THE THIRTEENTH ASIAN PARLIAMENTARIANS' MEETING ON POPULATION AND DEVELOPMENT

Kobe, Japan
March 17—18, 1997

THE ASIAN POPULATION AND DEVELOPMENT ASSOCIATION
(APDA)

THE THIRTEENTH ASIAN PARLIAMENTARIANS'
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Opening Ceremony

[10:00~11:00, March 17, 1997]

Opening Address
by
Fukusaburo Maeda
Chairman
Asian Population and Development Association

Mr. Toshitami Kaibara, Governor of Hyogo Prefecture, Mr. Kazutoshi Sasayama, Mayor of Kobe, the Honorable Taro Nakayama, Chairman of Japan Parliamentarians Federation for Population (JPFP), the Honorable Shin Sakurai, Chairman, Asian Forum of Parliamentarians on Population and Development (AFPPD), Dr. Prasop Ratanakorn, Secretary General of AFPPD, Dr. Nafis Sadik, Executive Director, United Nations Population Fund (UNFPA) represented by Mr. Katsuhide Kitatani, Senior Adviser of UNFPA, Mr. V. T. Palan, Regional Director of the East and South East Asia and Oceania Region, International Planned Parenthood Federation (IPPF), the honorable parliamentary delegates and ladies and gentlemen,

It is my pleasure to say a few words on behalf of the Asian Population and Development Association (APDA) on the occasion of the Thirteenth Asian Parliamentarians' Meeting on Population and Development.

It was two years ago when the City of Kobe was struck by a devastating earthquake of historic proportions. The city has risen from the disaster like an phoenix. I have nothing but admiration and respect for all those who has had a hand in rebuilding the city considering the amount of courage and work it must have taken.

This time the Asian Population and Development Association has decided to hold the Meeting here in Kobe in part to have an opportunity of sharing the miraculous recovery with the distinguished parliamentarians who in many ways have supported it. I would like at this time to especially thank the City of Kobe, Mr. Yukio Takenaka, Executive Director, Kobe International Association, Mr. Daisaku Komatsu, Secretary General, Asian Urban Information Center of Kobe and the staff at the secretariat for their most generous cooperation.

The Asian Parliamentarians' Meeting on Population and Development, APDA meeting for short, is held once a year and this is the thirteenth meeting . The Association which is a juridical foundation was established by the late Takashi Sato, the former Minister of Agriculture, Forestry and Fisheries for the purpose of supporting Asian legislators committed to the enormous challenge of population and development. Whether or not the humankind is able to build a bright future is wholly dependent on whether we can resolve the population issues and realize sustainable development in harmony with the environment.

Today the world population is increasing at a scale and rate, unprecedented in human history. It is said that every year we are adding approximately ninety-six million to the human family. In fact, it is estimated that the world population will reach six billion during the year. No one knows the capacity of the earth to sustain population. But one thing is certain. Humankind cannot live beyond the limits of the mother earth to sustain us.

Unlike natural disaster, the population crisis will not strike us suddenly. It is, however, advancing with certainty. The solution of this problem requires political will and commitment on the part of leaders in every country.

Having said so, the population issue, after all, boils down to an individual choice which cannot be forced. There is no other way but to bring the issue before the people and to encourage them to make their own choice. In this respect, among national leaders, the essential role rests with elected representatives of the peoples who have directly chosen them.

It is from this perspective that APDA makes its mission to support activities of Asian parliamentarians like yourselves concerning population and development. We were proud to have supported, with AFPPD, the meetings in Kuala Lumpur, Canberra and Geneva in preparation for the World Food Summit in Rome of the United Nations Food and Agricultural Organization.

Our Association also conducts research for the purpose of supporting activities on population and development and provides educational materials. At this meeting there will be presentation of two special reports: one on "Agriculture and rural development in Laos" and the other on "Population and urbanization in the Philippines". The former commissioned by the Ministry of Agriculture, Forestry and Fisheries will be presented by Dr. Shigeto Kawano, Professor Emeritus of the University of Tokyo, and a distinguished recipient of cultural award. The latter, commissioned by the Ministry of Health and Welfare will be presented by Dr. Toshio Kuroda, Director Emeritus of the Population Research Institute of the Nihon University and this year's recipient of the United Nations Population Award.

We are proud of these distinguished scholars and I am happy to tell you that they serve on the board of directors of the Asian Population and Development Association (APDA).

The theme of this year's meeting is "Population and Water Resources". Water in general and fresh water resources in particular is becoming more scarce everyday. We believe that it is timely to focus on the water resources which is said to be the first essential resource to suffer shortage.

Three outstanding scholars will be presenting papers on water. Professor Zenbei Uchijima, an authority on environment and meteorology from the Miyazaki Public University will be focusing on water from the perspective of the earth. The Honorable Vo Tong Xuan, member of parliament and professor of Vietnam Canto University will be presenting paper on agricultural production and water and Professor Yasutaka Ogawa from Jikei Medical University from the perspective of public health. As the organizer of the meeting we will be most pleased if these programs can assist participants in their deliberation of the subject and eventually in policy making at national levels for the bright future for their countries.

While our association is a small organization we are committed to working towards the resolution of population and development problems.

In concluding, I wish once again to thank each and every member of parliament here present, UNFPA, IPPF, and AFPPD and local leaders for their cooperation.

Thank you for your attention.

Welcome Address
by
Mr. Kazutoshi Sasayama
Mayor of Kobe

It is a tremendous honor for us to have the representatives of parliamentarians from the Asian countries gather here in the City of Kobe. I would like to welcome you all on behalf of the citizens of Kobe.

Humanity has experienced increase of population in an unprecedented scale after entering this century and various problems including food shortage, poverty, environmental destruction and urbanization are occurring on a global scale. These problems have become particularly serious in Asia where 60% of the world's population live.

I have learned that, following the discussion with focus on women until last year that led to adoption of the Manila Resolution, you will be talking about water from a global viewpoint this year under the theme of "Population and Water." I hope that the meeting will be fruitful, as water is an indispensable item for human survival as well as for the development of economy and culture.

With the support and guidance of United Nations Population Fund, the City of Kobe founded "Kobe Asian Urban Information Center" in 1989 to help solve the population problem in Asia, particularly numerous urban problems that accompany concentration of population in cities. In addition to carrying out study and research for solving various urban problems, the Center is holding seminars for urban planning administrators of Asia and has invited administrators from more than 40 cities to Kobe.

We have also established the Kobe International Cooperation Center in 1993. This Center is accepting trainees from the developing countries and working with NGOs based in Kobe. Furthermore, we established the WHO Collaboration Center in Kobe, in 1996 to study health problems that accompany urbanization, expansion of slums and aging.

Kobe has developed as an international port city and maintained strong connection with Asian countries. We therefore would like to create a system that will make it possible for us to cooperate with Asian cities at municipality level through these three centers.

Two years have passed since the great earthquake. I would like to take this opportunity to cordially thank your countries for the warm support that your countries kindly offered at the time of the earthquake to encourage the people of Kobe.

I believe that the best way we can respond to this warm friendship is to work hand in hand with all citizens of Kobe for the reconstruction of the city at an earliest possible time. The City of Kobe has taken the opportunity of this earthquake to work towards a pioneer city through conversion of industrial structure and improvement of citizens' life and welfare. We are convinced that this effort will bear fruit and result in strong resurrection of the City of Kobe.

Reconstruction is the hope and mission of all of us in Kobe. As we intend to pour all of our energy into reconstruction by seeking a path that will enable us to work together with the countries and cities of Asia towards mutual development, your assistance will be very much appreciated.

I would like to conclude my speech by praying for the success of this meeting and the health of all of you who are here today. Thank you very much.

Address
by
Shin Sakurai
Chairman,
Asian Forum of Parliamentarians on Population and Development

Your Excellency, Mr Toshitami Kaibara, Governor of Hyogo Prefecture, Mr Kazutoshi Sasayama, Mayor of Kobe, The Honorable Taro Nakayama, Chairman of Japan Parliamentarians Federation for Population (JPFP), Mr Fukusaburo Maeda, Chariman, The Asian Population and Development Association, Mr V.T.Palan, Regional Director of the East and South East Asia and Oceania Region, International Planned Parenthood Federation (IPPF), my parliamentary colleagues, ladies and gentlemen.

I very much appreciate for giving your precious time to come together to consider matters that are of keen concern to us all.

Let me start by saying how overwhelmed with admiration I am at the unimaginable efforts that must have been exerted to achieve the miraculous reconstruction of Kobe. The earthquake that struck the city was on such a scale that it left the inhabitants helpless. In the face of such a disaster, human beings can only aspire to do his utmost to minimize the damage and hope that nature will be sparing in its violence. In fact, human beings can only somehow strive to overcome such a tragedy and find new strength to get on with his life.

No human being can live beyond the limitations of his mother earth. We share our fate with that of our planet. Among our most pressing challenges we must remind ourselves that the production of food essential to our very survival is decreasing. While there will be, by certain estimates, a sufficient supply of food for the next twenty years or so, it is feared that the supply will not keep up with the world's population that continues to grow. To ensure that the future is one of hope, we parliamentarians must grapple seriously with this issue.

It was with this perspective, as you will remember, that the AFPPD called on like-minded parliamentarians from all over the world who were committed to solving the problems of population and development to attend a meeting in Geneva on the eve of the World Food Summit in Rome called the "International Meeting of Parliamentarians on Food Security, Population and Development." The Declaration adopted at our meeting was distributed at the Summit and personally introduced by our colleague, the Honorable Takao Fujimoto, Minister of Agriculture, Forestry and Fisheries of Japan.

The theme for this year's APDA meeting is "Population, Water Resources and Development". My country Japan has always been endowed with water whose benefits our forefa-

thers have striven hard to maintain guiding our lives to be in harmony with the environment.

Globally, the water resources are tight. At the Geneva meeting we heard an alarming prophecy from a delegate from the Forum of Africa and Middle East Parliamentarians on Population and Development that whereas the region fought wars over oil in the 1970s the future wars would be fought over water. At present aggregate precipitation per population is used to measure water resources requirement. With this yardstick, a country like Japan considered to have abundant water is shorter in its supply compared to Saudi Arabia.

Explosive growth of population is reducing this valuable water resources to scarcity. Water is essential to the life of all living things. No creature lives without water. We know that marine resources seemingly independent of fresh water are in fact depend on nutritients that are emptied by flowing rivers. I believe what humankind can do to resolve the issue is first of all to manage population increase and thereby to lighten load on the environment and secondly to nurture it by conducting our lives in such gentle ways as to avoid over burdening it.

Furthermore, water has an educational impact, for all men, including those with little education depend on it. If water is bad, no amount of efforts will improve public health of the area. No mother is unwanting in her wish for the survival and health of her child. Education imparted through Water can be expected to enrich her life just as rain does to a parched land. This can have important implications in our efforts to resolve the problem of population. This applies to agriculture as well. Community development can be promoted centered around Water.

By listening to her wishes and tailoring education to meet her needs we can open a wide window of opportunity to the future.

The population challenge we face is not an unpredictable natural disaster as the one that hit Kobe. It is a problem that can be avoided with our resolve and the understanding of the community. Let us do our utmost today so that we can ensure a future that is full of hope.

I am confident that we will have earnest deliberations and that they will be reflected in our national policies.

Thank you for your attention.

Address
by
Dr. Taro Nakayama, MP
Chairman, JPFP

Read on his behalf
by
Mr. Yoshio Yatsu, MP
Director, Chairman of Committee on Global Issue, JPFP

Mr. Toshitami Kaihara, Governor of Hyogo Prefecture, Mr. Kazutoshi Sasayama, Mayor of Kobe, Hon. Shin Sakurai, chairman, Asian Forum of Parliamentarians on Population and Development (AFPPD), Mr. Fukusaburo Maeda, Chairman, the Asian Population and Development Association (APDA), Dr. Nafis Sadik, Executive director, United Nations Population Fund (UNFPA), Mr. V.T. Palan, Regional Director of East and South East Asia and Oceania Region, International Planned Parenthood Federation (IPPF), Parliamentary delegates and Ladies and Gentleman,

I would like to congratulate the convening of the 13th Asian Parliamentarians' Meeting on Population and Development. I understand that a topic of the conference is "Population, Water Resources and Development". When I heard that you will be taking up the issue of water, I thought it was a very timely topic.

Water is indispensable for all living beings. And this water is facing a grave crisis today. Out of all the various factors that limit the future of mankind, water, fresh water resource, that is, is said to be the first resource that would get depleted on this planet. The amount of water on this globe may not change. However, the fresh water necessary for the survival of life on earth is changing into water that cannot be used owing to pollution and excessive use.

Without water, food production is impossible. Even if shortage of drinking water does not occur, what would happen if we can no longer produce food that is indispensable for the survival of mankind? Increase of population changes our lifestyle through greater demand for food and drinking water, and industrialization also contributes to greater use of water. Thus, the demand for water increases at a higher rate than the increase of population.

In fact, it is said that one thousand tons of fresh water is needed in order to produce one ton of grain, which is our staple food. In the breadbaskets of the world, shortage of fresh water in producing grains is said to be the greatest limiting factor of production.

Excess of use of agricultural water from spring to summer has already dried up the Yellow River in china. Colorado River in the United States is no longer reaching the Gulf of California because it has dried up due to the pumping up of water for agricultural use. The situation is very serious.

Also, in the northern part of China, it is said that the groundwater level has dropped 30 meters due to excess pumping of water. Water levels have also gone down in the breadbasket regions of the world such as the American Midwest and the Punjab Region of India and Pakistan and seriously affecting their agricultural production. In the Punjab plains, mixture of salt into the underground water, and is resulting in serious damage to agricultural production. All of these incidents are attributed to excessive use of fresh-water to meet the increase in demand.

While it is necessary to conserve the forest resources in order to recharge and secure the fresh water resource, these forest resources are also facing risk from industrialization and population pressure. The water issue is therefore serving as constraints for the future of humanity in such a significant way. This water problem not only affects us in terms of global environment and food, but asserts strong and direct impact on the resolution of the population problems.

One of the main agreements reached at the International Conference on Population and Development, which was held in Cairo in 1994, was that we have to create an environment for realizing reproductive health in order to solve the population problem. There is a physical aspect and a social aspect to such environment for realizing reproductive health-and water has great significance in the physical aspect.

The most important requirement for realizing reproductive health would be the availability of clean and hygienic water because this availability of clean and hygienic water is indispensable in reducing infant mortality rate.

It is not possible to pass over the water issue in the course of our effort to solve the population problem, which is placing burden on the earth and putting pressure on the future of humanity. Neither can we cope with the pressure of population increase without coming to grips with this issue. Despite its importance, water problem has hardly ever been approached from a comprehensive point of view.

This Kobe Conference will mark the first international conference – and the first parliamentary conference in particular – that will be held for comprehensive discussion of "Population, Water Resource and Development." Such discussion is essential for reflecting upon on the actions of the humanity and creating a promising future, and it is of great significance that this epoch-making conference will be held here in Kobe. I sincerely hope that the active discussion that will take place at this conference will produce fruitful results.

I would like to express sincere apologies for not being able to attend this conference because of an urgent trip I had to make to Korea. Thank you very much for your kind attention.

Address
by
Dr. Nafis Sadik
Executive Director, UNFPA

Read on her behalf
by
Mr. Katsuhide Kitatani,
Senior Adviser, UNFPA

Distinguished Parliamentarians, Excellencies,

Ladies and Gentlemen,

On behalf of the United Nations Population Fund (UNFPA), it is my great pleasure to welcome you today to the 13th Asian Parliamentarians' Meeting on Population and Development, with a special focus on population, water resources and development. Dr. Nafis Sadik, Executive Director of UNFPA, regrets that she is unable to attend this important meeting, but has asked me to assure you that UNFPA is honored to be part of the deliberations over the next two days and looks forward to the meeting's results. Allow me first to express my sincere appreciation to the organizers of this meeting Mr. Fukusaburo Maeda and the Asian Population and Development Association (APDA), and Mr. Shin Sakurai and the Asian Forum of Parliamentarians on Population and Development (AFPPD). I would also like to thank the Mayor of Kobe, Mr. Kazutoshi Sasayama, and members of the national preparatory committee for their support and hospitality.

The theme for this meeting is especially relevant, as it complements both parliamentarian and Heads-of-State agreements reached prior to and at the November 1996 U.N. World Food Summit in Rome. At that meeting, world leaders recognized that ensuring food security for the future would largely depend on the eradication of poverty, the elimination of unsustainable patterns of consumption and production, particularly in industrialized countries, and better management of both soil and water resources. In highlighting these priorities, they called for broader socio-economic development policies and affirmed the need to fully integrate population and environmental concerns into development strategies. Specifically, world leaders recognized that the responsibility for food security must be shared between women and men. To achieve this goal, governments agreed to promote policies which facilitate the productive and reproductive roles of women and men through better access to education, credit, technology, and basic health care, including reproductive health care and family planning.

For their part, parliamentarians at the AFPPD-organized International Meeting of Parliamentarians on Food Security, Population and Development, held just prior to the Rome

Summit, stressed that the early stabilization of population is a primary condition for realizing sustainable food security. Parliamentarians stated that the best prospect for slowing and eventually stabilizing population growth is to put decision-making power into the hands of women, and that an important first step in this regard is to ensure their education, reproductive rights and access to reproductive health care in all its aspects.

In addition, parliamentarians pledged to enact legislation providing rural producers of food, especially women, with equal access to and ownership of productive assets including land and water. At the same time, they recognized that water must be an integral part of national development planning, which brings me to the main theme of this meeting.

The latest United Nations findings on global freshwater resources are grim. There is clear and convincing evidence that the world faces worsening local and regional water quantity and quality problems, largely as a result of poor water allocation, wasteful use of the resource, and lack of adequate management. In other words, constraints on water, and water degradation are weakening one of the resource bases on which life itself depends.

According to the United Nations, water use has been growing at more than twice the rate of population increase during this century, and already a number of regions are chronically water short. About one-third of the world's population now live in countries that are experiencing moderate to high water stress, partly resulting from increasing demands from a growing population and human activities. By 2025, as much as two-thirds of the world population will be under stress conditions. Water shortages and pollution are causing widespread public health problems, limiting economic and agricultural development, and harming a wide range of ecosystems. Such shortages may put global food supplies in jeopardy and lead to economic stagnation in many areas of the world.

There are powerful forces of change that could make water problems worse, unless immediate actions are taken. These forces include a world population that is now 5.7 billion, and is heading to 8.3 billion by 2025. Much of this increase will be in the rapidly growing urban areas of developing countries, many in Asia, and many of which are already experiencing serious water stress and crushing poverty. In less than 20 years, six out of the world's ten largest cities will be in Asia : Bombay, Shanghai; Jakarta; Karachi; Beijing; and Dhaka. All will have population of more than 18 million people.

To make water use more sustainable, planners at all levels need to understand water issues, and make them a central part of their development plans. The management of both water quantity and quality has to be a central part of health, social and economic policies that recognize women's roles as providers of food and water, caretakers of their families' health, and managers and conservationists of forest, soil and water resources.

At the same time, the full implementation of the goals enshrined in the Programme of Action adopted at the 1994 International Conference on Population and Development (ICPD) would lead to both the early stabilization of population -- through the provision of basic social services, including basic education and reproductive health care -- and the improved quality of life for women and men everywhere.

Session I: Study on Population and Development

[11:00-12:00, 14:30-15:30, March 17, 1997]

"Survey on Urbanization and Development in the Philippines"

by
Dr. Toshio Kuroda
Director Emeritus,
Nihon University Population Research Institute

Chairman
Hon. Senator Prof Dr. Prasop Ratanakorn (THAILAND)

I would like to talk about the survey that was performed in the Philippines last year. I will be talking about the Philippines on the theme of urbanization and development, but before going into this subject, I would like to discuss a general subject.

I assume many of you have already seen. The State of World Population 1996, published last year by UNFPA. It is an annual report on the world population prepared by UNFPA that focuses on urbanization and shows the level of UN's concern regarding urbanization. I will talk mainly about urbanization in the Philippines today, but this UNFPA report shows that urbanization is an extremely important issue in considering the population issue not only on a national level but on a global level. As this is an excellent report that examines the issue in a very comprehensive manner and discusses how population is increasing in urban areas, what the ideal size of cities and population distribution should be and how urban areas need to establish link with rural areas, I highly recommend that you read it.

As I mentioned just now, we need to focus our attention on global urbanization, but few people have taken up this subject. It is not just the issue of urbanization—a new situation called globalization of urbanization is emerging. One out of every two persons in the world will be living in cities in the near future. Ii is predicted that half of the population in the developing countries will be concentrated in cities by the early part of the next century. If that happens, what will happen to future society? It will give rise to an unprecedented society of numerous extremities. People who leave rural areas to live in cities will be working in non-agricultural industries or service industry, which means that their lifestyle will be changed completely. This, in turn, will change the industrial structure as well as the values. Thus the issue of urbanization is one of the most important issues that will have to be addressed as we approach the next century, and the issue is not that of a distant future but an impending one. This is a situation that will be occurring at an unprecedented level in a few years from now. Therefore, when I discuss the issue of urbanization, please keep in mind that the issue is universal and that it is not limited to the example of the Philippines.

I think you have a gray book entitled "Survey on Urbanization and Development in Asia--the Philippines" among the materials that were handed out to you. Last year, we con-

ducted a survey on urbanization in the Philippines. The Philippines is a very interesting case to study and offers a guideline in understanding the situation in countries where economic and social development has been lagging. This report consists of seven chapters and discusses economic progress and development in addition to urbanization. It would only take an hour to read it, so I would like you to read it by all means.

Now, what are the implications of "urbanization" which is taking place extensively in your countries? What are the important points and how are the problems that will brought about by urbanization different from the existing ones?

First, development of urbanization differs from country to country. It is more advanced in some countries than in others and the rate of urbanization also vary. There is also a theoretical question of whether urbanization is blessing or not for the humanity. Theoretically speaking, the phenomenon of urbanization should be the same regardless of whether the country is developed or not, but its process is different. While urbanization occurs in the so-called developed countries as a byproduct of industrialization during gradual advancement of development, it occurs suddenly in developing countries without being accompanied by industrialization. This distortion resulting from the imbalance that is created between the speed of industrialization and urbanization has occurred in some of the Asian countries. Population has increased so rapidly in urban areas that it has become impossible for the governments to deal with the ever-increasing population. This is the case of urbanization in developing countries in Asia and other regions.

While developed countries are able to maintain balance in a sense because their urbanization and industrialization have slowed down considerably, the same is not true for developing countries. As urbanization is advancing much more rapidly, cities that are receiving the influx of population from rural areas do not have the time to make the adjustment. They do not have the leeway nor time to do so. The direction and phenomenon of urbanization may be the same between developed and developing countries but the process is different.

The problems of urbanization that are occurring in developed countries include ill effects of excessive concentration of industry and population in large cities as well as air pollution, water pollution and environmental pollution brought about by seeking only the economy of scale, resulting in further deterioration of social environment. These phenomena experienced by developed countries are now occurring in developing countries as well.

Let us return to the survey on the Philippines. I would like to raise some points here instead of going into details. First of all, if you were to describe the Philippines in one word, it would be "a country of multiple culture," i.e. a country in which various cultures coexist. It seems that this says more about this country than anything else. The characteristic that separates the Philippines from other Asian countries is that she has many cultures. The Philippines has a very large population of 69 million. China, Indonesia and Thailand also have large population but 69 million is also very large. And in the Philip-

pines, population dynamics-related transition, i.e. the so-called demographic transition is slow compared to other countries, slower than countries such as Thailand and Indonesia. You can see how much transition has been made in terms of population dynamics by looking at two indications; lowering of birth rate and improvement of mortality rate, i.e. total fertility rate and average life expectancy at birth. Demographic transition is slow in advancing if birth rate is high and mortality rate is high. Demographic transition advances and becomes infinitely close to 1.0 when improvement is seen in birth rate and mortality rate and both values decline.

Let us take a look at the demographic transition index of Asian countries by using data from ESCAP and UN from several years ago, although the figures may be slightly different from the most recent ones. Unfortunately, advancement of demographic transition is slow in the Philippines. Her index is 63%, which means that there is nearly 40% more room in lowering the birth rate and mortality. Meanwhile, Hong Kong and Taiwan have extremely high demographic transition index. China and Korea also have their demographic transition index on the 90% mark. In contrast to these countries, the demographic transition index of the Philippines is on the 60% mark. As total fertility rate of the Philippines is estimated to be lower than 40%, it needs to be modified somewhat. While these indicators suggest very interesting points in comparison with other countries, one can say that demographic transition in the Philippines is considerably undeveloped compared to other Asian countries.

The next point is that the level of urbanization very high—probably the highest in Southeast Asia. The percentage of urbanization has reached 54%.

As for the content of urban population, high degree of urbanization means that that the process of urbanization is very rapid and that population is increasingly attracted to cities. I think this is an extremely important point. Generally speaking, the factor that affects increases in urban population the most is immigration. In the case of the Philippines, however, the greatest factor is natural increase. This is followed by a factor unique to the Philippines—reclassification of administrative demarcations—signifying increase in population and industrialization of local areas. Towns, villages and small communities are being promoted to cities. And interestingly, this administrative reclassification is the second largest factor. Migration in pure sense of the term is rare and does not play an important role. Natural increase and administrative reclassification are the most important causes of increase in urban population.

In the Philippines, population is rapidly increasing in an administrative unit called Barangay, which is the smallest unit of community. This, in turn, raises population density and advances the process of industrialization. So administrative reclassification means these small communities called Barangay becoming bigger and bigger and being promoted to cities. I think this is an extremely important point.

I would like to show you some data on factors behind increase of urban population in the Philippines as a whole—the magnitude of increase and the reasons behind it. First of all,

net migration accounts for only 6% of the cause. Meanwhile, natural increase accounts for about 59% and increase owing to reclassification accounts for 35%. Although the causes differ from region to region, natural increase is the greatest cause when seen as a country. It means that urban population is growing very rapidly in the Philippines and that natural increase is the greatest cause. In other words, natural increase rate has risen all the way to 59% as a result of higher birth rate and lower mortality rate and becoming a major factor in increase of population—particularly urban population.

This issue of reclassification has occurred in other countries, and Japan is no exception. After the World War II, the Government was very concerned about small towns and villages because their tax base was undermined as a result of young people moving to large cities. For this reason, the Government encouraged integration of small local towns into adjacent cities from a financial standpoint.

In the Philippines, the Government created rules for promoting Barangay to cities during the '70s. In doing so, the Government took population size, population density and socioeconomic factors into consideration, but the greatest emphasis was placed on population size and promoted such small communities to cities when population density reached a certain level. After this started in the '70s, urban population in the Philippines increased in the '80s and '90s as a result of this reclassification, although natural increase is also significant.

As for distribution of population, many islands comprising the Philippines have local cultures of their own. At any rate, the Government wanted to avoid excessive concentration of population in Manila and prevent Metropolitan Manila from becoming bigger and bigger. Manila had a population of 8 million and the Government was concerned about excessive concentration of population. Japan also experienced the same problem. Concentration of population in certain area is a problem that often occurs in primate cities. Thailand, for instance, is encouraging decentralization because population is concentrated excessively in the Bangkok Metropolitan Area. The Government is inviting industries to local areas under the slogan of local development. The Philippines adopted the policy of administrative reclassification to urge people and industry to move out of Luzon Island and go to Mindanao and other islands by offering subsidies. Luzon is an island located in the northern part of the Philippines that has the capital city of Manila.

It was quite early in the '60s and '70s that this population decentralization policy started in the Philippines. The present distribution of population by region shows some very interesting results. For instance, Metropolitan Manila has been absorbing a large amount of population over many years but its production increase rate from 1980 to 1990 shows a decline in growth rate. The growth rate that marked 5% during the 10 year period from 1960 to 1970 has gone down to 3%. The Government uses an interesting expression called "metropolitan shadow" when it refers to the regions neighboring Metropolitan Manila. It may be equivalent to the suburb of Metropolitan Manila. These are the regions where rapid population growth is taking place in the recent years. The growth rate is 6.1%, which is twice as high as Metropolitan Manila. This is a very in-

teresting phenomenon. Metropolitan shadow is taking in population from the crowded Metropolitan Manila. The term "metropolitan shadow" is used to refer to regions that are surrounding Metropolitan Manila. I assume this is an indication of the fact that people want to build their houses in residential areas that are a little distant from Metropolitan Manila. The same thing is happening in Japan. Because urbanization is occurring so rapidly in Tokyo and Osaka, people are moving out to the suburbs of these cities.

In addition to this metropolitan shadow, there is another region called absorption control urban area. In other words, it is a region for absorbing the people who overflowed from the cities. For instance, as these regions promote invitation of population and industry, they offer cheaper taxes and advanced social infrastructure. Efforts are being made to absorb population from Metropolitan Manila and other large cities. Population is also growing rapidly in these regions. The rural-urban combined region's population is growing at the rate of 5.2%. This is a very high number. And in regions where farming villages are dominant, i.e. basic rural regions, the growth rate is 5.2%. The Government is realizing such decentralization through its population decentralization policy. In this sense, the Government policy is attaining success. This is a very important point, a very unique example offered by the Philippines.

Japan also has a similar experience. The Government adopted a decentralization policy in 1962 in response to deterioration of environment and infrastructure caused by excessive concentration of population and industry in Tokyo, Osaka and Nagoya. The most typical of such policy was the New Industrial City Invitation Act established by the Japanese Government in 1962 to promote 25 new industrial cities. It was an effort to create, for instance, medium-size cities with population of about 250,000 and build industrial base there. Then the Government, municipalities and prefectures worked together to create medium-size industrial cities and invited industry and population. A new law was laid down in 1962 to create these cities between large cities and rural areas. However, the time was not ripe then--people still wanted to move to Tokyo and Osaka and did not want to live in medium-size cities. So this created a considerable amount of deficit, not only for the central government but for municipalities and prefectures as well. However, 10, 20, 30 years have passed and people are moving to these medium-size cities in large numbers as the environment of large cities, both economic and physical, deteriorated further. Considering the amount of time that was required for people to start moving into these cities, the timing is important. It would work if the timing is right but otherwise a large amount of investment will be wasted.

So we must have a good understanding of what people are thinking and what they are trying to do when making a policy. This is the base on which policy of urbanization must be built. More detailed studies of this sort will be required for policy-making of the future. In this sense, the Philippines offers an example of success. The increase rate has been held down in Metro Manila as well as in metropolitan shadow. The fact that population is increasing in other regions is one of the proofs that decentralization is making progress.

What I would like to mention in conclusion is that economic growth is not taking place in proportion to the high literacy rate and advancement of urbanization in the Philippines. The distemper that had existed in the past was one of the reasons, but the political stability, high literacy rate and advancement of urbanization brought about by President Ramos entering the office will surely make positive contribution in this area. High level of education is particularly significant and the percentage of people receiving college education is on the increase. These factors of the Philippines are high compared to other countries in Asia.

Under President Ramos, the Ramos Administration is putting forward a program for catching up with other Asian countries in terms of economic growth called "Philippines 2000." I expect that this program will attain significant results thanks to the high percentage of urbanization and literacy rate. They did not prevail in the past but will contribute to social development as the social indices combine with the government policy under the new administration. Therefore, the Philippines will attain more rapid economic growth in the near future. Much has changed in the year or two. Years of negative growth did exist in the past but things have been moving up in the last couple of years. Economic growth rate, GDP growth rate, marked a 4.5% growth in 1995 and the policy of the Philippines Government is expected to create a favorable cycle. Like her neighbors that attained remarkable economic growth, Thailand and Indonesia should also be able to grow, and I feel that the experience of other countries can be used in this respect.

I discussed briefly about the survey results on the level of urbanization and economic development. I was very happy to see the results of administrative and legislative activities of the Philippines Government as well the effort made by government institutions and the Population Institute of the Philippines University that were demonstrated by this survey. I was able to receive enormous cooperation from numerous agencies of the Philippines in conducting this survey. I would be very happy if these results would be of some reference and use to all of you.

Now I would like to hear any criticism or question that you may have. Thank you very much.

Chairman

Thank you so much, Professor Kuroda. Now is time for Question and Answer. Questions?

Question and Answer

Question 1 (Hon. P.J. Kurien, MP, India)

Thank you, Chairman for giving me this opportunity. This survey and the presentation of Urbanization and Development in the Philippines was very impressive and very useful. It is certainly helping other countries to know what kind of development is taking place in the Philippines. This is especially a general problem for Asia, that the urban population is on the increase, and this certainly gives a lot of pressure on the resources, and also pressure on the governments. This has to be tackled. And when such changes are taking place in the Philippines, it is good for other countries in the Asian region to study those changes and copy them for their benefit. But what are the useful changes taking place there? I'm sure this study and presentation has been very helpful. We are quite impressed, and I thank you, Professor Kuroda for this excellent presentation, on behalf of my friends from India, also.

(Hon. Colin Hollis, MP, Australia)

It was a very interesting paper, about the urbanization in the Philippines. But I am not sure the Professor mentioned that the Philippines still is basically a rural society, even inspite of the urbanization in Manila. But still, I wondered, if there is any evidence to say, in contrast to other countries in Asia, whether the migration from the rural sector to the urban is greater in the Philippines than in other countries. Because it seems to me that there is still the bulk of the population, still a large population living in the rural areas of the Philippines. Is that right?

Professor Kuroda:

Are you talking about whether the migration into the big cities is continuing? And as to the rural area also, is it still sending population into the cities?

Delegate from Australia:

Yes.

Professor Kuroda:

Yes, that's true. In terms of legal policy, the government has very much modified the rules because of the excessive population migrating into the Manila area. The government was also very worried about it, and also the media. But in overall, I look at the statistics, and find that was true before. All was just like Japan, Tokyo and Osaka.

It is true that migration is continuing into that big metropolitan area from the rural area. But as of now, particularly in the recent decade of 1980-1990, one can simply judge from population increase rate in the Manila metropolitan area that it absorbed a tremendous population. But now, I say that it is coming down. Now the population of even the metropolitan shadow cities is coming to seven million, comparable to the population of Metro-Manila. In a sense, some populations are moving into the shadow areas from Metro-Manila.

As to other areas, this is also true for even the island of Mindanao. Now the Mindanao population is increasing, and it used to send migrants to other islands, particularly to Manila. So this is now the overall situation.

Anyway, in terms of population increase rate, it is actually coming down in the Manila Metropolitan area. And it has started to increase measurably in other islands also. This is my view of the situation.

Chairman

Thank you. Next question?

(Hon. Oscar S. Rodriquez, MP, PHILIPPINES)

Thank you, Mr. Chairman. I come from the Philippines as the sole delegate. I thank the good professor, Professor Kuroda for giving his optimistic statement that soon the Philippines will be a developed one, with its rapid economic development today. I want to thank him fully for this serious study on our urbanization problem. I think the study is very accurate.

However, we want to emphasize a point about reclassification. According to his lecture, the urbanization problem is brought about by the three different reasons, migration, natural increase, as well as the classification and reclassification of areas. In the Philippines we reclassify areas from municipalities into cities after attaining a certain level of economic growth, and after attaining a certain income level as well as a certain population level, and then only we will approve or agree to a transformation from an original municipality into a city which is duly approved by Congress. But definitely not from the Barangay level.

Now according to his lecture there was a delay in the transition from authoritarianism perhaps to the present democratic setup. But may I remind you, we have the earliest democracy in Asia, perhaps. But the delay was perhaps caused by the declaration of martial rule during President Marcos, which was removed after the end of the Revolution in 1986. We had at first a very rapid economic growth. In fact, we were third in Asia, second to Japan. But now because martial law resumed we put the Philippines back into square one. We are under President Ramos, and as correctly stated by Professor Kuroda, and have a faster economic growth than the 4.5 percent expected -- we are now at eight percent as per the latest report of the President about a month ago. Last, I want to thank the good professor for putting the Philippines into this discussion on urbanization and development. Thank you very much.

Chairman:

Thank you. Yes, from Vietnam?

(Hon. Vo Tong Xuan, MP, VIETNAM)

I'm from Vietnam and I would like to congratulate Professor Kuroda for his very comprehensive study on the Philippines urbanization. In your study you put it very rightly that the fast urbanization of Metro-Manila and Metro-Cebu in the past was due to the neglect of the development in the rural areas. So the people tended to go to the cities because the rural areas were still not a good place to live. I understand some of the economists now believe that for addressing the problems of the 21st century, governments should concentrate in developing the cities rather than the rural areas. But on the opposite, other development workers still believe that in order to stop this fast and rapid urbanization, development of the rural areas must take a priority in order to provide the people in the rural areas a better place to live, so they will not go to the urban areas. So I would like your opinion on this.

Professor Kuroda:

I'm not sure what should be the priorities based on the rural development. I think that significantly a very crucial link between the urban and rural areas must be made. In case of Japan's economic development after World War II, in the initial stage, the national growth rate has come up, and the economic development in general terms was done very quickly before the population increases. And in that case for any country with a limited financial budget, if metropolitan or big city metropolitan areas have already been developed and if they have already assessed or experienced this before, then it will be much easier for the government to invest in that area. And then the general economic growth rate per head will also increase. But on the other hand, I said that in the process the larger concentration of population and industrial capital into an area produces a gap between the developed area and undeveloped areas, including rural areas. This gap is seen quite often. Now even rural areas are growing in terms of level of economics. The income level and

the level of living is also growing up. The government has then to have to pay more attention to the rural areas, too. This is one stage in development.

All countries cannot pay equal attention to all the areas, villages, towns, cities, everywhere. There is a concentration on somewhere, some point, some sector, I think, is natural. Theoretically, of course,not only governments, are coming to think about the importance of the very critical linkage between the rural areas and the cities. The cities are very happy to have more labor force from rural areas. Sometimes the rural areas are also happy because of more unemployment or also underemployment, and because of a very high population increase rate. A rural area is also linked with a city, sending its underemployed to the city. The young people come into the city, get money and send it back, helping the family remaining in the rural area, and more positively. On one hand the big cities may face an unfavorable situation, in terms of environment, the so-called scaled economy, and due to community and social and environmental committee work, young people want to live outside. If they find the big cities very much unfavorable, some of them moving out into the local cities. A closer relationship between the urban and the rural areas are established, in such cases, so-called integrated policy or holistic approach must be made. The priority should be set by government policy on the basis of financial capabilities, depending upon the government policy .

Chairman:

Thank you very much. From Malaysia?

(Hon. Senator Kamilia Ibrahim, MALAYSIA)

We know that urbanization is actually inevitable. And urbanization also means that there will be development of crime as well as other social implications. We in Malaysia look at urbanization in the context of development where the economy and the social aspects need to be balanced. Now in your paper, Professor, you made the survey, and you identified problems with urbanization. And also I noted that the problems also relate to crime as well as the law, which also means social issues as well. I would like to ask you as regards to urbanization and government policies, how do we look at tackling the social aspects of urbanization, and how do we look at it in relation to economic development so that we can see a balance where there is economic development, the social changes would also not suffer from the economic development, i.e. with urbanization. .

Mr. Chairman, I'd just like to say a few more words. Urbanization, population, environment and food are all interrelated issues. And what you have discovered in the Philippines through your survey and through your research is a manifestation that happened in many other developing countries, not only in the Philippines. And, as we know, eighty percent of the world's wealth is controlled by the rich, eighty percent upwards. And now we are living in the what is called the "global village". My question: What is happening in the Philippines is a manifestation of a developing country, where developing countries

depend very much on the assistance by the rich countries, i.e. Official Development Assistance, ODA. And as far as I know, ODA is very restricted where the developing countries are not being given free use and also what is called upholding their right to see the proper perspective of how to tackle the problem in their own country. This depends very much on the fact that everything is very much interrelated, development and organization, etc., all depends on assistance. This is what we have seen before.

Chairman:

Professor Kuroda:

I cannot give any definite answer or comment, because each country is in a different situation, it varies from country to country, and especially regarding culture and tradition.

There is only one point in which I have much interest, and that is about the so-called informal sector in big cities that many countries are suffering from. I think this is very important. Our experience in this connection is that whenever I go to Indonesia, Jakarta, Bangkok, and my impression is that I find that the so-called informal sector and is a very important issue because they are certainly a very special labor force, an asset. How to use them? My impression is that the so-called informal sector and the formal sector seem to be heading separate ways. I think about how to link these in terms of labor utilization. People from the informal sector should be utilized, absorbed and incorporated into the formal sector, too.

In that sense, I think about the elderly people in Japan, the older people. We are sure that the young labor force is decreasing, and on the other hand the elderly population is increasing. So how to utilize the elderly who are active, experienced, and have worked for so many years? The so-called informal sector consists of mostly young people, a very important labor force. How can we bring the two together, incorporating the informal sector into the formal sector? I talk with people who are concerned with this kind of problem, how do they feel about it? I feel that it must be incorporated. There is so-called voluntary education and so on, which is not so much different, not costly, and very easy. On the other hand the human resources must be utilized much more.

Chairman:

Thank you very much, Professor Kuroda. It is just about time to close the morning session.

"Basic Survey on Agricultural and Rural Development in Laos"

by
Dr. Shigeto Kawano,
Professor Emeritus, The University of Tokyo

Chairman
Hon. Colin Hollis, MP (AUSTRALIA)

We conducted a preliminary survey in July of last year, and the field survey in September. During the research we dealt with the issues of population, family planning, as well as the community influence on agriculture, which were the main themes of our field survey. I myself was very interested in the agricultural development, so I would like to make the report on that first.

The most important point in the agricultural issues regarding the Laos PDR is that the country is surrounded by the other Asian countries without any direct exposure to the sea. The north is bordered with mainland China, Myanmar, the east is bordered with Vietnam, Kampuchea in the South, and Thailand in the west. The Laos PDR is surrounded by five countries. In other words, Laos is highly affected by the situation in the surrounding countries. Furthermore, Laos is covered mostly by hillside or mountains, as much as 80% of the land is covered by mountains over 1000 meters in height.

In the past, Laos was under French Law. The French regarded this country to be of very limited potential, and also because of its many mountains the cost of the infrastructure, including the construction of the roads, was very high. So the French administrator at that time decided not to make major investments in the infrastructure of Laos. In other words, although France did have control over all the areas, they still thought that Laos was not at the top of their priority list under their administration. That is just the reason why Laos, as a country, is still lacking in infrastructure, including nationwide road network and telecommunication network. Along the border with China, the Chinese currency is used in Lao. Along the border of Thailand, the Thai currency is available within the Laos territory. The currency of Laos has not been proliferated throughout the country, which should be regarded as one major feature very unique to Laos that cannot be found in other surrounding countries. That is the reason why the agricultural development is not so highly developed. The population of 4.6 million consists of 68 traditional tribes or historical ethnic groups. Thus it is rather difficult to identify the nationwide economic trend as far as national policies are concerned, as the situation is very divisive and separate within the country of Laos.

About 90 percent of the population is engaged in agriculture and forestry for a living. However, the domestic income is only about less than 60 percent of the GDP, and therefore the income level supported by agriculture and forestry is rather low. In the context of

foodstuffs, Laos imports foodstuffs to supplement the lack of domestic supply. Ten percent of the imports in monetary value is food, although 90 percent of the population is earning their living by agriculture and forestry. Still the supply of the food is not enough domestically. Laos spends 10 percent of its foreign currency to import food to supplement the deficiency in its domestic food production. In order to earn the foreign currency for importing foodstuffs, what is the export items? Mountains and forests cover a large area, therefore, timber and wood products, including logs, are exported, as well the textile goods, to accumulate foreign currency. However, the use of wood products for export will in turn result in deforestation, and the destruction of the forests soon.

Furthermore, about 20 percent of the population live in the area between the mountains and the lowlands. The lowlands, close to the Mekong River, have 60 percent of the total population. However, 20 percent of the total population lives in the upper hillside, in between the lowlands and the high mountainous areas.

In the practice of shifting cultivation, mainly for a certain period, the forest is burnt down to get ashes, which is utilized as fertilizer in the cultivation of the upland rice and other foodstuffs. The 20 percent of the population living in between the lowlands and the mountainous areas of an altitude of one thousand meters migrates to the steep hillside upland area. The cultivation of the steep upland area causes flooding in case of very strong rainfall, preventing accumulation of fertilizers nurturing the forest in the future. Therefore the destruction of the Laotian forests should be prevented.

What is important for Laos is also important for all surrounding countries; namely, the forest in Laos should be maintained to prevent the erosion in the surrounding countries. In other words, the erosion in Laos may cost a major disaster in the surrounding countries. So this is not only an issue of Laos, but it is also an issue for the surrounding countries. Preserving and maintaining the forest in Laos in a healthy and the safe manner will preserve the power generation supply and water resources for the irrigation not only in Laos but also for the surrounding countries. The current issue of how Laos can meet such expectations and arrive at solutions were the two frequent issues in our survey. First of all, the shifting cultivation in Laos is destroying the forests, the upper land and the hillside area. So how can the destruction of the forest and the upper land area due to the shift in cultivation be prevented?

Secondly, the vicinity of the Mekong River delta and the valley area, where 60 percent of the total population is concentrated, is living on paddy-rice. However, the paddy-rice productivity and efficiency is very low--maybe less than half of its Japanese counterpart. Thus the other issue is how to improve the productivity of the paddy-rice fields. Once there is an increase in paddy-rice productivity, then the food supply will be increased, and will not require the import of foodstuffs.

An Additional point of consideration is in the north, the mountainous area is subject to an increase in the population. This will further increase the coverage of the shifting cultivation, in turn totally burning and flushing out the forests, resulting in major erosion of

the forests. How to resolve such erosion or destruction of the forest is the other issue to be considered.

Although the time of our survey was limited, and the infrastructure required for the survey was lacking, we could not cover a wide enough area during the limited time of our field survey. Therefore, the only area we selected was the Luang Phabang Province, about 40 minute plane ride from Vientiane, as has been depicted on the cover page of this report. We interviewed the heads of the six villages in the Luang Phabang Province. Through these face-to-face interviews we tried to learn the current issues they are facing and their current status.

Within the Luang Phabang Province, we selected two villages. The first village selected was in the neighborhood of the trunk road, or about 3 kilometers away from the road with truck transportation. The second village selected was 20 kilometers away from that big road. We visited these two villages to interview the village residents and farmers.

Why did we select two villages, one village in the neighborhood of the trunk road and other at a distance from the vehicle road? Its advantageous infrastructure and truck transportation will enable the village closer to the highway to have better purchasing capacity, as well as enabling the sale of agricultural products produced in that village. With the truck transportation access such villages could obtain fertilizers or agricultural chemicals more cheaply. We tried to compare the two respective villages in terms of their different in levels of income and living standard. In the village far away from the trunk road it is rather difficult for the villagers to purchase agricultural fertilizers. The extension workers, the facilitators of the agricultural development, find it more difficult to visit the village far away from the trunk road. We tried to verify the importance of improvement of infrastructure during this comparative survey, the results of which have included in this report.

The agricultural and economic development will require the construction of the roads and bridges to enable the access of trucks to the village. It is then easier to sell the agricultural products, and it is easier to buy the other foodstuffs or the fertilizers as well. It is easier for the agricultural extension workers to visit the village if it is in the neighborhood of the highway or within the truck access. As I mentioned in the beginning, the shifting cultivation and its results may affect the surrounding countries, so we have to think about how to minimize the shifting cultivation. Shifting cultivation enables the upland foodstuff production. In other words, we have to improve productivity, rice-yields or the foodstuff yields per area, or modify the species subject to the shifting cultivation, or improve the fertilizer for higher productivity. Though this report did not clearly mention it, the area subject to shifting cultivation in the vicinity of the Mekong River Delta is smaller, as well as the yield per hectare is low and unstable in comparison to paddy-rice cultivation in the same vicinity. The area subject to shifting cultivation has an increased population ratio as well.

In order to minimize this increase in shifting cultivation, the Laos government introduced

the zoning policy; certain zones are nominated by the Laos government not to have any further increase in shifting cultivation. Thus by intensively cultivating the paddy-rice fields, the Laos government attempted to increase the productivity. The best way of shifting cultivation is to conduct it in a very concentrated manner, but this will again start the negative impact of erosion.

I have the comparisons of Nepal and Indonesia. Indonesia and Nepal have a similar practice of shifting cultivation. They have, however, constructed banks and over many years they worked out a system preventing and minimizing erosion. In the Lao Republic, however, such efforts to avoid erosion are not made, i.e. they cannot afford the time and money to construct banks or fortify the soil. Therefore, shifting cultivation is done without care, unlike Indonesia or Nepal. They spent many years to improve its infrastructure to conserve water and avoid erosion, they are now benefiting from higher yields and higher productivity. In the absence of such mechanism, Laos would be well-advised to stop the entire shifting cultivation practice and encourage people to migrate to other areas.

Now in the southern part of the country there are paddy fields. The land available for cultivation accounts for only 4 percent of the total landmass. Japan is also covered with many mountains, but notwithstanding its topology, Japan has at least ten-some percentage of the arable land. However, Laos is indeed a mountainous country with just 4 percent of cultivated land. Therefore Laos will have to really conduct more intensive and extensive farming to achieve higher yields, taking full advantage of paddy fields. However, of the total paddy fields, with or without rainfall, only 2 percent of the paddy fields have artificial irrigation. In other words, in other 98 percent of areas they just depend on rain.

Water can be drawn from the Mekong River for artificial irrigation using pumps or build canals to their paddy fields. This costs money, whether it's pumps or water canals, it will require investment. The country simply does not have the money. If they cannot use the water resources from the river, they must pray and hope for rainfalls and cannot enjoy a stable agriculture.

Until a decade ago, the country was under the socialist regime. The Lao Republic government organized government-owned farms and cooperatives and engaged in a command economy. In other words, they imposed government plans on the farmers. This has been the case for Laos until ten years ago.

However, during the last decade they embarked upon a new economic policy, which is an equivalent to the Doi Moi policy in Vietnam. They are trying to shift away from a socialist-planned economy to a more market-oriented economy, which, for the Lao Republic means that the government will no longer determine the prices of the agricultural produce. Who will determine the prices of fertilizers and chemicals? These will be determined by the producers and consumers. In other words, the government no longer has a say on pricing, and that is the consequence of a market economy. A market economy must have

a good distribution and a logical infrastructure. If there are no trucks or if there is a lack of infrastructure, a practiced market economy cannot be implemented. I believe that the building of an infrastructure, particularly the road network, would be very, very important.

Many former socialist countries are still going through very painful process of trying new approaches. There have been successes and failures. Laos is no exemption. Laos has not yet found a firm path for successful market economy. They are still struggling. Yes, the government has embarked upon many programs, they have recognized the need to promote extension workers, and they have recognized the need to provide credit to farmers. They are also setting up a rice bank scheme, whereby people should deposit rice during a good harvest and draw from that reserve when they are in need. The government is also suggesting cooperatives. Many things have been said, but the real challenge is how to put those words into actions.

Japan has been extending official assistance to the Laos Republic since 1986 when the Lao government embarked upon a new economic policy. For the past decade, the total accumulated assistance extended by the government of Japan in the form of grants was approximately 45 billion yen, which is about 45 million dollars. In other words, there have been 100 dollars of per capita assistance provided by Japan over the past ten years or so. In 1995 alone Japan has extended another 4.5 billion yen of such assistance.

This assistance money has been spent on improving the airport facilities in the capital city of Vientiane to make ensure the secure operation of the airport. The money was also invested to improve the road infrastructure linking the northern and southern parts of the country, the National Trunk Road No. 13, and many bridges exist alongside this trunk, of which many had deteriorated. The Japanese invested or provided assistance, to reinforce and build many bridges. The assistance was given with the recognition that the first thing that the country must do is to improve the infrastructure.

There should also be other assistance such as human development and transfer of technology. Japan has invited trainees from Laos in order to develop experts. Over the years 742 Laotians have come to Japan to be trained as experts. We have also been dispatching 258 experts from Japan. More than 1,000 people have been sent to Laos to come to grips with the realities and problems of the country. The government of Laos also requested the Japanese government to conduct numerous researches and studies on the agriculture. Just to name a few, from November 1995 to October 1997, in a two-year period, a program has been implemented to identifying impediments to agricultural development. Field investigations, researches and interviews are being carried out at this moment to identify the problems so that the Japanese government can assist in better designing the master plan for the national development of the country, with particular focus on agriculture. We are considering organizing demonstration farms and also setting up a model village. We are drawing up numerous ideas right now so for the next 5 years they can be implemented.

If the necessary policies are not implemented about the so-called shifting cultivation, we will see a rapid increase of population. Not only the people of Laos will have to suffer the consequences, but also the people of Thailand and Cambodia, in the neighboring areas. There must be regional cooperation, because the whole issue is so large, and cannot be tackled by one country. In view of the fact that the problems that Laos faces are not isolated to Laos, but also potentially includes its neighbors, we must recognize that it is a regional or international challenge requiring assistance and cooperation from many countries.

The Lao people must be able to determine their future, they must know about themselves, and they must open themselves to outside assistance. Bringing in physical goods to Laos would not be enough. In the past, the Lao people had just listened to the government, because under the socialist system all they needed to do is to follow the government's instructions. It was the government that made the decisions on their behalf, so it was sufficient that they just listened and obeyed, abide by the rules of the government. But it has progressed further than that stage, and in order to really reform, they must be motivated to think about themselves and to be able to express what they need. We have tried to respond to such requirements of the country.

We have chosen the mountainous area for our survey. In the future, we would like to conduct similar surveys in the southern areas where the paddy fields are concentrated. Improving the infrastructure, building of the bridges are done to some extent, but there are still fragmentary approaches for the entire country to be fully developed. There are so many things to be done. Instead of Thai Baht or Chinese Yuan, the Lao people, no matter where they are, should be able to use their own currency, and should be able to have an access to the market. Unless the country prospers and develops, it will not only be Lao, but other neighboring countries that will suffer the consequences. Whether it is Myanmar, Cambodia, Vietnam, Thailand or China, they will be affected. The French colonial administrators abandoned Laos in the past, but we Asians cannot do the same. We belong to this Asian home and we must work together for our common cause and benefit. Thank you very much.

Chairman:

Thank you very much, professor. A question from India..

Question and Answer

Question 1 (Hon. Sat Mahajan, MP, INDIA):

Dr. Shigeto Kawano, professor, you have made a very good speech, and it is a very elaborate paper. But there are two or three things I would like to say. Since I come from the mountain states of India. The first thing you said that the socialist economy is shifting to the market economy and the trucks don't reach. It is adversely affecting the inhabitants of those areas? Second, you have been laying stress on paddy cultivation, that two percent of the crop is the paddy, and you said the river's waters cannot be reached. I fail to understand why you have not made any suggestion about a crop that can be grown in those hard areas, as we are growing in India, which lasts very long. The third point is that you have said that there is going to be the devastation of forests. Unless you provide the people food, they have to destroy it. Ultimately the humanity will suffer, the environment will suffer, and erosion is bound to take place unless you protect the people and give them food. And you are giving them 100 dollars per person. Have you made any scheme, such as an irrigation scheme, which could give them a permanent solution about increasing the area of the paddy growing which with that thirst of their existence?

Dr. Kawano:

Thank you very much for your comment. The shifting cultivation is not bad. The extension of the shifting cultivation will result in the destruction of the forest, however. The issue is that we have to improve the productivity of the shifting cultivation. Then we will be able to minimize the increase of the surface area covered by the shifting cultivation. The next issue to be considered is as follows. What kind of irrigation is to be provided, in the context of the shifting cultivation? Cost estimates are necessary for the irrigation for the shifting cultivation is very huge. Even in the shifting cultivation of the maize and the wheat, such species be further improved in order to enhance the productivity, as well as the selection of the fertilizer should be well improved. Therefore there are a certain ways and measures to be taken to improve the shifting cultivation. But in the past decade, for the first time in the history, the western countries are now getting into the country for the cooperation. Up until a decade ago, the Lao PDR was quite separate from the global community. However nowadays, at last, the Lao PDR is ready to develop as a member of the global society, to be supported by the ODA or the other systems. I'm sure that instead of the reallocation of the people from the middle and the upland to the lowland area, we will be able to do something to maintain the shifting cultivation. In the context of the forestry, we have to take a certain measurement in order to maintain a certain coverage of the forest while increasing the productivity of the forestry goods. Let me also add, there is

only four percent of this land available for constant farming. It may be difficult to enlarge the agricultural land subject to the constant cropping and farming around the year. What can we can do is to enhance or increase the per hectare yield in the paddy rice field. As I mentioned in my presentation, we have to provide the stable irrigation. Currently only two percent of the paddy rice area is subject to palmtop or the artificial irrigation. The remaining 98 percent depends upon the natural rainfall. Therefore we should provide the stable water resource supply for the agricultural farming area through the artificial irrigation, that will be regarded in the good accumulation of fertilizer, say the product will be doubled, then the total food stuffs supply will be sufficient enough which will eliminate the means to import the food, at any rate. There are the good examples shown by the advanced nations. So the Lao PDR set forward this example. The issue is the budget, or the money. At the same time, the grants and assistance from the foreign countries to Laos should be well accepted. There should be the local community initiative, in cooperation with the ODA provided by the foreign countries. There are the ways to be solved.

Question 2 (Dr. Vo Tong Xuan, MP, VIETNAM):

Thank you, Mr. Chairman. I would like to congratulate Professor Kawano for his very good report on Laos. If you also consider serious input in the projects that is supported by the UNDP, World Bank and ADP. I think the international donors helped put in a lot of money, but the result so far to Laos are very small. This, I think, because of the biggest problem is the human resource that Laos is facing with. The capacity to absorb the aid would be very limited. I have been to Laos several times under several international missions, and found that without overcoming the human resource constraints, it will be very difficult to move ahead. And, in talking about human resource, I think most of the missions lack the human ecology experts to understand the people. Many of the projects given to Laos was imposed by the lowland people to the upland people, the civilized people to the mountainous people. So the mountainous people, Lao Tsen and Lao Tsong, they would not accept the idea of the lowland people. So in your forthcoming project, do you have such a vision in taking care of the human aspects?

Dr. Kawano:

Thank you very much. I don't know if I can fully answer your question. The human condition, yes, is very important. We have received many Laotians to Japan. There is already 740 people trained in Japan. I don't know whether they are engineers, experts or bureaucrats. But the question is, have they really learned anything in Japan, are they taking the advantage of the experiences in Japan? They may say that their stay in Japan was not productive. I don't know, but I would certainly like to hear their views, by learning from the experience of the past, maybe we can do better. What is lacking right now is follow-up, after they have received training. We have not heard from the trainees about their experiences. The experts may argue that no matter how many missions were sent to Laos, no matter how many trainees were sent to Japan, it did not help the country. If that is the case, what is the reason, what is missing? I think we must go into those specifically, we must go step by step. As you said, the human aspect is very important. After all, giv-

ing fertilizers, giving chemicals, is all done by human hands. You know, you have to have the people, the local people do the work. I think the development of human resources are very important. And to develop and nurture people, we have to learn from the past successes and failures. I think there should be increased opportunity, we can really communicate with the people who are involved.

Question (Hon. Ms. Tarnthong Thongwasdi, MP, THAILAND):

First of all, I would like to say that I do agree with Professor Kawano regarding the idea that Laos should improve its infrastructure. And the problem of Laos now is a regional issue. I'm from Thailand, I know this problem very well. Now we are trying to give some assistance to Laos, helping them to improve the airport in Luang Phabang. There was an opening ceremony that took place last month, and that is the first phase of assistance, and the second phase is coming. We also proposed to build the road links between Thailand, Laos and China, and also Thailand, Laos and Vietnam. Especially, the Deputy Foreign Minister of Thailand just went for a survey for Road No. Nine about two weeks ago, and I myself was in Vietnam last Thursday. The Vietnamese side also shows interest in having the road links, even it may not be the same road. About a month ago I was in Australia, and we discussed with the Australian government regarding the bridges between Thailand and Laos. The Australians seemed to be very interested in having the second bridge after building the first one. I seems to me that for this kind of infrastructure, there is no problem to get assistance from many countries to help to assist Laos. But I think the problem is not the hardware, it is more the software. As Prof. Kawano might have known when he was in Laos, that bridge that has been built between Thailand and Laos was not open, it was not in use, and it is not in use at this moment. We need to improve the software, and this may coincide with my colleague from Vietnam, that this concerns the human resource development. We need a better understanding among the countries of the region. Otherwise it is a waste if you build the infrastructure and hardware without thinking of the software. I would like to point out this, which is not a question, but a problem that we are very much concerned about in Thailand.

Dr. Kawano:

Thank you very much for your comments and your valuable information. The Lao PDR is surrounded by five countries, and I'm sure that all these surrounding five countries will take the positive action as has been just illustrated by the example of the Thailand. That will further develop the Lao PDR in line with the surrounding countries. As you pointed out, the hardware may be easier, but the software side will require the initiative taken by the local community. This should be inspired also by the surrounding countries as well as the advanced nations. I'm sure that the Lao PDR community will be further inspired and facilitated and I'm sure this type of meeting and gathering will serve a lot to contribute to further inspire and encourage the people of Laos. Thank you.

Session II: Population, Water Resources and Development

[15:45-17:00, March 17, 1997]

[9:00-11:45, March 18, 1997]

"Water, Living Things and Human"

by
Dr. Zenbei Uchijima
President, Miyazaki Municipal University, Japan

Chairperson
Hon. Hao Yichun, MP (CHINA)

1. Introduction

Earth was the only planet that had water until the existence of water was reported within the crest of Mars and at an Europa satellite of Jovian. About 4.6 billion years ago, release of heat energy from planetesimal collision turned the primitive earth surface (which was about 1,000km deep) into the magma ocean and the gases released from the magma ocean created the primitive atmosphere containing much water vapor.

The subsequent drop in temperature caused the vapor atmosphere to lose much of its moisture in the form of condensation and precipitation, which, in turn, created the oceans that we have today. This is considered to have occurred immediately after the earth was born. The existence of large quantity of water accelerated the deposition of carbon dioxide in the earth's atmosphere in the form of carbonate. In addition, through its excellent physicochemical properties, water maintained the temperature of earth's surface over the range in which life can survive (0 to 40℃) and functioned as an effective barrier against hazardous solar ultraviolet rays.

This led to birth of organism and subsequent evolution to create the world that we know today. Birth of life is believed to have occurred 3.6 billion years ago but it had spent nearly 92% of its existence in water. In other words, biomes did not go ashore until 300 million years ago when hazardous ultraviolet rays was weakened enough by the stratospheric ozone layer. That is why water is called "the cradle of life."

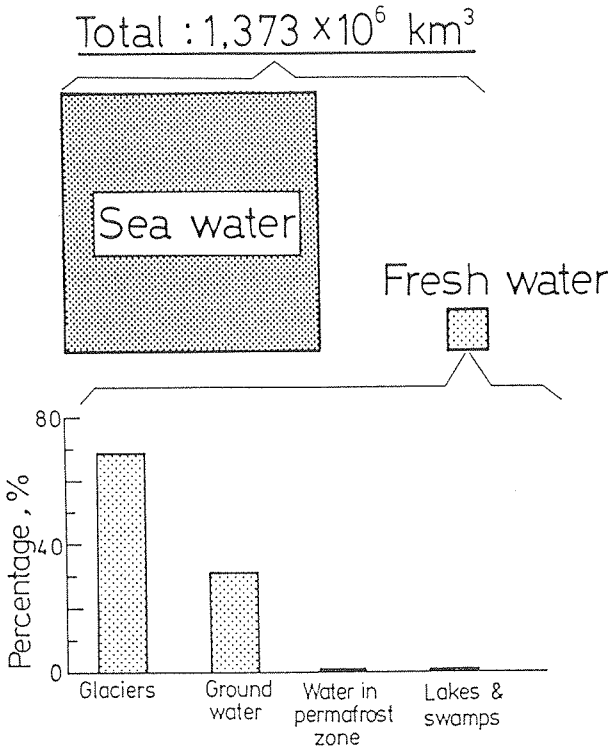
Thus, water on earth not only created life and made the environment suitable for it but plays an important role as indispensable resources for development and maintenance of modern civilization. For this reason, I would like to explain briefly about the relationship between the global environment and water resources.

2. Water on Earth

While some differences exist among researchers, the volume of water that was squeezed out from the magma ocean is estimated to be in the neighborhood of $1,373 \times 10^6 km^3$, corresponding to about 2,700m in depth when it covers the earth's surface (IHD Commit-

tee, USSR, 1974). Although this may appear to be an enormous volume of water, 97% of it is sea water containing 3% of salt. This means that, as shown in Figure 1, many terrestrial animals and plants as well as humankinds and its society is dependent on freshwater comprising only 3% of all water on the planet.

Figure 1 Distribution of water on earth



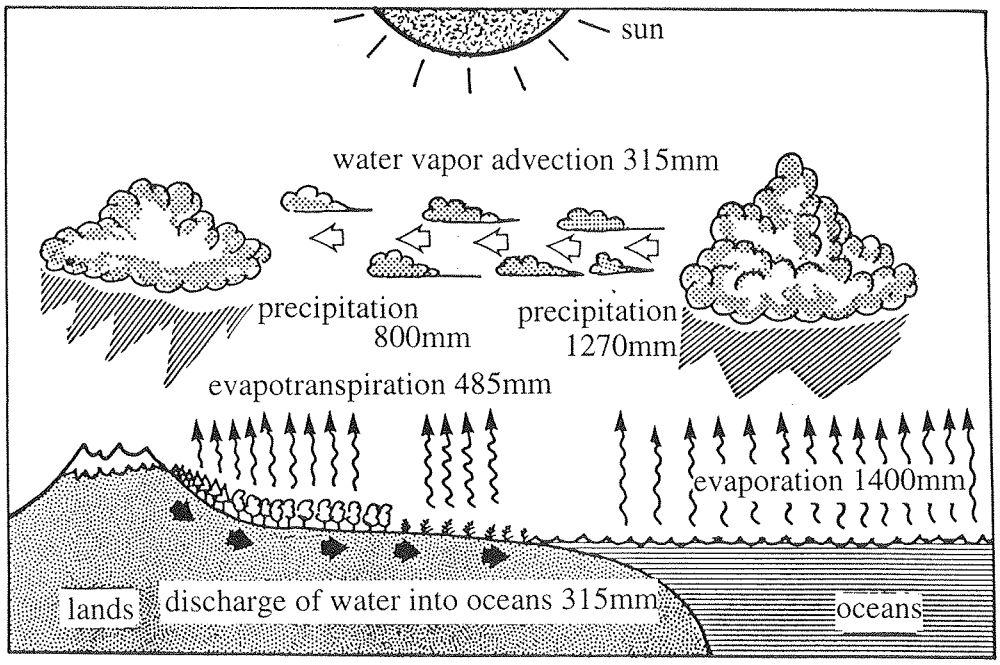
Prepared from the IHD Committee Report, USSR (1974)

It can be seen here that freshwater accounts for only a little less than 3% of all the water that exists on earth. Moreover, 70% of this is fixed in the form of glacier in Antarctica, Greenland and high altitude regions and nearly 30% is stored in the soil layer and permafrost. The water stored in rivers and lakes that supports the existence of humankinds accounts for a mere 0.51% of all freshwater ($35 \times 10^6 km^3$) on earth. The volume of vapor in atmosphere that feeds an enormous amount of precipitation accounts for only 0.04% of all freshwater and corresponds to a depth of 25mm if used to cover the planet. The amount of water that exists in the atmosphere can only provide 10 days of rainfall. Then where does the precipitation for the remaining 355 days come from?

To answer this question, we must look at the circulation of water that takes place between the ocean, atmosphere and land by using solar radiation that enters the earth after travelling 150 million kilometers from the sun as source of energy. Its process is shown in

Figure 2. An average of 1,400mm of water is evaporated from the ocean surface that covers 70% of the earth's surface and carried to the atmosphere. Meanwhile, ocean surface receives 1,270mm of precipitation. The difference between the two (315mm when converted into land area) is carried by a large current in atmosphere (atmospheric general circulation) to the continent and contributes significantly to precipitation. Continents receive an average of 800mm of precipitation, and about 60% of this precipitation returns to the atmosphere through transpiration from plants and evaporation from denuded areas. The remaining 40%, i.e. 315mm, flows into the ocean in the form of river water and groundwater.

Figure 2 Water circulation on earth driven by solar radiation energy



(Uchijima, 1990)

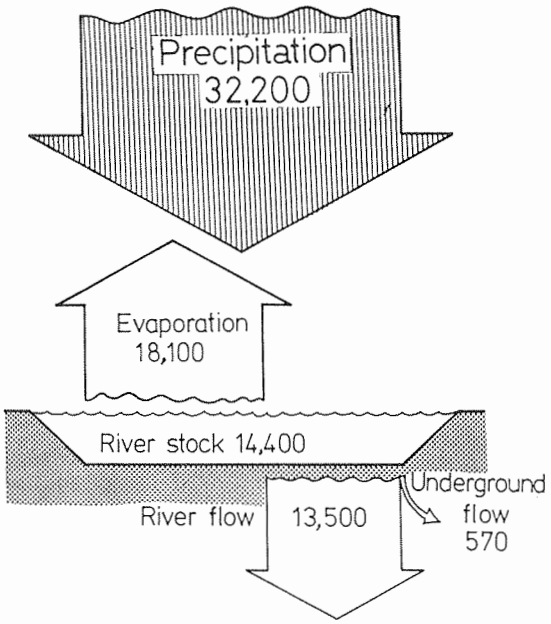
This circulation of water is the force behind the scenes that makes it possible to use the limited freshwater resources indefinitely. The circulation makes it possible for many animals and plants to survive and enables the human society to sustain and develop itself by steadily supplying freshwater to land. Water circulation also helps development of topography by eroding the continent surface and carrying a large volume of soil downstream. Furthermore, various minerals salts that are carried from land to ocean contribute significantly to increasing biological productivity on coastal waters.

3. Water Balance in the Asian Continent

Asian Continent and its surrounding island, which accounts for 27.4% (4.3475 billion hectares) of land area on the earth (148.89 billion hectares), has approximately 60% of the world's population (5.716 billion in 1995). Human activities that have been continuing since prehistoric times are inevitably becoming more vigorous and are accompanied by rapid increase in water demand for use in municipalities, industry and agriculture.

Meanwhile, a very arid region with estimated average annual precipitation of 742mm spreads extensively in the interior of the Asian Continent. This is the third smallest precipitation in the world after Australia and Africa and corresponds to only $930m^3$ of annual rainfall per capita. According to the data obtained from the International Hydrological Decade (IHD), water balance in the Asian Continent is as shown in Figure 3.

Figure 3 Water Balance in the Asian Continent



Source: Prepared from the IHD Committee Report, USSR (1974)

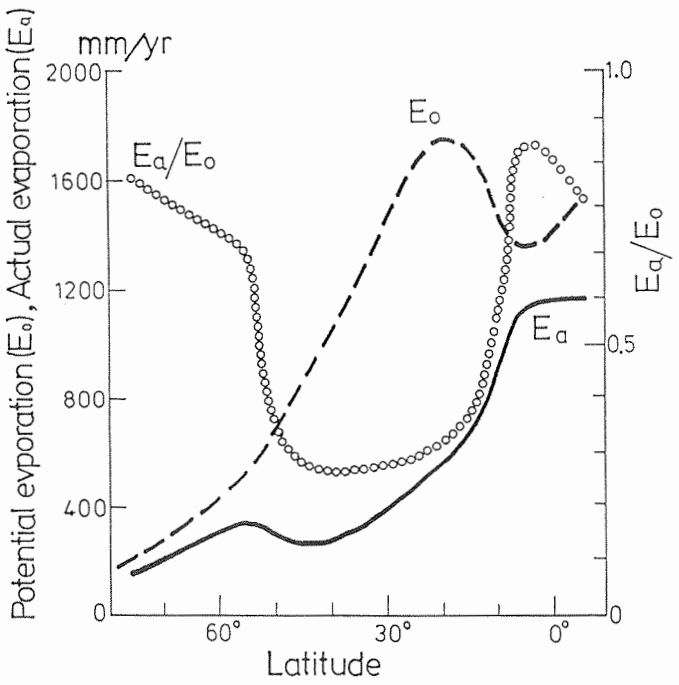
As shown in the diagram, 32.2 $\times$ 10^3km^3 of water is fed to the continent each year in the form of precipitation, of which 18.1 $\times$ 10^3km^3 is lost in the atmosphere through evapotranspiration. Of all the water that flows into rivers (14.4 $\times$ 10^3km^3), 94% (13.5 $\times$ 10^3km^3) flows into the ocean every year from estuaries and the remaining 6% (0.57 $\times$ 10^3km^3) turns into groundwater. Therefore, average runoff ratio of the Asian Continent will be as follows:

Average runoff ratio = Qr/P = 0.44 ····· (1)
Whereas, Qr is annual runoff volume from the continent to the ocean and P is annual precipitation amount on the continent

This value is only 68% of the value for a pluvial country such as Japan (0.65). Forty four percent of all precipitation turns into maximum freshwater resources that can be utilized ultimately (renewable fresh water).

Such low runoff ratio is brought about by the hydrological condition of the interior regions of the Asian Continent, particularly the characteristics of geographic distribution of evaporation. Changes in latitudinal average of the ratio between potential evapotranspiration (Eo) and actual evapotranspiration (Ea) in the Asian Continent are as shown in Figure 4. The difference in Eo and Ea between high latitude and low latitude regions is small by reflecting the prevailing wet climate and Ea/Eo ratio is higher than 0.7. However, the difference between Eo and Ea becomes significantly large in regions falling within 10 and 40 degrees north latitude because of the subtropical high region and dry inland climate and Eo/Ea ratio drops to below 0.4. Eo indicates the maximum evapotranspiration (potential evapotranspiration) which is determined solely by climatic conditions of each region and reaches 1,800mm/year in subtropical high zone of the 20 degrees north latitude. Rapid decrease of Eo with increase in latitude is attributable to the decrease in global solar radiation and consequenty net solar radiation.

Figure 4 Changes in latitudinal average of the ratio between potential evapotranspiration (Eo) and actual evapotranspiration (Ea) on the Asian Continent



Prepared from the IHD Committee Report, USSR (1974)

As explained above, the water that flows out of river basin determines the volume of potential water resources available to humankinds. The runoff ratio that determines the runoff volume changes significantly depending on the climatic conditions of the river basin. Runoff ratio can be approximated by the following hydrological relation.

$$\text{Runoff ratio} \cong \exp(-\text{RDI}) \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (2)$$

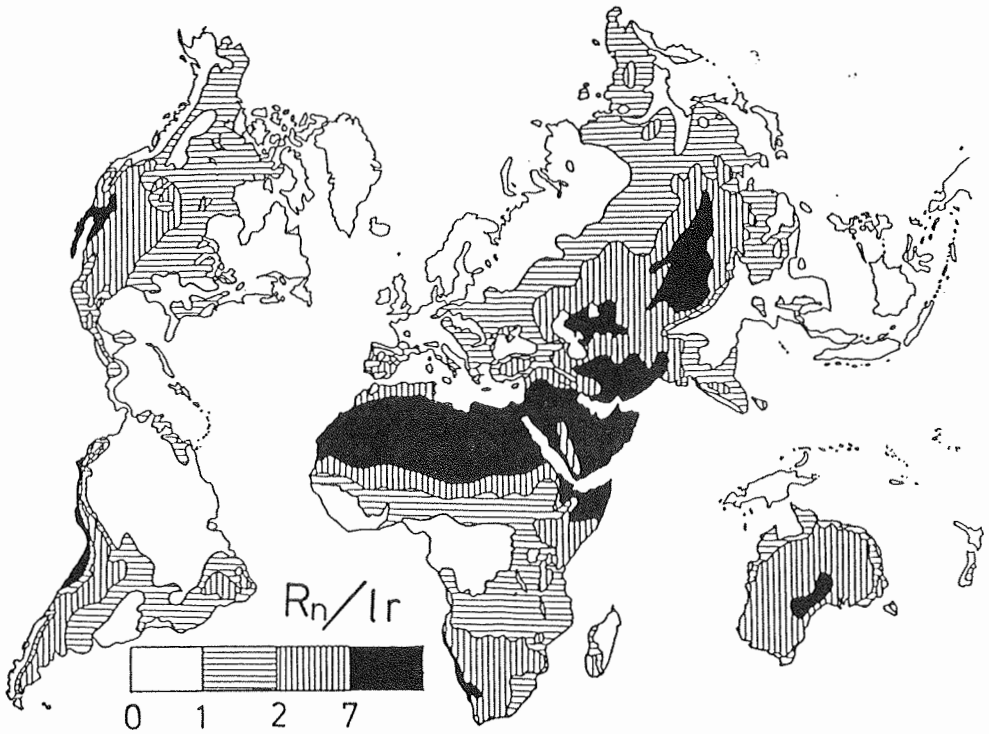
Whereas, RDI (=Rn/ λ P) is radiative dryness of the region

Rn is net radiation and λ is latent heat of evaporation

The above equation shows that runoff ratio decreases rapidly from values close to 1.0 in humid regions (RDI$\ll$1.0) to values close to 0 in dry regions (RDI$\gg$1.0).

Geographical distribution of annual RDI obtained from meteorological data from around the world is shown in Figure 5. Extremely dry regions with RDI 2.0 or more exist in the subtropical high zones around 20 degrees latitude of the both hemispheres. Humid zones of RDI < 1.0 exist in equatorial regions where intertropical convergence zone develops, regions where extratropical cyclones develop and regions facing the Arctic Ocean. The fact that runoff ratio in these regions is estimated to exceed 0.6 clearly indicates that the area of humid regions is small in the vast land.

Figure 5 Geographical distribution of radiative dryness (annual data basis)

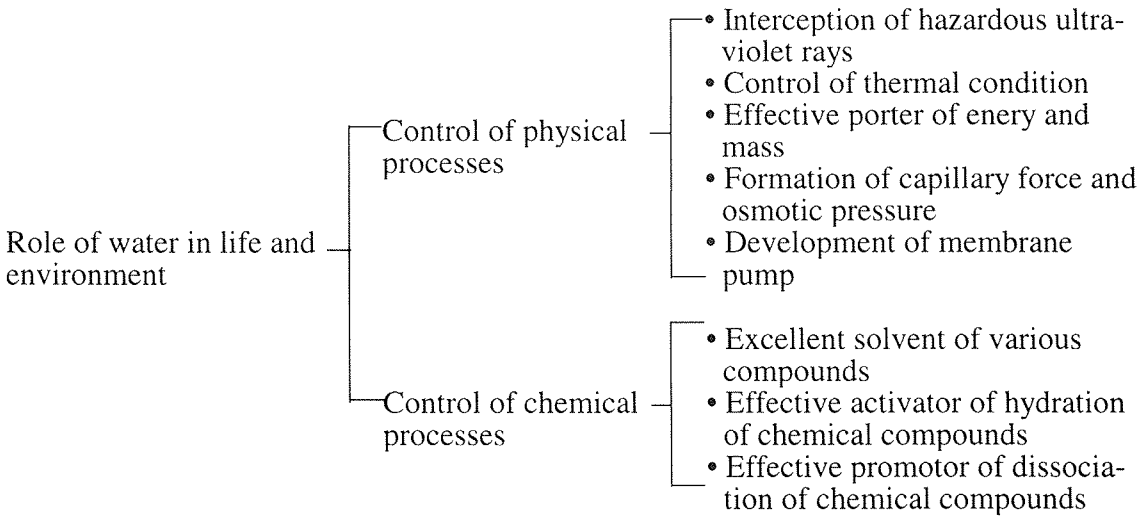


(Henning, 1970)

4. Physicochemical Properties of Water and Its role in Earth

As explained earlier, the earth is a "planet of water" in which the existence of large volume of water made occurrence and evolution of life possible. This fact is closely related to the properties of water shown in Table 1. As can be seen from this table, water is forming and adjusting the global environment through adjustment and control of grand physicochemical processes.

Table 1 Physicochemical characteristics of water



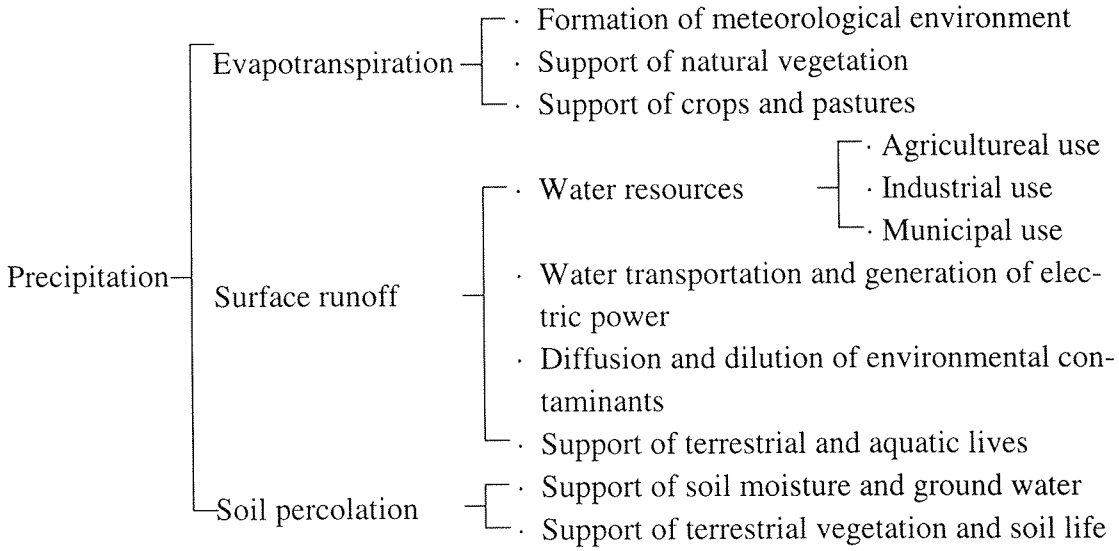
(Uchijima,1992)

Water is an excellent absorbent of radiation entering from the sun and one meter of water depth is sufficient to block the ultraviolet rays that are raising concern as being hazardous for living things (UV-B, C; λ <0.32μm). For this reason, it is believed that life on the earth was first born in primitive ocean and evolved gradually. High specific heat of water (4.18J/kg) and latent heat of evaporation (2.45×10^6J/kg) as well as phase change at relatively low temperature play a large role in the formation of the earth's environment (solid ↔ liquid ↔ vapor). Because of these characteristics, water holds down rapid changes in temperature, carries and discharges large amount of heat in the form of vapor and governs the formation of the earth's climate.

As summarized in Table 2, water is utilized extensively for survival of human beings and various life forms. As shown on this table, the majority of precipitation on the continent is lost as evapotranspiration but gives life to natural and managed vegetation that produces and supplies vital energy to the natural ecosystem and human society in the process. In addition, the water which is lost in the form of evapotranspiration from the continent

governs the formation of local climate and global climate by converting a large amount of thermal energy into latent heat and then into sensible heat.

Table 2 The role of water in the continent

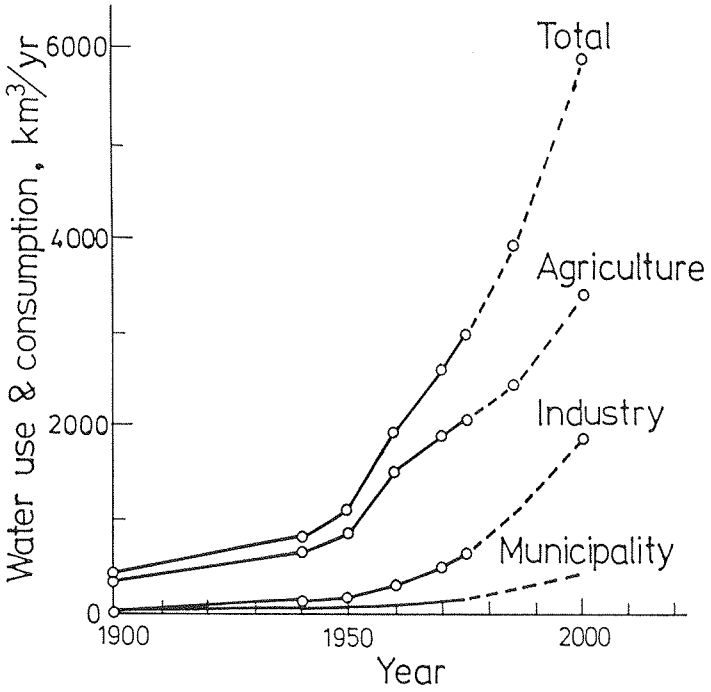


The water that runs off the surface and flows through rivers and lakes determines the amount of renewable freshwater that can be used by terrestrial life and human society. This is a usable resources and at the same time the habitat for aquatic life. It is also an indispensable medium for diffusing and diluting environmental contaminants that are discharged by human activities. According to a recent study, a minimum requirement of water is 28.3 liters/sec/thousand persons. This is referred to as dilution factor. According to this, cities with population of 1 million and 10 million require 2.44 million m^3 and 24.45million m^3 of water amount every day only to dilute their contaminants.

5. Use of Water Resources

The amount of water consumption in the world is increasing due to the uncurved increase in the world population and higher standard of living. As shown in Figure 6, this trend has become conspicuous particularly after the 1950s. As can be seen from this diagram, demand for water in agriculture, industry and municipalities has increased dramatically from the 1950s onward. This rapid increase first started in the agricultural sector and occurred in the industrial sector during the 1970s and has now shifted to the municipality sector. Municipality water consumption increased by about 50% between 1950 and 1990. Among all sectors, water demand for agriculture is far greater than any other use of freshwater resources and accounts for 50% of all water used. This can be understood easily by considering the fact that irrigation plays an important role in improvement of agricultural productivity.

Figure 6 Long-term changes in the volume of water used in the world



The dotted line shows the predictions made in the 1970s.
Source: Prepared from the IHD Committee Report, USSR (1974)

Figure 6 estimates the amount of water use in the end of 20th Century to be 6,200 km³/year. As shown in Table 3, however, this level has already been surpassed around 1990. Total water use volume has reached 15 to 20% of streamflow (34,000-42,000 km³/year). Largest users of water are in the order of agriculture (41.8%), instream flow needs (35%) and industry (15%) and municipalities accounts for only 4.5% of total. According to a recent U.N. report, however, water shortage has occurred at 80 countries and about 40% of the world population is suffering from water shortage. This trend is predicted to intensify in the 21st Century.

Table 3 Present world water use

Sector	Use km³/yr (%)	Evaporation loss %
Agriculture	2800 (41.8)	66
Industry	1000 (14.9)	12
Municipalities	300 (4.5)	27
Evaporation	260 (3.9)	100
Instream flow needs	6700 (100.0)	33

Source : Sandra et al., 1996

As many as 33% of water used is lost through evaporation and transpiration. In particularly, nearly 70% of water used for agriculture is lost into the atmosphere. For this reason, the use of water for field irrigation is considered as consumptive water use and has significant impact on the downstream region. This impact is particularly conspicuous in rivers that flow through arid and semiarid regions. In the Yellow River that flows through North China, it has been reported that water volume drops drastically in the downstream region in summer and that the river dries up for several hundred kilometers. Contraction of the Aral Sea at the Kazakhstan and Uzbekistan border was caused by excessive intake of water from Amu Darya and Syr Darya for field irrigation upstream. Its has become 10 meters shallower than it was 30 years ago, and wider salt deserts have appeared in areas where lakeshore receded and deterioration of the environment is advancing around the lake.

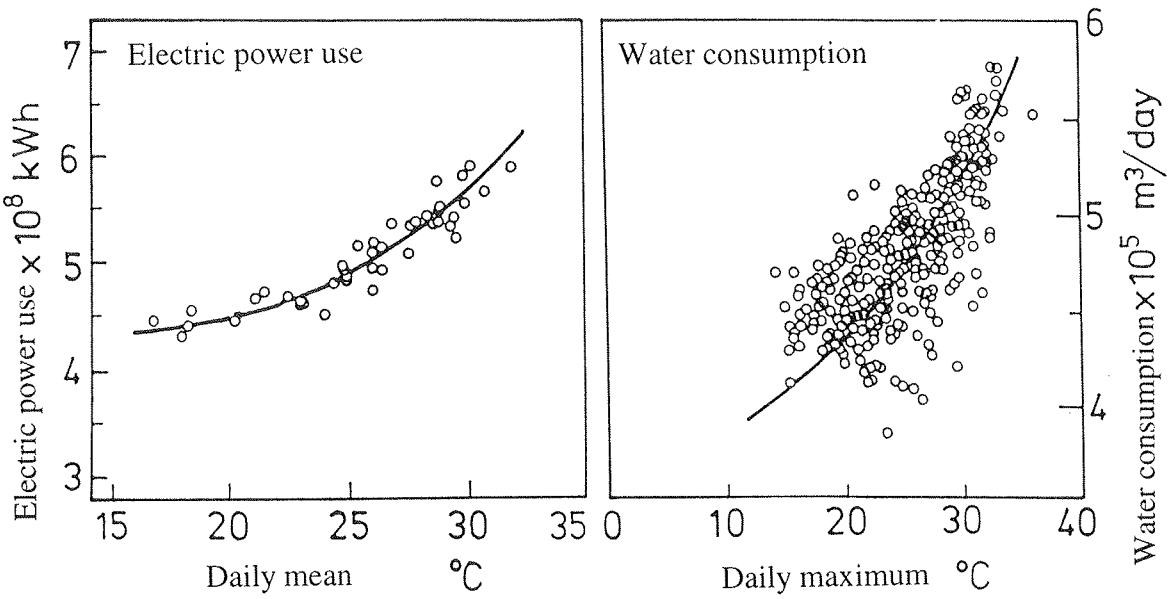
A problem related to water resources utilization that will become serious in the future is the impact of global warming caused by increase in concentration of greenhouse effect gases in the atmosphere. According to a recent IPCC report (1996), an increase of 0.5 to 1.0℃ and 1.0 to 2.0℃ from the present temperature may occur by 2050 and 2100, respectively. The changes in hydrological condition that may take place as a result of this warming can be summarized as follows:

1. Increase in heavy rainfall
2. Shortening of snow cover period and reduction in snow fall
3. Increase in evapotranspiration from ground and plant cover

These changes are likely to bring about lowering of decrease in renewable water resoures and reduction in effective soil moisture. In addition, warming will raise the snowline in mountain regions and cause water shortage at many oases that depend on mountain glaciers for their water. For instance, nearly a third of oases are said to have disappeared in the arid regions of western most China due to increase of temperature that has occurred in the last 40 years.

Meanwhile, increase in temperature is known to bring about increase in water use for municipalities. The relationship between temperature, volume of water use and electric power use according to data from Tokyo Metropolitan Water Bureau and Tokyo Electric Power Company is shown in Figure 7. As such relationship is likely to be found in any region of the world, global warming will intensify water shortage in many regions. As concentration of population in urban areas and birth of many so-called megalopolises are predicted for the 21st Century, securing water for municipalities use will become a very important issue.

Figure 7 Changes in electric power use and water consumption in relation to changes in temperature



Prepared from Ono and Morikiyo, 1985

6. Conclusion

As can be seen from the above explanation, Earth's water plays the role of 1) the environment itself, 2) environmental component, 3) habitat and 4) resources. Although freshwater is acting as if it can be exploited indefinitely by its solar energy-driven circulation on the Earth, it is not by any means an unlimited resources.

By 2025 when the world population is predicted to reach 8.3 billion, water demand will reach 6,400 km^3/year due to population increase and overgrowth of industrial activity. Furthermore, 3,430 km^3/year of water will be needed to maintain the state of rivers and streams. This amounts to 70% of river flow that can be used to maximum. For this reason, securing of water resources and improvement of utilization efficiency is one of the top priority issues face by humankinds in the 21st Century along with the issues of energy and food.

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Question and Answer

Chairperson:

Thank you, thank you very much, Dr. Uchijima, for your excellent and very interesting speech. Now we have still fifteen minutes for discussion, and please give your comments with your questions, if you have any.

Question 1 (Hon. P.J. Kurien, MP, INDIA):

Dr. Uchijima, thank you for your very nice presentation. Of course, it was more technical. But I would like to ask one question. In your presentation you have shown that due to salinization the area which has been damaged, the irrigated area that has been damaged, is maximum in India, it comes to 20% of the total. Could you explain to us why it happened, and what is the rationale of arriving at such data?

Dr. Uchijima:

Let me respond to the question. This has to do with the soil salinization, as has been stated, in the arid and semi-arid areas. If you irrigate, salinization is a problem you cannot avoid, it is bound to come. That is the case with the northern part of China, the inland of China, many parts of the former USSR, and in the United States, and also the western Asian regions and Africa. In the uplands of the semi-arid areas the salinization problem cannot be avoided. As I said, in contrast to rivers which have enough precipitation, rivers of the arid and semi-arid areas contain a lot of salt in their water, and when this water of high salt content is irrigated to the fields, and as you know, water escapes into the atmosphere through the plants and through the land surface, and thus a great amount of salt is retained in the land surface layer, increasing the salinity of the ground. As the salinity goes up beneath the land surface, there will be less and less water that the plants can absorb from the soil. So in terms of food production and increase in food yields, they are all receiving a very detrimental effect from the salinization. In order to avoid this problem of salinization, according to rough calculation, for the wheat production for one hectare, it is said that you need three thousand tons of water. But you have to double that amount, you have to apply six thousand tons of water to go through the crop fields to leach the salt from the ground. And then where we are going to discharge the leached water, it has a very high salinity, and this indeed is a very big challenge in resolving the soil salinization problem. In India you have a very high figure, twenty percent. And the graph I showed you that was carried in the magazine "Science in the United States, I borrowed that graph from "Science", and they warned that in India, China, Pakistan, in the United States, and in the former USSR, soil salinization is becoming a very major issue.

Question 2 (Hon. Senator Kamilia Ibrahim, MALAYSIA):

I must congratulate the speaker for a very educational and enlightening paper. And he has definitely managed to convey to us a very serious message: there is threat to the survival to human beings and the world at large due to the global warming and the mismanagement and misuse of water. The speaker mentioned just now that there is a need for water balance in Asia. May I ask the speaker to elaborate as to how we countries in Asia could work together in a constructive effort to come up perhaps with a plan of action so that we could save the world effectively. Thank you.

Dr. Uchijima:

Thank you very much, I think the question raised is quite difficult to give you the quick answer. The largest problem, as I mentioned in the end of my presentation, is as follows. Water is a resources not only for humankind, but also for the other living things. At the same time, the water is the most important factor affecting the global environment and atmosphere. And at the same time, the water is the habitat for the aquatic living things. So water has multi-faceted roles and functions. Therefore, how to ensure the sustainable symbiosis of water and the relevant factors should be considered. As has been already thought by so many people, we seem to think water is only for the humankind. But the more important issue is that how the resources, environment and the habitat on account of the water will be balanced. In other words, water is utilized as a habitat, as well as a resources, as well as the factor influencing the environment. Four hundred liters of water is consumed per day per person in developed nations. On the other side of the coin, in the arid and semi-arid regions of the world, we can consume only one or two liters of very low-quality water. One thing we can ask is how can we conserve the water resources? Secondly, how to recycle the water without polluting the water along the line? We should have some technological improvement to find out a way to recycle the water by eliminating pollutants of the water. As I mentioned, water is serving as a resources, so we do have the underlying assumption that all humankind can consume water and discharge it into the stream. The question raised is, what we can do in Asia in cooperation among the Asian countries. In Asia, nowadays, especially in the Southeast Asian countries, water is subject to the seasonal change of the dry season and rainy season throughout the year. So how to standardize or normalize the water availability throughout the year without constructing huge dams. They cause serious environmental destruction. Thus we have to construct small farm ponds with optimum technology and networking. We have to think about the optimum technology to be introduced to smooth the water availability throughout the year, whether the season is dry or rainy. This may be the issue that we can address in the region as well as in the area as a whole. Thank you.

Question (Hon. Oscar S. Rodriquez, MP, PHILIPPINES):

Thank you. Professor, did I get you correctly in your presentation that, due to daily evaporation of water, particularly from the sea, that there is a gradual reduction of water volume in the sea, and therefore the widening of the land area. If it is really so, if it's correct, how long will it take for the Mother Earth to be witnessing a majority of its area as desert, and the final removal of water globally?

Dr. Uchijima

The answer to the question you've asked, as I said at the very outset of my presentation, water evaporates from the ocean surface into the atmosphere. It will then precipitate and flow again into the sea. So the amount of water in these three spheres, the sea, the land and the atmosphere, is constant. So, your question is, should we worry that all the water from the oceans would be evaporated and the oceans would be dried up? Seventy percent of the global surface is the sea, and I don't think that this is going to change in the future. The important thing is that there will be a global warming of the Earth. According to the IPCC's prediction, by the year 2100 there will be a sea level rise of 60 centimeters, and there will be a geometric expansion of the sea water due to the global warming. And the remaining rise is due to the melting of the mountain glaciers, from which water would flow into oceans. Rather than worrying about the drying up of oceans, because of the global warming, the sea level will rise, and this sea level rise will certainly affect the human beings.

Chairperson:

Any more comments? If there are no more comments, I will close today's session. And I thank you again, Dr. Uchijima.

"Sustainable Agricultural Development and Water Resources"

by
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Chairman
Hon. Senator Ibrahim Ali (MALAYSIA)

1. THE SETTING

Despite remarkable improvement in living conditions of the poor accompanied by better health care, rising female literacy and the status of women, decreased infant and maternal mortality rates, improved health, nutrition and livelihoods, the Asian population is still growing at 1.8% per year and will double in 40 years as projected by the World Bank (Bos and Associates, 1994). In the next 30 years, the Asia population will increase 41% (if excluding China, this rate will be 51%) to reach a record 4,890 billion persons. The need of providing opportunities for everyone of this population to access to food, shelter, and clothing will be a great challenge to agricultural development in Asia. Under the contemporary force of market economy, agricultural development is affected not only by natural weather and climate, but even more by the tendencies of diversification that are deliberately chosen by farmers themselves or by government-induced incentives. In the meantime, as world population continues to grow, poverty continue to ride on the rural population while increases in urban and industrial demand can be satisfied only by diverting water from the very irrigation needed to produce food and other agricultural demands of that population (Brown, 1996). As a result, the first victim of the degraded environment is likely our planet's water resources. It is a great challenge to all of us, governments and civil societies, to work toward the most appropriate approach to save our water resources for sustaining agricultural growth and at the same time supporting the competing rate of urbanization and industrialization. In this paper, I shall briefly discuss the major factors that affect today's agricultural production of which the most limiting factor -water resources- will be analyzed and assessed for their uses in agriculture. Guidelines for better improvement of water resource use will be suggested.

2. THE THREAT TO AGRICULTURAL PRODUCTION

During the last three decades, heavy investments in irrigation and advances in agricultural technology helped keeping food production at a higher level than population growth. But it is almost universally recognized that the rate of increase in food production is being slowed down by various factors:

2.1 Soil-related constraints. Crop yields are affected by the following soil-related factors:

i) *Soil degradation:* due to water logging in the backswamp areas; salinization in estuary zones or in dammed areas, acidification and irreversible changes in physical properties (physical degradation) as in the case of drying acid-sulfate or peat soils, etc.

ii) *Decrease in soil fertility:* due to decrease in soil organic matter content, soil nutrient status, changes in soil fauna (earthworms, microbes), etc.

iii) *Nutrient imbalance in the monoculture soils:* too much nitrogen (N) while deficient in phosphorus (P) and/or potassium (K); or deficient in sulfur (S), zinc (Zn), iron (Fe), etc.

2.2 Water-related constraints.

i) *Quality:* irrigation water becomes more and more saline due to seawater intrusion as a result of excessive upstream abstraction; brackish water is used for irrigation due to less and less availability of good water.

ii) *Quantity:* irrigation water for agriculture will be less due to competing demands for water from industry, domestic service, etc. in the urban areas; lowering of ground water table due to over pumping; etc.

iii) *Management:* drainage problem; inefficient on-farm water use; etc.

2.3 Build-up of biotic stresses: because a large number of farmers applying too many kinds of pesticides at the wrong time and wrong doses, they unconsciously killed friendly insects and instead created favorable conditions for:

i) Resurgence of pests and diseases

ii) Minor pests, including weeds, becoming major pests.

2.4 Variety degeneration: crop varieties, specially rice, after years of uses without technical care in purification, may become mixed with off-types. The resulting seeds became unsuitable due to:

i) Low seed quality and inappropriate handling;

ii) Breakdown of varietal resistance/tolerance to a pest due to evolution of new biotypes.

2.5 Socio-economic factors and policy environment

Policy formulations may be unfavorable in some countries for profitable intensification of rice farming, e.g. policy on regulating the uses of water, fertilizers, pesticides. Integrated efforts of biological scientists are trying to overcome both the above biotic and abiotic factors. The social and political scientists have to consider the adverse effects of socio-economic changes that may bring about a decline in resource-based inputs essential for sustainable development. The policy concerning water resources management gradually become a more and more important item on the agenda of legislators in every country.

3. ASSESSMENT OF WATER RESOURCE USE

Water, the most important limiting natural resource of the earth, was discussed by numerous authors of whom the reviews by Tsutsui (1992), a National Geographic Special Edition (Parfit, 1993; Conniff, 1993), Lanz (1995), Rosegrant and Meinzen-Dick (1996), and Brown (1996) addressed heavily to the irrational water management and the scarcity of this resource. Most people used water but seldom had to think about it. The water cycle works so simple: water evaporates from oceans, the land, and the vegetation to form clouds. These are driven by wind across the continents where they discharge their rain, feeding the rivers, which then carry the water back to the seas to complete the cycle. Parfit (1996) described clearly how a modern human uses water: It comes to our taps when called. It drains away to somewhere else. Most of us have been able to swim when we want, bathe when we choose, water our lawns, and let our children drink from fountains at school. Like good health, we ignore water when we have it. But, like health, when water is threatened, it's the only thing that matters. Fresh water is the blood of our land, the nourishment of our forests and crops. The average modern human thus consume about 400 liters of clean water per day (Parfit, 1996) compared to about 20 liters for an average poor man. For domestic purposes the Asians living in capital cities use much more water (Table 1) than those in the countryside. Domestic water uses range from 116 liters per capita per day in Manila to 240 l/cap/day in Bangkok. As the cities will be flocked with more in-migration, their water needs have to be diverted from the agricultural reservoirs.

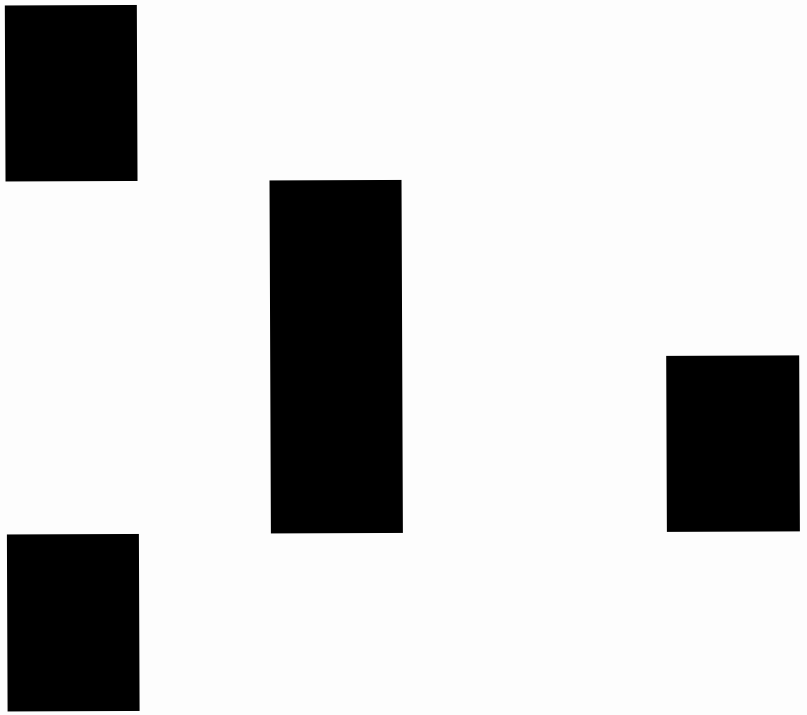

TABLE 2. Growth in area irrigated in selected countries in the Asia-Pacific region, 1970-93

	Irrigated area ('000 ha)				Annual growth rates		
	1970	1980	1990	1993	1970-80	1982-93	1970-93
Cambodia	89	89	92	92	0.00	0.30	0.14
China	38,123	45,837	47,837	48,728	1.32	0.81	1.07
Indonesia	3,900	4,301	4,410	4,597	0.82	0.61	0.72
Korea, North	500	1,120	1,420	1,460	7.42	1.95	4.77
Korea, South	1,184	1,307	1,345	1,335	0.86	0.16	0.52
Laos	17	115	122	125	17.52	0.52	9.06
Malaysia	262	320	335	340	1.92	0.30	1.14
Mongolia	10	35	77	80	13.35	5.37	9.46
Myanmar	8.39	999	1,005	1,068	1.84	0.21	1.05
Philippines	826	1,219	1,560	1,580	4.05	1.54	2.86
Thailand	1,960	3,015	4,238	4,400	4.49	2.59	3.58
Vietnam	980	1,542	1,840	1,560	4.70	0.82	2.83
Japan	3,400	2,952	2,825	2,782	-13.17	-5.76	-18.18

Source: FAO Stat-PC, Land Use Domain. 1995. Version 3.0, Food and Agriculture Organization, Rome.
Extracted by Rosegrant et al (1996). For Japan, FAO-RAP Publication 1996/32, Selected indicators of Food and Agriculture Development in Asia-Pacific Region, 1985-95, and Tsutsui (1992).

The growth of irrigated arable lands varies greatly among the countries due to the contrasting availability of their water resources as shown in Table 3. The Asian-Pacific region, as analyzed by Rosegrant and Meinzen-Dick (1996), is relatively land-scarce, with an average per capita arable land of 0.17 ha, ranging from 0.04 ha in the Republic of Korea to 0.60 ha in Mongolia. China, which account for nearly 60% of the total 159 million ha, has a per capita arable land of 0.08 ha, while a South Korean only has half of that area and a Mongolian 7 times that area. However, irrigated area in each country can account for about half of the total arable lands.

Water availability varies tremendously across countries, ranging from 1,428 m^3/cap/yr in the Republic of Korea to 58,632 m^3/cap/yr in Laos (see Table 3). According to Rosegrant and Meinzen-Dick (1996) countries with fresh water resources ranging from 1,000 to 1,600 m^3/cap/yr face water stress, with major problems in drought year. Countries are also considered water scarce when internal renewable water resources are less than 1,000 m^3/cap/yr; below this threshold, water availability becomes a severe constraint on socio-economic development and environmental quality (Engleman and LeRoy, 1993). These aggregate, country-level indicators of water availability may differ from the specific variability in water resources by region, locality, and season in each country. Chen and Ji (1995) reported that annual rainfall in China has decreased from 1,600 mm/yr in the southeastern coastal regions to less than 200 mm/yr in the northwestern region. Rainfall has become more irregularly distributed, causing drought, flashfloods, and waterlogging. Likewise, the monsoonal rains in Southeast Asia have been irregular during the last five years, particularly in the Indochina peninsula.

Large irrigation schemes by upstream waterwork development of large river in the Asia-Pacific countries did contribute to higher production of food grain and electricity, but on the other hand, they also cause adverse effects on the downstream areas, most readily felt in the Mekong Delta where salinity intrusion and impounded acid water during the dry season become a hindrance to agriculture production.

TABLE 3. Land and water resource indicators, 1993

	Arable Land ('000 ha)	Irrigated area ('00 ha)	Renew. Water Resources (BCM/yr)[a]	Popula-tion (million)	Arable land Per capita (ha)	Irrigated land Per capita (ha)	Water Per capita (m^3/cap/yr)
DEVELOPING COUNTRIES							
Cambodia	2,350	92	498.00	9.68	0.24	0.01	51,430
China	92,708	48,728	2,799.47	1,178.15	0.08	0.04	2,376
Indonesia	18,900	4,597	2,530.02	187.15	0.10	0.02	13,519
Korea, North	1,700	1,460	67.00	23.04	0.07	0.06	2,909
Korea, South	1,877	0,335	63.00	44.13	0.04	0.03	1,428
Laos	780	125	270.00	4.61	0.17	0.03	58,632
Malaysia	1,040	340	456.01	19.05	0.05	0.02	23,941
Mongolia	1,400	80	25.00	2.32	0.60	0.03	10,786
Myanmar	9,579	1,068	1,082.01	44.60	0.21	0.02	24,263
Philippines	5,520	1,580	322.9	64.80	0.09	0.02	4,984
Thailand	17,600	4,400	179.01	58.06	0.30	0.08	3,083
Vietnam	5,500	1,860	375.99	71.32	0.08	0.03	3,083
DEVELOPED COUNTRIES							
Japan	4,422	2,780	537.80	125.19	0.04	0.02	4,297

[a] Billion of cubic meters

Sources: For arable land and irrigated area: FAO Stat-PC, Land Use Domain. 1995. Food and Agriculture Organization, Rome.

For renewable water resources (except the Korea):Population Action International. 1993. Sustaining Water: population and the future of renewable water supplies, pp. 50-4.

For renewable water resources, North Korea (figure estimated by the Institute of Geography, USSR), Japan and South Korea : World Resources Institute. 1992. World Resources, 1992-93, p.329.

For population: World Bank. 1995. World Table 1995 Update, World Bank, Washington DC. *Modified from table quoted by Rosegrant et al (1996).*

4. APPROACHES TO WATER USES FOR SUSTAINABLE AGRICULTURE

In an earlier presentation (Vo-Tong,1996) I suggested a sustainable path to food security, taking full attention to the limiting natural resources, particularly water. Sustainable agricultural development must start with a farming system approach with accounts for every resource input to the whole system including human, natural, and socio-economic resources. The general guideline would provide equal opportunity to all producers. For food grain producers, particularly rice farmers, continuously improved technologies for increasing grain yield and lower production cost must be available. Here, the choice of technology should be labor intensive and low input affordable by the poorest farmers. Recently, the sustainable agricultural and rural development (SARD) approach advocated by the Food and Agriculture Organization (FAO) has been used, based on resource management domain (RMD) approach, in the technology generation and selection process. While scarce arable lands should be devoted to food grain crops, farmers should be encouraged to use non-rice food crops (pulses, root crops.) in rice-non-suitable lands, in home or school gardens to provide feeding materials for livestock and fishery production.

The watering of crop lands hereto forth should take a new approach to improve the efficiency of water resources. The following suggestions may be considered most appropriate in future water resources development for agricultural production:

4.1 Rehabilitation of existing irrigation and drainage systems.

Throughout Asia, numerous irrigation schemes were constructed with assistance from four main donors, the World Bank, the Asian Development Bank, the U.S. Agency for International Development, and the Japanese International Cooperation Agency. However, these investments were cut to half since 1990 compared to the late 1970s since the loans of this kind was difficult to pay back, and that the donors are constantly under the surveillance of environmentalist groups. The efficiency of these irrigation systems, according to a recent World Bank survey (Jones, 1995), measured in terms of internal rate of return ranged from 5-56%, demonstrating a wide variability which makes it difficult to generalize about irrigation system performance. An assessment by Rosegrant et al (1987) of economic returns to 51 irrigation systems in the Philippines showed that while small-scale irrigation had slightly higher average returns than medium and large scale irrigation, the difference was insignificant because of large variation in system performance. Furthermore, the authors confirmed that the overall irrigation efficiencies in developing countries are low, ranging from 25-40% for Thailand, Philippines, and Mexico, to 40-45% for Malaysia. For comparison, the overall irrigation efficiencies for Japan, Taiwan, and Israel were from 50 to 60% (Rosegrant and Shetty, 1994). The inefficiencies of Asian irrigation systems can be attributed to poor management of the system by the government agency and the irresponsibility of the users. In Vietnam, virtually all irrigation canals are earthen, irresponsible farmers broke open a side of the canal to let

water in their own fields, causing water losses in conveyance and preventing downstream farmers from getting water. The rehabilitation of the existing irrigation systems is extremely urgent to improve water use efficiency without much investments.

4.2 Improving on-farm water management for agricultural production.

4.2.1 *Irrigated agriculture:* Within each perfected irrigation system, further improvement of water use efficiency for crop watering can be obtained by each individual farmer.

- securing field levees to prevent water leakage and seepage to other fields;
- irrigating just sufficient water when the crop needs, instead of letting water running freely all time;
- alternate irrigation: precised volume of water is irrigated to the field at optimum intervals.
- drip irrigation: widely used in dry and sandy areas, i.e. Israel. The precised amount of water is dripped onto the root zone of each plant without any wastage.

4.2.2 *Non-irrigated agriculture:* large arable areas in the world could not be economically served with irrigation system because water sources are either to far away or too deep. If their rainfall is more than 1,000 mm annually, some rain water harvesting technique may be applied to grow some crops.

- Rainwater harvesting techniques: Normally in tropical region, the huge quantity of monsoon rains returns to the sea after making flash floods and eroding hill tops and hill sides. Several techniques of rain water harvesting were developed:

i) Rainfed farmers now can excavate on-farm water reservoirs to trap rain water or fresh flood water for use partially in the following dry season.

ii) Recently the technique of dry seeded rice (DSR) has been developed and is being practiced widely in rainfed areas of southern Vietnam. This technique makes use of every drop of rain water to successfully produce an extra, short-duration rice crop before the main rice crop is transplanted.

iii) Small dams on the hilly catchments could store sufficient water for irrigating downstream crops, such the practice of terracing.

iv) low-lift pumps --traditional or modern-- can bring water in creeks to irrigate the crops nearby.

v) Growing drought tolerant crops such as cassava, sorghum... on well mulched raised beds or ridges. The furrows serve as water reservoir trapping fresh water from the flooding season.

vi) Building flood protecting polders for growing fruit trees or high quality crops in flood-prone areas, particularly the Mekong Delta.

4.2.3 *Restricted use of underground water.* It is economical to develop shallow aquifers for small scale irrigation by an individual or a small group of farmers. Among the advantages of this technology are the renewable storage of the aquifer by annual flooding or rainfall, the minimal loss in conveyance, and the low cost of construction.

4.3 Expansion of new irrigated areas.

International investments for new dams, reservoirs, and irrigation schemes have been on the decline substantially due to high cost, low efficiencies, and environmental hazards. However, the huge corporate profits of these large engineering projects often overruled environmental and social benefits. Therefore despite all critics, such mammoth projects as the Three Gorges Project in China, the Son la Project in northern Vietnam, the Nam Ngeun II Project in Laos... will go ahead. As indicated above, when new irrigation schemes are necessary, careful selection of dam sites where only least environmental and social impacts will have to be allowed.

4.4 Desalination

We can have as much fresh water as we want from desalination of seawater, but at extremely high cost (USD 1-2 per m^3) with the present technology that only the oil-rich countries in the Persian Gulf can afford. This water can be used to grow high quality vegetables by hydroponic method under the glasshouse, but hardly for food crops.

4.5 Improving water allocation policies

Experiences with irrigation systems in Asia showed that much of the inefficiencies in the use of expensive water for agriculture can be attributed to inappropriate allocation policies. The painful result is big losses and wasteful use. Future demand for irrigation can come from savings from current uses. Mark Rosegrant, and expert in water management policy of the International Food Policy Research Institute, concurred that such a reform will not be easy, because both long-standing practice and cultural and religious beliefs have treated water as a free good, and because entrenched interests benefit from the existing system of subsidies and administered allocations of water. However, there may be four types of alternative water mechanisms to consider in setting appropriate

legislative measures, namely administrative allocation, user-managed allocation, market-oriented allocation, and water tax.

4.5.1 *Administrative water allocation* (Rosegrant and Meinzen-Dick, 1996). This alternative is more appropriate for large-scale irrigation systems that require large capital, and need to exert state rights over all uses, be it agricultural, industrial or domestic, wildlife or navigation. Unfortunately, many government-operated irrigation systems are performing poorly, excessive losses, damage to fishes and wildlife habitat. The main reason is the failure of public allocation to create incentives for users and managers to save water because of the fees for water use are under strong political pressure to keep it low. The resulting subsidies mainly favor the rich urban water users and the irrigated farmers but not the poor in slums or the rain-dependent farmers.

If the price of water use exceeds the marginal cost of conservation, users will reduce consumption, save water and hence reduce pollution. It was proven furthermore that if the irrigation system is financially autonomous, instead of centrally financed by the government, the performance management is even better: adequate and timely irrigation service because the agency's budget depends on service fees collected from farmers. Financially autonomous agencies will also be able to supplement irrigation fees with secondary income from interest on deposits, sale of water for non-agricultural purposes, and rental of assets owned by the agency. For example, irrigation districts in Western Hunan Province, China, have turned to hydropower generation, fish production, orchards around the reservoirs, and domestic and irrigation water fees, under the slogan "Use water to sustain water" (Svendsen and Changming, 1990).

4.5.2 User-based allocation system

Small-scale irrigation systems or base units of a large irrigation scheme may be entrusted to a group of farmers, cooperative, irrigation squad of a cooperative. Studies of such farmer-managed irrigation systems have shown a wide diversity of rules for within-system allocation; by timed rotation, water depth, land area, or share of the flow (Yoder, 1994). In many countries, due to inefficiencies in agency-managed systems, the government transferred management responsibility on both irrigation and domestic water supply systems from agencies to user groups. An important prerequisite for this management system is the formation of the appropriate group of users.

4.5.3 Market-oriented allocation

When water scarcity starts hitting agriculture and welfare, tradable water rights -the foundation of market-based water allocation- should be established by legislations. Tradable water rights are rights to use water that can be transferred all or in part, separately from land transfer. They are not permanent, can be leased for a season, a year, or many years at a price set within law. In formulation of the law, care should be paid to a clear definition of the characteristics of the water rights, the conditions and regulations concerning its trade. Water rights are practiced widely in Australia, New Mexico, California in the U.S., and in Chile.

4.5.4 Water tax

Several developed countries in Europe have levied a tax on water use in order to effectively control and save the limiting water resources in the country. In such a policy, the user must consider the opportunity cost of every liter of water he will be using, instead of growing rice, he might raise fishes in a pond. This concept is strange to the Asian norm, but may be the last measure to take when water is no longer plentiful to support agricultural development in the country.

5. CONCLUSION

Accelerating water scarcity problems and competition between uses of water pose a serious policy challenge to policy-makers in the developing and industrialized countries alike. As world population increases, the per capita water availability will decrease, affecting adversely our agricultural development. In order to sustain agriculture to ensure enough food for all, aside from good practice of population control and appropriate agricultural technologies, new approaches to water resource management have to be institutionalized as soon as possible in order to improve the efficiency and equity of irrigation and water supply systems. These approaches include the rehabilitation of existing ineffective irrigation systems, the empoldering of fruit tree orchards where ever it is planned in the flood-prone areas, various methods of increasing the efficacy of on-farm water management, various ways of rain water harvesting for growing crops, using shallow aquifers for small-scale irrigation schemes, and alternative water allocation policies. The government role in administering large-scale irrigation systems are clear, but for small-scale system it would be more efficient to transfer the responsibility to user groups. When water scarcity reaches a high level, water rights and water tax may have to be established. All these measures are to make sure that agricultural production would continue without failure.

Question and Answer

Chairman:

Thank you, Hon. Dr. Vo-Tong, and let's give a big hand to your excellent presentation. Thank you. Now is question time. We have about fifteen minutes for the question time, and I think I can allow at least three questions. And I suggest that, if you agree, the answers will be given together, I mean, we will get all the questions first, and you will answer them together, to save time. Now I open the floor, question number one, please, anybody? India, please.

Question 1 (Hon. P.J. Kurien, MP, INDIA):

Thank you very much indeed for this nice presentation that we could enjoy very much. Now as to water management, you said there are different ways. And I would like to know which is the most economic technology, the most efficient technology or system for the developing countries. This should also fit the economic criteria. I mean, is it drip irrigation or any other system that developing countries can easily adopt. Because the developed countries have access to better technology, they can spend more, but not the developing countries. That's why I think that you cannot have the same technology for developed and developing countries. Which is more suitable for the developing countries?

Secondly, you perhaps did not say much about the ground water resources and the depletion of ground water resources. During the presentations yesterday they said that the ground water resources are being depleted, and the water table is going down. How do we tackle that problem, that is perhaps not mentioned here.

Thirdly, I would like to know that in the first part of the presentation, you said that in the developed country like Japan the irrigated area is not increasing, it is in fact decreasing. You said that it is a result of industrialization. If that is the trend, then the developed countries also are getting more and more industrialized. You mean to say that industrialization will have a negative effect on agricultural production? If that is so, what is the remedy or solution for that? Or, what is the solution that Japan is contemplating for this negative reaction? Each country is developing, all developing countries are gradually or fast developing. For the developing countries, development should not mean that negative agricultural production. If Japan is taken as an example, that is not giving us an optimistic scenario for the next century. What is your reaction?

Chairman:

Thank you, second question? Yes, New Zealand, please?

Question 2 (Hon. Jill White, MP, NEW ZEALAND):

Thank you. Thank you first of all for a very interesting presentation. I really enjoyed it very much. You mentioned in passing about education. And it seemed to me that there is need for education at a number of levels, first of all amongst the farming population itself, but also amongst domestic users and amongst industrial users, of course. And I just wondered if you are able to tell us about any education programs that are occurring in different countries. Thank you.

Chairman:

Thank you, third question? Yes, Philippines, please?

Question 3 (Hon. Oscar S. Rodriquez, MP, PHILIPPINES):

You mentioned, Professor, that there is an adverse effect in the building of irrigation dams, like limiting, applying the balancing act theory. Which is more advantageous, the building of dams for irrigation purposes, or the non-building of dams?

Chairman:

Thank you. We have three questions, and the last one is from me, an extra question number four. You were talking about this balance of nutrition for the agricultural production. Do you think there any other way to overcome this besides water? For example, I was told that we have dolomite for Indonesia that can help to increase the rice production by twenty percent. In how far this is true? So we have four questions, so I hope that Dr. Vo-Tong can answer these together, thank you.

Dr. Xuan:

Thank you very much for these questions, and I would like to first discuss the questions from the distinguished delegate from India. Yes, you are right, that for the developing countries the ties between agriculture, urbanization and industrialization have to be considered in the light of population development. Of course, if we have a very rapid population increase, especially a mechanical increase in the urban areas, then urbanization will take place very fast, and in that the water use for urbanization will have to be diverted from agriculture. It is the same with industrialization. Your first question is, what is the most efficient water management system for agriculture in developing countries, is that right? Yes, you are right, drip irrigation would be very expensive. Usually it's good for well-to-do farmers, especially farmers like the ones in Israel. They can afford to drip irrigate their orange orchards on the desert, because they have a big market in Europe which can sell their oranges at a very high price. So they can afford drip irrigation. But for us, the Asian farmers, usually drip irrigation is out of the picture.

Usually the cheapest irrigation system would be what we call the irrigation by gravity. That means that you would have a water source that is high enough and can be led into the growing areas, and you just open the dike and this water can flow easily in. And that is the best way and the cheapest. But that kind of thought is now very much limited, almost has been developed already. And what we are doing now is to get a system coming from a big river, waterworks and so on. And from there they have to pump in.

But in my experience in Vietnam, and in Laos and in Cambodia we can see that rainwater harvesting by dry seeding, as I discussed, is perhaps the cheapest way. Because usually the farmers, traditionally, wait for the rain to come, about one month, to soften the soil before they plow. So that one month's water is wasted. Of course it is not wasted, but it is used for softening the soil. But if we harrow and plow right after the rain stops in the previous season, when the soil is still soft, the plow makes a dry fallow on the plowed soil, it will be easy to break up those plowed layers when the rain has started. And at the same time they sow the seeds. So the seed that time uses every drop of rain from the very beginning of the season. And it can grow. And if the farmer is careful to manage the weeds during the dry season, the weeds will not be a problem when the rain comes down. And by doing this we can get four to five tons of rice per hectare within that period when the farmer is waiting for the rain to soften the soil, then plow and harrow and prepare the land, to just plant the main rice crop. So this is one way, now is the second, have been increasing areas in Vietnam. And we tried to introduce this in Laos, for example. In Laos and Cambodia, now still they wait for the rain come, then soften the soil, and they plough it and they harrow, and then they transplant. But then, usually the rainy season there is the monsoon, as you know. After one month of rain, or after two weeks of rain, it stops raining for a few weeks, sometimes even one month, we have this dry spell. It is during this dry spell that the just-planted rice will die. Most of the hazard in Cambodia and in Laos, in their rice-production, is their use of this very old technique. If it sits through the dry-seeding, the dry-seeded rice is not afraid of the drought, because the soil is granulated. So the roots can find some water in the sub-soil, therefore dry-seeded rice can now be called the best technology in grain harvesting for rice growing.

The second question is the ground water depletion. Yes, yesterday we saw one slide from Dr. Uchijima about the cycle of the water. So the water evaporates from the oceans, and transpires from the land, become clouds, and then the clouds will move in and give the rain. That rain will replenish the river and replenish the water. So that cycle will go around. However, if in one deep well, using the water, they pump it too fast, the replenishment rate for the. will be less, and then they will have to suffer from the lack of water at that ground water. So the replenishing will come. Now in Bangkok, for example, the rate of extracting the water is so great because of the large population in that city, then subsidence of the soil take place every year because of that, because they extract too much. They need to replenish it from some other sources, but the replenishment is low. So we have to be very careful in exploiting the ground water resources.

Now if industrialization would give some adverse effect on agricultural development, yes, you are right. But not only industrialization, but also urbanization, these two go together.

They will have to use more water from the development of agriculture, divert the water there. So, for example, in Japan we can see that the rate of irrigation systems building is decreasing, that means that more irrigation systems have to be out of use, because they are replaced by urbanization and so on. Of course, in other cities in Asia this phenomenon will take place. Because that water, we have only one jar. And if we more for something else, then we have to divert from this thing to go there. So we have to balance on this. But because we have to see to it that our food production is not jeopardized, so we have first to correct the use of water, to improve the management of the water used. I think that is a number one step. We cannot stop the urbanization, we cannot stop industrialization. So what we can do is to ask farmers to use water, instead of using it very lavishly, now they have to use it more sparingly. And there are different ways, there are four ways that our legislation can prescribe.

Now for the question from the distinguished delegate from New Zealand, the education on water use. Yes, now several groups, NGOs, are trying to advocate the education of the children, of the women, and of the men, especially those in the rural areas, on the water resource. And I know of, like in the U.S., this movement of water education is very strong. And it is moving to several areas in Asia also now also, and we try to make our citizens be aware of this limited resource.

There was the question from the distinguished delegate from the Philippines, dams or no dams. Your question is very good. Actually, like I present there, each water work has their pro and cons. For example in Laos now, Laos is going ahead to build the Nam Ngum Dam, for example. And the International River Network and other NGO groups are trying to stop this finance of this dam, saying that it will destroy the environment and have lots of very adverse impact. But the Laos government said, look, we are a landlocked country, we are very poor, we need some dollars and the need to sell the electricity is our main source of income, so let's go ahead and build the dam. So this is why they build the dam. They can generate electricity to sell to Thailand and so on. But the environmental impact, they think not in their land. But actually it is, there will be a lot of areas will be flooded, inundated because of the dam. Now for each of each of these dam projects, I think that there some will be very beneficial if it is not affecting a large population on the upstream or the reservoir areas, and if it is not affecting the downstream, does not invite salinization or acidification of the soil downstream.

The question from my chairman regards the balance of nutrition in the soil. Dolomite is a sort of magnesium. Actually in some kind of soil it is quite acidic, then the ratio between calcium and magnesium is out of balance also. So they can lime it, put more lime for calcium, to make it less acidic. But because of the magnesium status in the soil is too low, then no matter how much nitrogen, phosphorus, potassium and lime we put in, then the crop will not increase unless they balance it with the magnesium. Dolomite is one source of magnesium in many acidic soils. Thank you.

Chairman:

I think we all agree that Dr. Vo-Tong answered very well to the four questions that we raised. .... So I think that's the end of this morning session. Thank you very much, Dr. Vo-Tong.

"Clean Drinking Water – Its Relation to Health and Medicine"

by
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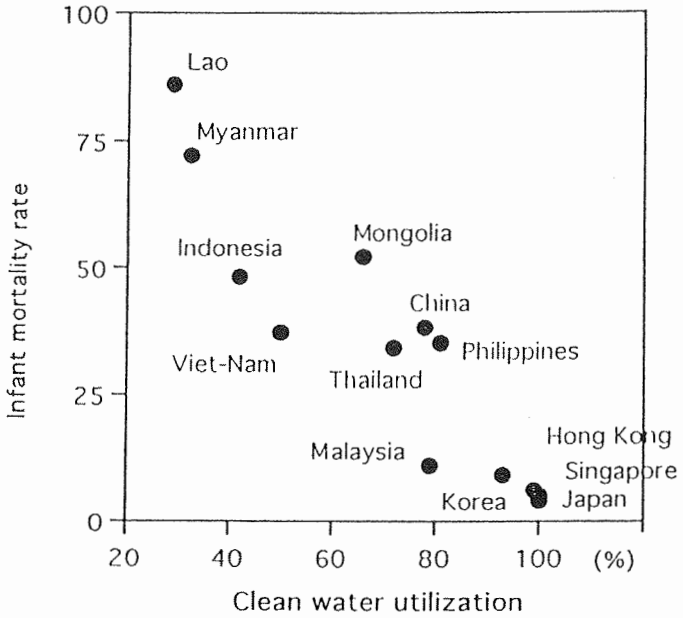
Chairman
Hon. Dr. Apenisa N. Kurisaqila (FIJI)

Dr. Apenisa, thank you very much for your kind introduction. And honorable Members of Parliament, Ladies and Gentlemen, I would like first to say that it is indeed a great honor for me to report the results of my research at this conference. Also I would like to thank the Hyogo Prefecture, Kobe City, and Mr. Maeda for providing me with this very valuable opportunity. So I would now like to begin my presentation.

I will be talking mainly on the three topics. First, I shall talk about water and health, and review the relationship between the two from macroscopic statistics. Second, I would like to focus on three countries, and I would be specifically citing those countries' situation later, and I believe that these three countries are representative. And third, I would like to talk about water and industrialization.

In 1996, the World Population White Paper produced the data by countries which is also included in your handout. Please refer to the graph in your handout (see Figure 1). For the abscissa we have taken the clean water utilization rate and for the ordinate we took the infant mortality rate. Then you can see a very beautiful negative correlation between the clean water utilization and the infant mortality rate, starting from Laos and Myanmar and all the way to Japan and Singapore. You can see that they form a straight line.

Figure 1 Clean water utilization and infant mortality rate



The maternal mortality rate is correlated to the clean water utilization (see Figure 2). You do not see a straight line in this case. The maternal mortality rate does not go down any more after the clean water utilization goes beyond a certain level, from a critical point onward. That is, there is a lower limit the maternal mortality rate can go down.

Figure 2 Clean water utilization and material mortality rate

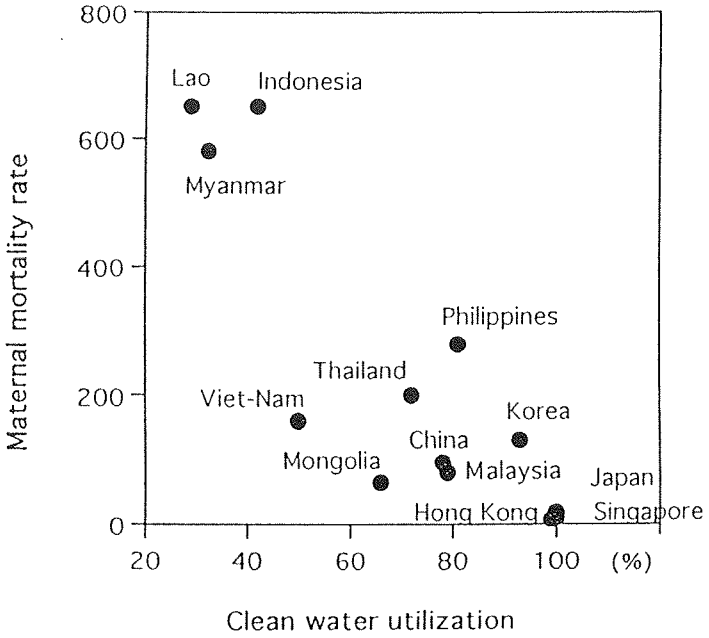
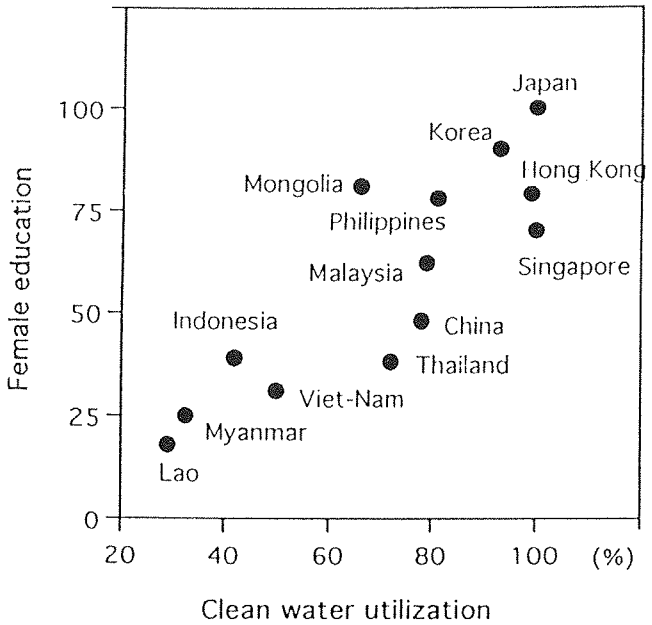


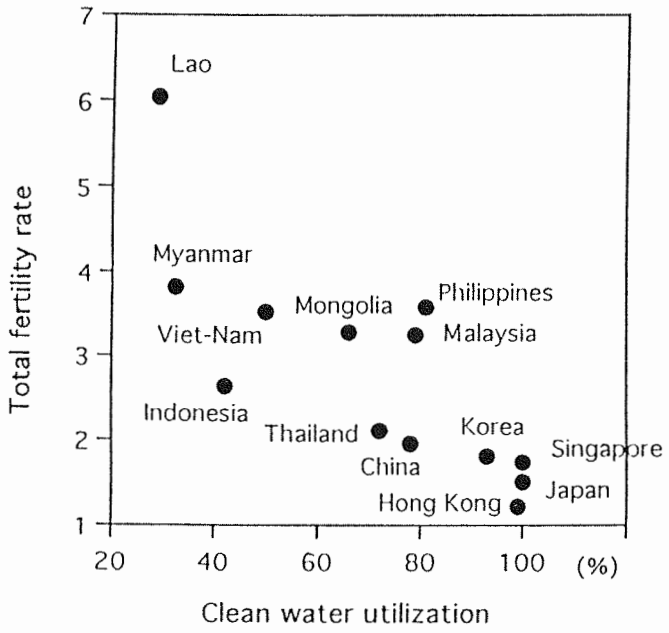
Figure 3 shows the relation between the female secondary rate and the clean water utilization. The female secondary education rate represents those women who have undergone a secondary education, that is for the ordinate and the clean water utilization for the abscissa. The relationship is invert to the previous one in this case. So the higher the education is, the higher you have the percentage of clean water utilization.

Figure 3 Clean water utilization and female education



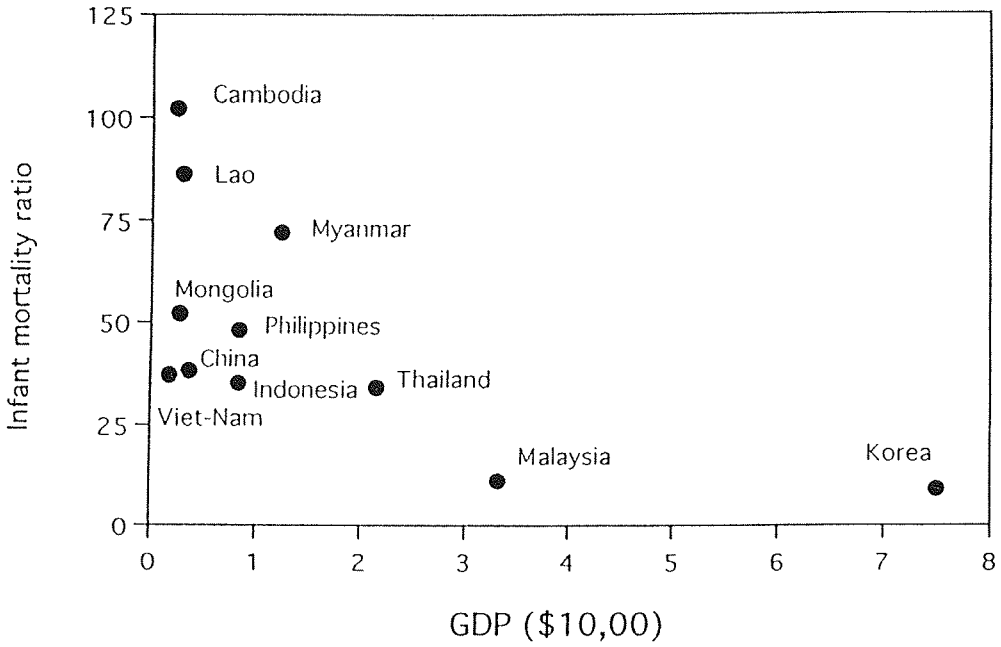
The total fertility rate means the number of births per woman during her whole lifetime, which is how many children she will bear during her whole lifetime. Looking at this, you can say that you don't really see a very clear-cut correlation as with the infant mortality rate (see Figure 4). Laos has a very high rate in this case, but for other countries there are maybe three or four children per mother. And, it is less than two in countries where the clean water utilization is high. In the long term, the population would decrease in the countries where one woman bears birth to two children or less throughout her lifetime. The countries of Thailand and China are a little different from countries listed on the right. This is because the government had been very aggressive in trying to reduce the birth rate. That is why the total fertility rate is low. The same applies somewhat to Indonesia, because the government is conducting a very systematic birth reduction policy.

Figure 4 Clean water utilization and total fertility rate



The GDP per capita here is shown in terms of 1000 dollars (see Figure 5). This ordinate is the infant mortality rate, and you can roughly see that there is the negative correlation up to 3000 dollars. That is to say, the infant mortality rate goes down as the GDP per capita goes up. And although the GDP is low in Vietnam, China and Indonesia, the infant mortality rate is already low. But roughly speaking, you can say that there is negative correlation between the two elements or factors. Other than that, Korea, Singapore, Hong Kong, and Japan would be out of the graph to the right. And in those countries where the GDP is high, it doesn't mean that you would have an even lower infant mortality rate the more you have of the GDP. Some babies still die due to other causes even after you reach a certain level of GDP. So you can see a very clear-cut factor of the GDP in reducing the mortality rate only up to this critical point.

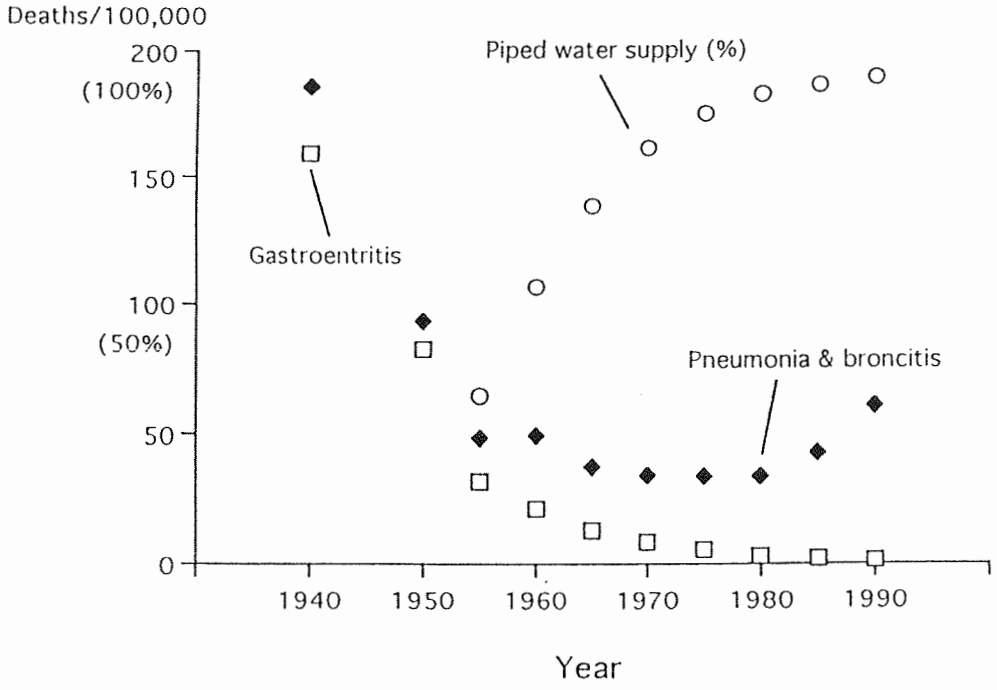
Figure 5 GDP and infant mortality ratio



As is generally known, gastro-enterological infections make many people sick in the developing countries, and especially many infants die of gastro-enteritis.

This graph has been plotted for Japan, starting around 1945 up to 1990 for every five years (see Figure 6). In the very beginning, that is around the World War II, there were many deaths due to gastro-enteritis, those are infections in the stomach and intestines. The black diamonds represent pneumonia and bronchitis, and the white circles show the piped out water supply ratio. We could get hold of data only from around 1955, which by that time had not reached 50 percent. After that the piped water supply rate went up substantially, and around 1980 it has reached 90 percent. By now it is 95 percent. So there has been a substantial reduction of deaths due to gastro-enteritis. And by 1980, it comes almost close to zero, there were no deaths due to gastro-enteritis. And so you can see that deaths due to gastro-enteritis are reduced the more you can use clean water. Also pneumonia decreases with the increase in piped water supply, but it reaches a sort of bottom and didn't go down further, and probably it is increasing. Pneumonia is not only related to clean water, but there are many other factors that are involved. On the other hand clean water and gastro-enteritis are very intimately related. The fact that pneumonia is on the rise in Japan is because its society is aging and that we now have more elderly people.

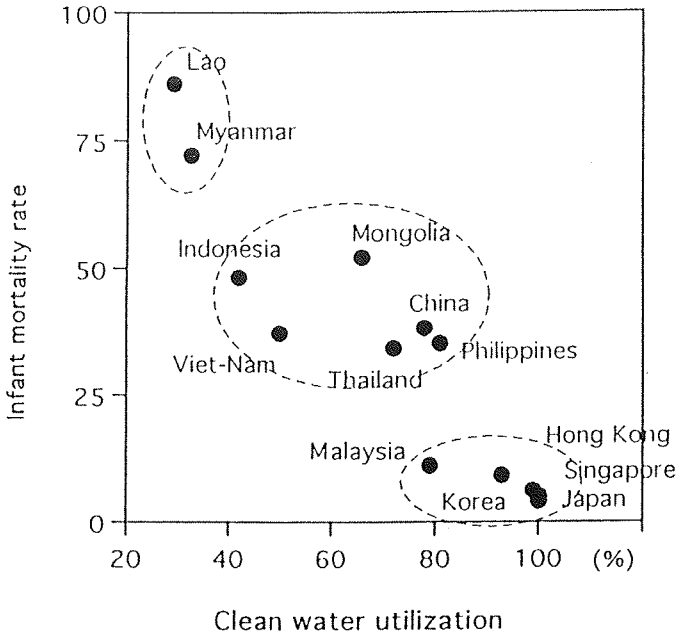
Figure 6 Percentage of piped water supply and yearly-transition of mortality rate of pneumonia & broncitis and gastroentritis



The infant mortality is mainly caused by the gastro-enteritis and most of the incidences were related to the bad quality of the water. Of course, it is important to increase the clean water usage rate, because this will bring down the prevalence of gastro-enteritis, and this will bring down the infant mortality rate. But it has been proved by the Brazilian research that it has a lot to do with the knowledge on the part of mothers as to sanitation and health. So it is very important that we have to teach the mothers on sanitation and how to keep their family members healthy. As I have said that there is an inverse correlation in the reduction of the Infant Mortality Rate and the education rate of mothers, this is the reason why it is important to educate the mothers.

Now, I would like to talk on the second topic and focus on three countries which may be representative of each three group in Asia (see Figure 7).

Figure 7 Three groups classified by clean water utilization and infant mortality rate



I would now like to compare the three countries, Nepal, Thailand and Japan, first in terms of the live birth rate (see Table 1). It is 42, 21, and 10, in that order. The crude death rate is 13.3 in Nepal, 6 in Thailand, and 7 in Japan. So for Thailand the death rate is even lower than Japan, and this has to do with the population structure. The infant mortality rate is 100 in Nepal, 8 in Thailand, and 4 in Japan.

Table 1 Comparison of Nepal, Thailand and Japan

	Nepal ('91)	Thailand ('90)	Japan ('91)
Surface area (10^4km^2)	14.7	51.3	37.8
Population (10^6)	18.5	54.7	123.6
Density (person/km^2)	132	107	332
Index of senior population		6.1	17.3
Live birth rate (/10^3)	41.6	20.5	9.9
Crude death rate (/10^3)	13.3	5.8	6.7
Infant mortality rate (/10^3 live birth)	97	7.5	4.4
Maternal mortality rate (10^5 live birth)	515	20	9.0
Expected life span at age 0		69.3	
(male)	55.0		76.1
(female)	53.5		82.1

And now let us compare these three countries briefly. I will be talking about the situation in Nepal based on the research by APDA conducted in 1995. The country can be roughly divided into three areas. There is a fairly depopulated mountainous area in the north, the central area with cities, such as Kathmandu, and a tropical jungle area to the south. Thus the country of Nepal can be divided into three geographical sections. Forty percent of the total population live in the central and the south area, where the population is concentrated. And there is the trend that more and more people are living in the southern plains area.

As for the social and economic condition, 90 percent of the total population are farmers, and the GDP per person is 180 dollars. So Nepal is predominantly a farmer country with urbanization at 13 percent, that is, 13 percent of the population live in cities.

As to the state of medical services and public health, these are the major causes for hospitalization, and the death rate (see Table 2). The top cause of death is gastro-enteritis, followed by pneumonia, typhoid fever, and tuberculosis. All of these are the top causes of infectious diseases. In children, 18 percent of the deaths are due to diarrhea. So this is typical of the death patterns of the developing nations. If you can get hold of clean water, that will be fine. However, they have problems in Nepal and they can't get water of good quality. To get water they have to go to a well and pump up the water.

Table 2 Ten major cause for hospitalization

(Nepal: 1990)

	death/hospitalization	in %
1. Gastroenteritis	105/8,951	(1.2)
2. Pneumonitis	245/3,372	(7.3)
3. Typhoid fever	30/2,412	(1.2)
4. Tuberculosis	185/2,005	(9.2)
5. Abdominal pain	18/1,276	(1.4)
6. Injury	22/854	(2.6)
7. Anemia	56/813	(6.9)
8. Hepatitis	53/653	(8.1)
9. Meningitis	104/587	(17.7)
10. Encephalitis	62/242	(25.6)

And now I would like to make a wrap-up, a summary of Nepal. Nepal is still a developing nation, and people are predominantly engaged in agriculture. Clean water is not sufficiently available. As the population migrates into the cities, the population increases, leading to environmental destruction. In Kathmandu the tap water supply rate is 70 percent, however water quality tests revealed fecal coliform in 50 percent of the water, which indicates that they still have a long way to go in supplying clean water. Even if they can supply clean water, there must be a greater increase of population to offset.

Thailand can be geographically divided into the four regions, the Northeast, followed by the North, the Center, and the South. Bangkok shares the 10 percent of the total population. Thailand has a per capita GNP level of 2157 dollars, and the total population involved in agriculture is 62 percent, which 20 years ago was 90 percent of the population. The urbanization ratio is now 22.6 percent, or 22.6 percent of the total population is living in the urban areas. This urbanization level is much higher than the counterpart in Nepal.

This is the list of the ten major causes of deaths in Thailand (see Table 3). The number one cause of death is heart disease with 54.4 percent, then accidents and poisoning, the third is the malignant neoplasms (cancer), followed by homicide, suicide and other injuries, the fifth is liver and pancreatic diseases, and finally the infectious diseases including pneumonia and other lung diseases appear. In Thailand gastro-enteritis is not included in the ten major causes of death. Now you can find that there is a major change in the cause of deaths in case of Thailand in comparison to Nepal. But please be noted that these are statistics taken from hospitals, and therefore the deaths outside the hospitals are not included in this list. Therefore these statistics do not reflect the nation-wide phenomenon. However, in comparison to Nepal, you can see a major transition coming out in Thailand.

Table 3 Ten major cause of death

(Thailand: 1991)

	death/10^5
1. Heart deseasc	54.4
2. Accidents and poisoning	45.4
3. Malignant neoplasms	41.0
4. Homicide, suicide, and other injuries	14.7
5. Liver deseases and pancreatic deseases	13.3
6. Pneumonia and other lung desease	11.2
7. Hypertension and cerebrovascular desease	11.0
8. Kidney diseases and nephrotic syndrome	7.9
9. Tuberculosis	6.4
10. Paralysis	6.1

As I mentioned previously, 10 percent of the total population of Thailand is concentrated

in Bangkok, which now experiences issues relevant to the advanced nations. For example, the Chaophraya River now has a BOD level, or Biological Oxygen Demand level of 3.3 mg per liter. Of course, the BOD level is much higher in Japan, with 5.0 mg per liter, but still the BOD level of the Chaophraya River in Bangkok is now approaching the level of Japan. In Bangkok, pollution has various causes, and the major contribution is the domestic sewage. Domestic sewage accounts for 65 percent of the causes of the BOD, while 22 percent is due to the industrial waste. Bangkok's domestic drainage and waste put a very significant burden on the environment.

Chiangmai is a smaller urban center compared to Bangkok. Chiangmai is, however, now also showing the transition which has already been experienced in Bangkok. This is the Chiangmai city, and about 10 kilometers away we selected two villages for comparative study. (see Table 4) Village A was selected because it has relatively affluent families. This is the view of the health center in that affluent village. As you can tell by the clothing of the children and mothers, they are well-dressed, as shown in this slide. Village B was selected in the rural area, where you can find that the clothing of the mothers and children are not yet urbanized in comparison to Village A. Village A is the affluent village, village B is somewhat rural. If you compare the income levels, Village A has double the income level of Village B. Villagers in Village A commute to the urban center for jobs, while only a very limited number of people commute from the Village B for their jobs. We can say that Village A is now under urbanization, while Village B, in comparison with Village A, has the characteristics of a rural village.

Table 4 Comparison of socioeconomic status

Group	A		B	
No. of families	40		40	
No. of household members	4	(2-9)	4	(2-8)
Two generation family household [b]	18		10	
No. of children	1	(0-3)	1	(0-4)
Age of mother (years)	29	(20-38)	28	(17-41)
Age of father (years)	30	(23-53)	30	(21-53)
Occupation of father: full-time employee [c]	14		1	
farmer	13		13	
Annual income of household (Bahts/year) [a]	30000	(1250-32767)	15750	(40000-32767)
Age of mother at marriage (years)	21	(15-25)	20	(15-27)
Mother's educational period beyond standard 6 years [c]	9		0	

Media (minimum-maximum) or number of cases.
a : $p<0.01$ by Mann-Whitney test.
b : $p<0.05$, c : $p<0.01$ by the chi-square test.

The nutrient intake of Village A is much higher in calories than Village B. (see Table 5) The average total calories is 2450 kcal/day in Village A, and is 1640 kcal/day in Village B. Especially, the calories from protein in Village A is much higher than in Village B. We compared calories from protein, fat, and carbohydrates. In Village A, 14.5 percent of

the calories are taken from protein, while it is only 10 percent in Village B. There is also a difference in the calories from fat between Villages A and B.

Table 5 Medians and ranges (minimum-maximum) of nutrient intakes per capita

Group	A	B
No. of households	29	32
Total calories (kcal/day) [a]	2450 (1324-3892)	1644 (1137-2743)
Calories from protein (%) [a]	14. 5 (10.7-21.7)	9. 9 (7.5-12.2)
Calories from fat (%) [b]	26. 7 (16.8-40.9)	20. 4 (9.8-52.8)
Calories from carbohydrate (%) [a]	58. 1 (44.1-72.0)	69. 7 (35.1-81.3)
Protein (g/day) [a]	82. 7 (55.8-147)	40. 4 (28.7-72.1)
Ca (mg/day) [a]	780 (325-1628)	304 (181-701)
Fe (ma/day) [a]	17. 5 (10.7-28.8)	9. 1 (6.2-16)

Households with pregnant mother were excluded.
a : $p<0.01$, b : $p<0.01$ by Mann-Whitney test.

Then, let's compare the hygienic status and customs in Villages A and B.(see Table 6) In Village A 90 percent of the households use some filter for domestic drinking water supply, while it is only 12.5 percent in Village B. The second point is whether they boil this water for baby use or not. In case of village A, 40 percent of the households boil the water for baby use, while only 2.5 percent of the households in Village B boil water for baby use. In other words, in Village B, raw water is utilized for drinking water for babies.

We interviewed the households for the percentage of certain diseases. In Village B, 80.5 percent of the households answered that the baby experienced a certain disease, while it was 56.2% percent in Village A. This verified importance of the clean water supply, and that the water should be boiled and cleaned. It reflects the hygienic education level of the mothers, which is closely related to the health status of the babies and infants.

Table 6 Comparison of hygienic status

Group	A	B
	%	%
Water supply: Using sand filter	90.0	12.5
Drinking water: Boiling for baby use	40.0	2.5
Toilet: Have own toilet	82.5	47.5
Use insecticide	47.3	12.8
Keep medicine in home	62.5	100
Diseased child	56.2	80.5
Maternity leave before delivery	71.8	97.4

all items achieved statistical significance
($p<0.01$ by the chi-square test) between the two groups.

I mentioned that mothers need to be educated and to know about the health and hygiene. It is relevant that if the economic premises are improved, and the utilization of the clean water is increased, then the mothers' education level will also be increased. Therefore the knowledge and education of the mothers plays a very important role in keeping and improving the healthy status of the family members, including the infants.

This is the issue of the finance. In Thailand the GDP level, the revenue or the income level is closely related to the level of the infectious diseases. However, in Korea, Singapore, Hong Kong and Japan, the relationship between the income level and the infectious diseases is not so closely or directly related. As has been shown in the previous data, in these countries chronic diseases such as the cerebral-vascular diseases, cancer, or heart disease serve as the major causes of the hospitalization, rather than the infectious diseases.

Let me take a look at the situation of Japan (see Table 7). These are the ten major causes of death in Japan. The first is the malignant neoplasm (cancer), which is quite remarkably high, followed by heart disease, diseases mainly due to blood vessels of the heart, and cerebral-vascular diseases. The fourth reason is pneumonia and bronchitis. As mentioned earlier, aging population is the reason behind high ranking of these infectious diseases. However, number one, two and three are chronic diseases, rather than infectious diseases.

Table 7 Ten major cause of death

(Japan: 1991)

	death/102
1. Malignant neoplasms	181.7
2. Heart deseases	137.2
3. Cerebrovascular deseases	96.2
4. Pneumonia and bronchitis	62.0
5. Accidents and adverse effects	26.9
6. Senility without mention of psychosis	18.8
7. Suicide	16.1
8. Nephritis, nephrotic syndrome and nephrosis	13.8
9. Chronic liver deseases and cirrhosis	13.7
10. Diabetes	7.8

These are the National Drinking Water Regulations given by the Japanese Ministry of Health and Welfare, which is closely relevant to the WHO's recommendations (see Table 8). These five items, in fact, are relevant to health situations. The first contaminant concerns infectious diseases, the bacteria; the second is relevant to the inorganic chemicals and heavy metals; the third contaminants are the solvents and other chemical contaminants involving the chemicals; the fourth contaminants are the by-products of the chlorine reaction; the fifth are the agricultural chemicals. These are the five categories of contaminants relevant to the regulations on the Japanese national drinking water.

Table 8 National drinking water regulations

Contaminants relating to health
Indicaters for microbiological contamination
Bacteria
E. coli
Inorganic chemicals and heavy metals
Cyanide, Mercury, Lead, Chromium, Cadmium, Arsenic
Selenium, Fluoride, Nitrate [as N]
Volatile organic chemicals, synthetic organic chemicals and other chemical contaminants
Tetrachloromethane, Dichloromethane
1,1,2 Trichloroethane
Trichloroethylene, Tetrachloroethylene
1,2 Dichloroethane
1,1 Dichloroethylene, cis 1,2 Dichloroethylene,
Benzene
Chlorine reaction products
Trihalomethanes (Chloroform, Bromodichloromethane, Dibromochloromethane, Bromoform)
Agricultural chemicals
Thiuram (Tetramethylthiuram disulfide)
Simazine (CAT: 2 Chloro 4,6 bis(ethylamino) S triazine)
Thiobencarb, Benthiocarb (DD: S [(4 Chlorophenyl)methyl]diethyl carbamothioate)

In Japan, the contamination by bacteria is rare because the bacteria contamination is well-regulated. The remaining four factors are the issues to be considered. In case of the developing countries, however, the issue of the bacteria was at the top of the priority list in regulating the contamination.

So let me move on with my third topic, which is the water and industrialization. The second category of contaminants are related to inorganic chemicals and heavy metals, which include cyanide, mercury, lead, chromium, cadmium, arsenic, selenium, fluorides, and nitrates. Among them, mercury in Japan was the symbolic contaminant in the past history. As you are well aware of, in the Minamata region of Kyushu Island, the Minamata disease was triggered by mercury, which verified how much mercury can damage the health of the people. This knowledge has been proliferated worldwide.

The first patient of the Minamata Disease was reported in 1956. Following that, in 1959 it has been assumed as one explanation that the mercury should be the cause of that disease. In 1963, it was determined that organic mercury, namely methyl mercury, should be

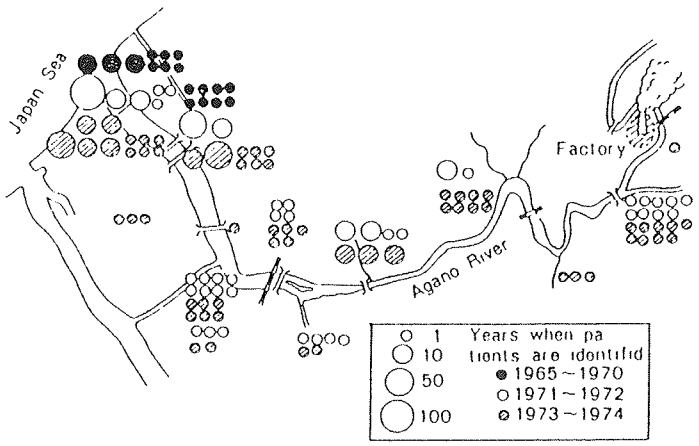
the cause of the Minamata Disease. However, this was not officially recognized, and that is the reason why the relevant factories continued to drain mercury as waste.

And in 1965, just nine years after Minamata, the Minamata Disease was identified for the first time at the Agano River in Niigata Prefecture, far away from Minamata. Then, finally, in 1968, the Japanese Ministry of Health and Welfare officially recognized that methyl mercury was indeed the cause of the Minamata Disease, and regulated the factories to stop the production of the relevant products. In other words, it took twelve years for the government to officially recognize the cause and ban the production in the relevant factories.

Let me refer to the example of the Agano River in Niigata Prefecture. When the Minamata Disease was initially experienced, the cause was identified through trial and error. When the Minamata Disease was detected in Agano River in 1965, we already had certain preliminary researches and surveys in Minamata. That is why once we experienced the Minamata Disease in the Agano River, we could conduct a more clear-cut investigation. We wish that the total ban of production would have been implemented prior to 1963, thus not to have a repetition in the Minamata Disease in Agano River.

There was the factory in the upstream producing the acetaldehyde, which drained and vested the methyl mercury in the river. Then along the river, these circles are the locations of the Minamata Disease patients (see Figure 8). And you would find the number of patients increasing towards the downstream.

Figure 8 Identified numbers of patients at the basin of the Agano River

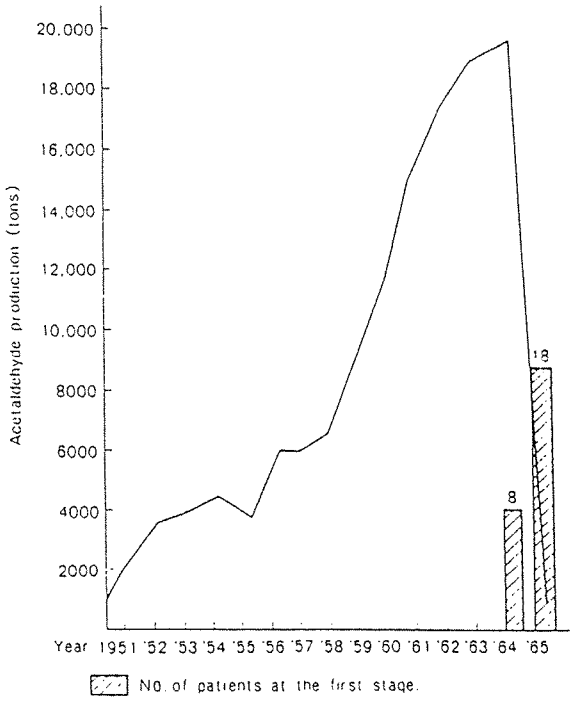


The concentration of the mercury in the water was not high. So even if you drink the water, the concentration was very low, not to cause the disease. Still, mercury was accumulated in the human body to cause the Minamata Disease. Let me elaborate. That was the

key point. Wide-ranging research showed that within the ecosystem, the mercury taken in was mercury concentrated through the food chain from the plant to the fish, and from the fish to human beings. So the human beings ate the food with a higher concentration of mercury. The mercury content in the water may have been low, but it was accumulated within the body of living beings through the food chain. Namely, the mercury in the water was further concentrated from water to the fish and the people through the food chain. So this has been verified by the example of the Minamata Disease.

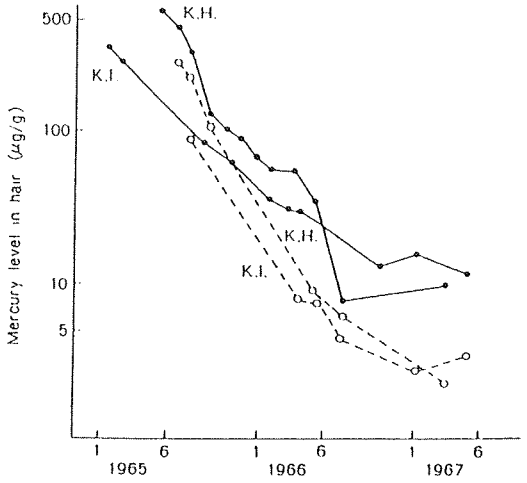
They had knowledge of the Minamata Disease at the Agano River, and that is why they have a more beautiful set of data. Due the production of acetaldehyde at a plant, you will start to have the patients after you reach a critical level of production (see Figure 9). And at this point in time it was already clear that mercury was to be blamed. The plant was therefore closed and it went down. The number of patients increased up to a certain time, but then it decreased because the plant was closed.

Fig. 9 Actual results for the production of acetaldehyde at the Kanose Factory of Showa Denko Co. (after a Special Research Report of the Ministry of Health and Welfare, Japan,1967)



This is the mercury level in the hair of the patients, as has been plotted from 1965 onwards (see Figure 10). When the plant stopped the production of acetaldehyde in 1965 and the mercury discharge was stopped, the mercury level in the hair of the patients decreased ever thereafter. So we do have such a very clear-cut results, that is, the cause was very clearly identified as the mercury discharge from the plant.

Fig. 10 Changes in methylmercury (○---○) and total Hg (●---●) levels in the hair of 2 patients



This is the amount of methyl mercury accumulated in the fish, and this is during the four years, from 1968 all the way to 1972 on a yearly basis (see Table 9). And you can see that, well, it is not on a continuous linear reduction. It went up at one instance, from 0.22 to 0.82. Although the plant stopped the production of mercury around 1965, there was a time delay in decreasing. There was still an increase of the concentration of mercury accumulated in the fish, and it peaked in 1970, and then started to decline. And this is because of the food chain. When human beings were exposed to the mercury, we looked into the mercury levels of their organs, the mercury got accumulated in the brain, liver and kidneys. There were the symptoms in the central nervous system observed in the brain, but not very clear-cut symptoms in the liver and the kidneys. But there was indeed a very high level of accumulation of the mercury in the those organs of the patients.

Table 9 Mercury levels (μg/g) in from the Agano River (after Takizawa et al., 1973)

Year		Species			
		"Nigoi"		"Ugui"	
		Total Hgt[1]	Methyl Hgt[2]	Total Hgt[1]	Methyl Hgt[2]
1968	*n*	12	12	5	5
	$\bar{X}$	0.67	0.51	0.24	0.13
1969	*n*	8	44	2	2
	$\bar{X}$	0.22	0.10	0.20	0.10
1970	*n*	34	34	11	11
	$\bar{X}$	0.82	0.19	0.83	0.07
1971	*n*	14	15	23	22
	$\bar{X}$	0.38	0.16	0.30	0.15
1972	*n*	5	5	–	–
	$\bar{X}$	0.21	0.17	–	–

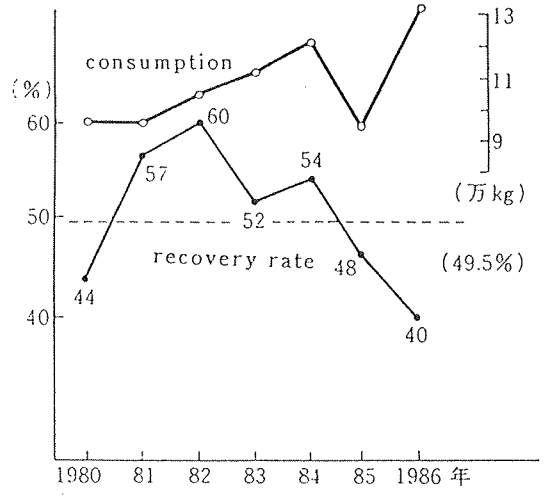
↑[1] Determined by the dithizon and atomic absorption methods.
↑[2] Determined by gas chromatography, with an electron capture detector.

Whatever is not decomposed, accumulates. In case of a metal, it is a basic material, so it doesn't get decomposed, and of course, if you should discharge it from your body, then that's okay. But once something gets into your body and it cannot be decomposed, it will accumulate in the body, and over the years you will get increased levels of concentration. This is a very big and crucial problem. Even if the concentration in the water were low, this would still cause bigger problems at the top of the food chain, because as you go higher in the food chain ladder, the larger the level of accumulation.

The third item I would like to talk about is volatile organic chemicals. In 1980, in Silicon Valley in the United States, there was a discovery of too many instances of leukemia and abnormalities in babies. It was found that there was a great amount of organic solvent discharged from a plant that was dissolving into the ground water. The organic solvent discharged from the plant was actually being accumulated in an underground tank, but there was a leak in the underground tank, thus polluting the underground water. This sewage got dissolved in the water, and this became a big controversy in the United States. We in Japan had had the Minamata Disease and the Itai-Itai Disease, where such pollution caused problems and diseases. And so we were very sensitive about these issues, and we immediately went looking into similar situations in Japan. We then found an instance of ground water pollution near the plants which were producing semiconductors. And the first report was by a plant located in Taishi City in Hyogo Prefecture.

This is a different semiconductor plant, and when the level of production was low, the recovery rate was fairly high (see Figure 11). However, as the production went up, the recovery rate went down. That is to say, the gap between the production and the recovery rate shows the amount of disappearance, but where has it disappeared? We have to ask the question, where has it gone? Up until this time, organic solvents were said to be volatile and would be discharged into the air, and therefore be treated very naturally and would not cause any problems. And nobody paid any attention to that.

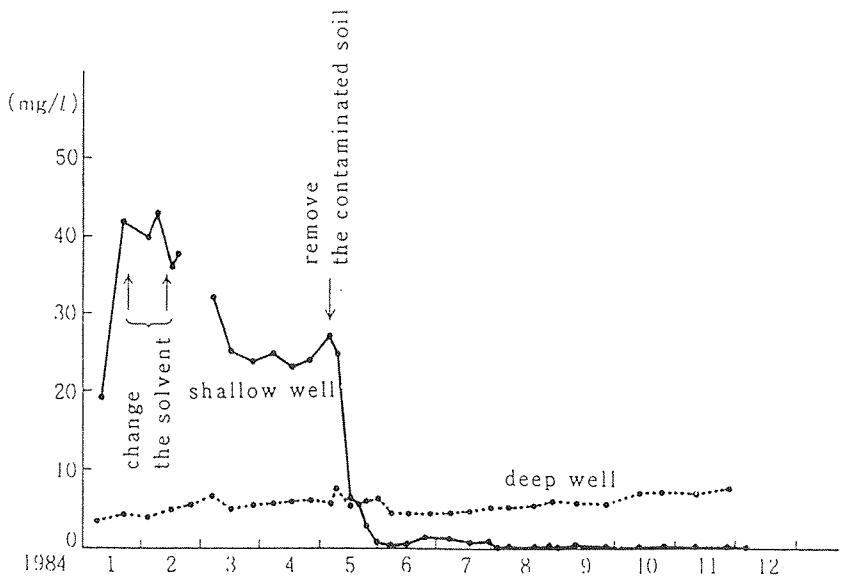
Figure 11 Time course of trichloroethylene consumption and recovery rate



There were actually a lot of the organic solvents just dumped on the ground or underground. And it was said that it was okay to dump organic solvents of these types on the ground because they are volatile, so they would just fly away somewhere. Nobody cared about these issues in those days. When we looked at the underground water, however, we found out that the level of contaminants were indeed very high. This is for the shallow well level, and then this is for the deep well concentration. And in case of the shallow well the concentration is high and, of course, lower for the deep well. And already at this time the semiconductor company changed the type of solvent used because the problem was mentioned, but there was still no change in the concentration of the shallow well. That means that the organic solvent did not really decompose, but remained in the soil. So they just took away the polluted soil into which the organic solvent had melted, and then the concentration of the shallow well went down dramatically.

However, if you paid attention to the deep well, concentration of the solvent in the deep well water had not changed at all (see Figure 12). That means that the organic solvent had gradually, very slowly, immersed itself into the lower part of the soil, and polluted the deep well. But it was impossible to remove the soil from the deep well level because that meant for you to take a tremendous amount of soil from the surrounding area. Trichloroethylene is said to be carcinogenic, as proved by the animal testing, so it is indeed a very big problem. And solvents such as these were not considered dangerous in the past but, are now considered dangerous products, and we should not just dump them elsewhere.

Figure 12 Time course of trichloroethylene concentrations of samples from shallow well and deep well



Third, I would like to talk about the problems caused by disinfecting with chlorine (see Figure 13). And I would like to talk about trihalomethanes, which have been proven as carcinogenic by animal experiments. In 1974, in Europe and in the United States, prob-

lems related to trihalomethanes were reported. For instance, the Rhine River was polluted by industrial discharge, and if you added chlorine to the water of the Rhine River in Europe, you would get chloroform. The water of Mississippi River in the United States is supplied as the piped water to many households, and contains a high level of chloroform. It was doubted that maybe this is a cause of the high prevalence of cancer. It was then found that this was caused by disinfecting with chlorine.

Figure 13 Trihalomethanes

In order to guard ourselves from bacteria, and to prevent gastro-enteritis and related diseases, we have got this very strong weapon of disinfecting with chlorine, and with this chlorine we could clean the water. This has led to the improvement of the state of health for the people. On the other hand, however, we found that chlorine does indeed lead to carcinogenic substances, so is the chlorine to be blamed for? That is not the case. Chlorine reacts with something, and then you get trihalomethanes. Water pollutants such as domestic discharge, household discharge, and night soil react with chlorine to produce trihalomethanes. So a portion of our river water reacts with chlorine and produces trihalomethanes. So it was found out.

For instance, this is the Bay of Tokyo, and there are rivers flowing into this bay (see Table 10). We know that there is a lot of discharge of nitrogen and phosphorus into the bay of Tokyo through these rivers. Where do they come from? Industry is the cause of about 60 percent of the discharge, and households about 20 percent. The majority is therefore industrial discharge. Still there is a fairly large proportion ascribed to domestic or household discharge. As far as the industrial discharge is concerned, of course you can come up with stricter standards for discharge by the government. However, to control household discharge and effluent, you have to raise the awareness of the people, you have to educate the public. People should be taught to reduce their discharge of domestic effluent.

We have reconfirmed of how important it is to teach the public. It used to be that in the developing nations, mothers were told to boil the water to be given to their children in order to prevent infectious diseases, and the mothers were taught about public health and hygiene. And now again, in everyday life we have to teach the people to control their waste to reduce their domestic effluent. It is, of course, important to teach, even in the developed nations.

Table 10 Nitrogen and phosphorus load on Tokyo Bay by different sources

	Nitrogen	Phosphorus
Waste water from		
Industry	57.3%	58.1%
Living	22.4%	20.0%
Others	20.3%	21.9%
Total	319.5 t/day	26.5 t/day

At last, going back to the developing nations, I would like to return to the story of Nepal. For Japan, compared with the Western countries, the change has been much more speedy. But even when we had reduced the infectious diseases by unclean water, still we have the problems caused by industrial and household effluent. We already had learned the lesson in the beginning, so we could cope with a second set of problems. However, the developing nations have a much faster pace of the problems, and in Nepal they still have to live with unclean water, and they have to cope with that problem. At the same time, they have to cope with the problem of the urbanization and industrialization. That is to say, Nepal is not going through phase one and then phase two, phase one meaning a reduction of infectious disease, and phase two coping with the industrialization. That was the case for Japan, whereas in case of Nepal they are going through these two phases, phase one and two, simultaneously. So they cannot learn from the earlier lessons because they are going through this simultaneously. With this I would like to close my presentation. Thank you very much.

Question and Answer

Chairman:

Thank you very much, Dr. Ogawa for that informative presentation. The floor is now open, ladies and gentlemen, for any question or comment. Professor?

Question 1 (Hon. Dr. Vo-Tong Xuan, MP):

Dr. Ogawa, please teach me something. The term malignant neoplasm, I don't understand, what kind of disease is like that? That is the first one. The second is, you say the nitrogen amount in the Tokyo bay is 319.5 tons per day. That is based on what volume, per cubic meters or what? Or total number or total quantity of nitrogen is 319.5 tons per day in the Tokyo Bay?

Chairman:

The first question is, he was talking about neoplasm. What is neoplasm malignancy, malignant neoplasm?

Dr. Ogawa:

The first one is the stomach cancer. Recently, lung cancer, has become the first cause, and followed by stomach cancer as the second. This is the same for both women and the men. The third cause is liver cancer in men, and maybe colon cancer in women. And is it okay for the first question?

The second one is that, I'm sorry, I need the slide again. I would like to refer to the last slide again to come back on the second question. This is per day. So this is 319.5 tons per day. This is the aggregate of all the water flowing into the Tokyo Bay area per day. The main river flows into the Tokyo Bay.

Question 2 (Hon. Sat Mahajan, MP, INDIA)

Dr. Ogawa, I am not a specialist. But I want to understand a very simple question. Your chart has shown that in Japan the maximum deaths have taken place because of the cancer and heart attacks. While in Nepal, there have been more because of the infant mortality and the mothers' mortality as the maximum because of bad water, or polluted water.

And there heart disease and cancer is highest in Japan. What correlation it has with each other? Is it the disease of civilization, or is it the disease of the backwardness? What it is, we couldn't understand. Why is a high mortality rate going on in such a highly advanced country, technically and other aspects, like Japan? That is, heart disease also and the cancers also? They on the rise. There they are higher than the Thailand and Nepal. May I know the reasons for this?

Dr. Ogawa:

Yes. In the case of Japan, and also in the western countries, in North America or Europe, cancer and the heart disease mainly affect people after their forties and mainly after fifties. The cerebral-vascular disease, mainly affects after the age of sixty. Infectious diseases such as gastro-enteritis or such will affect more younger generations in their twenties or thirties. It's quite a difference. Even in Nepal, the malignancy disease and the heart disease are not many as causes of death, but when they live longer, then maybe cancer and heart disease will become the major cause of the deaths.

Question 3 (Hon. Sat Mahajan, MP, INDIA):

One thing more. Why the males die earlier than the female? Your chart has shown, I have seen, that the males die earlier than the females, seven years difference, and they are in the same circumstances.

Dr. Ogawa:

Well, it is a quite difficult question to answer. But maybe, I'm not sure, so it is better to ask to a specialist, but I think it depends on the genetic reason. And the female is also considered to be more healthy than the male. It depends on the genetic reasons, perhaps.

Hon. Sat Mahajan, MP, INDIA:

But in India it is the male. About heart failures and cancer, what is the reason that caused these, I could not get the clear answer?

Dr. Ogawa:

Well, there are several reasons, maybe. And one big reason is that Japanese lifestyle is changing to Western life. The consumption of fat in the intake of food is growing compared with that thirty years ago. And Japan has become a little similar to the Western

countries. So maybe that is the reason why heart disease increased. But another reason is that also the life span got to be longer.

Question 4 (Hon. Nguyen Thi Than, MP, VIETNAM)

The female population is about fifty percent. Do you have any data showing that gynecological diseases in females are related to water supply in India or Asia?

Dr. Ogawa:

Well, I don't have any evidence about that, but I think that you need a certain amount of the clean water to clean for your sanitary living. You need a certain amount. So if you don't have this certain amount, then there will be some reason for infection of the women, especially during the maternity.

Question 5 (Hon. Senator Kamilia Ibrahim, MALAYSIA):

The question, Dr. Ogawa, is this. You have identified five types of contaminants relating to health in your paper. And from what I have heard, you have also indicated that several factors have led to the differences in the three countries in which you have conducted the research, and that had led to safe drinking water. My question is, what do you think are the main factors that would actually determine safe drinking water in any particular country, or to ensure that the public has safe water policy? Is it education and awareness, or is it the law and the regulation of policies? Because, we in Malaysia would want to have safe drinking water. We would like to reach that hundred percent that you have indicated. Thank you. So maybe you could tell us what other countries could then follow as guidelines, and how we can reach that level. Thank you.

Dr. Ogawa:

Well, each country, like your country, has its regulations, and maybe the water the people are using every day clears those regulations, so it is quite safe. So even you don't make the big effort of the education, it may still work. But it depends on whether the quality of the water is at the legal level or not, and if so then you have only to enforce and regulate the law. But if the water does not clear the law, then there is need for some adjustment. You will have to treat the water yourself and make sure it is clean before you use it. So in that case, education would be the good way to improve the health.

Question 6 (Mr. Katsuhide Kitatani, UNFPA):

I have a question that I would like to ask. Your slide mentioned TFR and clean water accommodation. I could not really understand the relationship between the two. In the extreme sense, maybe you can say that if you have the high permeation rate of the piped water supplied, you can reduce the birthrate. Rather than stating so, you have to have the education and awareness education. I think this will lead to a better level of hygiene for the people.

Dr. Ogawa:

Maybe I did not explain in full, that's why I just have caused some misunderstanding. The percentage of Female Education Rate and the Infant Mortality Rate, there are two very straight lines, as a linear relationship, whereas the TFR, the Total Fertility Rate, is not on linear. In that sense, if you really want to reduce the infant mortality rate, then I think it would be more closely correlated with the education. And on the other side, in the other graph, there is not that much close correlation between the two factors. So I agree to what you have stated.

Question 7 (Hon. Nguyen Thi Than, MP, VIETNAM):

Can you tell me a nice method for treatment of nitrogen-contaminated water? Which is the technology for the treatment of this waste water? Treatment of wasted water by nitrogen?

Dr. Ogawa:

I'm not a specialist in that area, so I can't answer the question with the correct answer.

Chairman:

Any other questions? Ladies and Gentlemen, we all politicians, this is just a general comment that.... the politicians who want to be voted in, they must make sure that they have some answer to the demanding of water. Particularly by the ladies, and I'm happy to see the ladies. Because the ladies are the ones entrusted to make sure that we have water in the home. And they are the ones who are utilizing it. If they are not helped, and that is the men's job, or the politicians' job, to get the water into the homes, you can forget your chance in the next elections. And just to illustrate my point, some years ago I was in a boat up on the River Nile to go to a conference in Cairo. I see P.D. I was sitting with a gentleman from Australia, who is not here, Herman Collins. And on the way I saw a lot

of women by the riverside, some with containers, some with lots of clothes to wash. This is day in, day out, when we were sailing up for almost a week. Then I told Collin, "Collin, if we just stop by, by the riverbank, and tell these ladies, we are now going to the conference to talk about reproductive health, to talk about family planning, to talk about nutrition. This is what they will say, this is what they will tell you, I bet you my bottle dollar: 'Gentlemen, you can forget about family planning, you can forget about reproductive health, we want the water from here to our homes.' So that they will be able to perform their jobs." I'm very happy to be closing with this remark, because it is always a subject that touched my heart.

The cleanliness of the baby, the infant mortality rate, the gastro-enteritis, it depends on the lady of the house. If she is capable and confident that she will have the water by her side, she will able to do her job properly. I thank you for all the contributions, particularly the good doctor here, who is a colleague of mine, because I'm also a doctor. I am very happy that we have come together to complete this session this morning, and I thank you most sincerely on behalf of the participants here.

Session III:

[14:00-15:05, March 18, 1997]

"Population, Water Resources and Development in China"

By
Dr. Hao Yichun
Vice Chairwoman of the Education, Science,
Culture & Public Health (ESCPH) Committee, NPC
Vice Chairperson of AFPPD

Chairman
Hon. Shin Sakurai, MP (JAPAN)

Respected Mr. Chairman,

Distinguished Parliamentarians,

Ladies and Gentlemen,

It has been recognized that water is a limited resource. Currently, many of the Asian countries and regions are suffering from water shortages in various degrees. Therefore, it is of significance for us to come together at the beautiful Kobe to exchange our views on population, water resources and development.

China is poor in water resources. It totally holds some 2,810 billion cubic kilometers of fresh water but the per capita share is low, merely representing one-fourth of the world's average, ranking 108th in the world. Furthermore, water resources are unevenly distributed, characterized by plentiful water and less farmland in southern China and less water and more land in northern China. Generally speaking, in the Changjiang River's Valley and its southern areas, 80.4% of the water resources concentrate there, accounting for 53.5 percent and 35.2 percent of the national totals in terms of its population and farmland. Water resources in the northern areas to the Changjiang River merely make up 19.5% of the national total while the population and farmland there represent 46% and 64.8% of the respective national totals.

Additionally, in eastern China, rainfall varies enormously in a year or between years. And dry and rainy seasons take place alternatively due to the influence of monsoon climate. Moreover, Dramatic changes in rainfall and river runoff, due to seasons and regions, often result in frequent floods and droughts. In more than two thousand years prior to 1949, a greater flood and drought usually happened in China every two years.

The Chinese government attaches great importance to protection, utilization and development of its water resources. Since 1949, the government has implemented a large number of projects for water storage, water diversion and water pumping to provide more

water resources for agricultural irrigation, hydro-electric power generating as well as livelihood and industrial usages. It has also expanded its water transportation and enhance the ability of preventing against waterlogging. In 1993, the volume of water storage from a variety of water conservancy projects came to 525.5 billion cubic kilometers, making up 19.1% of the national total. Of it, 83% was for surface water and 17% was for underground water. Through a more-than-40-year of endeavors, remarkable achievements have been attained in developing and utilizing water resources. For instance, several big rivers, such as the Changjiang River and the Yellow River have been not breached and basically ensured water supply for industrial production and people's livelihood. It has also laid a foundation for a steady and sustained agricultural development and played a key role in successfully solving the issue or feeding its population that represents 22 percent of world's total on the seven percent of the world's total land.

China is also confronted with many challenges. First, the rising demand for water will not ease up in a short period of time due to uneven distribution of water resources in some northern and highland areas; second, development and management of water conservancy projects have long been regarded as social welfare undertakings. Investment in this field has still been influenced to a certain degree by the ideas and patterns of mainly relying on the government's financial input provided gratuitously. A self-sustained supporting and developing system has not been established in this field; third, with population growth, urbanization expansion and industrial and agricultural development, the contradictions between water demand and supply have become increasingly serious in some medium- and small-sized cities; fourth, the comprehensive utilization of water resources has much room to be improved, the re-use rate of water appears to be rather low and water pollution is worsening.

To protect, mange, and rationally develop and utilize water resources is not only a major task for the Chinese government at present and for immediate future, but also a need for guaranteeing its food security and sustained economic growth. For this purpose, the Chinese government has insisted on the principles of "giving equal attention to economizing on the use of water and tapping new water resources, and integrating protection with management". The concrete measures have been accordingly formulated.

1. Strengthen the comprehensive management and treatment of soil erosion and water pollution. This job should be implemented as quickly as possible. Soil erosion and water pollution, resulting from economic construction and human activities should be mitigated to keep our water environment well maintained. In the construction of agricultural infrastructure, irrigation works will be consistently emphasized. Modern technology for saving water, such as drip irrigation and sprinkling irrigation will be popularized. Also Ecofarming will be given more attention.

2. Adjust the industrial and agricultural structure and distribution of urban centers in water scarcity areas. Some industries that consume heavily water or may bring about severe pollution must not be introduced. Meanwhile, the agricultural structure

will be also adjusted and those crops that heavily consume water are limited to grow. Distribution of cities and towns will be suited with water resources available by employing an urban development strategy of limiting big cities and meg-cities and rationally developing medium- and small-sized cities.

3. Explore new sources of water and address the issue on the shortages of water in water scarcity areas. Giving consideration of the reasonable demands for water required by both flowing-in and flowing-out drainage areas and their ecological environments, a number of the projects to divert water of the Changjiang River from South to the central and eastern areas. In the areas where certain conditions are available, motor-pumped wells are required to dig for well irrigation, so as to relax water shortage supply.

4. Deepen the reforms in the systems for development and utilization of water resources to improve the systems and regulations for the compensated use of water resources and its price systems. In this way, a compensated system for renewing resources will be gradually set up.

5. Renovation of waste water and utilization of sea water. With booming economic development, the discharge of sewage will substantially increase. It is possible for us to expand new sources of water to address water shortages in farming and make water environmental pollution controlled if waste water is processed to meet the discharge standards as permitted by the environment. In addition, China has a very long coastline. Thus, in China's coastal areas, people there can substantially make use of seawater, in some industries as cooling water. However, there is a big gap in seawater use rate, compared with other developed countries. Currently, some cities as Qingdao and Dalian have obtained rich experience in this regard. So, other coastal cities also follow them to solve their problems on water shortages by replacing fresh water with seawater.

In recent years, the Chinese government has paid special attention to the legislation of water resources and formulated a set of major laws and regulations governing the protection and management of water resources. In 1984 and 1991, the Standing Committee of the National People's Congress promulgated "Law of the Protection and Treatment of Water Pollution" and Law of the Protection of Water and Land Resources" respectively. In 1996, the former one was revised. It stresses the management of river valley over water pollution and centralized management of sewage from urban areas and reinforced the protection of sources of drinking water against pollution.

Closing Ceremony

[15:30~16:00, March 18, 1997]

Closing Remarks
by
Fukusaburo Maeda
Chairman
Asian Population and Development Association

Honorable Toshitami Kaibara, Governor of Hyogo Prefecture; Honorable Kazutoshi Sasayama, Mayor of Kobe City; Honorable Shin Sakurai, Chairman of Asian Forum of Parliamentarians on Population and Development; Honorable Prasop Ratanakorn, Secretary General of Asian Forum of Parliamentarians on Population and Development; Honorable Katsuhide Kitatani, Senior Advisor of United Nations Fund for Population and Development, Honorable V. T. Palan, Regional Director of East and Southeast Asia and Oceania Region of International Planned Parenthood Federation, Distinguished Parliamentarians, Ladies and Gentlemen.

Thanks to your enthusiastic discussion and cooperation, we were able to complete the 13th Asian Parliamentarians Meeting on Population and Development in great success. I would like to express my heartfelt appreciation to all of you. I would also like to express my gratitude to Mr. Yukio Takenaka, Managing Director of Kobe International Association, Mr. Daisaku Komatsu, Secretary General of Asian Urban Information Center of Kobe, and Staffs of the secretariat.

This marks the thirteenth conference of Asian Parliamentarians Meeting on Population and Development. We have entered what is referred to in English expression as "teenager" We are interpreting this to be the point at which we will break out of seedtime and move on towards matured activities. We would like to request further guidance and cooperation of those of you who are here today in this regard.

We humans are not capable of surpassing the forces of nature. We have no choice but to engage in "the work humans are capable of" to the best of our ability. Our task is to maximize this work we are capable of through our intelligence and effort so that the future of humanity will be full of hope.

"Water, which has been the theme of this year's discussion is said to be the first resource to become scarce on this planet. Population is becoming an increasingly urgent task that must be addressed. The effort of parliamentarians is essential in creating a promising future for the humanity.

We were fortunate to hear the magnificent presentations by Dr. Zenbei Uchijima, Dr. Vo-Tong Xuan and Dr. Yasutaka Ogawa on wthe topic of water resources and population from their respective viewpoints of environment, agriculture and public health. We have also had the opportunity to hear thought-provoking reports by Dr. Shigeto Kawano

regarding a survey conducted by our association entitled "Basic Survey on Agricultural and Rural Development in Laos" and by Dr. Toshio Kuroda entitled "Survey on Urbanization and Development in the Philippines.

It would be of our utmost pleasure if the results of these studies could be reflected in the policies of your government upon your return.

Although APDA is a small NGO, we intend to continue our all-out effort to support your activities on population and development. I would like to conclude my speech by praying your safe journey home and strong reflection of the results of this meeting on the policies of your respective governments.

Thank you very much.

Closing Remarks
by
Mr. V.T. Palan
Regional Director,
East and South East Asia and Oceania Region
International Planned Parenthood Federation (IPPF)

Hon. Mr. Maeda, Chairman APDA

Hon. Mr. Shin Sakurai, Chairman, AFPPD, Mr. Kitatani, UNFPA,

Excellencies distinguished guests, ladies and gentleman,

On behalf of the International Planned Parenthood Federation (IPPF), I am pleased to be here with you, and to have the opportunity to say a few words at the closing ceremony of the 13th Asian Parliamentarians' Meeting on Population and Development. This meeting, in this beautiful city of Kobe, has a very illustrative lesson for all of us here today - what human leadership, ingenuity, determination and hard work can do to overcome harsh challenges in such an amazingly short time, as that Kobe has faced and overcome, since its tragic earthquake some two years ago.

The IPPF is the world's largest and leading non-governmental organization in family planning and reproductive health, and has always held the view that any significant progress in the field of population and development must have the leadership, support and commitment of Parliamentarians. Without the commitment financially, technically and politically by Parliamentarians, we will not be able to deliver our programmes in our respective countries - be it population and development, gender equity, food security or water resources. The harder and more complex the tasks, the more critical becomes the role of parliamentarians in mobilizing the support of the people and the political community nationally and internationally. It is therefore, a particular pleasure for IPPF to note the fine work done by Asian Parliamentarians over the last decade and a half and is continuing with its proud tradition in this 13th Asian Parliamentarians Meeting on Population and Development - this time discussing Water Resources and Population.

The meeting over the last two days, has had a full and comprehensive discussion and has addressed, through papers presented by eminent scholars, the issues of population and the life saving concerns of water resources. Undoubtedly environmental considerations, water resources and food issues affect and are affected by population numbers. If we are to succeed in the essential economic development of a nation, then, without doubt one can has to talk about water resources and its future. There can be no doubt that population issues seriously affect environmental concerns, and therefore, it follows water resources and the quality and quantity of water available. Without managing water

resources, we can't talk about population or its quality in a meaningful way. There is no running away from the fact that Parliamentarians have to tackle the population numbers and disproportionate consumption patterns and wastage, if one is to seriously address water resources, or food security or environmental issues. Population numbers and rate of increase in population is one key factor affecting all other considerations.

The origins of the Parliamentary movement on population and development was in Asia. This is the region that has consistently built on its records and has helped to expand the parliamentary movement to the other parts of the world. We congratulate you for addressing systematically not only the question of population numbers but also all of the related issues. You have not only obtained the involvement of official Parliamentary groups, but have also helped respective governments to appreciate the dynamics, and inter-relationship of population to other aspects of life, such as food, water, environment etc..

The last two days discussion have touches on many important issues linking water resources to the global environment, agricultural development and safe drinking water and the consequences to the health of the nation. These are important issues which policy makers in this part of the world have to consider as they move into the next century.

I believe we have had a very productive and beneficial discussion, which now needs to be further reinforced at the national level. Only by addressing these from the regional to the national levels, can we look forward to the better management of water resources, which will inevitably mean a closer look at the dynamics of population, both in terms of its numbers and growth rates.

While congratulating you on a successful meeting, may I also offer a suggestion for the future. The Asian Parliamentarian as a group has come a long way. It may now need to shift gears by moving into a new phase. This must be a phase where each national parliamentary group begins a process of strategic thinking - or what population and population relates issues are of most concern to them - so that the APDA can address them systematically and thus be of immediate and direct help. By gathering together the key national parliamentarians association concerns in population and development, the Asian Forum can get a range of issues and address them through presentations by internationally identified eminent scholars on these subjects, and south - south exchange of successful approaches. To facilitate this dialogue early identification of the subjects to be covered, circulation of papers, and focused comments from other countries with relevant experiences, will be of benefit. I believe this will be a further step in the right direction.

One again congratulations for productive meeting and wish you all a safe journey home.

Thank you.

List of Participants

AUSTRALIA

Hon. Colin Hollis, MP	Vice Chairman, AFPPD

CHINA

Hon. Zhou Dongwan, MP	Member, The Standing Committee Chairman, The Education, Science, Culture & Public Health (ESCPH) Committee, NPC
Hon. Hao Yichun, MP	Member, The Standing Committee Vice Chairwoman, ESCPH Committee, NPC Vice Chairperson, AFPPD
Ms. Li Ying	Staff
Mr. Yang Shengwan	Staff
Mr. Liu Mingchao	Staff
Mr. Cai Hong	Interpreter

FIJI

Hon. Dr. Apenisa N. Kurisaqila, MP	Speaker, House of Representatives Vice Chairman, AFPPD

INDIA

Hon. P.J. Kurien, MP	Member, The Indian Association of Parliamentarians on Population and Development (IAPPD)
Hon. Sat Mahajan, MP	Member, IAPPD
Mr. Manmohan Sharma	Executive Director, IAPPD
Mrs. Kaolash Mahajan	

INDONESIA

Hon. Taheri Noor, MP	

JAPAN

Hon. Shin Sakurai, MP	Chairman, AFPPD Executive Director, Japan Parliamentarians Federation for Population (JPFP)
Hon. Yoshio Yatsu, MP	Director, Chairman of Committee on Global Issue, JPFP
Hon. Yutaka Fukushima, MP	Member, JPFP
Hon. Senator Kayoko Shimizu	Secretary General, JPFP
Ms. Yasuko Kikuchi	Secretary to Hon. Senator Kayoko Shimizu

Mr. Hiromasa Kaihata	Secretary to Hon. Yuriko Koike, MP

MALAYSIA

Hon. Senator Ibrahim Ali	Deputy Secretary General, AFPPD
Hon. Senator Kamilia Ibrahim	
Hon. Senator Habshah Osman	

NEW ZEALAND

Hon. Jill White, MP	Chairperson of Social and Economic Working Party and of Regional Policy Statement Working Party

NEPAL

Hon. Dilip Kumar Sahi, MP	Vice-Chairman of National Assembly (Upper House)
Mr. Anil Kumar Pandey	Secretary

PHILIPPINES

Hon. Oscar S. Rodriquez, MP	

SINGAPORE

Hon. Chew Heng Ching, MP	

THAILAND

Hon. Senator Prasop Ratanakorn	Chairman, Senate Committee on Public Health
	Secretary General, AFPPD
Hon. Tarnthong Thongwasdi, MP	

VIETNAM

Hon. Nguyen Thi Than, MP	Chairwoman, Committee for Social Affairs
	Treasurer of AFPPD
Hon. Le Quoc Khanh, MP	
Hon. Vo Tong Xuan, MP	Vice Director, University of Cantho
Hon. Le Thi Liem, MP	
Mr. Nguyen Van Tien	Executive Expert of VAPPD

EXPERTS

Dr. Toshio Kuroda	Director Emeritus, Nihon University Population Research Institute

Dr.Shigeto Kawano	Professor Emeritus, The University of Tokyo
Dr. Zenbei Uchijima	Dean, Faculty of Humanities, Miyazaki Municipal University
Dr. Yasutaka Ogawa	Assistant Professor, The Jikei University, School of Medicine

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Mr. Tsuguo Hirose	Executive Director and Secretary General
Mr. Masaaki Endo	Project Manager
Ms. Harumi Osawa	Accounting Manager
Ms. Haruyo Kitabata	Manager of International Affairs
Mr. Osamu Kusumoto	Senior Researcher

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Mr. Katsuhide Kitatani	Senior Advisor, UNFPA

Hyogo Prefecture

Mr. Kazuyuki Imai	Vice-Governor
Mr. Yoshihiro Kobayashi	Secretary
Mr. Nagatoshi Oonishi	Senior Officer
Mr. Akinori Sugimoto	Senior Officer

Kobe-City

Mr. Kazutoshi Sasayama	Mayor of Kobe
Ms. Ritsuko Hamamoto	Chairperson of the Kobe City Assembly
Mr. Hirotoshi Numata	Manager of Agricultural Planning Division
Mr. Daiji Oda	Assistant Manager of Agricultural Planning Division
Mr. Masao Taniguchi	Manager of Agriculture and Fishery Promotion Division
Mr. Masashi Konmoto	Assistant Manager of Agriculture and Fishery Promotion Division
Mr. Kimihiko Murakami	Director of Engineering Department of Water Supply Bureau
Mr. Nobuo Sadoya	Manager of Purification Division of Water Supply Bureau

Kobe International Cooperation Center (KICC)

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Mr. Ikuo Sato	Director
Mr. Yoshihiro Imamura	Director
Mr. Tsukasa Hashimoto	Manager
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Ms. Kiyomi Sato	Vice President

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