2 Content of Conference

Chairperson

Since we have come to the scheduled time, I would like to open the Asian-Pacific City Summit Second Working Level Conference. I am from the International Planning Section of Fukuoka City Hall. My name is Korai, the Asian-Pacific City Summit Coordinator. I should like to ask for your cooperation. Now we would like to introduce the Secretary General of the Asian-Pacific City Summit, who is the Executive Director of the International Affairs Department of the General Affairs and Planning Bureau of Fukuoka City. Here is Mr. Murakami, who is going to give us the opening remarks.

Opening Remarks

Mr. Hiroshi Murakami
Executive Director
International Affairs Department of Fukuoka City

Mr. Hiroshi Murakami (FUKUOKA)

I am Murakami, Executive Director of the International Affairs Department of the General Affairs and Planning Bureau of Fukuoka City. On the occasion of the opening of the Asian-Pacific City Summit 2nd Working Level Conference I would like to give you a few words. The Working Level Conference was proposed in the first City Summit which was held in this city in 1994.

This Working Level Conference was positioned to complement the City Summit. It is very important, in order to advance urban issues, that the heads of each city meet. It is also important that working level administrators, who are involved with active front line duties, should promote mutual exchange and cooperation. In this spirit, two years ago in October 1995, the first Working Level Conference was held on Traffic Issues. For the Second Working Level Conference the focus is Waste Treatment and Disposal, which is a very urgent and important issue for the cities.

We will have case study presentations from four cities, namely : Shanghai, Pusan, Jakarta and Auckland. We are also going to hear the keynote lecture by Professor Hanashima from the Department of Engineering of Fukuoka University. And there will be a United Nations report from the Human Settlements Officer of the United Nations Centre for Human Settlements (Habitat), whose Fukuoka office is on the eighth floor of this building. Additionally, under the initiative of Professor Matsufuji

of the Department of Engineering of Fukuoka University, there will be field work tomorrow. Today, we are honored by the attendance of directors and officers from the United Nations Department of Economic and Social Affairs, the Japan International Cooperation Agency, and the Japan Waste Research Foundation. For three consecutive days, today, tomorrow, and the day after tomorrow, we truly hope you will have valuable discussions and exchange of information. I also hope you will learn the landfill technology called the 'Fukuoka Method'. I hope the meeting will be informative for all of you. When you return to your homes, I hope you will be able to make practical use of the information. Last but not least, we trust the Second Working Level Conference will be fruitful and meaningful and we hope the ties and the network among the participating countries and cities will be further strengthened. This concludes my opening address. Thank you.

Chairperson

Thank you very much. Before proceeding, we would like to appoint the chairman for this conference. We would like to select Mr. Minoru Hirao to serve as the chairman. Mr. Hirao is the Executive Director of the Facilities Department of the Environmental Bureau of Fukuoka City.

Chairman

Good morning, everyone. My name is Hirao and I am pleased to serve as the chairman for this conference. Today we are honored by the attendance of city representatives who are involved in waste disposal issues, to exchange their views. We would like to have an informative and meaningful meeting in a relaxed manner. I appreciate your cooperation.

Now, we will move on to the introduction of today's participants. Because of time constraints, I will read the names. Would you please stand up when your name is called.

••• *Introduction of Participating Cities* •••

Keynote Speech

Prof. Masataka Hanashima
Faculty of Engineering
Fukuoka University

Chairman

Now for the keynote address by Professor Hanashima of the Engineering Department of Fukuoka University. He will speak about world trends in waste treatment and disposal and the current situation of landfill waste disposal in Japan. Professor Hanashima, please.

Prof. Masataka Hanashima (FUKUOKA UNIVERSITY)

Thank you very much for your kind introduction. I am Hanashima. It is my great honor to speak to you on the occasion of the Asian-Pacific City Summit Second Working Level Conference. Next month the COP3 Conference to control carbon sioxide emission is to be held in Kyoto, Japan. The environment of the world is deteriorating and the issue of waste is at the frontier of global environmental problems.This is the last frontier for the protection of the earth. There is overflowing waste around the world. In the United Nations, the waste zero emission project was proposed. (This project aims at the realization of technological innovations to prevent production of waste in any form). There is an attempt to establish a social system which will accord a resource cycle for the twenty-first century. In other words, to establish a system that reuses former wastes which have been treated and disposed.

Please consider the amount of waste of industrialized nations. It is interesting to compare wastes produced in industrialized countries and Japan. The highest producers are the United States and Japan. A great amount of waste is produced throughout the world. Compared to the USA and Japan, the amounts of other countries, European Countries and Canada, are lower. There is also a measure indicating the gas produced, which is a pollutant contributing to air pollution. The measure of gas produced is smaller in Japan compared to the amount of solid waste. This is because Japan has attended to air pollution, which we suffered greatly in the 1960s. We have made various technological developments to control air pollution. The ratio of incineration is very high in Japan. The percentage is as high as 74% of the total treatment and disposal. In China, the incineration rate is very low and most waste is landfilled. In the United States of America, 16% of waste is incinerated and the rest is landfilled. Sweden has the highest proportion of incineration among European Countries. Germany is considered to be the most advanced in terms of waste problems. And in Germany,

25% of the waste is incinerated and the rest is landfilled. Also they reuse waste as a resource.

I would like to talk about the present status of waste in Japan. In Japan, we have two major classifications of waste: industrial waste and domestic waste. Industrial waste amounts to 400 million tons a year, while domestic waste amounts to 50 million tons a year. The total amount of waste per year is 450 million tons. The reclaimed amount is 161 million tons, of which 40% is reused, while 38% is converted to water or gas through incineration. In between disposal and reclamation there is interim treatment. Waste is incinerated or dehydrated and the volume is reduced. The total amount of industrial waste ultimately disposed in Japan was 89 million tons or 22% of the total industrial waste. Reclamation and reuse needs to be promoted. For the seven years since 1990, 40% of industrial waste was reused. We seem to have leveled off at 40% reuse. We have to increase the reuse rate and that is one of the greatest challenges. If we can improve the rate to 60%, ultimate disposal will be close to zero. We would like to achieve this goal of 60% reuse rate.

Domestic waste is produced by households in Japan. An increase in amount begins around the 1960s and then levels off, in terms of domestic waste, at about 50 million tons. The daily production of domestic waste per capita was 200 grams in 1960 and at present it is five fold or 1,000 grams per person per day. This is the average production. The maximum value is 1,600 grams per day per person and the minimum is 700 grams. There is some variation depending on location, but the average figure of per capita production of domestic waste is 1,000 grams.

There are various types of reuse for industrial waste. Four categories occupy 88% of the total industrial waste in Japan: sludge, night soil, construction waste, and slag. Sludge is produced in the greatest amount, followed by the night soil of animals. Forty-three percent of 400 million tons is sludge, followed by night soil of animals at 20%. The third in amount is construction waste at 14% and then we have slag. Slag is the waste produced as residue of steel production and it comprises 11%. Night soil of animals is reused to 94%. It is made into compost and it is used to improve soil quality for agricultural purposes. Out of the four main categories, animal night soil is most highly reused, followed by slag. The reuse rates are 94% and 91%. Sludge is rarely reused and the second worst is construction waste. Construction waste has a reuse rate of 44%. Construction waste and sludge should be reused more actively so that we can improve the total reuse rate of industrial waste. We are making great efforts to improve the reuse rate of these materials.

Now for domestic waste. Effort is made to use domestic waste as resources. Municipalities collect domestic waste and try to recover reusable materials. Out of 50 million

tons, on average 1.5 million tons, or at most 1.7 million tons, are collected by the municipalities. Also there are 1.2 to 1.3 million tons collected by citizens' organizations. These are voluntary citizens' organizations that collect solid waste. Of domestic waste collected by municipalities 4.3% is reused, and 3.9% collected by the voluntary citizens' organizations is reused, giving a total of 8.2% reused. A recent figure shows 9.1% of domestic waste is recycled. Of course, there is variation by prefecture. Chiba Prefecture achieved the highest recycle rate of 19%, and the lowest rate is 3% in one prefecture.

Talking about waste in Japan, there are two major problems that we have to face. First is the citizens' rejection of the construction of ultimate disposal sites. Especially where a site is to landfill industrial waste, the citizens living nearby are strongly against the construction of the site. If this situation remains in effect, by the year 2010 current capacity will be filled and there will be no place to dispose industrial waste. We are trying to modify the laws to promote treatment of industrial waste so that we can establish disposal sites acceptable to the citizens. A major policy amendment was made this June.

The other major issue is the pollution of air and soil by dioxin. Dioxin is produced by incineration of waste. In Japan we have 1,850 incinerators to incinerate domestic waste. There are three types of incinerators. In terms of the treatment capacity, the total continuous incinerator is most efficient. There are semi-continuous incinerators which incinerate for sixteen hours a day, and batch incinerators which incinerate only eight hours a day. Out of 1,850 incinerators, 500 are totally continuous incinerators. Total continuous incinerators account for 70% of treatment capacity. However, in terms of the number of incinerators, only 500 are continuous incinerators and the remaining 1,350 incinerators are semi-continuous or batch incinerators. These semi-continuous or batch incinerators produce the greatest amount of dioxin, because dioxin is readily generated when a temperature range of around 300 degrees C is reached. In the case of semi-continuous or batch incinerators, they have to increase the temperature before incineration starts and they have to cool the incinerator after the incineration is done. So, twice a day there are 300 degrees C zones, where dioxin is generated. The government encourages the municipalities to construct continuous incinerators with 100 ton per day capacity. The National Government subsidizes municipalities only when they build this type of continuous incinerator.

In Asian countries the treatment system most widely used is landfilling. There are two major types of landfilling technologies. The first one is anaerobic landfilling, where air is not involved in landfilling. The second is aerobic landfilling. There is a forced introduction of air to make the landfilling site aerobic. One typical example of anaerobic landfilling is water landfilling or water filling of waste.

Aerobic landfilling introduces air to create biodegradation of waste through the contact of waste and air. In Europe, anaerobic landfilling is more popular and the methane gas thus produced is reused in European nations.

There is a very large ultimate disposal site in the state of California in the United States of America. The total area is 140 hectares and the waste is piled. At the landfilling sites, tubes are inserted and gas is collected through pipes. The maximum depth is 100 meters at this disposal site. The pipes measure sixty centimeters at the end of the systems. At this large scale power plant, the gas thus collected is used as fuel. The power generation capacity is 50,000 kilowatts and this supplies electricity to 17,000 families. Around ten years ago, they could sell one kilowatt hour of electricity for thirteen yen. However, in Japan, one kilowatt hour brings only five yen, because of very strict regulations. At the moment, we are deregulating to liberalize power generation and the sale of electricity, so we will have a higher price for electricity produced.

Let's look to the situation in Germany. Actually the data is somewhat old and depicts the situation when there were two Germanies ; East Germany and West Germany. At that point in time, the gas usage was at 38 % and gas disposal or gas processing from landfill site was at 34 % in West Germany. So in Europe, gas usage was less than active. Currently they are looking to Southeast Asian countries, particularly China. There is an increased demand for gas usage from landfills. Certainly gas usage will be significant but there are serious issues. One issue in Japan and other countries in the Asian monsoon region, where the annual precipitation is 1,500 millimeters or higher, is that we are faced with serious leachate coming from the landfills. A symposium was held recently in Beijing and the representative from Beijing reported a serious case of leachate resulting in odor for as far as two kilometers.

Gases are generated by landfills. Usually gas generation will continue for ten or twenty years. In the extreme it may last for thirty years, but in the norm for ten to twenty years. Even after usage of gas is finished, we are still faced with the long term impact of toxic materials on the quality of rivers and other components of the environment. In Japan, Korea, and China, where there is a high population density, land utilization is also high. In Europe or the USA, the population density is not as high as Asian population density, therefore the land utilization is not as high. There, according to one report, the current situation might continue for as long as 100 years. But in countries where land utilization is very high, it is imperative to stabilize landfills as soon as possible. Comparing aerobic and anaerobic structures, the decomposition stabilization speed is different on the order of three to four times. In areas with a lot of rain and the need to utilize gas, attention

to the environmental impact from gases is required. With raised standards for quality of life and heightened awareness among citizens, there is increased demand for better management at the site of deposition. Earlier stabilization of landfills becomes a priority.

I would like to direct your attention to what we are doing here in Japan. First, there is construction of aerobic site structures. Primarily, these structures act as a kind of reservoir for gases. When the gas yield comes down, the priority is to stabilize the landfills as soon as possible, as well as prevent pollution. At that point, we can inject air from the porous spaces. This is what we do here in Japan. This structure enables us to collect gas and then inject air. In one of Japan's very first aerobic sites, air is injected into the waste through pipelines. Ideally, we should have had more and deeper layers of crushed material but due to cost implications, we were, unfortunately, unable to do so. We also practice semi-aerobic construction here in Japan. With this semi-aerobic structure there is air injected on one side, and the other side is an anaerobic structure. The water coming out of the landfills shows poor quality on the anaerobic side. We have to spend a lot of money in processing the water. So aerobic site structures should be leveraged, particularly in terms of processing water. Regarding future operations, particularly for those areas with a lot of rain, I'd like to propose construction with an adequate layer designed in the initial stage, and a space to be used as a kind of reservoir for collecting gases. Then, when gas yield is down, air can be injected through a pipeline in order to stabilize the decomposition inside. These structures will likely be effective, particularly in the monsoon regions in Asia. Our plan in Japan is based on these elements. One strategy is to have a closed structure in the landfill area, in order to insure approval and consensus from residents. There are, of course, many issues yet to face but efforts are underway to develop appropriate technology. Waste treatment and disposal technologies are developing rapidly. Cities in the Asian-Pacific region should be encouraged to exchange specific information as much as possible.

In fact, currently there are active exchanges of information. I would like to mention a few examples. One arrangement was made between Japan and Korea in 1996, when I was serving as President of the Waste Management Society. Every year we exchange papers. In November 1997, in Beijing, the Chinese Waste Management Society was established and I was invited to make a speech there. Particularly in Kyushu, efforts are now underway to create a society and an economy where it is possible to leverage recycling technologies. Currently under development are both hardware technologies and software technologies. On November 17, 1997 at Hibikinada in Kitakyushu, an earth breaking ceremony was held for the Fukuoka University Recycling and Environmental Research Institute. Here, ten research groups

will come together to conduct research activities. We hope that this institute will be well utilized and that there will be effective service to support a recycling society for the twenty-first century. For the same purpose, we hope to receive contributions from Asian researchers. We would like to provide this research institute as a kind of forum in which Asian people, in particular, can educate themselves. In November 2000, we are scheduled to hold an international conference on final disposition here in the City of Fukuoka. Now, at the conclusion of my presentation, I would like to invite today's participants to come to this international conference scheduled for the year 2000. I truly wish for further information and human exchange among Asian-Pacific cities. This concludes my presentation.

Presentation

Mr. Zhang Yi
Deputy Director, Chief Engineer
Institute for Design and Research in Environmental Engineering, Shanghai

Chairman

Thank you, Professor Hanashima, for your presentation. Professor Hanashima's keynote speech focused on the status of waste in various industrialized nations, the current situation regarding waste management in Japan, waste processing methods suitable to Asian climate, and landfill construction, particularly comparing aerobic and anaerobic structures and their merits. I'm sure we all hope for the early realization of a recycling society as discussed. We also hope the international conference on final waste disposal in the year 2000 will be a great success.

Next we will have a case study presentation from Shanghai City.

Mr. Zhang Yi (SHANGHAI)

Thank you very much for inviting Shanghai to participate in this Asian-Pacific City Summit Second Working Level Conference. I would like to talk about the present status and future planning regarding household waste disposal in the City of Shanghai. The City of Shanghai presently presides over fifteen administrative districts and five prefectures. It has an area of 6,340 square kilometers, of which inland districts occupy 6,121.8 square kilometers and its wooded district 121.85 square kilometers. The population, as of 1996, was 14,191,000. Of this figure, 9.5 million is the city area population and 3.5 million a migrating population. The GDP (gross domestic product) growth of Shanghai in 1996 was 287.776 billion yuan. And, having set