctic (all sources)[5]

[5] An official information from Russian *State of the Environment* Report, 2004.was used

Types of anthropogenic influence	Regions						
	Archangelsk Oblast	**Murnamsk Oblast**	**NAO**	**Republic Sakha (Yakutia)**	**Taimyrsky AO**	**Chukotsky AO**	**YaNAO**
Discharge of polluted waters	794,6	1839,3	1,3	145,1	202,1	18,6	76,6
Emissions of air pollutants (thousand tons)	278,4	369,4	17,7	130,3	1236	31,8	586,6
Toxic waste generation (thousand tons)	293,5	468,9	28,6	19,1	12,9	0,3	249,3
Utilization and neutralization of toxic waste (thousand tons)	20	59,1	16,7	27,7	0	180,2	8,2

NAO – Nenetsky AO (Autonomous Okrug)
YaNAO – Yamalo-Nenetsky Autonomous Okrug.

Murmansk Oblast. Stationary sources of air pollution emit 315.51 thousand tons of air pollutants per year. Most important air pollutants are sulfur dioxide (222,000 tons per year) and carbon monoxide (37,000 tons per year).

Industrial enterprises of Murmansk Oblast discharged 1876.5 million m^3 of waste waters, including 373.88 m^3 of polluted waters. Every year, Murmansk Oblast generates about 150 million tons of waste. The most important polluters include OJSC “Apatit”, OJSC “Kovdorsky GOK”, OJSC “Cola GMK”, “Pechenga Nickel Combine”, OJSC “Olenegorsk Mining Enrichment Combine”, CJSC “Lovozersky Mining Enrichment Company”, and communal sectors of Murmansk, Apatity, Monchegorsk, Kandalaksha, Olenegorsk, Severomorsk, and Polyarny cities.

Archangelsk Oblast. Stationary sources emit 272,640 tons of air pollutants per year. Most important air pollutants in this Oblast are sulfur dioxide (109,780 tons per year) and carbon monoxide (46,690 tons per year). Industrial enterprises of Archangelsk Oblast discharged 649.65 million m^3 of waste waters, including 454.17 m^3 of polluted waters. The share of polluted water in total discharge of waste waters is 70%. Every year, Archangelsk Oblast generates about 5.1 million tons of waste. The most important sources of industrial pollution include OJSC “North Onega Bauxite Mine”, OJSC “Archangelsk Pulp-and-Paper Mill”, OJSC “Kotlas Pulp-and-Paper Mill”, North Dvina Heat-and-Power Plant (HPP-1), OJSC “Solombala Pulp-and-Paper Mill”, OJSC “Ustyales”, State Unitary Enterprise “PO Sevmashpredpriyatie” (Severodvinsk), and communal sector in big cities.

Komi Republic. Stationary sources emit 659,850 tons of air pollutants per year. Most important air pollutants in Komi Republic are hydrocarbons (without VOC) (334,570 tons per year) and carbon monoxide (151,210 tons per year). Industrial enterprises of Komi Republic discharged 554.62 million m^3 of waste waters, including 136.45 m^3 of polluted

waters. The share of polluted water in total discharge of waste waters is 25%. Every year, Komi Republic generates about 12 million tons of waste. The most important sources of industrial pollution include “Unjanginskoye Ltd.”, OJSC “Vorkuta Coal”, OJSC “AEK Komi Energo”, OJSC “Mondy Business Paper Syktyvkar Forest Industrial Complex”, OJSC “Vorgashorskaya Mine”, OJSC “Manganese Komi”, and “KB Ltd.”

Nenetsky Autonomous Okrug. Stationary sources emit 62,960 tons of air pollutants per year. Most important air pollutants in Nenetsky Autonomous Okrug are hydrocarbons (without VOC) (10,290 tons per year), and carbon monoxide (37,720 tons per year). Industrial enterprises of Nenetsky Autonomous Okrug discharged 2.24 million m^3 of waste waters, including 1.19 m^3 of polluted waters. The most important source of water pollution is communal sector. The share of polluted water in total discharge of waste waters is 53%. Every year, Nenetsky Autonomous Okrug produces about 0.5 million tons of waste. The most important sources of industrial pollution include communal sector, OJSC “North Oil”, Naryan-Mar Expedition “BK Eurasia-Perm Ltd.”, “Pechora Oil”, Federal State Unitary Enterprise “Naryan-Marsky”, Company “Polar Lights”, and others.

Yamalo-Nenetsky Autonomous Okrug. Stationary sources emit 1,088,330 tons of air pollutants per year. Most important air pollutants in Yamalo-Nenetsky Autonomous Okrug are hydrocarbons (without VOC) (272,880 tons per year) and carbon monoxide (682,120 tons per year). Industrial enterprises of Yamalo-Nenetsky Autonomous Okrug discharged 71.18 million m^3 of waste waters, including 32 m^3 of polluted waters. The share of polluted water in total discharge of waste waters is 46%. Every year, Yamalo-Nenetsky Autonomous Okrug produces about 0.2 million tons of waste. The most important sources of industrial pollution include communal sector, Urengoigasprom, Service Drilling Company, Sibneft-Noyabrskneftegas, Yamburggasdobycha, NK “Rosneft-Purneftegas”, NoyabrskEPUService, Tiumentransgas, Nadymgasprom.

Taimyrsky (Dolgano-Nenetsky) Autonomous Okrug. Stationary sources emit 15,130 tons of air pollutants per year. Boiler houses are the most important sources of air pollution. Most important air pollutants in Taimyrsky (Dolgano-Nenetsky) Autonomous Okrug are hydrocarbons (without VOC) (11,480 tons per year) and carbon monoxide (1,120 tons per year). Industrial enterprises of Taimyrsky (Dolgano-Nenetsky) Autonomous Okrug discharged 195.74 million m^3 of waste waters, including 96.83 m^3 of polluted waters. The share of polluted water in total discharge of waste waters is 49%. The most important sources of water pollution include communal sector of Dudinka, petroleum storage depots, storages of fuels and lubricants, diesel-fired boilers. Every year, Taimyrsky (Dolgano-Nenetsky) Autonomous Okrug produces about 31.49 million tons of waste. The most important sources of industrial pollution include Mining and Metallurgy Combine “Norilsk Nickel”, “Norilskgasprom”, “Norilsk Brewery”, “Kayerkanbyt”, CJSC “Alykel”.

Republic Sakha (Yakutia). Stationary sources emit 154,210 tons of air pollutants per year. Most important air pollutants in Yakutia are nitrous oxides (23,210 tons per year), and carbon monoxide (57,800 tons per year). Industrial enterprises of Yakutia discharged 132.09 million m^3 of waste waters, including 79.15 m^3 of polluted waters.

The share of polluted water in total discharge of waste waters is 60%. Every year, Yakutia produces about 193.15 million tons of waste. The most important sources of industrial pollution include Stock Company “Yakutskenergo”, Stock Company “Aldanzoloto”, OJSC HK “Yakutugol”, Aihalsky Mining and Enrichment Plant, Stock Company “ALROSA”, Njurbinsky Mining and Enrichment Plant, Udachninsky Mining and Enrichment Plant, Mirny Mining and Enrichment Plant, and communal sector of Yakutsk.

Chukotka Autonomous Okrug. Stationary sources emit 38,130 tons of air pollutants per year. Most important air pollutants in Chukotka Autonomous Okrug are sulfur dioxide (5,070 tons per year) and carbon monoxide (10,270 tons per year). Industrial enterprises of Chukotka Autonomous Okrug discharged 17.45 million m^3 of waste waters, including 4.85 m^3 of polluted waters. The share of polluted water in total discharge of waste waters is 28%. Every year, Chukotka produces about 7 million tons of waste. The most important sources of industrial pollution include OJSC “Artel of prospectors of Chukotka”, OJSC “ZDK KUPOL”, OJSC “Crystal”, Industrial Company “Artel of prospectors Polyarnaya”, “Artel of prospectors Mir”, CJSC “North Gold”, OJSC “League”, Anadyr HPP, State Enterprise “Chukotka Communal enterprise”, Egvekinotskaya Power Plant, Chaunskaya HPP, mining enterprises and boiler houses.

IV.2. Assessment of State of Individual Components of the Environment in Russian Arctic

IV.2.1. Air

Arctic atmosphere contains fewer pollutants than Arctic soils, bottom sediments and natural waters. However, atmospheric transport of pollutants is the fastest way of transfer of pollutants from their sources to the Arctic. Usually it takes from several days to several weeks. Persistent organic substances, heavy metals, soot and radioactive nuclides are transported from their sources in middle latitudes to the Arctic, where their sources are not many. About two-thirds of Arctic pollution by heavy metals originates in Europe and North America. Also, 40% of sulfur comes to the Arctic from industrialized regions of Eurasia, 20% of sulfur comes from North America, and the rest comes from South-East Asia, mainly from China.

Air transport of pollutants has pronounced seasonal variations. Atmospheric circulation creates the most favorable conditions for air transport of pollutants to the Arctic in winter and spring seasons (between November and May), when highly developed anticyclone over Siberia pushes Arctic atmospheric front far to the South, and frontal zone cannot prevent pollutants from penetrating into high altitudes, up to the North Pole. Low air temperatures and long polar night also facilitate transport of pollutants.

Along with long-range transport of pollutants, there are local sources of pollution in Russian Arctic. These include metal works, cement plants, power stations, open pit mining, oil and gas exploration, which affect local ecosystems within economically developed parts of Kola Peninsula, Archangelsk and Vorkuta Oblasts, Norilsk, and some other regions. Total air emissions from stationary sources in Russian Arctic

reached 6982 thousand tons in 2004, which was 34.1% of all Russian emissions. Almost 3 million tons were emitted in Khanty-Mansijsky Autonomous Okrug. The largest emitters (in a descending order) also included Yamalo-Nenetsky Autonomous Okrug (1088 thousand tons), Murmanskaya Oblast (315 thousand tons) and Archangelsk Oblast (272 thousand tons). The situation around Norilsk Mining and Metallurgy Combine “Norilsk Nickel” is especially dire, because its total air emissions in 1970-1980s reached 22.5 million tons per year. Their current level is 2 million tons per year. The regions of monopolistic extraction of fossil fuels - Nenetsky Autonomous Okrug (NAO), Yamalo-Nenetsky Autonomous Okrug (YaNAO) and Khanty-Mansijsky Autonomous Okrug (KhMAO) – currently emit 20% of all Russian emissions, and their share grows rapidly because of increasing extraction of oil and natural gas.

Although environmental investments increased in these Okrugs by a factor of 1.5-2 during the last 3 or 4 years, this was not enough to prevent rapid deterioration of environmental situation, to say nothing about its improvement.

IV.2.2. Surface and Ground Waters

Russian Arctic is characterized by large volumes of river flow. Total river flow is 3000 cubic kilometers per year, or 8.5% of global river flow. However, the flow of Amazon river (the largest river in the world) is twice as bigger. Arctic rivers are opaque because of high concentrations of suspended materials. Total transport of suspended materials is just over 100 million tons per year, or 0.7% of global transport. There are many lakes and bogs in Russian Arctic, many of which freeze to the bottom in winter. The ratio of surface river flow to groundwater flow in Arctic sea basins is roughly 10:1. This ratio increases from 7:1 in the west (the basins of Barents and White Seas) to 15:1 in the east (the basin of East-Siberian Sea).

Low population density and relatively low level of economic development in Siberia limit the scale of anthropogenic influence. Only 1% of river flow is drawn for industrial and communal needs. This proportion is projected to increase less than two-fold by 2025.

Recent research of AMAP and other investigations showed that the level of contamination of Arctic rivers by main pollutants did not exceed global range. The latest high-precision analyses of water samples from the lower ranges of the largest Siberian rivers (Ob, Yenisei, Lena) showed that concentrations of heavy metals did not exceed background levels. Concentrations of Hg, Cd, As and some other metals in Lena river were the lowest among the greatest rivers of the Earth. This does not mean that there are no serious environmental problems. Detailed research in the basin of river Ob river showed that waters of its largest tributary Irtysh were heavily polluted by industrial sources in Kazakhstan. These sources are associated with mining of non-ferrous metals, rock debris, tailing dumps, chemical plants, power plants, steel mills, etc. Downstream of river Ob, concentrations of heavy metals diminish, although concentration of nickel still exceeds background levels by factor of 9, while concentrations of lead and cobalt exceed background values by factor of 4. Industrial waste waters from Omsk city add some heavy metals in dissolved and suspended forms (concentrations of cadmium fall back to their background level some 600-700 km

downstream). At the mouth of river Ob, concentrations of heavy metals do not exceed background concentrations, which indicates that high concentrations of heavy metals are diluted by large amounts of water, and waters of river system Ob-Irtysh have significant self-purification capacity.

Until recently, little attention has been paid to river transport of suspended pollutants to Arctic seas. This problem deserves attention, because, for example, water carries 80 times more iron in suspended form than in dissolved form. Corresponding factor for lead is 50, for cadmium is 10, and for mercury is 5. Suspended matter also adsorbs radionuclides and oil products.

Very high, even catastrophic levels of pollutants are typically observed in the rivers and lakes near large industrial centers. Water and bottom sediments of rivers Kola, Tuloma and Rosta, which flow into Kola Bay, and waters of the bay itself, are highly polluted by heavy metals, oil products, benzpyrene (up to 20 MAC[6]), and radio-nuclides. Lakes Imandra and Monche are influenced by emissions and discharges of large industrial enterprises “Pechenga Nickel”, “Severo Nickel” and “Apatity”, and have very high levels of water pollution. Large rivers North Dvina and Pechora are highly polluted by copper, zinc, iron, oil products, phenols, and lignosulfates.

Several small rivers in the basin of Kara Sea belonged to the 5th water quality class (were classified as “extremely polluted”) during several years in a row: Uzhur (tributary of river Chulym, Krasnoyarsk Krai), Kamenka and Eltsovka (Novosibirsk city), Lake Shelugino (Chelyabinsk city), and other local water bodies. There were no “extremely polluted” water bodies in East-Siberian geographic region in 2003. Several rivers (Lena near Tabaga village, Yana near Jubileynaya station, Noya near Kurum village, Kolyma near Ust-Srednekansk settlement, and others) have high concentrations of iron, copper, phenols and oil products.

Still, most Arctic rivers and lakes remain relatively clean. On this soothing background, there are several extremely polluted large and small rivers and lakes.

There is very few data about condition of ground waters in the Arctic. Chemical composition of ground waters is similar to that of big rivers in the winter season, when they are fed by ground waters. Estimates show that ground waters exert little influence on Arctic environment, if we compare them with surface waters.

IV.2.3. Pollution of Arctic Seas

The open waters of the Arctic seas are clean, with the concentration of pollutants low or absent, and the state of the pelagic ecosystems as a whole is good. However, some of the shelf regions and essentially most of the coastal zones are considerably polluted and the state of a number of bays, gulfs and estuarine areas is as critical or even catastrophic. The ecological situation in these regions is aggravated by the presence in the bottom sediments of high concentrations of numerous contaminants of anthropogenic origin, which has accumulated for many years. The character of marine pollution is specific to each of the regions of the Arctic seas and depends on the degree

[6] MAC – Maximum Allowable Concentration.

of anthropogenic loading and the specific features of pollution sources. The main contribution to pollution in the Russian Arctic region results from diff use, non-point sources such as river run-off and long-range atmospheric transport as well as localised sources in the high latitudes or directly on the Arctic coast. Given their large catchment areas and run-off volumes, northern rivers exert a powerful influence on the character and level of pollution in the Arctic seas, particularly in the estuarine and shelf regions. More than half of the organic toxics (including phenols and chlorinated hydrocarbons), as well as nitrogen and phosphorus compounds, and the bulk of oil pollution that are exported from the Russian territory are carried by river flow to the Arctic Ocean. Practically all petroleum hydrocarbons and chlorinated hydrocarbons are transported to the Arctic seas by the run-off from the Ob and Yenisei rivers.

Local coastal sources determine the specific distribution of pollution and its severity. Local fluxes of anthropogenic pollutants are mainly formed from the atmospheric emissions and wastewater produced by large cities, public services, industrial zones and transportation. The greatest number of point sources of contaminants is centred in the western Russian Arctic in the territories of the Murmansk and Arkhangelsk regions.

The largest of Arctic Seas – Barents Sea – is bigger than Baltic Sea, White Sea, Black Sea, Sea of Azov, and Caspian Sea, all taken together. Arctic seas are shallow (average depth varies from 60 m in White Sea and East-Siberian Sea to 519 m in Laptev Sea). These seas also have large shelf. For example, shelf width reaches 1500 km in Barents Sea, 1000 km in Chukotka Sea, whereas the average shelf width in the oceans never exceeds 75 km. Shallow Arctic seas are greatly influenced by incoming rivers. For instance, over 50% of Laptev Sea is actually estuary zone, where fresh water mixes with salt seawater.

The Barents Sea is a unique Arctic marine ecosystem, characterised by distinct bathymetry and bottom topography, a large oceanic shelf, an extensive polar front, high productivity, and a high abundance and diversity of flora and fauna. The majority of the Barents Sea drainage basin is located in Russian territory, with small parts located in Norway and Finland. As the meeting point between the Atlantic and the Arctic Oceans, and Western Europe and Russia, the Barents Sea has attracted significant attention from many politicians and researchers, who are interested in its biological resources, its oil and gas reserves, as well as the potential risks of radioactive pollution.

Water pollutants, as well as natural sediments, mostly come to the sea from the continent with river waters. Other sources of pollution include offshore motion of sediments, ice motion, chimney materials (sedimentation of atmospheric pollution directly into the water). Ocean currents from the Atlantic bring radioactive nuclides, heavy metals and oil products to Arctic seas. Exploration of minerals on the sea shelf, dumping of waste, and sea transport of oil and toxic materials are classified as “aqua-polytechnogenic” sources of water pollution. There are also endogenous (natural) sources of water pollution in the Earth crust. For example, oil hydrocarbons may enter seawater directly from bottom sediments. Such sources of pollution have been discovered in Pechora Sea and near Shtokmanovsky Mining and Metallurgy Combine.

Sometimes, it is quite difficult to differentiate between natural and anthropogenic polluting materials.

Geologic research of Arctic seas demonstrated that capability of sea shelf to accumulate water pollutants varied greatly from one sea to another. Pollution mostly accumulates in so-called “geomorphological traps”, where the streams of sediments are interrupted, and bottom sediments themselves have high absorbing capacity. Resent studies showed that some regions of Barents Sea, Kara Sea, and Chukotka Sea have greater accumulative capacity than, for example, East-Siberian and Laptev Seas. Some seas have been studied more thoroughly than others. Barents Sea is relatively well studied. Recently compiled pollution maps show distribution of heavy metals, hydrocarbons, including polyaromatic organic substances, organic chlorine substances, phenols, selected radio-nuclides in sea water and bottom sediments of Barents Sea.

Numerous studies of Russian Committee for Hydrometeorology (Roshydromet) and academic institutions, as well as AMAP reports, have confirmed that large water areas are generally in satisfactory environmental condition. Only individual gulfs and relatively small areas (especially in the western regions) are highly polluted. These include Kola and Motovsky Bays of Barents Sea, Dvina and Kandalaksha Bays of White Sea, Pechora Bay, several bays of Novaya Zemlya, some parts of Baydaratskaya Bay of Kara Sea, and Khatanga Bay of Laptev Sea. Water of the south part of Kola Bay was graded as “moderately polluted” (3rd class), whereas the middle and north parts of this bay were “clean”. Bottom sediments of this bay were contaminated by heavy metals, surfactants, hydrocarbons, and phenols. In 2000-2003, Dvina bay was contaminated with nitrites, organic chlorine pesticides, while concentrations of heavy metals rarely exceeded MAC.

Detailed studies of seawater and bottom sediments over the last 15 years showed that average concentrations of heavy metals, polyaromatic hydrocarbons, phenols, and radioactive nuclides were exceeded in some hotspots. Several regions (western, south-eastern and north-eastern parts) had elevated concentrations of oil hydrocarbons – for example, Medvezhinsky Zhelob in the west, where elevated concentrations of oil hydrocarbons were probably brought by intrusion of Atlantic waters. South-eastern part is connected with the mouth of White Sea and south shore part of Pechora Sea. Oil hydrocarbons come from White Sea and with rivers, which collect drainage waters from Timano-Pecherskaya oil and gas province. Another source of hydrocarbons is diffusion from the bottom of Prirazlomnoye oil reserve.

Elevated concentrations of oil hydrocarbons have been detected in the bottom sediments of north and central parts of Barents Sea. The north anomaly is situated near the shores of Spitsbergen Archipelago and Frantz Joseph Land, where high concentrations of oil hydrocarbons are related to washout and resedimentation of coal-bearing sediments. There may be at least two feasible explanations for the central anomaly: the first is dispersion of coal-bearing particles from Beluzhia Bay (seaport of Novaya Zemlya testing grounds), because the bottom of this bay is layered with coal;

while the second is influx of oil hydrocarbons from the bottom due to fracture jet stream migration and diffusion.

Elevated concentrations of polyaromatic hydrocarbons near Shtokmanovsky Mining and Metallurgy Combine are caused by undercurrent of gaseous-fluid fluids from the underlying crust, and by the sediments of Chernaya Bay, which were contaminated after the nuclear tests on Novaya Zemlya.

Therefore, the most common causes of anomalously polluted areas are intrusion of Atlantic waters (radio-nuclides, phenols, oil hydrocarbons and polyaromatic hydrocarbons), river transport from the continent, washout of bottom sediments, consequences of nuclear tests, and diffusion of gaseous-fluid fluids from the bottom.

There are both global and regional processes, which cause pollution of Russian Arctic. These processes include transgenic exchange in the atmosphere and oceans, precipitation, river flow, regional economic activity, etc.

The main source of oil hydrocarbons (OH) is river flow. Total flow of organic compounds is about 28.5 million tons, including 0.78 million tons of OH. Elevated concentrations of OH are typical for Pechora, Kara, East-Siberian Seas, coastal zone of Laptev Sea, especially in the mouths of big rivers. Several regions have high concentrations of polycyclic aromatic hydrocarbons (PAH), which have mutagenic and carcinogenic properties. On the whole, the concentrations of OH and PAH tend to increase over time. This trend is likely to continue in the future because of increasing extraction, transportation and processing of oil products.

Chlorinated organic compounds (COC) present considerable risks for marine environment, because they are very persistent and stable in the seawater. COC may persist in the environment for years and decades. They usually come from other regions via atmospheric transport. The ban on DDT and other chlorinated organic pesticides did not put an end to their infiltration to the environment.

Polychlorinated biphenyls (PCB) belong to the group of persistent organic pollutants (POPs), whose concentrations in Arctic are generally lower than in the moderate latitudes. But these substances may accumulate in biota, including sea mammals. Fairly high levels of COC have been registered in coastal zones of Arctic seas.

Mercury, lead, cadmium, copper, nickel, and chromium are the most toxic heavy metals, which come to the environment during natural and technogenic processes.

Concentrations of mercury in sea birds and mammals continue to increase, which poses health risks for local population. Despite the ban on leaded gasoline, the levels of lead in sea biota remain sufficiently high. On the whole, concentrations of lead have decreased during the last 20-30 years.

The most important sources of radioactive pollution of Arctic are nuclear tests (conducted in 1945-1980), radioactive waste of facilities, which process nuclear fuel, and Chernobyl accident. Western Arctic seas bear pronounced “trace” of Sellafield sea burials. The existing and shut-down nuclear sites and objects (nuclear submarines,

radio-chemical combines, etc.) pose significant risks. On the whole, concentrations of radioactive nuclides in Arctic environment tend to decrease.

There is also additional threat of water pollution in the short- and long run because of growing extraction and transportation of hydrocarbons in Arctic seas and coastal zones of Russian Arctic. Certain risks are associated with industrial development of off-Arctic regions and rapid change of Arctic climate.

The ranking of resilience of Arctic seas to anthropogenic pollution (in decreasing order) looks as follows: Chukotka Sea > East Siberian Sea > Barents Sea = Laptev Sea > Kara Sea. This is why Kara Sea should deserve attention in the first place, then Barents Sea and Laptev Sea. The ecosystems of these seas will be especially vulnerable to planned large-scale expansion of oil extraction in the nearest future.

IV.2.4. Soils and Land Resources

There are hundreds of square kilometers of contaminated soils in Russian Arctic. Around Norilsk Mining and Metallurgy Combine, concentrations of heavy metals in soils, moss and lichen are 150 – 200 times higher than MAC. Considerable quantities of oil hydrocarbons have accumulated in the soils around oil producing centers in the Arctic. Concentrations of OH vary from several grams to hundreds of grams per kilogram of soil. Direct destruction of permafrost typically occurs at all industrial sites, located in permafrost zone.

IV.2.5. Fauna and Flora

Landscape and biological diversity of Russian Arctic survived and remained in much better condition than in the south regions of the Russian Federation. But there are particular sites (loci) of active degradation of soils and landscapes, which are subject to thermal erosion, fragmentation of habitats, destruction of vegetative cover, replacement of indigenous vegetation by successive forms, reduction of populations of rare species, etc. There are several factors, which influence the state of biota and ecosystems in the Arctic:

Natural factors:

- Regional warming of Arctic climate, which results in increase of vegetative period for plants, nesting period for birds, warm period for invertebrates, etc. Climate warming leads to northward expansion of areals of some mammals and birds, and to irreversible changes of habitats of some endemic rare species.

Anthropogenic factors:

- Global, regional and local pollution of the environment, including troposphere transport of air pollutants, emissions from impact sources, emergency oil spills, etc.;
- Mechanical disturbance of soil and vegetative cover by uncontrolled movement of vehicles, construction and exploration works;

- Poaching and unregulated using of biological resources lead to reduction of their stocks and populations within the boundaries of ethnic and economical zones;
- Overgrazing of domestic deer and violation of traditional grazing norms and practices;
- Introduction of adventive plant species often leads to loss of habitats of indigenous plant species. Some adventive species have been introduced voluntarily (e.g. Camchatka crab in Barents Sea), while some others have been introduced involuntarily (except reacclimatization of muck ox) in Arctic ecosystems, which may cause ecological crisis.

Pollution of air, soils and surface waters around industrial centers leads to rapid changes in biodiversity. During the last 100 years, vegetation around such centers has changed drastically, because of intensive construction, logging, fires, and agricultural development. Destruction of grazing lands and pastures lead to reduction of deer populations. Disturbance of water balance of surface soils, especially near water bodies, ditches, rivers and streams leads to loss of amphibious species, including very rare species in local biotopes. Environmental pollution and changes of hydrological regime of water bodies will cause reduction of populations of rare coastal and water mammals.

Increasing pollution of rivers, lakes and coastal Arctic seas by oil products, heavy metals, pesticides and other pollutants leads to biodiversity loss: reduction of biomass and biodiversity of bottom fauna and especially loss of habitats and fish stocks. Besides being constantly disturbed by ships, migrating birds suffer from chronic pollution of waters in coastal areas of Barents and Kara Seas by oil products.

Overall trends in the state of ecosystems and landscapes of Arctic regions may be characterized as moderately negative. The heaviest anthropogenic stresses are concentrated in already developed and disturbed territories, which are being restored very slowly. Economic development of virgin lands also proceeds slowly, because of immense investments required for such development. Below we report some data on dynamics of land use indicators during the last 5 years. During this period, extraction of natural resources and minerals grew steadily in Russian Arctic (Table II.3.2).

Table IV.2.5.1. Areas of natural biotopes in selected Arctic regions of the Russian Federation in 1999 and 2003, thousand hectares

Region	Grasslands		Forests		Bushes and shrubs	
	1999	2003	1999	2003	1999	2003
Murmansk Oblast	2.7	3.2	5386.8	5369.2	604.7	602.2
NAO	25.7	25.7	1743.5	1740.8	1441.7	1439.3
YaNAO	199.6	199.5	21980.8	20196.9	6796.7	4353.2
Taimyrsky AO	13.7	13.7	8026.3	8095.6	3130.6	2966.2
Republic Sakha - Yakutia	1499	1511.6	165876.2	164231.6	1411.6	1838.1
Chukotsky AO	8.5	8.5	12935.9	12935.9	2141.7	3957.5

Despite intensive migration and reduction of size of population, there is new construction development in YaNAO (6.5 thousand hectares) and Republic Sakha – Yakutia (1.2 thousand hectares). Considerable areas have been lost to automobile roads between 1999 and 2003 (1.2 thousand hectares in NAO, 1.7 thousand hectares in YaNAO). State statistical surveys do not report about increase of territories, which experience anthropogenic stress (pollution, transport-related disturbances, etc.). Instead, state statistics reports data on so-called “disturbed lands”. The noticeable increase of areas of this category of lands has been reported only in YaNAO (12.6 thousand hectares, see Table II.3.3).

Table IV.2.5.2. Areas of settlements, roads and disturbed lands in 1999 and 2003, thousand hectares

Region	Construction		Reads		Disturbed lands	
	1999	2003	1999	2003	1999	2003
Murmansk Oblast	33.5	35.7	35.5	31.6	21.7	20.8
NAO	2.3	2.4	7.8	8.4	3.3	2.9
YaNAO	62.3	68.8	60.8	69.1	99.9	112.5
Taimyrsky AO	1.4	1.3	0.3	0.3	0.9	0.8
Republic Sakha (Yakutia)	75.5	76.3	135.7	126.3	37.6	37.2
Chukotsky AO	4.5	4.3	23.1	23.6	45.0	38.6

So far, changes of natural ecosystems of Russian North have not been that significant as in other regions of the Russian Federation.

Polar deserts, with the exception of insignificant coastal stripes near polar stations and military objects, have not been altered significantly. About 20% of deer grazing lands are in the state of overgrazing digression in Tundra zone. Near Norilsk (Taymyr Peninsula) and Monchegorsk (Kola Peninsula) copper-nickel combines, vegetation was disturbed within several dozens of kilometers, in the result of sedimentation of emissions of sulfur and nitrous compounds. Up to 3-8% of tundra forests and northern taiga have been disturbed by extraction of minerals, oil and natural gas. There are many locally disturbed areas in Kola Peninsula, in West and North-East Siberia. Despite legislative bans on utilization of northern forests, their area diminishes because of logging and forest fires, especially in Murmansk Oblast, NAO, YaNAO, and Yakutia.

IV.2.6. Transboundary Transport of Pollutants

Analysis of long-range transboundary flows of pollutants should be an integral part of environmental assessment of Russian Arctic. There are sources of pollutants in lower latitudes (the USA, Canada, Norway, Denmark, Greenland, Sweden, Finland) on the shores of the Atlantic, which supply sustainably high levels of POPs to Arctic region, both airborne and waterborne. It has been found that about two-thirds of heavy metals come to Arctic from industrial sources in Europe and North America.

Airborne and waterborne transport of pollutants contributes to wide proliferation of pollution in Arctic Ocean. Waters of Arctic seas not only wash off the shores of Arctic countries, but also intensely transport pollutants to the Atlantic through Bofort Strait and Bering Strait. The islands of Novaya Zemlya, Severnaya Zemlya, Frantz Jozeph Land, Spietzbergen act as some kind of a barrier to waterborne transfer of pollutants, and divert sea current to the south, towards Greenland, Canada, and then further to Central and South Atlantic (at great depths), towards Indian Ocean and the Pacific. Thus, the importance of Atlantic Ocean in global water circulation is immense. World oceans are largely responsible for overall environmental situation on our planet.

Expansion of technogenic wastelands (which now constitute up to 2% of total area of the Arctic) also may bring about global environmental catastrophe. Planetary scale of environmental threats caused global community to develop and adopt several international agreements with the purpose to mitigate environmental damage in the Arctic. In Russian Arctic zone, there is a need to optimize the structure of natural resource use in accordance with environmental carrying capacity. Unfortunately, currently enforced environmental restoration and protection policies are not adequate to the degree of environmental degradation in Arctic region.

International community has identified six specific problems related to environmental pollution in the Arctic. These problems have been specified in *Strategy of Environmental Protection in the Arctic (1991),* signed by the heads of 8 Arctic states. These problems are related to contamination by POPs, oil and oil products, heavy metals, noise, radiation, and acidification.

Persistent Organic Pollutants. Production and utilization of POPs (PCB, DDT, Hexachlorcyclohexane (HCCH), chlordane and toxaphene) have been banned or limited in several countries, but these substances are still produced and applied in large amounts elsewhere all over the world. Although there are no large sources of these pollutants in the Arctic itself, they come to the Arctic with river waters, via atmosphere and ocean currents from industrialized regions. High concentrations of POPs are routinely detected in fat tissues of mammals, topping food chains (white bear, seal, whale). This causes special concern of local population, because these pollutants may enter human organisms with lipids that people receive with food products made from these mammals.

Oil pollution. Arctic is one of the regions, which suffer from long-term and intense oil pollution.[7] Accumulation of oil in the environment is facilitated by low air temperatures, long polar night, thick ice cover, and other factors. Low air temperatures reduce evaporation of volatile oil fractions (which are more toxic). Long polar night and long winter season slow down ultraviolet and biological degradation of oil. Drifting ice downplays scattering of oil by waves. Oil accumulates in ice-free patches and under ice cover. Very small amount of oil actually remains on the surface of ice sheets. Because of all these natural factors, oil degrades much slower in the Arctic, than in moderate

[7] Oil includes any persistent oil, including crude oil, fuel oil, heavy diesel fuels, lubricant oil, irrespective of the mode of transportation (either cargo or fuel).

latitudes. Therefore, oil may exert negative influence on biota for much longer periods in the Arctic than in moderate climate. The territories near the borders of ice-covered zones are especially vulnerable to oil pollution. Considerable fraction of primary biological production in the Arctic is concentrated in these territories, which makes them vitally important for the whole Arctic ecosystem. Oil spills directly affect sea organisms, and may have catastrophic consequences. Oil spills mainly happen during oil transportation and extraction, and to lesser extent, during surveillance and oil explorations. The probability of oil spills will depend upon the scale of oil extraction in the Arctic, technical regulations and preventive actions. Russian legislation contains 51 normative acts, which are aimed at prevention of environmental pollution after oil spills, but none of them directly refers to the Arctic.

Heavy metals. Heavy metals[8] have been detected in the air, precipitation, seas and rivers, bottom sediments, soils, freshwater and seawater organisms in the Arctic. Presence of heavy metals in the air and precipitation is explained by atmospheric transport from industrial centers. After being transported to the Arctic, heavy metals are deposited on vegetation, snow cover, and in Arctic seas.

Noise pollution. Ice cover creates unique conditions for propagation of sounds and noises underwater. Human activities generate noise[9] of such types and levels that may disturb sea mammals or block out natural sounds that play important role in life of sea mammals.

Some types of noises may affect both fish and sea mammals.

Radioactive pollution. According to international experts, radioactive pollution[10] of the Arctic is mainly caused by nuclear tests in the atmosphere, which were conducted in 1950s and 1960s. Another source of radionuclides is Chernobyl accident (1986). Radionuclides with long half-lives, including Stroncium-90 (half-life is 29 years) and Cesium-137 (half-life is 30 years), pose the most concerns. Arctic vegetation, especially lichen, actively accumulates these radioactive substances, and they enter the food chains. Other sources of radioactive pollution include emergency emissions from nuclear energy installations and nuclear transport, storage and disposal of radioactive waste.

The following problems can be defined in the field of ensuring nuclear and radioactive security in the region:

- Storage and treatment of spent nuclear fuel (SNF);
- Storage and treatment of liquid radioactive waste (LRW) and solid radioactive waste (HRW);

[8] Metals with atomic weight more than 50 belong to the group of "heavy metals" (Pb, Cd, Ni, Cr, Zn, Cu, Hg). These metals may have toxic effects in high concentrations (Russian standard GOST R 17.4.3.07-2001 "Environmental protection. Soils. Requirements to properties of sediments of waste waters used as fertilizers.")

[9] Noise is defined as irregular or statistically random oscillation. GOST R 26883-86 "External influencing factors. Terms and definitions."

[10] Radioactive pollution is defined as radioactive substances which are present on the surface in quantities exceeding background values. GOST 6901-91 "Radionuclide contamination and deactivation. Terms and definitions".

- Radiological safety of decommissioned nuclear powered submarines and coastal technical stations of the Russian Navy;
- Storage and transportation of radioactively dangerous materials, radioactive substances and isotope products;
- Radiation (radiological) terrorism.

Acidification. The most important acidifying substances are sulfur-containing and nitrogen-containing compounds. They are emitted by vehicles, industrial sources, heat-and-power plants, which are fired by coal and oil. These compounds are transported by air over long distances in the Arctic, especially during winter season. Sulfur and nitrous emissions from industrial sources in the Arctic also play important role. Acidification creates serious environmental problems in the regions adjacent to industrial centers. Cumulative effects of acid rains and climatic stresses increase risks for Arctic vegetation. The degree of acidification of Arctic environment is yet to be defined, but Arctic haze and drying of forests indicate that this problem does exist.

IV.3. Current Impact Regions and Hotspots in Russian Arctic

Industrial development in the Arctic creates risks for traditional types of subsistence, causes environmental pollution and degradation. Many years of research established direct links between the rates of economic growth and the degree of degradation of Arctic environment. The original loci or sites of economic development are being gradually replaced by wide expanses of industrialized areas and inter-regional areas of zonal scale. For example, the infrastructure of oil and gas industry in West Siberia spreads from the south limits of cryolite zone to Arctic coast, and soon will advance onto the shelf of Barents Sea. The intensity and energy-intensity of technogenic stress are adequate to territorial scale of development of destructive processes, which often have catastrophic character.

There are several regions with the greatest technogenic pollution in the Arctic. They are called “impact zones”. They are characterized by very strong transformations of natural geochemical background, air pollution, degradation of vegetative cover, soil and topsoil, intrusion of pollutants in food chains, excessive risks of morbidity among local population. Impact zone is defined as *territorial industrial complex, settlement and territory of industrial use, where, in the result of technogenic influence, negative changes in the environment led to emergence and development of unfavorable environmental consequences and related social and economical situations.*

Character and intensity of technogenic influence on the environment depend upon location, type and turnover of industrial production. These factors determine the extent of stress on the environment. Two approaches are used to define impact zones:

The first approach is based on assessment of amount of pollution and the size of disturbed areas. The following indicators are used to quantify anthropogenic influence on the environment:

- Types and quantities of pollutants;

- Indicators of excess concentrations of priority pollutants over background values;
- Percentage of disturbed lands and wastelands.

The second approach is based on assessment of the number of components of the environment, which have been disturbed and changed. The following parameters should be assessed:

Marine environment:

- Contamination of seawater;
- Contamination of seabed;
- Contamination of sea biota and migration of pollutants along food chains;
- Changes of geochemical indicators of sea waters;
- Changes of ice regime;
- Changes in species composition of sea biota and biological communities;
- Condition of particularly sensitive ecological objects (zones) near offshore construction sites and in the littoral zone;

Terrestrial environment:

- Air pollution;
- Contamination of groundwater and surface waters;
- Contamination and degradation of soils, seizures of land resources, changes of land use regime;
- Contamination of terrestrial biota and migration of pollutants along food chains;
- Anthropogenic degradation of vegetation, reduction of wildlife populations, loss of biodiversity of terrestrial ecosystems;
- Radioactive contamination.

For identification and description of impact zones, and for selection of hotspots, it was suggested to use the following classification of environmental situations in Russian Arctic:

Catastrophic – deep and irreversible changes in the environment, loss of natural resources and rapid deterioration of living conditions for local population, caused by excessive technogenic stress and air pollution, dire condition of groundwater and surface waters, degradation of vegetative cover and topsoil, development of erosion, cryogenesis, and formation of caves on large territories;

Crisis – considerable and weakly compensated changes of landscape, destruction of particular components of the environment, air pollution, contamination of groundwater and surface waters, loss of biodiversity of flora and fauna, large sites of degradation of soil and vegetation, development of erosion, cryogenesis, thermal cave formation. Changes in biota and ecosystems generally have irreversible nature.

Critical – there are negative changes in some components of the environment, air pollution, contamination of groundwater and surface waters, loss of biodiversity of flora and fauna, degradation of vegetative cover, development of erosion, cryogenesis, thermal cave formation, reduction of natural biodiversity of plant communities, local transformation of deer migration patterns, destruction of habitats of sea mammals, seabirds, and waterfowl. Changes in biota and ecosystems have reversible nature, but there is a need to artificially stimulate their restoration and land reclamation processes.

Strained – there are some negative changes in environmental components, but situation may stabilize, and natural ecosystems and biota may restore themselves independently, if timely nature conservation actions are taken.

The main causes of development of impact zones in the Arctic are extraction and transportation of hydrocarbons, and industrial production. Mining sector is the single most important sector of industry, which contributes to development of impact zones. In sum, eleven terrestrial impact zones, and sixteen sea and coastal impact zones have been identified in Russian Arctic.

Table IV.3.1. General characteristic of terrestrial impact zones in Russian Arctic

№	Impact zone	Sources of impact	Pollutants	Environmental situation
1.	Kola (Nickel, Monchegorsk, Zapoliarny)	Non-ferrous metallurgy, mining industry, nuclear power plant (NPP), heat-and-power plant (HPP), transportation and extraction of oil and natural gas	Oxides of sulfur and nitrogen, nickel, benzpyrene, mercury, methanol, strontium, carbon fluoride, aluminum, radionuclides, dust, oil products	Catastrophic
2.	Severodvinsky (Archangelsk, Severodvinsk, Novodvinsk, Koryazhma, Dvina Bay of White Sea)	Pulp and paper industry, military sites, HPP	Benzpyrene, polyaromatic hydrocarbons, heavy metals, oxides of sulfur and nitrogen, CS_2	Catastrophic
3.	Timano-Pechersky	Extraction of oil and natural gas	Oil products, oxides of carbon, sulfur and nitrogen	Crisis
4.	Novaya Zemlya	Military objects (drowned nuclear installations, etc.)	Radionuclides, heavy metals	Crisis
5.	Vorkutinsky (Vorkuta, Inta, Vorgashor)	Mining and cement industries, HPP	Dust, oxides of sulfur and nitrogen, heavy metals, polyaromatic hydrocarbons	Crisis
6.	Pur-Nadymsky	Extraction of oil and natural gas	Oil products, oxides of carbon, sulfur and nitrogen, strontium, radionuclides	Crisis
7	Sredneobsky	Extraction of oil and natural gas, water transport	Oil products, oxides of carbon, sulfur and nitrogen, strontium and	Crisis

			radionuclides	
8	Norilsky	Mining and non-ferrous metallurgy	Dioxides of sulfur and nitrogen, formaldehyde, copper, nickel	Crisis
9.	Yano-Indigirsky	Mining	Dust and heavy metals (tin, lead, strontium, etc.), redionuclides	Critical
10.	Valkumeisky	Mining industry and HPP	Dust and heavy metals (tin, lead, strontium, etc.), oxides of sulfur and nitrogen	Critical
11.	Bilibinsky	NPP	Radionuclides	Strained

Within these impact zones, 147 so-called “hotspots” have been identified. These hotspots represent territories, where technogenic sources exert negative impacts on the environment. Hotspot is defined as a compact area, where technogenic sources cause degradation of ecosystems, pollution, deterioration of public health, and create risks for sustainable development and local economy.

There are several environmental criteria, used for identification of hotspots in the Arctic:

- Accumulation of one or several pollutants above critical levels in the environment;
- Presence of one or several sources of anthropogenic pollution (it may be existing or closed industrial facilities, whose impacts on the environment are characterized as extremely high);
- Degree and reversibility of degradation of ecosystems or their components;
- Social tension and negative dynamics of indicators of public health among local population.

The main reason for emergence of hotspots is overexploitation of natural resources by mining industry, which leads to intensive pollution of the environment by oxides of sulfur and nitrogen, heavy metals, and other substances. Another negative consequence of economic development is mechanical disturbance of soils and topsoil, leading to formation of technogenic wastelands. Environmental restoration of wastelands is practically impossible today. The centers of mining industry are characterized by elevated levels of accumulation of toxic substances in ecosystems and along the food chains. Humans are the top consumers of many food chains, and they suffer from toxic pollution. Local population has higher incidence of bronchitis, cancers, skin diseases, and other diseases. Local toxicants are transported by air and water onto large territories, and reach Arctic seas. In Norilsk alone, emissions of sulfur dioxide reach 2 million tons per year. Non-ferrous metallurgy emits aerosols, which contain heavy metals (nickel, copper, cobalt, etc.). Annual average deposition of these metals exceeds MAC by 2-3 times. Besides heavy metals, elevated concentrations of nitrous compounds, carbon-containing compounds, chlorinated substances, and phenols are usually detected around such enterprises. In some instances, the levels of these pollutants exceed MAC. Surface waters are contaminated by suspended solids, heavy

metals and sulfates. Corresponding MACs are exceeded by 5 times or more. Water pollution threatens safety of drinking water supplies. Temporal “soil-geochemical bombs”[11] may evolve in several impact zones (Nickel, Norilsk, Monchegorsk, etc.) because of long-term accumulation of heavy metals on geochemical barriers.

Mining industry deals with extraction and processing of various minerals (coal, apatites, mica, construction materials, gold, etc.). Mining industry is one of the leading factors, which contribute to development of impact zones, because of mechanical disturbance of topsoil and subsoil in permafrost areas, contamination of ground waters and surface waters by waste waters, which often contain coal slums, strontium, heavy metals (especially mercury), and oil products.

Pulp-and-paper industry and wood processing (woodworking industry) intensely pollute waters by their waste, which contain phenols, formaldehyde, furfural, lignosulfates, heavy metals (zinc, copper, lead, mercury). They also emit specific air pollutants (methylmercaptane, hydrogen sulfide) and mechanically disturb vegetation and topsoil.

Food industry – fish processing, bread and baking industry, dairy farms – contaminate waters by their effluents, which contain organic substances, nitrous compounds, suspended solids, etc. Arctic water reservoirs usually have very low assimilative capacity with respect to organic pollutants, which leads to their rapid degradation.

Development of impact zones is facilitated by large heat-and-power plants, which burn black oil (mazut) and coal. HPP emit oxides of sulfur and nitrogen, heavy metals, soot, polyaromatic hydrocarbons, and also produce dangerous heat pollution of Arctic water reservoirs, which causes destruction of aboriginal biota and introduction of invasive species.

Transport centers and trunk lines in Russian Arctic also form zones of environmental stress of varying scales, because of contamination of waters by oil products, heavy metals, suspended solids, etc. Automobile transport in the cities pollutes the air by nitrous compounds, benz-(a)-pyrene, carbon monoxide, etc. The greatest environmental risks are associated with pipelines, because emergency situations at oil mains often lead to oil spills. Total losses of oil hydrocarbons during extraction and transportation of oil are very high – about 3% of annual oil production, according to information sources within the industry, or even 8-10% of annual oil production, according to external information sources.

Communal sector of towns and settlements in Russian Arctic inevitably contributes to development of impact zones, because of insufficient effectiveness and capacity of sewage treatment systems. Many settlements do not have sewage collection networks at all. Communal waste waters contain organic substances, suspended solids, oil products and surfactants. They are contaminated with bacteria. Communal sector also contaminates the environment with solid waste. Waste treatment is still underdeveloped in the Arctic.

[11] This term refers to the sites of intensive accumulation of pollutants on geochemical barriers. Such barriers may exist either near or far away from the sources of pollutants, and create potential risks for the environment.

Production of oil and natural gas creates a special kind of technogenic stress, and often leads to rapid development of impact zones on large territories of Russian Arctic. The most common pollutants on such territories are oil and oil products, condensates, waste waters of varying salinity, hydrocarbons, phenols, surfactants and additives ($Ca(NO_3)_2$ $Mg(NO_3)_2$, Na_2SiO_2, HCl, KCl, etc.), heat stress, corrosion inhibitors, hydrogen sulfide, iron, mechanical impurities, salts (especially chlorides), rare and scattered elements, polymers (polyacrylamides, polysaccharides), alkali (NaOH, NH_4OH, etc.), products of incomplete combustion of accompanying gas and condensates (emissions of polyaromatic hydrocarbons, including 3,4-benzpyrene), and other substances. Large amounts of oil enter the environment during emergency oil spills and transportation. Technology of extraction of gas condensate and oil-gas condensate is associated with emissions of methanol, diethyleneglycol (DEG), and condensates themselves. Technogenic sources of pollution include installations for complex gas preparation. High intensity of technogenic stress causes deep transformations of natural environment in oil producing regions: direct physical destruction of the environment and pollution of all environmental components (air, soils, surface waters, underground waters).

The most important negative impacts are associated with chemical, physical, radioactive pollution, and with mechanical disturbances. Chemical pollution causes development of impact zones in the centers of non-ferrous metallurgy, pulp-and-paper industry, production of hydrocarbons, and extraction of other raw materials. Complex chemical and mechanical disturbances are usually associated with mining industry. Mechanical disturbances dominate in gold- and diamond-producing regions, and are associated with overgrazing of deer. Radioactive pollution also creates risks of development of impact zones.

Radioactive pollution of northern territories has been detected near mining facilities, which process minerals with high content of radionuclides (Lovozersky and Kovdorsky mining and enrichment combines, “Yakutzoloto” company). Local zones of radioactive pollution are associated with the regions where nuclear explosions have been conducted for peaceful purposes: Kola Peninsula, Yakutia, north part of Archangelsk Oblast, West Siberia, North Urals, Igarka (in total, more than 30 explosions). Yet, the most important source of radioactive pollution in the Arctic is nuclear naval forces and State central nuclear testing grounds in Novaya Zemlya. Terrestrial ecosystems, flora and vegetation in Novaya Zemlya are locally polluted. Moreover, the traces of air and surface nuclear tests (more than 90 explosions) are registered in the Urals, West Siberia, Taymyr and other north regions. The consequences of nuclear tests may be fully estimated only after large-scale measurements of background radioactive contamination in the Arctic. Such measurements will help to map the most polluted territories and conduct corresponding actions to correct modern methods of utilization of environmental resources.

Reclamation of lands, polluted by chemicals and radiation, requires large investments and application of special technologies of radioactive cleanup of soils, application of special adsorbents, exclusion of these territories from grazing lands and commercial recreation for a long time.

Different types of economic activity often coexist in one hotspot. Such hotspots are either referred to as complex, or different types of economic activity are ranked (graded) according to their relative impacts on the environment. Some hotspots may coincide with settlements of different size, including urban type settlements with population under 10,000, while the others may exist beyond settlements (oil fields, sea areas). They may represent a single source of environmental impact (e.g., nuclear power plant) or several sources (e.g., mining enterprise and urban infrastructure). Therefore, hot spots are subdivided into point and point-area types. Depending upon their location, they may be also subdivided into (1) coastal hotspots, situated along the coast of Arctic seas, (2) river basin hotspots within Arctic region.

There are 18 hotspots in Murmansk Oblast, 8 in Archangelsk Oblast, 26 in Nenetsky Autonomous Okrug, 9 in Komi Republic, 41 in Yamalo-Nenetsky Autonomous Okrug, 11 in Khanty-Mansijsky Autonomous Okrug, 7 in Dolgano-Nenetsky Autonomous Okrug and north part of Krasnoyarsky Krai, 8 in Republic Sakha, 10 in Chukotsky Autonomous Okrug, and 18 in Russian coastal zone. This list will be subject to changes, because some hotspots will disappear after land restoration and reclamation efforts, while new territories are likely to enter into “hotspot” category. The following criteria may be used to assess if the territory should be classified as “hotspot”:

Scale of environmental impact	Global
	National
	Regional
	Near the Arctic Coast
	Local
Object of impact	Safety of population
	Public health
	Marine environment
	Components of terrestrial environment
	Natural resources
Size of impacted population	Town/city
	Small settlement
	Industrial zone
	Territory of enterprise
Environmental situationon the territory	Catastrophic
	Crisis
	Critical
	Strained

Source of technogenic impact	Industrial facility
	Mining
	Transport
	Communal sector
Type of impact being prevented	Air pollution
	Contamination of ground waters and surface waters
	Degradation of marine environment
	Contamination/degradation of terrestrial biota, ecosystems
	Extraction of natural resources, seizure of lands
	Noise, radiation, factor(s) of continuous disturbance

Identification of priority hotspots on the basis of intensity of technogenic impacts showed that rates of degradation of terrestrial and sea ecosystems are accelerating. This is caused by intensification of economic activity (e.g., expansion of seaports in Dudinka and Mezen, oil and natural gas exploitation in North-Urengoi and Prirazlomnaya oil and gas provinces, extraction of Kuloisky diamonds near river Zolotnitsa, development of sea transport, etc.). Other factors, which contribute to emergence of hotspots, include aging of technological equipment at most industrial enterprises, and increased risks of technogenic emergencies.

The first list of hotspots was put together in 2002 (see Table II.5.2). This list was substantially revised in 2006.

Table IV.3.2. Classification of hotspots in Russian Arctic, in descending priority order

№	Inventory of 2003	№	Taking into account forecast of industrial development
1	Monchegorsk – mining and metallurgy complex	1	Norilsk
2	Norilsk - mining and metallurgy complex	2	Nickel
3	Nickel - mining and metallurgy complex	3	Zapoliarny
4	Zapoliarny - mining and metallurgy complex	4	Monchegorsk
5	Archangelsk – pulp-and-paper industry, wood processing, machine-building, heat-and-power plants, transport, etc.	5	Archangelsk

№	Inventory of 2003	№	Taking into account forecast of industrial development
6	Obsky Bay – current pollution and future expansion of extraction of oil and gas. Exploration of sea shelf.	6	Murmansk
7	Murmansk – transport center, processing industry, heat-and-power plants	7	Vorkuta
8	Severodvinsk – machine-building, heat-and-power plants, etc.	8	Talnakh
9	Vorkuta – coal industry, heat-and-power plants	9	Severodvinsk
10	Urengoi - oil and gas producing center	10	Kola Bay
11	Talnakh – mining industry	11	Urengoi oil and gas producing center
12	Fedorovsky oil and gas producing center	12	Inta
13	Inta – coal industry	13	Tazovsky Bay
14	Usinsky oil and gas producing center	14	Obsky Bay
15	Olenegorsk – mining industry	15	Fedorovsky oil and gas producing center
16	Kovdor – mining industry	16	Vorgashor
17	Novodvinsk – pulp-and-paper industry	17	Olenegorsk
18	Krasnoleninsky oil and gas producing center	18	Kovdor

Comparative analysis of current and prospective priority lists of impact zones shows that the share of oil-related impact zones increases, while the number of terrestrial hotspots remains relatively constant. The priority of “sea” hotspots increases as negative impacts increase in Kola, Tazovsky and Obsky Bays.

Concluding this brief synopsis of environmental situation in the Arctic, let us repeat that the main sources of pollution include industrial sites (production of oil and natural gas, mining and metallurgy), river ports and seaports, urbanization, sea transport, fisheries, agriculture, and land use changes. Environmental situation in industrialized Arctic

regions is influenced by construction of dams across Siberian rivers, water intake for industrial and municipal uses, discharge of industrial, agricultural and municipal waste waters, development of river bottom sediments (construction materials and production of gold), and rising of sea level in the result of economic activity on land.

V. KEY ENVIRONMENTAL PROBLEMS OF RUSSIAN ARCTIC

GIWA (Global International Water Assessment) and GEF criteria have been used for selection of key environmental problems of the Russian Arctic. These criteria are based on methodology of identification, quantitative assessment and prioritization of environmental problems, and on identification of direct, indirect and fundamental causes of these problems. Identification of causes of environmental problems allows to determine practical methods, sources, objects and types of economic activity, which led to environmental deterioration and created environmental risks.

The focus of the assessment was given on the impacts of five pre-defined concerns namely; Freshwater shortage, Pollution, Habitat and community modification, Unsustainable exploitation of fish and other living resources and Global change, in transboundary waters. Considering the diverse range of elements encompassed by each concern, assessing the magnitude of the impacts caused by these concerns was facilitated by evaluating the impacts of 22 specific issues that were grouped within five these concerns:

A. Freshwater Shortage:

1. Modification of stream flow.
2. Pollution of existing supplies.
3. Changes in the water table.

B. Pollution:

1. Microbiological pollution.
2. Eutrophication.
3. Chemical pollution.
4. Suspended solids.
5. Solid wastes.
6. Thermal.
7. Radionuclide.
8. Spills.

C. Habitat and Community Modification:

1. Loss of ecosystems or ecotones.
2. Modification of ecosystems or ecotones.

D. Unsustainable Exploitation of Living Resources:

1. Over-exploitation.
2. Excessive by-catch and discards.
3. Destructive fishing practices.
4. Decreased viability of stocks through contamination and disease.
5. Impact on biological and genetic diversity.

E. Global Change:

1. Changes in hydrological cycle and ocean circulation.
2. Sea level change.
3. Increased UV-B radiation as a result of ozone depletion.
4. Changes in ocean CO2 sink function.

In line with GIWA methodology, the following criteria have been used for prioritization of environmental problems:

- Character of a problem;
- Scale of negative impact of each problem on the ecosystems of Arctic basin;
- Scale of impact of each problem on economic activity, the environment and public health;
- Correspondence to priorities set forth in the existing strategies, programs and action plans aimed at environmental rehabilitation and restoration of biodiversity in Arctic region, correspondence to the obligations of the Russian Federation under international environmental treaties and conventions;
- Number of systemic ties of each problem with other regional environmental problems and with sectors of economic activity;
- Potential multiplicity effect, which may be attained after solving of particular problem.

Approaches and criteria adopted by GEF and GIWA[12], were used in the process of identification of priority environmental problems of the Russian Arctic. They envisage (1) quantitative assessment and prioritization of environmental problems, (2) identification of immediate, underlying sectoral and root causes, and causal-chain analysis.

The socio-economic and environmental impacts of these issues have been taken into account during this assessment. The result of analysis of the current state and prediction of the possible change of environment in the Russian Arctic is presented in a Table V.1. below.

[12] *Global International Water Assessment;*

Table V.1. Integrated matrix of assessment of priority environmental problems of the Russian Arctic.

Major concerns and their total score	Consequences for environment			Consequences for economy			Consequences for population			Potential transboundary consequences		
Negative consequences and threats of global climate change (total score – 52)	-	+	+	+	+	++	+	+	+++	-	+	++
Transformation of permafrost (thawing, erosion, etc.), condition of habitat, biodiversity, ecosystems, bioresources (18)	-	+	++	+	++	+++	+	++	+++	-	+	++
Degradation and low adaptive capacity of economy and existing infrastructure (19)	-	+	++	+	++	+++	+	++	+++	-	+	+++
Destruction of life support systems, social infrastructure and increase of incidence rate of indigenous population and newcomers (15)	-	-	+	+	++	+++	+	++	+++	-	+	+
Pollution of environment (total score - 105)	+	++	+++	+	++	+++	++	+++	+++	++	++	+++
Transboundary transfer of pollutants via air and water flows (26)	++	++	+++	+	++	++	+	++	+++	++	+++	+++
Oil pollution as result of exploration, transportation and emergency situations , etc. (22)	+	+	+++	+	++	+++	+	+	+++	+	++	+++
Chemical pollution of environmental media, including PAH, POP, heavy metals, etc. (23)	+	++	+++	+	+	++	++	++	+++	+	++	+++

Major concerns and their total score	Consequences for environment			Consequences for economy			Consequences for population			Potential transboundary consequences		
Radioactive pollution (16)	+	+	++	-	+	+	+	++	++	+	++	++
Accumulation of solid wastes (18)	+	++	++	+	+	++	+	+++	+++	-	+	+
Land degradation and violation of conditions of land use (total score - 34)	+	++	+++	+	+	++	+	+	++	-	+	+
Fragmentation of soil and vegetation cover (13)	+	++	+++	-	+	++	-	+	++	-	-	+
Land degradation, thermokarst anf thermoerosion (12)	+	+	+	+	++	++	-	+	++	-	-	+
Transformation of pasture land for reindeers (9)	+	++	++	-	-	+	-	+	+	-	-	+
Biodiversity, ecosystems and bioresources changes (total score- 103)	++	++	+++	+	+	++	+	++	+++	+	++	+++
Loss and transformation of ecosystems (18)	+	++	+++	+	+	++	+	+	++	-	+	+++
Reduction in biodiversity, number and transformation of habitat of rare species (19)	+	++	+++	+	+	++	+	++	++	-	+	+++
Unsustainable use of bioresources and poaching (32)	++	+++	+++	++	+++	+++	++	+++	+++	++	+++	+++
Accidental biotic invasions and intended introduction of invasive species (15)	-	+	++	-	+	++	-	+	++	+	++	+++
Low efficiency and representativeness of territorial biodiversity conservation (19)	+	++	+++	+	+	++	-	+	++	+	++	+++

Major concerns and their total score	Consequences for environment			Consequences for economy			Consequences for population			Potential transboundary consequences		
Conservation of favorable environment (total score - 66)	-	+	+	+	++	+++	++	+++	+++	-	+	++
Degradation of residential properties, life support systems, including drinking water supply (17)	-	-	+	+	++	+++	++	+++	+++	-	+	+
Violation of traditional nature management of indigenous people (23)	+	++	++	+	++	++	++	++	+++	+	++	+++
Reduction of resource potential of traditional nature use of indigenous people (26)	+	++	+++	+	++	+++	++	+++	+++	+	++	+++

Consequences:1- past, accumulated; 2- current; 3- prospective, forecast. Evaluation of consequences: – - no; + - remarkable, tangible damage; ++ - significant, considerable damage; +++ - catastrophic, significant damage.

As a result of analysis of the current state and prediction of the possible change of environment in the Russian Arctic the following 5 environmental issues have been identified, ranked below in terms of their priority:

6. Pollution of the environment (trans-boundary transfer of pollutants by aquatic and atmospheric flows, oil, chemical and radioactive contamination, accumulation of solid wastes)
7. Change in biodiversity and depletion of biological resources, largely due to contamination of the environment and unauthorized use of biological resources and poaching
8. Deterioration of the human environment of the arctic inhabitants and disruption of traditional nature management conditions and reduction of the resource potential due to industrial pollution and other environmental disturbances
9. Detrimental consequences and threats of global climate change
10. Degradation of lands and infringement of land use conditions

The assessment integrates environmental and socio-economic data from each Russian Arctic region to determine the severity of the impacts of each of the five concerns and their constituent issues on the entire Russian Arctic.

The major hazard for the Arctic seas results from oil and its components that enter marine ecosystems from sewage discharges, accidental spills, navigation, and gas and oil production, especially directly on the shelf. Trace metals and chlorinated hydrocarbons in combination with other contaminants undoubtedly constitute a threat to life in the Arctic seas. Pollution is one of the main problems in the Russian Arctic region. Chemical pollution and spills are the most alarming issues. Eutrophication, microbiological pollution, suspended solids, solid waste, thermal pollution and radionuclide have an unknown or slight effect in the region. Over the next 20 years, environmental impacts from oil pollution are expected to remain significant. Chemical pollutants such as chlorinated hydrocarbons, heavy metals are considered to pose a moderate threat.

The SAP-Arctic addresses environmental consequences of land-based and sea-based activities although the marine activities under consideration are restricted by development of oil and gas resources of the Arctic shelf, transportation of oil and gas and marine shipping.

Causal chain analyses conducted for each of the five main issues illustrated clear links between environmental and socio-economic impacts, and described how factors such as economic incentives, governance arrangements, politics, and the lack of knowledge are often major root causes for the identified problems. The absence of effective long-term plans and legislation was identified as a recurring root cause for many issues.

SAP-Arctic sets forth the priority goals and objectives for the protection of the marine environment of the Russian Arctic from pollution for 2008-2012 and till 2020, as well as Action Plan for 2008-2012. The priority goals, objectives and activities were developed on the basis of the casual-chain analysis of the state of Russian Arctic environment and consultations at the federal and regional levels, sociological surveys of the population and other sources.

The long-term goals SAP-Arctic to protect Russian Arctic from pollution include:

6. Prevention and mitigation of the pollution of coastal and marine environment as a result of land-based and sea-based activities, including oil and chemical and radioactive pollution;
7. Improvement of the quality of drinking water supply;
8. Conserving the biological and landscape diversity and capacity of the renewable natural resources impacted by the man-induced pollution;
9. Support and maintaining the enabling conditions for traditional nature uses of indigenous peoples of the North;
10. Reducing the level of natural and man-made risks from industrial facilities and utilities as a result of global climate change.

The work on causal-chain analysis is in progress.

CONCLUSION

After finalisation of the diagnostic analysis it is proposed to publish it as a separate document with preliminary title “Russian Arctic – current state and prospects”. The content of this publication is given below:

Preface

Executive Summary

Introduction

Chapter 1. Physical/Geographical Characteristics of the Russian Arctic

Chapter 2. Physical/Geographical and Economic Characteristics of Russian Arctic Regions And Several Sub-Arctic Regions.

Chapter 3. Indigenous people of the Russian Arctic

Chapter 4.The Influence of Physical and Chemical Processes on Contaminant Transport into and within Arctic Ocean

Chapter 5.Environmental Characteristics of the Russian Arctic

Chapter 6. Biological Resources of the Russian Arctic

Chapter 7. Biodiversity of the Russian Arctic

Chapter 8. Oil Contamination of the Russian Arctic

Chapter 9. Persistence Organic Substances in the Russian Arctic

Chapter 10. Radioactive Pollution of the Russian Arctic

Chapter 11. Climate Change and its Consequences for the Russian Arctic

Chapter 12. Conclusions

An example of a content of part of Chapter 1 is posted to the web of the Project.

Annex 1. Statistical information on the Russian Arctic

Total area and dynamics of population in the Russian Arctic in 1985 – 2005 (thousand of square km and thousand of people)

Region	**Square**	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Murmansk	144,9	1092	1191	1159	1148	1117	1092	1067	1037	1012	988,0	984,0	941,0	923,0	906,0	890,0	880,0	873,0
Arkahgelsk	410,7	1482	1524	1522	1517	1510	1497	1453	1433	1413	1392	1372	1349	1328	1309	1291	1276	1263
Nenets AO	176,7	53	52	55	54	52	51	45	43	42	42,0	42,0	41,0	41,0	41,0	42,0	42,0	42,0
Republic Sakha (Yakutita)	3103,2	1013	1111	1109	1093	1074	1061	1037	1020	1010	995,0	977,0	963,0	958,0	952,0	949,0	949,0	951,0
Taimyr	862,1	54	52	54	53	51	49	43	42	41	40,0	39,0	38,0	38,0	39,0	40,0	39,0	39,0
Chukotka	737,7	155	162	154	146	124	113	96	84	78	72,0	67,0	61,0	57,0	55,0	53,0	52,0	51,0
Yamalo-Nenets AO	750,3	392	489	493	479	465	469	478	487	492	498	499	496	496	503	509	515	523
Republic of Komi	415,9	1221	1249	1265	1255	1246	1228	1157	1133	1116	1096	1078	1058	1043	1030	1016	1005	996

Dynamics of Gross Regional Product (in millions of RUR, until 1998 – in billions RUR)

Region	1995	1996	1997	1998	1999	2000	2001	2002	2003
Murmansk	14358	16436	18191	23652,0	41989,0	57441,0	57325,0	69325,0	81657,0
Arkahgelsk	14263	18306	20908	22889,0	36845,0	49990,0	55548,0	67988,0	82369,0
Nenets AO	*	*	*	*	*	12573,0	12658,0	16565,0	25239,0
Republic Sakha (Yakutita)	20335	27198	30181	33529,0	61623,0	61185,0	100731,0	114758,0	133143,0
Taimyr	*	*	*	*	*	1917,0	2698,0	2760,0	2965,0
Chukotka	1347	2334	2097	2504,0	2958,0	4004,0	7996,0	11432,0	18382,0
Yamalo-Nenets AO	*	*	*	*	*	126498	203518	283277	326295
Republic of Komi	19395	20563	25394	29369	46940	64831	85673	93147	113551
Khanty-Mansi	*	*	*	*	*	438743.0	538308.1	589493.4	760866.2

Dynamics of capital investment in environmental protection (millions of RUR, until 1998 – billions RUR)

Region	1994 *	1997 *	1998	1999	2000	2001	2002	2003	2004	2005
Murmansk	19,8	16,6	163,0	106,7	164,0	754,0	453,0	**517,0**	**646,0**	327,3
Arkahgelsk	15,7	86,6	143,0	369,0	845,0	975,0	832,0	267,0	334,0	**1430,5**
Nenets AO	10,9		1,0	**	28,0	48,0	92,0	**81,0**	**79,0**	**584,6**
Republic Sakha (Yakutita)	40,1	139,4	104,0	113,6	230,0	226,0	365,0	**1747,0**	**657,0**	1330,4
Taimyr	**		5,7	34,7	**105,3**	62,9	82,0	**19,9**	**86,4**	**
Chukotka	0,02		33,6	**22,2**	**20,5**	19,7	24,6	**31,8**	**35,1**	**
Yamalo-Nenets AO	73,7	116,5	154,0	423,1	624,0	528,0	505,0	**908,0**	**1075,0**	**793,5**
Republic of Komi	33,3	57,7		58,3	1036			261,6	492,6	959,6

Air emissions in the Arctic regions for 1988 – 2005. (in thousand tones)

Region	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Murmansk	714,1	699	650,2	616,6	538,8	469	543,5	**504,6**	557,2	448,4	367,9	373,3	369,4	333,0	318,0	316,0	301,1
Arkahgelsk	505,2	545,8	579,5	505,8	408	350	333,5	333	334,3	332,4	322,1	268,3	278,4	260,6	259,0	273,0	258,6
Nenets AO	*	*	*	*	49,6	45	24	24	7,6	7,9	8,2	21,9	17,8	15,1	37,0	63,0	55,9
Republic Sakha (Yakutita)	220,3	192,4	191,2	177,6	136,2	133,6	120,2	**141**	128,5	135,3	124,5	134,2	130,3	131,0	134,0	154,0	162,6
Taimyr	**	**	**	**	25,4	21	22	18	17,57	18,5	15,3	16,0	12,4	12,1	14,7	15,1	11,6
Chukotka	**	**	89,5	83,5	**68,3**	69,7	72,5	66,6	56,36	51,0	40,6	35,5	31,9	28,4	38,0	38,0	23,0
Yamalo-Nenets AO	**	**	**	**	536	560	757	**617**	505	525,4	539,6	576	586,6	725,5	914	1088,33	1071,1
Republic of Komi	979,7	912	900,9	781,9	754,3	989,5	945	**928**	873,7	891,4	835,9	685,4	688,3	663,8	631	659,85	670,5

Fresh water use in the Arctic regions for 1988 – 2005. (in mln m^3)

Region	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Murmansk	2038	2495	2494	2183	2040	1599	2095,8	1973	1859	1818,0	1903,2	1720,0	1722,0	1663,0	1666,0	**1739,0**	1655,0
Arkahgelsk	1136	1140	1157	1117	1091	985	963	807	804	738,0	802,0	832,0	828,0	756,0	713,0	**681,0**	704,0
Nenets AO	*	*	*	*	*	4	4	5	5	4,2	4,3	4,9	5,2	6,0	7,2	**7,0**	11,0
Republic Sakha (Yakutita)	358	290	274,1	249	216	184	176,1	**158**	157	138,0	123,7	128,0	135,0	134,0	135,0	131,0	167,0
Taimyr	**	**	**	**	**	14	14	14	14	13,0	13,0	271,0	278,0	273,0	268,0	**238,0**	**13,0**
Chukotka	**	87	**90**	83	72	68	54,3	43	36	34,0	29,9	27,0	27,0	27,0	24,0	**22,0**	23,0
Yamalo-Nenets AO	**	**	**	**	**	162	160	**165**	177	176	166,5	160	157	166	171	156,8	176
Republic of Komi	714	794	793,3	772	779	770	765	726	702	684	646	663	642	617	587	588	597

Wastewater discharge in the Arctic regions for 1988 – 2005. (in mln m^3)

Region	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Murmansk	260,3	382	321,4	343,4	307,2	305,4	303,1	279,8	343,2	**300,4**	362,1	429,0	370,4	366,0	340,0	374,0	394,0
Arkahgelsk	648,6	697	675	648,4	642,5	570,2	574	464,75		438,0	514	540,2	537,1	513,3	477,0	454,0	464,0
Nenets AO	*	*	*	*	*	*	0,5	*	*	1,2	1,1	1,1	1,0	1,1	1,2	1,1	1,2
Republic Sakha (Yakutita)	44,8	91	84,1	95,4	87,5	74,5	91,3	95,6		87,4	90,7	85,3	86,8	82,9	87,0	79,0	79,0
Taimyr	**	**	**	**	**	**	11	11		10,4	10,1	**95,8**	**95,9**	**94,1**	**93,0**	**97,0**	9,3
Chukotka	*	12	11,4	10,7	10,2	9,6	8,3	**8,6**		6,1	5,4	5,3	5,2	5,7	4,0	5,0	4,3
Yamalo-Nenets AO	**	**	**	**	**	**	32	37		**25,3**	26,8	27,7	33,2	33,1	32	32,55	31
Republic of Komi	184,1	194	188,2	180,2	**167,2**	168,6	158,6	132,6	137	136,6	138,4	146,4	146,4	144,7	141	136,45	133

Annex 2. An example of a content of a part of Chapter 1

ANNEX VII

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/5(1)

Item 5 of the Agenda

Environmental Remediation of the Decommissioned Military Bases on Franz Josef Land Archipelago

---

Prepared by:	the Project Office
Status:	approved by the Project Steering Committee

Environmental Remediation of the Decommissioned Military Bases on Franz Josef Land Archipelago

1. Introduction and Purpose

This proposal outlines a multi-year demonstration project under the United Nations Environment Programme Global Environment Facility project, “Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment (GFL/2732-03-4694). The project proponent is the Non-Profit Organization Polar Foundation.

According to the Project Document, the goal of this demonstration project is environmental remediation of the decommissioned military bases that can be further transferred to the civil authorities. As stated in the document, “the outcomes of these demonstrations will be applicable not only to other former military bases in the Arctic but also to other military structures in Russia, the final civil use of which may be any but the remediation procedures will be similar”.

The main features of the areas of decommissioned military bases in the Arctic are as follows:

- Sites with difficult access and high logistic costs;

- Large amount of abandoned equipment, fragments and technological waste accumulated for the whole period of the base operation;

- Large amount of fuels and lubricants containers mostly 200L drums, whose number usually amounts to tens and hundreds of thousands;

- High level of the base area contamination with oil products, waste oils, POPs, etc.

- Severe weather conditions reducing the period of active remediation work to several months.

That is why, immense public and international importance of the environmental remediation and transfer of the base area to public use and a possibility of cooperation with other national and international programs at various phases of the implementation of the project is crucial for the implementation of the project.

Taking into account all above mentioned, a decommissioned aviation base on Graham-Bell Island, Franz Josef Land archipelago has been selected as the object of the demonstration project. A complex environmental situation on the archipelago including Graham-Bell Island was the reason why NEFCO/AMAP ”Updating of Environmental ”Hot Spots” List in the Russian Part of the Barents Region: Proposal for Environmentally Sound Investment Projects” prepared at the request of the Kirkenes Summit of the Barents Euro-Arctic Council in January,

2003 considered Franz Josef Land as a matter of special concern and distinguished the archipelago in the list of hot spots and priority projects (Project A 7-2).

2. Overall Goals of Demonstration Project

The goals of this demonstration project are as follows:

Determination of oil product, PAH, POP and heavy metal contamination level of the site of the air base on Graham-Bell Island, Franz Josef Land archipelago; Inventory of contamination sources, determination of their quantity, state and threat of destruction, assessment of the possible consequences for the environment.

Demonstration disposal of drums with waste oils and fuel and lubricant residues, including discharge of liquids, removal of residuals, compaction of drums and their removal from the archipelago for their further disposal on the Arkhangelsk Region plants.

Demonstration conservation of PCB-containing equipment in airfield and air-defense equipment on the selected area

Cleanup of the area free from the drums with the use of modern methods of oil spill removal from soil in the North.

Development of guidelines on remediation of contaminated areas of decommissioned military bases in the Russian Arctic.

Determination of legal and organizational procedures for the release of cleaned up areas from the RF Ministry of Defense responsibility and their transfer to the Arkhangelsk Region Administration.

3. Rationale

Franz Josef Land (FJL) is situated in the Western Russian Arctic, northeast of the Barents Sea and is the northernmost landmass of Eurasia. Franz Josef Land is an archipelago consisting of 196 islands of 16096 sq. m., 13690 sq. m. of which is ice covered. It stretches 375 kilometers from west to east and 234 kilometers from north to south. Most of the archipelago islands are outliers of a wide basalt plateau divided by tectonic fractures into separate blocks and mostly destroyed by glaciers and other geological denudation agents. Due to the horizontal location of basalt covers the surface of most of the islands is plateau-like. The archipelago glaciers cover 85 per cent of the total island area. The glaciers are present on all of the medium and big islands (56 islands) and are not on the small ones (135 islands).

FJL falls administratively into Arkhangelsk Region. The archipelago has no permanent inhabitants.

The first Soviet hydrometeorological station on Franz Josef Land archipelago was founded in 1935 on Hooker Island. However, an active use of the archipelago for research and defense purposes began in the period of the 50's – the early 90's. During this period, several hydrometeorological stations, military and frontier sites were established on the archipelago. Since the early 90's, almost all of these sites have been closed. Actually, Krenkel hydrometeorological station on Heiss Island and a frontier post on Alexandra Island function on the archipelago.

After military, frontier and research sites had been closed, they were not duly mothballed and equipment and materials removed due to extremely high transportation costs. Up to 50 000 tons of oil products and lubricants in drums and tanks have been abandoned on the archipelago including waste oils and several millions of drums with fuel and lubricant residues. Waste oils from aircraft engines may have contained PCB used as lubricants. High-power transformers and condensers from airfield and radar equipment made in the 1970's almost surely contained sovtol and other PCBs used as dielectrics. Oil products and equipment are stores on the archipelago islands without proper control from the moment of their delivery. According to the Arkhangelsk Department of Natural Resources and Environmental Protection, several islands are ecologically critical areas.

Graham-Bell Island (According to the Arkhangelsk Department of Natural Resources and Environmental Protection and Roshydromet)

The island is the location of a long-range aviation regiment in the 70's-90's (transferred from Hoffman Island). The following objects are found on the island:

- Domestic and industrial waste landfill, damaged motor transport, up to 10 thousand drums with waste oils (about 2 thousand tons). The landfill is situated on the coastal beach; its size is about 0.3 x 6.5 km;

- Fuels and lubricants storage facilities with R-25 and R-50 drums (about 300 pieces). The total volume is about 3300 tons including TS-1 – 2200 tons; gasoline A-76 – 350 tons; diesel fuel – 750 tons. The actual state of the drums is satisfactory, however, some of them are leaking

- Fuels and lubricants in drums supplied in the 70's-80's ((jet fuel TS-1, diesel oil, gasoline A-76) up to 80 thousand drums (about 16 thousand tons). some drums are leaking due to corrosion.

- Airfield and radar equipment.

The latest survey was conducted in the course of determination of polychlorinated biphenyls (PCB) contamination of the island within the Roshydromet/AMAP Project in 2004.

The project was implemented in the 2004 navigation period (August 26 – September 3) from the RV Mikhail Somov board by Non-Profit Organization Polar Foundation at Roshydromet request with an active participation of the Northern HSA

The survey has included:

1. Flight around Graham-Bell Island to determine locations of possible contamination.

2. Soil sampling.

3. Technical liquids sampling.

Soil samples were collected following the Roshydromet's Regional Center "Monitoring Arktiki" guidelines. Five points have been selected for the survey (Figure):

1. Air defense post with mobile and fixed radars. There are two large stationary radars which of them has been not mounted; several smaller stationary and mobile radars, administrative/residential building, several auxiliary buildings (fuels and lubricants storage facilities, transforming stations, diesel generator rooms etc.) within the station area. The area is littered with metal structures and drums. The most severe soil pollution is found at the fixed radars location. There is the strong odor of petrol and oil spillage on the soil

2. Residential settlement with fuels and lubricants storage facilities (soil samples 23-88; liquid samples 2-5). There is an open drum storage area, large tanks with fuels and lubricants, a container with drums marked with "poison" label, transforming stations, diesel installations and sheds with equipment inside at the settlement area. Most of the drums are full and have corrosion marks on them. Soil close to sheds, diesel generator rooms, transforming stations and tanks with fuels and lubricants is severely polluted with oil products.

3. Area of the landing strip with fuels and lubricants drums. There are tanks with fuels and lubricants, transformers, fueling equipment and vehicles close to the landing strip. Soil close to the landing strip is severely polluted with fuels and lubricants. There is the strong odor of oil products; fuels and lubricants spillage on the soil.

4. Fuels and lubricants in drums on the coastal beach. There is a waste site, vehicle residuals and drums on the coastal beach – up to 10 thousand drums weighing about 2 thousand tons (Fig. 4.4). Most of the drums are closed and filled. The drums are not labeled or labels are not readable. The drums have corrosion traces. Some of them are sanded up in half. Soil has fuels and lubricants spillage traces.

5. There are stockpiled drums with POL supplied in the 70's-80's on the coastal beach (jet fuel TS-1, diesel oil, gasoline) up to 80 thousand drums weighing about 16 thousand tons (Fig. 4.5). Most of the drums are closed and filled. The drums are not labeled or labels are not readable. The drums have corrosion traces. Soil has fuels and lubricants spillage traces.

A total of 188 soil and 8 technical liquid samples were collected.
Chemical analysis of the samples was conducted by the Roshydromet's Regional Center "Monitoring Arktiki".

The highest PCB concentrations exceed AC and AAC levels more than 5 times. On this basis, it was decided to recommend to carry out a detailed survey in the most PCB contaminated areas in order to determine contamination sources and their characteristics and also develop project proposals for the island surface cleanup and remediation of contaminated areas.

4. SCOPE OF PROPOSAL

Within the framework of the demonstration project it is planned to perform a complete cycle of environmental remediation at the selected demonstration area of the decommissioned aviation base on Graham-Bell Island. According to the 2004 survey results a 1 sq. km area will be selected consisting of 3-4 objects including waste oil storage facility, drums with fuel and lubricant residues storage facility and a building of one of radar stations.

The following work will be done on the area:

- Comprehensive survey of identified sites including geodetic survey; mapping of the fuel/lubricant storage areas; determination of technical conditions of drums and tanks; determination of volumes and types of stored oil-products and evaluation the probability and rate of fuel/lubricant leakage from drums and tanks. Identification of PCB-containing equipment.

- Sampling and chemical analysis of soil, liquids and the drum content to determine contamination with oil, POPs and heavy metals.

- Demonstration disposal of drums with waste oil and lubricant residues including drainage and disposal of liquids from the drums, compaction and disposal of the drums and their removal from the archipelago for their further disposal on the Arkhangelsk Region plants

- Conservation of identified PCB-containing equipment to prevent further PCB leakage and environmental contamination.

- Demonstration work on cleanup of a 1 ha area free from the drums with the use of modern methods of oil spill removal from soil in the North.

According to the work results, the guidelines will be developed on the remediation of contaminated area of decommissioned military bases in the Russian Arctic. Legal and organizational procedures for the release of cleaned up areas from the RF Ministry of Defense responsibility and their transfer to the Arkhangelsk Region Administration will be developed in close cooperation with the RF Ministry of Defense and the Arkhangelsk Region Administration.

5. PROPOSAL.

Summary of Tasks

Task 1: Selection of the demonstration area of the decommissioned aviation base on Graham-Bell Island. FJL

Task 2: Comprehensive situational survey of the area.

Task 3: Determination of contamination level of the demonstration area.

Task 4: Disposal of drums with fuels and lubricants

Task 5: Cleanup of a contaminated territory on the demonstration area

Task 6: Conservation of PCB-containing equipment

Task 7: Development of guidelines on remediation of contaminated areas in the Arctic conditions.

Task 8: Development of legal and organizational procedures for the release of cleaned up areas from the RF Ministry of Defense responsibility and their transfer to the Arkhangelsk Region Administration

Task 1: Selection of the demonstration area of the decommissioned aviation base on Graham-Bell Island. FJL

Participants: NPO Polar Foundation, Roshydromet's SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

Determination of polychlorinated biphenyls (PCB) contamination of the island within the Roshydromet/AMAP Project in 2004

Activities:

1. Analysis of Roshydromet/AMAP Project (2004) on determination of PCB contamination of Graham-Bell Island.

i. Development of the situational plan according to the GPS survey of the main objects of the aviation base

ii. Selection of the demonstration area including waste oil storage facility, drums with fuel and lubricant residues storage facility and a building of one of radar stations.

2. Development of the working plan of the demonstration area situational survey and sampling to determine the level of the area contamination

i. Development of the survey logistic support plan

ii. Determination of technical means needed and routes of air survey of the area

iii. Determination of quantity, composition and points of sampling to determine the level of contamination

iv. Development of guidelines to determine the state, level of corrosion and filling level of the drums and containers with fuels and lubricants.

***Task 2*: Comprehensive situational survey of the area**.

Participants: NPO Polar Foundation, Roshydromet's SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces, RF FSS Aviation.

Activities

1. Air survey of the area with the use FSS Aviation MI-8 MTV helicopters.
2. Terrestrial GPS-coupling of the objects
3. Processing of the air survey results and development of the situational plan

***Task 3*: Determination of contamination level of the demonstration area.**

Participants: NPO Polar Foundation, Roshydromet's SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

1. Sampling to determine oil product, PAH, POP and heavy metal contamination.

i. Express analysis of ground and technological liquid samples to determine oil product and PCB contamination level

ii. Collection and conservation of samples of oil products and other technological liquids stored I containers.

iii. Collection of soil samples in the areas of contamination sources and contaminated areas.

2. Chemical analysis of samples is made in the Certified Chemical-Analysis Center, SPA “Taifun”, Obninsk

3. Cameral processing of the survey results with the use of GIS technologies including

i. Development of bitmap plans of the demonstration area

ii. Development of a digital thematic maps of contamination

iii. Development of a GIS-based database

Task 4: **Disposal of drums with fuels and lubricants**

Participants: NPO Polar Foundation, Roshydromet’s SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

1. Development of a work program on disposal of the drums with fuels and lubricants.

i. Determination of technical means needed to clean and compress the drums

ii. Determination of methods of disposal of fuels and lubricants and compressed drums.

iii. Development of logistic support plan and plan of activities with the use of RV “Mikhail Somov” and helicopter MI-8T based on the RV

2. Purchase of technical means and expeditionary equipment

3. Work on the discharge of fuels and lubricants, removal of fuel and lubricant residues from drums, compression of drums and disposal of fuels and lubricants.

4. Shipment of compressed drums on RV “Mikhail Somov” board, delivery to Arkhangelsk, disposal of compressed drums.

Task 5**: Cleanup of a contaminated territory on the demonstration area**

Participants: NPO Polar Foundation, Roshydromet’s SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

1. Selection of the method of rehabilitation of the area with account of FJL archipelago weather conditions.

i. Determination of composition and manufacturer of biosorbents

ii. Determination of composition of technical means and necessary equipment.

iii. Development of logistic support plan

2. Work on the area rehabilitation

i. Removal and disposal of technologic waste

ii. Processing of contaminated soil with biosorbents according to the method selected

iii. Removal and burial of soil with high level of PCB, POP and heavy metal contamination

***Task 6*: Conservation of PCB-containing equipment**

Participants: NPO Polar Foundation, Roshydromet's SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

1. Identification PCB-containing power equipment (transformers and condensers).

2. Development of the method of PCB-containing equipment conservation to prevent PCB leakage to the environment..

3. Conservation of equipment.

***Task 7*: Development of guidelines on remediation of contaminated areas in the Arctic conditions.**

Participants: NPO Polar Foundation, Roshydromet's SPA «Typhoon», Northern Hydrometerological Administration, Environmental Security Department of the RF Armed Forces.

1. Analysis of the demonstration work results.

2. Development of guidance documents on the cleanup of the areas contaminated with oil products, POPs and heavy metals

***Task 8*: Development of legal and organizational procedures for the release of cleaned up areas from the RF Ministry of Defense responsibility and their transfer to the Arkhangelsk Region Administration**

Participants: NPO Polar Foundation, Environmental Security Department of the RF Armed Forces, Ministry Ministry of Defense General Staff, Arkhangelsk Region Administration.

1. Determination of the status of the decommissioned aviation base area on Graham-Bell Island

2. Analysis of the regulatory framework.

3. Determination of procedures for the release of cleaned up areas from the RF Ministry of Defense responsibility and their transfer to the Arkhangelsk Region Administration.

6. Project Budget (estimated)

Activity	**Costs, USD**
1. Logistics	
1.1. Use of helicopters, 20 hours	50 000.00
1.2. RV ”Mikhail Somov” lease , 10 days	200 000.00
2. Materials and equipment	60 000.00
3. Purchase and lease of technical means	160 000.00
4. Hardware	20 000.00
5. Field work	50 000.00
6. Transport costs	20 000.00
7. Chemical analysis of samples	20 000.00
8. Cameral processing	20 000.00
9. Planning and preparation of reports	20 000.00
Subtotal:	**600 000.00**
Operating expenses and contingences, 20%	120 000.00
Total	**720 000.00**

NPA-Arctic cost will be about 200 – 250 K$. Other costs will be covered by NEFCO and other donors.

ANNEX VIII

STEERING COMMITTEE

of the UNEP/GEF Project

"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting

St. Petersburg, Russian Federation

April 25 - 26, 2007

STC 2/5(3)

Item 5(3) of the Agenda

Project Document for DEMO-CLEAN-UP "Use of Brown Algae for Cleaning-Up Marine Water from Oil and Other Pollutants"

Prepared by:	Project Office, Working Group on DEMO-CLEAN-UP
Status:	approved by the Project Steering Committee

Use of Brown Algae for Cleaning-Up Marine Water from Oil and Other Pollutants

INTRODUCTION

This document is designed to provide information to decision makers on a proposed pilot project, Marine Arctic Environment Clean-up by Setting up Brown Algae Shelter Zones Around Pollution Sources (hereinafter, the Project). The Project's pilot area is those Barents Sea water areas and ones in the Kola Bay where pollution sources are found – being potential sites for brown algae shelter plantations.

The fact that the UNEP/GEF Russian Federation – Support to National Programme of Action to Protect the Arctic Marine Environment Project has included in its list of potential demonstration projects a research paper, 'Use of brown sea algae to decontaminate sea water in the Arctic', aimed to demonstrate a method to deploy brown algae shelter zones in areas subject to oil contamination risks, was key to starting preparations for the Project.

Implementing this Project is in Russia's best interests as it helps protect the Arctic marine environments, and is compliant with international environmental standards, including US and Norway technical requirements and standards, as well as IFC environmental and social requirements.

The Project's initial preparation stage included an integrated assessment of:

- physical and geographical background, and the quality of the marine environment in the Barents Sea basin;
- background pollution levels in the Arctic marine environment;
- oil and gas projects' impact on the marine environment;
- marine ecosystems and coastal areas adjoining thereto;
- stocks of macrophytes available in areas in question, and opportunities for using them for Project's purposes;
- available biotechnology research work findings, and
- pilot areas with sources of environmental pollution, to be selected as potential sites for using biotechnology, as well as biotechnology approaches have been developed for cleaning up selected marine environment pollution sites.

Preparing this document has been based on the Project's preliminary materials and final report prepared for decision makers in 2006, special materials provided

by Algology Laboratory (Dr. Voskoboinikov G.M.) at Murmansk Marine Biology Institute (MMBI), RAS Kola Research Centre, as well as on an analysis of research findings by relevant research institutes and organizations.

PROJECT RESEARCH BACKGROUND

Russia has traditionally been included among leading sea world powers in exploration and exploitation of the World Ocean. An important area of economic and social developments in Russia is exploration and use of sea shelves with a total area of 4.2 million km^2, of which 3.9 million km^2 are promising in terms of hydrocarbon resources available. It is worthwhile mentioning that 80% of oil and gas stocks of Russia are found on the shelf of its Arctic seas. Exploiting these resources in harsh Arctic shelf conditions is a serious technical challenge, resolving which will require meeting a number of requirements pertaining to sustainable use of nature, industrial and environmental safety.

Along with using new technology helping ensure safer operations, another promising area is creating highly sustainable biologic systems able to effectively decontaminate sea water. One of the biologic methods involves using bio-filter shelter zones – made of associations of brown algae and oil-oxidizing bacteria – in areas of oil and gas development projects, oil and gas condensate storage, transportation and processing (hereinafter, as long as the Project is concerned, biotechnology).

Among marine macrophytes, brown algae have characteristically high resistance to petroleum contaminants, as they grow and develop actively with pollutants' levels of 0.01 mg/l, absorbing and using in their metabolism petroleum hydrocarbons and thus decontaminating the marine environment. In addition, as they produce large amounts of oxygen, it helps marine microorganisms effectively decompose oil. To be sure, in water with diesel fuel levels of 1 mg/l, no changes in their functional activity are reported compared to algae in the control group.

Setting up brown algae shelter zones in areas at risk of oil contamination can ensure sustainable purification of the marine environment, should it get contaminated. In case of a spill, floating algae, owing to their large surface area, can prevent the spill from spreading thus paving way for clean-up measures by whatever method.

The Murmansk Marine Biology Institute, of the RAS Kola Research Centre, has developed an innovation biotechnology. As experiments show, specially set up sustainable biological systems in the form of algae communities (plantations) are capable to protect a sea water site effectively against polluting spills spreading over large areas.

Biotechnology Description

Algae forming the proposed symbiotic association bio-filter plantation include:

1) Devil's apron (*Laminaria saccharina*) – a species common to the Arctic seas, well documented and of commercial value, as it is the key producer of alginate, mannitol, and an array of other compounds widely used in biotechnology and health care (*Commercial and useful algae…*, 1998). *Laminaria saccharina* reaches a length of 3 m and weight of over 1 kg. The project authors have gathered large enough experience in growing devil's apron in plantations in Barents Sea bays in one- and two-year cycles, with a productivity of 60-70 tons per hectare (Makarov et al., 1987; Voskoboinikov et al., 1999; Voskoboinikov et al., 2005).

It should be noted that at bio-filter plantation sites with intensive water motion (IWM) it is possible to replace *L. saccharina* with a close species but more resistant to high IWM, namely *L. digitata*.

2) Another species to use in the study is a representative of fucus algae, a littoral resident – bladder wrack (*Fucus vesiculosis*). Bladder wrack demonstrates incredible resistance to external forces: it survives in very low salinity water, sustains exposure to high dozes of ultraviolet and sun light for a long time, high waves and tidal processes, long exposure to lack of light, as well as high oil contamination levels, which makes it algae of choice (Makarov M., 1999; Wrabel and Peckol, 2000; Ryzhik, 2005; Voskoboinikov, 2006).

3) The third association component is oil-oxidizing bacteria, occurring in sublittoral and littoral waters in the Barents Sea, and documented in sufficient detail in recent years. These include 7 genera of hydrocarbon-oxidizing microorganisms: *Pseudomonas, Proteus, Micrococcus, Arthrobacter*, *Corynebacterium*, *Mycobacterium*, and *Rhodococcus*, which are omnipresent in the Barents Sea coastal waters, regardless of petrochemical contamination levels (Ilyinski, Yanushka, 1985; Koronelli, Ilyinski, Peretruhina, 2006; Peretruhina et al., 2006).

There is a set of measures to precede work on putting technology in question in place, as follows:

- hydrologic and hydrochemical studies in a proposed plantation area (near a source of pollution), that allow determining existing currents, IWM, temperature and hydrochemical characteristics, background levels of petroleum hydrocarbons, heavy metals and radionuclides; and
- production of an oil-oxidizing bacteria bank.

Proposed biotechnology is implemented in a few stages:

Stage 1. Assembling the plantation framework consisting of ferroconcrete anchors (FA) placed in a straight line 20 m apart at a depth of 12-25 m, and polymer cords: vertical ones, with a diameter of 5 cm, going from the anchors to the surface, and one horizontal cord connecting the ends of vertical cords along the surface. The horizontal cord is fitted with floats to keep it on the surface.

To grow the laminaria algae, leads are then made, i.e. synthetic cables 5 m long with a diameter of 1-2 cm, for interweaving young sporophytes, or that of 5-6 mm for subsequent sporing.

Stage 2. Two variants are available depending on timing for setting up the plantation.

Variant 1 – plantation is set up in May-July:

Collecting (at the littoral's lowest horizon) laminaria algae (young sporophytes 10-20 cm long) and interweaving collected items in the leads: in groups by 3 plants every 10 cm. Keeping the leads with sporophytes in seawater containers with oil-oxidizing bacteria cultures added for 24 hours.

Variant 2 -- plantation is set up in August-September:

Laminaria leads are sterilized (if required), e.g. in sodium hypochlorite standard solution obtainable on site by filtered seawater electrolysis.

After sterilization, the leads are rinsed in clean fresh water, placed in sporing baths, and laminaria spore suspension of required concentration is poured in. It takes 24 hours for the spores to settle and attach to the substrate securely (Makarov V.N. et al., 1986).

Variant 1 (young sporophyte interweaving) allows for the speediest putting of the bio-filter plantation into operation. As early as 10-15 days after leads were set with young sporophytes, that there will be secure attachment of algae rhizoids to the leads and a well formed symbiosis of bacteria/laminaria sporophytes. However, using this variant is feasible only in May-July as young sporophytes are not available at other times.

Lead sporing takes less man-power compared with sporophyte interweaving, however following sporing in August-September algae start to function in the association as late as May-June the following year (spores need time to germinate, and sporophytes need time to develop).

Stage 3. Transporting leads with interwoven plants or spore leads to the plantation site (done in containers with seawater) and fixing them along the horizontal cord 1 m apart. A weight is attached to the lower end of each lead to stretch it vertically. The stretching of the lead does not allow it to fold over in heavy weather.

Stage 4. Collecting (in the littoral) fucus algae, interweaving them into pre-prepared substrates (in groups by two-three plants 10 cm apart) and placing in seawater containers with oil-oxidizing bacteria cultures added. Transporting the substrates to the plantation site and attaching them to the horizontal cord.

As the plantation is operated, there is ongoing monitoring over the state of repair of the structure and the artificial symbiotic biocenosis, replacing fault modules as need be, and regulating the buoyancy of the structure, as well as the amount and composition of microflora.

The plantation's length can be increased if need be.

It should be noted that, in creating the bio-filter plantation, items are used that are not alien to the target environment.

The bio-filter plantation is a self-reproducing system owing to the algae's and oil-oxidizing bacteria's ability to propagate and grow in a plantation.

Growing algae in plantations will facilitate the restoration of natural algae communities.

Commercial macrophyte algae stocks across the Barents Sea coast alone are about 300 thousand tons of laminaria and around 200 thousand tons of fucus algae. This fact appears to be very important in terms of using macrophyte algae in this segment of the Barents Sea oil and gas-bearing province.

A shelter zone consists of two strips of algae communities 20 m apart, placed near the potential source of oil contamination.

It is need to mark the plantation site with buoys (illuminated at night) as early as possible, after coordinating this issue with relevant agencies.

The outer strip of algae (facing the source of contamination) serves to retain most of pollutants, as well as oil spilled through possible emergency discharges.

In the event of an accidental discharge, the algae secure oil patches in place until these are collected by a mechanical or other method, and are capable of retaining dozens of tons of crude oil on their surface. Since the algae are attached to the cord, they are easily retrieved from water along with oil stuck to their surface.

The inner strip of the algae is designed to retain anything that has escaped through the outer shelter strip. In addition, the inner strip can go to replace the outer one sent for utilization in case of excessive oil contamination, with new seedlings put in its place.

If there are no excessive contamination, part of the algae is taken out annually and sent for processing and utilization.

The described plantation structure ensures algae's optimal development, while protecting the marine environment from pollution and possible emergency oil spills.

Growing repair stock algae can be arranged:

- in the shelter zone itself, as an additional module; or
- as a separate plantation, at a distance from the oil pollution risk area

A reserve stock of algae to meet increased needs, such as in case of massive emergency spills, can be ensured by making an additional inner strip of algae on site or setting up a laminaria and fucus algae plantation some place else. As clean up is going on, algae with oil stuck to them are replaced with clean algae from the reserve plantation. In case of no emergency spills to tackle, the reserve plantation can be used as regular one producing clean algae for other needs.

The whole set of measures to protect the marine environment, harvest algae in shelter zones and prepare them for processing will include two shelter strips and an algae pre-processing workshop.

The shelter zone's parameters, such as total area and configuration, will be developed for a target area of choice during the Project's feasibility study in the inception phase.

Laminaria algae cultivation biotechnology is well studied and documented, e.g. for the Barents and White seas. The general approach is more or less the same, however, there can be modifications species to species and region to region.

Running an experimental plantation in 2005 led to the following findings:

- brown algae have characteristically high resistance to petroleum product pollutants, and with pollutant levels as high as 0.01 mg/l they actively grow and develop absorbing hydrocarbons;
- one square meter of a plantation can render safe a 100 ml oil spill slick in 4-5 days;
- a 1 ha plantation of adult, two-year-old algae forms an active sorption surface made of algae with a total area of about 0.3 square kilometers which is enough to completely absorb oil pollution resulted from a one time spill, with oil levels of up to 3 mg/l; and
- in case of an emergency spill, floating algae with a total area of 1 ha are able to capture up to 30 tons of crude oil until mechanical or other clean-up action is taken. Since the algae are fixed to a cord, they are easily pulled out of water with oil stuck to them.

Fucus algae's ability to absorb crude oil and petrochemicals has been tested in lab experiments mentioned above (Stepanyan, 2003; Stepanyan, Voskoboinikov, 2006), and in the field (Wrabel and Peckol, 2000; Stepanyan, 2003; Voskoboinikov et al., 2004). Findings by the project authors in studying petrochemical levels in *Fucus vesiculosus* in oil contaminated areas in Barents Sea bays are significant enough. To be sure, algae in Teriberskaya Bay, a free of pollution site, had oil levels of 1.637 mg oil/kg algae weight, whereas in the most polluted place (the pier, the settlement of Lodeynoye) these were 55.49 mg/kg. Similar to other documented studies (Voskoboinikov et al., 2004) where macrophytes' functional states were compared between areas varying in oil contamination, algae in this study remained to be able to grow, perform photosynthesis and build up polysaccharides, high oil pollution levels notwithstanding.

The revealed ability of marine macrophytes to neutralize oil slicks have a lot in common with findings in studies on purifying bodies of freshwater of oil contamination by freshwater macrophytes (Morozov, 2001; 2003). As oil, petrochemicals and other organic compounds decompose, there appear to be a growth of associative links between microorganisms and macrophytes. As is the case in marine communities, macrophytes stimulate the activity of oil-oxidizing bacteria. Research by I.V. Peretrukhina et al. (2006) suggested that oil-oxidizing bacteria's activity may grow as much as 20% in macro algae communities.

***Fucus vesiculosus* chemical composition (%), Voskoboinikov G.M., 2007**

Habitat	Total Lipids	Mannitol	Fucoidan	Alginate
Clean area	3.6	11.4	16.0	24.1
Contaminated area	9.8	6.7	5.7	21.4

The build up of petroleum hydrocarbons in *F. vesiculosus* algae in a contaminated area is 50 times as high as in one free of pollution.

In addition to the above, it is possible to use bio-filter plantations to protect marine environments from radionuclide or heavy metal pollution. Some algae are capable of accumulating radionuclides and heavy metals in amounts thousands of times the background amount found in the marine environment (Kamnev, 1989; Saenko, 1992; Tropin, 1992; Burdin et al., 1993; Hristoforova, 1989; 1999).

There are data suggesting that laminaria and fucus algae have the capacity to capture heavy metals and radionuclides. To be sure, research by MMBI at Isfjord (Spitsbergen Archipelago) reported some *L. Saccharina* samples, taken at the

settlement of Barenstburg, to have levels of arsenic almost 50 times MAC. However, as more detailed further research showed, it was a strictly local phenomenon having to do with the site where the sample had been taken. Sample taking was done next to Barentsburg Mine's coal washing facility. Algae samples taken less than 3 kilometers off the site did not have arsenic levels in excess of MAC (Voskoboinikov, Shahverdov, 2005). Bohn (Bohn, 1979) studied heavy metals levels changes in *F. distichus* as a function of distance from an ore deposit at Straskon Strait south coast (Canadian Arctic Archipelago). He showed that while zinc levels in algae 0.1 km off the river draining the area around the deposit and discharging into the strait could be as high as 138 μg/g dry matter, the levels in algae 18 km off the river discharge point were relatively low, 27 μg/g dry matter. Research in Ser-fjord (Norway, West Coast) and Trondheims-fjord (Central Norway coast) study areas (Lande, 1977; Melhuus et. al., 1978) reported zinc levels tens of times as high as MAC in fucus algae growing next to mines and a smeltery (up to 3,700 μg/g dry matter, *A. nodosum*), as compared to the same algae in open coast waters (107.3 μg/g dry matter).

A fundamental work by Matishov G.G. and Matishov D.G. (2001) reports a considerable build-up of radionuclides in algae in the direct vicinity of sources of pollution (RTP Atomflot, the Lepse ship): ^{137}Cs levels in algae 20-40 times MAC. Some macrophytes in this area were reported to have ^{137}Cs levels of 20-46 Bq/kg dry matter; ^{134}Cs – 1.2 Bq/kg DM, ^{60}Co – 1.6 Bq/kg DM, and ^{152}Eu – 4.6 Bq/kg DM. Devil' apron (Laminaria saccharina) was reported to have high (up to 260 Bq/kg DM) levels of ^{137}Cs.

In view of nuclear facilities located on the coasts of the Arctic seas (both military and civilian) there is a need to tackle the radionuclide issue promptly enough.

For example, the Americans put algae curtains at the entrance of the bays where nuclear ships are based, cut the algae once a year and incinerate the cuttings. This is a much more cost-effective method than using filters, sorbents, etc.

A US$ 38 million international project on purifying Arctic sea waters was presented in London in October 2003 (BBC).

The project was aimed at improving safety at military bases and involving local population in environmental action. It is being implemented under the aegis of a number of international organizations, including the UN Environment Programme.

One of its objectives was to show potential private investors ways to make profit by investing in Arctic ecosystem clean-up technology. In particular, one of its subprojects dealt with growing special algae to purify seawater of petroleum products. According to experts, cleaning up the whole Arctic region would require about US$ 40 billion.

Works by Ilyinski V.V. contain evidence that as crude oil decays some part of its

oxidized compounds are digested by bacteria and plants, while the rest is processed with non-toxic or low toxicity substances produced as a result. Thus oil decomposition is a result of joint action by heterotrophic microorganisms and coastal plants. The former act as key pollutant destructors and mineralizers, while the latter – as inducers, absorbers and consumers of oxidized compounds. Experiments show that various types of oil (crude, separator, emulsified oil, as well as petroleum products) at a concentration of 1 g/l disappear in 5-10 days with plants present, while without plants – in 28-32 days. Thus, higher water plants do accelerate oil and petrochemicals decay 3-5 times ('Oil contamination in water ecosystems: effects and microbiological monitoring', by Ilyinski V.V.)

According to Morozov N.V. (2001, 2003), bioengineering methods using coastal plants allow cleaning polluted runoff 2-5 times faster and reducing oil product levels in these by 95 to 100%.

Measurement and monitoring methods

The Project proposes to use the following types of environmental monitoring in a target area:

- periodical hydrochemistry analysis of the algae-oil-oxidizing bacteria habitat;
- non-stop real time measurements of the state of oil slicks within the target water area;
- non-stop real time measurements of levels of dissolved petroleum hydrocarbons in water in the plantation area and at conditionally 'polluted' and conditionally 'clean' control points;
- periodical measurements of levels of petroleum hydrocarbons in the algae;
- periodical measurements of levels of selected heavy metals in the algae;
- periodical analysis of the algae's functional state;
- periodical microbiological monitoring; and
- assessment of water velocity in the algae plantation area.

The assessment of the state of the environment in the bio-filter plantation area will be performed quarterly, using approved hydrology and hydrochemistry methods, put to test many times during laminaria algae plantation projects at the Dal'nezelenetskaya Station in the Barents Sea (Bardan et al., 1989; Bardan et al., 1990).

- Measurements of levels of pollution in the mycrophyte habitat, and those of heavy metals, radionuclides, and hydrocarbons in algae will be performed each month, in line with approved methodology guidelines (‘Methodology guidelines for determining…’, 1979; Saet et al., 1990; ‘Normative data on maximum allowable…’, 1994; ‘Addenda… to MAC List…’, 1995; ‘Kola Peninsula…’, 1997).
- Measurements of levels of petroleum hydrocarbons in natural environments will be performed pursuant to PND F 14.1:2:4.128-98, CV 1.12.52 –2002 “A”.
- Measurements of levels of heavy metals in natural environments will be performed pursuant to GOST 3 51309-99.
- It is planned that physiology and biochemistry methods will be used to monitor the state of macrophytes, as well as visual observations (Commercial and promising…, 1998), on a monthly basis.
- Microbiological monitoring: numbers and activity of oil-oxidizing bacteria – every quarter (Peretruhina, 2006).

It is planned that required analyses will be done at FGUP A.P. Karpinski VSEGEI (approximate quantitative, spectral, X-ray spectrometry, fluorescent, atomic absorption – heavy metals), RF Ministry of Health Toxicology Institute (chromatography, spectrophotometry – 3,4-benzpyrene, polychlorinated biphenyls, phenol coefficient), FGUP D.I. Mendeleyev VNIIM (gas chromatography-mass spectrometry – petroleum hydrocarbons group analysis), and OAO NTC RADEK (gamma spectrometry – radionuclides).

Algae Processing and Utilization

To assess the potential for processing algae for economic needs, it is needed first to appreciate the value of macrophytes as raw material for foods, healthcare and other industries. It is also important to have an idea of how large stocks of algae are available to ensure their sustainable use.

Alginic acid and its salts, with brown algae, in particular devil’s apron, their only source, are of special value. Apart from a wide range of uses they find in textile, paper, pharmaceuticals, foods and other industries, their ability to absorb and take radioactive substances, heavy metals and other toxins out of the body of humans or animals should be emphasized.

Need in algae for health care purposes alone in some areas in Murmansk Oblast, where environmental situation has been unsafe of late as a result of industrial pollution, is at least 20-30 thousand tons a year. To produce that amount of algae, 280-430 ha of plantations would be needed.

Producing alginates is only one way to use sea algae. Mannitol, that is used in blood conservation, is also of high value. Some studies provide evidence that algae are sources of highly valued polysaccharides that have anti-tumor (including malignant), heparin, antiradiation activity and thus can be potential raw material for manufacturing valuable drugs.

Chemical analysis of brown algae shows that it is for a good reason that they are considered a source of biologically active substances (BAS) with direct or indirect effects on metabolism in the body. Laminaria and fucus algae contain 100 to 1,000 times as much vitamins as land plants, some BAS are found in algae only, however, of all BAS found in brown algae carbohydrates are those used the most.

Without doubt, very promising research projects include ones launched at MMBI KRC RAS on using lipid systems, containing unique BAS, developing fucus algae processing technology for producing drugs based on fucoidan, as well as projects on using pigments found in algae.

Industries in Saint-Petersburg have started production of the Klamin drug that helps prevent some cancers, normalize lipid exchange, lower increased levels of cholesterol and lipids in the blood stream, and stimulate blood formation.

Chlorophyll and fucoxanthin derived from algae have been gaining a lot of attention of late among researchers as raw material for making blood formation, anti-infection, and immunostimulating drugs and deodorants.

The key algae harvester and processor in the White Sea is FGUP Archangelsk Pilot Algae Combine (APAC). Its main products include various drugs and biostimulants, ready-to-use bioactive and food and fodder additives. Yearly production is 2,000 tons. The combine has 5 production areas in the White Sea, and employs over 200 local residents in algae harvesting. At present, the combine operates at 50% its capacity. There are plans to start producing ready-to-use bioactive additives. All drugs produced here have been clinically tested. In view of a complex environmental situation and severe climate conditions in Russian Arctic areas bioactive additives are a promising method to address malnutrition issues.

Health Technology Studies Institute (Saint-Petersburg) has developed technology to utilize oil contaminated algae, and claims to be able to help set up production of marketable competitive products.

Research on processing petroleum hydrocarbons into fodder additives has been under way for a long time at the Moscow Protein Synthesis Institute. The institute’s lab where relevant bacteria cultures have been developed is open to cooperation.

Approximately, algae utilization procedure runs as follows:

1) Symbiotic algae-bacteria association is created to retain and neutralize oil slicks.

2) After a while (depending on pollution levels), the substrate (a cord) with algae and bacteria is taken out/replaced by new one.

3) The used algae with bacteria are placed in a reactor with a new group of bacteria to process them. One of the properties of the group is the ability to dissolve cellulose membranes in fucus algae and to process oil.

4) Fodder additive with a high content of paraffin yeast and protein is finally produced.

It will take about 2 weeks from the time substrates are harvested (from 1 ha) till additive is produced.

Marine Environment Protection Technology Comparative Analysis

Offshore oil spill clean up (OSC) action is taken by oil companies in accordance with special action plans that contain procedures, directives, checklists and other guidelines to minimize impact on the environment.

Oil spill action plans require that clean-up equipment be maintained in working order, drills and training be provided to staff, various oil spill scenario models (based on local tidal patterns and weather data) be prepared, etc.

Key groups of measures to be taken within an oil spill clean-up plan:

- operative function;
- offshore operations;
- monitoring; and
- waste disposal.

Operative function includes all action aimed at the removal of oil slicks and most auxiliary operations. This includes emergency response, coastline protection, clean up of coastline of oil spills, collection and disposal of oil, airborne monitoring and supporting measures.

There are a number of offshore responses to oil spills, including monitoring, confinement and collection, spraying of dispersants, in-situ burning, mechanical break-up of oil slicks, collection of oil from ships and coastline protection.

Dispersants, used in cleaning the coastline of spilled oil, often aggravate adverse impact of oil pollution on algae, being more toxic for algae than oil (Nelson-Smith, 1977). Using them at the Cornwell coast led to the extermination of fucus algae, as well as limpet, followed by an exponential increase in populations of green algae (Enteromorpha intestinalis (L.) Link, E. compressa (L.) Grev., Ulva lactuca L.) which are typical r-strategists.

Available to date chemical agents designed to fight oil pollution, unfortunately, inhibit the growth and propagation of hydrobionts along with neutralizing chemical contamination. The slick bar method only prevents oil spill from spreading, and additional significant resources are required to collect oil from the water when using this method.

Most researchers into fighting oil spills (Patin, 1997) have arrived at the conclusion that the ultimate objective of oil spill response operations is quite obvious: reduce as much as possible environmental and economic losses while affecting as little as possible natural systems and their ability to recover following stress caused by an oil spill. The author believes that there are only two ways to attain the objective:

1. collection, confinement and removal of spilled oil (an offshore area, littoral zone waters, coast waters) followed by treatment or disposal; and
2. relocation or redistribution of an oil slick (for example, changing the direction in which the slick drifts by means of booms, or dispersing the oil slick to make it dissipate into the water column).

Technical solutions whereby these are implemented involve a rather wide range of modern physical, chemical and biological methods and techniques.

The involved techniques have both strengths and weaknesses.

Either way is based on the confinement of spilled oil, largely by means of booms, and then collection of oil by various methods, or removal of slicks by sorbents or dispersants.

Traditional oil spill clean-up methods using booms (J. Williams, 1984; Kormak, 1989) allow preventing oil slicks from spreading for a relatively long time, and partly collecting oil by special oil-collecting ships, only when the sea is not rough. In addition, booms can prevent oil from spreading only in a thin enough layer of water, offering no obstacle for emulsified oil to travel down the water column.

To date, around two hundred sorbents are manufactured, grouped into inorganic, organic, organic-mineral, and synthetic kinds. The quality of a sorbent is commonly determined by its oil capacity, hydrophobic rate, buoyancy following sorption, whether oil can be de-absorbed or regenerated, or sorbent utilized. Using sorbents can be combined with mechanical oil spill clean-up methods. The latter can be used both before and after sorbents are applied to retain oil and prevent emulsions to form (Arens, Gridin, 1997). Sorbents can be sprayed manually, or by mechanical or pneumatic devices, over a contaminated area, and then the oil-soaked sorbent is picked up from the water.

Oil sorbent application techniques are little different from the ways other sorbents are used and are part of oil spill clean-up measures. The conglomerate that sorbent forms with oil is easily collected using a 1-3 mm mesh net. Magnetic

sorbent is collected by simple magnet systems with a field strength of up to 100 kA/m.

Naturally occurring organic raw material and waste of plant origin are best suited for sorbent production. Raw material that is in fact part of existing ecosystems is the most environment friendly one to make oil sorbents from (Arens, Gridin, 1997).

At present, the most efficient clean-up is achieved through a combination of sorption and biological methods. Thus, the combined approach has been named biosorption. The sorbent here act as a substrate carrying microorganisms. It is important that it has a large surface area (to this end, it is produced in powder, foam, granulated or fiber form). Whereas biochemical water treatment does not remove unoxidizable compounds virtually at all, using the biosorption method allows increasing both the degree and speed of treatment. To keep costs low, they try to us cheap materials and production waste as sorbents. Mineral substances and polymers are also commonly used. Frequently used substrates include acid- or alkali-treated wood chips, coal, chamotte, feather, pearlite, and burnt clay.

One example of the method just described is the technique in RU 2001135951/13 patent application ‘The method for producing biosorbent for purifying natural waters of oil and its products’ (Rumyantsev, Levchenko, 2001). Key weaknesses of methods of this kind include a relatively short sorbent’s lifetime, necessitating renewing it frequently, and a rather low efficiency of bacteria used, as these are taken from seawater in the target area without any selection.

Systems containing preparations of specially selected cool-dehumidified microorganism cultures consuming certain types of hydrocarbons, on a porous carrier, are more efficient.

To this end, the Patent RU 2255052 ‘The method to purify water environment from oil products, and the biopreparation for purifying water of petrochemical contamination’ (developed by Ausheva H.A. et al., 2005) can be considered as a good example. The biopreparation consists of a substrate, a growth factor, and biomass of oil destructor microorganisms. To produce the substrate a composition of Ca-alginate gel, C14 to C16 n-alkenes and a growth factor is used. The way the biopreparation is composed ensures the highest density of microorganism populations on the substrate in the zone adjoining the oil products-water interface. As the preparation is dispersed over the polluted area, it gets activated following contact with water, and the microorganisms start digesting oil cleaning up the area at the same time. Similar to the previous method, as the preparation is linked to no substrate that would prevent it from spreading, it may drift off on its own driven by waves, wind or currents, and this of course compromises the method.

The same weakness is characteristic of purely microbiologic methods, too, whereby an oil slick is eliminated by microorganisms that use hydrocarbons as

part of their metabolism. This method is used to remove oil spills in offshore waters, in fresh water reservoirs, on beaches and near shores, as well as for cleaning closed containers, such as oil holds or tanks, of heavy oil fractions. The method allows making oil polluted offshore and coastal waters clean and suitable for life again. The method suggests using microorganisms that do not produce adverse effects on flora and fauna, including humans and sea animals.

Not only selected types of microorganisms are commonly used, but bacteria super strains as well, as can be seen in particular in G.P. Golodyaev's patent RU № 2182529: 'The consortium of strains of destructor microorganisms, Bacillus species, Aeromonas species, Alcaligenes eutrophus, Alcaligenes denitrificans, used for purifying soils, lands and waters of oil pollution'. These strains are capable of assimilating a wide range of hydrocarbons and related compounds. To disperse an oil slick on water, a common approach is to use microorganisms plus surfactants (Ilyinski, 2000). The most effective way to use such techniques is in closed reservoirs. In offshore waters it becomes virtually impossible to control consumption of the destructor agent, e.g. when an aerosol dispersing method is used.

This Project's objective is to avoid the drawbacks above, by combining both key methods of fighting oil slicks. The proposed algae plantation will both prevent an oil slick from spreading, acting as a slick bar, and absorb petroleum hydrocarbons, make them part of their metabolism and expedite decay of oil with the help of man-made symbiotic association algae/oil-oxidizing bacteria.

The possibilities to absorb petroleum hydrocarbons, involve them in algae/bacteria metabolism and create a symbiotic algae/oil-oxidizing bacteria association to effectively expedite the decay of oil products have been documented in some research of late (Belous et al., 1999; Wrabel M., Peckol P., 2000; Stepanyan, 2003; Voskoboinikov et al., 2004; Stepanyan, Voskoboinikov, 2006; Peretruhina, 2006).

An algae/oil-oxidizing bacteria association's ability to purify polluted water has been successfully employed in cleaning up fresh water reservoirs.

This technology appears to be of special relevance and importance in Arctic regions, where it takes months for oil slicks to decay naturally. This poses a threat of coastal water pollution, e.g. in the Barents Sea, where in addition to the development of the Shtokman gas condensate field, it is currently planned to build a gas condensate plant and some very large oil and gas terminals. The same threat is now of relevance for clean and fish-abundant waters in the Okhotsk Sea's north off the West Kamchatka coast where it is planned to have exploration drilling for oil and other non-renewable resources. There have been some serious

damage reportedly inflicted on crab, scallop and urchin habitats off the east coast of Sakhalin as a result of drilling work and extracting oil.

The proposed approach is one in the domain of engineer ecology technology, used when, for a number of reasons, it is impossible to avoid or prevent pollution of a sea area by oil products. Some dramatic examples include ruptured pipelines, emergency discharges from oil wells, oil carrier accidents at sea, etc. However, that said, it must be emphasized that the method in question is expedient to use as part of the fine purification stage that starts when most of oil products have been removed already by common mechanical methods.

Using the proposed technology will allow increasing the rate at which dispersed across an area oil products are digested into products harmless for marine biota, as well as prolonging the lifetime of the proposed clean-up plantation through natural reproduction and resuscitation processes in an algae/oil-oxidizing association.

This will be achieved through using a triple function of an algae plantation: preventing oil slicks from spreading as it acts as a slick bar, and at the same time absorbing petroleum hydrocarbons by including them in algae (fucus) metabolism, as well as acting as a man-made symbiotic algae/oil-oxidizing bacteria association that not only facilitates the decay of polluting oil products, but also ensures that the plantation is self-sustaining as long as may be required.

The proposed technology is directly related to sanitary aquaculture, is designed to clean up a target area on a permanent basis. However, it is without doubt that it would help capture and retain oil even in case of large spills.

It is proposed that this Project should use biotechnology as an innovative approach aimed at preventing regular pollution and confining emergency spills. In case of an emergency spill, algae retain an oil slick till it is utilized by a mechanical or other method, and able to capture tens or even hundreds thousand tons of crude oil. Since the algae are attached to a cord, they are easily pulled out of the water along with oil stuck to them.

The inner side of the plantation completely neutralize oil products that get through the outer shelter strip. In addition, the inner strip goes to replace the outer one sent to utilization following a massive spill, and new algae are planted in its place.

Key outcomes of an experimental plantation project in 2005 have been presented above.

Undoubtedly, creating a symbiotic algae/oil-oxidizing bacteria association can contribute effectively into oil spill clean up.

Microorganisms able to use hydrocarbons (HC) as a sole source of carbon and energy for them are called HC-oxidizing (sometimes the term ‘oil-oxidizing’ is also

used, which is not quite accurate, as oil include compounds other than HC). HC-oxidizing microorganisms are different from other heterotrophic microorganisms, some of which are capable of oxidizing HC to an extent and only when other organic compounds are present, in that they have got not only ferments required to oxidize HC, but also a mechanism to digest the hydrophobic substrate. It is linked primarily to the fact that HC oxidization takes place intracellularly.

The fact that most bodies of water have HC at background levels and the fact that HC-oxidizing bacteria can consume a wide range of labile organic substrates, apart from HC, are the reasons behind these bacteria occurring commonly in most habitats, both oil polluted and pollution-free. In addition, as mentioned elsewhere, many heterotrophic bacteria are able to oxidize HC.

It is when the environment is significantly polluted by hydrocarbons that HC-oxidizing bacteria get an edge over other groups of bacteria. Oil pollution becomes an additional source of carbon in the ecosystem and the numbers of HC-oxidizing bacteria rise until some limiting factors come into play. For this reason, numbers of HC-oxidizing bacteria are always higher in areas polluted by petroleum hydrocarbons on a long-term basis, than in ones free of pollution.

The initial number of these microorganisms is a factor putting a limit on the rate that HC get biodegraded, in most areas where emergency spills occur (Ward, Brock, 1976). However, if conditions are conducive enough, their numbers can grow fast enough to ensure effective clean up.

Populations of HC-oxidizing bacteria in Arctic and Subarctic waters are normally lower than those at moderate latitudes, however in the presence of oil in water these can rise significantly (Atlas et al., 1978; Delille, Vaillant, 1990).

It has been shown that microorganisms can adapt quite well to functioning at low temperatures found in polar regions. To be sure, the biodegradation rate of oil of the Metula field in sand samples taken from an Arctic site polluted as a result of an oil spill was higher at 3°C than at 22°C, however even with the optimum scenario in place the destruction of petroleum HC ran very slowly (Colwell et al., 1978).

The highest rates of HC biodegradation are reported usually in areas polluted permanently, such as ports, oil-containing wastewater discharge sites, offshore oil rigs and others where there is a permanent or regular source of petroleum HC. It is characteristic of such areas to have an ongoing selection of HC-oxidizing microorganisms and genetic data exchange between these, with the result of oil degradation occurring at an increased rate. As a rule, HC-oxidizing microorganisms in relatively clean waters are less active toward HC, than those in oil-polluted waters. To be sure, American researchers did a comparative analysis of the ability to degrade crude oil in microorganisms in polluted and pollution-free areas in the Chesapeake Bay (Walker, Colwell, 1975). Water samples from

polluted areas at *in situ* temperature had a ^{14}C-hexadecane mineralization rate 4 times as high as samples of relatively clean water. These data are evidence that both the rate and degree of biodegradation, as well as the range of HC degradable by microorganisms, exceed by far the same parameters in pollution-free water areas.

Fresh water reservoirs with shores grown by aquatic plants cope with oil product pollutants they receive quite easily. The higher pollution rate the more intensive self-purification processes are. Microorganisms subject oil to biologic oxidation and involve it in metabolism, not only that of the bacteria, but also higher plants'.

Various types of oil (crude, separator, emulsified oil, as well as petroleum products) at a concentration of 1 g/l disappear in 5-10 days with plants present, and in 28-32 days without plants. This is evidence that higher water plants speed up oil and petrochemical decay 3-5 times.

The main factor in decomposing oil and its products is oil-oxidizing and saprophyte bacteria. The oil decomposition process starts as soon as oil gets into the reservoir, with the numbers of microorganisms increasing rapidly, and achieving a maximum on the 3rd or 4th day. The microbiologic processes involved lead to the destruction of an oil slick and oil in the water column, with oxygen levels dropping and those of carbon dioxide rising instead. As the amount of oil in the reservoir declines, so does the number of oil-devouring bacteria (Morozov, 2001, 2003).

The part aquatic plants play in self-purification processes in a reservoir is quite significant: photosynthetic aeration helps maintain sufficient oxygen levels, exo-metabolite excretions stimulate growth of oil-oxidizing bacteria, and a considerable total surface area the plants have ensures that the oil-bacteria interface zone is large enough. To be sure, oxygen levels in plant grown areas is 2-3 times as high as in an open water section in a reservoir, with the levels achieving a maximum in day-light hours, the time of the most intensive photosynthesis.

Researchers currently believe that epiphytic microflora on plants can digest petroleum hydrocarbons or products of oil decomposition.

Metabolic excretions of higher aquatic plants (amino acids, carbohydrates, organic acids, volatile amines, vitamins, organic carbon, etc.) serve as stimulants and a nutritional medium for oil-oxidizing and heterotrophic microorganisms (Ratushnyak, 2002).

As crude oil decays some part of its oxidized compounds is digested by bacteria and plants, while the rest is processed with non-toxic or low toxicity substances produced as a result. Thus, oil decomposition is a result of joint action by heterotrophic microorganisms and aquatic plants. The former act as key pollutant destructors and mineralizers, while the latter – as inducers, absorbers and consumers of oxidized compounds. According to Morozov N.V. (2001, 2003),

bioengineering methods using coastal plants allow cleaning polluted runoff 2-5 times faster and reducing oil product levels in these by 95 to 100%.

There is enough evidence collected to date that macrophytes and oil-oxidizing bacteria jointly provide an efficient way to purify fresh water reservoirs.

Expert assessments made during the time this report was under preparation were unanimous in that environmental and economic efficiency of the proposed biotechnology clean up method is at least a few times as high as that of traditional approaches.

Setting up shelter algae plantations around oil and gas development sites will allow increasing environmental safety of oil and gas extraction and transportation operations, reducing costs of measures taken to address environmental problems resulting from industrial activities on the Arctic coast, and boost the important sea algae industry in the region.

The UNEP/GEF Project's key outputs involve demonstrating the potential biotechnology offers in absorbing and capturing petroleum hydrocarbons, its cost-effectiveness, algae plantation standard design and management methods that can be replicated in the basins of the Arctic Ocean and its seas, as well as facilitating the implementation of two key international treaties: Arctic Environmental Protection Strategy (AEPS); and the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) as implemented in the Arctic Region through the Regional Programme of Action for the Protection of the Arctic Marine Environment from Land- based Activities (RPA) and the Arctic Council Plan of Action to Eliminate Pollution of the Arctic (ACAP).

2. PROJECT OBJECTIVES

The project's objectives include demonstrating what can be done in taking effective measures aimed at:

- reducing or preventing man-caused pollution of Arctic marine environments by using brown algae shelter plantations in high pollution risk areas;
- protecting existing stocks of commercial sea fish and other biodiversity in Arctic marine ecosystems;
- protecting Arctic seas from pollution by oil, with due respect to Russian Federation's commitments under the Arctic Environmental Protection Strategy (AEPS); and the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) as implemented in the Arctic Region through the Regional Programme of Action for the Protection of the Arctic Marine Environment from Land- based Activities

(RPA) and the Arctic Council Plan of Action to Eliminate Pollution of the Arctic (ACAP);

- fuelling the existing potential in the area of using biotechnology, including methodological support and help in staff training for implementing activities planned under the project; and
- disseminating experience gained in developing and implementing the biotechnology-based oil spill clean up project for marine environments.

3. TWO ALTERNATIVE SCENARIOS

The need to tackle practical oil pollution-related environmental issues is behind the growing importance that is being attached to the use of biotechnology in the country. The Government of the Russian Federation has taken a number of strategic decisions aimed at taking action in priority areas of Arctic region development policy. These include the Development and Use of the Arctic Sub-programme, under the World Ocean Federal Target Programme (endorsed by Russian Federation Government Resolution N 919 of August 10, 1998), State Support for Economic and Social Development in Arctic Regions Concept (endorsed by Russian Federation Government Resolution N 198 of March 7, 2000), Fundamentals of Russian Federation State Policy in the Arctic (approved by Russian Federation Government on June 14, 2001), and Russian Federation National Programme of Action for the Protection of the Arctic Marine Environment (NPA-Arctic).

The proposed measures are worth being examined by international stakeholders, to consider the feasibility of using them as part of joint action at both domestic and international levels.

The proposed pilot project is much based on what is the methodology of the UNEP/GEF Project whose key objective is to develop an integrated approach to resuscitating damaged environments in order to benefit the Russian Federation, its Arctic counterparts and the whole world to the greatest extent possible.

One of the alternative approaches might be the reconstruction of existing wastewater treatment plants of industries located close to the seas, as well as putting in place new WWTPs. Costs involved in waste water treatment plant reconstruction or constructing WWTPs from scratch are dozens of times as high as those for an algae plantation to be designed, put in place and serviced on a regular basis. As much as the current economic situation in the country permits, the proposed project is unmatched.

The pilot project’s original concept is in line with the integrated action plan developed under the UNEP/GEF Russian Federation National Programme of

Action for the Protection of the Arctic Marine Environment (NPA-Arctic) Project, and no practical alternative scenarios are proposed.

4. EXPECTED PROJECT OUTPUTS

Key project outputs include:

- recommendations on using biotechnology for tackling environmental problems related to oil pollution in areas of ongoing oil and gas development projects;
- standard biotechnology application project;
- procedure for utilizing polluted and processing clean algae for producing commercial raw material;
- project environmental and economic costs and benefits analysis;
- raising human resources potential, in both preparing project documentation, and project implementation;
- fully operational plantation fit to be used during project's implementation period and beyond.

A specific measurable expected output will be the size of prevented damage and that of laminaria algae harvest. The absorption capacity of a bio-filter algae plantation is as follows:

- It takes 4-5 days for one square meter of the plantation to neutralize a slick resulted from the spill of 100 ml oil or over 80 g of hydrocarbons.
- The capacity to absorb heavy metals is as follows: copper ions – 0.03 to 1.13 mmol/g, zinc ions – 0.0004 to 15.3 mmol/g, and cobalt ions – 0.0008 to 3.18 mmol/g.

Environmental damage prevented as a result of using the proposed technology can be over 86 million rubles. The calculations were made drawing on a 1 ha plantation's absorption capacity, 60 tons of weight, at 2006 charges on polluting discharges to surface and ground water bodies within government approved limits.

One hectare is expected to produce 50-60 tons of laminaria algae. The estimate is based on the productivity of the existing experimental plantations.

The proposed project aimed at oil spill clean up in Arctic seas using biotechnology is consistent with the UNEP/GEF Project's key priorities, namely:

- adherence to Arctic regions' industrial and social development objectives;
- meeting Arctic populations' interests, including indigenous low-population peoples';

- creating conditions for sustainable use of natural resources; and
- meeting the Russian Federations' commitments under relevant environmental protection treaties.

5. ACTIVITIES AND SCHEDULE

A 0.5 ha plantation will be created and operated for the project's purposes. The project's implementation period will be 18 months, to begin tentatively in May 2007 and last until October 2008 inclusively. A list of project activities is given below.

Project Activities

Preliminary activities

Implementation period: April to May 2007.

The main purpose of preliminary activities is to work out the scope of final tasks for the project and make preparations for launching the project, and they consist of the following:

- prepare a working document that includes a review of the current marine oil pollution issues, an overview of relevant experience gathered to date, an assessment of the potential for using biotechnology for oil spill clean up, and selection of the most likely pilot areas for the demonstration project to focus on – completed;
- prepare a final report to facilitate taking the decision to launch the project – completed;
- submit the final report to the UNEP/GEF Project Management and the Project Steering Committee;
- take a decision to launch the project;
- prepare terms of reference for the implementing agency;
- select the implementing agency;
- set up a project team of leading specialists in such areas as marine biology (team leader), biotechnology, environmental protection, microbiology, chemistry, as well as an economist and support staff.

Preparation work

Implementation period: May to June 2007.

The main purpose of this stage of work is to conduct exploration studies and select a pilot site, including the following action:

- survey work to select a site to set up the plantation at;

- a inception stakeholder meeting to have the proposed plantation site and appropriate local arrangements agreed on by all project sides;
- approval of the pilot site by UNEP/GEF Project Management;
- reach an agreement on the pilot site with relevant authorities, including local governments, basin fish protection agencies, local offices of Rosselhoznadzor, Rostehnadzor, Rosprirodnadzor (federal agriculture, technology and environment control bodies), as well as with the polluter company's management;
- develop complete project documentation;
- develop draft waste generation standards and waste disposal limits;
- identify potential subcontractors;
- approval of the project documentation by UNEP/GEF Project Management.

Project Activities

Implementation period: June 2007 to October 2008.

The main purpose of these is to achieve project outputs in accordance with approved project design documentation. The activities include:

- hydrologic and hydrochemistry studies;
- purchase of materials, equipment and gear;
- prepare oil-oxidizing bacteria cultures;
- site improvement measures to set up a plantation 0.5 ha in area;
- plantation maintenance and correction measures;
- environmental and plantation condition monitoring;
- evaluation of project activities against evaluation criteria;
- laminaria algae harvesting and preparing for processing;
- sanitation and epidemiologic tests to ascertain the quality of harvested laminaria algae;
- closure and handover of the plantation;
- project outputs review and evaluation;
- prepare project replication specifications;
- hold a round-table to demonstrate project outputs to project stakeholders;
- prepare a project final report;

- publish project findings.

Upon project completion clean laminaria are harvested and sent to a storage facility, where it is frozen and packed for shipment. Institute for Medical Technology Studies in Saint-Petersburg expressed interest in having the algae for processing.

Contaminated algae are harvested and sent to a licensed specialized company for utilization.

Project Methodology Support

Implementation period: April 2007 to October 2008.

Methodology support for the project is to be provided throughout its period of implementation by a team consisting of full-time project members and part-time consultants, and is along the following lines:

- methodology documents;
- recommendations as may be required to adjust the project's course of implementation ;
- proposals on utilizing contaminated algae, as well as processing and using clean algae;
- analysis and assessment of plantation parameters and environmental monitoring data;
- assessment of project outputs;
- preparation of stage 1 and 2 completion reports;
- preparation of replication specifications;
- organization and holding of meetings and round tables;
- liaison with project stakeholders; and
- preparation of project publications.

Consultant Team. The team shall include specialists in the following areas: marine biology (team leader), environmental protection (project manager), hydrobiology, microbiology, hydrology and hydrochemistry, construction, and economic science.

Project Administrative Support

Implementation period: May 2007 to October 2008.

Administrative support shall be provided by the leading implementation agency. It includes book-keeping, contract arrangements, payroll management, settlements with suppliers and contractors, office work and overhead coverage.

To implement the project successfully there is a clear need for close cooperation between project stakeholders in working out effective implementation mechanisms. Preliminary understandings have been reached with the following organizations:

- MMBI KRC RAS,
- FGUP SRZ NERPA,
- Petroleum storage depot (Vidyaevo),
- Institute for Medical Technology Studies,
- FGU Murmanrybvod, Murmansk Affiliate,
- Murmansk Oblast Administration.

Implementing the activities and meeting deadlines shall be in line with the project implementation schedule, presented in Table 1.

Table 1. IMPLEMENTATION SCHEDULE OF PILOT PROJECT UNDER UNEP/GEF PROJECT Total project duration: 16 months

N.	Activities	Outputs	2007			2008		
1.	Research and Methodical Support	Methodologies, requirements, standards, review and evaluation, reports						
2.	Project exploration studies	Project design documentation						
3.	Field studies at the site and setting up the plantation	Site parameters Plantation						
4.	Site improvement action, environmental and plantation monitoring	Plantation maintenance Plantation assessment. Environmental assessment						
5.	Laminaria utilization and preparations for processing	Shipping algae for utilization and processing						
6.	Preparation of replication specifications	Methodical recommendations and technical documentation						

6. PROJECT SUSTAINABILITY AND RISKS RELATING TO PROJECT IMPLEMENTATION, AND RISK MITIGATION

MEASURES

Relatively small experience available to date in using biotechnology for oil spill clean up is due to such reasons as:

- lack of industrial scale biotechnology that could be used in oil spill clean up;
- prevalence of physical-chemical and chemical concepts in oil spill clean-up technology, which, however, are used on a limited scale;
- lack of organizational, technical and methodological prerequisites for using oil spill clean-up biotechnology on an industrial scale; and
- state policy in this area that identifies oil companies as primarily responsible for oil spill clean-up action. However, boosting biotechnology research requires that the state have a hand in tackling the issue, too.

To overcome the above factors and to take forward biotechnology as an oil spill clean-up method a number of measures are proposed, as follows:

- create template models for developing standard projects on using biotechnology, to keep development costs low;
- make a costs and benefits assessment for the project and use it for developing the best cost-effective oil spill clean-up biotechnology solution;
- develop a management system for using biotechnology aimed at tackling environmental problems relating to oil pollution in oil and gas production areas; and
- raise the project's institutional capacity, including training for staff both in project design and project implementation.

The best opportunity for making advances in this direction is provided by the UNEP/GEF Russian Federation National Programme of Action for the Protection of the Arctic Marine Environment (NPA-Arctic) Project, implemented in Russia, with the Ministry of Economic Development and Trade (Minekonomrazvitiya of Russia) as Executing Agency. It includes a demonstration project on using brown algae for marine environment clean-up in the Arctic. The project is to demonstrate a method for setting up shelter zones of brown algae in high oil pollution risk areas.

Using a brown algae plantation as a clean-up method has the following associated risks:

- take-up of plantation cords by ships' propellers – the plantation site must be properly marked.

- gales or storms (Beaufort number over 6) – this should be taken into account while selecting a site for the plantation.
- formation of stamukhas (floating ice hummocks) – a plantation site must be selected properly.
- the Okhotsk Sea is a sea of increased risks as it has a great number of storm days.

Whether or not the project is sustainable will depend on how thoroughly the preparation stage is implemented, how well the plantation site is selected, as well as timely funding and qualified project management, the key factors to ensure the project is a success.

It is expected that the project will enjoy financial and institutional sustainability as it is implemented under the auspices of the UNEP/GEF Project and is in line with the Russian Federation Government's commitment to clean up the environment in the Arctic. To ensure sustainability of the proposed clean-up approach beyond its completion date, the project must:

- be compliant with the long-term strategy and detailed national action plan for preventing the pollution of marine Arctic environments;
- promote the practice of compliance with environmental standards and requirements in oil and gas development projects, as well as in other human activities that produce impacts on marine environments; and
- enhance technical and research capacity by creating a solid knowledge base in the area of using biotechnology for protecting the marine environment.

7. INNOVATION APPROACH AND OPPORTUNITIES FOR REPLICATING PROJECT OUTPUTS

The Murmansk Marine Biology Institute, Kola Research Centre of the Russian Academy of Sciences, has developed an innovative double purpose biotechnology for setting up a bio-filter plantation, which is a symbiotic association of laminaria and fucus algae, and oil-oxidizing bacteria.

Its first purpose is to capture, retain and utilize oil film on the water surface.

The second purpose is providing algae for utilization: clean algae can be used in food and drug production, while contaminated algae – for producing animal fodder additives.

The technology at issue has been tested more than once. In 1984 to 1991 in Dalnezelenetskaya Bay, there was a project on farming devil's apron (*Laminaria*

saccharina) in two-year cycles. There have been more experimental plantations in Dalnezelenetskaya Bay since 1996, for improving algae farming technology and making experiments. The plantations have had a total area varying between 500 and 2,000 m^2.

MMBI laboratories have developed know-how on how to create an artificial association of macrophytes with oil-oxidizing bacteria, with a hydrocarbon biodegradation rate increased by 20-30%, a larger duration of hydrocarbon biodegradation, and the latter remaining at its high even when water temperature drops significantly.

A one-year *Laminaria saccharina* cultivation method using compact substrates has been developed. The compact substrate method for laminaria cultivation allows reducing the time to grow laminaria algae to under one year, saving costs on expensive and requiring qualified maintenance and high power inputs equipment.

The project has a strong environmental bias. Implementing it will allow improving the quality of marine environments significantly, will have positive effect on the state and productivity of marine biological resources. Applying the selected technology solutions to other sea areas of concern, will allow bringing down environmental risks and rehabilitate some marine ecosystem items.

Findings of studies conducted to validate the method suggest that it is possible and indeed effective to set up and use artificial algae plantations both as bio-filters to prevent coastal water areas from pollution and perform oil spill clean up, and as a source of algae as raw material for relevant industries. Enhancing sanitation aquaculture is of especial importance in view of the now very real threat of impacts on Barents Sea coast ecosystems posed by the planned large-scale oil and gas condensate development projects.

Limiting factors for using biotechnology

The most typical areas with naturally occurring laminaria algae off the Murmansk coast in the Barents Sea include three: Rybachi Peninsula (Kiisk Road), Kildin Island and Drozdovskaya and Ivanovskaya bays. The fact that the Murmansk coast in the Barents Sea is habitat to much less laminaria algae, compared to the White Sea or the Norway coast, is due to some of its geomorphologic properties, namely: rather smooth coastline, prevalence of cliffy shores open to waves. Laminaria algae have average biomass of 10 kg/m^2, and are found in communities that are usually 10-50 m wide at most. In some areas biomass can reach 25-30 kg/m^2, and a community can be as much as 1 km wide.

As they grow, Barents Sea macrophytes are exposed to various environmental factors: light intensity., photoperiodic effects, ultraviolet radiation, temperatures, salinity fluctuations, dehydration during ebb tide, toxicant and wave impacts, etc.

Most algae physiology studies use the relative growth rate as a key criterion in assessing the state of seaweed (Luning, 1990; Hoek et al., 1990; Shoshina et al., 1996; Voskoboinikov et al., 1996).

Seasonality and photoperiod

Year-round observations at Franz-Josef Land (Averintsev, Vinogradova, 1990) showed that there were significant seasonal fluctuations at both individual organism and algae community levels in the Barents Sea and that there was a close correlation between seasonal growth parameters and environmental factors. It is characteristic of Murmansk area algae to have their growth intensity decline from spring to autumn, and on to winter (Shoshina, 2001).

The photoperiod, or the day length, is one of the key factors regulating the life of algae and most plants. At high latitudes in summer during polar day plants receive light 24 hours a day, in contrast to polar night in winter when it is the other way around: darkness lasts 24 hours a day. In view of the fact that algae start growing fast in February to March as the photoperiod increases, while water temperature is at its lowest average levels in the year (-0.5…-1.2°C), it was suggested that the photoperiod has a compensatory role in regulating algae growth. Works by V.N. Makarov and E.V. Shoshina jointly with German researchers, as well as works by G.M. Voskoboinikov with Dutch colleagues suggest that most study algae have an optimal photoperiod of 16:8 (light:dark hrs).

There are research data showing an increased photosynthesis in Barents Sea algae in springtime, with it leveling out in summer, declining in autumn and disappearing in December. In a joint research project, using an isotope method, MMBI, BIN RAS and MGU researchers registered photosynthesis in many algae on the Murmansk coast in winter, with an irradiance of 0.5-2 W/m^2 over 3 hours (Bykov, 2002; Voskoboinikov et al., 2004). Respiration prevailed in winter, however it is thought that it is through photosynthesis that many Murmansk coast macrophytes get life-sustaining energy.

While there is still very low light on the Murmansk coast in winter, at higher latitudes, in particular off Spitsbergen coasts, it is pitch dark in winter months. However, even in such conditions algae do not perish. In experiments in which fucus algae were kept in complete darkness for 15 and 30 days the study algae did not show signs of degradation. There is a theory that algae occurring at high latitudes survive as a result of switching from autotrophic nutrition to heterotrophic.

Ultraviolet Radiation

MMBI KRC RAS specialists established that background ultraviolet radiation, more specifically in the UV-B (320-360 nm) band, on the Barents Sea coast, can inhibit the growth of many algae. This particular factor can be used to explain a peak of spore-bearing in laminaria algae in springtime at low water temperatures, and can

be one of the reasons behind losses of young algae in the littoral zone (Makarov, 1999; Makarov, Voskoboinikov, 2001).

Temperature

Temperature is a powerful factor affecting both macrophytes' geographic range and their distribution along the water column. Average monthly temperatures on the Barents Sea coast do not fall below -10°C, however in some days temperature can be as low as -20°C.

In some macrophytes, irreversible damage is reported to start at temperatures as low as -20 to -25°C, however these data can only be used to suggest that some study algae may have short-term resistance to low temperatures. It is possible that species resistant to below-zero temperatures can produce cryoprotectors to protect themselves. However, *Laminaria saccharina* notable for a much higher levels of mannitol, a natural protector, than many other littoral algae, is way inferior to them in low temperature resistance. One theory has it that the combination of a large content of 'fixed' water and cryoprotector production in some algae species, help them survive during low tides in winter (at temperatures as low as -18°C).

Salinity Fluctuations

Barents Sea bays, especially at their apexes, have characteristically many streams discharging into them, which leads to a major decline in salinity in algae habitats, especially in spring to summer. It is an established fact that *Laminaria saccharina* is the least resistant to salinity fluctuations of all commercial or potential macrophytes (succumbs when salinity gets below 17‰).

Resistance to desalination observed in most Murmansk bays decreases in this order: *F. vesiculosus* > *F. serratus* > *L. saccharina.* Bladder wrack *(F. vesiculosus),* a euryhaline species, can survive 10 days in water with a salinity of up to 2.5‰. It is thought that algae can survive in low salinity areas owing to short-term surges (windows) of salinity brought in by high tides.

Wave hydrodynamics

V.F.Guryanova, I.G. Zaks and P.V.Ushakov (1929, 1930) identified four littoral bionomic types differing in tidal-wave activity, distance from offshore waters, salinity and velocity of currents.

According to the study, bionomic type 1 littoral includes exposed to tides and waves coast areas with a III-IV degree tidal activity, which are common to the Murmansk coast, and characteristically rich in algae stocks and diversity.

Bionomic type 2 littoral includes well protected from tides straits with strong tidal currents. Many algae reach their maximum size here.

Bionomic type 3 littoral includes areas of open coast with a I-II degree tidal activity, common to the Murmansk coast. Poor vegetation is characteristic of I-II degree tidal activity cliff shores. Fucus algae occur in mall groups in cliff crevices.

Bionomic type 4 littoral includes parts of bays with a V-VI degree tidal activity. It is characteristic of this type to have weak tides and currents, and normal or slightly decreased salinity. Fucoid communities are commonly found on littoral stone fields.

There is no single way to say what effects this factor has on the size, growth and reproduction of fucus algae. Among other things, response would depend on algae morphology. Waves play an important role in delivering biogens to and removing waste products from where algae grow, which has a bearing on species diversity, age structure, projective cover, and biomass.

Heavy metals levels

Studies revealed seasonality in heavy metal build-up in macrophytes: high levels in winter (resting), reduced levels per unit of dry weight in spring (intensive growth period), increased levels in summer (growth slow-down period and frond maturing). *Laminaria saccharina* and *L. digitata* collected in different habitats (an open site (high water circulation) and the apex of Dalnozelenetskaya and Yarnyshnaya bays in the Barents Sea) had the highest levels of heavy metals in rhizoids, and the lowest – in younger parts of the frond blade. It should be noted that algae samples taken in bay apex parts had higher differences in heavy metal levels between various part of the frond, than samples collected in open water areas (maximum differences were 6 and 1.7 times, respectively). Monitoring data over last more than 10 years suggest a significant decline in heavy metals levels in macrophytes.

Oil Levels

MMBI Algology Lab staff conducted studies to prove that oil is a complex non-specific toxicant affecting all aspects of algae life activity, from subcellular and cellular levels to inter-population and interspecies interactions. Effects on macrophytes of high levels of oil and its products in the environment may consist in reduced species diversity and projective cover, affected age structure, a slower growth rate in adult algae and inhibited spore and gametophyte development, reduced photosynthesis capacity.

Small levels of oil may be beneficial to some algae, while harmful to others.

Different types of oil (dissolved, emulsified, slicks) produce different effects on algae, oil pollution impacts are species-specific, and depend of such environmental factors, as: illumination, temperature and salinity, supplies of biogens, and some others.

However, despite the different impacts oil may have on macrophytes, algae communities are, on the whole, rather resistant to oil pollution achieving that

through certain restructuring, both at the micro- (individual alga organisms) and macro-levels (a whole coastal ecosystem).

Ice conditions

Some of the ice conditions that can put restrictions on setting up an algae plantation include:

- presence of drift ice most of the year and its significant changeability in time;
- fast shore ice with ridges of hummocks and stamukhas, mainly along the shoreline and with tide cracks. In some areas fast ice breaking off is possible. Fast ice along the Urals shore of the Baidarats Bay can break off up to 3-4 times during the winter;
- large ice formations: icebergs, hummocks, stamukhas, and giant ice fields;
- possibility of heavy ice moving in from the north;
- exaration of the seabed by ice formations. It is characteristic of shallow (below 20 m deep) areas on the shelf to have hummocks exarate the seabed. In the Baidarats Bay, seabed exaration can be 0.8-1.0 m deep on average, with a maximum depth of 2.2 m. The seabed can be affected by virtually immobile stamukhas, too, as these vibrate slightly under various external forces.

Replication of project outputs

MMBI, SevPINRO and NIIKAM studies on littoral and sublittoral algae communities and taking stock of available algae reserves in the White and Barents seas showed large stocks available. Twenty seven commercial harvesting areas have been identified on the Barents Sea coast. The total stock of laminaria algae in study areas on the south-west coast of Spitsbergen Archipelago is estimated at 165 thousand tons.

The fact that there are many areas where brown algae naturally occur, and the species' wide resistance to various environmental factors allows for using oil spill clean-up algae plantations in areas with different ice conditions.

The Murmansk coast in the Barents Sea is ice free most of the time, so embedding may not be required for the wintertime. However, the White Sea has a complicated ice situation, so the plantation framework would be embedded for a period of few months. SevPINRO has developed an appropriate embedding technique.

When there is no risk of ice damaging plantation structures, these can be set up at sites 10 m deep, when this risk is real plantations are set up at sites at least 15 m deep to be able to submerge them in winter.

There is well-tested technology to set up laminaria algae plantations in the White and Okhotsk seas. Over 10 year hands-on experience in this area is available to date.

At present, there is an operational laminaria plantation with an area of 0.5 ha near the Solovetski Islands (White Sea). Plantations in the White Sea have an average productivity of 50-60 t/ha, while those in the Okhotsk Sea – up to 70 t/ha.

8. STAKEHOLDERS AND BENEFICIARIES

Implementing the project will be based on an active involvement of project stakeholders, including:

- companies that produce environmental impacts relating to polluting marine environments by petroleum hydrocarbons;
- companies and organizations producing and supplying maricultures for biotechnology needs;
- companies that use algae to produce valued polysaccharides – alginates and their derivatives; and
- design and consulting companies specializing in relevant technology solutions.

Quite equally, other stakeholders will include government authorities and local administrations, as well as environmental organizations, all of them united by one objective – to ensure that companies-polluters meet environmental requirements and take action as to reduce human impacts on the marine ecosystems in the project's study area.

The projects' beneficiaries will largely be its stakeholders, with key benefits including, as follows:

- reduction and prevention of human-caused contamination of Arctic marine environments;
- preserving stocks of commercial sea fish and other biodiversity in Arctic marine ecosystems;
- development of standard projects and methodologies in the area of using biotechnology for fighting oil pollution, including a system of norm-setting requirements in the field of developing and using biotechnology methods;

- methodological guidelines for enhancing capacity in using biotechnology, including support in staff training for the project's needs;
- environmental and economic assessment of the cost-effectiveness of applying biotechnology to oil spill clean up, using the project's study area as a model;
- support for disseminating lessons in developing and implementing a project on using biotechnology for oil spill clean up in marine environments;
- paving the way for consulting companies in Russia and other countries that would be involved in developing and implementing similar projects as follow-ups; and
- raising public awareness of the fact of reduced human impacts on the marine environment in areas where biotechnology has been used.

9. PROJECT BUDGET

The UNEP/GEF Project has earmarked US$ 494 thousand for funding the proposed project. The funds are enough to stage a pilot project to demonstrate effects of using biotechnology for oil spill clean up, on an area of 0.5 ha over a period of 15 months. The project budget is presented in Table 2.

Table 2. UNEP/GEF PROJECT OIL SPILL CLEAN UP PILOT PROJECT BUDGET (in thousand US$) Duration: 15 months

	Activity	Outcomes	**Stage I Costs**						
			2007			**2008**			**Total**
1	**Research and methodological support for the projects**	**Review, assessment and recommendations**	**10**	**20**	**20**	**20**	**20**	**20**	**110**
2	**Project activities**		112	44	32	32	32	56	**308**
2.1	Project exploration activities	Project feasibility study	40	-	-	-	-	-	40
2.2	Field site studies. Plantation rigging	Site parameters.	45	-	-	-	-	-	45

	and setting up.	Plantation.							
2.3	Site improvement measures, environmental and plantation monitoring	Assessment of the state of the plantation. Environmental assessment.	27	32	32	32	32	32	187
2.4	Harvesting laminaria algae preparation for utilization and processing.	Plantation closure/ handover	-	-	-	-	-	12	12
2.5	Contingencies		-	12	-	-	-	12	24
3	**Miscellaneous**		18	9	11	13	10	15	**76**
3.1	Steering committee meeting	Meeting Minutes	2	-	-	-	-	4	6
3.2	Expendable materials		4	-	-	4	-	-	8
3.3	Communication costs		1	-	1	-	1	-	3
3.4	Travel		2	-	1	-	-	2	5
3.5	Administrative support		9	9	9	9	9	9	54
	TOTAL		140	73	63	65	62	91	**494**

Table 3. Project Activities Tentative Costs (US$ 1 = RUR 26.1)

	Cost Items	Unit of Measurement	Quantity	Price (US$)	Cost (US$)
1	**Design and exploration activities**				
	Project design documentation preparation	Set	1	40,000	**40,000**
2	**Site exploration and setting up the plantation**				**45,000**
2.1	Boats	days	5	570	2,850
2.2	Hydrologic and hydrochemistry characteristics analysis	units	1	5,400	5,400

2.3	Cargo and passenger fleet	days	20	280	5,600
2.4	Diving operations	days	5	1,520,	7,600
2.5	Growing oil-oxidizing bacteria cultures	set	1	1,300	1,300
2.6	Plantation rigging: Ferroconcrete anchors, vertical and horizontal cords, leads, floats, other material.	set	1	20,540	20,540
2.8	Materials and equipment	set	1	950	950
2.9	Land transport costs	days	2	380	760
3	**Site improvement measures, environmental and plantation monitoring**				**187,000**
3.1	Boats	days	5	570	2,850
3.2	Cargo karbass	days	60	250	15,000
3.3	Diving operations	days	40	1,520	60,800
3.4	Additional workforce costs	man/month	36	360	12,960
3.5	Cargo and passenger boats	days	120	280	33,600
3.6	Planting additional oil-oxidizing bacteria cultures	months	5	758	3,790
3.7	Hydrochemistry analysis, sampling for contaminants in biota, water, and soil	quarter	4	14,500	58,000
5	**Laminaria algae harvesting**				**12,000**
5.1	Cargo and passenger boats	days	15	280	4,200
5.2	Diving operations	man/day	2	1,520	3,040
5.5	Laminaria utilization preparation materials	set	1	1,820	1,820
	Additional workforce	man\month	4	360	1,440
5.6	Freezer costs	unit\month	1	1,500	1,500
6	**Contingencies**			**-**	**24,000**
	TOTAL				**308,000**

ANNEX IX

STEERING COMMITTEE
of the UNEP/GEF Project
"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting
St. Petersburg, Russian Federation
April 25 - 26, 2007

STC 2/5(2)

Item 5 of the Agenda

Project Document on co-management

Prepared by:	Project Office, Working Group on DEMO-COMAN
Status:	approved by the Project Steering Committee

Proposal for a Co-management Demonstration Project in the Russian North

2. INTRODUCTION AND PURPOSE

This proposal outlines a multi-year demonstration project under the United Nations Environment Programme/Global Environment Facility project, "Russian Federation: Support to the National Programme of Action for the protection of the Arctic Marine Environment" (GFL/2732-03-4694). The project proponent is the Russian Association of Indigenous Peoples of the North (RAIPON).

According to the Project Document, the purpose of this project it to examine "new effective legislative and economic mechanisms to strike the balance of interests of extracting companies and indigenous peoples in resolving economic and environmental problems while preserving the traditional way of life and habitat." The project will also look at "the advantages of establishing special areas – territories of traditional nature management by indigenous peoples of the North."[13]

The document states that the "final aim of the undertaken measures is to create conditions for co-management of environmental protection by executive agencies, local self-government bodies, extracting companies and indigenous peoples of the North in the areas of their traditional habitat and economic activities." It further states that an "active role in the Project development and implementation will belong to indigenous peoples organisations, first and foremost, RAIPON."

The demonstration project will examine new effective mechanisms to balance the interests of Indigenous Peoples and industry in the Russian North using the following approach:

1. An examination of existing co-management structures in three model regions, including territories of traditional nature management (TTPs) where they exist. Since there are no comprehensive rules for TTPs it is anticipated that the demonstration project will allow discussion of how these might be formalized and implemented.
2. An assessment of the "effective legislative and economic mechanisms to strike the balance of interests of extracting companies and indigenous peoples in resolving economic and environmental problems while preserving the traditional way of life and habitat." This will also involve, where relevant, an analysis of (i) the successes and/or problems associated with the mechanism and (ii) methods used to resolve conflicts.
3. Through a brief analysis of co-management structures in other countries, such as Canada and Norway, identify lessons learned and approaches that

[13] Project Document, paragraph 31, pg. 10.

might be used to strengthen and improve effectiveness of existing relationships in Russia.

4. Determine what elements in the demonstration projects could be transferred in order to avoid conflicts in other regions between Indigenous Peoples and industry.

The demonstration project will examine three model areas – Yamal Nenets Autonomous Okrug, Nenets Autonomous Okrug and Sakha Republic/Yakutia. Through a series of regional planning workshops, the project will identify common methods and approaches to ensuring that Indigenous Peoples' needs and rights are protected as industrial development proceeds. These workshops will also provide industry with a forum to meet stakeholders and government and allow for the kind of planning that takes into account the needs of all parties.

The project's goal is to demonstrate that it is possible to resolve environmental and economic problems and at the same time ensure that Indigenous Peoples' rights are respected, that they continue to have access to their land, and that they are able to make informed choices about their lives. To do this it is necessary to understand the link between environmental protection and Indigenous Peoples' traditional ways of life. Understanding will develop through participation in the co-management process.

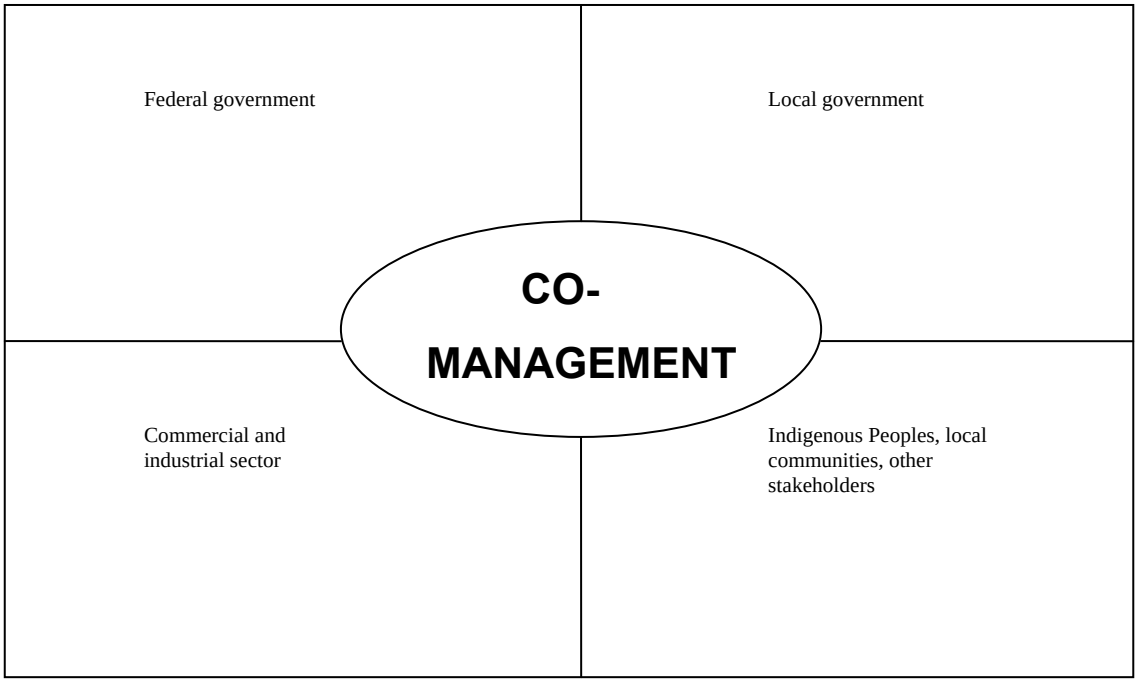
This demonstration project is guided by the fundamental principle that Indigenous Peoples have rights that need to be recognized, including the right to participate in a meaningful way in the management of resources – biological and non-renewable – on their traditional lands. In order for this to happen, there must be a dialogue based on mutual respect and recognition of different interests. This is an important first step in the creation of a process that brings all stakeholders to the table to develop effective management systems based Russian experience and informed by international norms and standards.

To be effective, co-management needs to be recognized in federal law and jointly implemented by federal, regional and indigenous authorities, with the full participation of the corporate sector. Co-management is a process whereby indigenous communities are informed about the plans for development before industrial activity takes place. And ensures that all stakeholders are provided the information they need to understand the effects of development – both positive and negative – in order to make informed decisions.

An emphasis will be placed throughout this project on the incorporation of Indigenous Peoples' knowledge.

Concept and Principles of Co-management

The models created in the three demonstration areas will be assessed for strengths and weaknesses and whether they can be applied to other regions in Russia where there is currently conflicted between Indigenous Peoples and industry. Authorities at the federal, regional and local levels will be able to use the knowledge generated in this demonstration project to reduce conflict, enhance cooperation and formalize relationships between stakeholders. In so doing, this project will fulfill the requirements outlined in the Project Document, paragraph 31.



Adapted from Carlsson and Berkes, 2005

2.1 Indigenous Rights[14]

Co-management is closely linked to the rights of Indigenous Peoples to lands and resources. There is a considerable body of international literature and jurisprudence which discusses the concept of indigenous rights, how they have been abrogated, and the steps that are currently being taken by Indigenous Peoples and governments to recognize and affirm those rights.[15]

It is important to understand the complex inter-relationship between Indigenous Peoples and the lands in which they live. All Indigenous Peoples emphasize that "'the spiritual and material foundations of their cultural identities are sustained by their unique relationships to their traditional territories.'"[16] This distinct relationship has been described as follows:

> It is essential to know and understand the deeply spiritual relationship between Indigenous Peoples and their land as basic to their existence as such and to all their beliefs, customs, traditions and culture.
>
> For such peoples, the land is not merely a possession and a means of production. The entire relationship between the spiritual life of Indigenous Peoples and Mother Earth, and their land, has a great many deep-seated implications. Their land is not a commodity which can be acquired, but a material element to be enjoyed freely.[17]

Indigenous Peoples in Russia share this world view and, despite many changes, still retain strong links to their traditional lands and cultures. Despite these historical changes, and increasing development pressures across the Russian north, the relationship between Indigenous Peoples and their traditional territories remains strong.[18]

Nevertheless, indigenous lands have been expropriated around the world to advance state development interests.

---

[14] This section is not meant to be comprehensive. Rather, it provides a foundation for the discussion on co-management that follows. For a more detailed discussion of Indigenous rights as they apply in several Arctic states, see Krasovskaya, T.M. (2000) **INDIGENOUS PEOPLES OF THE RUSSIAN ARCTIC: PRESENT SITUATION AND THE TRANSITION TO SUSTAINABLE DEVELOPMENT,** UNEP and State Committee of the Russian Federation on the Problems of the Development of the North, pp 74-92.

[15] A useful summary is United Nations Economic and Social Council, Commission on Human Rights, Sub-commission on the Promotion and Protection of Human Rights. **Prevention of Discrimination and Protection of Indigenous Peoples and Minorities: Indigenous Peoples and their relationship to land.** Final working paper prepared by the Special Rapporteur, Mrs. Erica-Irene A. Daes. E/CN.4/Sub.2/2001/21, 11 June 2001. For a thorough analysis of the concept of indigenous rights and the historical relationship between Indigenous Peoples and colonization see the Canada. Final Report of the Royal Commission on Aboriginal Peoples. 1996

[16] Cited in E/CN.4/Sub.2/2001/21, pg. 7.

[17] Ibid, pg. 8.

[18] For testimony that the relationship between indigenous reindeer herders and the land which has nurtured them continues, see Piers Vitebsky 2005. **Reindeer People**. London: Harper Perennial.

> In every part of the globe, Indigenous Peoples are being impeded from proceeding with their own forms of development consistent with their own values, perspectives and interests. The concentration of extensive legal, political and economic power in the State has contributed to the problem of development and Indigenous Peoples' rights to lands, territories and resources.[19]

There is no better illustration of the fact that this is the state of relations in Russia than recent protests by Indigenous Peoples over the Sakhalin-II project. The conflict drew international attention as Russian and international NGOs sided with Indigenous Peoples who were demonstrating for the right to have a say in the development, and to be compensated for damage to their lands and environment. This situation was drawn to the attention of the UN Economic and Social Council, Commission on Human Rights.[20]

2.2 Co-management in an international context

The International Union for the Conservation of Nature (IUCN) has defined co-management as

> …a partnership in which governmental agencies, local communities and resource users, non-governmental organizations and other stakeholders, share as appropriate to each extent, the authority and responsibility for the management of a specific territory or set of resources.[21]

Successful co-management is founded on a willingness to compromise and "respect for the territorial rights of Indigenous Peoples and the custodial responsibilities of government". It treats traditional knowledge and western science as equally valuable. Finally, it recognizes the importance of local people's cultural practices and institutions.[22]

Co-management strategies:

- Include non-traditional decision-makers i.e. non-traditional meaning those other than state or industry managers
- Encourage the participation of the local community in the management of natural resources in some capacity
- Are consensus-based with decision-making power being shared among the various actors.

[19] E/CN.4/Sub.2/2001/21, pg. 22.
[20] E/CN.4/2006/NGO/229, 7 March 2006.
[21] Quoted in ICC Canada, 2002. Co-management and Good Governance: A Summary of Presentations and Discussions at the Co-Management and Good Governance Workshop. Moscow, Russia, 20-21 November 2002, pg viii.
[22] Ibid, pg viii.

- Stress negotiation rather than litigation in situations of conflict
- Combine scientific knowledge and traditional environmental knowledge
- Include decision-making arrangements and agreements from public participation initiatives to land claim settlements[23]

The Arctic is undergoing dramatic change due to a combination of factors. Two key ones are the ways in which climate change is altering the natural environment, and the accelerating pace of oil and gas and other industrial development.

> The behaviour of ecosystems and how they respond to resource exploitation may also be highly unpredictable. A major change in ecological thinking of the last two decades is the recognition that nature is seldom linear; ecosystem processes are dominated by an essential quality of uncertainty.[24]

The authors of the above statement go on to assess the value of co-management as a decision-making process:

> These complexities have implications for different styles of resource management, including co-management. Command-and-control kind of resource management is a poor fit for ecological uncertainty. Instead, the adaptive management approach can be used, in which policies are treated as hypotheses and management as experiments from which managers can learn, so that uncertainty and surprises are accepted. Management processes can be improved by making them adaptable and flexible through the use of multiple perspectives and a broad range of ecological knowledge and understanding, including those of resource user communities. Such management systems tend to have capacity to adapt to change and are better able to deal with uncertainty and surprise.[25]

The authors provide a list of tasks that are more easily accomplished using a co-management approach. These include data gathering, logistical decisions such as who can harvest and when, allocation decisions, protection of resource from environmental damage, enforcement of regulations, enhancement of long-term planning, and more inclusive decision-making.[26]

2.3 A Foreign Perspective: Co-management in Canada

The last three decades have seen many important changes in the relationship between northerners and the State in Canada. The reassertion of indigenous

[23] http://www.iisd.org/ic/info/Co-Management.htm
[24] L. Carlsson, F. Berkes, "Co-management: concepts and methodological implications". **Journal of Environmental Management 75** (2005), pg 67.
[25] Carlsson and Berkes, pg 67.
[26] Carlsson and Berkes, pg 71.

rights and the evolution and creation of new territories has led to the demand that more decision-making powers be transferred to the North. A major impetus in this process is the settlement of what in Canada are called land claims – new treaties between Indigenous Peoples and the State. Most of these treaties took decades to negotiate and now cover the entire Canadian Arctic and much of the subarctic region.

Under the treaties, co-management bodies composed of community (indigenous and non-indigenous) and government representatives are responsible not only for wildlife matters, but also water, land use and environmental impacts. They all follow some model of consensus based decision-making and deliver recommendations to Ministers in the territorial and federal governments. Their recommendations carry considerable political weight and are difficult to ignore, especially if they have been developed through local participation. Under the Nunavut Land Claim Agreement, for example, Ministers may reject recommendations but must give written reasons when they do so.

Co-management institutions have evolved as land claims have been settled[27] but all operate by similar principles. There are a number of different models, but generally "this new relationship involves a change from a system of centralized authority and top-down decisions, to a system which integrates local and state level management in arrangements of shared authority, or at least shared decision-making."[28]

Besides the claims based arrangements, there are "species specific" examples of co-management which focus on migratory barren ground caribou. In fact, two of the oldest co-management arrangements in North America – the Beverly Qammanirjuaq Caribou Management Board and the Porcupine Caribou Management Board – focus on caribou and are the products of specific agreements which are transboundary in nature. These measures were "initiated by government in the search to find an appropriate policy response to a perceived or real resource depletion crisis."[29]

Structurally, these institutions establish formal rules that allow communities of resource users to be meaningfully involved in decision-making. Operationally, it allows for power sharing between communities and state agencies through decentralized decision-making. At the heart of the operations of these bodies is trust.

[27] These include the James Bay and Northern Quebec Agreement (1975), Inuvialuit Final Agreement (1984), Nunavut Land Claims Agreement (1993) and the Labrador Inuit Land Claims Agreement (2005), among others.
[28] Gerett Rusnak 1997. "Co-Management of Natural Resources in Canada: A Review of Concepts and Case Studies". **Minga Working Paper #2** International Development Research Centre, p. 2
[29] Rusnak, p 7.

> Trust-building is an important process in the development of new management institutions in such cross-cultural situations. Trust develops in conditions where the multiple perspectives of diverse stakeholders are addressed, so that the information for management decisions is clear, accountable and legitimate to all parties.[30]

There are many caribou co-management arrangements in North America. It is worth examining one such board, the Beverly Qamanirjuaq Caribou Management Board, in some detail.

The Beverly Qamanirjuaq Caribou Management Agreement was signed in 1982 and regulates the Beverly and Qamanirjuaq herds in the central Arctic, west of Hudson Bay. Because caribou do not respect boundaries, the agreement includes the Government of Canada, Northwest Territories, Nunavut, and the provinces of Manitoba and Saskatchewan.

> The BQCMB was created to help manage two caribou herds whose migratory routes straddle two territories, two provinces, and four different native cultures. The board consists of 14 members, including a chairman and vice chairman. Appropriately, since the main purpose of the board is to safeguard the caribou herds in the interest of aboriginal people who have traditionally relied upon caribou, the majority of board members represent aboriginal communities.[31]

The BQCMB was born in strife. In the late 1970s biologists were alarmed at what appeared to be plummeting herd populations and blamed aboriginal over hunting. Inuit, Dene and Metis peoples in the region disputed the numbers “in light of their own traditional knowledge and experiences on the land. They claimed that the animals had merely moved to another area and that government surveys were deficient.”[32]

An evaluation of the history of the board stated that over the years governments have seen its value as “a venue for consultation with users, and for coordination (especially with respect to research) among jurisdictions.” It provides a "single window" and

> If there is a problem with caribou, the Board is the place to deal with it. It provides a sounding board for government initiatives, as well as early warning of user concerns and an orderly way of dealing with them. The Board's recommendations are generally regarded as sound, even if

[30] Anne Kendrick 2003. “The Flux of Trust: Caribou Co-Management in Northern Canada”. **Environments**. Vol. 31-1, p 43.
[31] Beverly Qamanirjuaq Caribou Management Board http://www.arctic-caribou.com/about.html
[32] Gunther Abrahamson, http://www.learner.org/jnorth/www/jn95/migrations/satellite/canada.html

> governments do not or cannot act on all of them. The Board is seen as realistic, responsible, relatively non-political and diplomatic, but firm.[33]

In its 20th anniversary report, the Board identified its greatest accomplishment: "the improved level of trust and respect among different aboriginal and government groups that these meetings have fostered. Before, relations were uneasy as different cultures and knowledge systems collided. But both sides have made tremendous efforts to find common ground, in order to conserve caribou for the use of future generations."[34]

> Government board members have learned to be patient. They have learned to understand that aboriginal people avoid snap decisions and generally prefer decision by consensus. Aboriginal people prefer prolonged discussion that includes elders in each community.[35]

2.4 A Brief Review of Russian Legislation on Indigenous Environmental Co-Management

It is important to recognize that in Russia during the Soviet era, central planning dictated where oil and gas activities took place and what, if anything, was done to reduce conflicts with reindeer herders and others in the regions in question. Since 1991, however, industry and Indigenous Peoples have developed a number of formal and informal arrangements to handle their mutual issues.

On a recent visit to Salekhard and Yakutsk, RAIPON representatives and a foreign consultant met with local and state officials, including representatives of ministries, and states Dumas, companies and Indigenous Peoples' representatives. The purpose of these meetings was to discuss the co-management demonstration project and to get an assessment of current informal arrangements between government, industry and Indigenous Peoples.

In both regions, examples were offered of situations where companies and Indigenous Peoples were working together, or where local organizations were making efforts to ensure that their interests were being considered as development progressed. These examples will be used to inform the demonstration project being outlined in this proposal.

However, everywhere there were comments that federal and regional authorities, companies and Indigenous Peoples need to put their work on a consistent basis. Relationships were often seen as ad hoc. While federal legislation exists, the concern was expressed that it is not enforced adequately or consistently.

The proposed demonstration project will identify the advantages of these existing relationships and look at areas where legislation is being enforced effectively.

---

[33] Peter J. Usher 1991. **The Beverly-Kaminuriak Caribou Management Board: An Experience in Co-Management**. http://www.idrc.ca/en/ev-84415-201-1-DO_TOPIC.html
[34] Beverly Qamanirjuaq Caribou Management Board http://www.arctic-caribou.com/achieve.html
[35] Ibid.

Where there are inadequacies or gaps between what is written in law and how those laws are enforced, suggestions for improvement will be made.

Three key federal laws address Indigenous Peoples are:

- *Guarantees of Rights of Indigenous Peoples of the Russian Federation;*
- *Basic Principles of Organizing Communities of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation; and*
- *Traditional Subsistence Territories (Territories of Traditional Use of Natural Resources) of Indigenous Peoples of the North, Siberia, and the Far East of the Russian Federation.*

People in the regions said that since Indigenous Peoples do not own the lands where they live, hunt, fish, or herd reindeer, companies are not obliged to seek their permission to start work. Many people said the TTPs do not work in reality and need to be reformed. The demonstration project will examine the TTPs and provide an assessment of how they are working.

Other examples of issues people raised included the Land Code which states that "in places where indigenous minorities of the Russian Federation and ethnic communities live and practice their traditional livelihood activities, public meetings and referendums can be held in relation to the allocation of lands for purposes not related to their traditional livelihood activities" (The Land Code 2001: Art. 31, para. 3\ Status). It is the responsibility of the local authorities to organize referendums. However, very few referendums have ever taken place. What is more, the authorities are only obliged to consider the results of these referendums "when making decisions about the preliminary agreement on the location of construction sites" (Land Code 2001, Article 31). In most cases it is usually enough for companies to obtain the agreement of the legal land users – the former collective and state farms. However, this does not reflect the interests of the population living on the land. Only in three out of 29 northern regions where Indigenous Peoples live (Yamalo-Nenets and Khanty-Mansiiskii autonomous regions and Yakutia) do special laws oblige companies to hold talks and sign agreements directly with Indigenous Peoples' representatives. In NAO there are no special laws but there is a Governor's decree establishing seven TTPs.

Many people expressed concern that laws are not enforced. The Russian federal law "*On the ecological expert review*" (*Ob ekologicheskoi ekspertize*) was passed in 1995 and industrial projects are obliged to pass through a process of state ecological expert review (SEER). This law provides the following definition of an ecological expert review:

> An ecological expert review ascertains whether a proposed economic or other activity satisfies ecological requirements, and determines the

> permissibility of implementing [the project], with the aim of anticipating the possible negative impacts of this activity on the environment and the related social, economic and other consequences of implementing [the project]" (*Ob Ekologicheskoiekspertize*",1995: Article 1)

According to RAIPON's analysis, it is clear that while the Russian Federation has many laws that should control activities on the traditional territories of Indigenous Peoples, these laws are not enforced. Several federal laws contain provisions that "allow or provide for co-management of natural resources" but these are also not enforced. The Russian legal framework around co-management of natural resources is inconsistent. There is "discrepancy between federal laws on subordinate legislation on Indigenous Peoples" and regional legislation "disregards" the normative requirements of federal legislation.

> Contradictions among normative legal acts, both at different levels and within one level, prevent uniform interpretation of legislation on Indigenous Peoples. **This unstable legal situation has an impact on safeguarding the rights of Indigenous Peoples and destabilizes their political, social and economic lives**.[36] (emphasis added)

While, RAIPON continues to lobby for changes to these laws this is a long-term endeavour; in the shorter term, it is necessary to address the problems created by the lack of attention to and enforcement of federal laws. To move ahead, a process is needed whereby Indigenous Peoples, government, industry and other stakeholders can sit down together and work out problems. There are a number of positive examples at the regional levels to look to, and this project proposal will use the experience of three of them – YNAO, NAO and Yakutia. Activities in these regions are the main focus of this proposal.

2.5 Building on Regional Approaches to Co-management

In Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug and the Sakha Republic (Yakutia) regional authorities have worked with Indigenous Peoples to develop legislation and practices that take their interests into account.

In Yamalo-Nenets Autonomous Okrug, 29 regional laws related to the rights of Indigenous Peoples have been issued since 1996. Most of the new laws apply to social and economic development, social security and education of Indigenous Peoples. However, some of them outstrip federal legislation when it comes to the participation of minorities in negotiations with industrial companies involved in oil and gas development and mining. The laws require the companies to enter into agreements with Indigenous Peoples before the transfer of lands for industrial use; they ensure that Indigenous Peoples receive benefits from industrial use of their

[36] ICC Canada, pg 46.

lands; and they also ensure the free use of lands and traditional natural resources for Indigenous Peoples.

These regional laws support Indigenous Peoples' organizations participation in decisions regarding the implementation of industrial projects on their ancestral lands and waters. An example is the ethnological expert review of Gasprom projects initiated by the public organization Yamal for Posterity! However, this expert review is unique since the experience was based on corporate good will rather than legislation.

In the village of Sabetta, in the YNAO, herders rent a slaughterhouse from an oil company, which in turn buys the meat. Personal relationships between herders and oil company personnel are a key part of this arrangement. When it comes to land use, however, herders fear that oil and gas activities and infrastructure will harm the herds. In the Nenets Autonomous Okrug, herders created their own union called Yerv. Although each herder is the official user of a specific plot of land, the herders decided to act as a group in negotiations with the oil and gas company in their area.

The YNAO, as elsewhere in Russia, has seen growing indigenous empowerment in recent years. The organization Yamal Potomkam! ("Yamal for our descendants!") was founded in 1989. Before land is transferred for oil and gas extraction, this organization must be consulted. It has also helped push for recognition of herders' communities and their traditional use areas. The YNAO has passed a number of laws protecting indigenous economies, including provisions for self-government as well as reindeer herding.

Regional methods of assessment of damage to traditional lands are used in Khanty-Mansi and Yamalo-Nenets Autonomous Districts. They assess specific damage caused by industrial companies to reindeer pastures, and hunting and fishing areas. These methods assessed the damage from similar sized oil spills in KMAD and YNAD at a much higher level than was estimated in Nenets Autonomous District where the federal methods of assessment are used.

At present federal authorities are increasing pressure regions to revoke laws which do not comply with the federal legislation, even if the regional laws are stronger. Some companies take advantage of the situation and refuse to comply with the regional requirements.

RAIPON has negotiated with local indigenous organizations, regional government authorities and industrial companies, and the following criteria for the selection of regions for model territories have been developed:

- territories of traditional habitat and economic activities are located in the basins of rivers which drain into Arctic seas;

- there is indigenous and local population which relies the traditional economy for its survival;
- there is natural resource development in or near the model area that has a negative impact on traditional habitat and way of life of indigenous and local people, and these impacts lead to a conflict of interests;
- Indigenous representatives have appealed to RAIPON for assistance in resolving conflicts;
- Plans for a demonstration project have been discussed with regional authorities and industrial companies' representatives; and
- Examination of positive experiences of interaction of executive agencies, local self-government bodies, extracting companies and Indigenous Peoples of the North on environmental issues.

According to these criteria, and based on appeals by regional Indigenous Peoples' associations and the conclusions of field trips, the Nenets Autonomous okrug, Yamal-Nenets Autonomous Okrug, and Republic of Sakha (Yakutia) have been selected as model areas.

2.6 The Situation in the Three Regions

Nenets Autonomous Okrug—The total population of NAO is 41,546 of which 7754 are indigenous. There are also about 3000 Russian-speaking "old-timers" – long-time settlers in the region – and Komi-izhemts reindeer-herders. The main occupation of Indigenous Peoples is reindeer herding, and also hunting, fishing and wild plant gathering. Indigenous and local rural people suffer from reduction of reindeer pastures and environmental degradation which they blame on oil and gas development and road and pipeline construction.

The Resolution of NAO Governor "*On establishing traditional land use territories of Indigenous Peoples of the North*" was adopted in 2001. The Resolution "*On creation of traditional land use territories of Indigenous Peoples in areas where the model territory is planned to be established*" was adopted in 2002. There is a project to establish a factory to process reindeer products where the animals are slaughtered.

From 2002-05 RAIPON held different workshops and roundtable meetings in NAO where indigenous representatives expressed their concerns relevant to this program's items in their appeals to authorities and oil companies. There are no regional laws in NAO, although there are various resolutions and decrees. In NAO there is an experience of direct relations between Indigenous Peoples and companies without participation of local authorities. Thus while agreements are signed, they are not laws.

Yamal-Nenets Autonomous Okrug—The total population of YANAO is 507,006 people, including 36,700 indigenous (Nenets, Khanty, Selkup). There are about 5000 Komi-ziryan people and Russian old-timers. The main occupation of Indigenous Peoples is reindeer herding, and also hunting, fishing and wild plants gathering. As in NAO, Indigenous and local rural people suffer from the loss of reindeer pastures and environment degradation, which they connect with oil and gas and other development. There are regional laws obliging industrial companies to consider the opinion of Indigenous Peoples living in areas where they are active and to sign socio-economic agreements with Indigenous Peoples' organizations. At present these laws are contested because they do not correspond to federal legislation.

However, there is an experience in YANAO when industrial companies (such as Rosneft, Novatek, Purneftegas) built houses and trading post (forts) for Indigenous Peoples on the basis of signed agreements. Also companies buy traditional products of Indigenous Peoples to supplying their workers.

The YANAO Administration has been negotiating for several years with foreign companies process reindeer herding products and they have achieved some results: there is an agreement on establishing German-Yamal joint venture to sell reindeer meat. Half of the joint venture shares will belong to the companies "Yamal reindeers" and "Salekhardsky kombinat" and other half will belong to German company.

Indigenous Peoples in YANAO also have the experience organizing public ecological monitoring of industrial projects in the Purovsky district, and there is a desire to spread this experience to the Yamal and Priuralsky districts. RAIPON has also held a number of workshops and roundtable meetings in the Okrug where indigenous representatives expressed their concerns about the impacts of development.

Republic of Sakha (Yakutia)—The total population of the Sakha Republic is 949,280 which includes 32,258 Indigenous Peoples (Dolgan, Even, Evenk, Yukagir, Chukchi). There is also a population of Russian old-timers. Yakut people belong to indigenous population of Yakutia and their occupation in the rural areas is cow and horse breeding. Other Indigenous Peoples have similar ways of life to those in NAO and YNAO and share similar concerns.

The Yakutian Government has adopted regulations determining the procedure of issuing the licenses to industrial companies, signing agreements with indigenous communities and compensating people for losses due to development. There is some experience with signed agreements between Indigenous Peoples and industrial companies.

The Act "*On establishing traditional land use territories of Indigenous Peoples*" was adopted in 2006 and there is an active process of establishing TTPs in Yakutia. The Department on Indigenous Affairs of Sakha Republic has good contacts with RAIPON and has expressed its interest in implementing a demonstration project in Yakutia.

The main industrial activity in Yakutia is mining, which is taking place on territories that have been proposed as part of this demonstration project. Mining has already had a negative impact on the environment, including water and biological resources, and this has led to protests by Indigenous Peoples. The Government of the Sakha Republic is interested in developing a model of "civilized relations" between Indigenous Peoples and mining companies, and also using it to deal with the impact assessment of pipeline construction in the Lena River basin.

During meetings in November 2006 on the NPA-Arctic between RAIPON and a Canadian consultant with representatives of Indigenous Peoples, YANAO and Sakha (Yakutia) Governments, and industrial companies a clear desire was expressed to improve federal and regional legislation and regulation of natural resources and to improve the relationship between companies and local peoples. Some key concerns included

- the fact that the concept of "places of traditional habitat and land use of Indigenous Peoples" is still not clearly determined in legislation
- There are no mechanisms for compensation for damage to traditional occupations like reindeer herding, which often leads to conflict between companies and indigenous and local peoples, and
- these conflicts can not be resolved by courts and local authorities because of the absence of a legislative base.

These three regions each have their different approaches to dealing with problems faced by Indigenous Peoples and their need to be able to work directly with oil and gas and other industrial sectors. Their experiences provide a good foundation for the work to be carried out in this project.

3. OVERALL GOALS OF DEMONSTRATION PROJECT

The goals of the demonstration project are to:

1) Create conditions for co-management of environmental protection by executive agencies, local self-government bodies, extracting companies and indigenous peoples of the North in the areas of their traditional habitat and economic activities.

2) Ensure the sustainable development of the model regions by establishing three co-management planning commissions that will balance the interests of Indigenous Peoples, industry, government and other stakeholders.
3) Define the membership, role and priorities of these bodies and create a forum for co-operation between Indigenous Peoples, industry, government and other stakeholders that will influence policy assist decision-making at the federal, regional and local levels.
4) Decide on a set of activities to be carried out in each region, including mapping of traditional territories, resources and other issues.
5) Develop a list of priority tasks to be carried out in subsequent phases of the project. These include determining potential boundaries in of special protection areas for traditional territories, and developing strategies to change legislation that affects the rights of Indigenous Peoples.

4. RATIONALE

At the moment, there is no overall guidance for the relationship between Indigenous Peoples and companies working in the oil and gas, mining, or other sectors in the Russian North. Relationships between Indigenous Peoples and industry are unequal and, at best, ad hoc. Without a formal framework and structure, Indigenous Peoples will continue to be able to only get the “best deal” they can. In some places, they are able to develop relationships with industry, based on industry’s willingness to listen to what they have to say. In other situations, Indigenous Peoples’ voices are not being heard.

The Project Document deals calls for a “demonstration of advantages of establishing special areas – territories of traditional nature management by indigenous peoples of the North, as a new legal and economic mechanism which create conditions for co-management of environmental protection by executive agencies, local self-government bodies, extracting companies and indigenous peoples of the North in the areas of their traditional habitat and economic activities.” It further states that the demonstration project should elaborate “proposals on the organisational frameworks and functioning principles of the territories of traditional nature management: (2) principles, procedures and methods of designing of territories of traditional nature management.” Given the concerns raised about the TTPs and their functioning, a thorough analysis of their effectiveness is needed. The demonstration project will do this and, where appropriate, provide recommendations on how the TTPs can be made more functional.

For companies in the oil and gas, mining and other sectors, participating in a co-management process will provide certainty for project development. It will be a

cooperative forum where potential conflicts can be identified and managed before they become impediments to development or international political issues.

For Indigenous Peoples, co-management provides an opportunity have their collective views heard and ensures that they have a say in activities that are to take place on their traditional lands. Mapping traditional territories will provide indigenous communities with training and build capacity. Working at the same table as companies, governments and other stakeholders, Indigenous Peoples will learn how industrial development decisions are made and become more effective at influencing them. Co-operation will also create economic opportunities for a population that currently has few options for wage employment. Finally, co-management is a way to protect resources and territories that have support Indigenous Peoples' culture for centuries. Co-management will help Indigenous Peoples balance the demands of development and the need to protect the environment.

For other stakeholders, co-management presents an opportunity to participate in the planning of development projects, and to have their views considered.

The project is designed in the context of some serious problems facing Indigenous Peoples in Russia. The root of the problem is the lack of recognition of Indigenous Peoples rights, despite these rights being enshrined in Russian federal legislation.

Finally, in order to realize its goals, this project will be guided by the following assumptions:

1) People are a functional part of a dynamic biophysical environment, and co-management planning cannot be carried out without reference to the human community. Thus social, cultural and economic endeavours of the human community must be central to co-management planning and implementation;
2) The primary purpose of co-management planning shall be to protect and promote the existing and future well being of the people and communities in the model regions. Special attention shall be paid to the interests of Indigenous Peoples.
3) The planning process shall ensure that there is a balance between the priorities and values of the residents of the planning regions and the needs of the industrial sector, government and other stakeholders;
4) The planning process will be public and will provide an opportunity for the active and informed participation and support of Indigenous Peoples and other residents affected by the co-management plans. This participation will be promoted through various means, including ready access to all relevant

materials, appropriate and realistic schedules, recruitment and training of local residents to participate in comprehensive planning;

5) The plans shall provide for the conservation, development and utilization of land and shall ensure the protection of the rights of Indigenous Peoples.

5. SCOPE OF PROPOSAL

To be effective co-management bodies must be designed cooperatively and built from the bottom up. State authorities, industry, Indigenous Peoples, and other stakeholders share the responsibility to make this process work. There is much to be learned from co-management experiences in other parts of the Arctic.

This document proposes the establishment of a demonstration project in three regions of the Russian North: Yamal Nenets Autonomous Okrug, Nenets Autonomous Okrug and the Sakha Republic. The ideas in this proposal are the product of many discussions and visits and meetings held in November 2006 in Salekhard and Yakutsk with region representatives of Indigenous Peoples' organizations, state governments and industry.

This demonstration project forms is the first phase of a longer project, the implementation of which will require additional funding. The current demonstration project proposal should be seen as Phase I and will be implemented in 2007-2008. However, the proposal will identify activities based on short, medium and long-term timelines that need to be considered by the Co-management Project Steering Committee. **It is important to emphasize that the funding in this proposal is for Phase I only**.

The following lists some of the activities that could be conducted in each phase of the project. Phases II and III are speculative at this point and will be determined through the work of the regional co-management planning commissions.

Much of the work involves background research and analysis of Russian conditions, and information gathering about co-management institutions in other countries. There is a large body of literature and knowledge which can be used to develop co-management bodies and practices in Russia. There are also experts in the Arctic, particularly in Canada and Norway, whose knowledge should be drawn upon.

Phase I activities

Phase I of the demonstration project will look at positive experience of interrelations between Indigenous Peoples, companies and authorities (with a focus on co-management elements). Where necessary, it will changes to these relationships. It will also

- Provide an analysis of RAIPON participation experience in environment management in this three model areas (Nenets, Yamalo-Nenets AO and Republic of Sakha (Yakutia) has to be done;
- Analyse positive sides of this experience and recommendations for its replication in other Arctic entities of the Russian Federation are revealed;
- Analyse negative sides of the available experience and recommendations for its overcoming adjusted to positive Canadian and Norwegian experience are revealed.
- Develop an analysis of current legislation and prepare recommendations on its improvement;
- Develop methods of training all stakeholders on how to cooperate or improve existing cooperation;
- Disseminate information on experience and practices at the federal and international levels; and
- Work on ways to describe and analyze existing relations in order to systematize co-management in the demonstration regions.

Specific Phase I activities include:

- Hold workshops in three regions and Moscow to examine co-management issues, existing relationships and structures (including TTPs)
- Integrate lessons learned from Canada and Norway by bringing four co-management experts to participate in the workshops
- Provide a thorough analysis of the functioning of TTPs, including:
    - analysis of major participants;
    - mechanism of consultations with major participants in the process;
    - priorities of territory(ies) of traditional nature management;
    - exchange of information;
    - consideration of traditional practices of nature management used by indigenous people/communities;
    - conflict resolution mechanisms
    - identification of training needs;
    - mechanisms of financing.

- Develop a set of co-management tasks, including mapping and other work
- Discuss how to train local people to participate in the information gathering and mapping
- Train local people to participate in mapping and information gathering

Phase II activities

- Conduct mapping and other related activities
- Produce maps and other planning materials, including outreach materials for indigenous communities and other stakeholders

Phase III activities

- Use results to mapping and other activities to develop strategies for lobbying and changing legislation

6. PROPOSAL: PHASE I

Summary of Tasks in Phase I

Task 1: Hold planning workshops in each of the three model areas – Yamal Nenets Autonomous Okrug, Nenets Autonomous Okrug and the Sakha Republic (Yakutia). A similar workshop will be held in Moscow to brief federal officials and deputies on regional issues and problems, and to gain their support for the demonstration project. This workshop will include four co-management experts from Canada and Norway.

Task 2: Develop Regional Analyses using three model areas.

Task 3: Develop mapping plans and methodologies.

Task 4: Design a monitoring programme involving Indigenous Peoples and develop methods for its implementation.

***Task 1*: Hold planning workshops in each of the three model areas – Yamal Nenets Autonomous Okrug, Nenets Autonomous Okrug and the Sakha Republic (Yakutia).**

A similar workshop will be held in Moscow to brief federal officials and deputies on regional issues and problems, and to gain their support for the demonstration project.

Participants: *RAIPON, regional indigenous organizations, regional authorities, industry, other stakeholders*

Activities:

3. Develop a set of background materials for planning workshops. These materials should contain information about
    i. Indigenous rights, international norms and standards and the status of federal and regional laws affecting Indigenous Peoples
    ii. Links between co-management and indigenous rights
    iii. Examples of co-management systems in operation in other countries and lessons to be learned
    iv. Examples of co-management in Arctic regions, mechanism of its implementation, legal base, shortcomings and advantages, etc., recommendations for other regions
    v. Role and importance of incorporation of traditional knowledge in co-management
    vi. Other statistical and analytical information that may be required
    vii. Plain language communications materials on co-management for communities, including posters
4. Hold initial planning workshops in each of the three demonstration regions. The purpose of these workshops is to identify the principles, guidelines and major components of co-management systems to be established in each area on a basis of positive experience of co-management identified in Russian Arctic regions.

(Two or three such workshops will likely be needed in each region.) These workshops will include co-management experts from Canada and Norway.

The outputs of each planning workshop will include, but not be limited to:

v. Develop a set of overall principles of co-management
vi. Develop proposals for organizational structures
vii. Decision on membership and operating procedures of co-management bodies
viii. Develop a list of immediate tasks for these bodies, including regional analysis and mapping
ix. Elaboration of proposals on Indigenous Peoples' participation in environment protection activities, including ecological monitoring and reclamation and remediation of damaged traditional territories
x. Other activities outlined by the workshops

***Task 2*: Develop Regional Analyses using three model areas.**

The purpose of this activity is to apply the general principles and methods developed in Task 1 to the specific situation in the regions. The proposed activities below are designed for the three regions. However, it is likely that aspects of them may be modified at the initial workshop, or adapted to the specific circumstances of the individual regions.

Participants: *RAIPON, regional indigenous organizations, regional authorities, industry, other stakeholders*

Activities

1. Hold co-management planning meetings in three regions. These will be regional planning sessions, and their first task will be to outline the work needed to implement co-management activities in each region. Each body will
    - Develop a list of priorities and a work plan (based upon a template created at the initial planning workshop)
    - Identify areas to be mapped. This plan should be a document containing text, schedules, figures and maps for the establishment of objectives and guidelines for short-term and long-term development of co-management of indigenous people and industrial companies It should include, but not be limited to, the following factors:
        - Boundaries of Indigenous Peoples' territories of traditional land use;
        - demographic considerations;
        - the natural resource base and existing patterns of natural resource use;
        - economic opportunities and needs;
        - transportation and communication services and corridors;
        - energy requirements, sources and availability;
        - community infrastructural requirements, including health, housing, education and other social services;
        - environmental considerations, including parks and conservation areas, and wildlife habitat;
        - cultural factors and priorities, including the protection and preservation of archaeological and sacred sites, and
        - other special local and regional considerations.

2. Develop analysis of specific of traditional land use and ethno-demographic features of the population in areas where development is being carried out.
3. Develop analysis of impact on the environment and traditional land use in model areas.
4. Determine model territories' borders, and methods for zoning, protection and usage of natural resources in model territories.

***Task 3*: Develop mapping plans and methodologies.**

Participants: *RAIPON, regional indigenous organizations, regional authorities, industry, other stakeholders*

This task involves identifying the boundaries of areas used by Indigenous Peoples. An important component of successful co-management is agreement on the areas to be managed. Capacity building of Indigenous Peoples is important.

Activities

1. Select mapping methodology and institute or body that will carry out the task. This includes GIS formats, etc.
2. Develop regional mapping methodologies that include the active participation of Indigenous Peoples and incorporates their traditional knowledge.
3. Design questionnaires for Indigenous Peoples and other tools to be used in mapping the traditional territories.
4. Hold training workshops for local participants who will gather the mapping information.

***Task 4:* Design a monitoring programme involving Indigenous Peoples and develop methods for its implementation.**

Participants: *RAIPON, regional indigenous organizations, regional authorities, industry, other stakeholders*

Activities

1. Design proposals for the creation of an environmental monitoring programme involving Indigenous Peoples (an example of this is the model used in Purovsky district in Yamal).
2. Develop terms of reference for these programmes.
3. Develop proposals for appropriate training programmes for indigenous people in professions which let them to learn management and participate professionally in environment monitoring activities. This

includes determining the kinds of activities, and ensuring they do not contradict traditional ways of life and environmental protection practices.

4. Selection of people for training.
5. Exploration of the viability of new processing technologies and marketing of traditional goods.
6. Determination of recreational possibilities of model areas for organizing ethnic tourism, sport hunting and fishing.

7. OUTCOMES

The concrete outcomes of this project in the three regions will have the following concrete outcomes:

- common principles, order and procedure of establishing and elimination of TNM taking into account of the current legislation;
- expended conceptual instrument;
- proposals for power and functions of the Russian Federation state authorities and the Russian Federation local authorities when TNM will be created, setting up their routine and limites;
- all interested parties cooperation procedure including RAIPON representatives during formation, operation and elimination of the TNM;
- conditions for industrial and economic activities (boundary conditions and charges) that differ from traditional nature management;
- TNM legal regime which lets to reconcile RAIPON and other natural resources users in TNM borders;
- TNM design conventional guidance.
- A thorough assessment of existing co-management inter-relationships, including the functioning of TTPs.
- Development of consistent rules to guide the relationship between Indigenous Peoples, companies, government and other stakeholders.
- Creation of a formal framework and structure to manage environment in areas traditionally occupied by indigenous people.
- Creation of a forum where Indigenous Peoples will have their voices heard.
- Analysis of impacts of development on Indigenous Peoples and their traditional territories.

- Training opportunities for Indigenous Peoples in land use mapping, environmental monitoring, and other activities.
- Development of partnerships with industry and government authorities.
- For companies in the oil and gas, mining and other sectors, participating in a co-management process will provide certainty for project development.
- Creation of a forum where potential conflicts can be identified and managed before they become impediments to development or international political issues.
- For other stakeholders, co-management presents an opportunity to participate in the planning of development projects, and to have their views considered.
- Development of plans for balanced and sustainable industrial development in the three model regions.
- Creation of co-operative models that can be used in other parts of the Russian Federation.

8. PROJECT BUDGET (in USD) with Explanatory Note (provisional)

Maximal budget allocated for this DEMO project at Phase I of the Project is US$494,000

.

ANNEX X

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/7(1)

Item 7 of the Agenda

Disposal in environmentally sound manner of outdated RITEGs at the Arctic coast of Republic of Sakha (Yakutiya) and Chukchi autonomous okrug

---

Prepared by: the Project Office
Status: approved by the Project Steering Committee

Disposal in environmentally sound manner of outdated RITEGs at the Arctic coast of Republic of Sakha (Yakutiya) and Chukchi autonomous okrug

BACKGROUND

1.1. What RITEGs Are?

An RITEG tranforms thermal energy from decay of radioactive material into electricity. They have a steady output voltage of 7 to 30 volts and the power capacity of up to 80 watts. The most frequent application for RITEGs is as power sources for navigation beacons and lighthouses[2]. RITEGs are also used as power sources in radio beacons and weather stations.

The core of an RITEG is a thermal energy source based on the radionuclide strontium 90—also known as radioisotope heat source 90 (RHS-90). An RHS-90 is a sealed radiation source in which the fuel composition, usually in the form of ceramic titanate of strontium-90 (SrTiO3), is sealed hermetically and two-fold into a capsule using argon welding. Several RITEGs use strontium-90 in the form of strontium borosilicate glass[3]. The capsule is protected against external impact by the thick shell of the RITEG, which consists of stainless steel, aluminium and lead. The biological protection shield is configured in such a way that radiation levels do not exceed 2 mSv/h on the devices,' and 0.1 mSv/h at a distance of one meter.

The strontium-90 radioactive half-life is 29.1 years. At the time of their production, RHS-90s contain from 1,100 TBq to 6,700 TBq of strontium-90, which is a strong beta-emitter. The level of gamma radiation reaches 4 to 8 Sv/h at a distance of 0.5 meters from the RHS-90, and 1 to 2 Sv/h at a distance of one meter.[4]Together with the energy from strontium-90 radioactive decay, its beta-emitting daughter radioisotope, Yttrium-90 (90Y is a radioactive by-product of strontium-90 decay and has a half-life of 64 hrs), also produces heat energy from its radioactive decay.

Table 1. Specifications of the RHS-90.

Dimensions of the cylinder	10 by 10 centimetres
Weight	5 kilograms
Capacity	240 watts
Concentration of strontium 90	1,500 TBq, or 40,000 curies
Temperature on the surface, centigrade	300-400 degrees
Exposition dose rate at the distance of 0,02 to 0,5 metres	28-10 Sv/h

It takes no less than 900 years before RHSs reach a safe radioactivity level. According to the Russian's independent nuclear watchdog—known until March 2004 as Gosatomnadzor, or GAN— "the existing system of RITEG management does not allow for providing adequate security to these installations, so the situation they are in can be classified as 'an emergency manifested in the unattended storage of dangerous radioactivity sources.' This is why these generators need to be evacuated urgently.

According to IAEA classification, RITEGs are 1 class — meaning they are among the strongest radiation emitters.

According to Russian Agency on Nuclear supervision (Rosatom) there are 303 RITEGs along the Northern sea route (as of January 2006).

2. RITEG Safety

Most RITEG locations do not meet the requirements specified in existing regulatory documents.

Russia's RITEGs used beyond their operational limits have been waiting to be sent to a repository for decades. Some of them have become the prey of non-ferrous metal hunters, who crave a quick buck for RITEGs' metal, regardless of the risk of radioactive contamination.

Most Russian RITEGs are completely unprotected against potential thieves or intruders, and lack even minimal security measures like fences or even radioactive hazard signs. Nuclear inspectors visit these sites as seldom as once every six months, and some RITEGs have not been checked for more than a decade.

The biggest danger coming from these unprotected RITEGs is their availability to terrorists, who can use the radioactive materials contained in them to make so-called "dirty bombs" —bombs that are triggered by standard explosives, but disperse radioactivity. The damage from such an explosion could surpass by many times that from a conventional bomb, with the ground zero area—potentially dozens of kilometres depending on the power of the explosives dispersing the radiation—remaining radioactively contaminated for years to come. Russia's RITEGs used beyond their operational limits have been waiting to be sent to a repository for decades. Some of them have become the prey of non-ferrous metal hunters, who crave a quick buck for RITEGs' metal, regardless of the risk of radioactive contamination.

According to official reports by the Russian State Committee for the Protection of the Environment, "the existing system of RITEG management is in contradiction with the provisions of the federal laws 'On the Use of Atomic Energy' and 'On the Radiation Safety of the Population,' because no physical security or safety has

been ensured to these installations. At the time when these RITEGs were placed at their locations, no consideration was made regarding the probability of damaging impact effected on them by natural and anthropogenic factors. Due to the inefficient practice of RITEG accounting and control performed by the operators of these installations, certain RITEGs may be 'lost' or 'abandoned.' In effect, the sites where RITEGs are located can safely be regarded as temporary storage places for highly radioactive waste".

3. Use and Ownership

RITEGs in Russia are owned by the Ministry of Defense, the Ministry of Transport, and the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet). The Ministry of Transport has jurisdiction over approximately 380 RITEGs, with the State Hydrographic Service (SHS) of Ministry of Transport responsible for their monitoring and accounting. The Ministry of Defense owns 535 RITEGs, including 415 RITEGs run by the Main Directorate for Navigation and Oceanology.

4. Types of RITEGs

The 10 RITEG types are based on heat sources like the RHS-90 developed by the All Russian Scientific Research Institute of Technical Physics and Automation (VNIITFA) between 1960 and 1980 (see table below).

Table 2. Types and main characteristics of RITEGs of the Soviet design

	RHS heat capacity, watts	RHS initial nominal activity, kilocuries	RITEG electric capacity, watts	RITEG output voltage, volts	RITEG mass, kilograms	Year of start of mass production
Efir-MA	720	111	30	35	1250	1976
IEU-1	2200	49	80	24	2500	1976
IEU-2	580	89	14	6	600	1977
Beta-M	230	35	10		560	1978
Gong	315	49	18	14	600	1983
Gorn	1100	170	60	7 (14)	1050 (3 RHS-90)	1983
IEU-2M	690	106	20	14	600	1985
Senostav	1870	288			1250	1989
IEU-1M	2200 (3300)	340 (510)	120 (180)	28	2 (3) x 1050	1990

RITEGs differ by parameters, which vary according to their voltage output, output power capacity, mass, size and other characteristics. Beta-M type RITEGs—one of the first designs, developed in the late 1960s—have been used most frequently. In 2003 around 700 RITEGs of this type were in operation. However, the joints in

the carcasses of Beta-M RITEGs are not welded, and, as the past 10 years experience shows, such RITEGs can be easily dismantled right where they stand with the help of nothing more than common fitting tools, like crowbars and hammers. No new RITEGs have been developed in the last 15 years.

According to the Ministry of Transport some 380 RITEGs of the Beta-M, Efir-MA, Gorn and Gong type are located along the Northern sea route

5. Accounting for RITEGs

Orders for new RITEGs came principally from the Ministry of Defense, the Ministry of Transport, and the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet). and the former Ministry of Geology, now part of the Ministry of Natural Resources. All the Soviet RITEGs were designed in Moscow by the All-Russian Scientific Research Institute of Technical Physics and Automatisation, or VNIITFA. The Institute also developed corresponding design documentation, which was then handed over to the plant that would produce the RITEGs.

Mass-scale production of RITEGs in the USSR was the responsibility of a plant called Baltiyets, in the city of Narva in the former Soviet republic of Estonia. In the early 1990s, the plant underwent major changes, including re-specialisation, and stopped producing RITEGs. Now it is called Balti EES, and it has no information on the precise locations of those RITEGs that it did produce.

In the 1960s commissioning of the RITEGs was the responsibility of a now-defunct specialized organization within the Ministry of Medium-Level Machine Engineering (Minsredmash) its which later became Minatom and, more recently Rosatom. RITEGs were also put into operation by the organizations that were to operate them.

Despite lacking documentation, it is known that 80 percent of all RITEGs are concentrated along Northern Sea Route. They were delivered to hydrographic military units of the Ministry of Defense, as well as civilian hydrographic bases scattered along the Northern Sea Route. Considering the current situation with RITEG accounting in Russia, several years ago VNIITFA took upon itself the task of collecting information on RITEGs that operate both in Russia and other former republics of the Former Soviet Union (FSU).

The institute's data point to the same fact: All RITEGs located in Russia have completed their projected operation terms and urgently need to be delivered to the Russian nuclear industry’s specialized sites for dismantlement. As per the agreement with the Ministry of Transport, VNIITFA annually sends specialists to inspect RITEGs at their operation sites. In 2001 and 2002, such inspections were carried out at 104 RITEG locations run by the ministry.

In 2004, Gosatomnadzor (GAN) stated that the most ‘unfortunate’ organizations, operating RITEGs with serious safety violations, are the Tiksinskaya, Providenskaya and Pevekskaya hydrographic bases of the SHS. Regulators reported that “condition of physical protection of RITEGs is extremely low. Inspections of RITEGs are carried out rarely and mostly not far from the bases themselves; several RITEGs haven’t been inspected more than for 10 years due to lack of qualified specialists." Sometimes RITEGs are simply lost: an inspection in August-September 2003 failed to find an RITEG of the Beta-M type N57 at the “Kuvekvyn” lighthouse in Chukotka; inspectors officially claimed, the RITEG either sank in the sand during a heavy storm, or was stolen by unknown criminals.

The threat of terrorism

The US Defence Department-run Cooperative Threat Reduction, or CTR, programme, which was launched in 1991 considers Russian RITEGs a threat of proliferation of radioactive materials that could be used in a dirty bomb by potential terrorists. CTR is also known as the Nunn-Lugar programme for its creators, Indiana Senator Richard Lugar and former Georgia Senator Sam Nunn.

Senator Lugar's website states that "the Russian government does not have an accurate accounting as to where all the generators are located." Accordingly, says the website of Senator Lugar, who is also Chairman of the influential Senate Foreign Relations Committee "we must find these units, secure them and remove the dangerous materials”

On March 13th 2003, at an IAEA conference entitled "Security of Radioactive Sources" in Vienna, Minatom head Rumyantsev admitted to the problem.

According to Rumyantsev—whose speech was quoted on the IAEA website—among aggravating circumstances are "the increasing threat posed by various terrorist organisations in the world, the disintegration of former Soviet territory that led to the loss of control over [these radioactive] sources, and in some cases to the loss of radioactive sources as such."

As an example, Rumyantsev cited incidents of "unsanctioned opening of RITEGs by residents of Kazakhstan and Georgia [in order] to obtain non-ferrous metals. For some, the dose that they have been exposed to turned out to be too high." Rumyantsev also concluded that after the break-up of the USSR, the integral system of government control that used to oversee the installation and transportation of radioactive and nuclear materials had to be recreated anew in separate independent states, which caused an unprecedented wave of previously rare criminal offences, including those involving radioactive sources, reports the IAEA website.

According to the closing statement made by the IAEA, "high-risk radioactive sources that are not under secure and regulated control, including so-called "orphan" sources, raise serious security and safety concerns. Effective national infrastructures for the safe and secure management of vulnerable and dangerous

radioactive sources are essential for ensuring the long-term security and control of such sources.

OVERAL GOALS OF DEMONSTRATION PROJECT

The goals of this demonstration project are as follows:

Determination of location and finalization of inventory of RITEGs in the Republic of Sakha (Yakutiya) and Chukotsky AO.

Demonstration of collection and equipment of temporary storage place for RITEGs in line with requirements of radiation safety

Demonstration of safety transportation and disposal of RITEGs on specialized enterprises

Development of guidelines on environmentally sound disposal of RITEGs.

PROJECT RATIONALE

The Far Eastern region of Chukotka, according to official data, has 101 RITEGs. Many of them are long neglected, such as the RITEGs in the Bay of Shelting and on Cape Yevreinov. They belong to the regional Kolyma Hydrometeorological Service, but were abandoned after the monitoring service practically ceased to exist in the region. Of these RITEGs, 58 are of the Beta-M type, 13 of the Efir type, eight of the Gorn structure and six of the Gong. Hydrometeorological Service of Providenie base and Pevek buoy inspection team of are responsible for 85 RITEGs. Their total net activity of $209*10^{15}$ Bk. In addition military bases operate 16 RITEGs.

The Republic of Sakha-Yakutia has on its territory approximately 75 RITEGs with total net activity of $256*10^{15}$ Bk. Hydrometeorological Service of Ministry of Transport owns these RITEGs. The generators located on the islands in the Laptev Sea, on the East Siberian and Arctic shores of the Anabar, Bulun, Ust-Yana and Nizhnekolymsk Regions, are all the responsibility of the Khatanga (11 RUTEGs), Tiksi (41) and Kolyma (15) Hydrographic Bases, as well as the Pevek buoy inspection team (8). The operation of these North Sea Route RITEGs does not meet radiation standards. In fact, authorities have effectively lost control over 25 of these generators. As of January 2004, 29 RITEGs were in operation, 6 were in reserve and 38 were subject of disposal.

Of 38 RITEGs to be disposed 6 are collected in temporary disposal place near Ust-Yana bay, all the others are located in the costal area and the islands in the Laptev Sea, on the East Siberian and Arctic shores from 1 to 3 pieces in one place (Peschany, Preobrazheniya, Medvezh'I and Novosibirsk icelands.

The Siberian Territorial District owns more than 100 RITEGs, the bulk of which are concentrated on the Taimyr Peninsula. In 2003 another 153 RITEGs were scattered along the shorelines of the Barents and White Seas, of which 17 were located in the Kandalaksha Gulf, now a part of them has been decommissioned (see RITEGs and International Efforts below).

A dilapidated RITEG in Chukotka: strontium-90 leaked into the environment

According to an August 16th 2003 report by GAN's branch of the Far Eastern Interregional Territorial District, the monitoring commission, while inspecting RITEGs located on the Arctic shore of the Chukotka Autonomous District, found one RITEG in a state of utter dilapidation, on the Cape of Navarin in the Bering region.

The level of the so-called exposition dose on the surface of the generator was as high as 15 R/h. The commission also concluded that a release of radioactive substances into the surrounding environment may have taken place. The commission found out, that the RITEG "self-destroyed as a result of some, not specified yet, inner impact". In July 2004 a second inspection of the RITEG at the Cape of Navarin was carried out. The check-up showed, that radiation situation had worsened, gamma radiation had rose to 87 R/h, but the main observation was that strontium-90 began to leak into the environment (earlier VNIITFA experts stated that leakage of strontium-90 and destruction of the RHS-90 capsule, unless strong explosives were used, were impossible).

There is an assumption that this RITEG was run over with a land rover by deer farmers of a brigade that was staying at Navarin in 1999. The heat exchange was violated, and RITEG warmed up inside to 800 degrees Celsius. Metal plates, securing from radiation, cracked. In 2003, the RITEG was covered with a concrete slab, but still the radiation exceeds the norms. Deer farmers continue tending herds on Navarin — the southern-most cape of Chukotka. Animals, as well as people, come close to the dilapidated RITEG, despite radiation warning placards.

The nuclear regulators' (FSAN) report for 2004 states, "technical condition of the RITEG and dynamics of thermo-physical processes in the RITEG makes its complete self-destruction possible", while these "thermo-physical processes" are still "unknown"

Abandoned RITEGs in the Chukotka Autonomous District

Shalaurov Island	Radiation levels exceed those considered the accepted norm by 30 times. The TEG is abandoned and unmonitored.
Nutevgi Cape	The RITEG has undergone severe external damage. The generator was installed th no regard to the dangerous influence of natural forces, in close proximity to ermokarst depression. Additional damage may have been done to the RITEG in arch 1983, during a transportation accident that the management specialists put der wraps.

Okhotnichy Cape	The RITEG was lost in the sands due to tides, as it was installed in immediate oximity to the inshore area. The accident was caused by the management team's competence. The RITEG is still kept on the site in violation of the law.td>
Serdtse-Kamen Cape	The RITEG was installed 3 metres away from the edge of a 100-metre-deep ecipice. A crack in the ground can be traced throughout the site, causing the risk at the RITEG may be caught in a landslide together with big masses of rock. The stallation was performed with no regard to the influence of natural elements, in this se, marine abrasion. The RITEG is kept onsite in violation of the law.
Nuneangan Island	External radiation levels exceed accepted limits by 5 times. The cause of the abnormal radiation levels is a design defect. The RITEG is untransportable by routine methods.
Chaplin Cape	The lower part of the RITEG's carcass lacks a plug, radiation levels exceed the accepted norm by 25 times. The RITEG is located on the territory of a military base. The emergency condition of the RITEG is caused by the defective design of this type of generators. The abnormal radiation levels were also kept under wraps by the maintenance team.
Chekkul Island	Radiation levels surpass the accepted limits by 35 percent at the distance of one metre from the RITEG's surface.
Shalaurova Izba Island	Radiation levels surpass the accepted limits by 80 percent at the distance of one metre from the RITEG's surface.

The republic of Sakha-Yakutia has on its territory approximately 75 RITEGs. The generators located on the islands in the Laptev Sea, on the East Siberian and Arctic shores of the Anabar, Bulun, Ust-Yana and Nizhnekolymsk regions, are all the responsibility of the Khatanga, Tiksi and Kolyma Hydrographic Bases, as well as the Pevek buoy inspection team. But this responsibility is mostly on paper. The operation of these North Sea Route RITEGs meet no radiation standards. In fact, authorities have effectively lost control over 25 of these generators

RITEGs in states of emergency in Yakutia, the Tiksi Hydrographic Base

Kondratiev Cape	Due to gradual decay of the shore-slope rock, two Gong type RITEGs sank down to a 20-met re-depth inside a thick layer of permafrost, which has been steadily thawing
Makar Cape	The dose exposure levels of the Efir type RITEG exceed the accepted norm by 10 times due to malfunction of the biological protection shield.

Of the generators operated by the Tiksi Hydrographic Base, 15 more RITEGs have been established as surplus and subject to removal.

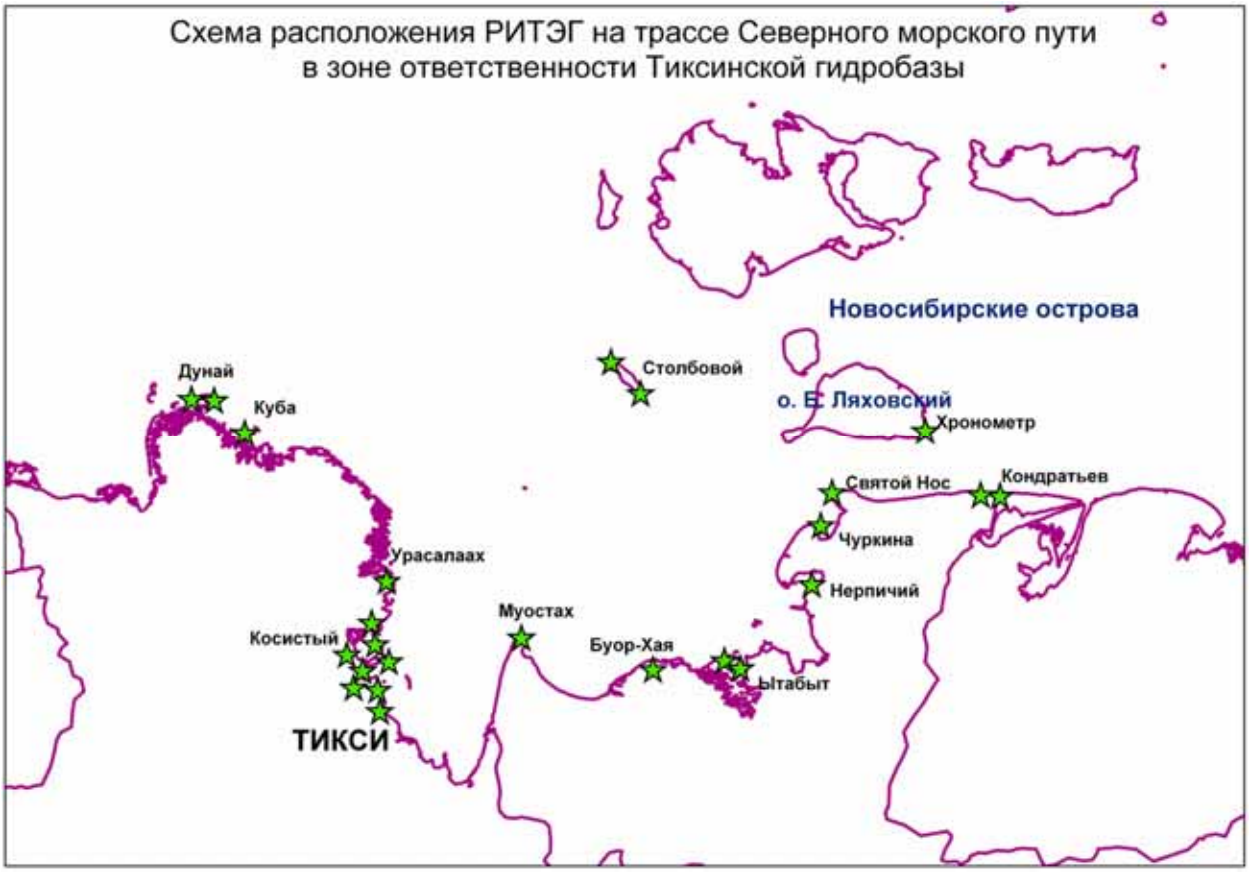
As a result of natural conditions and permafrost structure of costal area where navigation equipment is located in majority of cases RITEGs are deeped into tundra ground and in a case of high speed erosion of the costal zone can buried.

BUDGET

The budget of this demonstration project as well as scope of the work depends on amount of money allocated for this project. Preliminary estimates indicate that full disposal of RITEGs in Repiblic of Sakha (Yakutiya) and Chukotsky AO are equal

to several millions of US$. High cost of disposal is associated with difficult access and high logistic costs. Severe weather conditions reduce the period of active remediation work to several months.

Budget of the project and scope of work will be further elaborated in consultations with VNIITFA and regional authorities.



ANNEX XI

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/7(2)

Item 7 of the Agenda

Processing of Associated Gas and Use for Heat Supply in Konda Region of Khanty-Mansiysk AO

Prepared by: the Project Office
Status: approved by the Project Steering Committee

Processing of associated gas and Use for Heat Supply in Konda Region of Khanty-Mansiysk AO

Introduction

An important pollution source of CO2 in Kondinsky District of Khanty-Mansiysk Autonomous Okrug-Yugra (KhMAO-Yugra) is petroleum Associated Gas (AG) burning in flares. About 130 million m^3 of AG is flared annually in Kondinsky District by different oil companies and about 6 Billion m^3 in the KhMAO-Yugra region.

Supply of heat and hot water to the region's municipal facilities and industrial enterprises is now an acute issue. The base fuel for boiler houses is solid fuel (coal, wood) and liquid fuel (oil). Coal is transported from distance more than 3,000 km.

The cost of heat energy is high and ranges from 900 to 4,000 rubles/Gcal. This is because of inefficient equipment in the boiler houses, significant losses in the heating networks, and low fuel use efficiency. Local Administration has to partially subsidize residents the total amount of which is 11,1 thousand people.

In the city of Urai (in Konda district) the cost of heat energy in central boiler houses that operate on gas does not exceed 500 rubles/Gcal, whereas at individual gas-fired boilers the cost of heat energy is 200-250 rubles/Gcal.

The problem of utilizing flared natural gas associated with oil extraction remains a problem in Konda region, however.

The OAO "Yukon Gas" together with the Administration of Konda district, with the active support of the Government of Khanty-Mansiysk Autonomous Okrug-Yugra and with participation by the Department of Oil, Gas, and Minerals, Department of Investment, Science, and Technology, and Department of Development of the Housing and Municipal Complex of the autonomous okrug, have initiated a project designed to utilize associated natural gas and transport the processed product by vehicles to the site where it is consumed, using cryogenic technologies

Project Objective

- Utilization of associated natural gas (ANG) at small-scale flares by separating it into fractions and liquifying it.
- Supply of ANG processing products to meet the needs of Konda and October districts (municipal heat supply, replacement of solid and liquid fuels with natural gas at industrial boiler houses, and household needs of the district population).

- Reduction of the cost of heat supply for the people of Konda region, reduction of the level of subsidies from the regional budget for the production of heat energy.

Baseline Scenario

Pursuant to a work assignment from the Administration of Konda district, the Urals Center for Energy Efficiency and Ecology has prepared a business plan for "Reduction of Associated Natural Gas and Its Utilization for Heat Supply of Konda district," within the framework of the district "Energy Conservation" program.

Pursuant to a work assignment from the Department of Investments, Science, and Technologies of Khanty-Mansiysk Autonomous Okrug-Yugra, a Technical Report has been prepared on the scientific-research work entitled "Cryogenic Technologies for Utilization of Associated Natural Gas in Konda region."

Both documents confirm the technical, economic, environmental, and social feasibility of introducing cryogenic technologies for ANG utilization and the use of ANG processing products at heat-generation facilities in Konda region.

The project provides for taking 35 million m^3 of associated natural gas from the flaring line directly at the Danilovskii TPP (territorial production plant) site operating by" Urai NegteGas" of OOO "Lukoil - West Siberia" by an ANG processing facility manufactured as a modular unit.

The unit dries the associated natural gas and strips the carbon dioxide and hydrogen sulfide. It processes the ANG using low-temperature separation to divide the ANG into desired gas mixtures to obtain compression gasoline in liquid form and further stable compression gasoline (SCG) and a propane-butane mixture (PBM). Using low-temperature technologies, a methane-ethane fraction (MEF) in liquid form is obtained.

Storage containers for SCG, PBM, and MEF are set up at the processing unit site based on a three-day unit production cycle.

Transport of the ANG processing process to the place of use will be by vehicles in containers for the liquified hydrocarbon gases, including MEF in cryogenic containers.

The equipment for ANG processing and transport of the ANG processed product is Russian-made, except for certain automated control units.

Project Results

The processing unit will receive 45 million m^3 of natural gas per year. Estimated emission reduction will be equal to 433 072 tons of CO_2 equivalent

The rated production capacity of the unit is as follows:

MEF				PBM				SCG			
t/day	m3/day	000t/ day	000 m3/ year	t/day	m3/day	000t/d ay	000 m3/ year	t/day	m3/day	000t/ day	000m3/ year
46.9	152.9 9	16.2	52.78	13.4	24.6	4.62	8.49	6.825	10.82 5	2.364	3.70_

Project activities and timetable (project duration)

Current project status	Conceptual phase; business plan has been developed
Financing status	Investors are being sought. The issue of financing the development of a comprehensive technical and economic project justification is being decided in the Government of Khanty-Mansy Autonomous Okrug
Key agreements	Contract with OOO “Lukoil-West Siberia” for the supply of associated natural gas from the Danilovskii field – in development phase (Agreement on cooperation for gas supply for the district has been concluded by the Konda district government and OOO “Lukoil-West Siberia.”) Agreement for MEF supply for municipal needs has been concluded with the district government Agreement for MEF supply with MDF Forest Products Company – protocol of intentions has been concluded Agreement for design of the ANG processing unit - (protocol of intentions has been concluded) Loan agreement with investors (investors are being sought)
Project development	By August 1, 2007
Equipment delivery	By January 1, 2008
Completion of construction and assembly	First half of 2008

Full start-up	August 2008
Project risks	Organizational risks: Operation of the cryogenic unit is possible only if there is a permanent market for the product. Therefore, parallel to the implementation of this project, a project is planned for renovation of the municipal heating system, the installation of SSOG receiving tanks in population settlements, and the installation of individual gas-fired boilers in public facilities and residential buildings. This program has district-level status and will be financed with budget participation by Konda district
Project risks	Technical risks: Liquification units are not standard equipment, because the overall plan and equipment composition depend on a number of facility-specific parameters: gas pressure, gas composition, presence of valuable and harmful admixtures, moisture, and solid admixtures. At the same time, there is an agreement with an organization (ZAO "Neftegastop") that has appropriate experience in design, manufacture, and assembly of the unit (www.cryogenmash.ru/In.php) Financial risks: Project costs are relatively high ($18.9 million). But the financial indicators are good (payback period five years, IRR 31%, and NPV 182.4 million rubles). The financial risks are lessened by the Okrug Government's guarantee of favorable conditions for the project and "Yukon Gas's" amortization of the interest payments on the loan.
Innovative approach and opportunities for project dissemination	1. The ANG utilization project has two innovative features: – Utilization of associated natural gas from small-scale flares at oil facilities – Use of cryogenic technologies to liquify the gas and transport the methane-ethane fraction of the gas in a liquid state to place of use. 2. Further application of the technologies and approaches tested during project implementation to solve the problem of using associated natural gas at small-scale flares and to develop "small" energy industry on this basis.
Interested parties and beneficiary	Administration of the Konda district municipality Open Joint-Stock Company "Yukon Gas"

Project Budget

Costs		Rubles	US$ (26.33 rubles/$)
Total cost (all investments 2007)	all costs	498,000,000	18,913,787
	capital costs	378,000,000	14,356,248
	materials	15,750,000	598,177
	production costs	5,634,820	214,008
	staff	10,668,000	405,165
	other (including taxes, design, consultants, administrative support, travel, meetings, conferences, communication services)	87,947,180	3,340,189

Implementation monitoring plan and project assessment

Annual income after project completion (2008-2016)		182,966,102	6,948,959
Anticipated annual costs (2008-2016)		88,154,493	3,348,063
Net annual profit (2008-2016)		94,811,609	3,600,897
Project financial indicators	Payback period		5 years
	IRR		31%
	NPV		182,426,559 rubles
	Sales profitability		51-53%
	Budget revenues (10 years)		292,985,400 rubles

ANNEX XII

STEERING COMMITTEE

of the UNEP/GEF Project

"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting

St. Petersburg, Russian Federation

April 25 - 26, 2007

STC 2/8(1)

Item 8 of the Agenda

Localisation and removal from a thermokarst crater of two radioisotope thermoelectric generators (RITEGs) of GONG type at the Kondratiev navigation beacon site (Sakha (Yakutia) Republic, Ust-Yanski Ulus)

Prepared by: Project Office
Status: approved by the Project Steering Committee

Localisation and removal from a thermokarst crater of two radioisotope thermoelectric generators (RITEGs) of GONG type at the Kondratiev navigation beacon site (Sakha (Yakutia) Republic, Ust-Yanski Ulus)

Project Name	**Localisation and removal from a thermokarst crater two radioisotope thermoelectric generators (RITEGs) of GONG type at the Kondratiev navigation beacon site (Sakha (Yakutia) Republic, Ust-Yanski Ulus)**
Overall Goal	**Radiation safety and radioactive contamination threat to an Arctic aquatic area at Ust-Yanski Ulus**
Objectives	**- to determine the depths two RITEGs are buried at near the Kondratiev navigation beacon site** **- to extract the two RITEGs from a thermokarst crater to the surface**
Location of the Kondratiev Site	**Ust-Yanski Ulus, the coast of Dmitry Laptev Strait, connecting the Laptev Sea and East-Siberian Sea. The site is serviced by the Tiksi Hydrographical Base (the settlement of Tiksi). The distance from Tiksi to the site is 650 km by air.**
Duration	**2007 - 2008**
Implementing Agencies	Research institutes, accredited labs, companies, organizations
Total Project Cost	3,000.0 thousand rubles
Expected Project Outcomes	A radioactive contamination threat is eliminated for Ust-Yanski Ulus' aquatic area
Monitoring Agency	Ministry of Environmental Protection of the Sakha (Yakutia) Republic

1. OUTLINE OF ISSUES AND WAYS TO ADDRESS THEM

Radioisotope thermoelectric generators (RITEGs) are commonly used to supply power to onshore navigation safety beacons placed on the Sakha (Yakutia) Republic's coast along the Northern Sea Route,

As they have been in operation longer than their design lifetime, there is now an important issue of replacing them with new ones and transporting for safe utilization until 2011.

In 2002, it was found that the Kondratiev navigation beacon at Ust-Yanski Ulus had been destructed completely and two RITEGs of the Gong type had been lost (Figure 1).

According to IAEA, the Gong type RITEG is a permanent storage container for radioisotope heat source (RHS) using Strontium-90 isotope (^{90}Sr) (Fig. 2).

Its dimensions are 111x80x103 sm^2, weight - 700 kg. It has a biologic shield made of lead and depleted uranium, and a heat radiator of aluminium alloy.

RHS is a double hull capsule of heat-resistant stainless steel, and contains ^{90}Sr with a total activity of 3.5x10^{15} Bq.

A radiation at the RITEG's surface does not exceed 2 mSv/h, while that of 1 m away is 100 μSv/h.

RITEG's outer case temperature is at most 25°C higher than the ambient temperature, and RIT's thermal energy output is 315W.

Studies in 2003 revealed that the RITEGs were buried at a depth of 2 to 5 m under a layer of mud. The reason was the collapse of a section of the shore as a result of progressing thermokarst processes.

As the site where the navigation beacon is located is very hard to access, no monitoring of the site by competent authorities has been carried out for a long time. The first time that radiation levels were measured within the area controlled by the Tiksi and Pevek hydrographic bases was in 2001 by Ms. Argunova T.V., Head of Nuclear and Radiation Safety Monitoring Department [*Radioisotope…*, 2001]. The study revealed many violations of the existing radiation safety norms and requirements:

- RITEGs are beyond design lifetime;

- Lack of disciplinary barriers;

- RITEGs are placed too close to residential areas at polar stations;

- Equipment at navigation safety sites including RITEGs are damaged by humans,;

- Absolute majority of navigation sites with RITEGs do not ensure proper operation;

- Lack of proper control on the part of the agency operating the sites, maintenance not carried out for a long time (6 years);

- There are threats of RITEGs being flooded (Island of Peschany, etc.), falling into the sea (Paksa Cape, etc.) or sinking into a thermokarst crater (Kondratiev navigation beacon, etc.).

During a helicopter trip to the Kondratiev site by Naryzhenko A.I., Lead Engineer, Tiksi Hydrographic Base, it was found that the 2 RITEGs were sunk in the mud by ¾ of their height, as a result of shore abrasion.

From 26 to 28 August 2003, field studies were carried out by researchers of Regional Geophysics and Deep Technology Department and Integrated Geologic and Ecologic Studies Department, FGUP All-Russian Research Institute for Exploration Geophysics VIRG-Rudgeophysika (Saint-Petersburg), near the Kondratiev site to locate the GONG type RITEGs and determine the depth they were buried at [*Locating…*, 2003]. Based on geomagnetic, electric exploration and radiometric survey data and their interpretation using a mathematical model, the buried RITEGs' co-ordinates were calculated, with one of them buried at 2-3 m depth, and the other at 3-5 m depth, with no leaks of radioactive matter detected.

Proposed approaches

A number of actions is proposed to be undertaken in 2007 to prevent radioactive contamination of the sea near the Sakha (Yakutia) Republic's coast. , The actions are aiming at extracting the two GONG type RITEGs at the Kondratiev navigation beacon from where they are currently buried.

The project participants will include:

- Tiksi Hydrographic Base – RITEG operating agency;

- Representative of the All-Russian Research Institute for Technical Physics and Automatics (VNIITFA) – RITEG manufacturer;

- VIRG-Rudgeophysika – agency that conducted studies on locating the RITEGs in 2003.

The first stage of the project will involve preparation of required equipment and outfit, and conclusion of contracts with implementing agencies.

Field operations should be preferably scheduled at the end of March, or at the beginning of April, when it is still possible to use caterpillar transport to deliver the equipment and project team to the site. The use of land transport will allow:

- Providing machinery assistance to work on the RITEGs extraction;

- Transporting the RITEGs to the site where these will be loaded on a ship and transported to the utilization facility;

- providing team members with mobile homes, what is really important taking into consideration harsh local weather conditions.

It is possible to deliver the team and equipment to the project site at the Kondratiev beacon by sea in early autumn (August-September). In this case it will also be needed to deliver to the extraction site a hoisting device with a load-carrying capacity of around 2 tons. A helicopter will be needed later for carrying the RITEGs to the ship-loading site.

The RITEGs will be located by using a set of geophysical methods, including geomagnetic, electric exploration and radiometric surveys. The survey data will be then interpreted by means of mathematical simulation.

Earth and ice moving and RITEG extraction operations will be carried out with the help of hoisting device of 2 ton capacity (a RITEG with its transport container clogged up with ice and mud will weigh at least 1.5 tons).

When extracted, the RITEGs will be cleaned, inspected, rendered safe and loaded into special transport containers. Before the RITEGs are transported to the utilization site, all required documentation will be prepared.

All necessary measures will be taken to meet radiation safety requirements and to protect the personal involved.

Duration: field operations – March-April (August-September) 2007, and deadline for the completion report – December 2007.

Total project costs: 3,000,000 rubles.

References:

1. Radioisotope thermoelectric generators of the Tiksi and Pevek hydrographic bases and their impact on the environment. Report / Nuclear and Radiation Safety Monitoring Department, Ministry of Environmental Protection of the Sakha (Yakutia) Republic, Argunova T.V. – Yakutsk, 2001.

2. Locating power-generating radionuclide devices, GONG type, near the Kondratiev navigation beacon on the Laptev Strait shore by a set of geophysical field methods. Report / VIRG-Rudgeophysika, Ammosov D.A. – SPb, 2003.

STEERING COMMITTEE
of the UNEP/GEF Project
“Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment”

2nd Meeting
St. Petersburg, Russian Federation
April 25 - 26, 2007

STC 2/8(2)

Item 8 of the Agenda

Increasing the efficiency of electrostatic precipitators at Arkhangelsk pulp and paper mill

---

Prepared by: Project Office
Status: approved by the Project Steering Committee

1. Project Background

The key sources of environmental pollution in the Russian Arctic are pulp and paper industries, with their polluted emissions and discharges affecting ambient air and waters negatively. One way to pollute the atmosphere with solid particles is through incinerating black lye in soda regenerating boilers whereby fine sodium sulfate particles are produced. These particulate matter is usually trapped by electric filters (EF), but a proportion enters the atmospheres nevertheless, as the filters have limited capacity.

Many studies conducted worldwide suggest that the solid particles have an adverse impact on human health. Many respiratory illnesses, such as asthma, chronic bronchitis, and lung cancer, may be linked to elevated solid particle levels in ambient air. A percentage of patients suffering from these illnesses die [1].

In addition, solid particles depositing on buildings and facilities facilitate destruction processes thereon, as a result of chemical reactions they have with surface materials. Solid particles emitted to the atmosphere can be carried over long distances to pollute the environment far away from their source. Findings of solid particle transcontinental transfer studies are published in [1,2].

The US Environmental Protection Agency (EPA) offers funds to spend on reducing polluting emissions. In 2003, EPA, jointly with OAO All-Russian Electrotechnical Institute (VTI), developed a project on reducing ash emissions from thermal power plant (TPP) electric filters. Implementing this project in 2003 through 2006 resulted in significant ash emission reductions [3].

In Russia's arctic areas, electric power is mainly produced by hydroelectric and gas- or mazut-fired plants. Key sources of environmental pollution in the region include pulp-and-paper combines (PPCs), totaling over two dozens to date. Electric filters in use at these combines are normally not efficient enough. As a result, the PPCs' emissions pose a serious threat to Arctic Russia's environment.

An especially serious situation is reported in Archangelsk Oblast where three large PPCs are located: Kotlasski, Solombalski and Novodvinsk. Annual emissions of harmful substances in the town of Novodvinsk are 200 kg per capita. The Novodvinsk combine is often referred to as 'the Archangelsk combine' as it is located very close to Archangelsk. In accordance to environmentalists, Novodvinsk is considered to be one of the most polluted towns in Russia [4]. Respiratory illness cases in Novodvinsk have been rising by 9.5% each year [4]. The main reason behind this is adverse impacts on human health that the Novodvinsk PPC produces. Therefore, reducing emissions produced by the Novodvinsk PPC electric filters is an important objective, and attaining it would help clean the environment in Russia's north.

2. Project Objectives

The proposed project is a follow-up on the EPA/VTI CIS TPP Emission Reduction Project. It involves reducing emissions from electric filters in use at the Novodvinsk PPC and cleaning the environment in Archangelsk Oblast. In addition, the project can be used as a model for increasing the efficiency of electric filter at PPCs elsewhere.

3. Basic Scenario

3.1. Electric Filter Description

The Archangelsk Pulp-and-Paper Combine has three electric filters: No. 3, No. 4 and No. 5. These filters serve to trap sodium sulfate produced by sodoregenerating boilers. The No. 3 Alston filter has a capacity of over 99.5% and needs no upgrading.

The No. 4 and No. 5 filters (made by Flakt and Semibratovsk Plant Company, respectively) has a capacity of about 90%. Annual emissions the two produce are around 1,000 tons. To contribute to cleaning the environment in Archangelsk Oblast it is needed to rise the efficiency of these electric filters.

3.2. Measures to take to increase the efficiency of the filters

Data provided by the combine suggest that around 50% of mechanical parts of the No. 4 and No. 5 filters have considerable wear and tear, including as a result of corrosion. It is evident that it is impossible to increase the filters' efficiency without upgrading the mechanical parts that are in need of repair. The extent of current wear and tear must be investigated first, to determine the existing faults and ways to effectively upgrade the electric filters.

The No. 4 electric filter has a control system manufactured by the Craft Company. The controls in question are reliable and ensure optimum voltage in the electrode system. It is clear that in case the filter's mechanical parts have been upgraded properly, the filter will run with efficiency that is high enough. Therefore, measures to increase the efficiency of the No. 4 filter will include mainly ones aimed at restoring and upgrading the filter's mechanical parts. The combine plans to implement a major renovation project in 2007, which will include upgrading the No. 4 electric filter's mechanical parts at their own cost.

By contrast, the No. 5 electric filter has an analogue control system supplied by a Russian producer. Studies conducted within the EPA/VTI project showed that doing just as little as replacing the outdated controls systems by modern microprocessor-controlled systems can result in reducing emissions at the filter's outlet by as much as 20%. In addition, the old system tends to break down frequently, which leads to additional emissions of solid particles. As coal-fired TPP electric filter modernization projects suggest, the most cost-effective measures to reduce solid particle emissions include those on replacing outdated power supply and automated controls systems.

The Novodvinsk Pulp-and-Paper Combine plans to have some repair work on the No. 5 filter in 2007, which will result in increasing its efficiency to an extent. However, to completely upgrade the filter's mechanical parts the combine is going as part of a capital repair project slated for 2008. It is expected that this will result in bringing emissions to the safe level.

Thus, 2007 will see the basic scenario to achieve the following objectives:

- Analyze the state of repair of the No. 4 and No. 5 filters and determine the amount of work needed to upgrade these;
- Supply a modern controls system for the No. 5 electric filter and equipment needed to complete installation;

- Have repairs and upgrading work done on the No. 4 and No. 5 electric filters;
- Install, tune up and optimize the controls system at the No. 5 filter;
- Run tests on the No. 4 and No. 5 electric filters.

4. Project Outcomes

As a result of project implementation, the No. 4 filter's efficiency is expected to rise to 98-99%, which is equivalent to a reduction of annual emissions by 800-900 t/year. The efficiency of the No. 5 filter is expected at 91-92%, or reduced emissions by 100-200 t/year.

In 2008, following major upgrading the No. 5 filter its efficiency is expected to be at 98-99%, with an additional decline in emissions of 600-700 t/year.

Additionally, the project can serve as a model for upgrading electric filters at pulp-and-paper combines elsewhere.

5. Activities and schedule

Table 1 contains project activities and implementation schedule.

Table 1

Project Lifetime (months: 11)												
Activities	Indicators	Project Months										
		1	2	3	4	5	6	7	8	9	10	11
1. Conclude contracts between Archangelsk PPC, OAO VTI and EPA	Contracts											
2. Study the filters' state of repair, and develop upgrading proposals	Report											
3. Purchase controllers, switchboards, interface modules for microprocessor control systems and equipment to install these	Documents to prove equipment delivery to VTI											
4. Manufacture power supply, automation and protection units for the control systems, assemble and install them into control system cabinets	VTI has control systems installed into control system cabinets											
5. Conduct work to repair and upgrade No. 4 and No. 5 electric filters												
6. Install microprocessor automated control systems at the No. 4 electric filter	No. 4 electric filter has control systems installed											
7. Run tests on the electric filters												
8. Project Completion Report	Report											

6. Project Implementation Arrangements

The project was agreed by the Archangelsk PPC administration (Mr. S.V. Churakov, Deputy Chief Engineer for New Technology) and OAO VTI (Mr. A.G. Tumanovski, First

Deputy Director General).

7. Project Sustainability (including financial sustainability) and risks relating to project implementation as well as mitigation measures

The project is designed to complete in 11 months and is funded by EPA, and thus its budget depends on the inflation rate and that of the US dollar. Additionally, the project involves importing equipment with customs duty implications. Risks that may affect project costs are as follows:

- Declining US dollar rate;
- Inflation;
- Rising customs duties.

The US dollar had a drop of 8% in 2008, while inflation ran at 11%. It is reasonably expected that customs duties on equipment import may grow by 10%. If 2007 sees the same US dollar and inflation rate trends, this will imply a rise in import equipment costs by 10%, as equipment purchase must complete within 6 months of the project's start date. In addition, imported equipment costs may rise along with customs duties. Therefore, the worst scenario will have a 20% rise in imported equipment costs.

The cost of the rest of project activities will be affected by inflation and dollar rate fluctuations only. The later the work is done the higher the costs involved are expected. To be sure, the cost of work done within the first month of the project may rise by 1.6% in the worst case, while the same done at the project's end – by as much as 18%.

To rise the project's sustainability the following measures are proposed:

1. Produce part of the equipment in Russia. This measure will reduce the total cost of equipment purchased under the project and allow reducing risks relating to increasing customs duties.

2. Pay most (or all) of the project's costs in advance. This measure will allow excluding risks relating to a drop in the US dollar exchange rate. The costs of work done under the EPA-VTI project in 2006 were covered by EPA as early as in March 2006.

3. Schedule the most expensive measures (purchase of equipment) for the project's early stages. This will allow reducing inflation implications on these project costs.

8. Innovation Approach and Possibility to Disseminate Project Outcomes

The project's outcomes at the No. 4 electric filter will include installing state-of-the-art microprocessor controls systems by the Castlet Company (Great Britain). These systems allow non-stop electric field monitoring. They include algorithms that allow achieving an electric filter's maximum feasible efficiency, regardless of trapped dust's or furnace gas' composition. Similar systems can be used not only at the rest of PPCs in the Russian Arctic, but also at other industries that use the filters in question, as a matter of increasing their efficiency.

9. Stakeholders and beneficiaries

The Project's key stakeholder is the Novodvinsk PPC. Sodium sulfate trapped by the filters can be re-used. Thus, as the electric filters have their efficiency boosted, the combine will have a surplus income, which comes as payback resulted from the capital renovation of the filters. To be sure, an average sodium sulfate price of 2,000 RUR/t, and a 800 t/year reduction in sodium sulfate emissions would result in a payback amount of 1 million 600 thousand Russian rubles a year.

The Novodvinsk population will have a solid benefit, too, as harmful emissions are reduced, resulting in a lower number of respiratory patients.

As the project is replicated at other pulp-and-paper combines, there will be a reduced pollution of Arctic seas and a decline in transcontinental transfer of solid particles. This will have clear positive implications worldwide.

10. Project Budget

The project budget is given in Table 2.

Table 2

	Activity	Cost, in thousand US$	Deadline, in months from the Project start
1	Conclude contracts between Archangelsk PPC, OAO VTI and EPA	3.0	1
2	Study the filters' state of repair, and develop upgrading proposals	7.0	2
3	Purchase controllers, switchboards, interface modules for microprocessor control systems and equipment to install these	50.0	6
4	Manufacture power supply, automation and protection units for the control systems, assemble and install them into control system cabinets	20.0	8
5	Install microprocessor automated control systems at the No. 4 electric filter	5.0	9
6	Run tests on the electric filters	9.0	10
7	Project Completion Report	6.0	11
	Total	100.0	11

Work under activities 1**,** 2, 6, 7 is to be done by OAO VTI, and that under activities 3, 4, and 5 – by a subcontractor, ZAO Novaya Atmoshperoohrannaya Tekhnika (New Air Protection Technology). Advance payment will be required for activities 3, 4 and 5. Such work structure was successfully implemented in the joint EPA-VTI project in 2003 to 2006.

All costs listed in the table include pay to people involved. Activity 2, 5 and 6 costs include participants' per diems, those of activities 3, 4 and 5 – costs of material and equipment involved, and those of activities 1 and 7 – communication costs.

The Novodvinsk PPC will do repair and upgrading work on the No. 4 and No. 5 filters at its own costs.

11. Project Monitoring and Evaluation Plan

The progress of the project will be monitored against indicators, presented in Table 1. Project is to be evaluated based on electric filter efficiency measurements following the completion of all proposed upgrading work.

References

1. "Health and Environmental Effects of Particulate Matter - Fact Sheet," available at http://www.epa.gov/ttn/oarpg/naaqsfin/pmhealth.html.
2. "Transboundary Particulate Matter in Europe: Status Report 2001," available at: http://www.nilu.no/projects/ccc/reports/emep4-2001.pdf
3. Report on the Russian-US Project «Low-cost ESP Upgrading at Russian and NIS TPPs» 2006 Prepared for EPA by VTI
4. ECO Monitor – Greening Novodvinsk will not Solve its Environmental Problems, http://www.ecomonitor.ru/printfrom_news/?nid=ce950d42ebac76ba9f6198abc5c518d2

STEERING COMMITTEE

of the UNEP/GEF Project

“Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment”

2nd Meeting

St. Petersburg, the Russian Federation

April 25 - 26, 2007

STC 2/8(3-6)

Small Pilot and Demonstration Projects For Kola Bay

Prepared by:	Project Office on a basis of results provided by Murmansk region and pre-feasibility studies performed by NEFCO in 2006 as well as on the results obtained from Environmental Harmony Evolution Fund
Status:	approved by the Project Steering Committee

Small Pilot and Demonstration Projects for Kola Bay

INTRODUCTION

The Murmansk Oblast coastal area and the Kola Bay represent a vital resource for people, flora and fauna in the region as well as the basis for industrial development.

The period from the 1920s until the end of the 1980s was characterized by the rapid development of port facilities and industrial activities in the region. Towns and villages were built and military garrisons were set up with little attention to environmental issues.

Today there can hardly be found any undisturbed ecosystems along the Kola Bay coast, mainly as a consequence of the fishing activities, the commercial and nuclear fleets, and other water users. The problem was aggravated by dramatic changes in the economy of the region, and the country, during the period from the Perestroika (early 90's) to present day. Large fishing fleets, fish processing and ship repair enterprises collapsed, replaced by smaller companies paying no attention to environmental problems, seeing them as an unnecessary burden.

The coastal area of the Murmansk region is, due to its geopolitical position and economic development peculiarities, characterized by high density of ships belonging to the civil fleet (fishing and merchant) and the Navy. On the expiry of their lifetime some ships are decommissioned, and are bought by new owners for further exploitation, sent for dismantlement and scrapping/recycling, or partially scrapped/recycled. Hulls are left in the coastal areas, and even worse – scuttled. Vessels abandoned along the Kola Bay coast and scuttled in its water area give reason for concern, as they trigger irreversible processes of the environmental degradation and ecological threat to the coastal areas.

Environmentalists are increasingly concerned by the finding of petroleum and other hazardous compounds in and near the abandoned and scuttled ships. There have been reported cases where abandoned ships have been used by careless ship owners as reservoirs for waste, which ought to have been delivered through official services to harbor reception facilities for further treatment or utilization. Monitoring the bottom sediment pollution revealed a content of pollutants (heavy metals, PCB and petroleum hydrocarbons) at the dumpsites ten times higher than in other areas of the Kola Bay. There are no national standards in Russia for the allowed content of pollutants in the bottom sediments. Therefore, the level of the bottom sediment pollution was analyzed as compared to the pollution level of the open area in the Barents Sea. Recently the pollution level classification system from Norway, defined by the Norwegian Pollution Control Authority (SFT) is often used. According to this classification, the bottom sediment pollution by heavy metals in the region of the Green Cape dumpsite refers to the group V (Very Bad) when it comes to copper and lead content, and to the group IV (Bad) for chrome and nickel (based on the analysis of samples taken in 2002 and treated at the MUGMS laboratory).

The Kola Bay is ranked as fishing reservoir of top priority, where Atlantic salmon and humpback salmon are migrating through to the spawning areas in the Kola and Tuloma rivers. The dumpsites of abandoned ships and shipwrecks contribute to pollution already done by liquid waste and sewage originating from Murmansk, Severomorsk, Polyarny and other coastal settlements, by preventing pollutants from being transported away by water masses. The purity of the fish, as well as people's health, depends on the purity of the Kola Bay environment. Waters from the bay transport pollutants to the coastal areas of the Barents Sea, areas of intensive fisheries' activity. Thus, ship dumpsites produce negative impact on bottom sediments and waters of the Barents Sea. This attributes an international dimension to the problem.

Some 120 ships and metal constructions are located on the bottom of the Kola Fjord in Murmansk Oblast, which - apart from being a threat to the environment - also form a serious obstacle for navigation. Several studies have been made on this topic. In recent years, increasing prices on metals have stimulated many private initiatives to take care of the scrap, which for a while has reduced the authorities' priority to this hot spot. However, recent studies, e.g. by the WWF, has raised the problem on the Oblast Administration's agenda. The Regional Target Programme for 2006-2008 pays higher attention to the Kola Fjord, especially on the treatment of oil spill and ship wrecks.

The major part of abandoned and scuttled ships cannot be regarded as ships anymore as they are not seaworthy and their hulls look like sieves as the result of profound corrosion. According to expert estimations, in addition to abandoned and half – sunken ships along the coastline, there are 40 scuttled ships and metal constructions located in the Kola Bay water area. Sad truth, proven by statistics, is that even nowadays, in spite of all modern navigation and safety facilities, accidents still happen and ships still sink even in the Kola Bay where salvage units are readily available. The latest accident happened in 2005 in the Saida Bay, where the floating crane No1735 sank. As a rule, ships sunken in the Kola Bay are neither recovered nor removed. The reason is that salvage is expensive. All in all, shipwrecks are the source of serious navigation danger, even though their location is marked on navigation maps and in situ by navigation signs in the water.

Another noteworthy example of sunken ships causing navigation danger is the hunting ship "Teriberka" that sank in the water area of Murmansk Commercial Harbor in 1993. In addition to the navigation danger, this ship is an environmental danger as she still holds some 46 tons of gasoline (by ASMI records). The ship sunk in the fairway, and buoys mark her location. Minimum clearance between the body of the ship and the water surface is 17 meters. There have been 4 registered cases of collisions of large ships with the "Teriberka" hull. As good luck would have it, no major consequences followed.

Over the last years, the problem of scuttled and sunken ships posing danger to navigation in the Kola Bay has become more acute with the view of dynamics and development of shipping and transshipping of oil products in the Kola Bay. Especially the development with the use of large tankers and offshore oil terminals network,

represent a risk. The number of ship calls at the Kola Bay increased in 2004 as compared to previous years. The statistics is as follows: total number of calls; 86928, including 1855 foreign-, and 84507 Russian ships. The number of large capacity ships was 4224, and 2929 calls was accompanied by foggy weather.

All abandoned and scuttled ships, as well as all other ships, are regularly detected and monitored on the screens of the SUDS operators. It enables to provide the tankers navigation and mooring safety. The Kola Bay is the federal property. Yet, none of the federal programs provides any measures for rehabilitation of the Kola Bay environment. Removal of ships from the dumpsites will eliminate the source of the intensive water and bottom sediment pollution, the ecological danger hot spot, and enhance navigation safety.

This proposal described potential projects proposed by Murmansk regional administration and is based on pre-feasibility study performed by NEFCO in 2006 as well as on the results obtained from Environmental Harmony Evolution Fund (EHEF).

2. PROJECT OBJECTIVES

The following projects have been proposed by the Murmansk regional administration:

1. ***Salvation and scrapping of the hunting ship "Teriberka"*** Objective of this Project is to remove the hunting ship "Teriberka" from the bottom of the Kola Fjord and utilise it as well as its load, in an environmentally safe way (due to its location in the mid of the fairway close to the surface)

2. ***Complete salvation and utilisation of the 12 remaining ships at the dumping site "Lavna"*** Objective of this Project is to remove all remaining vessels and other constructions from the Lavna dumping site and serve for its safe and environmentally safe utilisation (since almost half of them were removed and utilised in 2005 and it would be positive to have a whole dumping site completely eliminated)

3. ***Complete data base on abandoned vessels in Murmansk Oblast****.* Objective of this Project is to get a thorough overview on the potential content of environmentally hazardous substances and estimated salvation costs of all abandoned vessels and other constructions along the shores of Murmansk Oblast as a guidance to future salvation projects aimed at the complete elimination of Hot Spot M9.

4. ***Cleaning of hazardous substances from the bottom sediments of the Kola Fjord. Phase 1. Monitoring of hazardous substances in the bottom sediments of the Kola Fjord.*** Objective of this Project is to map the concentrations of hazardous substances of the bottom sediments of the Kola Fjord with the aims to a) identify pollution sources and deposits and b) to map the changes of concentrations over time.

5. ***Decontamination of oil sludges and oil contaminated soil.*** Objective of this Project is to test bioremediation technology for oil contaminated soil. Additional pre-feasibility study is required for this project

3. BRIEF DESCRIPTION OF THE PROJECTS

Project # 1. Lifting and scrapping of the hunting ship "Teriberka"

Project Title:	***Lifting and scrapping of the hunting ship "Teriberka"***
Objective:	To remove the hunting ship "Teriberka" from the bottom of the Kola Fjord and utilise it as well as its load, in an environmentally safe way.
Activities:	1. Underwater inspection of the ship incl. video-taping as preparation for lifting 2. Technical preparations for the salvation/lifting operation 3. Lifting 4. Tugging to port 5. Dismantling, scrapping and utilisation of the ship
Expected results:	- The "Teriberka" has been removed from the bottom of the Kola Fjord without discharges of hazardous substances to the water and the sediment - The shipwreck does not cause danger either to the environment nor to navigation - As well the "Teriberka" and its load (incl. 66 tons of oil products) have been utilised in an environmentally safe way, limiting emissions of hazardous substances to the environment in accordance with RF norms. Deposits of environmentally hazardous substances shall be destructed in an environmentally safe way in accordance with RF and/or international standards. - The cleaning of the site as well as the utilisation/destruction methods have been well documented as well as the amounts and quality of utilised materials. - All necessary permissions and de-registration procedures have been completed in accordance with previous owners and the requirements of local, regional and federal authorities so that the formal existence of the previous vessels, constructions etc. could be regarded as ceased. - The action has been announced in local and regional mass media
Impl. Period:	March –October 2007
Operators:	- Committee on Nature Resources and Environmental Protection of the MRA - Murmansk Commercial Port - Salvation enterprise - Scrapping enterprise - Diving enterprises
Coordinator:	EHEF
Estimated costs:	12,0 MRUR (352 kEuro)
Allocated funds	Income from scrapped metal (135 USD x 900 tons): 3.1 MRUR (106 kEuro) Commercial Port: 2,5 MRUR (73 kEuro)

	EHEF: 1,0 MRUR (29 kEuro)
Remaining needs for funding:	6,6 MRUR (144 kEuro)

Project # 2. Complete salvation and utilisation of the 12 remaining ships at the dumping site "Lavna"

Project Title:	***Complete salvation and utilisation of the 12 remaining ships at the dumping site "Lavna"***
Objective:	To remove all remaining vessels and other constructions from the Lavna dumping site and serve for its safe and environmentally safe utilisation
Activities:	1. Employment of sub-contractors (operators) 2. Underwater survey incl. videotaping and description on every vessel and recommendations for its salvation 3. Preparation of permission on the salvation, dismantling and scrapping 4. Monitoring of the bottom sediments before and after the operations 5. Remove all vessels, constructions and remaining items from the bottom and shore at and nearby the Lavna dumping site. 6. Safeguard complete and environmentally safe utilisation of all items removed from the Lavna dumping site. 7. Final inspections and documentation of shore and bottom. 8. Reporting of activities, results and economy.
Expected results:	- The dump site of Lavna is free from vessels, constructions and other scrap related items earlier located on its bottom and shore - All removed items have been scrapped and/or utilised in an environmentally safe way limiting emissions of hazardous substances to the environment in accordance with RF norms. Deposits of environmentally hazardous substances shall be destructed in an environmentally safe way in accordance with RF and/or international standards. - The cleaning of the site as well as the utilisation/destruction methods have been well documented as well as the amounts and quality of utilised materials. - All necessary permissions and de-registration procedures have been completed in accordance with previous owners and the requirements of local, regional and federal authorities so that the formal existence of the previous vessels, constructions etc. could be regarded as ceased. - Relevant measures from the authorities prevent that the area around the Lavna become a dumping site again. - The action has been announced in local and regional mass media
Impl. Period:	January –October 2007
Operators (sub-contractors):	- Diving enterprises - Scrapping enterprises

	- The Laboratories of MUGMS and PINRO
Coordinator:	EHEF together with the Commercial Port (the latter being the owner of the site)
Estimated cost:	13,0 MRUR (381 kEuro)
Allocated funds	Income from scrapped metal (135 USD x 2000 tons): 7.0 MRUR (205 kEuro) The Regional Target Program: 3.0 MRUR (88 kEuro) 10.0 MRUR (293 kEuro)
Remaining needs for funding:	3,0 MRUR (88 kEuro)

Note: The project is included in the Regional Target Programme, and the conditions for its implementation thus have to be firmly coordinated with the Regional NRC.

Project # 3. Complete data base on abandoned vessels in Murmansk Oblast

Project Title:	***Complete data base on abandoned vessels in Murmansk Oblast,***
Objective:	To get a thorough overview on the potential content of environmentally hazardous substances and estimated salvation costs of all abandoned vessels and other constructions along the shores of Murmansk Oblast as a guidance to future salvation projects aimed at the complete elimination of Hot Spot M9.
Activities:	1. Inventory of all abandoned and sunken ships 2. Determination of their positions 3. Determination of the status of the objects and their pollution potential 4. Solve the property issues on every identified object (define it as scrap) 5. Prepare a complete data base on all abandoned and sunken ships in the Kola Fjord and define it as scrap metal
Expected results:	A digital data base on all abandoned vessels and other constructions along the shores of Murmansk Oblast, showing - Name and identity of the vessel/construction (incl. owner, load etc) - Location (Long, Lat, Depth) - Hull size in tonnes - Amount and quality of potential pollution sources in and in absolute adjacency to the vessels etc., especially hazardous pollution such as oil, heavy metals and in particular potential sources and content of PCB - Suggested salvation incl. lifting, transportation and utilisation/destruction works - Estimated costs for the salvation operation The data base shall be open for relevant authorities and potential funding partners and serve as a base for the preparation of further salvation projects in order to enable the complete elimination of Hot Spot M9.
Impl. Period:	February – October 2007
Operators:	Committee of Nature Resources and Environmental Protection of the MRA Rostechnadzor Murmansk Commercial Port Murmansk Fishing Port Naval Register Arctic Special Marine

	Rosprirodnadzor Inspection
Coordinator:	EHEF
Estimated costs:	1,5 MRUR (44 kEuro)
Allocated funds	0
Remaining needs for funding:	1,5 MRUR (44 kEuro)

Project # 4. Cleaning of hazardous substances from the bottom sediments of the Kola Fjord. Phase 1. Monitoring of hazardous substances in the bottom sediments of the Kola Fjord

Project Title:	***Cleaning of hazardous substances from the bottom sediments of the Kola Fjord. Phase 1. Monitoring of hazardous substances in the bottom sediments of the Kola Fjord (in combination with BEAR authority co-operation project!)***
Objective:	To map the concentrations of hazardous substances of the bottom sediments of the Kola Fjord with the aims to a) identify pollution sources and deposits and b) to map the changes of concentrations over time.
Activities:	1. Planning and preparations of the monitoring operation 2. Sampling of water and bottom sediments in the Kola Fjord 3. Laboratory analysis of the water and sediments with respect to heavy metals, petroleum products and PCB 4. Assessment of the results and preparation of pollution distribution maps 5. Preparation of recommendations 6. Reporting
Expected results:	Map of the concentrations of hazardous substances in the bottom sediments of the Kola Fjord and other dump sites for abandoned ships, with respect to (at least) the following substances: - PCB - Oil products - Heavy metals as Cd, Zn, Cu, Pb - Recommendations for remedy/cleaning actions of these sediments - Annual reports presented to federal and regional authorities at a certain annual follow-up seminar and regarded by the annual action plans of these authoriites and by the Regional Target Program. A final report including maps for all five years of the survey and an anlysis of changes and actions.
Impl. Period:	January 2007 – December 2012
Operators:	Nature Resource Committee of the MRA Arctic Specialised Marine Inspection

	MUGMS (Gidromet) PINRO
Coordinator:	EHEF
Estimated costs:	10,0 MRUR (300 kEuro)
Allocated funds	0
Remaining needs for funding:	10,0 MRUR (300 kEuro)

Project # 5. Decontamination of oil sludges and oil contaminated soil.

Additional pre-feasibility study is required for this project. Experience gained within LIFE-project implemented by the Finnish Environment Institute (SYKE) should be used. Biodegradation potential of petroleum hydrocarbons has been studied extensively in a research projects of the Finnish Environment Institute in 1999-2002. In those projects the biodegradation was found to be efficient and potential exist for remediation by natural attenuation.

4. PROJECT IMPLEMENTATION ARRANGEMENTS

As project owner, probably the Committee for Nature Resources and Environmental Protection of the Murmansk Regional Administration should be identified. However is seems appropriate to suggest the Environmental Harmony Evolution Fund, EHEF as operator referring both to the official role it has been given by the Administration but also to the broad experience the organisation has of similar activities.

the EHEF, has organised and co-ordinated similar operations on the abandoned ships in the Kola Fjord both in 2002, 2005 and earlier. The operations have included both survey with sonar, sampling and scuba divers, as well as administrative surveys of maritime registers, and legislation etc. The work has been conducted by EHEF on request of the Murmansk Commercial Port and the Murmansk Regional Administration, and several well known large scientific and state institutes have been participating such as the MUGMS, PINRO, MMBI, MAGE etc.

In addition EHEF has good overview over enterprises in the Murmansk area specialised on salvation, diving, dismantling and utilisation of scrap metals from abandoned ships. This long and broad experience probably also contributed to the chose of EHEF as the co-ordinator of the operations now funded by the Murmansk Regional Administration in 2006-2008.

Referring to this experience, EHEF is ready to take the complete organisational responsibility for any proposed action, including the financial part. In the second EHEF Study, the organisation got a grant from the Barents Secretariat as co-financing and EHEF has the legal and organisational capacity to arrange it the similar way this time.

In 2002, EHEF by own means organised and carried out a survey on the sunken vessels in the Kola Fjord in co-ordination with the Special Arctic Marine Inspection (SAMI). The survey comprised a first overview over the sunken vessels in the Kola Fjord with focus on the major dump sites of Lavna, Mishukovo, Zelenyi Mys and Retinskoye. By videotaping, geodetic positioning and on site studies by divers, one overview map (Fig.1) and four site maps were produced for the four dump sites. All in all 72 objects were mapped in this first survey (19 at Lavna, 22 at Mishukovo, 9 at Zelenyi Mys and approximately 22 at Retinskoye dump site). In addition 20 samples of the bottom sediments were taken at Lavna (12 samples), Zelenyi Mys (3samples), Retinskoye (3 samples) and Belokamenka (2 samples) and analysed for petrol products and heavy metals at the MUGMS[37], the MMBI[38] and the MAGE[39] institutes in Murmansk.

The analysis showed that the bottom sediments on these sites contain 5-10 times higher concentrations of Cu, Pb, Hg, Cd and Zn than in the open water. The concentration distribution indicate the dump sites being the pollution source in all cases. The highest concentrations for both heavy metals and petroleum products were detected at Lavna and Zelenyi Mys dump sites.

Since there is no MAC determined for bottom sediments by Russian regulations, the analysis of bottom sediments can only be discussed from a benchmarking perspective rather than from a legal perspective, although comparisons with regulations and concentrations of bottom sediments from other countries makes a good reference. The complete study is available by request

The first EHEF survey was followed up and deepened in 2005 with assistance from the WWF-Russia in Murmansk. The second study, carrying the short name: “The Kola Bay Case Study”[40], made a more deep survey of the scrapped ships in the Kola Fjord, including partial salvation and scrapping of the ships at the Lavna dump site, further monitoring of the bottom sediments of the Kola Fjord, survey of legal aspects on the property issue at salvation operations, comparison with examples from other federation subjects and finally a refined survey of solitaire ships forming a navigation risk in or nearby the fareway channel. The findings of the second EHEF survey make the base of the information gathering for this assignment in respect of the current situation (Section 2.1). The complete report from the second study is presented in Appendix 4.

These actions have resulted in a rather good overview of the sunken or scuttled vessels in Murmansk Oblast, a rough mapping of the contents of oils, heavy metals and PCB in the bottom of the Kola Bay, and an overview of legal aspects and possibilities. The register set up on the sunken vessels as a result to the survey of 2002, gives information on the number of ships at the respective dump site, their identity, location,

[37] MUGMS = Murmansk State Authority for Hydrometeorology and Environmental Monitoring
[38] MMBI = Murmansk Marine Biological Institute
[39] MAGE = Arctic Marine Geological Expedition
[40] Environmental Challenges in the Coastal Areas of Murmansk Region – Liquidation of Abandoned and Scuttled Ships in the Coastal Areas of the Murmansk Region as Elimination of the Source of Environmental and Navigation Risks, Murmansk 2005.

tonnage, former ownership etc. In some cases the Maritime Register also can give information on the remaining load.

A direct result of the EHEF actions in 2002-2005 was that through definition of the non seaworthy ships as waste rather than “ships”, the property problem addressed in Section 2.1.4 could be neglected. Based on this legal approach, EHEF salvaged 8 ships and 2 metal constructions entirely and another 4 ships partially. All in all 5280 tons of metal scrap was removed from the Lavna dump site and utilised as scrap. The cost difference was collected by EHEF from private companies in Murmansk and from the Barents Secretariat.

Another important result of EHEF’s studies is that the Regional NRC has started to review the problem seriously.

5. POSSIBILITY TO DISSEMINATE PROJECT OUTCOMES

Taking into account that the described problems are characteristic for other regions of the Russian Arctic the above-described project have huge potential for dissemination.

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/8(7)

Waste treatment plant for problematic hazardous wastes

Prepared by: the Project Office
Status: approved by the Project Steering Committee

Waste treatment plant for problematic hazardous wastes

Murmansk region, Kola district

1. **Project Name.** Waste treatment plant for problematic hazardous wastes including oil sludges
2. **Construction Site Location.** Murmansk region, Kola district, the site should meet requirements for hygiene and sanitary conditions.
3. **Project substantiation.** Huge amount of wastes are produced in the Kola district annually. Producing and collecting of 1300 metric tons of oil-slime as a result of economical activities are caused the biggest concern. Oil-reloading complex in the Kola Bay accumulated 570 metric tons of oil-slime and oily waste as of 01.01.2006. At the moment there is no safe system in the region for utilisation of the problem wastes.
4. **Target Groups Included in the Project:**
   - populations;
   - municipal and regional authorities;
   - federal controlling executive aythorities.
5. **The Project Idea** arose due to analysis of the existing situation and it was discussed on many meetings of the Kola region local authorities' representatives. The project is supported as a whole by the Kola regional administration, Murmansk regional administration and Murmansk regional Department for technological and environmental supervision (Rostekhnadzor).
6. **The project activities relation to the project long-term targets.**

   The project long-term targets addressing to develop an efficient system for utilisation of the oil-slime accumulated by enterprises and plants located on the Kola region territory and in Murmansk, Kola, Severomorsk cities.

   The project develops new work place.

   The project is called upon solving many problems and undoubtedly would reduce a harmful impact on the environment. This is a pilot project and experience gained during its implementation can be extended over other municipal unions.

   The project implementation would be stimulating environmentally oriented business development.

The project has a potential for future development and project participants enlargement.

The project is supported by the Murmansk regional administration, municipal authorities and territorial form of federal executive power.

7. **The Project activities.**

   A plant for problem waste treatment has been erected based on ZAO “Turmalin” (St Petersburg) equipment. The plant is situated within the Kola district municipal union. All required documents for hazardous waste handling are issued including License for hazardous waste handling. A total equipment cost is 14 million of rubbles. A cost of equipment for oil-sludges treatment, plant mounting and its commissioning is 2.45 million of rubbles.

8. **Approximate capital investment requirements** - 2.45 million of rubbles.
9. **Payback period** – 4 months.
10. **Contact official** – Alexander Istratov, Deputy head of Kola district municipal union of Murmansk regional administration; phone: (911) 3 01 00 11; email: mo_kr@mail.ru

STEERING COMMITTEE

of the UNEP/GEF Project

“Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment”

2nd Meeting

St. Petersburg, Russian Federation

April 25 - 26, 2007

STC 2/8(8)

Removing sunken wood and ship frames from the sea bottom in Tiksi Bay

---

Prepared by:	Project Office
Status:	approved by the Project Steering Committee

Removing sunken wood and ship frames from the sea bottom in Tiksi Bay

Project Name:	Removing sunken wood and ship frames from the sea bottom in Tiksi Bay
Overall Goal	Protect biological diversity from human impacts in Tiksi and Bulunkan bays' sea and coast areas
Objectives	- clean sea bottom of submerged wood items; - collect and utilize 5 ship frames in Tiksi Bay's water area
Location	Tiksi and Bulunkan bays (Laptev Sea)
Implementation Period	2007 to 2008
Implementing Agencies	Public Corporation Tiski Sea Port
Funding Required	3,200.0 thousand rubles
Expected Project Outcomes	An area of over 100 square kilometers, or around 1 billion cubic meters of water, will be cleaned up in Tiksi Bay, which will contribute to improving health of an over 15 thousand population in Arctic settlements, including 5 thousand of low-number Arctic peoples whose main diet consists of Arctic fish, with increased fish quality and fish harvesting for human consumption.
Project Supervising Agency	Ministry of Environmental Protection of the Sakha (Yakutia) Republic

1. OUTLINE OF ISSUES AND WAYS TO ADDRESS THEM

The settlement of Tiksi, nicknamed 'Yakutia's sea gates', was founded in 1934 to meet growing need for a port in the area as the Northern Sea Route traffic grew, and spreads over part of Tiksi Bay coast and that of Bulunkan Bay.

Gone are times when the Northern Sea Route flourished and the Tiksi Sea Port operated 24 hours a day to meet pressures of a stressed polar summer navigation period.

The famous Yakut fish specialist, Dr Kirillin F.N., indicates in his work ‘Tiksi Bay Fish’, published by Tomsk State University in 1951 (pp. 155-162), that Tiksi Bay has 14 fish species: sturgeon, herring, nelma, ryapushka, omul, broad whitefish, cisco, muskun, grayling, smelt, flounder, cod and Arctic sculpin. Of these six – sturgeon, nelma, ryapushka, broad fish, cisco and muksun – are highly valued commercial fish species.

Tiksi Bay is an important fisheries and fish feeding area.

For over 70 years of human impacts on Tiksi Bay, a lot of environmental problems passed away, some of which remain to be resolved (Fig. 1, diagram).

Submerged wood, steel wire and steel cables used to fasten floats of driftwood, as well as sunken ship frames in the bay’s water areas give off harmful substances (organic, biogenic, etc.), as they decompose and rust, this killing all types of plankton (bacterio-, phyto- and zoo-) and zoo-benthos, and thus probably resulting in the loss of important feeding grounds for highly valued commercial Arctic fish species.

It takes a long time for biogenic substances to be extracted from submerged wood. Ecosystem losses are a region-wide problem with implications going as far as affecting biodiversity in the World Ocean.

A study of sea bed sediments in Tiksi Bay conducted in 1990, suggested that the current status of it not only affected local biocenoses, but also resulted in some species losses.

The findings of water pollution studies conducted in Tiksi Bay were as follows: bacterioplankton – highly polluted, and zoobenthos – highly polluted.

Further pollution in Tiksi Bay is likely to affect biocenoses even more, and may also result in additional species losses. Broken food chains in the largest fisheries area lying close to the Lena fish spawning grounds are likely to result in reduced stocks of most valued fish species with a lot of fish leaving the area. This will pose direct threats to local populations’ well-being, especially that of native Arctic peoples’.

To bring the environmental situation in Tiksi Bay back to normal it is needed to attain the key Project objectives: clean the sea bed of submerged wood; and collect and utilize 5 ship carcasses in Tiksi Bay’s aquatory.

There are two ways to raise sunken wood from the sea bed, in winter and summer.

1. As thick ice forms over Bulunkan Bay, heavy machines travel on ice to where clusters of submerged wood are, and large holes are sawn in ice to facilitate operations to lift sunken wood.

At a safe distance off the hole edge, a hoisting crane is put up that uses a grab bucket as the load-grappling device. Lowering the bucket to the bottom, the crane operator scoops up sunken logs, along with float wire and steel cables, across the whole area under the hole, and hoists them to the surface making small stacks of them.

As it clears up the bed, the crane moves to another location where sinker is found. A signalman assists the crane operator in hoisting operations. Another group of workers in the team, made of four workmen and a tractor driver, detach wire and cables from the hoisted logs, tie them up in bundles and transport them by a bulldozer or haulage tractor with a sledge to a storage site to be sorted out later, while wire and cables are sent to scrap.

2. In the shipping period the sinker hoisting operation above is carried out using a floating hoisting crane. The hoisted sinker is put on a lighter to be transported to the port to a pier at which it will be moved to the shore. Sinker unloading is done by a port crane fitted with a grab bucket. Dockers using a forklift truck and a port crane sort the logs, tie them up in bundles and put in stacks.

Hoisting and utilizing ship carcasses need to be done in two stages: preliminary and final. The preliminary stage will include the following activities:

- diving exploration;

- sealing of holes and damage openings;

- determine the hoisting method and costs involved, based on diving exploration findings and sealing of holes and damage openings.

2. LEGAL FRAMEWORK

The project shall be based on the federal and republican ‘On Environmental Protection’ laws.

The National Action Plan on Protecting Marine Environments from Human Impacts in the Russian Federation’s Arctic Region Programme (NPA-Arctic) contains Chapter 3 ‘Develop investment projects to protect Arctic seas from anthropogenic pollution’, item 1.3 ‘Develop an investment project on preventing contaminating Russian Arctic seas by submerged logs, driftwood and metal scrap’, these have been used as the basis for the proposed Project.

3. PRELIMINARY ASSESSMENT OF PROJECT’S SOCIAL AND ECONOMIC EFFECTS

Implementing this project in Tiksi Bay will provide clean up for a water area of over 100 square kilometers, equivalent to almost 1 billion cubic meters of water, which will benefit wellbeing of the over 15 thousand population of local Arctic settlements, including 5 thousand of low-number native Arctic peoples, whose

main diet consists of fish. Other effects will include higher quality and quantity of fish supplied for human consumption.

In 1995, the Tiksi sea port collected 700 cubic meters, in 2000 – 2,100 cubic meters, and in subsequent years – up to 200 cubic meters of submerged driftwood a year, spending millions of rubles of its own funds, excluding indirect costs.

In view of the fact that only 5% of loading capacities are currently in use, very limited funds (up to 100 thousand rubles) available for the maintenance of hydrotechnical facilities, aquatory and port compounds, and thus the objective of cleaning up Tixie Bay at the port's own cost being quite unattainable, the OAO Tiksi Sea Port seeks to have the proposed Project funded from available funding sources elsewhere.

To implement the Project successfully, following action will be required:

- deployment of equipment currently in long-term storage;

- repair of equipment if needed;

- staff training;

- floating grab bucket crane operations: a) sea bed trawling and loading sinker on a barge; b) transport the logs and unloading; and c) sorting and stacking;

- diving exploration of sunken ships;

- sealing holes and damage openings on the ships;

- determining the hoisting method, preparing project documentation and cost calculations;

- actual hoisting and utilization operations (stage 2).

Total Project costs, save hoisting and utilization, will be 3.6 million rubles. Of these, the Tiksi Sea Port is prepared to provide a total funding of 0.4 million rubles, with the NPA-Arctic's contribution being 3.2 million rubles.

ANNEX XIII

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/9

Item 9 of the Agenda

Justification for prolongation of the NPA Arctic Phase I Project

---

Prepared by:	Project Office in consultation with Executing and Implementing Agencies
Status:	approved by the Project Steering Committee

Justification for prolongation of the NPA Arctic Phase I Project

2. According to signed on July 18, 2005 Project Document, Phase I of the NPA Arctic Project should be finalized in June 2007. It is proposed for the approval by the Project Steering Committee to extend Phase I implementation of major project activities until the end of September 2008 and following terminal evaluation of 2 months duration, officially close Phase I by 15th December 2008. This explanatory note justifies this request prepared jointly by the Project Office and the Executing and Implementing Agencies.

3. GEF Secretariat informed UNEP in December 2006 and subsequently UNEP informed the Russian National Focal Point and the Project Executing Agency in March 2007 about the decision to take the project "Support to the National Programme of Action for the protection of the Arctic Marine Environment Tranche 2" off the 2007 project GEF pipeline. The reason for such decision was a general revision of a whole GEF pipeline and "duration in pipeline". At the same time, GEF requirements have been heightened for all projects with expected tangible practical result. GEF Secretariat informed UNEP that re-pipelining of the Project Phase II would depend on evaluation of the outcomes of the Phase I. Literally, it means that the earliest date when the Phase II of the Project can be submitted in the pipeline will be 2008.

4. Project implementation is delayed as compared with the Project Document schedule for the SAP development for up to12 months, for PINS - up to 14 months and for demonstration projects - up to 6-8 months. This delay is due to the following main reasons: 1) the preparation and coordination of 3 months integrated work plan (IWP) and then the preparation and coordination of the Phase I IWP took a lot of time as a result of uncertainty with donor input into certain project components; IWP for Phase I was approved by the Project Steering Committee only in August 2006; 2) the Procedure of Disbursement of Donor Funds from the Trust Funds set up by Partner Agencies was also adopted in August 2006; 3) consultant contracts signing was delayed for about 4 months as a result of summer vacations of UNDP personnel; 4) Project Office personnel did not have an adequate working experience to deal with such large-scale and multidisciplinary project, which is actually the biggest UNEP project in the Russian Federation.

5. Conceptual issues of the SAP for the protection of the Arctic marine environment in the Russian Federation from land-based activities as it was specified in the Project Document are submitted to the Steering Committee. However, the threats of the Arctic seas pollution resulted from the continental shelf development and increasing of maritime traffic are headily increasing. The SAP cannot be considered as a sound document if it does not take into account these threats, which will impose the biggest transboundary consequences in future. Executing and Implementing Agencies and Project Office make a proposal to the Steering Committee to confirm the necessity of including in the SAP development these additional threats.
6. Completion of the SAP draft, which would take into account continental shelf and shipping activities and include costed measures with possible terms of implementation for prevention and elimination of Arctic marine environment pollution threats would take 3 months. In reality, the SAP draft can be submitted to federal and regional authorities, businesses and non-government organisations for comments at the end of July – beginning of August 2007. Taking into account summer vacations time for all comments and addressing the comments would take additional 3 months. Then the SAP will be submitted for international comments. The SAP can be finally agreed with the federal and regional authorities only at the end of 2007 and the agreed SAP can be finally approved only in the first quarter of 2008.
7. Completion of the five Phase I benchmarks is envisaged in the Project Document: 1. Successful establishment of Project implementation structure, including Project Office, Project Steering Committee, and Project Supervisory Council; 2. Strategic Action Programme fully developed and endorsed by relevant stakeholders; 3. Working document revised at the first meeting of each of sub-group for each pre-investment study; 4. Selected lead implementing organization and members of each of the three working groups for the development of the Environmental Protection System; 5. Fully designed demonstration activities; and 6. Mid-term review of the project indicating satisfactory implementation of the Project in the phase I. All above can be achieved at the beginning of 2008 only. All these Phase 1 achievements except the SAP are not sufficiently ponderable. They were planned in the Project Document on a basis of the confidence that the Phase II is logic stage of the Project. . There is no such confidence now therefore the ways to achieve really tangible results of the Phase I should be found to increase the probability of positive result of GEF on accepting the Phase II of the Project.

8. The following possibilities are appeared in case the Phase I will be prolonged till the end of 2008:
    - pre-investment studies – the second Project component that was prolonged in the Project Document to the Phase II - can be totally carried out;
    - in addition to the 3 demonstration projects envisaged by the Project Document several other demo or pilot projects can be implemented;
    - these new results of the Phase I could be considered as an important argument for GEF for supporting the Phase II of the Project.
9. The need for the Phase I prolongation is also governed by the financial considerations. By the end of 2006, the GEF project budget spending is about US$475,500, which is 8% out of the total GEF budget for Phase I. It is possible in reality to spend more than US$5.4 million only by the end of 2008 and only in a case of hard work of all project participants.
10. The Project demonstration activities are planned to start in summer of 2007 and will be completed not earlier than the fall of 2008.
11. Up to now most project activities were concentrated on the assessment and analysis of the environmental issues related to the Russian Arctic. Minekonomrazvitiya of Russia informed all concerned ministers and authorities of the Russian Federation about the Project and invited them for cooperation. An Interagency Work Group has been established for taking into account federal and local authorities and big company interests in the Project implementation. The Project Office keeps with the Arctic region administrations informed on the progress. Progress reports are delivered at the Arctic Council meetings. Project website was set up. Nevertheless, there is not enough publicity of the Project. The weakest side is industrial companies' involvement in the Project. This was planned for the beginning of pre-investment studies. Thereby, the favourable climate for necessary investments into the systematic pollution reduction is not created yet.
12. There is an uncertainty that the Phase II of the Project will be supported by GEF. Even if the Project will be supported it should conform to the new strategic priorities and guidelines to be endorsed at the next GEF Council in June 2007. Furthermore, GEF will revise all implementing agencies for all projects involved.
13. Bearing in mind all above, several important amendments into the approved in August 2006 IWP are submitted to the Steering Committee:

- to finalise pre-investment studies during the Project Phase I implementation if it is prolonged till the end of 2008;
- to initiate and to start an implementation of several “ready-to-go” pilot investment projects aimed at addressing Arctic pollution issues with co-financing from EPA and NEFCO;
- to reduce provisioned overcharged expenditures for pre-investment studies and for 3rd project component “Development and implementation of Environmental Protection System (EPS)”. To reallocate saved funds to pilot projects;
- to use GEF funds for co-financing the program on the environmentally sound elimination of RITEGs (radioisotope thermoelectric generators) in the Republic of Sakha (Yakutia) and Chukot region;
- to increase funding of the public awareness on the Russian Arctic environmental issues in the Arctic regions of Russia and among Arctic states and International organizations;
- to hold a Partner Conference in Russia at the beginning of 2008 with the purpose: (i) to search possible interested parties for co-funding of the Phase II of the Project and (ii) to reveal interested parties for investment projects included in the list of projects for which pre-investment studies are fulfilled during Phase I.

ANNEX XIV

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/10

Item 10 of the Agenda

Integrated Work Plan and Budget until the end of Phase I

Prepared by:	the Project Office in consultation with Executing and Implementing Agencies
Status:	approved by the Project Steering Committee

Integrated Work Plan and Budget until the end of Phase I

Explanatory note

The proposed Integrated Work Plan and budget for 2007 and until the end of 2008 reflects that during the Phase I of the Project it is necessary:

- to finalise pre-investment studies during the Project Phase I implementation if it is prolonged till the end of 2008;
- to initiate and to start an implementation of several "ready-to-go" pilot investment projects aimed at Arctic pollution issues with co-financing from EPA and NEFCO;
- to reduce provisioned overcharged expenditures for pre-investment studies and for 3rd project component "Development and implementation of Environmental Protection System (EPS)" (at the expense of excluding the co-operating implementing organisation during the Phase I). To reallocate saved funds to pilot projects;
- to use GEF funds for co-financing the program on the environmentally sound elimination of RITEGs (radioisotope thermoelectric generators) in the Republic of Sakha (Yakutia) and Chukot region;
- to increase funding of the public awareness on the Russian Arctic environmental issues in the six Arctic regions;
- to hold a Partner Conference in Russia at the beginning of 2008 with the purpose of possible co-funding for the Phase II search and interested parties for pre-investment studies fulfilled during Phase I participation.

To reach the above objectives it is proposed to reduce considerably financing for the following budget lines: travel on official business, meeting (conferences), and translation costs.

A table below compares proposed budget with the previous one:

Budget line	Activity	Budget 2005-2008	Previous budget	Difference
1100	Project Personnel	342 446	197 196	145 250
1200	Consultants	581 220	716 995	-135 775
1300	Administrative support	40 800	26 020	14 780
1600	Travel on official business	116 376	224 884	-108 508
2200	Sub-contracts with cooperating organisations	4 197 405	4 081 500	115 905
3300	Meetings / Conferences	166 430	203 000	-36 570
4100	Expendable equipment	6 970	7 000	-30
4200	Non-expendable equipment	39 813	47 000	-7 187
5100	Operation and maintenance of equipment	10 413	12 000	-1 587

5200	Reporting & Translation	62 686	91 000	-28 314
5300	Sundry (including communication services and audits)	62 709	36 205	26 504
5500	Evaluation	25 000	13 000	12 000
1181-1182	GEF/UNEP staff	232 732	229 200	3 532
	Grand Total	**5 885 000**	**5 885 000**	**0**

Implementation of several new pilot and demonstration projects will be conducted and completed during the extended Phase I to make its output more significant.

Detailed budget and revised IWP are given in a separate Excel file: Revised IWP and Budget for Phase I of the project.xls

At this moment only GEF funds are included into budget, as we do not have proposals from Partner Agencies (ACOPS) on donor funds and no information on funds disbursed to the moment of revision.

Russian Federation - Support to the National Programme of Action for the Protection of the Arctic Marine Environment, Tranche 1

GFL-2732-03-4694/Rev.3

Phase I activities completion - Sep 2008

		2005		2006				2007				2008				Actual 2005 GEF	Actual 2005 Donors	Actual 2006 GEF	Actual 2006 Donors	Proposal 2007 GEF	Proposal 2007 Donors	Proposal 2008 GEF	Proposal 2008 Donors	Total 2007	Total 2008	Total project
		3	4	1	2	3	4	1	2	3	4	1	2	3	4											
	PC & M																									
1101	Project Manager															18500		44400		44400		44400				
1102	Project Deputy Manager															10933		24000		24000		24000				
1103	Project Financial Management Officer															14213		31200		31200		31200				
1104	Project Assistant Financial Management Officer																									
1181	Technical Expert																	21852		65628		72000				
1182	Technical Expert/Fund mangmt																	-12463		47915		37800				
1301	Admin support Project Assistant, Financial Management Officer																	800								
1302	Admin support Project Secretary															4000		12000		12000		12000				
1601	Travel on official business																	7700		64000		42000				
3301	Steering Committee Meetings		Nov								Apr				Mar	18623				15000		24000				
3307	Supervisory Council Meetings (teleconf)		Dec			Apr	Jul	Nov				Jun	Nov					2053		2000		1900				
3308	Russian Interagency WG Meetings			Mar							May		Oct	Mar				1807		5000		5000				
4101	PO expendable equipment															1713		1356		2400		1500				
4201	PO non-expendable equipment															27308		505		8000		4000				
5101	Operation & maintenance of equipment															1157		2156		4500		2600				
5201	Reporting costs incl. copying, translation and distribution																	3724		30000		25000				
5301	Sundry															1975		984		5000		1000				
5302	Communication services																	10241		12000		15000				
5303	UNDP admin costs and project auditing								Mar				Mar		Oct O-N			6509		5000		5000				
5501	Evaluation														O-N							25000				
1245	Russian Consultant-Project Advisor															9020		19800		19800		19800				
	Activity 1 SAP																									
	1.1. Proposals and selection of the TT Co-ordinator																									
	1.2. Proposals and selection of the TT members																									
	1.3. Preparation of the consultancy contract with the TT Co-ordinator																									
	1.4. Preparation of consultancy contracts with TT members																									
	1.5. Preparation of the working document to be considered at the 1st TT meeting																									
	1.6. Review of the working document at the 1st TT meeting																									
1206	Lead Russian SAP TT Consultant (1.5, 1.6, 1.8- 1.12, 1.16) x 2																	19500		23400						
	1.7. Preparation of ToRs for WGs and their consultants (activities 1.7.1 – 1.7.7 will be carried out by these WGs)			WG1		WG2		WG3																		
	1.7.1. Development of financial mechanisms of the SAP implementation																									
	1.7.2. Regional aspects of SAP																									

	1.7.3. Strategic environmental assessment on the SAP			
1214	Lead Russian Consultant WG-1 SAP (1.7.3)	15600	11700	
1215	Russian Consultant WG-1 SAP (1.7.3)	3300	9900	
1216	Russian Consultant WG-1 SAP (1.7.3)	9900	3300	
	1.7.4. Diagnostic analysis of environmental situation in Arctic region			
	1.7.5. Causal chain analysis			
	1.7.6. Stakeholder analysis and development of public involvement			
	1.7.7. Information of stakeholders and communication strategy to public on project results			
1217	Lead Russian Consultant WG-2 SAP (1.7.7)	3900	3900	
1218	Russian Consultant WG-2 SAP (1.7.7)	3300	9900	
1219	Russian Consultant WG-2 SAP (1.7.7)	3300	9900	
	1.8. Preparation of the first draft of the SAP to be reviewed at the Second Meeting of the TT			
	1.9. Review of the first draft of the SAP at the Second Meeting of the TT			
	1.10. Preparation of the second draft of the SAP.			
	1.11. Review of the second draft of the SAP by federal and regional executive authorities.			
	1.12. Preparation of the third draft of the SAP to be reviewed at the Third Meeting of the TT, Moscow			
1201	International SAP Consultant (1.10-1.13)		10000	
1207	Russian SAP TT Consultant (1.10-1.13)	23100	6600	
1208	Russian SAP TT Consultant (1.10-1.13)	16500	6600	
1209	Russian SAP TT Consultant (1.10-1.13)	9900	9900	
1210	Russian SAP TT Consultant (1.10-1.13)	13200	3300	
1211	Russian SAP TT Consultant (1.10-1.13)	9900	6600	
1212	Russian SAP TT Consultant (1.10-1.13)	7800	5200	
1213	Russian SAP TT Consultant (1.10-1.13)	7800	5200	
	1.13. Review of the third draft of the SAP at the Third Meeting of the TT, Moscow.			
	1.14. Preparation of the fourth draft of the SAP			
	1.15. International review of the SAP			
	1.16. Preparation of the fifth draft of the SAP			
	1.17. Endorsement of the SAP by relevant state authorities after taking into account comments received on a basis of international evaluation			
	1.18. Adoption of the SAP by the relevant executive authority			
3302	SAP regional Meetings (round tables in regions)	1048	30000	
3303	Public awareness activities on SAP		18000	12000
5206	General translation	3962	0	
	Activity 2 Pre-investment studies			

	2.1. Proposals for and selection of the Co-ordinator of the Working Group (WG) for Pre-Investment Studies (PINS) will be prepared.		
	2.2. Proposals for and selection of the WG members.		
	2.3. Preparation of the consultancy contract with WG Co-ordinator.		
	2.4. Preparation of consultancy contracts with WG members.		
	2.5. Preparation of the working document to be considered at the First Meeting of the WG.		
	2.6. Review of the working document at the First Meeting of the WG, Moscow.		
	2.7. Update and review of the existing hot spots identified at PDF-B stage		
	2.8. Preparation of Guidelines on conduction of preinvestment studies		
	2.9. Development of criteria for selection of hot spots for which PINS will be prepared, on the basis of comments given at the First Meeting of the WG.		
	2.10. Hot spots screening and selection. Preparation of the list of potential pre-investment studies.		
1223	Lead Russian Consultant PINS WG (2.5-2.12, 2.15, 2.16)	7800	19500
1224	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)	6600	9900
1225	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		9900
1226	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		9900
1227	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		6600
1228	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		3300
1229	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		3900
1230	Russian Consultant PINS WG (2.5, 2.7, 2.9, 2.10-2.12, 2.16)		2600
	2.11. Preparation of tenders dossiers and ToRs for 3 cooperating organisations. Selection of lead cooperating organisations for the conduction of PINS.		
	2.12. Selection of hot spots for which PINS will be done, at the Second Meeting of the WG. 2.13. Concluding the contracts with bid-winners		7000
	2.14. Investment Forum (Partnership conference)		50000

	2.15. Consultations with potential financers for selected PINS	10000	
	2.16. Review of PINS and approval of final reports		
2210	Sub-contract with three organizations	600000	400000
3304	Meetings of the PINS WG	5000	5000
	Activity 3 Environmental Protection System Improvements		
	3.1. Proposals for and selection of the Co-ordinator of the Task Team on Implementation of the EPS (TT EPS).		
	3.2. Proposals for and selection of TT members.		
	3.3. Preparation of the consultancy contract with the TT Co-ordinator.		
	3.4. Preparation of consultancy contracts with TT members.		
	3.5. Preparation of the working document to be considered at the First Meeting of the TT.		
	3.6. Review of the working document at the First Meeting of the TT, Moscow. Lead Russian Consultant EPS TT (3.5-3.7,		
1234	3.9)	7800	3900
1235	Russian Consultant EPS TT (3.5-3.7, 3.9)	6600	3300
1236	Russian Consultant EPS TT (3.5-3.7)	6600	
1237	Russian Consultant EPS TT (3.5-3.7)	6600	
1238	Russian Consultant EPS TT (3.5-3.7, 3.9)		3300
1239	Russian Consultant EPS TT (3.5-3.7, 3.9)		3300
1240	Russian Consultant EPS TT (3.5-3.7, 3.9)		3300
1241	Russian Consultant EPS TT (3.5-3.7)	3300	
1242	Russian Consultant EPS TT (3.5-3.7, 3.9)		2600
1243	Russian Consultant EPS TT (3.5-3.7)	2600	
	3.7. Preparation of tender documents for organization to improve EPS		
	3.8. Carrying out tender and selection of the organization to improve EPS		
	3.9. Preparation of the report on EPS improvements and its approval by EPS TT Sub-contract with organization to improve		
2220	EPS		350000
3305	Meetings of TT	10000	5000
	Activity 4 Demonstration Projects		
	4.1. Proposals for and selection of the Co-ordinator of the WG on Contaminant Clean-up (WG CLEANUP).		
	4.2. Proposals for and selection of the WG CLEANUP members.		

	4.3. Preparation of the consultancy contract with the WG CLEANUP Co-ordinator.			
	4.4. Preparation of consultancy contracts with the WG CLEANUP members.			
	4.5. Preparation of the working document to be considered at the First Meeting of the WG CLEANUP.			
	4.6. Review of the working document at the First Meeting of the WG CLEANUP, Moscow.			
1247	Russian Consultant CLEANUP DEMOS (4.4-4.6)	6600		6600
1248	Russian Consultant CLEANUP DEMOS (4.4-4.6)	5200		
	4.7. Preparation of ToR and conduct of the tender and preparation of the contract with the lead cooperating organisation for the development of Contaminant Clean-up demonstration.			
	4.8. Proposals for and selection of the Co-ordinator of the WG on Indigenous Environmental Co-Management (WG COMAN).			
	4.9. Proposals for and selection of the WG COMAN members.			
	4.10. Preparation of the contract with the WG COMAN Co-ordinator.			
	4.11. Preparation of contracts with the WG COMAN members.			
	4.12. Proposals for and selection of the Co-ordinator of the WG on the Environment Remediation in the areas of Two Decommissioned Military Bases (WG BASES).			
	4.13. Proposals for and selection of WG the BASES members.			
	4.14. Preparation of the contract with the WG BASES Co-ordinator.			
	4.15. Preparation of contracts with the WG BASES members.			
	4.16. Preparation of the working document to be considered at the First Meeting of the WG COMAN.			
	4.17. Preparation of the working document to be considered at the First Meeting of the WG BASES.			
	4.18. Review of the working document at the First Meeting of the WG COMAN, Moscow			
	4.19. Preparation of ToR and conduct of the tender and preparation of the contract with the lead cooperating organisation for Indigenous Environmental Co-Management			
	4.20. Review of the working document at the First Meeting of the WG BASES, Moscow.			

1249	Russian Consultant BASES DEMOS (4.17, 4.20)						3300		6600						
1250	Russian Consultant BASES DEMOS (4.17, 4.20)								3900						
1251	Russian Consultant COMAN DEMOS (4.16, 4.18)						2600		2600						
1252	Russian Consultant COMAN DEMOS (4.16, 4.18)						2600		10200						
	4.21. Preparation of ToR and conduction of the tender and preparation of the contract with the lead cooperating organisation for the environmental remediation in the areas of two decommissioned military bases														
	4.22. Preparation and Review of Progress Report to be considered at the Second Meeting of the WG CLEANUP.														
	4.23. Preparation and Review of Progress Report to be considered at the Second Meeting of the WG BASES														
	4.24. Preparation and Review of Progress Report to be considered at the Second Meeting of the WG COMAN														
	4.25. Consultations with potential financers on pilot projects														
	4.26. Preparation of project documentation for pilot projects														
	4.27.Contracting companies on selected pilot projects (preparation of tenders where applicable)														
	4.28. Final evaluation of conducted pilot projects and their replicability potential														
1605	Travel on official business						2676								
2201	Sub-contract with various organizations (to be specified at SCM)								1149000		450395				
2230	Sub-contract with one organization for CLEANUP								494000						
2231	Sub-contract with one organization for COMAN								494000						
2232	Sub-contract with one organization for BASES								250000						
3309	DEMOS WG meetings								10000		5000				
99	**GRAND TOTAL**				**107442**		**368010**		**3769243**		**1640305**				**5885000**

ANNEX XV

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

Item 11 of Agenda

STC 2/10(1)

Budget for 2007 and until the end of Phase I in correspondence with Russian requirements

Prepared: by Project Office on a basis of approved budget

Approved by the Project Steering Committee

"Russian Federation - Support to the National Programme of action for the Protection of the Arctic Marine Environment"

(Document of SC NPA Arctic 26.04.07 № 2)

Budget of the Project "Russian Federation - Support to the National Programme of action for the Protection of the Arctic Marine Environment" (NPA-Arctic), Phase 1

2007-2008.

Object of expenditure	Description	January - April USD	May - December USD	Total 2007 : USD	2008 USD	Total PHASE 1
1100	Remuneration for Project Personnel	26 970	60 200	87 170	86 400	173 570
	consolidated social tax	6 057	6 373	12 430	13 200	25 630
1200	Remuneration for consultants	5 361	210 009	215 370	32100	247 470
	consolidated social tax	1 238	47 592	48 830	7 400	56 230
1300	Administrative Support (project Secretary)	3 169	6 840	10 009	10000	20 009
	consolidated social tax	830	1 161	1 991	2 000	3 991
1600	Travel on official business		64 000	64 000	42 000	106 000
2200	Sub-contracts with cooperating		2 987	2 987 000	1 200	4 187

	organizations		000		405	405
3300	Meetings/Conferences	12 480	149 520	162 000	57900	219 900
4101	Expendable equipment		2 400	2 400	1500	3 900
4201	Non-expendable equipment		8 000	8 000	4000	12 000
5101	Operation and maintenance of equipment		4 500	4 500	2600	7 100
5201	Reporting costs incl. copying, translation and distribution		30 000	30 000	25000	55 000
5301	Sundry	29	4 971	5 000	1000	6 000
5302	Communication services	1 360	10 640	12 000	15000	27 000
5303	UNDP admin costs and project auditing		5 000	5 000	5000	10 000
5501	Evaluation				25000	25 000
	Total	**57 494**	**3 598 206**	**3 655 700**	**1 530 505**	**5 186 205**

Project Manager I. Senchenya

Project Financial Management Officer G. Zaytseva

ANNEX XVI

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

Item 11 of Agenda

STC 2/11

Russian Input to Project Co-financing

Prepared: by Project Office

Status: approved by Project Supervisory Council and by the Project Steering Committee

JUSTIFICATION
of Russian input into co-financing of the 1st Phase of the UNEP/GEF Project "Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

The Russian input into the Project co-financing consists of the following components:

1. Federal funds of the Russian Federation budget allocated for implementation of Federal Target-Oriented Program (FTOP) "World Ocean"

2. Funds of the Arctic regions of the Russian Federation and industrial companies of all forms of ownership including private sector

3. Federal funds of the Russian Federation budget spent for implementation of other projects, which results can be used for the purpose of the Project implementation as in kind input.

4. In kind input given to the project by governmental officials at federal and regional level and representatives of the industrial companies of all forms of ownership who participate in the Project planned activities.

5. Expenditures of the Russian Federation associated with Project Office premises.

1. Funds of the Russian Federation federal budget allocated in the FTOP "World Ocean"

Funds of the Russian Federation federal budget allocated in the FTOP "World Ocean" are shown in a table in the section 1 below. The funds are represented in accordance with FTOP codes:

3.1 Improvement of a mechanism of state management in Arctic

3.2 Increase of power supply independence in Arctic regions.

3.3 Increase of reliability and efficiency of Arctic transport system

3.4 Creation of condition for sustainable development of Russian Arctic regions

3.5 Improvement of a management system of a social development

2. Funds of the Arctic regions of the Russian Federation and industrial companies of all forms of ownership including private sector

The justification of the input of the subjects (regions) of the Russian Federation and industrial companies of all forms of ownership including private sector will be presented to the next meeting of the Project Supervisory Council.

3. Federal funds of the Russian Federation budget spent for implementation of other projects, which results can be used for the purpose of the Project implementation as in kind input.

The federal funds from the budget of the Russian Federation spent for implementation of other projects, in particular, environment management project, which results can be used for the purpose of the UNEP/GEF Project implementation as in kind input are presented in the Section II of the table below.

4. In kind input given to the project by governmental officials at federal and regional level and representatives of the industrial companies of all forms of ownership who participate in the Project planned activities.

In kind input given to the Project by the governmental officials of the federal and regional levels and the representatives of the industrial companies of all forms of ownership who participate in the Project planned activities consists of the funds spent by the governmental authorities of different levels, the representatives of the companies of all patterns of ownership in connection with their participation in the Project planned activities. It includes arctic regional representatives travel expenses (taking into account a distance of the flights, an average air ticket cost is taken as US$500) as well as the cost of the time given to the Project. The latter was considered to be an inclusive costing of salary and benefits, plus office support costs that was to be applied to all governmental and industrial companies representatives regardless of their level of seniority or actual salary. The cost of the time given to the Project by all individuals would be estimated and costed using a uniform coefficient of US$ 100 per person per day. This coefficient undervalues the real co-financing of some individuals and over-values it for the others, but obviates the necessity for maintaining detailed records.

Cost estimates for this component is based on the participation of the federal and regional representatives in the following Project planned activities:

Interagency Working Group meetings (twice per year):

7 regional representatives (travel expenditures – 7 * 2 *US$500 = US$7000); cost of works 7 * 3 days (1 day – meeting preparation, 1 day – work at meeting and 1 day – work with IAWG materials after meeting) * US$100 * 2 meetings = US$4200.

5 representatives of the federal authorities – cost of works 5 * 3 days (1 day – meeting preparation, 1 day – work at meeting and 1 day – work with IAWG materials after meeting) * US$100 * 2 meetings = US$3000

TOTAL: US$ 14200

SAP Task Team meetings (twice per year)

Participants name	Number	Fair expenditures	Working days number	Cost	Total US$
Governmental representatives and representatives of companies	9		3	9*3*100	2700
Total for 2 meetings					5400

Working Group for PINS meetings (twice per year)

Participants name	Number	Fair expenditures	Working days number	Cost	Total US$
Regional representatives	7	500*7=3500	4	100*4*7=2800	6300
Representatives of federal authorities and of companies	5		4	5*4*100	2000
Total for 2 meetings					16600

Working Group for DEMOS meetings (twice per year)

Participants name	Number	Fair expenditures	Working days number	Cost	Total
Regional representatives	15 (5 regional representatives for each DEMO project)	500*15=7500	4	100*4*15=6000	13500
Representatives of federal authorities and of companies	15 (5 representative for each DEMO project)		4	15*4*100=6000	6000
Total for 2 meetings					39000

5. Russian Federation input (Project Office rental costs)

The Russian Federation input by way of office premises granting to the Project Office is equal in cash to US$ 57,000 per year (95 sq.m * 600 US$)

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
1	2	3	4	5
I. ACTIVITIES IN FRAME OF FTOP "WORLD OCEAN" (approved by decision of the Government of the Russian Federation dated 10 August, 1998, N 919)				
1.Strategic Action Programme (SAP)	3.1 Improvement of a mechanism of state management in Arctic 3.2 Increase of power supply independence in Arctic regions. 3.4 Creation of condition for sustainable development of Russian Arctic regions	1. Materials to the concept of the sustainable development, science-based long-term perspective and strategy of economic activities in Russian Arctic including the following R&D projects, funded by Mineconomrazvitiya of Russia: - Preparation of the comprehensive action plan on environmental protection from anthropogenic pollutions of the marine, land-based and transboundary origin for Russian Arctic - Development of different scenarios of the sustainable development of the North-West part of the Russian Arctic taking into account prospects of natural resources development at Arctic shelf and substantiation of possibilities for development of offshore hydrocarbon deposits in areas of the Russian and Norwegian mutual interests. - Elaboration of predictive scenario and necessary activities in the field of	2005- 2006	**90** **75** **80**

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
		sustainable development, taking into account possible climate change, methane emission and assessment of their impact on the ecological balance. - Medical and economic substantiation of an action plan on reduction of the negative effects of natural climatic and ecological conditions on migrants and indigenous people health conditions in the Arctic zone of the Russian Federation - Elaboration of the indexes characterizing the efficiency of measures for securing the environmental safety and protection of the Arctic territory from negative man-caused impact including industrial and consumption waste.		**70** **75**
				390

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
	3.4. Creation of condition for sustainable development of Russian Arctic regions	2. Materials to the National Action Plan on sustainable development of the Russian Arctic, including the following R&D projects: - Development of the Strategic Action Programme for elimination of the Arctic environment degradation or threats from land-based activities in the Russian Federation directed to fulfilment of international obligations and solution of national and regional environmental problems - Development and justification of main elements of ecological regime and economic mechanisms ensuring the reduction of negative effects on the Arctic environment. 1. Development of Strategic Action Program on elimination of environment degradation or threats from land-based activities in the Russian Federation	2005- 2006	**75** **70** **80**
	TOTAL			**225**

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
	3.2 Increase of power supply independence in Arctic regions. 3.3 Increase of reliability and efficiency of Arctic transport system 3.5 Improvement of management system of social development	3. Materials on the Arctic seas pollution prevention during marine activities (concerning coastal zone infrastructure impact); on power consumers transfer to use low and alternative power engineering and about sanitary-hygienic conditions of the Arctic territories.	2005-2006	137
	TOTAL for SAP			**752**
2. Pre-investment Studies (PINS)	3.3 Increase of reliability and efficiency of Arctic transport system	1. Analysis of AMAP reports regarding the environmental pollution in the Arctic and justification of the Arctic pollution monitoring system development including feasibility study of the radiation and ecological monitoring on the Novaya Zempliya archipelago and adjoining seas	2005-2006	20
	3.3 Increase of reliability and efficiency of Arctic transport system	2. Pre-investments studies related to the Arctic seas pollution prevention from the coastal infrastructure.	2005-2006	39

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
	3.4. Creation of condition for sustainable development of Russian Arctic regions	3. Pre-investment studies for defining optimum package of investment projects aimed to elimination of damage/ threats for environment and ecological risks for the Arctic economic development. .	2005-2006	74
TOTAL for PINS				**133**

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
3. Environmental Protection System (EPS)	3.1 Improvement of a mechanism of state management in Arctic	Materials for the mechanism of the state management in the Arctic, including the following R&D projects: • regulatory and legal framework for territories and water areas of traditional nature management by aboriginal population of the North; • the Arctic seas pollution prevention from coastal infrastructure; • for improving of sanitary-hygienic conditions of the Arctic territories; • improvement of the mechanism of state management in the Arctic (in part of environmental protection); • for power consumers transfer to the low power engineering resources. • Development of a system of unique natural complexes of water areas and territories; • Development of migration and demographic processes management system in the Arctic • Justification of defining the south border of the Russian Arctic zone • Development and justification of main elements of environmental regime and economic mechanisms providing reduction of negative impact to the Arctic environment	2005-2007	100 100 80 250 70 150 50 50 150

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
TOTAL for EPS				1000
4 Demonstration projects 4.1. Indigenous Environmental Co-management	3.4. Creation of condition for sustainable development of Russian Arctic regions	Development of efficient legal and economic instruments for setting up of a balance of convenience between state, industrial companies and aboriginal population on the assumption of traditional way of life and natural habitat preservation	2005-2007	280
4.2. Remediation of the Environment through the Use of Brown Algae	3.3 Increase of reliability and efficiency of Arctic transport system	Research materials for brown algae-macrophytes protective zones creation around offshore Barents sea mineral and petroleum deposits	2005	70
4.3. Environment Remediation of Two Decommissioned Military Bases	3.4. Creation of condition for sustainable development of Russian Arctic regions	1. Research materials for coordination of military and economic activities in the Arctic, in part of ecological rehabilitation of the territories and particularly toxic substances utilisation 2. Development of measures on the environment remediation of decommissioned military bases transferred to the civilian sector. 3. Development of economic justification and activities for arms and heavy armament utilisation, environment remediation of the territories and establishments transferred to the civilian sector. 4. Development of a concept of agreeing of defence and economic activity	2005-2007 2005-2007 2005-2007 2005-2007	180 120 240 110

Name of UNEP/GEF Project activities	Code and name of activities in under Federal target-oriented programmes	Output of works under FTOP	Date	Set off cost, X US1000
TOTAL for the demonstrations projects				**1000**
TOTAL for the FTOP "WORLD OCEAN"				**2885**

II. Federal funds of the Russian Federation budget spent for implementation of other projects, which results can be used for the purpose of the Project implementation as in kind input.				
ENVIRONMENTAL MANAGEMENT PROJECT (EMP) (Based on agreement between the Russian Federation Government and World Bank for Research and Development of February 6. 1995)				
1.Strategic Action Programme (SAP)		1. Sectoral action plans for environment protection for ferrous and non-ferrous metallurgy (including RAO "Norilsky Nikel" enterprises), environmental condition forecasts for Murmansk and Arkhangelsk regions (in-kind)	2001	700
TOTAL for SAP				**700**
2. Pre-investment Studies (PINS)		1. Feasibility study for the RANARC Project (Russian-American-Norwegian Project for the safety and environmental protection regime in marine oil and gas operation in Arctic seas) (in-kind)	2001	400

		2. Environment analysis of Murmansk and Arkhangelsk regions, recommended practice on priorities selection, guidelines for environmentally sound investment projects, RAO “Norilskiy Nikel” environmental audit, regulatory, informational and guidance documents package for preparation of environmentally sound investment projects (in-kind)	2001	**500**
TOTAL for PINS				**900**
3. Environmental Protection System (EPS)		1. Materials for model legal and regulatory acts in the field of environment protection, which could be adapted to the Russian Arctic region (in-kind).	2001	640
		2. Model legal texts for waste management as well as in the field of ecological epidemiology and water resources and water quality management (in-kind).	2001	560
		3. Automated systems for decision making support in the field of environment protection (in-kind)	2001	240
TOTAL for EPS				**1440**
TOTAL EMP				**3040**

III. In kind input given to the project by governmental officials at federal and regional level and representatives of the industrial companies of all forms of ownership who participate in the Project planned activities.

Project Management	***Interagency Working Group meetings (3 *7.1)***	2006-2007	21.3

1. Strategic Action Programme (SAP)	***Task Teem meetings (3 * 2.7)*** ***Working Groups meetings (3*3.0*2)***	2006-2007 2006-2007	8.1 18
2. Pre-investment Studies (PINS)	***Working Groups meetings (3 * 8.3)*** ***Sub-group for investment projects meetings (10 * 2.0 * 2)***	2006-2007 2006-2007	24,9 40.0
3. Environmental Protection System (EPS)	***Task Teem meetings (2 * 2.7)*** ***Working Groups meetings (2*3.0*2)***	2007 2007	5.4 12.0
4. Demonstration projects (DEMOS)	***Working Groups meetings (2 *19.5)***	2006-2007	39.0
TOTAL			**168.7**

IV. RUSSIAN FEDERATION TOTAL INPUT **6,207.7**		
1. Strategic Action Programme **1478.1**	**752 (FTOP) + 700 (EMP) + 26.1 (meet.part.)**	
2. Pre-investment Studies **1097.9**	**133 (FTOP) + 900 (EMP) + 64.9 (meet.part.)**	
3. Environmental Protection System **2457.4**	**1000 (FTOP) + 1440 (EMP) + 17.4 (meet.part.)**	
4. Demonstration projects **1039.0**	**1000 (FTOP) + 39 (meet.part.)**	
5. Project management **135.3**	**57.0 * 2 + 21.3 (IAWG meet.part.)**	

ANNEX XVII

STEERING COMMITTEE

of the UNEP/GEF Project

"Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment"

2nd Meeting

St. Petersburg, Russian Federation

April 25 - 26, 2007

STC 2/12

Item 12 of the Agenda

Procedure of Co-financing through NEFCO Funds and Relevant Reporting

---

Prepared by:	Nordic Environment Finance Corporation
Status:	approved by the Project Supervisory Council and by the Project Steering Committee

Procedure of Co-financing through NEFCO Funds and Relevant Reporting

1. Introduction

1.1. The UNEP/GEF Project "Russian Federation – Support to the National Programme of Action for the Protection of the Arctic Marine Environment" (hereinafter UNEP/GEF Project) is implemented in accordance with the Project Document signed on July 18, 2005. The Executing Agency for the UNEP/GEF Project is the Ministry of Economic Development and Trade of the Russian Federation and the Implementing Agency is the United Nations Environment Program (UNEP). The Advisory Committee on Protection of the Sea (ACOPS) and Nordic Environment Finance Corporation (NEFCO) are designated as Partner Agencies with the functions set out in Annex X to the Project Document.

1.2. Pursuant to the Project Document, the Project Office established in Moscow manages activities in the integrated work plan approved by the Project Steering Committee. As appropriate, the Partner Agencies will take part in these activities upon confirmation from the Executing Agency and Project Manager.

1.3. The UNEP/GEF Project has three sources of funding:

- GEF funds;
- funds of the Russian Federation (in cash and in kind);
- funds from other co-financing countries and organisations (donors).

The procedure of disbursement of the GEF and Russian Federation funds and relevant reporting has been defined by the Project Document. Donor funds for the purposes of the UNEP/GEF Project implementation, if and when the donors wish, may be sent to the Currency Account of the Project Office (See STC 1/7) or channelled (i) through the Trust Funds established by a Partner Agency explicitly for the purpose of the UNEP/GEF project implementation through such specific Trust Funds, or (ii) through investment funds managed by a donor organisation on sovereign basis (parallel co-financing).

1.4. This document determines

(a) the co-financing procedure and relevant reporting by NEFCO, as a donor and co-financing organisation, for the purpose of the parallel co-financing of UNEP/GEF Project implementation through NEFCO funds such as, but not limited to, the Investment Fund, the Nordic Environmental Development Fund, the Testing Ground Facility carbon fund and the Barents Hot Spots Facility (NEFCO Fund(s)); and

(b) the disbursement procedure and relevant reporting for donor funds provided to NEFCO explicitly for the purpose of the UNEP/GEF project implementation through specific Trust Fund(s), applicable only in the event NEFCO makes a decision to establish dedicated Trust Fund(s) for the UNP/GEF Project implementation.

2. Procedure of Parallel Co-financing and Relevant Reporting by NEFCO

2.1. Principles of Parallel Co-financing by NEFCO:

2.1.1 In accordance with NEFCO's Statutes NEFCO, as a sovereign international financial institution, shall retain sovereignty over its funds and funding procedures.

2.1.2 In parallel co-financing of UNEP/GEF Project implementation NEFCO shall apply the same procedures that are applied to all NEFCO activities.

2.1.3 The regulations of the relevant NEFCO Fund shall be complied with in any UNEP/GEF Project implementation by NEFCO.

2.1.4 The main investment phases are: identification phase, evaluation phase, approval by the NEFCO Board of Directors', signing of project agreements, implementation and monitoring. The investments to be financed can be identified by NEFCO or be introduced for NEFCO's financing by for example the Project Office. The investment proposals are evaluated project per project based on the NEFCO criteria for financing.

2.1.5 The inclusion of a NEFCO financed investment as part of the co-financing of UNEP/GEF Project implementation shall be subject to the approval by the Steering Committee.

2.2. Reporting by NEFCO:

2.2.1 NEFCO will agree with the Project Office the procedures for reporting on the progress of an investment approved for the co-financing of the UNEP/GEF Project.

2.2.2 NEFCO will yearly submit reports to the Executing Agency, Implementing Agency and Project Office on disbursement of funds from NEFCO Funds for projects and activities accepted by the Steering Committee as part of co-financing of the UNEP&GEF Project.

3. Procedure of Disbursement of Donor Funds through dedicated Trust Funds and Relevant Reporting

3.1. Notification:

Subject to NEFCO having made a decision on establishing dedicated Trust Fund(s) for the UNEP/GEF Project implementation, the donor will send a letter to the Implementing and Executing Agencies, Project Office and NEFCO as relevant Partner Agency with the following information:

- donor's consent to participate in co-financing of the implementation of the entire UNEP/GEF Project or its individual components in accordance with the integrated workplan approved by the Steering Committee and on the basis of the amount of funds allocated by the donor;
- identification of NEFCO as the Partner Agency with which the donor chooses to work;

3.2. Agreement Between Donor and NEFCO:

The Donor and NEFCO will sign an agreement, whose activities will be in accordance with the integrated workplan, and which will be shared with the Implementing/Executing Agencies and Project Office.

NEFCO will be legally responsible for disbursement of the donors' funds received in the Trust Fund(s) established by NEFCO.

3.3. Principles:

NEFCO may establish Trust Funds for the UNEP/GEF Project after the official notification letter is received from the donor.

Work that will be financed with donor funds should be in conformity with the integrated workplan approved by the Steering Committee.

Donors will transfer funds to the Trust Fund(s) established by NEFCO based on the terms of their legal agreement.

NEFCO will disburse donors' funds directly, based on the consent of the donor, applying NEFCO funding procedures.

3.4. Disbursement of donors' funds directly:

- NEFCO on a basis of donor request will send to the Project Manager and the Executive Agency for agreeing the drafts of ToRs for activities described in the Integrated Workplan for donors funds and schedule of their implementation
- NEFCO will sign the contracts for implementation of specified above activities after agreeing the ToRs and the work schedules with the Project Manager and the Executing Agency
- NEFCO will send to the Project Manager for comments the draft reports on implemented works in the framework of contracts concluded by NEFCO. Project Manager will evaluate these reports using competence of TT and WGs leaders, if necessary. NEFCO should take into account comments received when preparing the final versions of the report, Project Manager informs Executing and Implementing Agencies in a case of difference in

opinion on quality of performed works and contentious issues are subject for consideration at the next meeting of the Project Supervisory Council[41].

- NEFCO will be legally responsible for disbursement of the donors' funds accumulated in the Trust Fund(s) established by NEFCO and disbursed directly by NEFCO

3.5. NEFCO will, in a timely manner, inform the Executing Agency, Implementing Agency and Project Office of the total amount of donor funds accumulated in respective Trust Fund(s) to be accounted for in drafting the integrated workplan and budget.

3.6. NEFCO will quarterly submit reports on disbursement of donors' funds within co-financing of the UNEP/GEF Project to donors and in copy to the Executing and Implementing Agencies and Project Office.

3.7. For preparing budget applications and reports on expenditure of donors' funds, formats provided for by the Project Document are used, if not otherwise proposed by the donors.

[41] According to item 53 of the Project Document "The Project Manager at the Project Office shall be responsible for ensuring that all Project activities are carried out in compliance with the Project design and the instructions of the Steering Committee, and Executing Agency".

ANNEX XVIII

STEERING COMMITTEE

UNEP/GEF Project - Russian Federation: Support to the National Programme of Action for the Protection of the Arctic Marine Environment

Second Meeting

Saint Petersburg, the Russian Federation

April 25-26, 2007

STC 2/13

Item 13 of the Agenda

Procedure of Approval of Project Documents via Electronic Communication

---

Prepared by: the Project Office
Status: approved by the Project Steering Committee

Procedure of Approval of Project Documents via Electronic Communication

1. Documents which are subject of approval either by Project Supervisory Council or Project Steering Committee, should be prepared by the Project Office and agreed by both Executing and Implementing Agencies. These documents should be sent via e-mail by the Project Office to members of the Project Steering Committee and the Project Supervisory Council.
2. StC/SC members in 10 days period should send their comments on the document back to the Project Office. Project manager summarises all received comments, agreed changes with both Executing and Implementing Agencies and resend the final version of the corresponding document to STC/SC members.
3. By receiving the final version of the document the StC/SC members inform the Project office in 7 days term that they have or do not have objections. In the complicated cases if consensus cannot be achieved via e-mail a teleconference can be held to discuss the document.
4. When written positive responses have been received from all STC members the document can be considered as approved by the Steering Committee.
5. If STC/SC member is on business trip or is sick and cannot express his/her opinion on the document under consideration in due time this member can do it later on after finishing the mission or recovering from his illness provided he informed the Project Office about his/her incapability to perform his/her duties in time.