A study on collaborative environmental risk management : modeling to facilitate the prevention of soil contamination by local governments, businesses, and local stakeholders

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CHAPTER FIVE

A COMPARATIVE CASE STUDY OF SASEBO CITY IN NAGASAKI PREFECTURE AND TACOMA CITY IN WASHINGTON STATE

5.1 INTRODUCTION

Previous chapters provided the details on the various environmental management systems, regulatory and non-regulatory methods for controlling pollution, and the benefits and barriers associated with adopting a collaborative system to prevent soil contamination. This chapter examines two similar medium-sized cities in very different cultures to assess their current approach to environmental protection drawing on the previously introduced material to determine what level of environmental risk management for soil contamination they incorporate in their environmental system. It considers if the application of the CERM system proposed in this dissertation would provide better risk protection from future soil contamination than is currently in use.

Tacoma City in the State of Washington and Sasebo City in Nagasaki Prefecture were selected because they are both in the small to medium sized city category, they share demographic, geographic and economic similarities. Both are situated on bays with a U.S. Naval base, support international shipping companies both of which have a history of hazardous chemical releases, and a fishing industry that is affected by industrial pollution. However, each industry contributes significantly to the local economy, and must be co-exist in a sustainable but environmentally friendly manner.

Table 5.1: Background Facts on Tacoma City and Sasebo City

(By Author)

	Tacoma	Sasebo
Location	47°14'29" North, 122°27'34" West	33°10'00" North, 129°43'00" East
Population	199,600	256,737
Area (Km^2)	126.9	248.42
Government	Council/Manager	Mayor/Council
Industry/Commerce	High-tech, commercial shipping Naval operations, tourism, fishing	Ship building, commercial shipping Navel operations, tourism, fishing

Like the majority of cities in most developed countries, Tacoma and Sasebo are small and medium-size cities and share many of the same political, economic, and environmental pressures that present unique challenges in meeting the expectations of their citizens. Both of these cities have put forth concerted

efforts to protect their citizens and the environment, but they face environmental pressures trying to meet sustainability goals.

5.1.1 TACOMA CITY PAST AND PRESENT

Tacoma called "The City of Destiny," is situated in the southern region of Puget Sound at the foot of the majestic Mt. Rainier. The city is located in Pierce County (Figure 5.1); it has a population of 196,300 covering an area of 49 square miles, has a large international port, affordable living and progressive cultural activities. The economy is supported by a wide variety of Small and Medium-sized Enterprises (SMEs), various industries, a large agriculture and forestry base. The two largest suppliers to the labor market are the commercial port facilities, and the U.S. military at the Puget Sound Navel Shipyard and Bremerton Navel Station, U.S. Army's Fort Lewis, and the McChord Air Force Base. According to a report by the Tacoma Chamber of Commerce, the bases provide more than 188,000 jobs that create $7.2 billion in annual payroll to workers [1]. Wages received from the 101,000 port-related jobs amounts to $471 million, which contributes $77 million in annual state and local tax revenues [2].

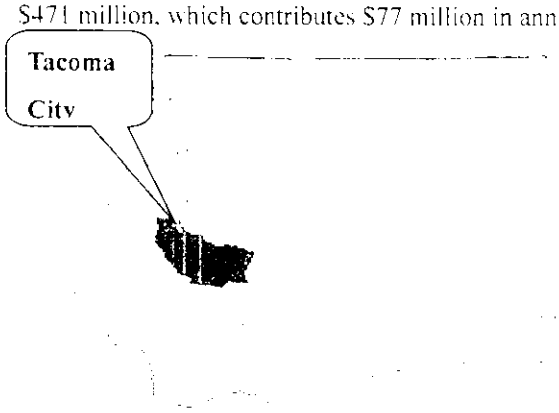

Figure 5.1: Map of Counties in Washington State--Pierce County in Red
(Pierce County Homepage: http://www.co.pierce.wa.us)

Tacoma's former paper and pulp, coal, and smelter industries that once turned out vast amounts of profitable products have left a legacy of toxic waste on the land and in the bay. One of the largest polluters was the Asarco Smelter better known as the "Tacoma Smelter". It was a major producer of arsenic, lead and copper from 1890 to 1986. Its toxic air emissions and water discharges have left the city with a remediation task of monumental proportions [3]. The city has cleaned up several severally contaminated residential and business sites, but much work remains to finish remediation construction. When the pulp and smelter factories were billowing out their toxic byproducts Washingtonians called the city as, "The Armpit of America," and when wind blew towards Seattle, the horrible odor released was sarcastically referred to as, "The Aroma of Tacoma." Figure 5.2, is a graphic contrast of the beautiful Mt. Rainier in the background compared to the black trail of toxic smoke spreading Tacoma's Aroma to pristine areas far away.

Figure 5.2: Tacoma in the Early 1900s

(Tacoma City Homepage: http: www.cityoftacoma.org)

The offensive smell worried local citizens so after its closure in 1986, the government asked the EPA to conduct a survey of the area to check the amount of soil contamination. It found significant soil contamination to issue a Records of Decision (ROD) for clean up action. In a four county study prepared for the Washington State Department of Ecology in 2005, arsenic, lead, and cadmium were discovered to be above the state's Model Toxic Control Act (MTCA) 20 mg/kg clean up level in 55 percent of arsenic samples, and 17 percent of lead samples exceeded the clean up level of 250 mg kg [4]. The results in Table 5.2 were through analysis using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for arsenic, and by ICP-MS EPA Method SW6010 for analysis of lead samples in Pierce County [5]. It shows an extreme deviation between the minimum and maximum values. This is due to the differences in close proximity of the boring sites to the former Tacoma smelter.

Table 5.2: Summary of Arsenic and Lead Concentration Data in Pierce County

(Compiled from Table 4 and 7 Tacoma Smelter Plume Project Extended Footprint Study, 2005)

Toxic Material	Boring Depth (inches)	Number of Samples	Minimum Concentration (mg/kg)	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	Standard Deviation (mg/kg)
Arsenic	0-2	904	2	29.8	1,100	57.0
	2-6	904	1	26.1	1,000	52.8
	6-12	174	1	21.3	170	32.0
Lead	0-2	904	4	130.74	4,000	234.33
	2-6	904	3	105.20	6,700	277.97
	6-12	174	1	79.41	790	115.68

Current environmental issues center on preventing stormwater run off from reaching Puget Sound or entering groundwater wells, ensuring shipbuilding companies and Bremerton Navel Station maintain environmental controls to prevent air, water and soil contamination resulting from their operations, and protecting the underground water supply in South Tacoma. The thirteen wells supply drinking water for over 300,000 people in Tacoma and surrounding cities in Pierce County. Two of these wells were contaminated by chlorinated hydrocarbons in 1981. The cause for the contamination was determined to come from poorly managed hazardous waste disposal and poor handling by a variety of facilities that use hazardous wastes, so the city created a special zone known as the South Tacoma Groundwater Protection District. Businesses in this area are required to obtain permits for underground storage containers and undergo biennial inspections [6].

The city reorganized in 1992 and formed eight Neighborhood Councils with the passage of the Growth Management Act (GMA) by the Washington State legislature. This act gave local governments more control over protecting their natural environment while undergoing economic growth.

> "The GMA requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing comprehensive plans and implementing them through capital investments and development regulations. This approach to growth management is unique among states" [7].

This act has it critics, but most think that it has helped to give citizens more voice in the planning process and increased participation by local stakeholders, and it has helped to streamline implementing new measures. A good example is the Neighborhood Action Strategies, which are not directly involved, in Tacoma's comprehensive plan, but the recommendations coming from the group are included into the plan when appropriate. Any change in the plan that affects the Neighborhood Council must be approved by it and the City Council.

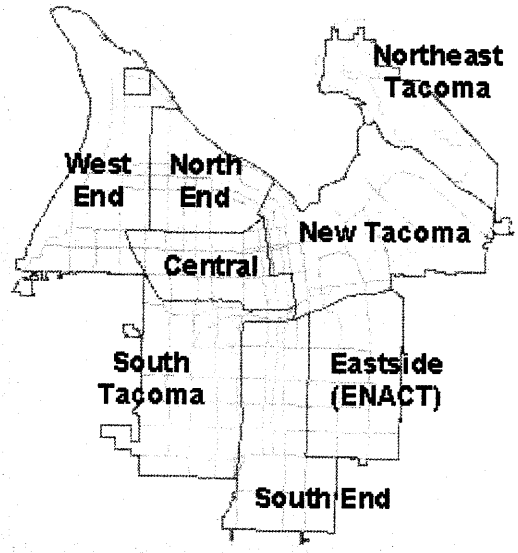

Figure 5.3: Tacoma's eight neighborhood councils created after passing the Growth Management Act are outlined in grey.
(Map, Tacoma City Homepage: http://www.cityoftacoma.org/)

The Tacoma government has exerted a great amount of effort to improve and protect its environment resulting in it being named "America's Most Livable Communities" in 2004, by the national *NPO Partners for Livable Communities* [8]. In 1998, the city started its "Click! Network," which is a fiber-optic system bringing high-speed Internet connections to citizens, this has earned it the honor of being called "America's #1 Wired City." This system has vastly improved telecommunications that allow for better service and communication between citizens and the local government officials.

5.1.2 SASEBO PAST AND PRESENT

Citizens of Sasebo proudly protect their natural heritage which includes the Kujukushima (99 islands) located in the Saikai National Park, and the Nanatsukuma limestone cave [9]. The proposal for constructing the Dutch theme park *Huis Ten Bosch* to attract more tourists came to the city council; it required designers to produce an eco-friendly park to the surrounding bay. It became the World's most eco-friendly theme park and model for future theme park development.

Historical ties with Europe can be traced back to Dutch traders who used Nagasaki City and Sasebo for trade between Japan and Korea and China. Many western inventions and customs were introduced to Japan through these two cities in Nagasaki Prefecture, so Sasebo has long been a progressive city in many respects.

During the Second World War, the bay served as an important base for the Japanese Imperial Navy, and after the war, the shipyards continued to produce a large amount tankers and commercial vessels. In addition to Japanese shipbuilders, the U.S. Navy began its U.S. Fleet Activities in 1946. Figure 5.4 provides a panoramic view of Sasebo Bay.

Figure 5.4: Sasebo Bay Including the U.S. Navel Base left of the center of the photo. (Sasebo 99.com: http://www.sasebo99.com/english/sasebo_info/index.html.r)

The bay consists of 28 square kilometers, which is larger than either Kobe or Yokohama ports, and its depth has allowed the production of some of the largest oil tankers in the world at the Sasebo Heavy Industries Co. Ltd. facilities.

Sasebo has a history of pollution from local industries that put stress the eco-system and had potential health concerns. PCB levels exceeding the government standard were discovered as early as the 1980s in the bay and nearby rivers by the MOE, but had not been cleaned up until the MOE 2003 report [10]. However, recent surveys of rivers and the bay by the city's Environment Department have uncovered no cases of PCBs exceeding the national EQS [11].

5.2 A COMPARISON OF THE MUNICIPAL STRUCTURE OF TACOMA CITY AND SASEBO CITY

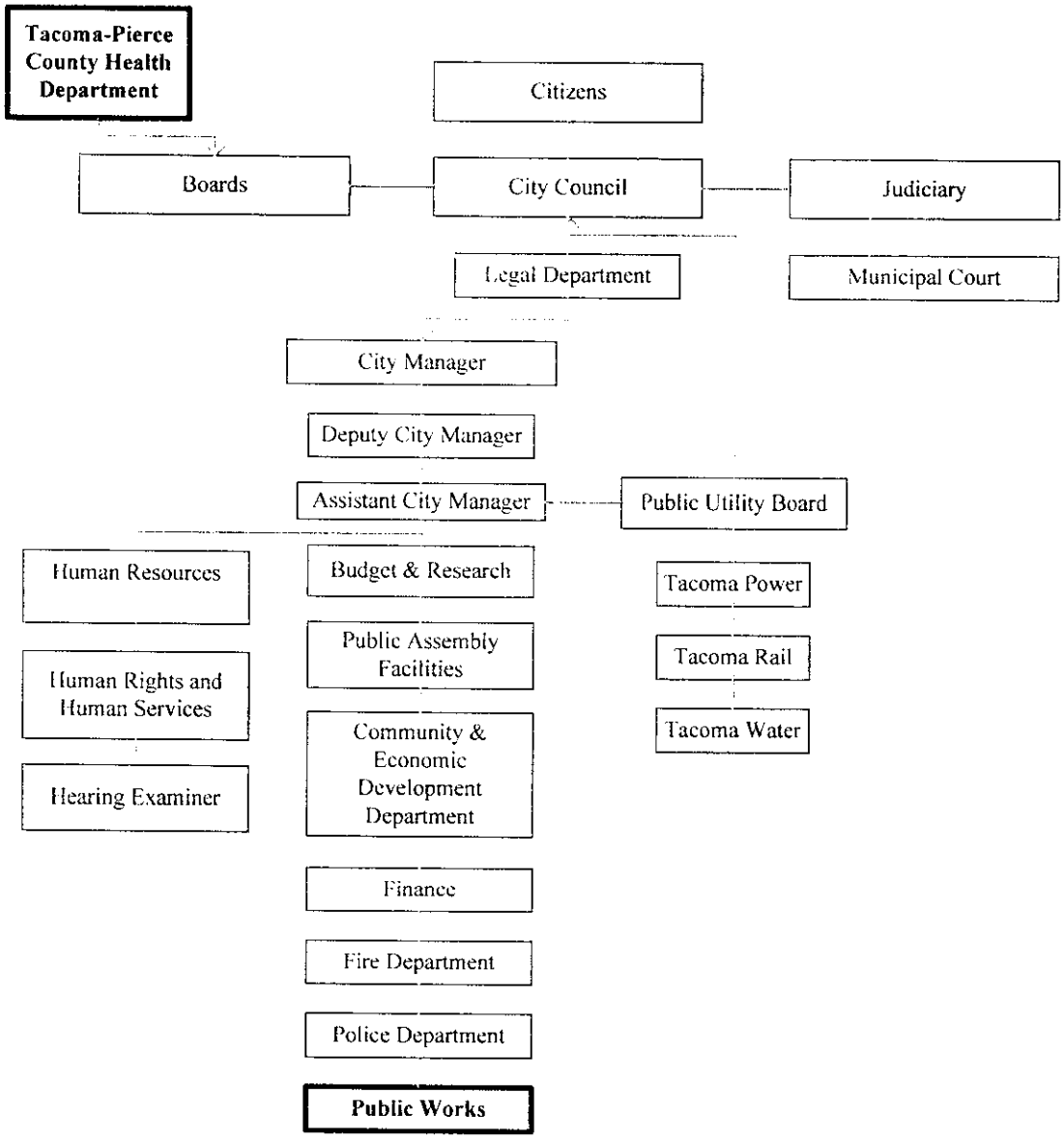

Figure 5.5: Tacoma City Government Organization Flow Chart
(By Author)

An elected mayor and council members head Tacoma City government. The mayor and eight city council members serve four-year terms. The council is responsible for legislating new laws and making amendments to existing ones. The stated mission is as follows: "We provide high-quality, innovative and cost-effective municipal services that enhance the lives of our citizens and the vitality of our neighborhoods and businesses through teamwork, integrity and continuous improvement in partnership

with our community" [12].

Tacoma's governmental organization related to environmental protection and management is more complex than the Sasebo system. As figure 5.7 illustrates, Sasebo has a single Environment Department that deals with MSW, recycling, and sewage treatment; whereas, Tacoma uses the combined funds of its Public Works Department, the Tacoma-Pierce County Health Department, and the State Department of Ecology's Toxic Control Account to carry out its environmental policies. There are seventeen departments that perform various civic duties, but only three are directly related to environmental protection: 1) The Finance Department which is responsible for giving advice on proposed programs; 2) the Budget and Research Department that provides the necessary funds once they are approved by the city council; 3) the Public Works Department that handles a majority of the environmental tasks including garbage and recycling management, permits, the EnviroChallenger program, Central Treatment Plant upgrades, surface water, and wastewater control measures.

The Tacoma-Pierce County Health Department is responsible for the health and safety of Tacoma City residents, and other cities and towns within the County's jurisdiction. Tacoma's mayor, one city council member, two Pierce County council members, and an elected official representing the other cities or towns, and one Member-at-Large decided by the board [13] set the County Health Department policy.

The State Department of Ecology provides funds to Tacoma and other cities and counties to prevent pollution, clean up pollution, and support sustainable communities. The funds come from the Model Toxics Control Act (MTCA), which citizens initiated and passed into law in 1989. The MTCA compliments the Superfund law in protecting public health and the environment by removing contaminants, preventing the contamination, and maintaining sustainable communities. Limited funds, and higher than expected costs for remediation, has forced the department to develop new strategies to meet the department's goals. Director Linda Hoffman stated, "Through innovation, collaboration, and a commitment to sound investment practices, we will continue to invest in environmental projects and activities that are in the best interest of Washington's communities" [14].

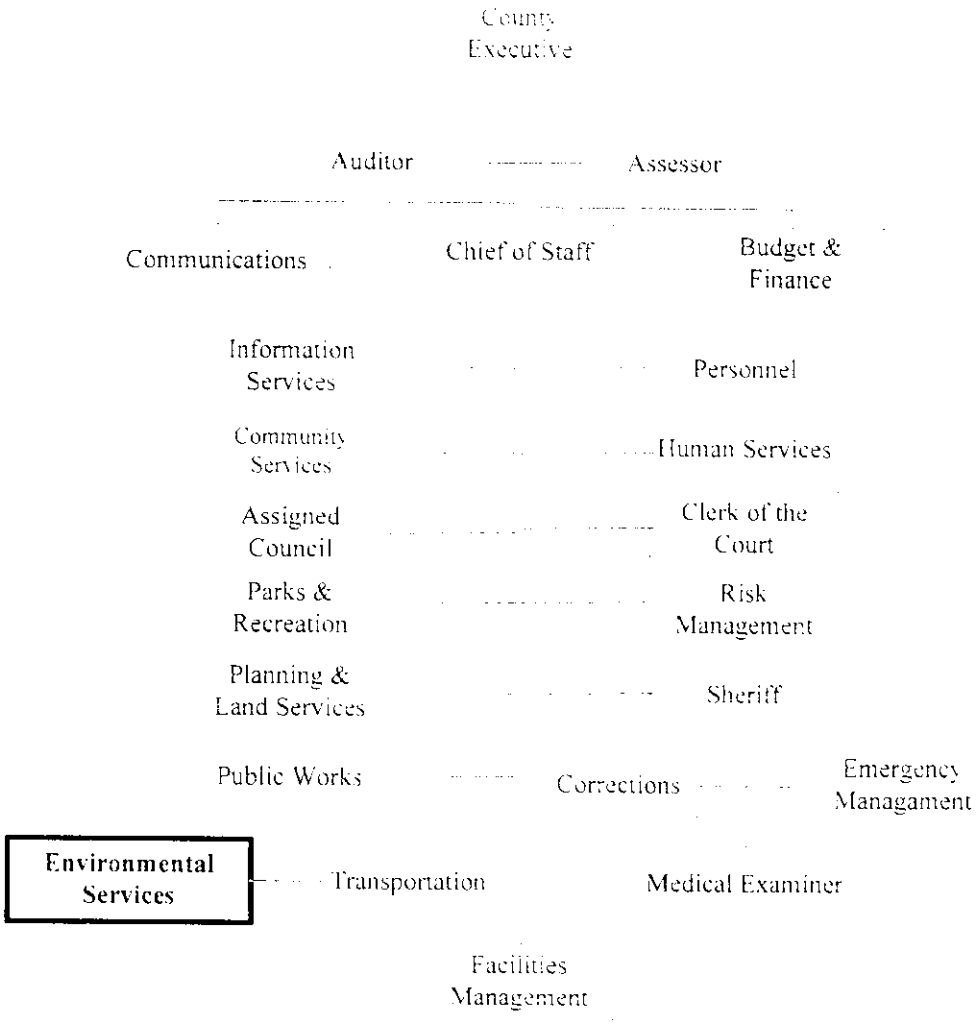

Figure 5.6: Pierce County Organization

(By Author)

Figure 5.5 and 5.6 present quite a different structure compared to Sasebo City illustrated in figure 5.7. Tacoma and Pierce County have separate departments for public safety and judicial matters. Legal services, Prison management, Fire and the county and city must cover Police Department budgets. Sixty percent of Tacoma City's expenses were allocated for public safety in 2004 as presented in figure 5.8. In Japan, the prefecture government is responsible for the Police Department and judiciary funds, so Sasebo City only must supply public safety funds for its Fire Department.

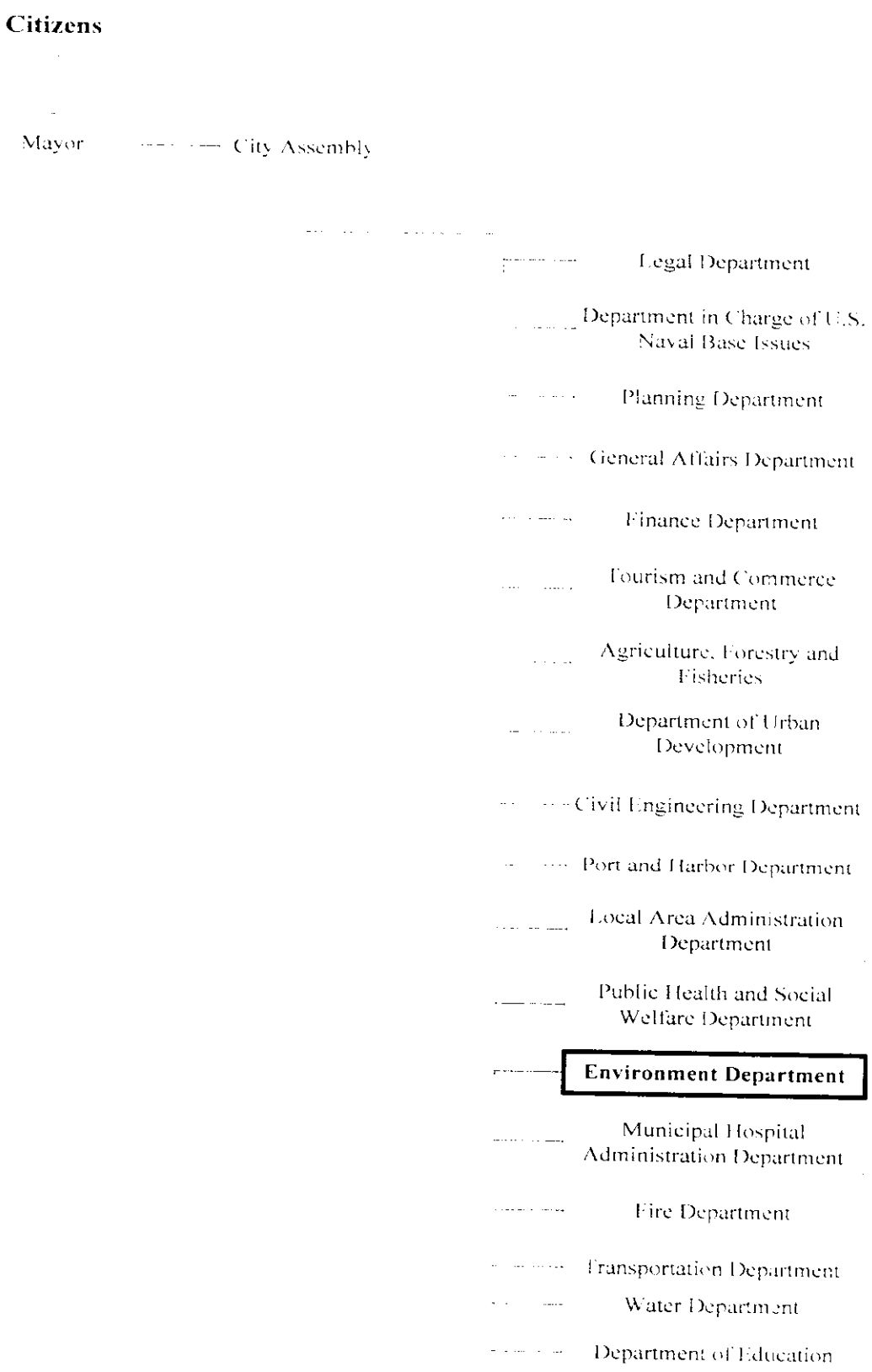

Figure 5.7: Sasebo Government Organization (By Author)

By comparing the organizational flow charts, it appears that the Sasebo City system clearly delineates the responsibilities; whereas, Tacoma and Pierce County systems combine areas like the environment. This increases the horizontal communication and collaboration between departments. Another outstanding difference is the lack of direct departmental support for information services by Sasebo City. Tacoma City and Pierce County both have separate departments for information management. Sasebo City relies more on each department to develop its own information and communication methods with local stakeholders. This has some advantages over a centralized system because each department staff can prioritize the issues that require the most attention, and to a certain degree, can customize its communiqués. Another benefit is that it streamlines the process by not having to discuss communication strategies on an organization-wide level. This type of information system requires evaluation to audit execution methods and the effectiveness in reaching the departments goals.

5.3 A COMPARASION OF REVENUES AND EXPENSES FOR PIERCE COUNTY, TACOMA CITY AND SASEBO CITY

Data for Tacoma and Pierce County was acquired from the homepages and Sasebo data was taken from the homepage, the Environmental Department's 2004 Operational Report Manual received from two personal interviews Sasebo Environment Department staff.

Table 5.3: Total General Expenditures

(Compiled from Tacoma City Homepage and Sasebo City Environmental Department Report)

	2000	2001 (Actual)	2002 (Actual)	2003 (Actual)	2004 (Actual)
Pierce County	$640,000,000	$723,000,000	$769,000,000	$767,825,205	$739,729,205
Tacoma	N.A.	$360,132,381	*	$339,482,582	*
Sasebo	¥96,481,080,000	¥91,529,682,000	¥88,818,102,000	¥84,130,666,000	¥82,810,343,000

Pierce County's total budget annual fluctuations are due to the level of major construction projects. Physical environment expenditures in 2004 amounted to 4.7 percent of the total budget. Capital needed to finance many of the county's programs comes from other funds, and these can only be used for specific activities, so they are reported separately. Surface water management and solid waste funding directly affect soil contamination control and the health of Puget Sound. Surface water management expenditures increased because of a large stormwater system outlay ($7,351,300) to upgrade the present system. Conversely, the solid waste expenditures decreased due to a reduction in post closure care for a

landfill site and self-insurance expenses [15]. Tacoma budget is biennial; therefore, the figures for Tacoma are displayed as 2001 2002, 2003 2004. This system began in 1985 when the Washington State Legislature permitted all cities to use the two-year budget system. Since its inception, four main advantages and three disadvantages have become evident to city and county finance directors [16]:

Advantages for Biennial System

1) Time Saving
2) Longer Perceptive
3) Potential Improvements in Policy View
4) Political Implications

Disadvantages for Biennial System

1) Loss of Control Over Budgeted Expenditures
2) Change of Leadership
3) Difficulty in Forecasting

Currently twenty out of the original twenty-five cities are using the system. The five that reverted back to the annual budget reporting style gave reasons listed in the negative factor list above [17]. Cities and counties have adopted various ways to report budget information since the system began. Seattle determines how much it will need for the first year and lists the figures for the second year as "planned"; whereas, Tacoma uses the true two-year appropriation. The funds are not used equally in the first and second year, so it is not accurate to report the appropriations divided in half to account for the even years.

The biennial system appears to be functioning well for some local governments in Washington, but there is little possibility for its adoption into Japanese government budget planning. This system difference has no significant influence on the main points of interest in this comparative case study.

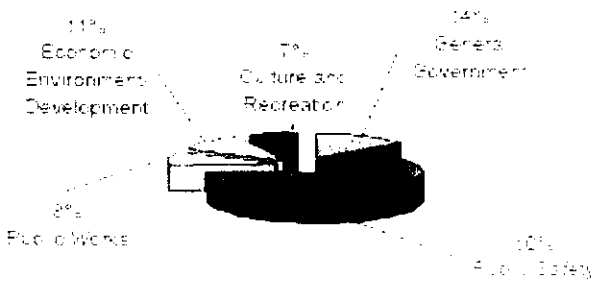

Figure 5.8: Tacoma's Governmental Activities Expenses for 2004
(Tacoma City Homepage: http://www.cityoftacoma.org/)

The pie chart in figure 5.8 clearly shows that most of Tacoma's General Fund expenses cover the public safety organizations like the Police and Fire Departments. This percentage is roughly the same for the years 2000 to 2004, leaving fewer funds available for environmental protection measures. Prevention measures and remediation on the significant soil and water pollution in the city has been able to progress using funds supplied by Pierce County Health Department and State Ecology Department.

Table 5.4: Funding Sources for Pierce County Health Department

(Pierce County Homepage: www.tpchd.org)

	2000 (Actual)	2001 (Actual)	2002 (Actual)	2003 (Actual)	2004 (budget)
Licenses & Permits	$2,611,477	$2,605,807	$3,013,971	$3,291,329	$3,263,685
Intergovernmental Revenue	$19,396,554	$24,803,412	$24,134,232	$24,020,760	$21,648,722
Charges for services	$2,654,726	$3,082,668	$4,229,968	$4,768,215	$4,792,455
Miscellaneous revenue	$950,657	$1,331,770	$1,754,047	$889,573	$660,511
Other financing sources	$439,521	$1,457,123	$1,273,507	$362,129	$767,298
Total	**$26,052,935**	**$33,298,780**	**$34,282,053**	**$33,332,026**	**$34,033,255**

Table 5.5: Expenditures for Pierce County Health Department

(Pierce County Homepage: www.tpchd.org)

	2000 (Actual)	2001 (Actual)	2002 (Actual)	2003 (Actual)	2004 (budget)
Salaries & Wages	$10,506,392	$11,890,709	$12,938,849	$13,369,594	$14,471,331
Personnel Benefits	$3,375,293	$3,507,413	$3,882,713	$4,182,553	$4,772,606
Supplies	$2,620,156	$4,380,056	$3,756,150	$4,179,714	$1,032,548
Other services & charges	$7,631,993	$10,486,771	$11,189,768	$9,869,661	$11,850,455
Intergovernmental Services	$31,308	$24,569	$1,111,185	$1,302,479	$1,556,315
Capital outlays	$95,235	$703,735	$481,871	$231,748	$350,000
Total	**$24,260,377**	**$30,993,253**	**$33,360,536**	**$33,135,749**	**$34,033,255**

Table 5.6: Environment Expenditures from General Fund

(Compiled from Tacoma City Homepage and Sasebo City Environmental Department Report)

	2000	2001 (Actual)	2002 (Actual)	2003 (Actual)	2004 (Actual)
Tacoma	N.A.	$1,842,570	*	$1,905,858	*
Sasebo	¥7,574,924,000	¥9,128,780,000	¥6,906,935,000	¥5,585,848,000	¥4,655,068,000
	*(7.85%)	(9.97%)	(7.78%)	(6.64%)	(5.62%)

*figure in parenthesis represent percent of general fund.

Table 5.7: Environment Expenditures According to Functions in Sasebo (thousands yen)

(Sasebo City Environmental Department Report)

	2000	2001	2002	2003	2004
Administration	1,728,477	1,633,372	1,559,809	1,511,824	1,386,827
Prevention	153,932	148,730	323,038	359,269	430,695
Solid Waste	986,077	2,859,525	2,757,961	1,568,321	1,915,604
Sewage	252,941	146,074	148,386	131,885	112,440

Table 5.8: Environment Expenditures According to Functions Tacoma (dollars)

(http:// www.cityoftacoma.org)

	2000	2001	2002	2003	2004
Administration	N.A.	1,670,352	*	1,699,357	*
Prevention	N.A.	N.A.	N.A.	N.A.	N.A.
Solid Waste	N.A.	103,700,031	*	90,868,031	*
Sewage	N.A.	66,484,283	*	110,621,368	*

The data reveals that Sasebo City has continued to cut funding for the environment department's total budget, specifically for administration and sewage; conversely, over the five-year period from 2000 to 2004 there has been an increase of funds allocated for pollution prevention. Tacoma City's budget on the other hand has increased slightly over the same period with increased spending for sewage and administration. Tacoma invests large sums of capital on stormwater systems to protect its underground wells and Puget Sound from contamination, but the figure is not included in the table because Sasebo City does not list such funds, so a comparison is not possible

Tacoma Spending on the Prevention of Soil Contamination

There was no direct mention of the amount budgeted for environmental preventive measures by Tacoma, but the city receives funds from the State Department of Ecology's Toxic Control Account, and uses funds from the Public Works Department toward this purpose. The data in Table 5.9 provides the most current

data on the amount of money collected through permits, fines and penalties, and funds recovered from responsible parties, and the allocation of those funds for remediation and prevention statewide.

Table 5.9: Department of Ecology Revenue and Expenses for Local and State Toxics MTCA 2004 (Pierce County Department of Ecology 2004)

Toxics Control Account Revenue	Local Toxics	State Toxics
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
Total Revenue	30,582,746	34,429,681
Ecology Expenditures		
[illegible] Program	[illegible]	[illegible]
Hazardous Waste & Toxics Reduction [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible] Program		[illegible]
Solid Waste & Financial Assistance Program	[illegible]	[illegible]
Spill Prevention, Preparedness & [illegible] Program		[illegible]
Environmental Assessment Program		[illegible]
Water Quality Program		[illegible]
Total Ecology Expenditures	2,361,367	[illegible]
Other Agency Expenditures		
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
Total Other Agency Expenditures		2,647,945
Total All Agency Expenditures	**2,382,367**	**30,125,235**

The three important programs that the state funds to prevent soil contamination are listed in the Ecology Expenditures section in the 2004 report. Table 5.10 provides a five-year history of these three programs. There has been steady increase in spending for the Spill Prevention, Preparedness, & Response Program (SPPRP). The Hazardous Waste & Toxics Reduction Program (HWTRP) has seen a fluctuation of funding, but overall it has shown a decrease. The Solid Waste & Financial Assistance Program (SWFAP) has also fluctuated, but funding has remained stable showing a slight decrease in 2004 compared to the previous year. More significantly is that the percentage of total expenditures for preventing soil contamination is relatively high. This suggests that Tacoma places a high priority on soil contamination concerns.

Table 5.10: State Ecology's Expenditures Toward the Prevention of Soil Contamination for State Toxics & Percentage of Total Expenditures for Each Year

(Compiled from Pierce County Department of Ecology 2004 data)

	2000	2001	2002	2003	2004
HWTRP*	$4,581,147	$4,968,814	$4,816,396	$5,431,640	$4,665,283
	(17.6%)	(18.3%)	(16.6%)	(13.1%)	(15.4%)
SWFAP*	$1,604,244	$1,693,194	$1,558,627	$2,050,341	$1,747,392
	(6.2%)	(6.2%)	(5.4%)	(5.0%)	(5.8%)
SPPRP*	1,537,695	$1,441,156	$2,558,500	$3,389,901	$2,986,569
	(5.9%)	(5.3%)	(8.8%)	(8.2%)	(9.9%)

*** Author's original abbreviations for each program**

Further explanation of these programs is necessary because they play an important role in Tacoma's environmental protection particularly remediation of soil contamination and prevention of groundwater contamination. These programs provide a good benchmark for other cities, states and countries in dealing with soil contamination in a collaborative manner and provide solid evidence that a combination of command and control and voluntary compliance can be effective.

1) The Hazardous Waste & Toxics Reduction Program (HWTRP)
2) The Solid Waste & Financial Assistance Program (SWFAP)
3) Spill Prevention, Preparedness, & Response Program (SPPRP)

The Hazardous Waste and Toxics Reduction Program was established to provide businesses and government agencies with technical assistance on how best to decrease the use of hazardous materials and how to handle them safely. The most common training method involves personal visits to all types of facilities. The visit usually lasts no more than one hour, in which the advisors give supportive advice, and if the personal discovers a problem that will result in violations, the business is informed about the best method to resolve the problem [18]. Figure 5.9 shows the significant progress the program has made since it began in 1990 to reach the 50 percent decrease in hazardous waste generation goal in 2004.

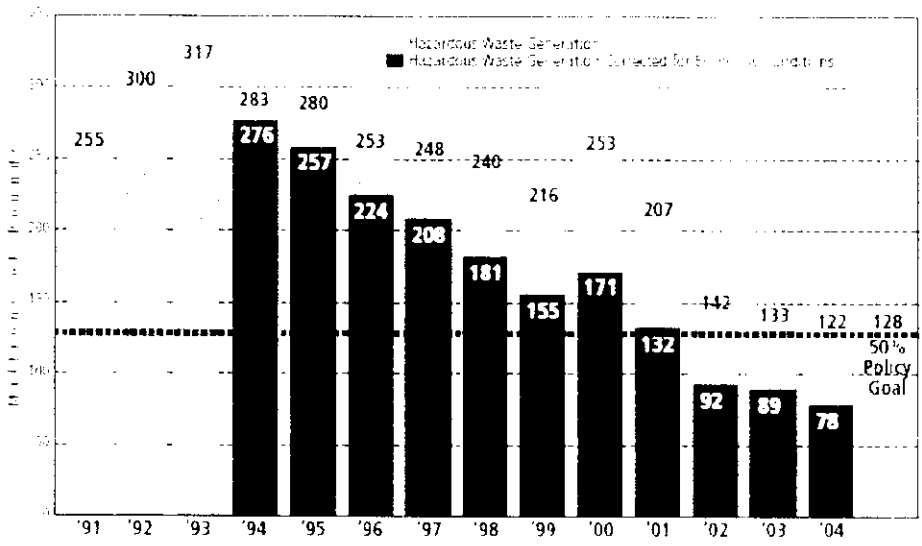

Figure 5.9: Progress Toward the 50 percent Hazardous Waste and Toxics Reduction Goal (Washington State Department of Ecology Homepage: http://www.ecy.wa.gov.programs/hwtr/index.html)

The Solid Waste and Financial Assistance Program supplies technical service and support to local governments about MSW, regulates large industrial facilities, and regulates and enforces remediation activities of closed landfill sites [19]. The program works in partnership with local governments to assist in proper reuse, recycle, reduce, methods and disposal of solid waste. An example of efforts the staff has used includes the following five examples:

1) A training course involved how to measure the effectiveness of public education, and another was about Social Marketing. The goal was to teach local government officials about performance based programs.
2) The staff provided technical and innovative methods to assist in the closure of the abandoned landfill at Dryden because it was located on unstable land. The staff also provided innovative technical support for other closed landfill sites around the state.
3) When the new Solid Waste Regulations were adopted in February 2003, the staff provided technical advice on how the new rules and regulations should be conducted. It worked with local Health Departments, Public Works staff, and private consultants.
4) In order to address new issues the staff actively facilitates collaboration between public and private organizations.
5) Finally, the staff works on waste reduction to help rural counties develop their waste management programs. One recent project is to identify waste streams where reduction will have the greatest immediate positive impact on the environment [20].

Funds allocated from the Toxic Control Account clean up oil and hazardous materials spills and prevent their reoccurrence. If the responsible party cannot be identified, or is unwilling to clean up the contamination then funds from the Toxic Control Account are used on these "orphan sites" for remediation in an expeditious manner under the supervision of an Ecology specialist. Since this program was established, including the new regulations that were passed to control Underground Storage Tanks (USTs), dramatic positive results as illustrated in the graph in figure 5.10 have been achieved. There were reports of 944 releases in 1990, the first year of the program, but by 2004, only 83 cases were cited. Figure 5.11 graphically illustrates the significant decrease of hazardous spills in Pierce County from 768 reported in 2003 to 468 in 2004. Statewide only twelve of the counties in Washington recorded increases from the previous year, with most of those increases being insignificant, and the remaining counties reporting large reductions.

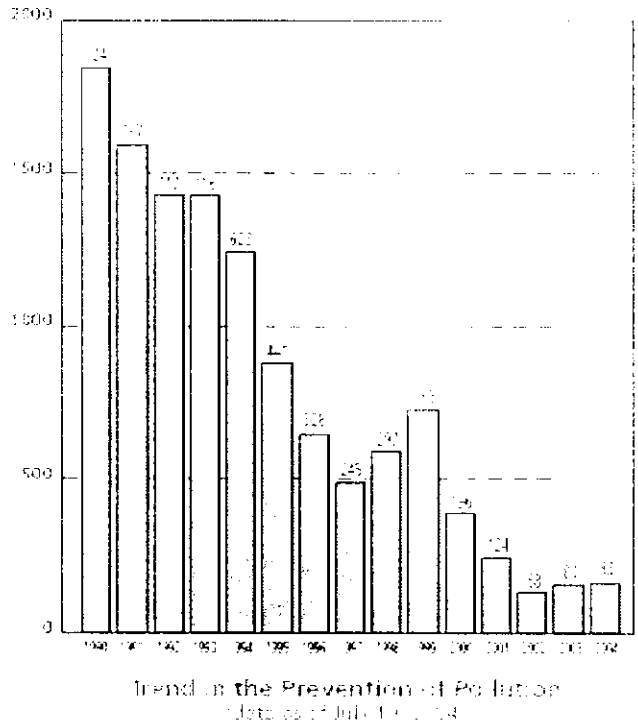

Figure 5.10: Number of Releases from UST

(Washington State Department of Ecology Homepage: http://www.ecy.wa.gov.programs/hwtr/index.html)

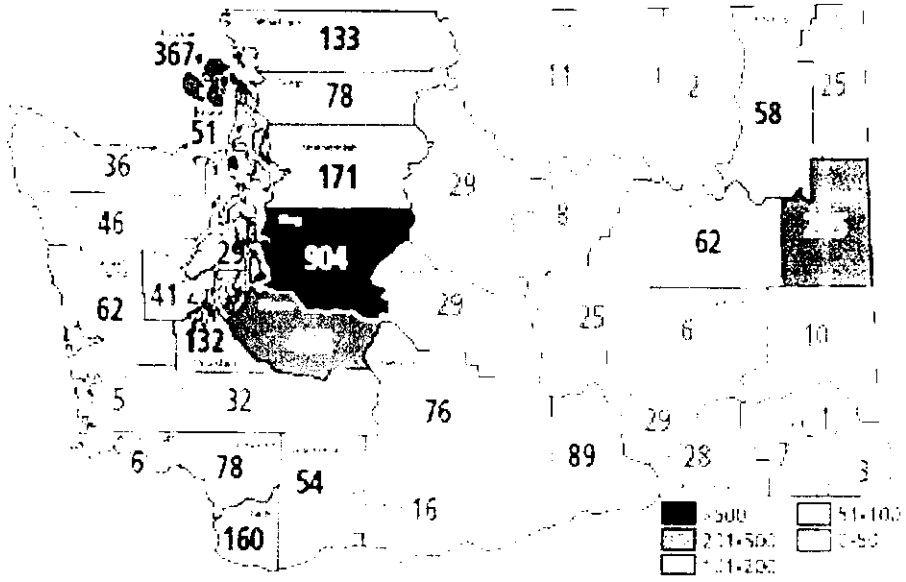

Figure 5.11: Spill Reports by County for Fiscal 2004

(Washington State Department of Ecology Homepage: http: www.ecy.wa.gov/programs/hwtr/index.html)

Sasebo Spending on the Prevention of Soil Contamination

In the first personal interview in September of 2005 with the Sasebo Environment Department staff, they said that the department had conducted annual soil contamination tests at seven locations around the city from 1999 to 2003 (the most recently released data), and as recorded in the 2004 environmental report, none was found. When asked about preventive measures against potential soil contamination sources, the response was that since there was no evidence of existing contamination, there was very little effort by the city. However, illegal dumping has been on the increase, and in order to try to reduce occurrences and catch offenders, the city asked two former police officers to voluntarily patrol during the weekdays. Their experience in dealing with criminal behavior has proved more effective in tracking down violators than asking someone inexperienced in law enforcement. The city has hired a private security firm at the cost of several million a year to patrol on weekends to replace the volunteers on their days off.

The city does not directly promote environmental education at local elementary and junior high schools. Education matters are the responsibility of the Education Department, but the staff in the Environment Department asked students to design signs that inform citizens that illegal dumping is harmful to the environment and damages the natural beauty of Sasebo. Next, the author asked if there were any plans to use a GIS system to monitor soil contamination levels at illegal dumpsites and to assist in identifying common dumping areas. They responded by saying there were no funds available for such a system at

this time. Finally another option used in the United States and Germany is placing cameras at strategic points to catch offenders. They responded negatively to this suggestion because the rough terrain would make it cost prohibitive. Many of the illegal dumpsites are frequently alongside the winding roads up in the hills of Sasebo. Numerous cameras would be required and lighting provided at very close intervals in order to capture images of offenders, which is cost prohibitive for the city.

5.4 A COMPARATIVE EXAMINATION OF ENVIRONMENTAL SYSTEMS AND POLICIES OF TACOMA CITY AND SASEBO CITY

The organizational structure for the protection of the environment in Tacoma and Sasebo are vastly different, but share many of the same goals. Tacoma City's goal as written in Section II of the Environmental Policy states: "Ensure conservation, protection, enhancement and proper management of natural resources and shoreline, while providing for a balanced pattern of development and the needs of the citizens of the City of Tacoma" [21]. Sasebo City's mission statement is as follows: "Sasebo City endeavors to solve current environmental problems facing humankind and protect the natural environment for the present and future generations. 'A city living in harmony with nature—Sasebo' is our motto to promote a better environment" [22].

Figures 5.12 and 5.13 provide the hierarchical outline for both cities.

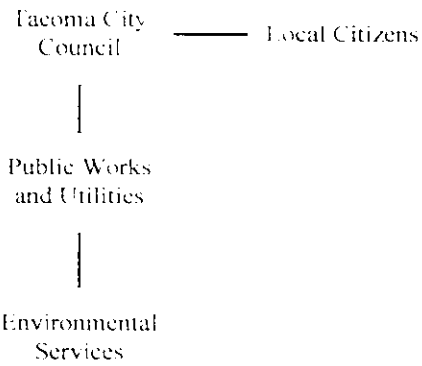

Figure 5.12: Tacoma City Environment Structure (By Author)

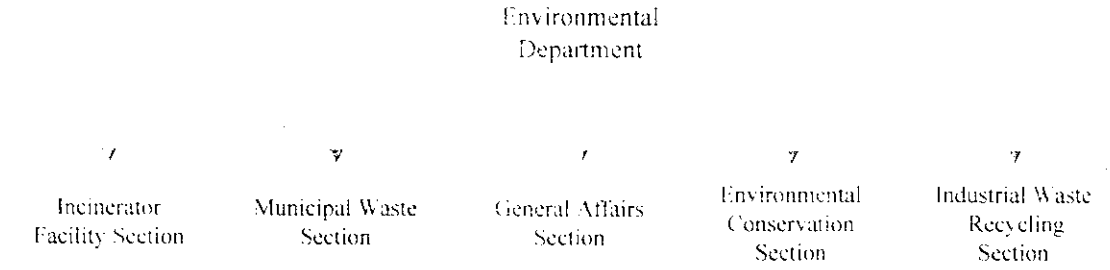

Figure 5.13: Sasebo City Environment Department Structure
(By Author)

Figure 5.12 illustrates the difference between the two cities. Tacoma's Environment Services is an extension of the public utilities; whereas, Sasebo's Environmental Department as shown in figure 5.13, includes a specific range of responsibilities that include MSW services, recycling, and environmental conservation. The amount for environment expenditures displayed in table 5.8 for Tacoma appears quite low compared to the demands put on the environment by a growing city like Tacoma. It is important to note that this figure does not include expenditures for remediation of soil contamination, sewage, and MSW, which are also funded by the public utility and Tacoma-Pierce County Health Department budget. The amount listed in table 5.8 refers solely to personnel services and supplies. The data also indicates that both Tacoma City and Sasebo City share a positive attitude toward pollution prevention activities.

Tacoma Environmental Policy

Tacoma's environmental policy has General Goals and Policies, and Critical Areas. The first section deals with preserving the natural resources, natural features, growth and development, low impact development, recreation and open spaces, and managing the various types of pollution. The second section focuses on protecting and providing public education about aquifer recharge areas, fish and wildlife conservation, wetlands and stream protection and development, and best management practices for mineral resource lands.

Ordinances passed by the City Council control the development. Municipal Codes maintain the natural environment while providing for low impact development that preserves natural features and protects non-renewable resources. The codes also attend to the health hazards that are associated with air, water and soil pollution, and the city stringently enforces infringements to alleviate these dangers [23]. In addition to conservation and prevention activities, the city has comprehensive remediation strategies in designated environmentally sensitive or critical areas that include vital aquifer recharge areas, fish and wildlife habitat areas, and stream and wetland areas. These strategies further include the clean up of Commencement Bay, the connecting waterways, and upland areas. Identification of contaminated sites

that affect the shoreline and surface waters is an important method to provide a safer city for current and future generations. In order to carry out these policies the city encourages public and private partnerships. These partnerships help to facilitate timely response, provide cost effective solutions for the city's limited environmental budget [24].

The second section of the Environmental Policy Elements focuses on the protection of the aquifers located in South Tacoma. There is a clear connection between land use and the quality and quantity of groundwater, but determining sources of contamination that filters down through the soil is much more complex. Consequently, controlling the potential dangers that soil contamination brings is essential. Tacoma presently uses four mechanisms: strict zoning building and health regulations; education and public awareness activities; increased monitoring; and capital improvements [25]. According to Chapter 13.09 of the Official Code of the City of Tacoma which codified the South Tacoma Groundwater Protection District (STGPD), mandates that the Tacoma-Pierce County Health Department, the Tacoma Public Works Department, Tacoma Water Division, the EPA and other participating agencies all cooperate to implement the code [26].

The State of Washington, Pierce County and Tacoma provide funding for a number of programs that directly or indirectly prevent soil contamination. Table 5.11 outlines the funding source, the type of program, the purpose, and the effects it has had on preventing soil contamination.

Table 5.11: Government Funded Soil Contamination Prevention Programs in Washington, Pierce County and Tacoma

(Compiled from Homepage data Washington State, Pierce County and Tacoma City)

Program Name	Sponsor	Type	Purpose	Results
Waste Pesticide Identification Disposal Program	WA. State	State Run (funding from Model Toxics Control Act)	Two goals: reduce and eliminate remaining prohibited pesticides stored by users; prevent further accumulations of unusable pesticides.	Has provided free safe disposal of over 820 tons of unusable pesticides for over 5,000 customers since 1988.
Rehab the Lab Grants	WA. State Department of Ecology	Cooperative EPA & State Dept. of Ecology	Educate high school teachers and administrators about the dangers of hazardous and toxic chemicals which are often stored in deteriorating conditions at schools.	The program has identified that many school science labs, storerooms and photo labs have excessive amounts of unneeded dangerous chemicals. It also provides advice on less hazardous chemicals.
Dirt Can Hurt	Public Health of Seattle & King County	Collaborative public health, government agencies & community groups	Educates children and communities living within 1,000 mile area from the Tacoma Smelter about the dangers of lead and arsenic poisoning, and how to avoid these toxic substances.	Identified areas dangers levels of lead and arsenic in the soil, and child use areas that are affected.
EnviroStars	Seattle & King Counties	Cooperative City & County	A voluntary environmental management program to adopt eco-friendly practices.	Participating businesses have saved money through reduced waste, fewer penalties, and lower remediation costs.
EnviroChallenger	Tacoma	City	Provides free environmental education for children from second to eighth grade focusing on 5 R's (Reduce, Reuse, Recycle, Respect, Responsible). Also provides web based educational games and contests and teaching materials	No specific data, but the program director was named Best Environmental Educator in the State for 2005.

Volunteer Efforts by Tacoma Citizens

In addition to the programs listed above that address environmental problems, VolunteerMatch, an Internet portal for environmental volunteer organizations in Pierce County and Tacoma listed 16 different organizations [27]. The majority focus on general environmental issues, youth education and community improvement efforts. The Audubon society homepage listed an additional ten groups contributing to environmental preservation [28]. One association in particular, Friends of Pierce County centers on empowering Pierce County citizens to preserve, restore and promote a better community. The group was formed in response to the fast-pace growth occurring in Pierce County. The organization assists the local government in providing a communication link between businesses, local citizens and other parties [29].

Another approach for interested citizens to volunteer for the community is to apply for membership on the city's Task Force or join an Advisory group, which work on a specific community problem. An example of the work these groups perform comes from The South Tacoma Groundwater Protection District Advisory Group formed in April 2005 The Health Department and Tacoma Water are responsible for ensuring the 13 wells supplying drinking water remain safe. Conditions have changed in the city since the STGPD was first established. Therefore, the Health Department asked local business owners and other stakeholders to participate in an Advisory Group to ensure that revisions to the STGPD matched the current community requirements. The group included facilitator to keep records of the meeting, maintain an efficient use of members' time by clearly identifying the important issues and encouraging group discussion on those matters. The group met monthly from June to December 2005 and published its recommendations on December 21, 2005 [30]. The Health Department commented, "The Advisory Group provided a forum where the Health Department and other local agencies could work through the necessary collaborative efforts and highlight the areas of redundancy within the STGPD and facilitate a way to correct this [31].

Sasebo Environmental Policy

The mayor and city assembly ensure that the national regulations are implemented, draft environmental articles to match the environmental mission to protect citizen's health, and maintain a sustainable city. Sasebo City shares many of the same goals established by Tacoma City, but it is structurally different for cultural and political reasons. One major difference between the two cities that has affected the direction of environment protection is the different concerns expressed by local citizens. Sasebo citizens are uneasy about the U.S Navy nuclear powered navel vessels entering the harbor. This concern resulted in the establishment of a monitoring program that regularly checks the level of radioactivity in the harbor. Another difference is the management of household sewage. Even though many homes are connected to the city sewage system, a significant number of homes still depend upon a septic system. In order to

ensure proper maintenance, there is a special section in the Environment Department to educate the public on proper care and usage. A third major area, which is of special interest for this study, is that there is no section or program for the prevention of soil contamination.

The Environment Department Conservation Section is divided into two main parts with specific duties listed below.

Environment Guidance

1) Pollution Administration
2) Air Pollution Prevention, Noise and Vibration Pollution Regulation, Offensive Odors Prevention, Water Pollution Prevention
3) Administration of Complaints about Environmental Pollution
4) Environment Surveys
5) Administration of the Municipal Septic Tank System
6) Radiation Monitoring of U.S. Nuclear Powered Navel Vessels
7) General Affairs Administration

Environment Planning

1) Basic Environmental Planning
2) Promoting and Providing Information about the Natural Environment
3) Evaluation of Environmental Effects
4) Survey of the Natural Environment
5) Environment Planning with Conservation Organizations
6) Hunting Permits and Animal Control Permits

Environmental Management System

Sasebo has been ISO 14001 certified since 2001, and is focusing on reducing usage of the following nine natural resources:

1) Electricity
2) Diesel Fuel
3) Kerosene
4) LPG gas
5) Water
6) Gasoline
7) Heavy Oil
8) City gas
9) Paper

City data confirms that savings for each natural resource has been achieved over the period; the most

significant savings have come in water (29 percent), diesel fuel (27 percent), and kerosene (25.1 percent) [32].

The Environment Department listed two major goals in its 2004 evaluation report. First was to raise citizens' environmental awareness. Second, is that the city wants to local stakeholders to improve their environmental activities to sustain a better environment. In the report, the department listed four main activities that it conducted over the year.

1) Monitored companies' air, water, and noise pollution and provided advice for improvements when necessary
2) Provided maintenance and installation assistance to septic tank owners
3) Educated the public on eco-friendly actions
4) Carried out programs like its ISO 14001 system to reduce global warming

Volunteer Efforts by Sasebo Citizens

The held research conferences and events in order to educate the public and increase awareness. The actual number of events was not listed, but the projected attendance was 8,000 attendees, but the 18,000 citizens who attended were much greater than expected. This indicates that there is a greater interest in the environment than the government expected, and it should increase its promotion efforts even more to enlist local stakeholder future participation. Comments for future improvements at the end of the evaluation report cited this need; in addition, it called for the formation of local environmental protection groups [33].

An example of the city's efforts to include local stakeholders was a symposium sponsored by Sasebo City and Nagasaki Prefecture that focused on global warming and the municipal waste problem held on January 15, 2005. The panel consisted of two environmental experts one from a NPO and the other from a consulting company, a professor from Nagasaki University, a leader of a citizen group, and a high school teacher [34]. The author proposes similar symposiums be held with soil contamination as a theme as a means to introduce the importance of the problem. Considering the lack of knowledge and awareness on this issue, this is an essential first step in the process to establish the collaborative environmental risk management system presented in this thesis.

A second example is the *Kankyo-kanshi kyoukai* (Environmental Monitoring Association), which is a NPO located in Sasebo City. Its program focuses on advising citizens about measures to prevent illnesses and other harmful effects commonly found in "Sick Building Syndrome", now referred to as "Sick House" in Japan. In addition to warning about the use of certain building materials, it also educates the public on the hazards of pesticides and other harmful household chemicals, and the dangers

of environmental hormones present in Sick Homes [35]. This organization's current effort does not directly involve education about soil contamination, but the strong connection with the soil contamination issue presents a platform for incorporating the author's proposal into its future activities.

Personal Interview Topics and Responses

The author conducted two separate interviews with the staff of the Environment Department. Both lasted for one hour and a half with the first interview occurring in September 2005. It covered topics relating to the costs of soil contamination prevention and the measures implemented to monitor and prevent it. Comments related to the cost of preventing soil contamination were mentioned earlier, so this section will cover other issues discussed in the first interview, and elaborate on the most significant responses communicated in the second interview that was held a year later in September 2006. Other significant questions and the answers are summarized in table 5.12.

The issue of Underground Storage Tanks (USTs) was addressed in both interviews because the leakage from tanks in the United States has become a health issue for many local governments, and the author wanted to know if any measures were being taken by Sasebo City to monitor USTs assuming that similar problems exist in Japan. The manager mentioned in the first interview that contamination from oil products was under review by the national government to include amendments to the SCCL, but he said that there was not any law or regulation requiring monitoring related to soil pollution from USTs. However, if it entered the underground water supply, it would fall under the Water Pollution Control Law Article 14-2 No. 2. In the second interview, he mentioned that guidelines published in March 2006 covered oil contamination from USTs [36], but the Environment Department has yet to implement any reforms in its policy.

Asked if the city had any preventive measures or education pertaining to old and unused chemicals in schools and hospitals, the manager said his department recognizes the potential problem associated with the improper disposal and handling of hazardous chemicals often found in school labs, and hospitals, but admitted that such advice was insufficient.

Table 5.12: Summary of Interview Questions and Answers by Sasebo Environment Department (By Author)

Questions	Answers
What environmental education program is there for elementary and junior high school students?	The department has no program.
What efforts do you take to communicate about the environment with the community?	There are events to try to raise citizens' interest and participation, and disclosure.
What efforts do you take to communicate about the environment with local business?	It interviews companies using hazardous chemicals that they are following the SCCL
What means does the department use to control Illegal dumping?	Four volunteer retired police officers patrol during the week, and a private security firm is employed on the weekends. Suppliers of kerosene and pesticides are trained on proper disposal methods.
Does the department collaborate with universities on soil contamination issues?	Not directly for soil contamination, but there is collaboration with Nagasaki National University on environmental education.
Does the city have environmental insurance?	Not now, but considering it for the future.
Have there been any discussions about soil contamination by the City Assembly?	Yes, but only concerning the reclaimed land behind Sasebo JR Station.
How much communication is there between Nagasaki Prefecture government and Sasebo City?	Once a month on the phone about general environment topics, and exchange information about following SCCL disclosure policies
Are there any special funds allocated to prevent soil contamination?	No. to protect against water pollution
Does the city employ any consultants for the soil contamination?	No, but it used them to establish the ISO 14001 system.
What are the main concerns about soil contamination for the future?	Hazardous waste research is necessary and users like cleaners need more training.
What are the main concerns about soil contamination in dealing with companies?	Banks and real estate agencies have a great interest in soil contamination and SCCL, but they need increase their knowledge.
What are the problems concerning soil contamination from a government standpoint?	The national government must increase the SCCL fund and hopes that local governments will provide more support for the fund.

The answers referring to soil contamination in table 5.12 clearly show that Sasebo City has yet to implement programs to prevent soil contamination. Its efforts to maintain a safe level of air, water and noise pollution, have been successful, and with its strong interest in improving the environment, the author believes that the government can achieve the same positive results if it would expand its environmental program to put more emphasis on soil contamination prevention. This is possible through applying its stated central environmental policy, which is to collaboration with businesses and local stakeholders.

Table 5.13: Command and Control Regulations for the Prevention of Soil Contamination
(Compiled from EPA, Tacoma City and the Japanese Ministry of the Environment)

	National	**Features**	**State/ Prefecture**	**Features**	**County/ City**	**Features**
Tacoma	✓ The Resource Conservation & Recovery Act	"Cradle-to-grave" control of hazardous waste.	✓ Growth Management Act	control over sustainable growth.	✓ Critical Areas	Allows local government to designate sensitive areas for special protection
	✓ Pollution Prevention Act	Product stewardship.	✓ Underground Storage Tank Statue	Monitoring to prevent leaks.		
	✓ The Toxic Substance Control Act	Screen, track and ban hazardous chemicals	✓ Washington Pesticide Control Act	Safe usage and prohibit toxics.		
	✓ Oil Pollution Act	Prevent & Respond to major spills	✓ Waste Reduction & Model Litter Control Act	Foster public awareness for recycling and litter.		
Sasebo	✓ Law Concerning Special Measures Against Dioxins	Prevent and remove dioxins.	National laws are implementated by prefecture and local governments			
	✓ Agricultural Land Soil Pollution Prevention Law	Protect the food chain from contamination				
	✓ Chemical Substance Control Law	Screen, track, and ban hazardous chemicals				

5.5 INTERNATIONAL, NATIONAL AND LOCAL PUBLIC OPINION ABOUT THE ENVIRONMENT

When proposing a new system that involves organizational change and public cooperation, public attitudes provide critical insights into the areas that require more attention and how it might be possible to change public opinion. Figure 5.14 illustrates some noteworthy differences among the three countries compared in this paper. More than half of the Japanese public and in the U.S. do not participate in environmental protection because they lack specific information about how they can make a difference; whereas, a little more than 40 percent of Germans felt the same. The most significant difference and the one that pertains to the proposal in this dissertation, is that nearly 60 percent of Japanese stated the lack of an individual's power to improve the environment. In Germany and the U.S., this attitude was below the 40 percent mark. Earlier in this thesis, the rate of volunteering for environmental activities was nearly the same for the three countries. The author speculates that this attitude stems from the cultural difference in which Japanese are more group oriented, and perceive individuals have less power than the group. However, local governments in Japan must attempt to change this attitude starting with more environmental education at the elementary and junior high school level and increasing promotion efforts to the adult population.

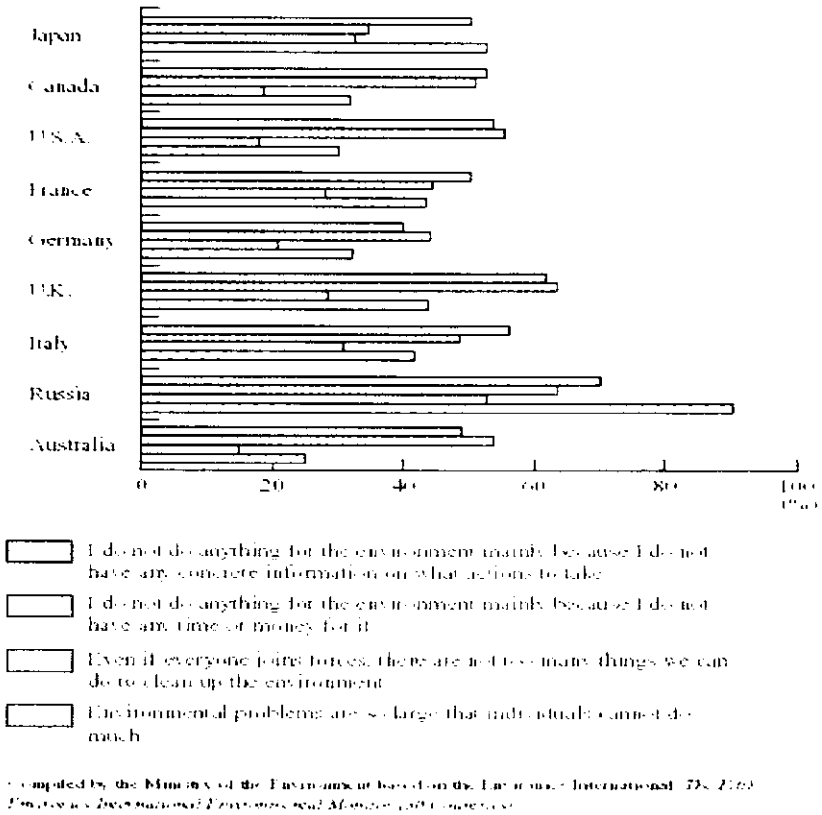

Figure 5.14: An International Comparison of Environmental Awareness

(MOE White Paper of the Environment 2004)

Washington residents' comments about environmental efforts for the Puget Sound area were revealed in a public opinion poll conducted in May 2005 by Moore Information and released in 2006. The research focused on water quality issues, but also included other general social topics. The study found that environmental issues accounted for a shocking low one percent compared 16 percent for transportation issues as the leading concern. However, on the national level, 57 percent responded that the environment should be the top priority for Congress in 2006 [37]. This contradiction may be the result of the lack media attention to environmental problems, or the lack of knowledge about actual state of their local environment. Water pollution is the top environmental concern followed by soil pollution according to a 2006 Gallup Poll. One disturbing, but not surprising result, found that most people believed the source of pollution was from businesses and industries and listed non-point sources like their own personal activities as having a minor impact on the environment [38]. In reality, individuals leave a large environmental footprint by driving, consuming more resources than necessary, and releasing household chemicals into the soil and water.

Washington residents living near Puget Sound had a much different rating for the environment than the national level; only six percent rated the environment as their leading concern [39]. When asked about what their leading environmental concern, 22 percent of respondents chose water, 18 percent urban growth, followed by 11 percent for air pollution [40].

A national survey on environment-conscious lifestyle conducted in Japan in 2003 by MOE using a random sample of 3,000 people 20 years or older with 1,211 responding to the survey. Eighty percent replied that their major environmental concern was global warming, followed by 59 percent for ozone depletion, 55 percent for air pollution, and close behind at 54 percent was inadequate waste treatment including illegal dumping. On a local level, people were concerned about air, noise, vibration, and offensive odors. Compared to similar surveys carried out by MOE in 1995 and 1999, the interest in environmental problems had decreased [41].

The Sasebo Environment Department carried out its own survey involving 1,374 citizens, 666 junior high school students, and 252 businesspersons. In order to maintain consistency with the results found in the Tacoma study, results reported from the 128-page report will be limited to responses by citizens on the same two main areas of concern.

When asked about the quality of the environment compared to ten years ago, 11.5 percent responded that the air was worse, 16.1 percent think the water is less clean, and 26.4 percent responded that that the greenery had decreased. This was the largest negative response. Out of the 14 different categories, respondents said ten of them had gotten worse compared to ten years ago [42].

When asked about which party is responsible for air and soil pollution, 58.4 percent blamed businesses and a mere 4.6 percent held themselves responsible. Finally, the major environmental concern was municipal waste at 29.1 percent, next is the need for better promotion and education about environmental problems at 27.2 percent, soil contamination held the least concern at 0.2 percent [43].

These results show a limited regard for soil contamination, but do indicate that the public's concern for the environment provides local governments with an opportunity to change the current opinion about environmental protection efforts if there is more information and more promotional campaigns.

5.6 CONCLUSIONS

Some interesting similarities were uncovered in the comparison of these two similar cities that supplies evidence that even though the cultures are bipolar in many respects, problems facing environmental risk management are universal.

1) As the public opinion survey showed, citizens' awareness about the seriousness of soil contamination and the importance of preventing further contamination is low in both cities, but much lower in Sasebo than Tacoma. One reason for the low response in Tacoma could be that the city has spent significant capital on remediation and created collaborative programs to promote prevention measures, so the public might feel concern is unnecessary.
2) Tables 5.6, 5.7, 5.8, and figure 5.8, show that funding for environmental activities is too limited in both cities to achieve high performance toward remediation and prevention efforts without a system of collaboration. Both cities devote more attention and funds to the more visible environmental areas like air and water pollution than to soil contamination.
3) Both cities are at a high risk for soil contamination because of the large military presence, and the major commercial base in the shipping industry. Both of these use large quantities of hazardous materials in their daily operations, and have a history of accidents.

The difference between the two cities also provides important clues on how to customize future policy improvements towards soil contamination risk management for similar sized local governments. The following summarizes the three main differences that add value to this comparative study.

1) Systematic differences exist, but these do not necessarily mean that one approach is better than the other is. Tacoma is involved in more intergovernmental cooperation and promotes government-industry-public collaboration more than Sasebo to execute its preventive environmental policies, help enforce it regulations, and remediate its contaminated land and waterways. Table 5.11 lists five programs that directly provide preventive steps and systems

to prevent soil contamination; whereas, Sasebo's Environment Department has mainly relied on reactive rather than proactive measures as required by the national government with no cooperative program, but an increasing interest in forming environmental protection groups.

2) Sasebo's ISO 14001-certification has brought financial and natural resources savings to the city, but there is no ERM system for the prevention of soil contamination. Tacoma on the other hand, has not acquired ISO certification, and there is no mention of trying to be certified in the future, but as the case study showed, the city has invested more funds than Sasebo into soil contamination measures to both remediate contaminated sites and prevent further contamination.
3) Tacoma obtains most of it drinking water from wells located in the city, so it is of the utmost importance to have measures to preserve safe drinking water, whereas in Sasebo City, the water supply is obtained from rivers and dams.

Results from both of these cities show that concern for the environment is low, so citizens might find it difficult to perceive the value in paying extra taxes for environmental improvements. Water quality was a major concern for citizens in both cities, but neither of them believed that individuals' actions left much of an environmental footprint compared to businesses. Previous chapters have detailed the serious consequences of ignoring risks, the potential benefits that collaboration offers and the importance of strong leadership in making a successful program, but in order to address environmental issues that have no sense public urgency, the local government must take the lead in education, disclosure and partnership formation.

In order for the proposed model to be accepted by a public that shows little concern for soil contamination, local governments will have to employ the three basic motivating factors that a study by the Midwest Academy (a well-known training center for grassroots organizations) uncovered:

1) Awareness of the problem
2) Easily understand the problem
3) Believe they can make a difference

Education is the quickest method to raise awareness, the Sasebo Environment Department stated this as one of its goals, and Tacoma established the well-received EnviroChallenger program for students. Both cities exhibit interest in environmental promotional events, collaboration with citizens and business, have developed programs that deal with air, water and waste issues. Greater use of NPOs, university and local experts through symposiums including the soil contamination issue is highly recommended to accomplish improve citizen and corporate involvement. Sasebo is following the national government's global warming reduction scheme so Japan can meet its Kyoto Protocol target, but is highly advisable that

it more seriously consider the consequences of ignoring the ramifications associated with the Soil Contamination Countermeasures Law

Disclosure creates trust and understanding, but the early reports by the U.S. and Japanese governments to inform the public about toxic chemical releases and management were overly technical, and that reduced the effectiveness of the Right-to-Know laws enacted by both countries. The disclosed information must be easy to comprehend for the non-scientist in order to be an effective tool, and this has improved on a national level, but the Sasebo Environment Department recognizes that it must make improvements to it citizens more closely as it commented its department evaluation report.

Forming a solid partnership with a long-term goal at its core will aid in making people believe they can make a difference; and as this research uncovered, Tacoma has established various programs that educate and encourage public participation, and Sasebo has held events and research conferences to inform and build partnerships. After reviewing the present environmental systems in each city and considering the facts on the soil contamination issue presented throughout this dissertation, Sasebo City needs to take the following three actions:

1) Adopt preventive measures to reduce the potential financial and health risks due to increasing waste treatment problems.
2) Increase education, community action and business involvement in reducing the illegal dumping problem.
3) Expand its efforts to work with businesses to reduce the potential for industrial accidents that contaminate the soil with hazardous chemicals.

Because of its current achievements in reducing air and water pollution, the author believes Sasebo City would benefit from a shift from reactive regulatory measures to preventive actions for the soil contamination issue. Considering the city's interest in working with the local businesses and citizens, and a strong non-profit network with potential support by a high-level university nearby, the CERM system offers an affordable solution that corresponds to its overall environmental goal.

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