

The E-waste Situation in the FSM

Country Report

Overview

Among the general population of the Federated States of Micronesia (FSM), perhaps relatively few people are aware of the potentially adverse effects that are associated with various environmental issues. While some people understand that litter is unsightly, and that there are polluting substances that can poison fresh water sources, make soil unsuitable for agriculture, and cause damage to coastal areas and reefs, most people are quite unaware of the wide variety of items that can contribute to these pollution problems. Since there has yet to be a large scale environmental disaster in this island nation, and the international news of such incidents happening in far-away places (India, US, Europe) seldom filters down sufficiently so as to be included in the local community level dialogue, the level of awareness of the average FSM citizen, the “man in the street”, is low. There may be some understanding of the hazardous nature of items such as waste oil, petroleum products, and other chemicals if they are not handled properly, but few people would realize that their cell phones or a washing machine are also included in the list of items with polluting potential.

“E-waste” is a term that is used to describe a type of waste consisting of broken or unwanted electronic or electrical devices. Although some of the products with e-waste potential have been imported into the FSM continuously since the late TTPI (Trust Territory of the Pacific Islands) period, roughly 30 years ago, the overall volume has remained relatively small until the late 1980s. Since that time, the number of imported computers, fax machines, televisions, various types of telephones, printers, large and small household appliances, entertainment systems, electric tools, and certain types of batteries has increased dramatically. At the end of their “product life” such items will add to the amount of hazardous wastes present on an island. E-waste should be viewed as one of the categories of hazardous wastes which a country must safely manage on an ongoing basis. E-waste contains over 1,000 different substances, many of which are toxic, and have the potential to create serious pollution following improper, unsafe disposal.

Many appliances and other products manufactured in the last two decades include circuit boards that enable the machine to be more “automatic” or “programmable” than models manufactured in earlier years. The addition of electronic components to many products has provided expanded features, improved versatility, and increased ease of use. However, the addition of the circuit board converts the appliance into a potential e-waste item, if it is not disposed of in a proper manner. When circuit boards are incinerated, the resultant ash contains hazardous substances.

Many of the products that can be classified (based upon the above definition) as e-waste, have recycling potential and thus economic value, either as “parts” for repaired or re-built items, or as “raw” recyclable materials, such as aluminum, other metals, and plastic. The processing required for raw materials adds an additional cost factor to the value of these items. Presently, very small scale recycling activities are occurring in the FSM, mostly dealing with salvaging aluminum and other scrap metals. Due to the small size of the market and the distances involved, the electronic repair industry that has evolved in some Asian countries has not appeared in the FSM, as it has not yet been proven to be economically viable. A small number of electronics and small appliance repair shops operate in the country, however these establishments provide services to the local cliental demand, thus there is no importation of parts to be reassembled for resale, nor export of rebuilt items.

Presently there is no specific system in the FSM that provides for the collection and safe disposal of e-waste potential items. Given this limitation, such products are discarded along with other commercial, office, and residential wastes into the local dump/landfill, or at some other location. There are a number of unofficial (and illegal) dump sites on all of the larger islands. Many of the FSM’s smaller atolls, by necessity, have had to take efforts to properly manage the solid waste flow. The population of a small island, less than a square kilometer must struggle to balance the consumerism trends of this modern era of transportation and communication, with the trash that is generated. Some of this trash is dangerous. On small and large islands alike, certain amounts of hazardous wastes, and e-wastes, are present and must be properly managed.

The municipal, state, and national authorities concerned with such matters have limited resources to allocate to a problem of which they are not fully aware, and in some cases unaware. Each FSM state has an office tasked with environmental protection responsibilities. These offices undertake the appropriate measures to tackle some of the more pressing environmental issues, however these offices are under-resourced and under-staffed to support the level of environmental protection surveillance maintained by some of the more developed countries, and other national or regional agencies. Since pollution does not always respect political boundaries, and the addition of e-waste pollution to the flow increases the danger, international organizations and the developed nations must support the efforts of all the levels of the local governments to fully implement environmentally sound management and control various environmental issues. The welfare of the community living “downstream” or “down current” is the barometer by which the effects of pollution need to be measured.

Due to a number of influences, the lifestyle of many Micronesians has been becoming more sophisticated with respect to the appliances, other devices, and tools that people use in everyday life. Some of the behaviors of persons living in the “modern” developed countries are frequently being adopted by FSM citizens, and as a result, use of the various machines and other apparatus associated with those adopted behaviors has increased. As the nation’s consumers are increasingly able to afford new personal computers (PC), mobile phones, and other electrical and electronic items, many consumers are also

replacing these items at an increased rate as well. This pattern of high rate of replacement contributes to a higher rate of waste generation.

Discarded computers, televisions and other electronic devices are becoming a significant disposal problem. A large percentage of these items are operated by electricity and have e-waste potential. Over the past two decades, the growth in the number both government and private sector offices has substantially added to the volume of the e-waste flow. With the advance in information and communication manufacturing technology, electronic product life spans have become increasingly shorter. In some industries, new models of some electronic products are being produced every three months. Thus, there is a trend towards shorter useful lives of electronic equipment, particularly PCs and mobile phones.

One of the differences between the FSM and many other countries is that there is a very, very small local market for secondhand electronic products, compared to the situation in many Asian countries and some other parts of the world. In today's FSM, there is no manufacturing for export of any kind of products, new or secondhand, with e-waste potential. Secondhand products are "manufactured" in a number of Asian countries from products imported from countries, such as China, Finland, France, Hong Kong, Japan, Malaysia, Republic of Korea, Singapore, Thailand, and the US. Workers in these manufacturing shops are often exposed to hazardous substances. Fortunately, without such an industry in the country, this is not a presently a problem in the FSM.

Background - FSM Country Characteristics

The Federated States of Micronesia is a developing island nation comprised of 607 islands spread across more than one million square miles of Western Pacific Ocean, north of the equator. While the FSM covers a very large area of the ocean (the east-west dimension is more than 2,000 miles), the total land area is small, only 271 square miles. The 2000 population and housing census indicated that 107,008 people inhabited 65 of the islands. Of the total, 52,817 were female, and 43,172 were under fifteen years of age. An additional 13,237 persons were in the 15-19 age group. In 2000, the median age for the country was 19.3 years, a 3.5 year increase than that reported in the 1973 census. The state populations (2000 census) were Chuuk - 53,595; Pohnpei - 34,486; Yap - 11,241; and 7,686 for Kosrae.

According to 2008 populations estimates (Secretariat of the Pacific Community fact sheet), some islands are very sparsely populated, but the more "urban" state centers range up to nearly 5,000 persons per square mile. Approximately 22% of the FSM's population lives in "urban" areas. The 2008 state population estimates, which include as a factor significant out-migration to the US, are Chuuk - 53,221; Pohnpei - 34,886; Yap - 11,736; and 8,183 for Kosrae, for a national total of 108,026. The life expectancy for males is 67.4 years, and for females, 68 years. In 2008 the median age has risen to 20.3 years.

The four FSM states are comprised of a main state center island, and except for Kosrae, outer islands which range from a few to several hundred miles distant. The state

government offices are situated on the largest island which is also the center of commerce, post-primary education, transportation (airport and dock facilities), and the location of the state hospital. Elementary schools and dispensaries are located in most of the larger island municipalities and on the outer islands with the relatively larger populations.

Geologically, most of the inhabited islands of the FSM are volcanic in origin, and include both high island and low atolls. The high islands have rainforest covered mountains rising to more than 2500 feet, with steep slopes and deep valleys, both broad and narrow coastal plains, mangrove swamps, and are fringed by coral reefs. The outer islands of the FSM are all low coral atolls, some tiny and at considerable distances (three or more days on the field trip ship) from the state centers. The climate throughout the FSM is tropical with an average daytime temperature around 27 degrees Celsius (80 F), a relative humidity between 70%-100%, and, depending on location, an annual rainfall of 200-400 inches. Low lying areas on the high islands, and all of the nation's atolls are susceptible to flooding during storms or unusually high tides

The capital of the FSM is located at Palikir in Pohnpei State. The national political arrangement is a three branch government, with a unicameral legislature from which the president and vice president are selected. The state governments are similarly set up, but have gubernatorial elections, and Chuuk has a bicameral legislature. States are further divided into municipalities, most with three branch government systems. Until just a few years ago, the government was the largest employer, and today there are still more government run offices and facilities (police/schools/health centers) than any other sector.

For the FSM, the 2001 World Almanac reported an estimated 1996 national gross domestic product (GDP) of US\$220 million, and a per capita GDP average of US\$1,760. Eleven years later, the Statistics & Demography Program of the Secretariat of the Pacific Community (SPC) give a 2007 national GDP of just under \$236 million, and a per capita GDP estimated average of US\$2,183. This measurement varies significantly from island to island and also between communities on the larger islands. Large portions of outer island populations, and the more isolated communities on the main islands are primarily involved only with subsistence farming/marine resources activities. However these populations usually have access to the cash economy by means of sales of agricultural produce or fish and other marine items. Thus even a farmer or fisherman may have a number of potential e-waste appliances or other items in the house.

Manufacturing activities are limited to fish and coconut product processing, cottage level handicraft assembly (mostly carving and weaving), and some small scale, local food processing. Electricity generation, rock quarry operations, and coral dredging are the largest commercial enterprises. Most other employment is located in retailing and service oriented occupations.

The tourism sector has seen slow growth over the years with an estimated 20,150 visitors to the islands in 2007, about 1,000 more than in 2006. Lack of a wide range of recreational activities, and very expensive airfares to reach these isolated islands, are limiting factors to development of a larger tourist industry.

On most islands, and particularly in the more “urban” areas of the nation, increased available financial resources has resulted in increased imports, including a substantial increase in potential e-waste products. In 2006, imports valued at nearly \$138 million entered the FSM.

Legal Framework

At the state and national levels, environmentally “friendly” legislation needs to be in place to support waste reduction strategies, proper waste management procedures, hazardous substance registration, and regulations that ensure that the general public is well informed and aware of the safe storage, use, and proper disposal of all potentially dangerous substances, including e-waste products. Presently, regulations in the FSM do not directly deal with management of e-waste from electrical and electronic equipment as a separately identified waste stream. National waste management legislation is in the formulation stage as of the date of this report. The offices charged with this task must incorporate a consideration of e-waste in this legislation.

Current state and national laws focus on hazardous substances that are included in specific lists. These lists identify categories of items based upon the degree of control that is needed. Some items are completely banned. Some items are banned, but a waiver can be granted under certain conditions.

At the international and the Pacific regional levels, there are several treaties and conventions that control various aspects of the management of hazardous waste, and also manage dangerous wastes from some industrial manufacturing processes. The agreements include:

- The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal,
- The Stockholm Convention on Persistent Organic Pollutants,
- The Waigani Convention to Ban the Importation into [Pacific] Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Trans-boundary Movement and Management of Hazardous Wastes,
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, and
- Agreement on Regional Cooperation in Matters Affecting International Shipping in Micronesia

The FSM is a party to all of these conventions, and as a result of these arrangements, some technical assistance and financial support has been made available to address certain hazardous waste and pollution problems. In that e-waste constitutes a portion of the overall hazardous waste stream, all of these agreements, to some extent, assist in the

safe management of potential e-waste items, and often address some of the various e-waste substances themselves.

There are a number of laws and regulations at the FSM national and state levels which, while again not specifically identifying e-waste, provide processes and guidelines for the management of hazardous wastes in the country. In the FSM, the actual implementation activities, regardless of the sector, usually occur at the state level. Concerning the control of e-waste, limited information and awareness exists since, to date, as has been previously explained, this matter has not been one of the high priority topics of discussion in the nation. Nonetheless, the approaches and procedures are state level activities, and each of the four FSM states has an entity responsible for EPA-related activities, although in Kosrae the responsible office is KIRMA (the Kosrae Island Resource Management Authority), an agency with an EPA-type mandate. Some examples of the laws and regulations that these offices enforce include the following.

- Title 25 of the FSM Code (from TT EPA Board Regulations 1975), which deals with the control of chemical wastes as a potential source of water pollution.
- Lists of controlled and banned substances which cannot be imported, or can only be imported under certain conditions exist at both the state and national level. These do not include items which have e-waste potential, but some of the specific hazardous e-waste substances are on the lists.
- An example of a state level Regulation is Title 18 of the Yap State Code Section 1509(a) which is the Yap State Environmental Quality Protection Act (YSL 3-73) created on 15 February 1995. This law empowers the Yap State EPA's activities to control air and water pollution. As mentioned, similar regulations and responsible offices exist in each of the other FSM states.
- Another state level measure to control pollution is the Environmental Impact Statement (EIS), which is a prerequisite for most commercial and other large scale projects. The EIS assessment of potential waste created, considers not only the construction phase, but also the operational phase of a project and its potential for pollution, is considered.

Since state level staff are responsible for the efforts to protect the local environment, and they also possess the most extensive and accurate knowledge of the situation in their particular state, it is reasonable for most of the e-waste monitoring and enforcement activities to be handled by the state governments. However, without sufficient resources and support from the national level devoted to the state monitoring and enforcement activities, the effort will be weak.

Strategies to further develop capacity among the organizations tasked with monitoring and enforcement are necessary. The existing legal framework in the FSM is sufficient to support public education and community awareness activities at this time. Enforcement of laws that protect human life and the environment from hazardous wastes is also supported under the existing framework. As the need for additional regulations arises, it

will become necessary to make some legislative adjustments to properly address the e-waste issue.

Methodology for Estimating the Quantity of E-waste Products Entering the FSM's General Waste Flow

As of the date of this writing, the FSM has not yet developed an e-waste product inventory, and there is only indirectly calculated information available regarding the quantity of e-waste released annually into the nation's flow of solid waste. This calculated information indicates the amount of potential e-waste product imported into the FSM based upon the information collected by the FSM's Customs and Tax Administration under the National Department of Finance. For the purposes of classification of all imported goods, an international system has been adopted for use in the FSM, which is designated the *Harmonized System Nomenclature* and is published by the Customs Co-operation Council in Brussels. The listing covers about 400 pages (with 21 sections and 97 chapters) and includes tens of thousands of specific items, and classes of those items broken down by specific characteristics of the items. For example, items may be characterized by size, operational methods (automatic or manual), specific accessories included, whether for household or commercial use, portable or stationary, composition materials, etc.

The *Harmonized System Nomenclature* was introduced in the FSM during 2002 and 2003 and import data was first collected nation-wide in 2003. Each FSM state has available information for a different portion of 2003, but not the entire year as not all states instituted the system on the same date. Information in the tables below reflect the complete years 2004 to 2007.

The FSM's Custom and Tax Administration has compiled a subset of the *Harmonized System Nomenclature* which contains approximately 800 of the nation's more commonly imported items. All imported items are coded and entered into a database, from which total imports in a category or combined categories over a specific time period can be computed. For the purpose of this report, in order to capture the full measure, but not falsely overestimate all of the potential e-waste items being imported, careful selection of code numbers of products was employed. Thus, washing machines of both "household type, automatic" and "laundry type, automatic" were included in the import count. But, "non-automatic" machines and washing machine parts, were not included.

The vast majority of all products entering the FSM are imported from the following locations: China, Guam, Hong Kong, Japan, Republic of Korea, New Zealand, the Philippines, Singapore, Taiwan, Thailand, and the United States. All importers in the country are required to complete a declaration of all imported products as part of the importation procedures. Importers submit this information to the customs offices by means of a Self Assessment Declaration (SAD) form. Import duties are assessed based upon rates established for the various categories of items. The import data collected is also a reasonably accurate record of almost all commercial products entering the country.

Such data is also collected by the Customs Officials at the nation's four airports, however the main focus of the information collected at these sites is to determine: 1) if any invasive species are present, and 2) payment of import duties to be charged on items brought into the country. The number of imported items entering the nation carried by airline passengers is a very small fraction of the FSM's total imports.

Being an island nation, the FSM is visited by many different kinds of vessels, including various kinds of fishing boats, ships delivering cargo, cruise ships carrying tourists, and private vessels visiting for just a few days or longer periods of time. As with the airports, goods carried by passengers and crews arriving on ships entering the seaports in each of the FSM states are subject to a customs inspection that is primarily related to environmental protection efforts and import duty matters. Import data is also collected, but again, the volume of imports brought in by these passenger is a very small fraction of the total imports.

Customs officials conduct random verification checks of the declarations provided by the importers, but not every container entering the country is examined. There are also instances when either importers or customs officials have incorrectly identified, and therefore mis-coded, imported products on the declaration forms. Thus, all of the information provided by the Harmonized System database is not always 100% accurate. It is however, currently the best source of information concerning the volume of e-waste product in the FSM at this time.

The following table gives information pertaining to the import quantities of select potential e-waste products in each of the four FSM states during the period from 2004 until 2007. The numbers represent quantities of units imported in to each state.

Chuuk State - Select potential e-waste imports - 2004 to 2007

Description	2004	2005	2006	2007	Totals
Appliances – Ovens	64	18	3	0	85
Appliances - Washing Machines	73	106	4	31	214
Batteries – Cells	4	9	0	0	13
Cameras - Digital & Video	1	13	0	0	14
Communications - Line Telephony and Apparatus	69	90	41	1	201
Communications – Radio and Apparatus	182	181	1	2	366
Computing – Calculating Machines, all types	57	753	81	1	892
Computing - Cash Registers	6	42	0	0	48
Computing - Data Processing Machines	103	232	507	406	1,248
Computing - Electric/Automatic Typewriters	3	4	0	0	7
Copiers - Duplicating Machines	2	6	14	0	22
Entertainment - Amplifier Sets	2	0	0	0	2
Entertainment - Sounds Recording Apparatus	158	114	27	0	298
Entertainment – Televisions	133	120	177	111	541
Entertainment - Video Monitors/Projectors	24	57	9	0	90
Refrigeration - Air conditioning machines, all types	613	78	82	0	773

Refrigeration – Freezers	22	9	4	8	43
Refrigeration – Refrigerators	268	68	107	70	513

Kosrae State – Select potential e-waste imports – 2004 to 2007

Description	2004	2005	2006	2007	Totals
Appliances – Ovens	29	50	0	0	79
Appliances - Washing Machines	228	72	159	95	554
Batteries – Cells	1,399	587	0	0	1,986
Cameras - Digital & Video	2	0	0	0	2
Communications - Line Telephony and Apparatus	61	2	0	0	63
Communications – Radio and Apparatus	15	4	0	0	19
Computing – Calculating Machines, all types	428	72	0	0	500
Computing - Cash Registers	2	0	0	0	2
Computing - Data Processing Machines	47	26	71	16	160
Computing - Electric/Automatic Typewriters	0	0	0	0	0
Copiers - Duplicating Machines	0	0	0	0	0
Entertainment - Amplifier Sets	0	0	0	0	0
Entertainment - Sounds Recording Apparatus	16	46	0	0	62
Entertainment – Television	33	108	39	19	199
Entertainment - Video Monitors/Projectors	13	92	0	0	105
Refrigeration - Air conditioning machines, all types	15	0	0	0	15
Refrigeration – Freezers	24	45	18	6	93
Refrigeration – Refrigerators	134	18	9	15	176

Pohnpei State – Select potential e-waste imports – 2004 to 2007

Description	2004	2005	2006	2007	Totals
Appliances – Ovens	534	74	1,101	162	1,871
Appliances - Washing Machines	6,267	4,319	5,865	1,047	17,498
Batteries – Cells	6,881	6,601	5,931	6,619	26,032
Cameras - Digital & Video	0	0	6	0	6
Communications - Line Telephony and Apparatus	431	372	559	57	1,419
Communications – Radio and Apparatus	18	265	185	10	478
Computing – Calculating Machines, all types	143	392	1,071	18	1,624
Computing - Cash Registers	50	7	8	1	66
Computing - Data Processing Machines	537	385	777	577	2,276
Computing - Electric/Automatic Typewriters	0	20	18	0	38
Copiers – Duplicating Machines	0	0	0	0	0
Entertainment - Amplifier Sets	0	0	0	0	0
Entertainment - Sounds Recording Apparatus	54	168	272	46	540
Entertainment – Televisions	326	497	477	814	2,114
Entertainment - Video Monitors/Projectors	39	179	237	5	460
Refrigeration - Air conditioning machines, all types	190	37	877	2,467	3,571
Refrigeration – Freezers	226	198	191	244	859
Refrigeration – Refrigerators	581	254	333	151	1,319

Yap State – Select potential e-waste imports – 2004 to 2007

Description	2004	2005	2006	2007	Totals
Appliances – Ovens	0	0	0	0	0
Appliances – Washing Machines	221	2,114	60	101	2,496
Batteries – Cells	0	1	10	202	213
Cameras - Digital & Video	0	0	0	4	4
Communications - Line Telephony and Apparatus	0	8	14	0	22
Communications – Radio and Apparatus	0	0	0	0	0
Computing - Cash Registers	0	0	45	0	45
Computing - Data Processing Machines	412	607	445	890	2,354
Computing - Electric/Automatic Typewriters	0	0	0	0	0
Copiers – Duplicating Machines	0	0	0	0	0
Entertainment - Amplifier Sets	0	0	0	0	0
Entertainment – Televisions	331	104	53	42	530
Refrigeration - Air conditioning machines, all types	0	19	3	0	22
Refrigeration – Freezers	207	123	57	40	427
Refrigeration – Refrigerators	168	45	95	30	338

FSM Totals – Select potential e-waste imports – 2004 to 2007

Description	2004	2005	2006	2007
Appliances – Ovens	627	142	1,104	162
Appliances - Washing Machines	6,789	6,611	6,088	1,274
Batteries – Cells	8,284	7,198	5,941	6,821
Cameras - Digital & Video	3	13	6	4
Communications - Line Telephony and Apparatus	561	472	614	58
Communications - Radio and Apparatus	215	450	186	12
Computing - Calculating Machines, all types	628	1,217	1,152	19
Computing - Cash Registers	58	49	53	1
Computing - Data Processing Machines	1,099	1,250	1,800	1,889
Computing - Electric/Automatic Typewriters	3	24	18	0
Copiers - Duplicating Machines	2	6	14	0
Entertainment - Amplifier Sets	2	0	0	0
Entertainment - Sounds Recording Apparatus	228	328	299	46
Entertainment – Televisions	823	829	746	986
Entertainment - Video Monitors/Projectors	76	328	246	5
Refrigeration - Air conditioning machines, all types	818	134	962	2,467
Refrigeration – Freezers	479	375	270	298
Refrigeration – Refrigerators	1,151	385	544	266

For illustrative and discussion purposes, the estimated average period of service or “lifetime” of selected electronic equipment used in the FSM are given as follows:

5 years for computers

- 4 years for television sets
- 2 - 2.5 years for mobile phone
- 2 - 2.5 years for portable radio/tape/CD player

Given these lifetimes, as is indicated in the table below, many of the items included in the above chart have already reached the end of their lifetime (Year of Death) and have entered into the general waste flow. As is indicated, as the years pass, the number of units of these products that enter the waste flow will accumulate. Unless efforts to remove, or neutralize, these items are successful and can keep up with the “flow”, the volume of e-waste will continue growth, year after year.

“Year of Death” of select potential e-waste items, imported between 2004 to 2007

	Approx. Total Imports (Units) by Year				Estimated Cumulative Number of Units at End-of-Life in:				
	200 ⁴	200 ⁵	200 ⁶	200 ⁷	200 ⁸	200 ⁹	201 ⁰	201 ¹	201 ²
Two-year "life span"									
Communications - Line Telephony/ Apparatus	561	472	614	58	1,647	1,705	<i>a</i>	<i>a</i>	<i>a</i>
Communications - Radio and Apparatus	215	450	186	12	851	863	<i>a</i>	<i>a</i>	<i>a</i>
Four-year "life span"									
Entertainment - Sounds Recording Apparatus	228	328	299	46	228	556	854	900	<i>a</i>
Entertainment – Televisions	823	829	746	986	823	1,652	2,398	3,384	<i>a</i>
Entertainment - Video Monitors/Projectors	76	328	246	5	76	404	650	655	<i>a</i>
Five-year "life span"									
Computing - Calculating Machines	628	1,217	1,152	19	<i>b</i>	628	1,845	2,997	3,016
Computing - Cash Registers	58	49	53	1	<i>b</i>	58	107	160	161
Computing - Data Processing Machines	1,099	1,250	1,800	1,889	<i>b</i>	1,099	2,349	4,149	6,038
Computing - Digital Processing Units	59	19	119	8	<i>b</i>	59	78	197	205
Electric/Automatic Typewriters	3	24	18	0	<i>b</i>	3	27	45	45

a – data for units imported in 2008 and the following years is needed to complete these cells.

b – data from years prior to 2004 is needed to complete these cells

The information in this table suggests that telephones, televisions and computing equipment are three of the products that will constitute the largest segments of the FSM's e-waste stream. This situation would be consistent with other countries. As additional years of data become available, it will be possible to identify other potential e-waste products that warrant special attention. Awareness raising efforts should target the users importers and of these items.

E-waste Stream

The typical lifetime of an e-waste potential product upon arrival in the FSM follows the sequence described below, ending with event #5. Step # 6 occurs in one state, illegally, but not consistently. In-country step #7 has occurred, however not on a regular basis and not driven by e-waste considerations. Steps #s 1 to 5 are typical of many island nations' solid waste, and e-waste streams. Regarding step #1, other countries may have fewer imported items because of in-country manufacturing.

1. Importation of e-waste potential products;
2. Retail sale of products to offices and consumers;
3. Use by offices and consumers;
4. Product becomes obsolete/broken beyond repair and is discarded;
5. Final product disposal at official (legal) or unofficial (illegal) dumpsite;

6. Salvage/Scavenge of product and sale to recycler;
7. Removal from island to overseas recycling or destruction facility.

Salvaging and scavenging (Step #6) are discussed below. Concerning removal from island (Step #7), to date only PCBs, pesticides, and some other hazardous substances have been removed from islands in the FSM for transportation to destruction at overseas facilities. E-waste substances were included, but not identified as such. The *POPs in PICS* (Persistent Organic Pollutants in Pacific Island Countries) program has removed a number of containers from several FSM islands over the last decade. Shipments of salvaged e-waste items for recycling purposes has not yet occurred, except occasionally in the private sector. Specific salvaging of e-waste items for in-country recycling is rarely, if ever, done.

A step between #6 and #7 would exist in nations with an in-country repair and recycling industry. Economic factors, such as the price of metals, significantly influences the economic viability of small scale shops. For the FSM, transportation costs are also a major factor responsible for the lack of development of this type of industry.

Open Dumping Sites

On the islands of the FSM, almost all wastes are eventually discarded in an open dumping site. This location of "final rest" may be at the main solid waste dumpsite for the island, which may or may not operate in compliance with local regulations, or it may be in an unofficial/non-compliant/illegal dumping site. In some cases the disposal site is the ocean. State and municipal governments attempt to control dumping in their

jurisdictions; however in most communities the effort is minimal due to limited resources to direct at an operation that is not high profile, and not seen as high priority, as well. As has been previously mentioned, the level of awareness of the dangers associated with many e-wastes is very low.

In each FSM state, there are some private sector endeavors to collect and transport wastes to open dumping sites. Some of these efforts are simply the work of large commercial establishments to dispose of their own wastes, e-wastes unconsciously included. In two of the FSM states (Yap and Pohnpei) there are organized solid waste management businesses, which provide service to a number of customers. In Kosrae, technical assistance provided by Japanese Volunteers (JICA) has enabled the establishment of the Fukuoka system for solid waste management. This project is slated to be replicated in the other FSM states. In none of these operations is any special handling afforded to e-waste. None of the solid waste management commercial enterprises provide any special handling of e-wastes, with the exception of the operation on Pohnpei which has begun segregating computer components, and white goods such as refrigerators, stoves, washing machines, and dryers.

The separation of certain items in the waste stream can be accomplished provided that the education/public awareness activities, the necessary collection infrastructure, and incentive systems, are all in place. Sufficient numbers of island residents can be motivated to have a positive effect on the situation. General recycling efforts have been successful in many large countries and in many small countries, island countries as well. With adequate support from the different levels of government and other development partners, the establishment of a recycling program, which included e-waste, is possible.

Scavenging and Salvaging

Scavengers play very important role in the e-waste stream in some countries because they collect various kinds of wastes and provide a service transporting the discarded items to repair or recycling shops for processing back into functional products. In these places, scavengers collect and transport almost all kinds of wastes including both hazardous wastes and municipal solid wastes, using hand-carts, bicycles, motorcycles, small trucks, tricycles, etc.

E-waste scavenging activities sometimes includes the “processing” of e-waste products to remove less valuable components in order to reclaim the more valuable parts. In Cambodia, for example, one of the most popular imported secondhand products is the television set for domestic use, and also for the dismantlement of primary components to reuse in other equipment. In the TV set; the Cathode Ray Tube (CRT) has lead and other heavy metals inside. The process involves separating the back funnel from the front panel glass. The CRT is then crushed to collect only the metal for resale to a recycler. Most of plastic housings and other small plastic components are crushed into small pieces and bagged for transport elsewhere for raw materials recycling. Toxic residue for the metals is often spilled when the tube is broken. Workers in these shops are often exposed to hazardous substances.

One of the main problems in the various processing operations of secondhand e-products is that there is very little consideration for the health and safety of the workers, or for the environment. Fortunately, without such an industry in the country, this aspect of scavenging is not a problem in the FSM. FSM scavenging is mostly the unauthorized entry into landfills and the removal of valuable items. There is the potential for serious negative health issues associated with the practice, as dumpsites are rife with sharp objects and other injury causing agents, such as acids and fires. On some islands often children are employed as scavengers. At any age, the activity is illegal in most countries, as it is in the FSM, and should not be permitted nor encouraged.

The collection of e-waste and other items with recyclable value should be organized so that the items are removed from the waste stream prior to arrival at the dumpsite. This is most effectively done by increasing awareness of the health and environmental issues surrounding e-waste and other hazardous wastes, and providing a conducive infrastructure and convenient system by which these wastes can be properly managed, beginning with the consumer at Step #4 of the waste stream.

In the FSM, scavenging is illegal, but salvaging can be legal if the proper procedures are employed. These include, but are not limited to, the use of proper personal safety protection gear for those involved in salvaging, and restrictions on who may be involved in such activity. Since, in the FSM, there is very little local demand for any of these items and the volume is so small that it is not economically viable to ship most e-waste recyclable items off-island, usually very few individuals are interested in salvaging or scavenging e-waste or any other items.

However, there have been times in each state, when there has been interest in the collection of aluminum, copper, and other items with the relatively higher recycling value. The buyers of these items are usually off-island firms which have developed short term arrangements with a local contact person who in turn organizes the collection efforts (sometimes both salvaging and scavenging) over a certain period of time, and then arranges for transport, which is provided by the off-island firm. A well coordinated collection trip made to several of the more populated islands in the FSM and the neighboring island nations could potentially provide enough volume to make the enterprise economically worthwhile. Such operations do not target e-wastes specifically, but collect any items with recyclable value. Government cooperation is essential to the operation.

Awareness Raising for the General Public and Other Entities

In the FSM, it is fortunate that some of the most hazardous aspects of e-waste reuse and recycling efforts are not a problem in this country. But we are also unlucky in that a relatively small hazardous substance “spill” can potentially cause substantial damage to our fragile island environments. Proper handling of e-waste items, and all hazardous waste, is a case of everyone benefiting if everyone cooperates, and the possibility of everyone losing if only a few do not join in and continue to pollute.

One of the top priority concerns in the area of safe solid waste management is the lack of understanding and awareness among the general populace pertaining to the serious and potentially impending crisis nature of the local situation regarding the presence, and the probability of continued importation and increased use of items containing hazardous wastes, including e-waste. The unintentional, in-country use of potential e-waste products, is of particular concern as it is the result of specific “innocent” behaviors which are practiced by many residents on a regular and frequent basis. The term “innocent” is used with reference to the fact that the vast majority of FSM residents who are involved with operating office machines, watching televisions and video monitors, using cell phone and home appliances, are not aware of the hazardous substances which may be released when these items are eventually discarded. People are not aware of the possible harmful exposure to family members, neighbors, and other people living in the community.

This lack of awareness presents a significant obstacle to effective concerted action to address the situation at the community, state, national, and international levels. Without such action, the country remains very susceptible to the public health and environmental problems caused by the toxic substances in e-waste. Some of these substances are identified as POPs (Persistent Organic Pollutants), the twelve most poisonous substances as determined by the Stockholm Convention. Human morbidity and mortality due to direct exposure to toxic materials, and indirect exposure by consumption of contaminated food stuffs and/or water, or breathing polluted air, can place a considerable added, but cause un-associated, burden on the nation’s health systems. Due to the persistent nature of some of these substances to remain in the environment and in animal tissue for long periods of time, and the very minute amounts often involved, it is typically impossible to identify a cause and effect relationship between the exposure to a toxic substance and an individual’s later-in-life poor health outcome connected to that exposure. At the same time, the potential for contamination of off-shore oceans, reef and coastal marine environments, inland waterways and streams, soils, and the air, by hazardous wastes, including e-waste, could result in food shortages and lead to possible economic ruin for important sectors of the local economy, including agricultural, fisheries (and other marine commodities), and tourism.

The FSM has been fortunate because no major, large scale health or environmental disasters caused by hazardous wastes or other dangerous chemicals have occurred in the country. Tragic disasters that have occurred in other countries (disasters caused by hazardous materials, radioactive materials, or buried toxic wastes) have served to create a general consciousness among the affected populations, sensitizing residents to these important health and environmental issues. The publicity surrounding these unfortunate events has increased the number of people who have concerns about hazardous wastes, which in turn increases public influence on both government decisions and social behaviors. The FSM, without such incidents and with limited media resources, faces the challenge of making the general public aware of the potential risks posed by the use and disposal of potential e-waste items and other hazardous substances. Given the relatively

fragile nature of the small island environments and the critical dependence of populations on these environments for food and livelihoods, the government must not wait for a major catastrophe before undertaking a wide-ranging awareness building effort.

An awareness raising campaign in each state will serve to instill interest in the general public with regard to the overall objective of environmentally sound management of electronic wastes. During these awareness campaigns, information such as the negative environmental and health effects arising from exposure to hazardous materials found in e-waste, how and where to dispose of e-wastes responsibly, and government/private initiatives for the environmentally sound management of e-wastes currently being undertaken, should be widely disseminated. Specific target groups to which to direct the awareness raising campaign efforts include the users of e-waste potential products, such as:

- Staff in any offices, schools, hospitals, and any other place where computing and communications equipment is used
- Homemakers who use microwaves, sewing machines, clothes washers and dryers, and other home appliances
- Users/owners of cell phones, televisions, VCR/DVD/CD players and recorders, radios, electric hand tools
- Anyone who uses particular batteries: including lead/acid (vehicle), nickel-cadmium, and lithium-ion.

The E-waste Recycling and Awareness Campaign could be organized under a state level task force involving the Environmental Protection Agency (or equivalent) offices, the Department of Education, the Department of Health Services, and the Department of Public Works (or equivalent), in each of the FSM states. A combined effort with commitment from all of these government agencies will provide a clear signal that the proper disposal of e-wastes through recycling is the way of the future.

Information must be made available to residents about how to recognize potential e-waste products, and explanations provided on how to properly dispose of e-waste items. A national conference focused on e-waste, and other waste management issues, would be a good “kick off” event for the E-waste Recycling and Awareness Campaign. Prior to this a planning workshop is necessary.

E-waste Management Policy and a National Workshop

As a first step to developing a national e-waste policy, the office having the responsibility for environmental protection in each state should have the opportunity to recommend suggested policy items, regulatory framework features, and specific guidelines for the proper management of e-waste. The FSM national level environment office, as the organizer of the policy development project, would collect this state level data, compile it, and use it to produce a draft package of policies, regulations and guidelines regarding the management of e-waste. The draft package would then be disseminated to all potential stakeholders, and possibly to the general public.

A national level workshop would then be called to finalize the draft package documents into recommended national and state level policies/legislation. Representatives from 1) the offices having the responsibility for environmental protection in each state, 2) state departments of health, education, and public works, 3) the national environmental office, and 4) any NGOs or other organizations having an interest in environmental protection or conservation, should be invited to the workshop. A consultant/facilitator to conduct the workshop and assist in the development of the policy and other documents should be retained. The primary objective for workshop consideration must be controlling and/or eliminating potential hazards to the environment and to human health. The FSM National Policy for E-waste Management should reflect the implementation demands of each FSM state, and identify the common, and the state-specific, needs. It must also provide the necessary legal and financial resources to support the development of systems to properly manage e-waste (and other hazardous wastes) in the nation.

A System to Manage E-Wastes in the FSM

Community level recycling programs, that serve to reduce the waste stream in the island neighborhoods, need to be developed. These programs would target the recycling of e-waste items, as well as plastics, metals, glass, and paper. There are many strategies and approaches to consider. Some of these would be directed towards the specific behaviors of individuals and how collective support from the family and community can improve everyone's compliance. In the private sector, strategies to reduce unnecessary imported waste and responsibility for product "end-of-life" handling are needed. Stores should encourage customers to reuse shopping bags, not to use plastic bags, and importers should reduce the ordering of products with unnecessary, excess packaging. Potential e-waste and other potentially hazardous items must be labeled, with proper disposal instructions provided. The importation of "Green" products should be encouraged.

The country's NGOs and faith based organizations can assist with the public awareness component, conducting community meetings, and utilizing other public gatherings to discuss the e-waste/hazardous waste issues. Traditional leaders should also be tapped to provide their views and encouragement, as their subjects and lands are at risk.

The government must provide the leadership and be the catalyst for implementation. Project leadership and facilitation in terms of human resources, technical assistance, and financial resources to undertake the system implementation tasks are required. It is anticipated that the system can reach the point where it will be self-sustaining; the revenues generated from the more valuable recycled materials subsidizing the handling of the less valuable materials, a model that has been successful in other countries. Following identification of the individual or task force to lead the project, the suggested basics of first implementing, and then operating, the system, are as follows:

1. Public Awareness campaign – short term (2 or 3 months duration) activities:
 - a. Public Services announcements and informational discussions/interviews on broadcast media (radio/cable TV)
 - b. Newspaper articles, banners

- c. Posters and pamphlets to public and private sector offices
 - d. Presentations to schools, churches and other community groups
 - e. National Solid Waste Conference
2. Public Awareness campaign – long term activities:
 - a. E-waste information included in school science/social studies classes
 - b. Identification and announcements about Recycling Centers
 - c. Visits to offices to conduct recycling presentations as services become available
 3. Infrastructure Development:
 - a. Advocacy/Lobbying efforts to leaders to pass e-waste/recycling legislation (including funding scheme) at state and national levels
 - b. Recruitment of service providers to perform collection and storage
 - c. Establishment of Recycling Centers
 - d. Collection efforts initiated and maintained
 4. Disposal Arrangements:
 - a. Recruit overseas recycler to receive items from FSM states
 - b. Separation of items depending upon recycling in-country and/or overseas processing needs
 - c. Recycle items that can be processed in-country
 - d. Ship items to be recycled overseas
 - e. Safely store all remaining hazardous materials (including e-waste) for future overseas disposal

These are suggested steps and may be modified by the entity which eventually becomes responsible for implementing the system.

Conclusions/Recommendations

This report has examined the e-waste situation in the FSM, and identified it as a subset of the nation's broader hazardous waste stream circumstances. It has been noted that none of the four FSM states currently have specific procedures to properly handle e-waste and that none of the three levels of government in the FSM (national, state, municipal) have, as of the writing of this report, any plans to initiate actions to address the e-waste matter. In fact, the overall capacity of these governments to address the significant solid waste management problems in the islands is limited, and thus many of the hazardous wastes on the islands, including e-wastes, are not dealt with utilizing the most effective and safe methodologies. A positive point to note, however, is that through the efforts of the Secretariat of the Pacific Regional Environmental Program's (SPREP) *POPs in PICS* project, a large volume of hazardous materials (including some e-waste substances) has been removed from the country.

The report has explained that one of the main reasons that e-waste and other hazardous wastes do not receive much attention in the FSM, is that there is a very low level of awareness of the problem. A major hazardous waste related disaster has not yet occurred in the country, so there has never been the impetus for an awareness of this kind of environmental danger to develop.

This report has recommended that an awareness building campaign to be undertaken, along with the creation of guidelines and other disseminated information to provide guidance on e-waste matters to the general public, to select target groups of potential e-waste product users, and to the portion of the private sector which is involved with import and retail sales of potential e-waste products. Many offices and organizations can partnership to make this campaign an effective short term endeavor. More long term efforts will be necessary to have e-waste information included in school classroom instruction, and to change the behaviors of the staffs in offices nation-wide.

At the same time as the awareness building efforts are undertaken, this report has also recommended that the political leadership of the three levels of government be approached and requested to give their support to the design and development of a system to properly handle hazardous wastes, including e-waste. Collection sites must be located and transportation and storage must be arranged. A recycling project which was piloted in Kosrae State has had good success, and is now being introduced in Yap. Further expansion of these existing efforts to provide appropriate management for e-waste products is necessary, as is the need to implement similar programs in Chuuk and Pohnpei states.

The development of a local small scale e-waste recycling industry could happen and it must be carefully monitored for health, safety, and environmental concerns. The safe and legal transport of recyclable items to overseas facilities must also be arranged. At this time the Pacific Islands Regional Recycling Initiative (PIRRI) has the potential to facilitate a more cost-effective regional-based collection effort, that would serve to make island or state level recycling programs more economically viable.

The FSM is fortunate in that the nation's e-waste situation is of much smaller scale and less of a health burden than in many other countries, particularly those located nearby on the Pacific rim. This survey has not found any information indicating the import or export of e-waste between the FSM and any other countries (either legal or illegal). But, if in the future there is economic impetus for this kind of trade to develop, additional and deeper investigation will be necessary. It is already well documented that, in the western Pacific rim/East Asian region, China is a major import centre for the recycling of electronic waste because of low labor and operational costs. As has occurred in other countries, any pre-export processing of e-waste would most likely happen with little regard for environmental and/or health concerns. The FSM state and national governments must provide due diligence to keep a similar situation from developing.

Information collected through this survey has provided a rough estimation of the volume of electronic waste in the FSM and provides some perspective for the relevant authorities to produce a framework for implementation steps to appropriately reduce and manage electronic waste. To achieve this E-waste recycling objective, the key to success lies in a strong public education and awareness program, some aspects of which must be sustained over several years. This duration of time is necessary, while a pro-recycling social

environment is created and the collection/processing infrastructure is established and program management capacity brought up to adequacy. Partnership with the private sector is also vital in building up the infrastructure for the country to fully implement E-waste recycling activities. The role of the government is to set the wheels in motion, to create the necessary impetus for the recycling “revolution” to occur in this country. From that time forward and on into the future, the people of the FSM can take pride in the level of stewardship that they have provided for their islands.