LAND-OCEAN INTERACTIONS IN THE COASTAL ZONE

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LOICZ AfriCat 1 – Coastal impacts of damming and water abstraction in African catchments

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Introduction

The impoundment and abstraction of freshwater in river systems for the purposes of power generation and agricultural irrigation has provided huge economic benefits at the global scale over the last 50 years. In many cases the construction of large dams has also significantly reduced the threat of devastation by flooding resulting from extreme rainfall events. However, the environmental and social costs of large dams have been poorly accounted for in economic terms so that the wider, long-term cost/benefit analysis to determine the true profitability of these schemes remains elusive (World Commission on Dams, 2000). The regional LOICZ-Basins core project (http://w3k.gkss.de/loiczbasins/Approach.htm) has explored the linkages between the principal human activities in river catchments and the issues affecting downstream and coastal environments and communities using the DPSIR (Driver-Pressure-State-Impact-Response) analytical and response framework (OECD, 1993). For the Africa region, the AfriBasins study (Arthurton et al., 2002) identified particular concerns over the coastal impacts from damming and water abstraction that were subsequently further explored by the AfriCat project (Snoussi et al., in prep.) as case studies covering six catchments in four countries - Morocco, Senegal, Kenya and Tanzania (Figure 1). While the studies focused mainly on the impacts of damming and water abstraction, they also considered the environmental and socio-economic impacts from other socio- economic and climate-related pressures to downstream and coastal state changes. The results of the individual case-studies will be published, together with an overview, in LOICZ R & S Report No. 30 (Arthurton et al., in prep.).

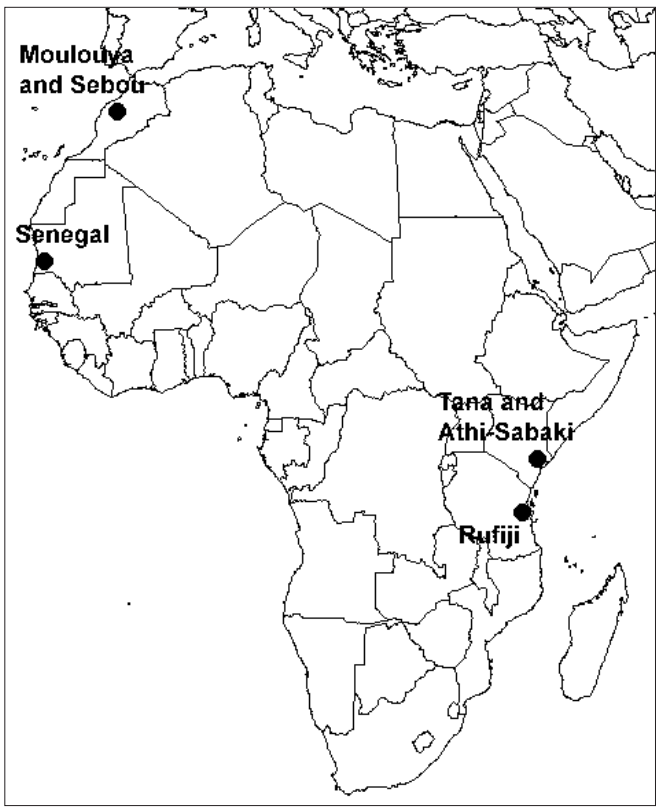

Figure 1. Catchments studied in AfriCat 1

The pressures of damming and water abstraction

The impoundment of water since the 1950s, principally for power generation and agricultural irrigation, in five of the six catchments has enabled major urban and industrial growth with considerable socio-economic benefits at national scales. In Kenya, for example, power generated from hydro-stations in the upper Tana basin provides 78% of the total national electricity output. In Morocco damming in the Moulouya and Sebou basins has enabled a major expansion in industrial and agricultural development (Snoussi et al., 2002).

A major benefit of most of the dams has been control of the water cascade so that damage and loss of life and livelihood caused by flooding episodes have been greatly reduced.
In the Sebou basin in Morocco, for example, the Al Wahda dam can reduce the flood volumes at the Gharb plain by more than 95%, avoiding an economic loss estimated at close to 27 million US$/yr. In the Senegal river system, the seasonal emplacement of the Diama dam at the head of the estuary, restricting the intrusion of sea water to the lower basin during the dry season, has led *inter alia* to a significant improvement in agricultural production above the dam. The demands for power and irrigation water are set to continue their increases of the last few decades, with new schemes being commissioned or planned, notably in Kenya's upper Tana and Morocco's Moulouya basins.

State changes and impacts of damming

Although there are obvious economic benefits accruing from damming and water abstraction at the national and sub-regional scales, pressures from these activities also cause significant long-term changes in water and sediment fluxes within catchment water cascades. These changes of state affect the downstream and coastal environments and their dependant or associated communities (Table 1). Some of the impacts are beneficial, but many are negative. The damming in the Moroccan basins illustrates the scale of the state changes. In the Moulouya, the total annual average volume of water carried to the Mediterranean before construction of the Mohamed V dam, from which water is diverted for irrigation, was close to one billion cubic metres, though with a marked variability. Comparison of the downstream water flows before and after damming shows a reduction of 89%. The corresponding fluxes of suspended sediment show a reduction of 94%. Reductions in the water flows following dam construction in the Sebou system are illustrated in Figure 2.

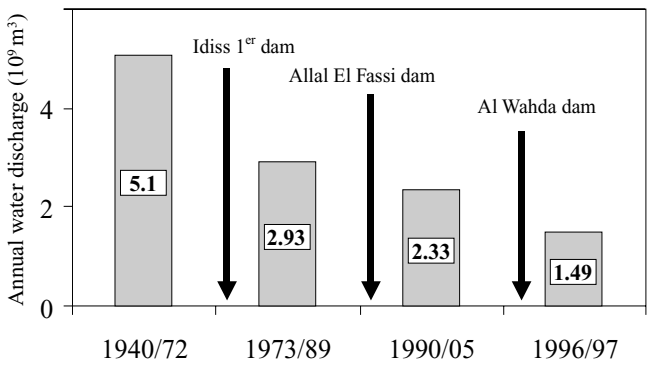

Figure 2. Reductions in the Sebou water discharge at Mechra Bel Ksiri (downstream measuring station) following the construction of three dams between 1972 and 1996 (Haida, 2000).

The changes include not only major reductions in the quantities of water and sediment transported to the coast (and coastal sea) but also the pattern of delivery of those fluxes – notably reductions in the incidence and amplitudes of peak water flows. While peak flows formerly created a threat of flooding, and still do in the case of the Rufiji system in Tanzania, they were also a key element in the maintenance of floodplain agriculture and deltaic ecosystems through sedimentation and addition of nutrients. The reduced frequency of floods in Kenya's upper Tana basin following the construction of the Masinga dam, in particular, led to the disruption of established agricultural practices in the lower basin. The increasing salinization of groundwater that is reported to be adversely affecting estuarine and deltaic agriculture, notably in the Moulouya basin, is seen as another consequence of upstream freshwater impoundment and abstraction for irrigation. There is a similar problem below the Diama dam in Senegal, which, unusually, provides no protection against flooding. Its barrage is raised during the wet season leaving the estuary town of St Louis vulnerable to inundation. Estuarine siltation is yet another issue believed to be caused by damming. The estuary of the Sebou river in Morocco now requires costly dredging because its channel sediments, increasingly of marine derivation, are no longer flushed by river flood discharge.

Other contributors to coastal impacts

Damming and water abstraction are major contributors to state changes in the water cascade, but catchment land-use and climate changes also have an important influence. As well as these catchment pressures, there are pressures exerted in the coastal zone itself, both socio-economic and physical. Understanding the relative strengths of each of these contributing pressures, their temporal variation and their bearing on the state of the coastal environment and its management issues forms a key element in the formulation and activation of an appropriate response strategy within the DPSIR framework.
As with damming and water abstraction, land-use changes in all of the basins studied have become increasingly evident over the last 50 years or so, driven by human influences including poverty, governance issues, national development policies and external trading agreements. Of these changes, those involving deforestation and the extension of agriculture into marginal land have resulted in faster rainfall run-off and increased sediment flux. The consequent increase in the rates of sediment entrapment in dam reservoirs is reducing the effective lifespans of dam reservoirs – a matter of particular concern to catchment managers in the Moroccan basins (Snoussi et al., 2002). Within the next few decades, expensive remedial actions – e.g. dredging or excavation – will be necessary if the existing benefits of damming are to be maintained. Climate change pressures are also reported in the catchments studied, mostly with increased drought conditions and increased frequencies of extreme events that exacerbate the problems of soil erosion and sediment run-off. Major increases in sediment discharge recorded over the last few decades in the undammed Athi-Sabaki system in Kenya, where land-use changes and increased rainfall, including extreme events, have occurred, are particularly striking (Table 1). Not only has this change resulted in higher turbidity in freshwater supplies but it has caused major accretion and resultant economic losses in Malindi Bay adjoining the river's mouth, and threatened coral at the northern end of the Malindi-Watamu Marine Park with siltation.
The contributions to water cascade state changes due to climate change are difficult to isolate and quantify, particularly in dammed systems. While there is a general perception that forest clearance and the spread of cultivation has led to increases in the rate of water run-off, the mobilisation of sediment in catchments and the sediment loads being discharged, it may prove difficult to distinguish such changes from those due to increased rainfall, including extreme events.
Of the human-related pressures created in the coastal zone itself, the unsustainable use of coastal resources is a major issue in the lower Rufiji basin and delta in Tanzania. There the pressures of over-harvesting woodland and mangrove resources

for fuel wood, charcoal production and construction poles, and the clearance of mangrove in favour of agriculture are impacting adversely on the sustainability of those resources and on the biodiversity that those environments support.

All of the case studies identified coastal geomorphological changes, though none reported specific evidence of sea-level rise. The long-term extension of the Langue de Barbarie, a spit at the mouth of the Senegal river, appears to be controlled by wave-dominated, longshore sediment transport. Conversely, the instances of coastal erosion noted near to the outflow of the Tana river's distributaries and adjoining the Moulouya's mouth are ascribed to reductions in the discharge of sediment as a consequence of damming.

Table 1. Changes in the states of water and sediment discharges at the coast in the river systems over the last 25 years.

Country	River catchment	Damming objective(s)	Annual water discharge	Mean water flow	Incidence of peak water flow	Annual sediment discharge
Morocco	Moulouya	Irrigation Power	Major reduction	Major reduction	Major reduction	Major reduction
	Sebou	Irrigation Power	Major reduction	Major reduction	Major reduction	Major reduction
Senegal	Senegal	Irrigation Power Flood control	Major reduction	Major reduction	Major reduction	Major reduction
Kenya	Tana	Power mainly	Minor reduction	Minor increase	Medium reduction	Medium reduction
	Athi-Sabaki	Undammed	No significant change	Major increase	Major increase	Major increase
Tanzania	Rufiji	(Gt. Ruaha trib.) Power	Minor/ medium reduction	Medium reduction	Medium increase	Medium increase

Review of the issues

As part of a Synthesis and Futures Workshop for AfriCat 1, the downstream and coastal impacts and issues for the various catchment to coastal sea cascades were reviewed on a country-by-country basis by two groups with different perspectives – scientists who had collected/collated the data and participants who represented major funding bodies and policy-makers. In each case the issues were ranked according to their perceived importance or severity and, where feasible, an indication was given of the trends of these impacts. For some of the key issues, particularly downstream flooding, saltwater intrusion and sediment trapping, there was close agreement between the scientists' and the policymakers' rankings. However, the policymakers did not rank the issues of changes in water discharge and water supply, and placed much less emphasis on sediment discharge than did the scientists. Such differences illustrate that, in this African situation, there are significant perception gaps between scientists and policy-oriented advisers on a number of key issues.

An important part of the review was an assessment of the validity of the perceived causal linkages that connect downstream and coastal impacts and issues to specific pressures and drivers in the catchments – a key process to determining relevant remedial strategies. The impacts of the changes due to the pressures of damming and water abstraction are of particular significance considering the timescale of their occurrence. Almost all of the dams in the AfriCat 1 catchments have been constructed and commissioned within the last 60 years. Within this period, there have been some major reductions in the availability and discharge of freshwater at the coast as dams have been built and major irrigation schemes commissioned – mostly with immediate effect. Secondary effects of these reductions – notably the salinization of soils, intrusion of sea-water into estuarine groundwater tables affecting agricultural productivity in estuaries, and impacts of diminished sediment discharge – have been slower to appear.

The current trends of change in all of the dammed catchments suggest that the physical adjustments to the water cascades are by no means complete and that the downstream, estuarine/deltaic and coastal sea environments will continue to be subject to changing conditions as a result of damming. Little is known of the likely consequences of the existing damming and water abstraction over the long term, or the ways in which catchment systems may respond to further damming and water abstraction.

Responses

As in most coastal countries, catchment and coastal management responsibilities in the AfriCat 1 countries are divided among many different bodies, often focused to specific sectoral goals that lack effective linkage between environmental and developmental objectives. The case studies here illustrate an imperative for the integration of catchment and coastal management by agencies that take into account the whole water cascade and its human dimensions – those affecting the cascade within the catchment as well as those being affected by the cascade in downstream and coastal environments. Such agencies would have dual roles of dealing with the inputs to the system and coping with the outputs.

Development authorities with responsibilities specifically for damming and irrigation water supply, as well as other key stakeholder groups, should be represented within those agencies, which would provide the essential interface with government policymakers. In the case of the transboundary Senegal river, an international management body covering the four catchment countries already exists, though its remit is currently restricted to the river basin and excludes the coastal zone. The recommended responses relating to the catchments studied imply a need for capacity building at the institutional level, in the science – both in terms of human capacity and the resources needed for comprehensive monitoring – and in communication including the improvement of public awareness. Observational monitoring networks should form the basis of the physical and socio-economic information and modelling required for catchment management. There is a strong case for the re-establishment of many former river gauging stations that have ceased to operate, and a need to enhance the observational meteorological network to provide a control for climate change models. Greater capacity in all countries to forecast the impacts of climate and demographic changes is another priority.

The responses from the case studies include a wide range of recommended actions mostly at the catchment level of management. Those directly concerning damming and water abstraction include:

- Promotion of water discharges to provide improvements in downstream and coastal conditions, while still providing protection against damaging floods. This is one of the Strategic Priorities of the World Commission on Dams (WCD, 2000).

- Assessing the downstream and coastal impacts of planned future schemes in catchments that are already dammed, as well as those presently un-dammed, particularly in the light of climate change forecasts.
- Addressing the problem of sediment trapping impacting on the sustainability of dam reservoirs together with the rigorous application of soil conservation measures through improvements in land-use in upper catchments.

Beyond the specific context of damming and abstraction, the studies have highlighted the urgent need to tackle the root causes of land degradation and soil erosion, and the over-harvesting of estuarine and coastal resources.

Acknowledgements

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Impacts of the fluvial sediment inputs and channel morphology in the mobility of the Rhône delta coast during the holocene and recent periods

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Over the past 7000 years, delta progradation phases are associated with significant variability of the Rhône river inputs due to climatic forcing, gradually combined with increased anthropic influence in the catchment basin, starting from the Neolithic period. Five periods of more abundant sediment supply have been determined on the basis of sedimentological and paleontological studies (long cores, bank and lagoon deposits along the paleochannels and near archaeological sites): 5800-3800 yr BP, 2500-2400 yr BP, Ist century B.C. to IInd century A.D. and Vth –VIIIth centuries (Bruneton et al., 2001, Arnaud-Fassetta et al., 2000; Arnaud-Fassetta, 2002). For the most recent phase (XVIth-XIXth centuries), field observations are corroborated by historical data recorded at Arles since the end of the XVIth century (Pichard, 1995, Arnaud-Fassetta & Provansal, 1999). Therefore, channel bathymetric data, recorded since the middle of the XIXth century permit reinterpretation of the paleohydrological evolution at the end of the Little Ice Age and show that decrease of the liquid discharges could be moderate, taking into account the incision of the channel in the calibration of limnigraphic scales.

Since subsidence is negligible on this time scale (Vella & Provansal, 2000), three constraints introduce a distortion in the relationship between sediment input and coastal mobility: (1) rate of sea-level rise, which temporary slowed down between 4500-3000 yr BP, (2) the accommodation space in front of the mouth, which depends on the topography of the Pleistocene bedrock and/or the previous Holocene sedimentary aggradation, (3) the channel geomorphology, which allows sedimentary transit to the coast. Due to a feedback effect, the abundant and coarse inputs, initially responsible for rapid progradation, lead to the development of a "braided river style", storing the sediments and thus facilitating avulsions and mouth shift.

In this paper, the fluvial and coastal morpho-dynamics were particularly studied during the last three centuries. Anthropic forcing corresponds to the rural demographic maximum in Western Europe. The hydro-climatic forcing of the Little Ice Age is illustrated by several major episodes of flooding recorded at Arles since 1580.

River channel evolution

The decennal frequency of months with floods > 4m (fig. 1) is significant in 1700-1710, 1750-1790, 1810-1820 and 1850-1860 (Pichard, 1995). Before river management, the abundance of sedimentary inputs led to a rapid advance of the mouth (80 to 180 m yr^{-1}), but induced infilling of the channel. In 1711, an avulsion stopped the seaward progradation and favoured spreading out of the deltaic system over a wide area.

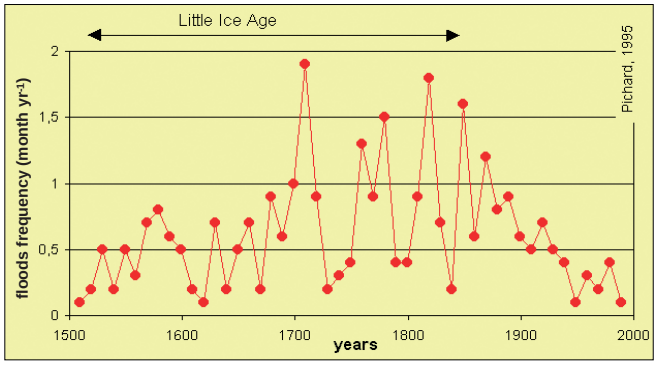

Figure 1. Ten years floods frequency (> 4m on the Arles city scale) during the Little Ice Age on the lower Rhône valley. *From the XVIth to the XIXth century, the floods > 4m on the Arles city survey scale are more frequent, with four major phases (beginning and end of the XVIIIth, beginning and middle of the XIXth century).*

The total solid load of the Rhône is reducing from 20 Mt yr^{-1} at the end of the XIXth century, to 8-10 Mt yr^{-1} for in the second half of the XXth century as a consequence firstly with the reduction of the frequency of the main floods (fig. 2a, b, c) and the reafforestation in the catchment area, and, secondly, with the building of dams and gravel extractions in the channel (Pont et al., 2002; Antonelli, 2002).

fig. 2a

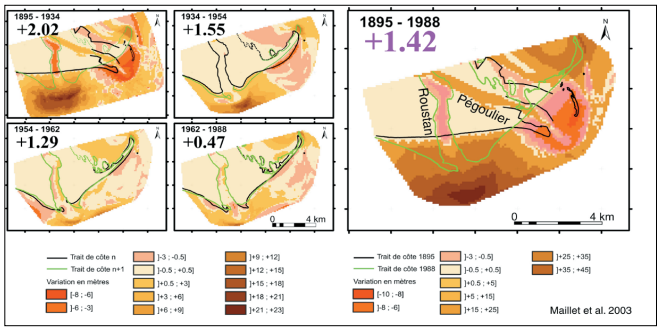

fig. 2b ***fig. 2c***

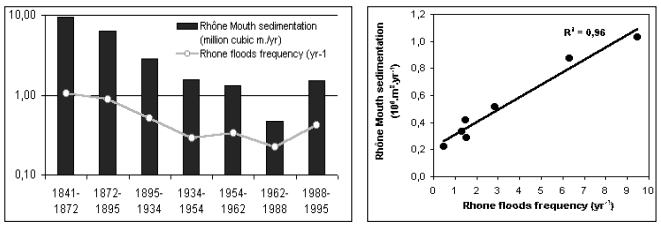

Figure 2. Slowing down in sedimentary input at the Rhône mouth (x10^6 m^3 yr^{-1}) according with reduction of the frequency of the major floods since 1841.

2a. Total solid load of the Rhône deposited at the mouth (bathymetric comparison).

2b. Reduction of the frequency of the main floods.

2c. Correlation between floods and sedimentary input at the mouth.

Bathymetric data in the Rhône channel permits measurement of morphological adjustments of the river. Results compared with those obtained upstream, or in other European rivers, suggest that the lower Rhone River developed in response to external stresses. The first part of the XXth century is characterised by an average erosion rate of the riverbed of 2.8 mm yr^{-1}, followed by a decrease since the 1960's to <1.5 mm yr^{-1}. The erosion rate depends partially on local constraints, however the embankments and engineering works, started around 1860's in order to protect people against flood and make navigation easier, probably explain the beginning of the entrenchment. The role played by dams in the channel incision needs to be considered since the more degraded period (1908-1965) corresponds to the construction of 5 dams whereas the next period (1965-1999) is synchronous with the construction of 17 dams on the whole Rhone River. The decrease in flood frequencies since 1950 probably explains the relative recent stabilisation of the channel morphology leading towards a state of "dynamic equilibrium"

River management has induced better sedimentary transport to the mouth and has given rise to the latest stage of mouth progradation (>180 m yr^{-1} between 1860-1875). However, human intervention has prevented excessive lengthening of the profile, leading to the management of a "controlled" avulsion by opening a new mouth in 1893. A last recent advance (60 m yr^{-1} from 1895 to 1952) is itself slowing down, by growth of the accommodation space in front of present mouth, where the prodelta probably acts as a sediment trap. In fact, since 1895 to 1974/88, cores and bathymetric comparison show an important sedimentary deposit between 0 and 20 m (1.9 Mm^3 yr^{-1}, including 500 to 700 Mm^3 of sands (fig. 3)). The mouth has become stabilized and then gradually deformed by longshore drift over the last few decades (Sabatier, 2001).

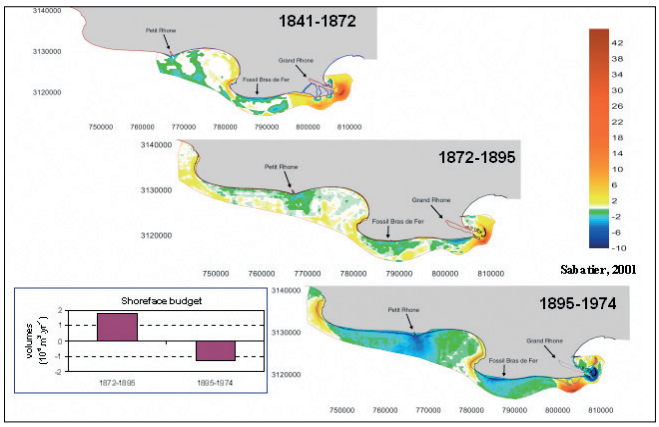

Figure 3. Sedimentary losses (1895 to 1974/88) on the upper shoreface (0-20 m). *Bathymetric comparison and shore face budget.*

Coastal evolution

The river containment has led to a very weak supply of river sediments, which has itself led to a destabilization of the coastal zone, reinforced by the resumption of the rise in relative sea-level (2.1 mm yr^{-1}). Erosional process now prevail and the delta coast exhibits an overall negative sedimentary budget, characterized by an average retreat of 4 m yr^{-1} from the 1940's until the beginning of the 1980's (fig. 4). The predominant effect of the storms was demonstrated by Suanez and Bruzzi (1999)

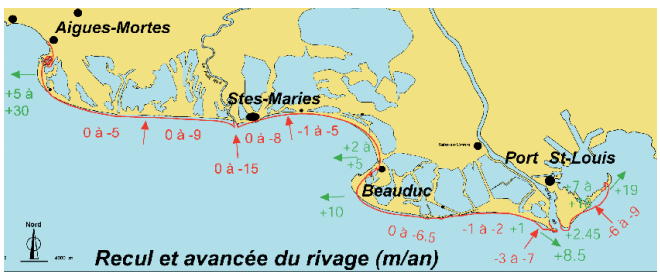

Figure 4. Variations of the coastline in the Rhône delta (m/year) by photo-interpretation: average retreat of 4 m yr^{-1} from the 1940's until the beginning of the 1980's.

The use of digital processing techniques has been instrumental in integrating and managing, via a Geographic Information System, the large database compiled from the analysis of various sources. Variations of the coastline, analysed from 98 profiles drawn perpendicular to the shore, leads to measures of the secular evolution of surface area: the Camargue coast records a gain of 3,875,600 m^2 between 1895 and 1944, a loss of 1,707,800 m^2 between 1944 and 1987-1990, and a gain of 209,600 m^2 between 1987-1990 and 1998-2000. The surface area determined over the scale of the century thus shows a net gain of about 2,377,400 m^2.

Longshore sediment transport is the major process reshaping the Rhône delta coastline, defining the identification of four sedimentary cells, confirmed by simulations of longshore sediment transport using empirical equations (Suanez & Provansal, 1998; Sabatier, 2001). The beaches close to the Grand Rhône mouth are dependent on river sediment input but the erosion of fossil sub-deltas plays also an important role in feeding the spits. The large increase recorded between 1895 and 1944 can be explained by an abundant supply of sediment to the coast.

After 1944, agricultural decline and forest extension in the Rhône catchment resulted in a decrease in sediment supply, which became even more marked in the years 1950-1960 due to the construction of hydroelectric dams. But it remains difficult to separate the effects of hydrological changes (end of the Little Ice Age) from modifications due to changing land use or hydraulic engineering works. The increase in surface area between 1987-1990 and 1998-2000 demonstrates the effectiveness of coastal defence structures in slowing down coastline retreat and the trend towards a new equilibrium of the littoral system, in a context of sedimentary starvation. There has been a heated debate about their long-term effectiveness, especially in view of the forecasts of sea-level rise and the poorly known long-term evolution of the submerged shoreface profile (Suanez & Sabatier, 1999; Provansal & Sabatier, 2000).

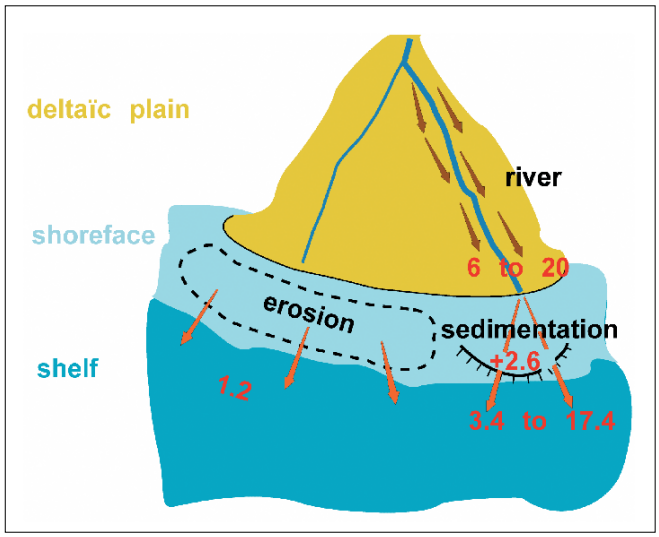

Figure 5. Mean global sedimentary budget of the Rhône delta during the last 50 years.

In such a context, several stake-holders in coastal management have put forward the idea of a strategic withdrawal of activities and settlement assets in certain sectors (Conservatoire du Littoral, Parc de la Camargue, Réserve Nationale de Camargue). This position is evidently resisted by the local residents and inhabitants of Saintes-Maries-de-la-Mer and by the salt extraction industry and farmers of the Petite Camargue. The pursuit of scientific monitoring and analysis should enable politicians and managers to make decisions with a fuller knowledge of the coastal processes. Figure 5 indicate the first mean global sedimentary budget of the Rhône delta during the last 50 years.

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MEETING REPORTS

START SC Meeting in Amsterdam 7-9 February 2005

On invitation LOICZ presented its future directions and key features of the new Science Plan and Implementation Strategy to the START SC Meeting hosted by the Royal Netherlands Academy of Sciences (KNAW) in Amsterdam. The presentation generated a substantial discussion which concluded in the recognising that an enhanced collaboration between START and LOICZ can play a leading role in building regional capacities. Three issues received particular attention, (i) the Erasmus Mundus Masters programme that promotes exchange of expertise and education with third country coastal change scientists involved in coastal management, (ii) the role the regional LOICZ offices can play and how best to generate synergies between the regional organisation of START, e.g., through collaboration with SARCS and SASCOM and (iii) the role LOICZ can play in promoting and supporting but also benefiting from the activities of the regional intergovernmental global change programmes such as the IAI and the APN. In the latter case the LOICZ role in particular in the recently completed APN regional coastal change synthesis was also highlighted in the presentation given by Martin Rice from APN. These links will need to be further elaborated and built and LOICZ Regional Nodes will have to play a key role here.

20th IGBP SC Beijing, China, 19-23 February 2005

Following an invitation by the Chinese Academy of Science, under the chairmanship of Guy Brasseur assisted by IGBP's new Executive Director, Kevin Noone, the IGBP held its 20th SC Meeting in snowy Beijing in February. The most important outcomes for the new LOICZ are threefold: Firstly, the Science Plan and Implementation Strategy (SPIS) for LOICZ 2003-2012 has now been officially approved by the IGBP and will go into print following the also final approval that came from the IHDP SC Meeting in Bonn, Germany, on 21-23 March. This is a major step which puts and end to a three year long process of synthesising findings from the first decade and designing a new and truly interdisciplinary LOICZ, a process which iteratively engaged a world wide community of scientists and institutions. Thus the new SPIS can rely on a broad ownership of both the natural and social science community. Secondly LOICZ will participate in a fast-track initiative suggested by PAGES looking into the relevance of paleo-records for future scenarios on ocean acidification. This initiative found a broad support also by IMBER and SCOR, and LOICZ can bring in its experiences made in earlier investigations by Buddemeier and Kleypas which resulted in the special issue of American Zoologist (Vol. 32) published in 1999. Ocean acidification is seen as one of the major global change issues, the effects of which for ecosystem health and functioning, such as global reefs, is not yet fully understood and ramifications for the human dimensions remain unclear. Thirdly, in a second joint activity, probably under the umbrella of the IGOS, LOICZ will collaborate with LUCC/LAND in a multi-participants group on the issue of harmonisation of land-based data for application in other GC projects. This is expected to be of high relevance in particular in our efforts to integrate land use and cover change and demographic data with coastal change information on a river catchment scale. Partner here is the LUCC Focus 1 office, W. McCornell at Indiana University, USA.

National ICZM strategies conference with international perspectives, Berlin, Germany, 28 February-1 March 2005

Organised by the Social Science Research Centre (WZB), Berlin on behalf of the Federal Office for Building and Regional Planning and the Ministry of Transport, Building and Housing, this meeting was held to take stock of recent ICZM initiatives and look ahead to expected future developments. It took place in response to the 2002 EU recommendations to develop and implement national ICZM strategies and other EU-led agreements concerning the economic potential and development of coasts. The meeting was convened by Bernhard Glaeser from the LOICZ SSC and a LOICZ presentation on "Research for coastal system sustainability" was given. The meeting highlighted the challenges for LOICZ to connect its science to the demands of policy development and strategic spatial planning of the coastal zone in a way that balances the needs for economic development with ecological concerns and protection. However, there is clearly a role for LOICZ and its networks to play in facilitating ICZM as a framework for responding to the many conflicting needs of the goods and services provided by the coastal zone.

IPO NOTES

LOICZ Inaugural Open Science Meeting, Egmond aan Zee, the Netherlands, 27-29 June 2005

Coasts and Coastal People

Scenarios of Change and Responses

Planning for the meeting is now advancing with over 250 abstracts submitted. The quality and breadth of abstracts submitted is very high, and we can be confident that we have the basis for an exciting, motivating and stimulating meeting to kick-start the implementation of the new decade of LOICZ research. The meeting is being well supported by the stalwarts of LOICZ, who will bring their experience and future vision to the meeting, as well as a new community of LOICZ researchers with the expertise and experience to implement the more human dimension focussed aspects of the new LOICZ.

We look forward to an interesting dialogue and exchange of views during the sessions and workshops. The conference website (www.loicz.org/conference) is being continuously updated with information, and now includes a full programme and details of the various sessions and workshops. In the near future it will include a list of participants and papers to be presented as confirmations and registrations flow in. You can still register online until April 30th.

SSC UPDATES

A warm goodbye to Jozef and James

At the beginning of the last transitional year of the new LOICZ, we would like to express our sincere thanks to **Jozef Pacyna** (SSC Member since 1999 and Vice Chair 2004) and **James Syvitski** (SSC Member 1999-2004) who have officially finished their terms. They both provided fundamental input and dedication in the SSC, been very actively involved in the synthesis of the first decade of LOICZ research and integral to the design of the future of LOICZ in the form of the new Science Plan and Implementation Strategy. However, we are glad that they have both confirmed a wish to stay strongly involved in the new LOICZ.

Following his leading role in the complex ELOISE synthesis, which has generated a comprehensive digest of almost 60 EU funded research projects opening results and outcomes to the wider scientific and user community, Jozef will keep building LOICZ links into the New Independent States in Eastern Europe and has been actively promoting the recent formation of the Polish National LOICZ Committee. He also remains a key link to the European Commission focusing in particular on the role of coastal research in the 7th Framework Programme.

James Syvitski will stay connected to LOICZ as a leading member of the recently launched LOICZ/SCOR/IAPSO working group No 122 on sediment dynamics in estuaries and will continue his work on global change of sediment fluxes and sea level issues. Both will be offered an Ex Officio membership in the new SSC.

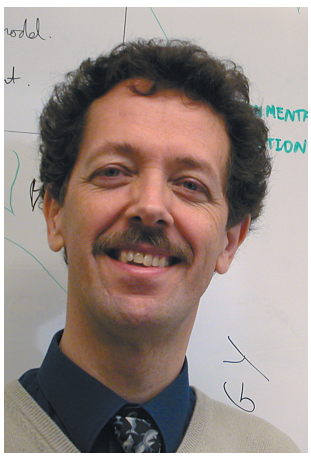
Three new SSC members – Bernhard Glaeser, Laurence Mee and Stephen Olsen.

LOICZ is fortunate to have 3 leading scientists at the cutting edge of the science-policy interface join the SSC, and who we look forward to working with to realise the potential of the recently approved Science Plan and Implementation Strategy. They are:

Bernhard Glaeser

Bernhard is a senior researcher at the Social Science Research Center Berlin (WZB) in Germany and Professor of Social Science in the Department of Political and Social Sciences at the Free University of Berlin in Germany. His interests are in environment, development, and sustainability research and has worked on research projects in East Africa, India and China.

Between 1995-98, Bernhard was appointed Professor and Chair of Human Ecology at Göteborg University in Sweden where he developed an interest in integrated coastal zone management (ICZM) and was appointed Program Director of the Swedish national coastal zone research program, "Sustainable Coastal Zone Management" (SUCOZOMA) from 1996 to 1998. Upon his return to Germany from Sweden in 1999, he set out to apply the Swedish experience to German coastal areas, and in 2003, he began coordinating "Regional spatial planning for the German coast: the national ICZM strategy". This politically significant project is in the process of developing a conceptual framework for a German national ICZM strategy, with particular emphasis on institutional cooperation and processes of dialogue. The German government will submit a report on its national strategy to the European Union in 2006. In 2004, Bernhard became involved in two more projects: "Coastal Futures" and "ICZM Oder" that investigates the economic and social impacts of offshore wind farm development on the North Sea coast of Schleswig-Holstein and the administrative framework required for implementing ICZM in a cross-border Baltic context respectively. Beyond his involvement in national projects, Glaeser is also part of the German-Indonesian international collaborative research project, "Science for the Protection of Indonesian Coastal Environments" (SPICE), where he assists in building up a social science cluster focusing on governance, designed to complement natural science research on mangroves, lagoon sedimentation, and the consequences of sea level rise. Bernhard has been in contact with LOICZ since the late 1990s and contributed to the 2002 LOICZ Synthesis and Futures meeting in Miami, Florida (USA). As an SSC member, he hopes to be able to help integrate social and natural science subject matter and issues, and to link these to coastal policy and management.



Laurence Mee

Laurence is Professor of Marine and Coastal Policy and serves as Associate Head of the School of Earth, Ocean and Environmental Sciences of the University of Plymouth. He was originally trained as a Chemical Oceanographer, earning his PhD from the University of Liverpool in 1977 following extensive fieldwork in the lagoons of Mexico's Pacific coast where he studied nutrient flux and primary production. He was also involved in studies of upwelling in the Canaries Current and from 1977 to 1987 was a senior researcher and lecturer at the National Autonomous University of Mexico. During this time he played a lead role in planning and managing the University's offshore research fleet including two 1000 ton purpose-built vessels, also participating and leading expeditions on marine fertility in the tropical Pacific. From 1987 to 1993, Laurence worked at Head of the UN funded Marine Environmental Studies Laboratory, the non-nuclear section of the IAEA Marine Environmental Laboratory in Monaco where he built a strong team conducting research on marine pollution worldwide. His activities also included work on the development of the marine strategy (Ch. 17) within 'Agenda 21', the substantive policy

document agreed at the 1992 Rio Summit. During this time, he became increasingly interested in the Black Sea and facilitated negotiations the first ministerial agreement on its protection (the Odessa Declaration), signed in 1993. He helped to establish the Black Sea Environmental Programme and raise the initial US$11 millions from the Global Environment Facility and EU for its implementation. He was appointed to manage the programme in the same year and continued in the role until 1998 when he decided to return to academia. In 1998 Laurence was awarded a Pew Fellowship in Marine Conservation for his work on research and environmental education in the Black Sea region and he joined the staff of Plymouth University where he now leads the interdisciplinary Marine and Coastal Policy Research Group. He continues to act as an advisor to the GEF and is Chairman of the UK based Advisory Committee for the Protection of the Sea. Apart from continued work on the Black Sea, he brings to the SSC his focus on socio-ecological systems including on the theory and practice of the ecosystem approach and adaptive management. He leads the 27 institute pan-European FP6 project 'European Lifestyles and Marine Ecosystems', a project that is examining future scenarios for Europe's seas through a systems approach bridging natural and social sciences.

Stephen Olsen

Stephen has been the Director of the Coastal Resources Center (CRC) of the Graduate School of Oceanography at the University of Rhode Island for nearly three decades. In that position he has worked with interdisciplinary teams to formulate, monitor and evaluate coastal governance initiatives at a wide range of spatial scales. Since 1985 the majority of CRC's activities have been in developing nations in Latin America, Southeast Asia and East Africa. All the work of CRC strives to incorporate the best available science into a participatory governance process in which issues of equity and transparent dealing play a dominant role. He served as the co-chair of the GESAMP working group that produced the report "The Contributions of the Sciences to Integrated Coastal Management" in 1996. His interest in assessing how to measure progress in ICM and to analyze the outcomes of governance processes has led to a number of recent publications on this topic and to working with both scientists and resource managers to better design the next generation of coastal initiatives. For example, one on-going effort brings together practitioners from across Latin America to develop coastal governance baselines for mature initiatives and then to engage in a collaborative learning and action process that will be sustained over at least the next three years. Stephen was invited to deliver a keynote at the final LOICZ conference that marked the close of its first ten years and came away feeling that he could make a useful contribution as someone with long experience in bridging the natural and social sciences to promote effective coastal stewardship.

Publish your science with LOICZ!

You want to reach out to the global LOICZ community of natural and social scientists and institutions? Than LOICZ strongly encourages publication of your science highlight in the LOICZ Newsletter and/or on the LOICZ website!

If you want to submit your scientific article or an extended executive summary for publication in the LOICZ media please send it to loicz@nioz.nl indicating where you would like it to go. The science highlight should report recent new research and be relevant to global LOICZ science as described in the new Science Plan and Implementation Strategy. It will be subject to an internal review procedure. Your contribution should have a maximum of three printed pages including figures, tables and references.

If you would like to submit notification of an up-coming meeting/workshop for inclusion in the LOICZ newsletter and/or on our website please also contact the LOICZ IPO.

PUBLICATIONS

Keep an eye on the LOICZ website for news on **new LOICZ R&S reports** that will soon be available as hard copy and electronic download.

Nutrient fluxes in transitional zones of the Italian coast. Eds. Giordani, G., P. Viaroli, D.P. Swaney, C.N. Murray, J.M. Zaldivar and J.I. Marshall Crossland. 2005, ***LOICZ Reports & Studies No. 28***, ii + 157 pages, LOICZ IPO, Texel, The Netherlands.

"Coastal Biogeochemistry" Eds. H. Thomas and A. Borges, Biogeosciences, Special issue, http://www.cosis.net/members/journals/df/special_issues.php?j_id=9

Special issue: New Guinea and its coastal seas, a testable model of wet tropical; coastal processes: an introduction to the Project TROPICS. Edited by: Gregg J. Brunskill. 2004, Continental Shelf Research, Volume 24, Issue 19.

Coming out soon:
LOICZ R & S No. 29- Russia Basins

The LOICZ Science Plan and Implementation Strategy 2003-2012

HAVE YOU SEEN

10-15 April 2005, Rio de Janeiro, Brazil:
Summer School on Environmental Modeling of Amazonia
www.cptec.inpe.br/summerschool

2-11 November 2005, Helgoland, Germany: 4th GKSS School of Environmental Research; Environmental Crisis: Science and Policy; H. von Storch, GKSS Research Centre and Richard Tol, University Hamburg, co-sponsored by LOICZ. http://w3k.gkss.de/events/4thschool/

Call for Ideas for the Next Earth Explorer Core Missions: As part of its Earth Observation Envelope Programme, the European Space Agency (ESA) announces an opportunity for scientists from the Earth Observation communities in ESA

Member States and Canada, to make proposals for ideas to be assessed as potential Earth Explorer Core Missions. These missions are intended to be used to conduct research in the field of Earth Observation and/or to demonstrate the potential of new innovation Earth Observation techniques of relevance to both the scientific and the application communities.
http://explorercall.esa.int

MEETINGS & WORKSHOPS

For a complete list of future meetings and regular updates visit our web-site at www.loicz.org

4-8 April 2005, Esbjerg, Denmark: Wadden Sea Symposium "Monitoring and Assessment - Foundations and Perspectives". www.wassensea-secretariat.org/news/symposia/Esbjerg2005/Esbjerg-2005.html

9-13 May 2005, Hong Kong SAR, China: International workshop on Sub-aerially exposed continental shelves since the Middle Pleistocene climatic transition.
Contact Dr Wyss Yim, wwsyim@hku.hk

23-27 May 2005, New Orleans, USA: Special symposium within the AGU-ASKLO Joint Assembly-ED04: Geoscience Education and Outreach in the Americas: Opportunities for North-South collaboration.
Convenors: Gerardo M.E. Perillo (perillo@criba.edu.ar) and Ivani Pereira (ipereira@pop900.gsfc.nasa.gov)

23 May - 3 June 2005, Gallipoli, Italy: NATO Advanced Study Institute (ASI): Advanced course on Seasonal to Interannual Climate Variability - its Prediction and Impact on Society.
http://www.ecmwf.int/staff/alberto_troccoli/nato_asi/index.html

6-9 June 2005, Brest, France: 4th EuroGOOSm - European Operational Oceanography: Present and Future.
www.eurogoos2005.org

19-24 June 2005, Santiago de Compostela, Spain: A Pilgrimage through Global Aquatic Sciences. SS04: Nutrient Transformation along the land-ocean continuum in the in the context of Global Change http://aslo.org/meetings/santiago2005/

6 July 2005, London, UK: Offshore development – new frontiers of opportunity: A CoastNET conference delivered in association with CIRIA. www.coastnet.org.uk and www.ciria.org

10-12 August 2005, Beijing, China: 2nd PAGES Open Science Meeting – Paleoclimate, Environmental Sustainability and Our Future. Deadline for abstract submission: 31 March.
www.pages.org

23-27 August 2005, Amsterdam, The Netherlands:
45th congress of European Regional Science Association (ERSA) 2005. Special session on: Modelling land use change.
www.feweb.vu.nl/ersa2005

6 - 8 September 2005, Bologna, Italy: Third International Conference on River Basin Management including all aspects of Hydrology, Ecology, Environmental Management, Flood Plains and Wetlands. Paper deadline: 6 May.
http://www.wessex.ac.uk/conferences/2005/rm2005/4.html

19-21 September 2005, La Coruña, Spain:
Third International conference on Fluid Structure Interaction.
www.wessex.ac.uk/conferences/2005/fsi2005/3.html

4-9 October 2005, Klaipëda, Lithuania: 2nd European Lagoon Conference: European lagoons and watersheds: function and bio-diversity. http://artiom.home.mindspring.com/gumilev/ch4.htm

9-13 October 2005, Bonn, Germany: Open Meeting of the Human Dimensions of Global Environmental Change Research Community, "Global Environmental Change, Globalization and International Security: New Challenges for the 21st Century". http://openmeeting.homelinux.org

21-16 January 2006, Boulder, Colorado, USA: 1st iLEAPS (Integrated Land Ecosystem – Atmosphere Processes Study) Science Conference. www.atm.helsinki.fi/ILEAPS/boulder

23-27 January 2006, Paris, France: 3dr Global conference on Oceans, Coasts and Islands

21-24 May 2006, Baton Rouge, Louisiana, USA: International conference on challenges in coastal hydrology and water quality. www.aihydro.org/conference2006/

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