

# Environment and Health Management for Climate Change in China

## Volume I – EH Governance and Management



Ministry of Health, P.R. China



Institute for Environmental Health  
and Related Product Safety, China CDC

**MDG Achievement Fund**

# **Environment and Health Management for Climate Change in China**

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Safety, C h i n a C D C

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## Forward

This report has as its primary focus the identification of the Capacity Building measures necessary to prepare China and in particular the Ministry of Health for adaptation and mitigation policy and practice to address the public health impacts of Climate Change.

The impact of climate change on health in China necessitates both health protection and health promotion responses. Mitigation of GHG emissions is a key government priority as reflected in its recent white paper outlining its planned emphasis on deceleration and adaptation – a key feature outlined in the white paper was the recognition of the need to enhance the countries capacity for sustainable development thus placing emphasis not only on addressing direct impacts but "enhancing the Capacity of Adaptation to Climate Change" (State Council Information Office 2008)

In this context WHO (2008) indicates "Adaptive capacity refers to both actual and potential features. Thus, it encompasses both current coping ability and the strategies that expand future coping ability. For example, access to clean water is part of the current coping capacity for developed countries – but represents potential adaptive capacity in many less developed countries.

The main determinants of a community's adaptive capacity are: economic wealth, technology, information and skills, infrastructure, **institutions**, and equity. Adaptive capacity is also a function of current population health status and pre-existing disease burdens."

### **Governance/ Institutions**

Countries with weak institutional arrangements have less adaptive capacity than countries with well established institutions. For example, institutional and

managerial deficiencies such as lack of good levels of collaboration and co-operation will contribute to China's vulnerability to climate change. Collaboration between public and private sectors can enhance adaptive capacity and in particular experience in implementation of policy to address climate change and health from countries such as Canada, UK and Australia indicate the importance of many attributes within government including;

- focused research on Climate Change and Health
- Education of community
- Utilization Risk assessment tools
- Engagement with community and health promotion
- Monitoring and assessment
- Effective Emergency responses
- Information sharing
- Local Planning and action
- Integrated governance

All of these attributes form important elements within what is more broadly a countries ' Environment and Health Management System'. International experience confirms that countries like China need to not only develop specific adaptations to expected climate change impacts but ensure it has the Adaptive Capacity, ie the ability of institutional systems to adjust and cope with Climate Change. The rebuilding or improvement to existing public health systems is considered the most cost – effective and needed adaptation strategy and can include aspects such as review and improvement of training, more effective monitoring systems and effective legislative controls and enforcement.

It is therefore of no surprise that a countries existing health burden is a vital ingredient in a countries adaptive capacity. China, like many countries face the

burdens of both increased in non- communicable disease and continued spread of existing and emerging infectious disease. China needs to ensure it has the best possible system in place to address these current health priorities as a first step in its adaptation planning as climate change can offer future amplification of the these health issues but also offers opportunities for health benefit through win-win mitigation and adaptation options.

This report therefore not only has a major focus was placed on improving the assessment, management and reduction of environmental health risks from both development and Climate Change, but recognizes that China needs improved mechanisms to integrate environment, health and development issues and to improve development planning and management at the local and national levels. It therefore places great importance to supporting the implementation of the **National Environmental Health Action Plan** focusing on management and governance systems development with a particular focus on the need to build capacity to enhance the systems ability to not only address the current disease burdens but to actively explore relevant adaptation and mitigation responses.

As stated in the Chinese Government White Paper;

"China will continue to follow the guidance of the Scientific Outlook on Development, unswervingly stick to the road of sustainable development, adopt more powerful polices and measures to strengthen the ability to deal with climate change in an all-round way."(State Council Information Office 2008).

This recognizes that *Sustainable Development* can reduce vulnerability and increase resilience to climate change—and reinforces the need to focus on adaptation capacity reflected in a countries environment and health management system as well as the more specific climate change health impacts , adaptation and mitigation polices.

## Chapter 1 Background

At present, human society and the economy are in a period of rapid growth, globalization of the world economy has become an inevitable trend. Tremendous changes have taken place in the world over the past 20 years. The world's population increased from 5.0 billion to 6.7 billion, per capita GDP got 2% growth at an average annual, the development of science and technology improved the human life and health. However, there are still more than 1,000,000,000 poverty population in the world, who lack of clean drinking water, adequate nutrition, comfortable housing and clean energy. These people are vulnerable to the environment and socio-economic changes. More and more obvious impacts have been showed of the complex natural systems by the scale of human activities. In the ongoing globalization of the industrialized world, the human activities of production and living and the environment have taken place in an unprecedented change significantly.

Air pollution and its health impacts call the world's environment and public health concern. Although in the recent years, urban air quality has improved, there are still a lot of serious air pollutions in the world which lead serious health damages. The air pollution has a wide range of sources, including industrial production, vehicles emission, energy production and so on which produce large quantities of atmospheric pollutants. The air pollution situation has different trends in different regions, take  $\text{SO}_2$  and  $\text{NO}_x$  for example, Since 1987, the emissions of North America, Europe and the developed countries showed a downward trend, while the emissions of Asian developing countries that in the process of industrialization over the past 20 years, showed a significant increasing trend. From 2000 to 2005, the emission of  $\text{SO}_2$  increased around 28% in China. From 1996 to 2003, the emission of  $\text{NO}_x$  increased around 50% in China. Globally,  $\text{PM}_{10}$  concentration in the

developing countries was significantly higher than it in the developed countries. Although the concentration of  $PM_{10}$  has shown a downward trend by the measures of pollution sources control, energy patterns change, but in many big cities the situation is still higher than in the World Health Organization recommended standards limit Value several times. The World Health Organization estimates that each year 800,000 young people died due to inhalation of atmospheric fine particulate matter ( $PM_{10}$ ) in the worldwide, of which 500,000 live in Asia and the Pacific developing countries. Poverty regions in developing countries widely use bio-fuel and coal as the main fuel for cooking and heating. The unclean fuel combustion, particularly the open or bad ventilation burning can release hundreds kinds of harmful pollutions to health and cause indoor air pollution. This situation which burning solid fuels will not much improved for a long period of time by the traditional life style and the economical restriction. Long term exposure to the serious polluted indoor air can cause the acute respiratory infection, COPD, lung cancer (by coal smoke), asthma, nasopharyngeal cancer, laryngeal cancer, tuberculosis and eye disease. Indoor air pollution in 2000 contributed about 3% of the global disease burden, the burden of the main causes of the disease in the rank of 8.

Safe drinking water, sanitation and good health are the foundation of human health and development. More and more people can get better water supply and sanitation, 83% and 59% population in the world can get the improved water supply and sanitation respectively in 2004. We indeed get improvement, but in the world wide, we have not achieved the MDG sanitation standard. These basic needs of life are luxurious to the poor population in the world. At present, over 1.1 billion people still do not use the treated drinking water; 2.6 billion people still lack basic sanitation. These figures in recent years and has not changed much. The movement of population from rural to urban areas which bring big challenge to the government and urban planners who have to extend the basic need of drinking water supply and sanitation services to the

urban surrounding areas, as well as the poorest of the poor population. With the rapid world population increase and social production development, a sharp increase in the number of living waste, commercial waste, municipal maintenance and management waste, as well as solid waste from industrial production. It is estimated that the global solid waste increase about 100 million tons every year. Solid waste components are complex, which is much higher than the natural self-purification capacity. If it is not cleared in time, by the process of sunshine and rain, the liquid toxic substances can leak into the soil and cause mosquitoes breeding bacteria increase, so that the disease spread rapidly and endanger human health. Each year, 20-50 million tons of electronic waste is produced around the world, most of the e-waste contains toxic materials.

Due to an increasing number of e-waste, as well as the growing trend of e-waste exports to non-production or use of countries to deal, 80% e-waste of the world were shipped to Asia, 90% of which was dealt in China, China is becoming the world's largest e-waste collecting and distributing center. How to deal with the complaints arising from pollution have become sensitive issues of the local environment and health management. In recent decades, more than 60 serious chemical pollution happened in the world, 40 -50 million people caused disease and 100,000 people died.

### **1.1 IPCC and The Route Map of Bali Island**

Among the numerous environmental problems, global climate change is the important one which attracts worldwide attention in recent years. Although the great effort has been making to improve the energy efficiency, the total energy consumption keeps increasing, from 5.559 billion tons of oil equivalent in 1990 to 7.645 billion tons of oil equivalent in 2004. Carbon dioxide emissions let out by fossil fuels is the major cause of climate change. However, since the mid-1990s, the proportion of fossil fuel consumption has not changed significantly in total energy consumption. Greenhouse gases produced by

human being are increasing at an alarming speed. CO<sub>2</sub> is the single most important infrared absorbing, anthropogenic gas in the atmosphere. For about 10,000 years before the industrial revolution, the atmospheric abundance of CO<sub>2</sub> was nearly constant at ~ 280 ppm. Since the late 1700s, atmospheric CO<sub>2</sub> has increased by 36%. The latest analysis of data from the WMO-GAW Global Greenhouse Gas Monitoring Network shows that the globally averaged mixing ratios of carbon dioxide (CO<sub>2</sub>) have reached new highs in 2006 with CO<sub>2</sub> at 381.2ppm (ppm = number of molecules of the greenhouse gas per million molecules of dry air), mean annual absolute of which increased by 1.93ppm during 1997~2006. The stratospheric ozone can be fully restored for a long time after the decrease of CFCs and HCFCs consumption.

Global warming has become an irreversible trend, and will become more serious in the near future. Humanity will have to bear the disastrous brought about by the climate change. Water shortage, quick melting of ice in the North and South poles, disappearance of some of the island caused by Sea-level rise, rainstorm, drought, heat wave and other extreme weather will occur frequently, biological chain has been disrupted and the infectious diseases will prevail. The marine survey found that the changing speed of the Earth is various and non-linear. *Global Risks 2007* issued on the World Economic Forum mentioned that the Climate change will become one of the world's most serious challenges in 21st century. Natural disasters caused by global warming may lead to large-scale migration in some areas, energy shortages, economic and political turbulence over the next few years. Stern Review on the Economics of Climate Change released by the end of 2006 warned that the world's annual economic will lose 5% -10% if the efforts to control the global climate change fail, as a consequence, an economic and social upheaval as the Great Depression will becoming. The report also shows that dealing with climate change will promote economic growth too. In 2006, the world stakeholders and social groups became more and more concerning about the

climate change. A recent international survey found that among the surveyed 30 countries, at least 80% of the people being surveyed in 27 countries believe that climate change was "very serious" or "rather serious"

To control greenhouse gas emissions and global warming, the United Nations Conference on Environment and Development adopted the *United Nations Framework Convention on Climate Change (UNFCCC)* in 1992. In 1997, the implementation of UNFCCC made a great breakthrough on its 3rd Conference of the Parties in Kyoto, Japan. All the parties adopted *Kyoto Protocol*, which made specific provisions on the types of reducing greenhouse gas emission, the timetable and the amount for emission reduction for the main developed countries and so on. The *Kyoto Protocol* came into force in 2005, but the United States and other industrialized countries refused to sign *Kyoto Protocol*, and the implementation of UNFCCC didn't get remarkable achievements.

On 15 Dec, 2007, the largest United Nations climate change conference in history came to an end in Bali Indonesia. After rivaling for Interests among the representatives of more than 180 countries, and at the last minute the *Route Map of Bali Island* was adopted, which laid a foundation for the greenhouse gas emissions negotiation when the first commitment period of *Kyoto Protocol* expire in 2012. *Route Map of Bali Island* is mainly about significant reduction of global greenhouse gas emissions, future negotiations should set specific greenhouse gas emission reduction targets for all developed countries (including the United States), developing countries should strive to control the increasing of greenhouse gas emissions with no specific targets, developed countries were obliged to help developing countries, such as technology development and transfer support, financial support and so on, to deal with global warming more effectively. At the end of 2009, new agreement will be adopted to succeed the *Kyoto Protocol*.

*Route Map of Bali Island* is a hard-won and landmark painting, which, for the first time, took the United States, who's greenhouse gas emissions account 1 /

4 of the total emission of the world, into the process of future negotiation of new agreement to slowdown global warming, and request all the developed countries must fulfill the measurable, reportable, verifiable responsibility for reducing greenhouse gas emissions. This is a delightful step forward. In addition, *Route Map of Bali Island* also stressed the importance of adaptation to climate change, technology development and transfer of the three funds, which have not been given sufficient attention in the past global climate change negotiations. For most developing countries, these problems are the key point to deal with the global warming and emissions reducing effectively, particularly on the 'Achilles heel' problems, such as transfer of technology and financial issues, in developing countries. Without the help of the developed countries, developing countries can only passively endure the disaster brought about by global warming, such as drought, floods, sea-level rise and so on,

Climate change is very complex and challenging problem. Decision-makers need objective source of information about the causes of climate change, its potential environmental and socio-economic impact and possible countermeasures. In 1988, the World Meteorological Organization and the United Nations Environment Program jointly established the United Nations Intergovernmental Panel on Climate Change (IPCC). IPCC is open to the World Meteorological Organization and all the members of the United Nations Environment Program. The role of the Committee is to evaluate the latest scientific, technical and socio-economic information about global climate change on a comprehensive, objective, open and transparent basis. These assessments have absorbed the research results of hundreds of the world's experts to ensure that the assessment report evenly reflected all points of view, and provide important scientific basis for international community to protect the environment and other aspects about climate. In 1990, 1995, 2001 and 2007, IPCC has completed and published four reports about global climate change, encouraged the United Nations to make the decision of map out the *United*

*Nations Framework Convention on Climate Change* , as well as did great contribution to negotiation of the *Kyoto Protocol*. IPCC Fourth Assessment Report assessed the latest findings on climate change comprehensively, systemically and comprehensively. Although there are still many uncertainties on the scientific of Climate Change, as a consensus document of scientific understanding of climate change among international community and governments, it will become an important basis for decision-making about how to deal with climate change. As the lead of IPCC's work, China Meteorological Administration and other departments, such as the Ministry of Foreign Affairs, National Development and Reform Commission, Ministry of Science and Technology, Ministry of Agriculture, Ministry of Water Resources, Environmental Protection Administration, Ministry of Forestry, Chinese Academy of Sciences, Chinese Academy of Social Sciences, and other related, all took part in the compiling of the Previous IPCC report and the government assessment work. These departments also held a series of international conferences and events relevant to IPCC and recommended more than 100 Chinese authors to IPCC. In the preparation process of IPCC Fourth Assessment Report, as the IPCC report's main author, 28 Chinese experts played an important role for the preparation of the report. IPCC efforts to deal with global climate change over the years have been recognized by the international community and won the Nobel Peace Prize in 2006.

## **1.2 Development of China National Environment and Health Action Plan**

Chinese government has persistently paid attention to the environment and health problems. Shortly after the founding of the People's Republic of China, "prevention first" was formulated as a health approaching guideline, and vigorous patriotic health campaigns were carried out for the extensive rehabilitation of environmental sanitation, which played a positive and irreplaceable role in preventing the outbreak and spread of epidemics, thus protecting people's health and ensuring the smooth progress of national

construction and economic development. Since the early 1980s, Chinese government has been keeping environmental protection as a basic national policy, developing and using natural resources reasonably, making efforts to control environmental pollution and ecological damage, preventing deterioration of environmental quality, and ensuring sustained economic and social development. For many years, our government has been continuously strengthening environmental and health management and research. Great achievements have been made in environmental and health protection, thus making positive contributions to economic building and social development.

However, compared to the situation of economic and social development, the environment and health work in our country is still weak in capacity and at a lower level. Since reform and opening up in 1978, with the rapid development of economy, people's expectations on living environment and health security are continuously rising. But the declines of environmental quality caused by pollution, the break of ecological balance, and the public health hazard are increasingly becoming the major factors restricting continuous economic growth and affecting harmonious society development. Realistically strengthening environment and health work, making efforts to solve the obvious contradictions among development, environment and health have become the major issues which need to be solved urgently.

Recently, the World Health Organization (WHO), United Nations Environment Programme (UNEP) and their partners cooperated closely with member states to advance the establishment of environment and health strategies and policies, proposed a series of recommendations on strengthening environment and health work, stressed the setting up of a long-term institutional cooperative mechanism between environment and health departments by drawing up *National Environment and Health Action Plan (NEHAP)* in order to promote the positive development of the environment and health work.

In order to effectively promote the environment and health work in China, as an

active response to the international community proposal, and in view of our obvious problems in environment and health areas, the leading group of environment and health was established by 18 ministries including Ministry of Health, State Environmental Protection Administration, National Development and Reform Commission, Ministry of Education, Ministry of Science and Technology, Ministry of Finance, Ministry of Land and Resources, Ministry of Construction, Ministry of Transport, Ministry of Water Resources, Ministry of Agriculture, Ministry of Commerce, State Administration of Radio Film and Television, National Bureau of Statistics, State Administration of Work Safety, Information Center Legislative Affairs Office of the State Council, China Meteorological Administration, State Administration of Traditional Chinese Medicine. Ministry of Health and State Environmental Protection Administration work as core members of the leading group. *China National Environment and Health Action Plan (2007-2015) (CNEHAP)* was developed jointly by the 18 ministries in 2007.

General objectives of CNEHAP were to improve legal, administrative and technological supports for environment and health activities, to control harmful environmental factors and their impacts on health, to reduce the incidence of environment-related diseases, to protect people's health, to promote the achievement of the restricting targets set in the State Outline of the 11th Five-Year Plan and UN Millennium Development Goals, so as to ensure the sustainable and coordinative economic and social development. The stage objectives during 2007~2015 were to fully establish a comprehensive environment and health cooperation mechanism, to develop the institutions for pushing forward the coordinative conduction of the environment and health work, to build the risk assessment system of health hazards caused by environmental pollution, to complete the comprehensive assessment of the existing laws, regulations and standards on environment and health, to propose the requirements of building systems of relevant laws, regulations and

standards, to complete a national survey on the current situation of environment and health, to fulfill the research and demonstration of an implementation plan for the monitoring network of environment and health, and to strengthen the scientific research on the assessment of environmental pollution and health safety. The stage objectives from 2010 to 2015 were to carry out research, development and revision of laws and regulations on environment and health, to perfect the system of environment and health standards, to expand the environment and health managing team and laboratory technical capacity, to basically accomplish the setting up of monitoring networks and information-sharing systems of environment and health, to realize the effective integration of environmental factors and health effects monitoring and information sharing, to perfect the risk assessment, forecasting and pre-warning of environment and health, to realize the multi-departmental collaborative emergency response to the public urgent events caused by environmental pollution, and to basically achieve a good situation that all social sectors participate in environment and health work .

According to the objectives, action strategies were put forward in CNEHAP as follow:

- To establish and perfect laws, regulations and standards on environment and health;
- To establish environment and health monitoring networks;
- To strengthen pre-warning of environment and health risks and emergency handling;
- To develop national systems of information sharing and services for environment and health;
- To perfect technical support capacity on environment and health;
- To strengthen propaganda and communication on environment and health.

As first programmatic document in this respect, CNEHAP will have great significance in guiding the scientific conduction of national environment and health work, and in promoting the sustainable development of our economy and society.

### **1.3 China's National Climate Change Programme**

From the late 1980s, Chinese government began to pay attention to the changes of economic growth pattern and economic restructure. Reducing the consumptions of energy and resources, promoting clean production and industrial pollution prevention and control become the important part of China's industrial policy.

By the implementation of *People's Republic of China Energy Conservation Law* and the related laws and regulations, the energy-saving work is promoted effectively. The Chinese 10000 yuan GDP energy consumption decreased from 2.68 tons of standard coal in 1990 to 1.43 tons of standard coal (purchasing volume in 2000) in 2005, the annual average was 4.1% lower. According to the method than the ring, in the 15 years from 1991 to 2005, China saved energy about 800,000,000 tons of standard coal, equivalent to the reduction of about 18 billion tons of carbon dioxide emission. Meantime, by the national policy guidance and funding, strengthen the hydropower, nuclear power, oil, gas and coal-bed methane development and use. In rural areas, remote areas and areas suitable conditions to support the development and utilization of biomass energy, solar energy, geothermal energy, wind energy and other new types of renewable energy. In China's primary energy consumption, the coal proportion decreased from 76.2% in 1990 to 68.9% in 2005; the proportions of oil, natural gas, and hydropower increased from 16.6%, 2.1% and 5.1% in 1990 to 21%, 2.9% and 7.2%. respectively in 2005. Renewable energy in 2005 has reached 166,000,000 tons of standard coal (including large hydropower), accounting for about 7.5% of total energy consumption which equivalent of 380,000,000 tons of carbon dioxide emission

reduction. As a responsible country, since the 1992 United Nations Conference on Environment and Development, the Chinese government issued the "China Agenda 21 - 21 China's Population, Environment and Development White Book" in 1994. At the year of 1996, China made the sustainable development as an important economic and social development guideline and strategic objectives for the first time and in 2003 formulated the *Program Sustainable Development Action for China in the early 21st Century*.

In June 2007, according to the *United Nations Framework Convention on Climate Change*, China formulated the *National Climate Change Program* which made clear the objectives, principles, priority areas and policy measures to China in 2010 to slow down and adaptation to climate change made a positive contribution. According to *China's National Climate Change Programme*, China will strive to achieve the following main objectives:

In the aspect of greenhouse gas emission control, by the year of 2010, the unit GDP energy consumption will be 20% lower than which in 2005, the proportion of total quantity (including large hydropower)of renewable energy development and utilization of the primary energy supply structure will increase 10 %. Coal-bed methane extraction volume will reach 100 billion cubic meters. Nitrous oxide emission of industrial production will maintain at the level of 2005. Forest coverage rate will reach 20%, the carbon sequestration will be 50,000,000 tons more carbon dioxide than 2005. In the aspect of climate change adaptation capacity, in the year of 2010, 24,000,000 hectares of improved grassland will be increased, 52,000,000 hectares of degradation, desertification and alkalization grassland will be managed, the coefficient of agricultural irrigation effective use will increase to 0.5. Ninety percent of typical forest ecosystems Systems and key national wildlife will be protected effectively. The nature reserve area will account for 16% of the total national area; 22,000,000 hectares of desertification land will be managed.

In the aspect of energy structure improvement, in the year of 2010, by the

means of hydropower development, nuclear power construction promotion and Coal-fired Power Plants technology progress the carbon dioxide emissions will reduce by about 500 million tons, 50 million tons and 110 million tons respectively. Through the great efforts to develop coal-bed methane industry, to promote biomass energy development, and actively support to use the wind, solar, geothermal, ocean energy, the greenhouse gas emission, carbon dioxide equivalent and carbon dioxide emission will reduce 200 million tons, 30 million tons and 60 million tons respectively.

China is still a developing country, there are many development problems to be resolved, but as a responsible member of the international community, China will continue to implement the *United Nations Framework Convention on Climate Change* and the *Kyoto Protocol* to make new contributions for greenhouse gas emission Control and global climate protection.

## Chapter 2 Project Summary

### 2.1 Spanish MDG Process and Outcomes

On 18 December 2006, UNDP and Spanish Government made an agreement to program €528 million over the next four years through the UN system, towards key Millennium Development Goals (MDGs) and related development goals in select countries. This agreement paved the way for the establishment of the UNDP/Spain MDG Achievement Fund (MDG-F) which was launched in the first quarter of 2007.

The MDG Achievement Fund aims to (1) Supporting policies and programs that promise significant and measurable impact on select MDGs; (2) Financing the testing and/or scaling-up of successful models; (3) Catalysing innovations in development practice; (4) Adopting mechanisms that improve the quality of aid as foreseen in the Paris Declaration on Aid Effectiveness.

The Fund established a number of thematic areas, including, gender equality and women's empowerment, economic and private sector development, culture and development and conflict prevention and peace building. The first thematic window to be established in June 2007 was 'Environment and Climate Change'. The process involved interested Countries submitting an initial proposal; a Concept Note which outlined the scope and resource requirements of the country proposal. In China, development of the 'Environment and Climate Change' proposal involved the UN agencies (UN agencies participating will include 9 Country Team members (UNDP, UNIDO, WHO, UNEP, UNESCO, UNICEF, ILO, FAO and ESCAP (APCAEM)) and one non-resident agency (UNCTAD) and Government partners developing the broad parameters of a proposal aimed at supporting the Governments commitment to both mitigation and adaptation strategies.

The primary aim of the proposed program entitled 'Climate Change Partnership Framework'. This program implements the new National Strategy through national policy/legal measures and improved local capacities and partnerships for financing and technology. It aims to ensure that vulnerable communities – including the world's biggest rural population – can adapt to climate impacts”.

In August 2007, China was invited to proceed to submit a detailed program proposal. This proposal was again developed by both the UN agencies and Government partners and included specific details relating to the phased implementation over three years, 2008-2010, of all proposed activities and resource needs. In December 2007, the UN County Team was successful in its bid to secure funding for a joint program from the Spanish Government to support China in its efforts to address Climate Change. The program, now endorsed by both the UN and Government began implementation in 2008. The following outcomes will be achieved through this joint program: (1) Mainstreaming of climate change mitigation and adaptation into national and sub-national policies, planning, and investment frameworks; (2) Establishment of innovative partnerships and dissemination of technologies to mitigate climate change and increase local access to sustainable energy; (3) Accelerated action by China in assessing vulnerability to climate change and developing adaptation plans and mechanisms.

## **2.2 Health Context**

It is estimated that climate change will have a great impact on human health, mostly in countries like China with poor environmental health systems in rural areas. In the health sector, a key planning document is the National Environment and Health Action Plan (NEHAP, adopted August 2007), which focuses on the relationship between environmental factors and human health impacts in China in order to recognize, evaluate, and better manage various environmental factors related to human health and ultimately promote people's

health. The NEHAP refers specifically to mainstreaming climate change considerations into control policies for all major health sensitive climate outcomes (such as water stress/desertification, flooding, dust storms, smog, etc.) and enhancing capacities to adapt to climate change. China has not yet conducted a national assessment of the potential impact of climate change on human health. There is a need to support China and the international community to better understand human health vulnerabilities and study adaptation and mitigation strategies. Therefore, the health-based joint program entitled “policies and capacities developed to manage environmental health issues from climate change” was approved.

This program will help develop capacities to implement climate change aspects of a new National Environment and Health Action Plan approved in November 2007. The Plan identifies the need to establish monitoring and health risk assessments related the risks to health posed by climate change. The overall strategy will be to facilitate a transfer of knowledge and skills that will enable the strengthening of environmental health risk managing functions in China among various agencies, especially in the health sector. The component will include development of a knowledge-base of good practice in environmental health management and improvements to policy and practice related to climate change mitigation and adaptation measures that could be used widely by municipalities and local and regional authorities. Results from this output include the implementation of the key elements of the National Environmental Health Action Plan focusing on improvement of the management of environmental health risks related to climate change.

WHO coordinates this joint program at international level. At the country level, the Ministry of Health (MOH) will be the projects' key focal point. The proposed activities include the exchange of international experiences on environmental health systems, leadership development for climate change and development of new environmental health management and information systems.

The focal point for health related activity is the Ministry of Health. The Ministry, together with other government agencies has now developed China's First National Environment and Health Action Plan, which seeks to develop strategies to address the many current and emerging environmental determinants affecting public health. The process of Plan Development has provided a powerful framework and collaborative network to facilitate the implementation of proposed activities and utilization of program outcomes related climate change and public health.

### **2.3 Objectives**

The relationship of this report with UN-China Climate Change Partnership Framework Project has shown in Figure 2-1. Under "UN-China Climate Change Partnership Framework Project", there are "Mitigation Projects" and "Adaptation Projects". MOH and WHO coordinate the project named "Policies and Capacities developed to Manage Environmental Health Issues from Climate Change" which is the subproject of "Adaptation Projects". In 2008, the outcomes of this coordinated project are four reports. As the first report of this project, this report will assess the environment and health management system in China.

The objectives of this report include (1) assess environment and health management system in China (2) point out and analyze the problems within the system (3) develop the recommendations for environment and health management system and the strategies to bring Climate Change and human health management into environment and health management system.

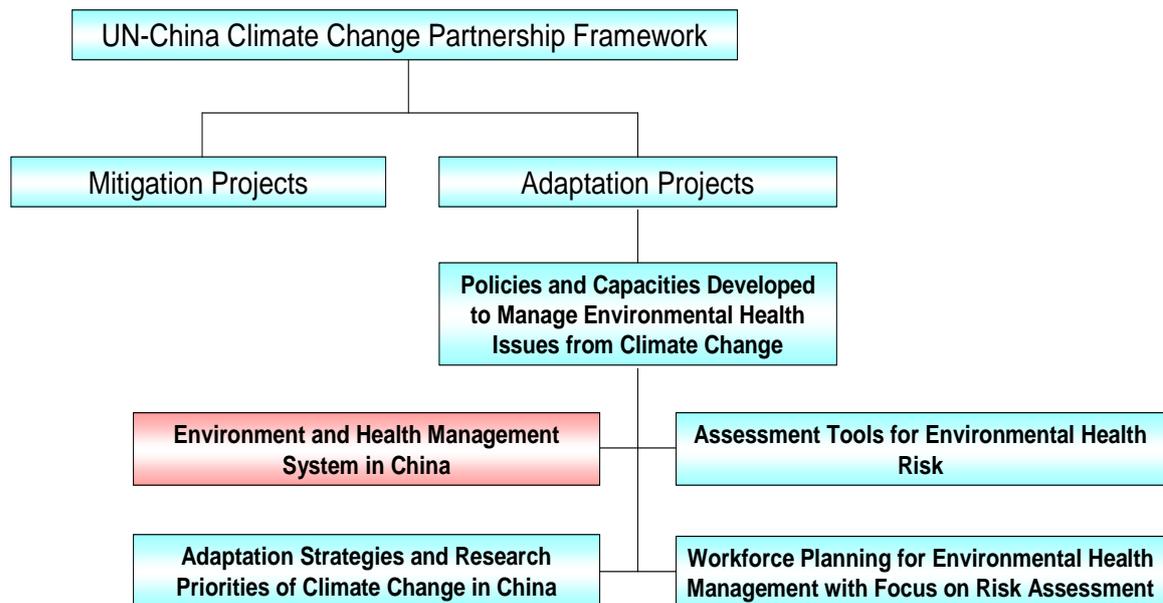


Figure 2-1 Relationship of this report with UN-China Climate Change Partnership Framework Project

According to above objectives, the technique route of this report was developed shown in Figure 2-2. Not only the materials searching but also questionnaires surveying were used in this report. First, via materials and questionnaires, we obtain the status of environment and health management systems in China. Second, we review the international management experience. Furthermore, we analysis the problems within the system and point out the gap to manage the climate change and human health based on present environment and health management system. At last, we will develop recommendations according to the present problems and gaps.

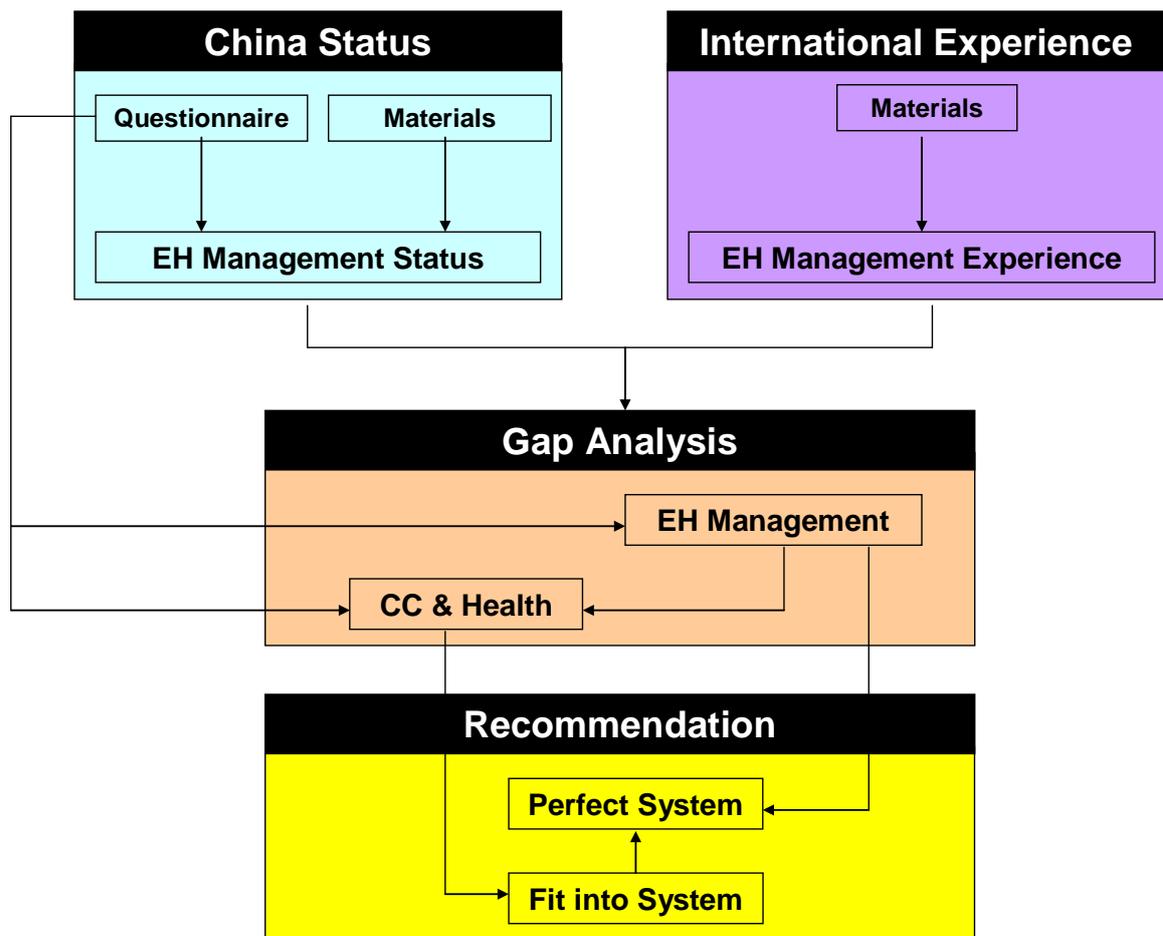


Figure 2-2 The technique route of this report

This report includes seven chapters which can be divided into three parts.

Part 1 Background (Chapter 1 to Chapter 3)

Chapter 1 Introduce international and Chinese background on environment and health and Climate change

Chapter 2 Summarize this background, objectives and methods of this project

Chapter 3 Focus on the reasons why we pay attention to environment and health and climate change and health in China.

Part 2 Status (Chapter 4 to Chapter 5)

Chapter 4 Address the status of environment and health management system in China

Chapter 5 Analyze the international management experience

Part 3 Problems and Recommendations (Chapter 6 to Chapter 7)

Chapter 6 Assess the present system and indicate the problems within the system

Chapter 7 Develop the recommendations

# **Chapter 3 Impact of Environment & Climate Change on Human Health**

## **3.1 Environment and Health**

### **3.1.1 The Summary of Global Environment and the Health Status**

The United Nations Environment Program issued a report named "Global Environment Outlook 4" on the 25<sup>th</sup> 10 2007. The report was scientific, comprehensive and authoritative, and provided a map of the Earth's environment to us. Environmental degradation of the Earth's current situation sounded the alarm to human once again. Despite governments and related agencies are working to improve the governance of environmental pollution since many years, however, there are a number of "illness" is still not resolved and not taken seriously - from the rapid rise of oxygen "dead zone" in the ocean, to old and new diseases of environmental degradation happening again. No matter what the level of economic development in the world, various countries and regions are facing a grim situation.

For the African region, drought and land degradation has exacerbated by climate change, and has affected rivers and forests. And then it become a serious threats the same as climate change and biodiversity loss. It affects the survival of humanity through pollution, soil erosion, nutrient depletion, water shortages, salinity and damage of biological cycle. Food production per capita has declined by 12% in Africa since 1981. The average infant mortality rate (54 per 1,000) is 23 percent higher than other developing countries, and is 10 times than industrialized countries. Climate change for poor countries is tremendous and long-term. In Ethiopia, climate change means that approximately 2,000,000 additional malnourished children in 2005. In Niger, the possibility of the height of the 2-year-old or children under the age of 2

borned in the drought year is lower than peers increase by 72% (UNEP Human Development Reporter 2007).

Developing countries faced with the double threat of the current environmental problems: the development of its own environmental problems and the impact of environmental damage caused by the developed countries. It should be noted that following problems including urban air quality and fresh water resources. In the northern hemisphere, the pollution to the ozone layer is increasing and is affecting human health and agricultural harvest - including some of the main crop production in developing countries. Acid rain problem in Europe and North America have reduced ("over the past few decades, one of the most success case"), but in parts of Asia it is still a threat to humanity. In developing countries, about annual 3,000,000 of population were killed by diseases caused by polluted water, most of them are children under the age of 5. It is estimated that 26 million people lack health-the-art facilities.

Second, outstanding problems also include the rapid expansion of the city, biodiversity loss, the coastline has been polluted, marine pollution, as well as difficult to deal with others new problems such as climate change and electronic waste, hazardous waste, illegal trading and so on.

Developed countries in Europe and America are working to resolve a number of a new type of environmental issues dues to high-speed economic development, although they still suffer from" the old diseases "of the lack of fresh water resources, low air quality, biodiversity growing scarcity, but the "new diseases" brought about by global climate change, ozone layer depletion, Toxic chemicals and hazardous waste transboundary movement, increasing the number of cars, huge energy consumption, and other issues is also urgent. Only 5.1 percent of the world's population are in North America, but they consume more than 24% of primary energy of the world's energy, where per capita energy consumption is 6.37, the total energy consumption in the United States increased by 18%, while the transport sector accounted for 40% of the

total energy used .This shows that the enormous pressure of energy is come from the expansion of transport. (UNEP Global Environment Outlook 4 2007)

Another environmental problem in developed countries is the increasing of e-waste. In Japan, the United States and the European Union, the proportion of e-waste in municipal solid waste is 1%, 2% to 5%, 4%, and this number is growing at a speed of 16% to 28% per year. This speed of increasing is 3 to 5 times than the growth of municipal solid waste. (Liang et al 2003)

### **3.1.2 Environmental Pollution and Health Status of China**

With the development of economic and the improvement of the people's living standards, environment pollution is getting worse and has been one of the common important subjects of the whole world. In China, environment pollution is just like a 'tumor' which is too difficult to cure to the economic development. In the pursuit of the GDP growth, environment always quietly under the heavy burden from the economic growth. It can be said that each environment disaster case is a weak-up call from the nature to us. The government of China has developed lots of polices and related laws, and made much efforts to slow down the step of environment degradation and protect the human's health. In recent years, the environment situation of China has improved significantly under the various efforts of related departments. However, as result of the unbalance of the economic development among the different areas, and the policies about environment and health are still at the exploratory stagy, the situation of environment and health in China still worrying.

#### **3.1.2.1 Air Pollution and Health Effects**

China's air pollution is growing along with the rapid development of modern industry, the increase of urban population, coal and oil fuel's rapid growth. A series of measures have been established to against this problem, include developing the related laws, regulations, polices and monitoring network of air and health. Although the air situation of China has improved, at the same time,

some new problems effected air quality also can not be ignored (eg. motor vehicle emissions).

Nationwide, coal-burning air pollution in China is still the main types of air pollution. The main pollutants are total suspended particles (TSP) and sulfur dioxide (SO<sub>2</sub>).The monitoring data of China's 31 provincial capitals shows that although the concentration of TSP and SO<sub>2</sub> in the atmosphere of most cities are still in excess of the national secondary air quality standards, The trend of the concentration of 23 cities' TSP in the atmosphere has been slowly declining (Figure 3-1), the concentration of SO<sub>2</sub> in 27 cities also is on a downward trend (Figure 3-2) in the past 10 years. This is mainly due to China's coal consumption steadily. At the same time, the adjustment of some city's industrial layout and industrial structure has led to reduce the concentration of air pollutants in urban areas. Since the 1990s, some cities in China due to the rapid growth of motor vehicles(Figure3-4), the concentration of nitrogen oxides (NO<sub>x</sub>) in the atmosphere of 14 cities is on an upward trend (Figure3-3).The type of air pollution in part of the cities has been changed from pure coal-burning pollution to the pollution caused by vehicle exhaust mixed soot. Nitrogen oxides (NO<sub>x</sub>) concentration in the whole country did not change significantly.

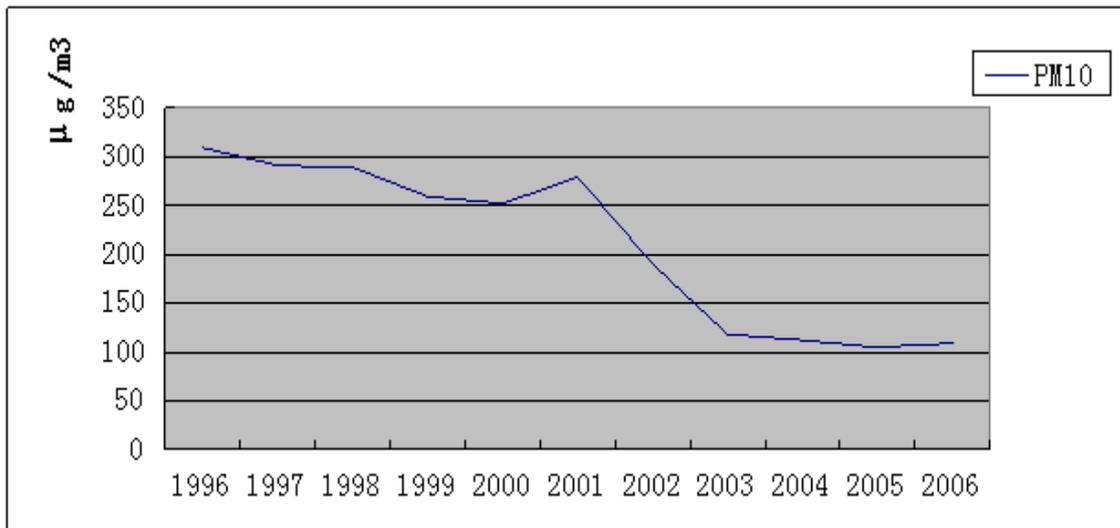


Figure 3-1 The trend of the concentration of PM<sub>10</sub> in the atmosphere in China's 31 provincial capitals in the 10-year

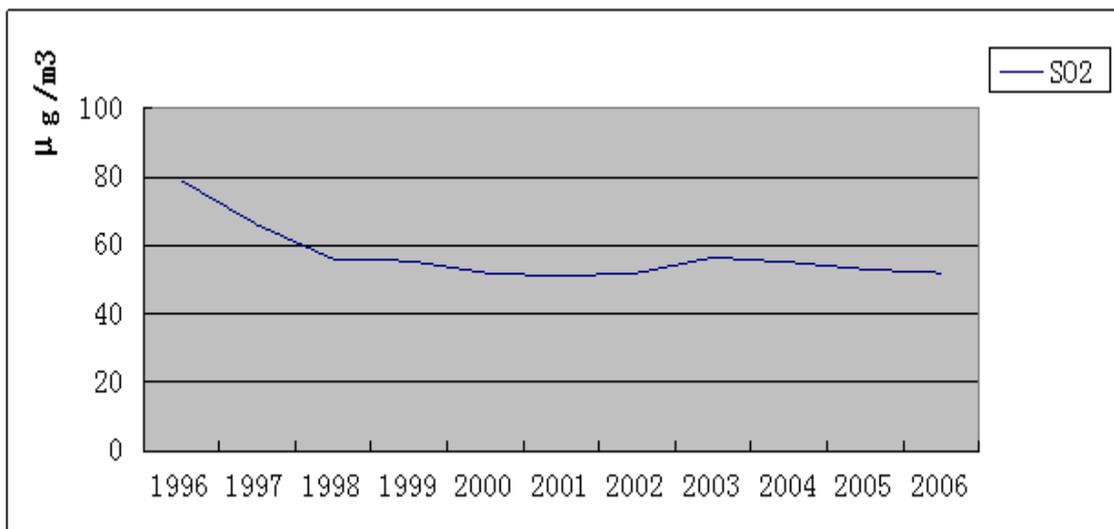


Figure 3-2 The trend of the concentration of SO<sub>2</sub> in the atmosphere in China's 31 provincial capitals in the 10-year

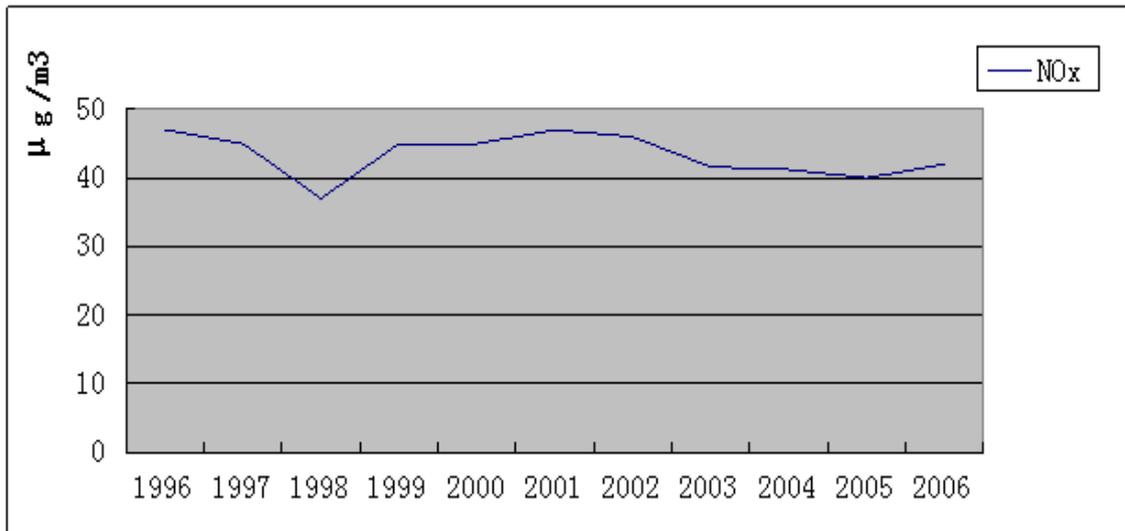


Figure3-3 The trend of the concentration of NO<sub>x</sub> in the atmosphere in China's 31 provincial capitals in the 10-year

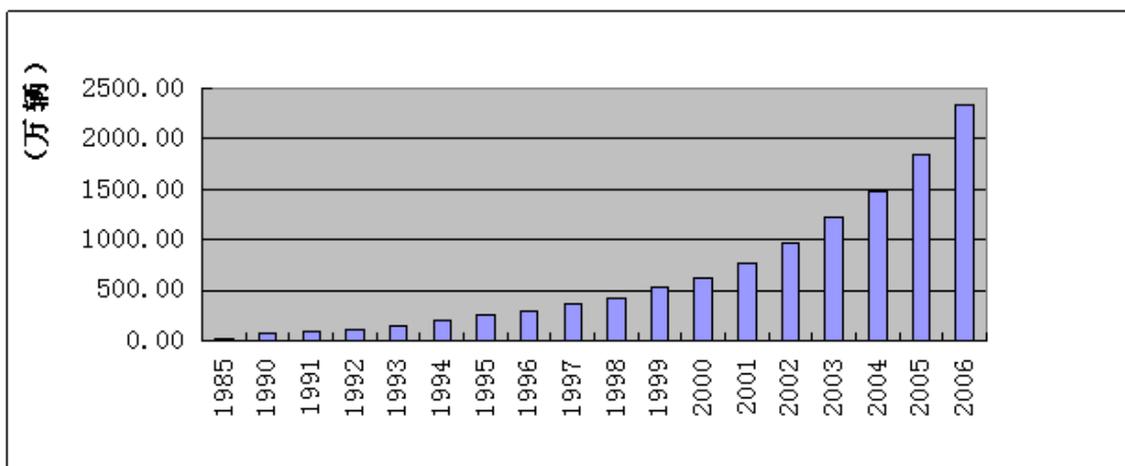


Figure3-4 The trend of the number of motor vehicle owned in China between the year 1985 and 2006.

(Data Resources: China Environment Yearbook 1998-2007; China Statistical Yearbook 1996-2006)

The hazards on the health caused by air pollution people have already been studied clearly. A study named "China's environmental pollution hazards to public health" was carried out by China's CDC. In accordance with the air

pollution index, 28 cities will be divided into heavy pollution (seven cities), moderate pollution (sixteen cities) and light pollution (five cities). The city-wide age group mortality due to respiratory diseases, COPD, pulmonary heart disease, cardiovascular disease, lung cancer and tumor of heavy pollution cities was significantly higher than that of light pollution cities. The mortality caused by respiratory diseases, COPD, lung cancer and tumor of 60-85 age group was significantly higher than that of light pollution urban (State Environmental Protection Administration of China, China Environmental Status 2007 ).

An investigation among China's traffic police by Chen FM and his partners(2005) showed that respiratory illness rate of China's traffic police was significantly higher than other occupational groups and is in the top of their various diseases list. And another study(Pei et al 1993) showed that the survival rate of traffic police sperm, the sperm density are also lower than that of other professional men ( $P < 0.05$ ), sperm motility also declined, with the rate of sperm malformations was significantly higher than other professional men ( $P < 0.01$ ). Bao YS and others(1996) have done a study to introduce that the spontaneous abortion rate of chauffeur and clerk was 8.2%, significantly higher than that of other professional women(4.6%,  $P < 0.005$ ), the incidence rate of babies with low birth weight born to this staff is 65.1 ‰ and significantly higher than the other female staff (30.4 ‰,  $P < 0.005$ ).

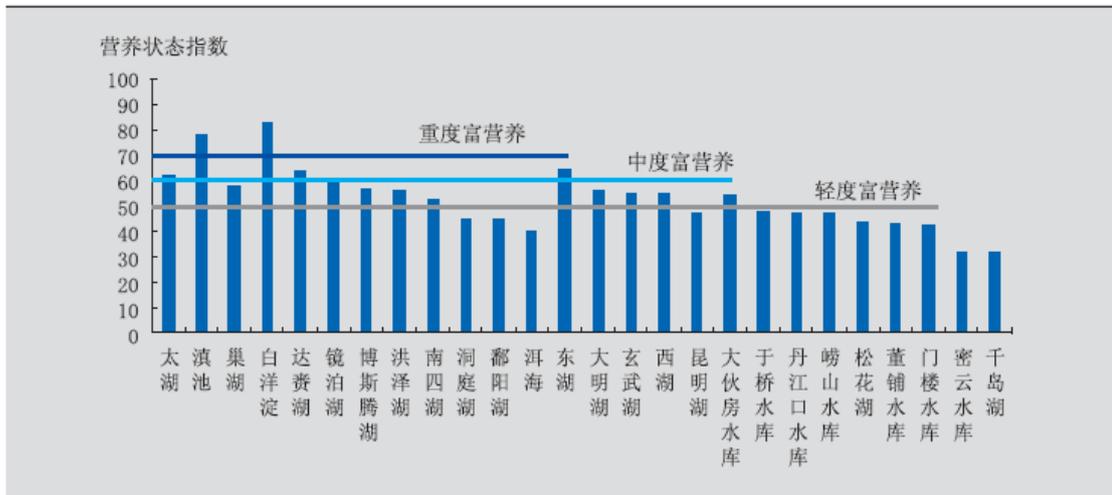
Lead poisoning of children once have a serious impact on our children's health issues. However, since promoting the use of unleaded gasoline in 1990, the average blood lead level of children has declined, lead poisoning situation has effectively improved. Despite the lack of national epidemiological data, some studies show that the use of unleaded petrol can effectively promote the health of children. A study (Zhang et al 2005) on children's blood lead level of China's 15 cities in 2005 shows that: Children's the average blood lead level is  $59.52 \mu\text{g/L}$ , the incidence of lead poisoning in children to 10.45% (A person

whose blood lead level  $\geq 100 \mu\text{g/L}$  is diagnosed with lead poisoning. Diagnostic Criteria of the U.S. CDC). This result is lower than the data (Children's the average blood lead level was  $88.3 \mu\text{g/L}$  and the rate of lead poisoning in children was 29.9%) of 6502 children's blood lead level studied by the Chinese Center for Disease Control and Prevention in 19 cities of China's 9 provinces in 2001 (Qi et al 2002). A investigation (Yan et al 2002) was carried out after promoting the use of unleaded petrol in Shanghai, the result suggested that the children's blood lead level had dropped to  $76 \mu\text{g/L}$  from the previous  $83 \mu\text{g/L}$ , the difference was significant.

In addition, indoor air pollution is also a serious threaten to the health of people in China, especially to women and children. At present, the main indoor air pollution problems of China's rural areas, include harmful substances dues to solid-fuel incomplete combustion, as well as the release of harmful substances caused by interior decoration materials. There are nearly 80% of households using solid fuels (straw, firewood and coal) as the fuel of life in China's rural areas. Solid fuel consumption in China's rural areas accounted for 90 percent of energy consumption. The survey carried out by China CDC in 2002 shows that in 221 patient districts and counties, 1,667,000 people were diagnosed with dental fluorosis, 1,460,000 people were diagnosed with skeletal fluorosis; about 45,000 people are exposed in coal-burning arsenic, of whom 3,000 were diagnosed as arsenic poisoning. World Bank estimates that additional 11.1 million people death from indoor air pollution every year in China. The out-patient cases number of respiratory is about 220,000 people, the number of emergency cases is 4,300,000 people. Economic losses due to indoor air pollution are about 10,700,000,000 U.S. dollars per year.

### **3.1.2.2 Water Pollution and Health**

At present, surface water pollution is still serious in China. China's water quality monitoring data (GB3838-2002 standard) shows that seven major water systems are moderate polluted as a whole. Liaohe, Haihe are seriously



polluted, the quality of rivers in Zhejiang and Fujian area and the rivers of south-west and northwest areas are good, outstanding problem of lake pollution is the eutrophication problems and the evaluated index is NQI. The most of lakes of China exist eutrophication problem of various degrees (Figure3-5). (State Environmental Protection Administration of China China Environmental Status 2007 ). The outbreak of blue-green algae in Taihu Lake directly led to water problems of millions of residents in May 2007. And then , the Chaohu Lake in Anhui province and Dianchi Lake in Yunnan province have emerged outbreak of blue-green algae one after another, also "black water" caused by blue-green algae appeared in Xuanwu Lake in Nanjing. So the situation of lakes in China is also worth to concern. China's ground water level and water quality still remain relatively stable situation, the water level of the deep water changes significantly than shallow water, the groundwater quality of the monitored area are mainly well. The trend of declining of water quality mainly existed in North, Northeast and Northwest of China, only a few regions' water quality are improved. (State Environmental Protection Administration of China China Environmental Status 2007)

Figure 3-5 The eutrophication situation of lakes and reservoirs in China

(Data Resources: China Environmental Status 2007)

Related survey shows that the non-standard rate of drinking water sources in China is 35.69% (Chen, 2008). The unsafe drinking water problem in China is not only water shortage, but also water pollution and clean water supply imbalance. Due to natural, economic, social constraints and other factors, drinking water situation is very different between rural and urban. The latest "Science Development Report 2007" published by Chinese Academy of Sciences pointed out that compared to urban drinking water, the situation of safe drinking water in rural areas can not be more optimistic. Assessment of the official data show that there are approximately 320,000,000 of the rural population are drinking unsafe water, of which 190,000,000 people drinking water with excessive hazardous substances. A research about Chinese environment hazards on public health carried out by China CDC (2003) shows that, the cases of water-based arsenic poisoning disputed in 9 provinces, the number of affected population is about 2,673,760(Arsenic in drinking water>0.05mg/L); the number of population of high exposure to arsenic in drinking water is about 834,389; the number of identified cases of arsenic poisoning is 7824. National endemic diseases statistics data show that national average prevalence of water-based dental fluorosis is 34.3%, the average prevalence of skeletal fluorosis is 1.64%.

The same as food safety, drinking water security have a direct bearing on the health of the masses. As destruction of the drinking water resources and environmental pollution, the effects on the health of people have become more prominent. The foremost reason of water pollution threatening the health of residents is industrial pollution. The cases of drinking water pollution caused by polluted water sources occurred frequently in the Yangtze River Delta, Pearl River Delta, and so densely populated, economically developed cities and towns since urban water supply stopped caused by the Songhua River pollution at the end of 2005. As a result of industrial pollutants with a persistent,

bioaccumulative, early low-level presence and other characteristics, it has not yet attracted enough attention. The harm is difficult to find early and it will be difficult to treat after finding the problem, human health and ecosystems can be a great harm. For example, the high incidence of cancer problem in the areas of China's Huaihe River valley, give us a wake-up call.

### **3.1.2.3 Solid Waste Pollution and Health**

With economic development, population growth and the process of urbanization speed up, solid waste in urban life has increased year by year in China. Especially in densely populated cities, solid waste caused by urban life has a serious impact on the urban quality of life and good health. The ingredient of urban solid waste is so complicated that could not be recovered and reused, so these characteristics of urban solid waste has become the bottleneck of improving the environmental situation.

Data shows that two-thirds of more than 600 cities in China were surrounded by rubbish, the per capita garbage production capability of China's urban is 0.4-0.6kg in the years 1982-1989, and this number has been achieved 0.76kg in the year 1990. The rate of innocuous disposal of domestic garbage in China achieved at 59.71% on average in the year 2005. (practical the proportion of truly coming up to the innocuous disposal standard is less than 20%) The rate of innocuous disposal of domestic garbage of 130 cities in China is 0, this number of cities account for the "test city" 25.59 percent of the total city. There are 80 prefecture-level cities of which centralized treatment rate of hazardous waste is 0 (reference building medical waste centralized disposal equipment).Solid waste could endanger the human's health through contaminative air, solid, water(Sun and Zhao, 2007)

With the rapid development of economic, e-waste is entering the vision of people's attention. China has a large number of population, about 400 million fridges,600 million washing machines,500 million TVs and computers and 10

million mobiles would be eliminated every year.(Lee et al 2003) In addition, many e-waste products in the developed country was dumped in China and the other Asia countries.(Hicks et al 2005) At present, although many technologies such as gadgetize of plastic, chemical recycling and thermal cracking have been developed(Hai et al 2005), incineration and landfill are still the main methods of disposing the heavy metal and plastic components in e-waste. Then this will lead to harmful substances into the environment and finally cause serious harm to the ecological environment and human health.

There exists a serious problem of environmental pollution in Guangdong, Zhejiang and other areas in which electronics industry is relatively developed, and has affected the health of local residents. Much content of injurious ingredients of atmosphere in the town of GuiYu in GuangDong province are much higher than them in some cities in the Asia countries. The concentration of Cr, Zn and Cu in the PM<sub>2.5</sub> is 4 to 33 times in other parts of Asia (Deng et al 2006). Leung and others (2006) had carried out a study on the environment pollution situation of E-waste recycling in GuiYu town, and the result showed that the contents of the same family compound of the single-PBDEs and seven PBDEs in the soil near the dump were 1140g/kg and 1169g/kg. A research by Yu and others (2006) showed that the content of Polycyclic aromatic hydrocarbons is 44.8-3206g/kg. Local food and the environment has been seriously polluted, causing toxic substances in the body of residents such as PCBs are severely overweight. PCB content in fetal cord blood was significantly related to it in urine of infants. These pollutants may be transferred to the baby through the mother and have a serious threat to the health of local newborns (Zhao et al 2006). An investigation about health of workers working on dismantling and recycling electronic waste once was carried out, and the data shows that not only workers engaged in the dismantling of e-waste own have a significant impact on health, and the micro-average rate of the peripheral blood lymphocytes (1.77 ‰) of the other residents lived in the areas

which have many dismantling factories is higher than the normal range (0-1.5 ‰) in this province.(Wu et al 2001) E-waste pollutants, including heavy metals, organic pollutants, can lead to a variety of adverse health effects to the human body. A number of overseas studies have found that PBDEs is a toxic substance. A research showed that it can interfere with the secretion of thyroid hormone and may lead to nerve damage of new-born mammalian, pregnant women, fetuses and infants are especially sensitive to it.(Cynthia et al. 2002; Ilonka ATM 2001; Thomas and McDonald 2002; Thon'men et al. 2002) Schechter et al (2006)'s study showed that the compounds of dioxins or furans can lead to immune deficiency, diseases of the nervous system, reducing lung function and the changes of plasma hormone levels and have carcinogenic. The result of Bennett 's study (2004) suggests that the contents of PCBs in blood is related to the changes of thyroid hormones, immune function, and the nervous system, the people who exposure to PCBs can changes in liver function, skin diseases, as well as to increase the risk of cancer. There are a few relevant data to indicate health effects caused by the e-waste in China.

#### **3.1.2.4 Environmental Pollution and Disease Surveillance**

With increasing concern of environment and health problem, many active measures have been taken out by China government and relative institutions to response the increasingly serious environment situation and improve China's ability of early warning, early prevention and control the environmental pollution-related diseases and protect the human health.

At first, the surveillance points of quality of drinking water and water-borne disease have been established in the 15 provinces of our country such as: Beijing, Heilongjiang, Shanghai, Jiangsu and so on. At the same time, urban drinking water health monitoring network pilot was launched. And take this work as a basis, related institution will gradually establish and improve the health of drinking water monitoring network. This work will include monitoring of water quality at all levels in the municipal water supply factory, as well as

water-borne disease surveillance. Through the infectious disease surveillance network and the cause of death surveillance point in the city, information related water-borne diseases are collected to form a water-borne disease surveillance network and to master the situation of water-borne diseases. The water-borne disease surveillance network will include the following content: to monitor water-borne gastro-intestinal infections (such as typhoid, cholera, dysentery, etc.); to monitor the cause of death of tumors and chronic non-communicable diseases; to monitor the acute chemical poisoning caused by sudden drinking water pollution; to monitor the endemic caused by drinking water and the other diseases caused by water.

At the same time, after the 10 years of effort, China's rural drinking water health monitoring network has been basically established. The main aim of this network is to monitor the type of rural drinking water sources, water ways, waste sources pollution situation, and finally know well the health status of the rural drinking water.

In addition, China's air quality monitoring network has also become more perfect. A project named "air pollution and diseases surveillance", which are responsible by institute for Environmental Hygiene and Health-Related Product Safety of China CDC, has been carried out smoothly. The aims of this project include: to carry out a network of air pollution and diseases surveillance in China's major cities; to monitor the level of exposure to atmosphere pollution risk factors and the human symptoms and signs through the collection of long-term weather and disease data; to forecast the health events caused by air pollution and the final aim is to reduce the health risk related with air pollution. Because this project is still in its demonstration phase, only four different type cities were chosen as pilot trials and community-based disease surveillance was launched. At present, the network has to provide a large number of rich data and information for the study of air pollution exposure on human health.

Finally, on the study of technical on monitoring load leveling of pollutants in the human, we are also carrying out many researches in order to make up for domestic-related fields blank in China.

### 3.2 Climate Change and Health

#### 3.2.1 International Brief Overview

The fourth assessment report of intergovernmental panel on climate change (IPCC), was published in August 2007, stated that the global temperature has increased  $0.74^{\circ}\text{C}$  in the past 100 years, especially in recent 50 years; and it will be increased  $0.2^{\circ}\text{C}$  once 10 years in the next 20 years.

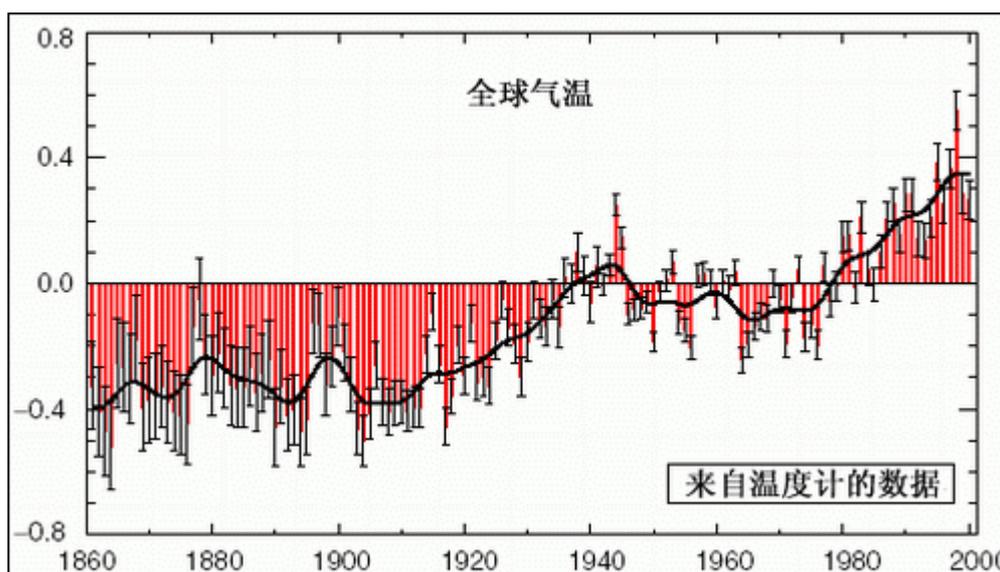


Figure 3-6: the global temperature changes Since 1860. Abscissa on behalf of the Year, Ordinate on behalf of the temperature, unit is degrees.

Climate warming caused a lot of danger to the human environment and human health, as a result of climate warming is the changing of climate zone, Tropical border will be extended to sub-tropical and temperate regions will become part

of the sub-tropical. It is estimated that the global average temperature rised 1 degree Celsius, the weather to bring about over 100 km polar direction, this can not be over uniform, Certain type of climate and climatic zones due to high mountains, ocean, desert and the barrier stopped or even disappear. And in the world, Africa is the tropical infectious diseases, parasitic diseases regions of high, particularly the largest origin of the virus. With the warming of the temperate regions, So that the infection or carry disease pathogens (especially viruses), insects and rodents to expand the distribution of the region, Each year against the extension of the deadline so that the spread of these diseases is possible.

Another result of climate warming is expanding of the scope of the suitable for the growth of animal breeding environment for media time and space, so that can expanding the breeding season of bacteria and viruses. The most direct impact of Global warming on human health is the extreme heat generated by thermal effects, it will become more frequent and more widespread. Due to intensity of high temperature heat wave and the increase of duration, the Morbidity and mortality of heart and respiratory disease were increased. And the impact of heat wave on the health in city is much greater than in suburbs and countryside. As the global climate warming, the number of day's high temperature in summer will increase by obviously and the frequency and intensity of high temperature and heat wave will increase by with that. In 2003 summer, the heat wave have swept the globe once again, First, India, Pakistan, and then in Europe, China, more than 1,000 people were killed by heat wave in India. (Lu Chen and Xie Pu, 2003). With the increased of temperature and heat waves, the morbidity and mortality of heart disease and high blood pressure patient increased. (Chen Hu et al. 1999) .

### **3.2.2 National Brief Overview**

The impact of Global warming on China is very serious. Since the 1950s, China's coastal sea-level rise rate of 1.4-3.2 mm per year. In the northern

Bohai Sea and Yellow Sea Ice decline in grade; A reduction of glaciers in the northwest area of 21%, Tibet's permafrost layer thinning, up to 4-5 meters. Drought in the north of the affected area to expand, increasing floods in the South; Agricultural production's instability increases, Partial drought endanger the temperature increase, Crop development period ahead of time, the cold resistance weakened, By the end of 2006, by the Ministry of Science and Technology, Chinese Academy of Sciences and China Meteorological Administration, and other six ministries jointly issued a "national climate change assessment report", The report pointed out: the future of our climate change will further accelerate the pace of, Most likely in the next 50-80 years, the country's average temperature 2-3 °C, it will impact the national economy significantly.

### **3.2.2.1 The Impact of Climate Change on People's Chronic Non-communicable Diseases**

Cardiovascular disease morbidity and mortality in a number of weather-related factors. Temperature is one of the major factors. Research shows that: the temperature change on cardiovascular disease mortality have a certain impact on, The maximum temperature on the day to reach a certain height, with the daily maximum temperature, With the temperature on mortality reduction and increased gradually, On the other hand, in the winter, when the temperature dropped to a certain temperature, with the temperature on mortality reduction and increased gradually. In Beijing, Nanjing, Guangzhou and Harbin, the study confirmed this(Zhang Lijuan et al. 1999).Pressure on the cardiovascular effects, research(Xu Zhao et al.1989) has shown that the majority of stroke, coronary heart disease and sudden death of high pressure was positively correlated.

Some research has shown that the temperature have a certain impact on the morbidity and mortality of respiratory disease. As Lu Chen's study in Beijing shows(Zhou Xiaonong et al. 1999) with the average temperature on the

incidence of respiratory disease was significantly positive correlation. In Guangzhou, Nanjing and Shanghai areas of study: the day of the summer the highest temperature reached a certain height, with the daily maximum temperature, respiratory disease mortality (rate) increase; Summer respiratory disease deaths (rate) a marked increase in the temperature threshold Guangzhou, Shanghai and Nanjing respectively 36 °C, 35 °C, 33 °C.

The incidence of respiratory diseases and the wet air pressure are also partly related, Tong Fagong (Zeng Yunhong et al. 2003; Sun Leping et al. 2001) et al. research confirmations, The average high or low atmospheric pressure (840 ~ 907hPa) (926 ~ 971hPa) and average relative humidity low (50% to 60%), with a high incidence of respiratory diseases. Wet air pressure on the poor greater, the higher the incidence of COPD.

### **3.2.2.2 Effects of Climate Changes on Vector-borne Disease**

Climate change caused by some infectious diseases and increasing transmission, increase the level and scope of cardiovascular disease, malaria, dengue fever and heat stroke, and other diseases (Zhou XN et al. 2001 ) Endanger human health; it has been observed that the emergence of new pathogens, caused by new infectious diseases, Often be most harmfulness' to human being, Virus or the bacterium ecological balance with the host, in a organism's habits buddy who builds newly, virus or the bacterium often establishes supremacy. (TDR, 2000).

The continuing climate warming, for insect-borne pathogens and parasites, reproduction and dissemination of creating suitable conditions, expanded the scope of the epidemic, the epidemic has depended the extent of the disease caused by a change in distribution, thus increasing the danger of the crowd (Zheng lun et al.1994).In our country, affected by climate change, the more insect-borne diseases including malaria, schistosomiasis, dengue fever and so on.

### **3.2.2.2.1 Malaria**

Malaria is the world's worst epidemic of insect-borne infectious diseases. China's malaria-endemic areas are mainly located in the south of latitude 45 degrees in most parts, and the land area in China accounts for 1 / 4 of the Qinghai-Tibet Plateau, malaria does not belong to the alpine zone. Global warming caused by changes in temperature and rainfall, malaria is bound to affect the distribution pattern of the original.

Anopheles is the media of malaria, by the Anopheles ecological effects of climate reflected in temperature and rainfall on the number of mosquito groups, in which the temperature on the density of mosquitoes have a greater impact(Chinese Academy of Medical Sciences Institute of Parasitic Diseases. Malaria practical learning [M], 1978; Xi Guo Liang, 2000). Larvae growth and development of optimal water temperature around 28 °C, the water temperature dropped to 28 °C from 25 °C, gradually slow down development, 25 °C following more slowly, 10 °C when the complete cessation of development (Zhou Zujie,1991). As a result, when warming, in a certain place on the lowest average temperature rose to 10 °C or higher, and the survival of a large number of mosquitoes can breed malaria-endemic area will be extended so as not a threat to the population immunity (Tian Wenqiang,2001).

Temperature affects not only the mosquito survival and life expectancy, but also effect the development of the mosquito parasite in the body. In 16 ~ 30 °C, the higher the temperature, the sooner the parasite development. Below 16 °C or 30 °C higher than that, were slow pace of its development. (Xu Zhao et al.1989;Yang Guojing,2002). With global warming, the original monthly average temperature of 16 °C lower than the malaria-free areas may become malaria-endemic area.

### **3.2.2.2.2 Schistosomiasis**

According to the existing series of studies show that(Zhou Xiaonong et

al.1999;Sun Leping et al.2001;Sun Leping,2000), global warming brought about by climate change, such as winter minimum temperatures, rainfall increased, the snail has brought the possibility of relocation. At the same time, South-North Water Diversion Project is located in the eastern mouth water snails distribution of Jiangdu City, Jiangsu Province, north of the river will pass through Lo Jiangsu Province, there are areas of Jiangdu, Gaoyou City, and three Baoying (County), together with the Jiangsu Lo area in the northern province have, in recent oncomelania density has gone up, thus diverting water flowing in the snails moved northward spread of the possibility of the existence of an objective, and to be able to monitor the spread of further propagation studies. As a result, global warming, the spread of schistosomiasis in China on the potential impact of the first through the spread of snail to the north, so that the expansion of schistosomiasis endemic area; at the same time, enable the original popular in the region of schistosomiasis prevalence has increased. And through the application of RS and GIS technology to monitor climate change with the analysis of the relationship between the spread of schistosomiasis, will help to predict schistosomiasis epidemic situation(Zhou XN et al. 2001)for schistosomiasis prevention and treatment decision-making on-site service.

#### **3.2.2.2.3 Dengue Fever and other Arthropod-borne Infectious Disease**

The world has more than 500 kinds of insect-borne virus which can cause more than 100 kinds of human diseases, where appropriate, insect-borne viruses can cause diseases related to the outbreak of the epidemic. Affected by climate change, the more insect-borne virus diseases including dengue fever, yellow fever and viral encephalitis (TDR, 2000; Zheng Lun et al.1994). The world has 250000-500000 cases of dengue fever, if not treated in time, the fatality rate as high as 40% to 50%, but rehydration therapy in a timely manner, will significantly decrease mortality. At present, the number of dengue fever mainly in the tropics, but with global warming, the spread of dengue fever may

be the expansion of (the spread of dengue virus mosquito easily sustained cold weather and frost killed)( TDR, 2000).

### **3.2.2.3 Impacts of Climate Extremes on Health**

Strong rains and strong convection, heat, drought, heavy snow, strong typhoons, the stronger the disaster, some of the extreme weather and climate events. Extreme weather events in the history of climate has occurred there, in 1998 China torrential rain and flood disaster, that year there were 22 provinces (autonomous regions and municipalities) have suffered varying degrees of flooding, the disaster-stricken population of 223 million, 3004 people died, it is estimated that direct 166,600,000,000 yuan of economic losses.( National Climate Center, 1998)<sup>[17]</sup>China was in 2008 snowstorm on January 10, 2008 from China, Zhejiang, Jiangsu, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang and Xinjiang Production and Construction Corps, and other 19 provincial-level administrative region are low temperature, rain and snow, freezing disasters, the death of 60 people; 2 people missing, emergency resettlement of the transfer of 1,759,000 people; crops 1000 hectares of the affected area of 7270.8; 223,000 houses collapsed, Damage to housing 862,000; 53,790,000,000 yuan in direct economic losses. One of Hunan, Hubei, Guizhou, Guangxi, Jiangxi, Anhui Province, 6, the worst affected areas. Drought can lead to lack of water, food production, leading to hunger, malnutrition or even death. According to the Chinese Ministry of Water Resources, an annual water shortage in the country 21.8 billion M<sup>3</sup>, which the water shortage in the north 18,100,000,000 M<sup>3</sup>. Hebei Province in 2002 as the continuing drought, 81 million people in the drinking water problem of seasonal occurrence, more than 2,000 hectares of farmland affected. Also in 2001 suffered a serious drought in Shandong, 218 million people in the drinking water problem. ([www.enviroinfo.org.cn](http://www.enviroinfo.org.cn)).

Tropical cyclone is also a major impact on our weather systems in the world. In

the course of its activities, accompanied by strong winds, heavy rain, huge waves and storm surges. As a result, after a tropical cyclone of the region despite the lifting of the role of late summer, but it can also cause people's lives and property of great loss. In 2005, the strong typhoon "Katrina" visit the United States, the direct economic losses of up to 125,000,000,000 U.S. dollars.

According to the 2020 and 2050 forecasts of climate change, it is estimated that summer mortality will increase greatly, especially the elderly particularly hard to adapt to high temperatures. The climate in Beijing and the health of the relationship between the study found that people over the age of 15, increased with age, changes in the temperature sensitivity of the human body has also increased, and more than 65-year-old age group had the most significant relationship between temperature and the death of its most Close. (Tong Fagong et al.1998) global warming on human health is the most direct impact on the extreme heat generated by thermal effects, it will become more frequent, more widespread.

#### **3.2.2.4 Climate Change and Agricultural Production**

Climate change has been China's agriculture and animal husbandry have had a certain impact, mainly since the 1980s, China in the spring of phenological ahead of the 2 to 4 days. The future of climate change on China's impact on agriculture and animal husbandry main problems: First, agricultural production increase, in the absence of adaptive measures, wheat, rice and corn crops are the three main production. Second, the distribution and structure of agricultural production will be changes in cropping systems and crop varieties will change. Third, the 17 agricultural production conditions change, agriculture and the cost of investment demand will increase significantly. Fourth, the potential trend of increasing desertification, reduce the area of grassland. Climate warming, the grassland area increased risk of drought emerging, longer duration, to further reduce soil fertility, the decline in primary productivity. Fifth,

climate warming on animal husbandry will also be some impact, some of the livestock disease may increase the incidence.( China National Climate Change Program).

The climate warming has the globalized characteristic and the historical root, question of the non-once here and there, also the non-pure climate question, the non-common environment question, must from politics, the economy, the society, the science and technology and so on each aspect make diligently, must realize the scientific progress diligently, slows down the climatic change, must take the effective action, deals with the threat which positively the climatic change brings.

Climate warming has the characteristics of globalization and historic roots, we must strive to achieve scientific development, the mitigation of climate change, but also to take effective measures to actively respond to climate change brought about by the threat.

## **Chapter 4 Environment and Health Management System in China**

Since reform and opening up, China's economy has been sustained and rapid development. With the improvement of living standards and the enhancement of health awareness, people's expectations on living environment and health security are continuously rising. But the declines of environmental quality caused by pollution and the public health hazard are increasingly becoming the major factors restricting continuous economic growth and affecting harmonious society development. Thus, to build a resource-saving and environment-friendly society, strive to solve the obvious environmental issue endangering people's health, ensure efficient environmental and health protection, as well as to promote the sustainable development of economy and society have become an important and urgent tasks for carrying on the scientific outlook on development, establishing in every respect the concept of people-oriented approach, and accelerating the process of building a socialistic harmonious society.

For many years, The Central Committee of the Communist Party and the State Council have persistently paid attention to the environment and health problems and have taken a series of effective measures in all stages of social development. Our government has set up environment and health agencies on all levels and has been continuously strengthening environmental and health management and research. Besides, the government has given a series of policies, laws, science and technology, financial support and so on. Great achievements have been made in environmental and health protection, thus making positive contributions to society development and protecting the fundamental interests of the broad masses of the people.

### **4.1 A Model For Chinese EHMS**

The Government, enterprises, non-governmental organizations and social groups as the three pillars of the modern social structure (Chi, 2003), which are indispensable parts of Coordination and operation in the modern society. The academic community holds that, If we consider the governmental organizations that provide the public interest by enforcement mechanism to be the first sector (Public Service); the profitable sector such as the enterprises that pursue the interests to be the second sector (private sector); then the non-governmental organizations and social groups that can effectively make up for the negative effect which caused by "government failure" and "market failure" and achieve close cooperation between the government, market and society ,which are considered popular in recent years to be so-called " third sector "(Guo et al, 2003) . The three sectors as pillars of social structure in our country, there is also no doubt that they have become an important part of the environmental health work system. However, the protection of the environment and health is taken as a job relating to the interests of the whole nation. Except for three sectors above, the public, being the most general and fundamental stakeholders of environment and health protection also become the important social strength that promotes the sustainable development about environment and health protection.

According to the basic characteristic and management foundation of the Chinese environment and health problems, at present, being the managing core of the environment and health work, the Ministry of Health and that of Environmental Protection take responsibility for the management and guidance on Chinese environment and health. Departments such as National Development and Reform Commission, Information Center Legislative Affairs Office of the State Council, Ministry of Scientific and Technology, Ministry of Finance etc, have given support on programming relating to environment and health, the establishment of the laws, the regulations, and the standards, safeguard on finance and fund, research and development of the scientific and

technology, etc. to make sure that the environment and health work effectively go on. In the management system of environment and health, taking the government as its main body (Figure4-1), the government can adopt administrative measures and legal means to directly conduct the management and education of environment and health for enterprises and the public, but also carry out the propaganda and education under the social groups and non-governmental organizations co-management. Enterprises and the public as managed objects which are monitoring and working in conjunction with the government's environment and health-related work, and actively reflect the appeals of their own. Being an important subject of China's market economic system, the enterprises are of economic and social attributes. And the social attributes decide that the enterprises must bear the corresponding social responsibility, which has a bearing on scientific development, social harmony, as well as the achievement of environment and health goals. The China government has always attached importance to promoting the fulfillment of corporate social responsibility through the enactment of relevant industrial policies, the active adjustment of industrial structure, taking a new road to industrialization and other measures to promote the construction of resource-saving and environment-friendly society. The measures have improved the quality of the environment, protected the public health and made the enterprises gradually realized that carrying out clean production was not just social responsibility of enterprises but also an effective way to sustainable development of enterprises. Of these, as the environment and health relevant special business, Eco-business develops gradually with the development of the environment and health protection. At present, China's environmental protection enterprises involved in the industry include: production and operation of environmental protection equipment (products), comprehensive utilization of resources and environmental services to three categories (Li et al, 2002) . Energetically developing the environmental protection industry in China is of great significance of the effective protection of our people's health

and the environment, and promotion of sustainable economic and social development. Environment and health protection is an affair that is not just a commonweal concept, but is closely related to everyone's self-interest. When the protection of environment and health is combined with the public interest, it will have a profound driving force. In the face of increasingly serious environmental and health problems, on the one hand, national public responds positively to the government's call, one after another participate in the creation of National Hygienic City, Sanitation Town, Green Community, Health Village and other activities to enhance their awareness of the environment and health and promote construction of China's environmental sanitation in urban and rural ;On the other hand, the public strongly urge the government to improve the level and ability of environment and public health services, supervise the government work related to environment and health, and give advice and suggestions to better protect their own rights and interests of the environment and health. However, due to the legal mechanism, funds guarantees, rules of the operational procedures and channel that China's public participate in environmental health-related work are not perfect etc., the social groups and non-governmental organizations which claim that protect environment and health as folk strength, with unique expertise, flexibility and the ability of the grass-roots level to go down to, and become a bridge that government, enterprises, and the public exchange of information, interaction of management. In our country, social groups and non-governmental organizations are the social organizations that between the government and enterprise, do not for profit, a formal of organization, and the provision of public goods and public services. With the exception of organization, volunteer and the public welfare characteristics, they also have their own characteristics. For instance, the officially registered social groups and non-governmental organizations are usually attached to the name of the administrative units so have a certain degree of dependence on government and often require the authority of the government departments to better the maintenance of their

survival and development (Wang et al, 2002). At present, the social groups and non-governmental organizations which China's take participation in the protection of environment and health are mainly three types -- social groups, domestic non-governmental organizations, representative offices of international non-governmental organizations (Figure4-2). In china's environment and health management system, the above-mentioned three categories of social groups and non-governmental organizations, on the one hand, they take the initiative to accept government regulation, to work with the government, to transfer the government policies, while at the same time they also carry out social supervision on the government, give advice and suggestions and actively participate in environment and health policy-making; On the other hand, the social groups and non-governmental organizations work together with the government to do management and education for the public and enterprises, while they also actively reflect the demands of the enterprises and the public and mobilize social forces to participate in the environment and health work to improve the environment and health awareness, so that the public and enterprises with a more positive attitude to participate in the protection of the environment and health work .So as to gradually form the government as the main body, social groups and non-governmental organizations as the bridges, businesses and public participation and many other common support, that is, "government leadership with public participation," the environment and health work situation ( "China National Environment and Health Action Plan ", 2007).

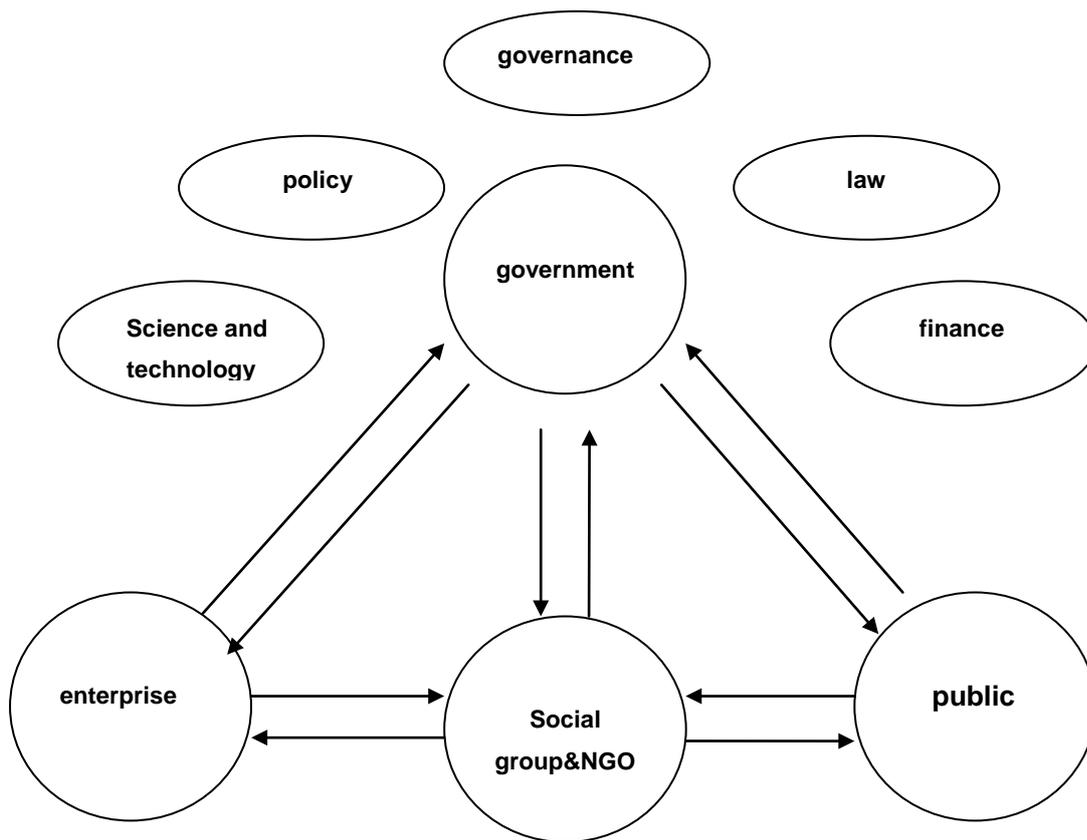


Figure 4-1: Government leadership with public participation

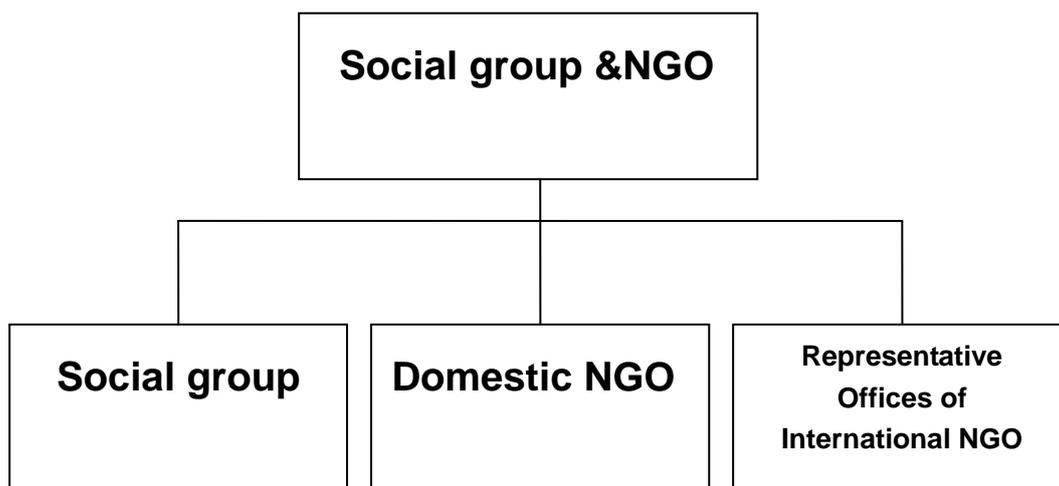


Figure 4-2: The types of social group &NGO in the field of environment and health in China

## **4.2 Management Support System in the Field of China Environment and Health Protection**

The problem of environment and health has its own complexity and determines to develop inevitably cooperation in environment and health management among departments of government. China National Environment and Health Action Plan (2007-2005) is the first programmatic document in respect and CNEHAP defines the fundamental principle of "Cooperation and integrated arrangement among sectors"----various sectors should strengthen their coordination and collaboration, make full use of existing foundation and resources, and draw up reasonable plans (2007). The establishment of the fundamental principle above has a great significance for coordinating the collaboration of relevant departments and defining the respective function.

### **4.2.1 To Promote Cooperation between Relevant Departments**

Coordination as one of the key elements in administration can ensure the effective implementation of environment and health work. As the core and leading departments of national environment and health work, Ministry of Health and Ministry of Environmental Protection have carried out a great deal of work in promoting coordination and cooperation of environment and health field , driving the smooth and scientific implementation of environment and health work and sound safeguarding the public health. In November 2004, the Ministry of Health aimed at the key problems in the field of environment and health and began to organize some experts to draw the "China National Environment and Health Action Plan" (2007-2005). This was a significant step in the field of environment and health work. Then in 2005 -2006, the experts on environment and health discussed the framework and content of "China National Environment and Health Action Plan"(2007-2015), the situation and tasks of domestic and international environment and health work, the current priority areas and specific cooperation projects and put forward new proposal in the first and second National Environment and Health Forum which were

organized jointly by the Ministry of Health and Ministry of Environmental Protection etc. In April 2006, the drafting group of the Action Plan with the Ministry of Health and the Ministry of Environmental Protection as leading ministries, and relevant departments participation was established formally. In February 2007, the "Coordination Mechanism of SEPA and Ministry of Health on Environmental and Health Work" was established by the Ministry of Health and Ministry of Environmental Protection. Furthermore, the national environment and health leading group with the vice ministers who are in charge of environment and health work of two ministry above as supervisor and Director General of business-related department as members was set up. The leading group steers to study the national macro-control policy on environment and health and guides the scientific development of environment and health work. At the same time, there were three levels organizations--Joint Office, Expert Consulting Committee, Theme Workgroup. They are responsible for the operation and coordination of relevant work, advisory advice and technical support, taking on specific responsibilities in a certain key areas of environment and health work, respectively. To ensure that the efficient operation of the different levels of the organization and the smooth and effective implementation of environment and health work, a routine meeting institution of leading group, a working system of joint office, a local working institution for coordination as appropriate coordination mechanism were also set up. Besides, according to the respective functions and work characters the Ministry of Health and Ministry of Environmental Protection also pointed out the orientation and content of the cooperation between them in this coordination mechanism. Such as, the ministries above conduct the monitoring of environmental pollution and its health hazards according to the practical needs of environment and health activities. The Ministry of Health is responsible for organizing and implementing the monitoring of health impact that caused by the environmental factors and the Ministry of Environmental Protection is responsible for organizing the environmental factors that affect

health monitoring, then the two ministries to share monitoring information and programs , coordinate and develop the environment and health risk evaluation and pre-warning work; to carry out survey on current situation of major environment and health; to organize and implement the projects and scientific research; to establish and improve the environment and health-related laws and regulations in cooperation, as well as” the system of the environment and public health emergency event information regularly informed and major events immediately announced”. The introduction of the coordination mechanism has great significance in defining responsibility of the Ministry of Health and the Ministry of Environmental Protection in the respective areas, strengthening the cooperation of inter-departments, and promoting the sustained, sound, sooth implementation of environment and health work.

November 21, 2007, under the Ministry of Health, Ministry of Environmental Protection and other relevant departments’ joint efforts, the state officially launched the "China National Environment and Health Action Plan" (2007-2015) which jointly signed by 18 ministries and commissions and put forward the framework of ideas and the target in stages on the national environment and health work from 2007 to 2015. This action plan points the way for china’s environment and health work. At the same time, in order to ensure the effective implementation of the country's environment and health work, the "action plan" specially emphasizes on the importance of inter-departmental collaboration and points out that it is necessary to establish a comprehensive coordination mechanism on national environmental and health in the 2007 -2010 year. That is, to establish the National Environment and Health Leading Group, the Secretariat Agency, the Expert Consulting Committee, and set up a routine meeting institution of the state environment and health leading group, a working institution of the state environment and health secretariat agency, a local working institution for inter-departmental coordination, together with an assessing and accountability institution.

Moreover, it also defines the division of duty on environment and health supervision among 18 departments in accordance with their respective administrative functions, and put forward the establishment of national, local and departmental cooperation working mechanism so as to provide the institutional and mechanism protection for environment and health work in future. Jan 31, 2008, in order to strengthen the leadership of environment and the health work and collaboration between departments, the General Office of the Ministry of Health and the General Office of the Ministry of Environmental Protection jointly issued the "Circular of the establishment of the National Environment and Health work leading group" in accordance with the "China National Environment and Health Action Plan ", and set up the national environment and health leading group with the vice ministers who are in charge of environment and health work of the Health Ministry and Environmental Protection Ministry as supervisor and Director General of 18 business-related ministries and commissions as members. The leading group steers to study the national macro-control policy on environment and health and guides the scientific development of environment and health work. Under the leading group there was an executive office-- Joint Office which was composed of the Ministry of Health and the Ministry of Environmental Protection and was responsible for the coordination and operation on environment and health-related work. In addition, there also defined the Liaison Offices which steer to carry out the specific environment and health work in 18 relevant ministries and commissions and the division-level leaders of the ministries and commissions as liaison officers who maintain regular contact with the Joint Office and assist the implementation of the sectors ' environmental and health-related work. The practice not only is favorable to fully exerting the departmental expertise and resources efficiency to carry out the specific environment and health work, but also ensure the arrangement and implementation of the Leading Group and Joint Office's work.

This shows that, the strengthening of the inter-departmental collaboration in health and environment-related work, particularly the cooperation of the Ministry of Health, Ministry of Environmental Protection and other main administration sectors is of great significance in comprehensive and effective implementation of environment and health work.

#### **4.2.2 To Identify the Responsibilities of the Relevant Departments**

Strengthening the coordination and cooperation of relevant departments, making full use of existing foundation and resources, and establishing the mechanisms of the unified multi-departmental collaboration, a clear division of responsibilities, is of great significance in ensuring the smooth and effective implementation of national environment and health work.

China is faced with the dual pressures of traditional and modern environmental health issues and a serious challenge, so that dealing with the environment and health issues is no time to delay. The Ministry of Health as head of the health departments of the State Council adheres to people-oriented and the scientific outlook on development, and takes the environmental pollution and its health effects and the disease prevention and control as an important task to develop the "Prevention First" approach and a number of targeted management policy. At the same time, the Ministry of Health as the central management and lead department of the environment and health work, together with the Ministry of Environmental Protection is responsible for organizing and coordinating the national environmental and health work, carrying out pollution-related damage to health and disease monitoring and management; developing environment and health policies, regulations and standards with the Ministry of Environmental Protection; framing the work plan and long-term planning of the Health Ministry; organizing the prevention and early warning of the environment and health work; providing the technical support for preventing the environmental pollution and the confirming the control object; carrying out emergency medical treatment on the environment

and health emergencies; organizing the investigation and research on environment and health problems.

Bureau of Health Supervision, Bureau of disease prevention and control (National Patriotic Health Campaign Committee Office), Division of Policy and Law etc. of the Ministry of Health, as the main departments which participate in the "Action Plan", they effectively perform the related duties on the field of environment and health around the "action plan". The Bureau of Health Supervision is mainly responsible for the supervision of environmental health, the establishment of the organization of environment and health work, the multi-departmental coordination mechanisms and systems of work, emphatically carrying out the survey on health impact resulted from environmental pollution, researching and establishing the risk assessment mechanism of environment and health, to promote the environment and healthy work. The Division of the Prevention and Treatment of Infectious Diseases and the Supervision and Management of Environmental Health which is attached to the Bureau of Health Supervision, has made a positive contribution, such as strengthening health education, supervising and improving the environment of the public's lives and work, improving the health knowledge and health awareness to effectively protect the masses health. Bureau of disease prevention and control (National Patriotic Health Campaign Committee Office) is responsible for the disease prevention and control and the patriotic health in accordance with the law which as the other one main participating department. Besides, proposing interventional measures for environmental pollution and other serious health hazard to public health issues, coordinating the implementation of prevention and control and intervention with the relevant departments, and establishing the Division of Environmental Health and Endemic Diseases and the Division of rural water renovation which steer to do some specific guidance in the environment and health-related work and so on, are also the main responsibilities of the Bureau of disease

prevention and control (National Patriotic Health Campaign Committee Office); At the same time, the Bureau of disease prevention and control (National Patriotic Health Campaign Committee Office) adheres to carry out the national patriotic health campaign, which as an ingenious and novel concept of China's environmental health work has improved the image of china's environmental sanitation and the health of the masses, had attached great importance to all levels of government, as well as the active participation and wide authorization of the masses.

In addition, the unit directly under the Ministry of Health, China Disease Prevention and Control Center is an important part of the system of public health and disease prevention and control. Institute for Environment Health and Related Product Safety (IEHS), China CDC is a national professional institution for environmental health and related product safety and it's responsibilities includes that: to provide technical guidance and instruction on environmental health and related product safety for all over the country; to provide scientific evidences and technological support for formulating related laws, rules, regulations and hygienic standards; to provide consultative service for the government making decision on environment health; to monitor and investigate environmental factors related to human health impact and environmental related diseases, so as to propose preventive strategies and control methods and to assess the implementing effect of the preventive and control program; to survey health hazard due to environmental pollution breakout, so as to provide technical support for environmental health emergency; to collect and release concerned environmental health information, preventive care knowledge, and to participate in community-based environmental health promotion work and so on .China Preventive Medicine Association is also directly attached to the Ministry of Health. The Environmental Health Branch of China Preventive Medicine Association also plays an important role in the field of environment and health. On the one hand,

to promote the communication and development in the environment and health disciplines, and propagandize environmental knowledge; on the other hand, to assist the health authorities finish the environment and health-related projects. The above-mentioned departments have played a positive role in reducing the occurrence of diseases related to the environment, controlling the harmful environmental factors and health impacts and safeguarding the public health.

The Ministry of Environmental Protection is another central management department of the environment and health. Department of Science, Technology and Standards, Department of Policies, Laws and Regulations, Research Academy of Environmental Science, Environmental Monitoring of China, and so on are attached to the Ministry of Environmental Protection. They being the important participant sectors in the "National Environment and Health Action Plan" are responsible for carrying out health-related environmental pollution monitoring, co-organizing the prevention, early warning of environment and health and the emergency handling of urgent public events by environmental pollution with the Ministry of Health, developing national standards for environmental pollution and control, formulating the policies, laws and regulations for environment and health with the Ministry of Health, developing the plan and long-term planning in the field of environmental protection, and so on.

The Department of Pollution Control which belongs to the Ministry of Environmental Protection is mainly responsible for drawing up and implementing the laws and regulations for the atmosphere, water, noise, solid waste, toxic chemicals, and motor vehicle pollution control, organizing and supervising the implementation of the programming of pollution control in national major river basins and regions, and guiding the renovation of the Urban and Rural environment, and so on. Besides, in order to better carry out pollution control and other related work, the Department of Pollution Control has been set up some relevant offices which take in charge of specific tasks,

such as the Division of Water Environmental Management, Division of Air and Noise Pollution Control etc. The Department of Science, Technology and Standards focuses on organizing and coordinating the scientific research and technology import on environmental protection, developing industry standards for environmental protection, and the management of national environment monitoring work. In January 2005, the Division of Environmental Health and Monitoring was set up under the Division of Science, Technology and Standards so as to improve management and technical support systems of the environmental protection sector. The division's responsibilities include that: to establish a joint working mechanism with relevant departments, to carry out the investigation and research on environmental damage, and to propose and organize the research projects required for the Environment and health management and so on. In addition, in China's environmental monitoring system, the Environmental Monitoring of China as a unit under the ministry of Environmental Protection is responsible for providing technical support, technical supervision and technical services for the environmental supervision and management of the Ministry of Environmental Protection. At the same time, the Environmental Monitoring of China as the national network center, technology center, information center and training center of environmental monitoring is also responsible for the management and guidance of the nationwide environmental monitoring system to promote the implementation of the environmental monitoring work. In the past years, the environmental protection authorities have established certain basis for environment monitoring work, provided a large amount of monitoring data, enhanced the environment and health work in a series of environmental supervision and management and have initially formed the environmental monitoring network system on the ground. The regular reporting system also has been established and various types of environment quality monitoring reports are compiled and submitted on a regular basis. However, environment monitoring work related to public health is rarely carried out in our own country, so it's difficult to provide

sufficient technological support to management on environment and health. Submitted to the Ministry of Environmental Protection, Chinese Research Academy of Environmental Sciences (CRAES) is a national non-profit institute for environmental protection and takes the responsibilities of providing of strategic foreseeing overall scientific and technological support to national environmental management and decision-making, serving for technical and consultative demands of main environment issues' engineering during social economic development, so as to play an irreplaceable role in improving scientific decision-making capability of China's environmental protection. Department of Research on Environmental Pollution and Health of the CRAES, Center for Climate Impact Research of the CRAES respectively have certain advantage of the risk assessment of environmental contaminants, exposure assessment and the research on countermeasures of climate impact etc. and promote the research on the relationship between environmental pollutants and health, the influence of climate and corresponding countermeasures.

National Development and Reform Commission (NDRC) is responsible for coordinating and organizing to develop the macro management and controlling policies which are propitious to the harmonious development of environment and health; putting the environmental and health work plans and mid and long-term programs into the program and plan for national economy and support them with policies and projects. The Department of Social Development is responsible for putting forward strategies for social development and coordinating development policies concerning population, education, public health and so on; advancing the society causes construction and providing a good environment for the management of environment and health work. The Environment Protection Division as a comprehensive coordination of environmental protection work in the NDRC, which belongs to The Department of Resource Conservation and Environmental Protection. This division is responsible for studying and putting forward polices for environmental protection; participating in the formulation of environmental protection plans .It's activities provides policy support for the environment and

health work. In addition, the Division of Response to Climate Change is responsible for drawing up the strategy, planning, policy in the field of climate change, coordinating and carrying out the international cooperation and capacity-building about climate change, and taking the special work that National Leading Committee on climate change, saving energy and reducing emissions to provide the policy support and guarantee in promoting the national environment, health, response to climate change.

Health education is an important part of the quality of civic education. Ministry of Education is responsible for incorporating the environment and health knowledge into relevant courses and special education programs; implementing the environment and health propaganda and education activities at schools; exploring the environment and health education that is suitable for Chinese conditions; keeping the environment and health education as an important part of the quality of civic education; improving the subject layout on the environment and health disciplines. So as to enhance the public awareness of the environment and health protection and participation sense; to promote the development of environment and health education to the Socialization, popularization, standardization and lay a good ideological foundation for environment and health activities. Improving education and personnel training has provided personnel and knowledge reserves for the environmental and health work and guarantee the effective implementation of policies and measures.

It is essential that mastering the environment and health status, developing the research of key areas according to the situation that confronted, enhancing the scientific and technological innovation and achievements transformation and can provide technical support for the environment and health work. The Ministry of Science and Technology as an important scientific and technological support department in the field of environment and health, is responsible for conducting the major scientific and technological research, incorporating the national major scientific and technological work of environment and health into national science and technology development

programs and national technology plans, incorporating the relationship between environment and health benefit into national key scientific and technological project , so as to provide the support of the technology and brainpower for the national environment and health work. The Division of Resources and Environment of the Department of Social Development as an important sector which participate in the "National Environment and Health Action Plan" play an important role in the resources, environment and health-related issues, the preparation and implementation of the project.

China's environmental and health work has been in the charge of different departments long since. Under the influence of such a system, the link between environment and health became a weak point in management and the money allocated for investments is not enough in public fields. Adequate fund is the basis of guaranteeing the environment and health work system in the normal operation. Giving necessary fund support for work concerned environment and health is an important aspect that Ministry of Finance should do in the field of health. Social Security Department is responsible for the capital budget, supervision, and management in environment and health work. This work will do enough preparations for putting the fund for environment and health management into the routine budget list and will be helpful to guarantee the implementation of "China National Environment and Health Action Plan".

Ministry of Land and Resources is responsible for the planning, protection, management and a rational use of the natural resources such as land resources, mineral resources, marine resources. Land and resources, education, science and technology, culture, along with Social Security as the basic department of the national economic development stimulates Chinese economic growth. This highlights the fundamental position of land and resources in the national economy. The Division of Geological and Environment belongs to Ministry of Land and Resources and is responsible for geological environmental protection, the monitoring and supervision of preventing pollution and excessive exploitation of groundwater, organizing and

coordinating the work of geological disasters prevention. These work will protect and improve the living environment and ecological environment for people and prevent a series of health problems which caused by environmental degradation.

Ministry of Construction (Ministry of Housing and Urban-Rural Development) is responsible for the preparation of urban and rural planning favorable for environment and health development, organizing and implementing water quality security of urban water supply, supervision and management of urban environmental sanitation, strengthening guidance and supervision of urban sewage treatment, and developing standards and norms related to relevant project construction, etc.. Division of Urban Construction as a part of Ministry of Construction to participate in the “China National Environment and Health Action Plan” and is responsible for the routine work which relates to the environment and health protection. For instance, drawing up the strategy, medium and long-term planning, reform measures, regulations of urban construction; Guiding urban water supply, water conservation, Municipal government on Environmental Sanitation, urban construction supervision, etc. These works have improved the living conditions of the residents and have provided advantageous conditions to the development of environment and health work.

Ministry of Transport is responsible for organizing and coordinating the environmental and health protection in transport industry; making the transport development plans and policies which will improve environmental and health protection; striving to control and gradually eliminate the pollution in transport enterprises and institutions’ production and construction process so as to safeguard human health and promote the development of transport industry. Division of Labor and Management Wages in Division of Personnel Labor has made significant contributions in environment and health work such as guiding the patriotic public health and preventing and controlling the infectious

diseases in transport industry.

In the new period, if we want to do a good job in our country's water conservancy work, we need to further establish and implement the scientific outlook on development and stress that to solve the principle contradiction and prominent issues remained in development. Safeguarding the drinking water, and protecting the people's lives and health are the primary tasks of the water conservancy work at present. Drafting plans of water resources protection; organizing the zoning of water function areas and the control of discharging sewage to the drinking water source and other water areas; the unified management, monitoring and supervision of water resources (including aerial water, surface water, groundwater), examining the pollutant receiving capacity of water areas; monitoring the quantity and quality of the rivers and lakes and proposing advice to restrict the total discharge of pollutants are the necessary measures that Ministry of Water Resources takes in the implementation of environmental and health-related work. Among them, doing a good job in guiding the work of rural water conservancy and attaching importance to the environmental protection in the zone of rural drinking water sources and the safety of drinking water quality are of great significance to our country that the agricultural population accounts for the majority of the population.

The Ministry of Agriculture as organs composing the State Council which takes charge of the development of agriculture and rural economic, play an irreplaceable role in the related monitoring work of agricultural environment and agro-biological security. The Department of Science, Technology and Education of the Ministry of Agriculture also play an important role in studying out the development strategies, policies and measures on agricultural science and technology, education, resources and environment, organizing the agricultural science and technology education, and the international exchange and cooperation etc., which further protect the agricultural environment and health work.

The Ministry of Commerce as organs composing the State Council takes charge of the domestic and foreign trade and international economic cooperation. For instance, the Ministry of Commerce through the development and implementation of policies related to import and export product directory etc. to eliminate the outmoded products, safeguard the environmental safety, and protect people's health. Under the Department of Mechanic, Electronic and Hi-Tec Industry, the Policy Division plays an important role in formulating the relevant trade development programs and policies which are favorable for environment and health development.

The State Administration of Radio Film and Television as an important publicity department about the environment and health work, is responsible for widely publicizing environment and health-related laws and regulations, the actualities, situations and challenges in china's environment and health work by television, radio, newspapers and other media. The Division of management of publicity of the State Administration of Radio Film and Television is responsible for drawing out the policies, planning of specific radio and television propaganda and the implementation of it, guiding and monitoring the propaganda and broadcast work of radio film and television, to improve the recognition of all sectors of society to the environment and health work, which is favorable to creating the positive atmosphere of the society as a whole to protect the environment and safeguard the health, and laying a solid ideological foundation and basis for the masses.

Environment and health information is the basis to control the environment on human health hazard and the important evidence of formulating national environment and health policies, regulations, standards. The National Bureau of Statistics of China plays an important role in constructing the information support of the national environment and health management system. The Department of Social, Science and Technology Statistics (Department of Population and Employment Statistics) is responsible for comprehensively

coordinating the information of social development, environmental health and so on, providing the survey statistics and inspecting, assessing the quality of the statistics, and guiding the establishment of the relevant database and information-sharing platform, so as to better serve the environment and health work.

In order to improve the quality of the environment, promote the development of security and safeguard people's safety and health, the State Administration of Work Safety as the general administration department in charge of production safety plays a significant role in developing environment and health protection programs in workplaces and organizing their implementation, so as to effectively implement the corresponding duty and protect safety and health of the masses in workplaces.

In the light of the China's environment and health work of the late start, most of the existing environmental management standards, policies, laws and regulations lack the convergence with the health problems, and there also lacks the environment and health-related laws, regulations, standards. Legislative Affairs Office of the State Council, in conjunction with relevant department, is responsible for conducting research, development and revision of laws and regulations related to environment and health to better ensure that the development of the environment and health work.

The meteorological services in China, which are based on sciences and technologies, fall into a category of basic public welfare service adhering, and adhere to the objectives of "taking the people as our fundamental interests, being thoughtful, considerate and ready for serving any customers anywhere at any time". China Meteorological Administration (CMA) as the administrative services and management division of national weather work, which is responsible for organizing the monitoring and forecast of meteorology, organizing the related meteorological researches, and providing related meteorological data. The Department of Forecasting Services and Disaster

Mitigation as an important sector which participates in the "China National Environment and Health Action Plan" is responsible for the joint meteorological prevention of major disastrous weather and forecasting air quality together with other departments to safeguard the people's health.

State Administration of Traditional Chinese Medicine is mainly responsible for the applied researches on traditional Chinese medicine in environment and health areas. The Science and Technology Division takes charge of studying out Chinese medicine science and technology development planning which relates to environment and health, organizing the implementation of major scientific research projects, and participating in the organization of Scientific and technological cooperation projects, so as to provide a broader technical support for the development of environment and health work.

Management on environment and health involves many departments and it's difficult to solve the existing difficulties and problems in the environment and health field by only relying on one department. To establish inter-departmental coordination mechanism on environment and health work by defining the division of tasks among departments in accordance with their respective functions and work foundation, developing their work plans scientifically, and fully exerting the departmental expertise and resources efficiency will be favorable to ensuring the smooth and effective implementation of environment and health work.

#### **4.3 China's Environment and Health Policy Support System**

Policy means that prescribed by the national party and government organs in the form of the authority, in a certain historical period, the goal to reach, the principle of action to follow, a clear mandate to complete, work method to adopt, general and specific measures to assume. The environment and health policies as an important component of the system of national policy, means that to protect and improve the environment and health, determine and

implement the lines of work, guidelines, principles, as well as a variety of countermeasures. Environment and health policy is not only the guidelines for environment and health behavior of at all levels of government, enterprises, institutions and organizations, and citizen, but also the actual code of conduct. So the policies are of guiding, standardizing and charisma in environment and health protection (Wan et al, 2003) .

In China, the Ministry of Health and the Ministry of Environmental Protection are responsible for the health work and environment work respectively. The status quo decides that China's environmental and health policies tend to show a certain degree of independence and complexity. Over the years, according to the current situation of China's environmental protection and the needs of people's health, the Ministry of Environmental Protection, the Ministry of Health and other relevant departments respectively established and implemented the basic state policy of "environmental protection" and the approach of "prevention first", as well as a number of other environment-related policies and health policies. In order to further strengthen the correlation between the environment policies and health policies, improve the system of environment and health policy, guide the allocation of resources and related work in the field of environment and health, the State Council and related departments introduced the "China Environment and Health Action Plan" (2007-2015), meanwhile, implemented a series of related policies, such as the prevention, treatment and redress of the environment and health damage, and the emergency response and handing of urgent events etc., and published a series of decisions, planning, action plans, notifications and so on in the field of the environment and health. In addition, in recent years, with the growing attention to climate change, how to better mitigate and adapt the climate change and protect public health based on the "China National Environment and Health Action Plan" and national conditions, become another new challenge of environment and health work.

#### **4.3.1 "China Environment and Health Action Plan" (2007-2015)**

"China National Environment and Health Action Plan" (2007-2015) is the first programmatic document in the field of China's environment and health, but also the most comprehensive policy paper in this respect. It has a great guiding significance of promoting the establishment of the environment and health strategy, policy, the foundation of the inter-departmental institutional long-term cooperation mechanism in the field of environment and health, and advancing the scientific implementation of the environment and health work.

"China National Environment and Health Action Plan" points out that China's environment and health work should be under the direction of the scientific outlook on development for achieving people-oriented, all-around, coordinated and sustainable development and the building a socialistic harmonious society, to adhere to the basic principles of "government leadership with public participation; cooperation and integrated arrangement among sectors; prevention first and strengthening monitoring; scientific implementation and carrying out measures", and puts forwards to the relevant action strategies , such as establishing and perfecting laws, regulations and standards on environment and health, strengthening pre-warning of environment and health risks and emergency handing, perfecting technical support capacity on environment and health, establishing environment and health monitoring networks etc.. In addition, in order to ensure the smooth and effective implementation of national environment and health work, the "action plan" also defined that, establishing coordination mechanisms on environment and health etc. guarantee mechanism and placing environment and health in the list of government priorities. It provides the guarantee of policy, organization and systems for China's environment and health work and plays an important role in the improvement of the environmental quality, the protection of public health and promoting the sustainable development of the society.

Since the "China National Environment and Health Action Plan" has been

introduced, the relevant ministries based on the principle and strategy of "Action Plan", have continuously improved the related policies and regulations, intensified scientific and technological support and the construction of monitoring network. At the same time, the relevant ministries also have carried out various activities and established the National Environment and Health Leading Group in 2008, to ensure the smooth implementation of environment and health work and make the "Action Plan" deserved better use.

#### **4.3.2 Preventive Policies in the field of Environment and Health**

Over the years, the Chinese government has consistently adhered to the "prevention first" approach, attached importance to the promotion and protection of environment and health work, and the relevant departments also have taken some measures to take precautions against the happening of environmental and health damage, such as a series of relevant policies and health education, environmental protection and monitoring, the protection of high-risk groups etc..

With increasing attention on environment and health, in the new period, the State continues to adhere to the strategy of sustainable development and the guiding ideology of people-oriented, through urban and rural planning, adjusting the industrial structure, environmental impact assessment, the management of public places hygiene etc. to improve the quality of the environment, prevent pollution and improve people's health.

In "strengthen ecological construction, protect and improve environment" chapter of the "Outline of the Tenth Five-Year Plan of the National Economy and Social Development" of 2001, stipulates "strengthen the comprehensive management of environmental pollution" and "promote cleaner production, pay attention to pollution control in key industries, control and address industrial pollution sources and close enterprises which cause serious pollution and

endanger people's health according to law". In 2006, the "Outline of the Eleventh Five-Year Plan of the National Economy and Social Development " ranked the "build a resource-conserving and environment-friendly society" as a chapter and described in detail "the development of circular economy", "reinforcing the dynamics of environmental protection" , then in the chapter of " promote building of a socialist harmonious society" took "raise people's health level" as an important strategic task . "National Program for Eco-environmental Protection" and other planning documents also include the policies of the prevention of environmental Pollution, and the protection of human health through planning. It is of great significance in improving the people's health that the protection of environment and health coming within the "Outline of the National Economy and Social Development " , the prevention and control of environmental pollution and ecological damage in economic development. At the same time, the State actively readjust the industrial structure, promote industrial upgrading, develop the renewable resources and recycling economy etc., and formulated and implemented a series of policy and planning to prevent environmental pollution, such as the "Renewable Energy Law" that provides the preferential policies for Renewable resources; "Some Suggestions on Accelerating the development of circular economy of the State Council " is focused on the provisions of the circular economy policy; In addition, the "Some Policies on Promoting the Development of Bio-industry" which was formulated by the National Development and Reform Commission together with relevant departments, is of great significance in the realization of major demand for the health, environmental protection, energy and materials in areas and new breakthroughs in key technologies and importance products, which is put forward in " The 11th Five-Year planning of the Bio-industrial Development " of 2007.

The system of environmental impact assessment is one of the main systems that China carries out the principle of "prevention first" and controls new

pollution, and means forecasting, analyzing and assessing the impact of environmental quality changes that may be caused by planning and construction projects on human health and the safety of such projects. As early as 1979, the "Environmental Protection Law of the People's Republic of China (for Trial Implementation)" provides for the system for the first time; Since then, in the "Management of Environmental Protection in Capital Construction Project" of 1981 and the revised supplementary document of 1986 provides specific provisions on China's environmental impact assessment system: Where engaged in the construction projects of environmental impact must be carried out environmental impact assessment, and implement the examination and approval system of the environmental impact report; without the approval of the project, the project will be launched. The Ministry of Health published "Appraisal of Impact of Environmental Pollution on Health (Tentative)" in 2001, which is a unified standard for appraising the damages caused to people's health by environmental pollution and incidents concerning the impact of environmental pollution on health in a scientific, correct and impartial way, is favorable for protecting people's health rights. On September 1, 2003, the "Environmental Impact Assessment Law of the People's Republic of China" (hereinafter referred to as environmental impact assessment law) was passed, and the promulgation of law is considered to be the most significant advances in China's 10 years of environmental legislation, then the EIA work in China has laws to go by. Since then, the "Environmental Impact Assessment Interim Measures for Public Participation" was issued in 2006, which had great significance in promoting and regulating the public participation in the environmental impact assessment activities, realizing the participation principle of genuine openness, equality, universality and convenience. Conscientiously implementing the system of environmental impact assessment is of an important significance in the control of environmental pollution and the improvement of public health. According to statistics, from the 2003 EIA law to be implemented by the end of 2007, China examined and approved the

construction projects 1,170,000, the field and scale involved were expanded (Guo, 2008), the rate of implementation of the environmental impact assessment has also been greatly improved. From 2006 to 2007, the former State Environmental Protection Administration didn't approve or suspend approval for 337 "two high and one capital" (high energy consumption, high emission and resource-based) projects which involved the investment of nearly 1.5 trillion yuan to curb the environmental pollution and ecological damage, and protect the public health (Law of Environmental Impact Assessment making 1.500 billions the pollution project hung, 2008).

In addition, strengthening the hygiene management of public place and establishing the suitable policies have great significance in improving the preventive policies in the field of environment and health. Since the promulgation of "health regulations in public place" and "implementation details of health regulations in public places," China's health monitoring in public places has been improved and the procedure of health laws and regulations also gradually standardized. In 2006, in order to further strengthen the health management of public places, protect the public health, and prevent the transmission of air-borne disease in public places, the Ministry of Health issued the notice of the "health management of central air conditioning ventilation system in public places", as well as the "health norms of central air conditioning ventilation system in public places" etc.. It has an important guiding significance of the health management of central air conditioning ventilation system in public places. In 2008, in order to further strengthen the supervision and management of health in public places, the Ministry of Health on the basis of "Law on the Prevention and Control of Infectious Diseases of the People's Republic of China" and "health regulations in public places" revised the "implementation details of health regulations in public places" and changed its name for "health supervision and management of the public places", then released on "health supervision and management of the public

places (the draft)" to seek the views of the letter. The activities show that the government emphasis on the health inspection in public places and have an important significant of the prevention of environment related diseases.

#### **4.3.3 Remedial Policies in the field of environment and health**

In the face of the problems that have emerged in the field of environment and health such as sewage exceeding the standards, how to prevent and control the further deterioration of environmental and health problems as an important part of the environment and health work, includes the management of environmental pollution and the treatment of health damage. The job is of great significance of the improvement of the quality of our environment and people's health.

Strict access of industry, standardization and elimination of related industries production, changes in the way of development, the implementation of energy reduction, the development of cleaner production, are an important way of the environmental management. In 1999, the State published the "Catalogue of Outdated Production Capacities, Techniques and Products to Be Eliminated Batch I, Batch II and Batch III", and "the Circular of General Office of State Council on Transmitting Opinions of State Economic and Trade Commission about Closing and Stopping Small Thermal Generating Units" etc. to eliminate backward production technologies, equipment and products, objectively prevent environmental pollution from further deteriorating and protected people's health. The "Outline of the Eleventh Five-Year Plan of the National Economy and Social Development "of 2006 provides that the total discharge of major pollutants will be reduced by 10%. The Ministry of Environmental Protection took the two pollution reduction targets for chemical oxygen demand and sulfur dioxide emissions to break down level by level, clearly defined responsibilities, concentrated efforts on the implementation and vigorously pushed forward the emission reduction of the structure, engineering and management, and introduced a series of policies of the

reduction of industrial pollution, such as industrial policy, , taxation policy, price policy etc. Besides, the Ministry of Environmental Protection issued the "Policy of the Use of Natural Gas," "Comprehensive Work Program of Saving Energy and Reducing Emissions ", "China Energy Technology Policy Outline (2006)" etc. in 2007, and by optimizing the using structure of natural gas etc. work to comprehensively deploy the saving energy and reducing emissions, clearly defined the assessment and accountability system that the energy consumption of key enterprises and major pollutants emission reduction targets of every provinces (autonomous regions and municipalities directly under the Central Government). It has an important significance for the energy-saving and emission reduction and the management of environmental pollution. In order to speed up the adjustment of industrial structure, standardize industrial behavior, reasonably and orderly develop the resources, improve the utilization rate of resources, and protect environment, the National Development and Reform Commission developed the "Lead-zinc Industry Entry Criteria," "Coal Industry Policy" in 2007, which is of important significance in the development of cleaner production, the protection of the environment and health related to industry. In 2008, the introduction of "Management of Plastic Shopping Bags Compensation for the Use in Merchandise Retail Establishment" has played important canonical role in saving resources and protecting the ecological environment. In addition, perfecting the environmental and economic policies, including funding and tax preferential policies, such as giving financial support to the key national pollution control and ecological protection projects; using the pollution discharge fee for the prevention and control of environmental pollution; using the wastewater, waste gas, waste residue as raw materials for production will be reduced or exempted from income tax in five years etc., which has an important guiding role in the control of environmental pollution (Peng, 2001) .

With the increasingly grim situation of environmental pollution, the damage to

health caused by environmental pollution incidents also is rising. At present, the governance of health damage mainly through the health sector to solve the problem. Ministry of Health of China as the administrative department of health work, has always focused on "improving the level of the people's health" and given medical treatment for health damage caused by various reasons though the System of Medical Insurance and Medicare Assistance System etc., so as to make outstanding contributions for the protection of people's health. However, in aspect of the treatment and remediation of health damage caused by environmental pollution, China is still a lack of specific policies. In order to improve the status quo, in 2006, the Ministry of Environmental Protection issued the "reply on carrying out environmental health damage assessment of the Chinese Society for Environmental Sciences", and agreed the Chinese Society for Environmental Sciences to set up an Assessment Center for Identification of Environmental Damage and carry out the relevant survey, assessment, technical advice and services etc.. The decision is of important guidance and promotion for the establishment of treatment and remediation policy of China's environmental health damage, and is favorable to safeguard public health.

#### **4.3.4 Emergency Policies for Emergent Environment and Health Incidents**

With the rapid development of economy and society, environment and health emergencies often occur and they are a serious danger to the normal life and productive activities of the people. In order to improve the emergency monitoring and disposal capacity of the relevant departments and prevent and control the public emergency brought about environment and health damage, the state in areas such as environment and health adopts a series of corresponding policies and measures.

In order to intelligent use the country's the response to emergency right and public resources, in 2005, the State Council divides the public emergencies into natural disasters, accidents and disasters, public health incidents and

social safety incidents four categories (Ma et al, 2005 ) in "the draft law on a state of emergency", and environmental pollution and ecological damage as an important component of the accidents and disasters, they are of great significance of the China's environmental protection work. In the new period, the establishment and improvement of the emergency response mechanism to enhance the government's ability to deal with the crisis is crucial. Since 2003, the Chinese government has gradually built and improved an emergency preparation system for emergent environment pollution incidents, published "the Master State Plan for Rapid Response to Public Emergencies" as the regulatory documents to prevent and handle public emergency. Besides, the government also issued "the State Plan for Rapid Response to Public Emergencies", "the Technical Norms for Emergency Monitoring of Emergent Environmental Pollution Incidents" and other documents that specially respond to the emergent environmental events, and opened a system for directly reporting information on emergent environmental pollution incidents which is of great significant in the prevention, monitoring, emergent handling, disposal and remediation of the sudden environmental pollution accidents, the establishment of a rapid and effective emergency response system and emergency rescue mechanisms, and minimizing the ecological damage to the environment etc.

In the field of public health, China is entering a high-incidence season of the public health crisis (Cao, 2004) , including infectious diseases, collective diseases with unknown causes, food safety and occupational hazards, animal epidemics and other emergent events that have caused or may cause serious harm to the society and the public or have a serious impact on public health etc., then in 2003 the outbreak of the Severe Acute Respiratory Syndrome (SARS) caused the Chinese government to attach great importance to public health emergency. In May of the same year, the State Council promulgated the "Public Health Emergency Response Ordinance", which put the public health

emergency on a legal track. On March 5, 2004, Premier Wen Jiabao in the government report clearly pointed out: "We should strive to basically complete the Disease Prevention and Control, Treatment System covering the rural and the urban areas and functions perfect, and improve the response ability to major infectious diseases etc. public health emergencies in 3 years." Moreover, the State in responding to health emergencies above issued "the Master State Plan for Rapid Response to Public Emergencies", "the State Plan for Rapid Response to Emergent Public Incidents by Medical and Health Aid ", "the State Plan for Rapid Response to Emergent and Major Animals' Epidemics" etc. and established emergency reporting, monitoring, warning and information-releasing systems. These systems are favorable to actively responding to all types of public health emergencies in the field of public health, earnestly safeguarding the public health security of our country, and also promote the institution-building in dealing with public health emergencies, improve its early warning capability.

In 2007, on the basis of a series of policies that focus on emergent environmental pollution events and public health events, the Ministry of Health and the Ministry of Environmental Protection jointly issued the "Collaboration Mechanism of State Environmental Protection Administration & Ministry of Health on Environment and Health Work", which definitely stipulates the response on emergencies of environment and health. That is, if the emergencies of environment and health should occur, the corresponding departments of the Ministry of Health and Ministry of environmental protection will be joint action, specifically take charge of relevant work, together protect the public's health and life security. In addition, the mechanism also proposes the establishment of the system of the environment and public health emergency event information regularly informed and major events immediately announced etc. There is an important guiding significance in the construction of emergency handling policy system of China's environment and health. The

same year, the "China National Environment and Health Action Plan" (2007-2015) as the first policy documents for specifying the pre-warning of environment and health risks and emergency handling was introduced, and explicitly put forward the requirements of carrying out environmental and health risk assessment, strengthening pre-warning of environmental and health risks, as well as strengthening the capacity of emergency response and handling. Moreover, the "Action Plan" elaborates on the contents above, Such as, in aspect of strengthening capacity building on health emergency incidents handling, it requires that "According to relevant laws, regulations and departmental functions, to establish working systems of emergency response and handing of urgent events, and reporting mechanism of urgent and major events; to define emergency response and handing arrangements of urgent public event caused by environmental pollution; to enhance the emergency response and handling abilities by integrating corresponding institutions or positions of environmental protection and health departments to strengthen the coordination between decision-making and action, ensuring the emergency response and handling work reasonable, orderly, efficient and effective. " and so on, which points the way for the disposal of environment and health emergency and provides strong policy support.

#### **4.3.5 Policies of China to Address Climate Change**

Addressing climate change as the priority areas of China's environment and health work, which aims at strengthening the capacity to deal with climate change and improve environment and health work. The Chinese Government has always attached great importance to climate change. In 1990, the State set up to deal with climate change-related institutions and established the National Climate Change Coordination Group to strengthen the leadership of addressing climate change in 1998. In addition, the Government of China has also actively participate in the process of addressing climate change of International Community and fulfilled the obligations of the " United Nations

Framework Convention on Climate Change" and the "Kyoto Protocol", so plays a constructive role in international cooperation in this regard. On May 30, 2007, the Premier of State Council, Wen Jiabao presided over the executive meetings and stressed to adhere to the scientific concept of development as guidance, to combine responding to climate change with implementing the sustainable development strategy, accelerating the construction of resource-saving and environment-friendly society and innovative country, to integrate it in the national and regional plan for national economic and social development, effort to control greenhouse gas emissions, and continuously improve the ability of adapting climate change, to promote a coordinated development of the economy, population, resources and the environment and contribute to the international community etc. Besides, the executive meetings considered and decided on the promulgation of the "China National Climate Change Program". In June of the same year, the State Council set up the Leading Group of National Response to Climate Change and Mitigation and Energy-saving Work which is composed of Premier Wen Jiabao as the group leader and the relevant ministries' leaders as members. The leading group as the Bureau of Nuclear Safety of national response to climate change and mitigation and energy-saving work, is responsible for researching and developing major strategies, policies and measures of national response to climate change and mitigation and energy conservation, unified deployment of the relevant work, studying and examining the international cooperation and negotiated program, and coordinating and solving the major problems of the response to climate change and mitigation and energy-saving work and so on. On October 29, 2008, the Chinese Government promulgated the "White Paper: China's Policies and Actions on Climate Change", which comprehensively introduce the policies and efforts of China response to climate change, as well as the progresses and results of implementation of the "China National Climate Change Program". It will have important guiding significance of response to climate change.

China is one of the countries most susceptible to the adverse effects of climate change and the basic conditions of China present the country with great challenges in addressing issues regarding climate change. In order to better promote the area of climate change work and protect the public health, China sticks to the principle of “placing equal emphasis on both deceleration and adaptation”. “Deceleration and adaptation are integral components of the strategy for coping with climate change. Deceleration is a long and arduous challenge, while adaptation is a more present and imminent task. The latter is more important for developing countries. The two must be well coordinated, and with equal stress placed on them.” (“White Paper: China's Policies and Actions on Climate Change”, 2008) Thus, under the guidance of the principle the state has adopted a series of policies, measures and achieved a series of results.

#### **4.3.5.1 Policies to Decelerate Climate Change**

There are two reasons for global warming. First, a large number of burning coal, natural gas produce a large amount of greenhouse gases; Secondly, the wanton cutting of forests makes the ability to absorb carbon dioxide declined. For the above reasons, the Chinese Government adopted a number of policies and measures to adjust the economic structure, change the development patterns, promote industrial upgrading, save energy and raise the efficiency of energy use, and optimize energy mix, develop circular economy, promote afforestation and increase research and development and so on. Marked achievements have been made in the field of decelerating climate change. On the one hand, the national unit GDP energy consumption fell by 3.66 percent in 2007; saved a grand total of 147 million tons of the standard coal in 2006 and 2007; the total of the utilization of regenerated energy was 22 million tons of the standard coal in 2007; installed new wind power machine 3.05 million kilowatts and an average annual increase of 148 percent in 2006 and 2007; by the end of 2007, there were over 26 million households in China using marsh

gas etc. . On the other hand, at present, China has 54 million ha of man-made forest, its timber volume reaching 1.505 billion cum, with the country's rate of forest coverage going up from 12 percent in the early 1980s to 18.21 percent now. It is estimated that tree-planting activities in China between 1980 and 2005 effectively absorbed 3.06 billion tons of carbon dioxide, that forest management absorbed 1.62 billion tons of carbon dioxide, and that carbon dioxide emission was reduced by 430 million tons because of improved forest protection. All this has further enhanced the capacity of forest as the sinks of greenhouse gas ("White Paper: China's Policies and Actions on Climate Change", 2008). The pollution mitigation as one of the most important measures of the mitigation of climate change, the "Kyoto Protocol" of 1997 meant that the international community have reached a consensus on the issue of mitigation and taken an important step forward. In the new era, China's government considers that combines the pollution abatement work with the socio-economic development and issued a series of policies and measures of promoting pollution reduction, such as the introduction of related taxation, credit, price, insurance, trade policies and measures etc. Establishing the long-term mechanism of encouraging the pollution mitigation will play an important role of slowing greenhouse gas emissions. In addition, strengthening the key environmental and health risk assessment and response capacity-building and determining the mitigation of climate change policies needed for health contents, will be of significant technical and instructive meanings in the development and introduction of mitigation of climate change policies.

#### **4.3.5.2 Policies to Adapt to Climate Change**

Faced with China's apparent climate warming trend, the frequency and intensity of extreme climate events, as well as geological disasters are also increasing, which will bring about serious threats and challenges on natural ecosystems and economic and social development, as well as the protection

of health and others.

In 2003, there was not enough attention on adapting to climate change in the international community and didn't form an international document on this issue. In the backdrop of these, our country has drafted the "to adapt to climate change protocol," which has an important promoting role in the introduction of the "China National Climate Change Program" and "White Paper: China's Policies and Actions on Climate Change".

In order to better adapt to climate warming, China actively applies policies, take actions and establish the relevant laws, regulations and planning in natural ecological systems such as agriculture, forestry and water resources, as well as ecologically fragile areas like coastal zones and regions, and has achieved positive effects. In the agricultural aspect, the state has made great efforts to establish and improve a law regime for agriculture to adapt to climate change, to strengthen the construction of agricultural infrastructure, and vigorously foster and promote the fine varieties, and so on. In the field of Natural Ecosystems, the state has stressed to push forward the all-round implementation of a national program of eco-environment development and protection, and has established a comprehensive monitoring system for forest resources and ecosystem conditions. Additionally, strengthening the functions restoration of eco-fragile areas and ecosystems is also the focus of the work. In Water Resources, China has worked out and enforced laws and regulations in this regard. It has formulated and completed the program of flood control on major rivers and other water-conservancy programs, and has set up an elementary law regime and a program on water conservancy commensurate with China's conditions, and established an elementary flood-control and disaster-alleviation system for major rivers and a water-resource allocation and protection system and so on. In addition, the coastal zone and coastal areas as another important area of dealing with climate change, the Chinese Government has always focused on improving its capability to control and

prevent marine disasters and has initially formed an all-dimensional observation network pertaining to the marine environment, which promotes the work of adaptation to climate change ("White Paper: China's Policies and Actions on Climate Change", 2008) . So china has made some progress in increasing ability of disaster prevention and disaster relief, strengthening the protection of forest resources and other natural ecosystem, as well as the pre-warning, forecasting and responding to various types of extreme weather and climate events etc..

In addition, as the growing of impact of climate change on global health security, in recent years, in order to better adapt to climate change and actively promote the national environmental and health work, the China's Ministry of Health as health authorities jointly signed "China National Environment and Health Action Plan" with 18 relevant ministries and identified the climate change and healthy impact as the a priority area of work. At the same time, the Ministry of Health also through the research on impact mechanism of climate change and environment-related disease, to explore the effect of the health of residents caused by the interaction of the type of climate, air pollution and climate change etc. factors; actively participates in the International Symposium on China Climate Change and the Health of Residents organized by the World Health Organization; and commits the projects of the United Nations Millennium Development Goals Fund of Climate Change and Health and so on. These activities lay foundations for further studying the measures of dealing with climate change, improving the ability to cope with climate change and effectively protecting human health, but also provide the data supports for the development of relevant policies of the climate change and health effects.

#### **4.4 China's Environment and Health Legal Support System**

The legal system has a significant status in the entire management system of environment and the health. Laws are efficient instruments to make policies carried out thoroughly. Once been fixed in the form of law, the government's

policies and orders about health that relates to environment will have stability and will be brought into effect by the force of the state, any other provisions or orders can not work against it. With the idea that “governing the country according to law”, China now has stepped into a new stage that establishments of laws and statutes have a rapid development and full improvement. In the area of environment and health, China has primarily established a comprehensive legal system, which is centered by the Constitution, ensured by the laws on environment protection, sanitation and other related areas, assisted by the State Council’s statutes and ministry’s regulations, embodied by a series of standards. Since the outbreak of SARS, more and more attention has been put on the subject of environment and health. The government has paid much more attention to the emergencies on public health, and has put more support on this subject. In response to climate change, climate change has been included in the framework of sustainable development. The major channel is earnestly implementing United Nations Framework Convention on Climate Change and Kyoto Protocol. In June 2007 the Chinese Government issued the "National Climate Change Program" which put forward the overall objective to deal with climate change by 2010 and in which more policy and law instruments are used to a greater extent.

#### **4.4.1 the Status Quo of China’s Environment and Health Legal Support System**

##### **4.4.1.1 Constitution**

The status of legal system of environment and health is firstly authorized by the Constitution, which is the father law of China and has the highest force and effect. Article 21 of the Constitution (1982) stipulates that “the state develops medical and health services, promotes modern medicine and traditional Chinese medicine, encourages and supports the setting up of various medical and health facilities by the rural economic collectives, state enterprises and

undertakings and neighborhood organizations, and promotes sanitation activities of a mass character, all to protect the people's health." This article shows that citizens' health has been placed in an important position and the state is obliged to adopt various methods to guarantee the health of the citizens. Article 26 stipulates that "the state protects and improves the living environment and the ecological environment, and prevents and controls pollution and other public hazards. The state organizes and encourages afforestation and the protection of forests." This article not only reflects the country's environmental concern, but also reflects the importance of civic health. Article 42 stipulates that "using various channels, the state creates conditions for employment, strengthens labour protection, improves working conditions and, on the basis of expanded production, increases remuneration for work and social benefits." "labor protection" and "working conditions" in this article in fact contains the requirements of the work environment, which is an obligation of the employer to improve the business environment for workers in the workplace in order to ensure the health of the workers. All the articles above in the Constitution conform the important status of environment and health and are also the basic foundation to establish laws on environment and health.

#### **4.4.1.2 Laws and provisions**

The systems of environment and health are embodied in various department laws in China. The law, the regulatory documents enacted by the NPC and its Standing Committee, has the legal status second only to the Constitution. In the legal level, the environment and health work in China are mainly regulated by the laws in the area of health and environmental protection. Other related laws such as the Criminal Law and Labor Law also have contents of environment and health. In regulating the work of environment and health, there are different points of view: The Health Act focuses on disease prevention; the Environmental Law focuses on the perspective of

environmental protection while the Labor Law focuses on the protection of the workers under the work environment.

It is only more than 30 years for China to carry out the environmental protection on modern sense, and even less than 30 years to legislate. However, an environmental and health legal system with Chinese characteristics is taking shape. As followed, system of laws and regulations on the field of environment and health are introduced from various points of department laws.

### **Relevant provisions in the Health Law**

In order to ensure the effective implementation of the law, the State Council has formulated the relevant administrative rules and regulations, so has the departments directly under the State Council and the local governments. The rules and regulations are legislated to improve the legal issues or to develop and refine the laws on the basis of the constitution and the law. For example, the NPC Standing committee passed the Law on Prevention and Treatment of Infectious diseases. corresponding with it, the State council promulgated administrative regulations, departmental rules and regulations such as the Law on the Implementation of Prevention and Treatment of Infectious Disease, the Ministry of Railways details for Implementation of the Law on Prevention and Treatment of Infectious diseases and so on.

### **The Environmental laws**

All through more than ten years of efforts, China has primarily established a legal system that protects the environment using scientific technologies, including technical alterations to prevent industrial pollutions, environmental impact assessment, environmental standards, environmental supervision and measurements, clean production, environmental symbols, ISO14000 environmental administer standards, etc. Although China's environmental legal systems, health is put on a basic position. All the laws stipulates that they are

formulated for the purpose of safeguarding the human health, including Environmental Protection Law of the People's Republic of China , environmental noise prevention law, clean product promotion law ,etc. To prevent and control polluting, China has put into effect many laws or statues, such as law of the People's Republic of China on prevention and control of water pollution, law of the People's Republic of China on Prevention and control of Environmental Pollution Caused by Solid Waste, law of the People's Republic of China on Prevention and control of air pollution, law of the People's Republic of China on Prevention and control of radioactive pollution, regulation of the People's Republic of China on control over dumping of wastes in the ocean.

In order to keep pace with international environmental pacts, China's environmental legal system embodies many related contents that stipulated in international pacts such as Vienna Convention on Protecting Atmospheric Ozone Layer, United Nations Framework Convention on Climate Change, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. And China has established many environmental laws and regulations.

Environmental impact assessment refers to the methods and system that including the analysis, forecasting and assessment of the possible environmental impact of construction projects, and put forward policies and measures to prevent or mitigate adverse environmental impacts.

China has law of People's Republic of China Environmental Impact Assessment that took into effect on sep 1 of 2003 and regulation of Construction project environmental impact assessment of the management of classified directory that put in to use on oct 1 of 2008. People's Republic of China Environmental Impact Assessment Law provides both that project in planning and in construction should be through environmental impact assessment and that the corresponding authorities in violation of this Law shall

be liable. The environmental impact assessment of the planning projects plays an important role in preventing the possible adverse impact and in promoting the harmonious development of economy, society, and environment. In order to implement the "Environmental Impact Assessment Law", planning to further regulate the environmental impact assessment work, the former State Environmental Protection Administration drafted the "Planning Environmental Impact Assessment Ordinance" based on seriously sum up the practical experience and extensive solicitation of opinions, and reported it to the State Council for approval.

State Council Legislative Affairs Office listened in full to the relevant departments and local people's government and expert advices, repeated demonstrated and researched with the State Environmental Protection Administration, former Ministry of communications , Development and Reform Commission, Ministry of Water Resources and other departments and formed a "planning environmental impact Evaluation of the Ordinance (the draft) ". At present, the Ordinance has been completed consultation on the draft.

As our work on the environmental health of has just started, it is still too early to immediately proceed with the special environmental health laws and regulations. During "Tenth Five-Year Plan" period, the State Environmental Protection Administration organized national scientific and technological issues of "environmental pollution on human health damage and compensation mechanism ", worked out the legal framework of the health damage classification and compensation mechanism, struttred the technology platform of environmental and health management, Environmental and health damage and compensation. On this basis, coordinated with relevant departments, increased health-related provisions in the formulation of laws and regulations on environmental protection in the drafting and formulating. For examples, the development of "Environmental Impact Assessment Law" in the human health evaluation guidelines and the corresponding increase in

provisions; added the contents of the health damages in "compensation for environmental pollution,"; in the "environmental monitoring regulations" increase the environmental health survey data call, and so on.

### **Laws and Regulations to Cope With Climate Change**

China has long been an active part in and support the activities under the frame work of United Nations Framework Convention on Climate Change and Kyoto Protocol and take efforts to promote the effective implementation of these laws, Chinese experts participated actively in the Intergovernmental Panel on Climate Change and contributed to the preparation of the related report. China has earnestly fulfilled in the obligation under the "UNFCCC" and " Kyoto protocol ",and submitted the report of "the initial national communication for climate change of PRC" and published the "National Climate Change Program" and the "special science and technology action to address climate change" in 2004.

Domestically, China has actively promoted the policies and actions to mitigate climate change, and have adopted a series of policies and measures in adjusting the economic structure, changing the way of development, energy saving , energy efficiency improving and energy structure optimizing, afforestation, and have made significant Results. The state council issued the implementation of the program of the statistics monitoring and assesses of energy-saving and emission reduction and made it clear that the provinces (autonomous regions and municipalities) and the key energy consumption enterprises should be examined and strict accountability should be use. the "Energy Conservation Law" should be amendment.

General Office of the State Council issued "Temperature control of the air-conditions of public building, "From 2007 We have released 22 mandatory national standards include thermal power, caustic soda and other high energy consumption products. Arrange the supervision of 16 categories of end-use

products, such as motors and energy-saving lamps. The department and agency in charge of energy-saving and energy-saving monitoring have carried out energy-saving administrative law enforcement in accordance with the law; promulgated the "Law on renewable energy," in 2005 and develop the policies of the priority of renewable energy on the grid, full purchase, favorable price, share by the society. Establish special funds of the development of renewable energy support the evaluation and investigation of resources, technical research and development, pilot demonstration projects, development and utilization of renewable energy in rural areas.

In agriculture, "Agriculture Law", "Grassland Law", "Fisheries Law", "Land Management Law" and "sudden major animal disease emergency regulations", "Prairie Fire Protection Ordinance" and other laws and regulations were developed and implemented by the state. Take great efforts to establish and improve the law and policy system of adapting to climate change in agriculture, To strengthen agricultural infrastructure construction, carried out capital construction of farmland water conservancy expand the irrigated area, improve the efficiency and capability of irrigation, promoting water-saving techniques to enhance disaster prevention and mitigation, Implement the "Seed Project" to cultivate high-yield, good quality and resistance of drought, flood, high temperature, pests plants.

For forest and other natural ecosystems, "Forest Law" and "Law on the Protection of Wild Animals" and "Soil and Water Conservation Law," "Law on Desertification" and "regulations of returning farmland to forest ", "Forest Fire Prevention Regulations" , "Forest pest control regulations" and other relevant laws and regulations were developed and implemented, the state have take great efforts to protect forests and other natural ecosystems related laws and regulations on nature reserves, wetlands, natural forest protection are being drafted to promote the full implementation of the planning of national ecological construction and environmental protection.

For water resources, the "Water Law" and "Flood resistance law", "river regulations" and other laws and regulations have been formulated and implemented, preparation of the flood control planning of the country's major river basin has been completed, the basic system of flood control and disaster mitigation, of rational distribution of water resources and of water of the river basin has been established. At the same time, the control of soil erosion are vigorously pushed forward, as of the end of 2007, the total area of water and soil that has been treated is about 1,000,000 square kilometers, the water and soil resources is protected effectively, and the ecological environment is improved.

For the coastal zone and the coastal areas, the objectives and contents of the building of business system for cope with climate change in coastal field has been identified according to "marine environmental protection law" and "Law on the use and management of the waters "and "air-sea interaction of business development planning system (outline)". An integrated management decision-making and coordination mechanism has been established. we spare no efforts to slow down and adapt to the adverse effects of climate change. Capacity building of coastal zone and coastal areas to adapt to climate change was Strengthened and the investigation and the study of air-sea interaction was carried out and the understanding was deepened. At the same time, an initial three-dimensional marine environment observation networks has been established so the defense capability of the marine disaster has been improved.

### **Other Laws**

**Criminal Law** Environment has a close relationship to human health. Considering that environment pollution events will do great harm to human health, Criminal Law of the People's Republic of China prescribes the Crime of Jeopardizing Public Health and the Crime of Undermining Protection of

Environment or Resources. So any activities that pollute the environment or do harm to human health will be punished by Criminal Law. For example, Article 338 stipulates that anyone who violates the state regulation to dump, discharge or dispose wastes that are radioactive or include infectious pathogens, toxic substances or other hazardous things to land, water or air, which results in environment pollutions and heavy losses to public or private properties, will be sentenced to fixed-term imprisonment of not more than three years or criminal detention, and shall also, or shall only be fined. If the consequence is serious, he shall be sentenced to fixed-term imprisonment of not less than three years but not more than seven years and shall also be fined.

**Labor Act** With fast developing of the economy, it is necessary for the country to take measures to improve work conditions so as to acquire safety and health. A prominent character of these laws is the emphasis on protecting workers' right, which embodies in the law that prescribes more obligations for the employing unit and more rights for the workers. For example, Article 54 of Labor Act stipulates that the employing unit must provide laborers with occupational safety and health conditions conforming to the provisions of the State and necessary articles of labor protection, and provide regular health examination or laborers engaged in work with occupational hazards. So far, China has established a series of laws including Labor Act, the regulation on occupational safety and health, law on safety in mines, etc. Those laws play an important role in safeguarding safety and health of workers.

#### **4.4.2 China's Environment and Health Standards System**

Environment and health laws and regulations can not be separated from effective implementation of comprehensive scientific environmental and health standards. Standards are usually put into use through the stages that on file, drafting, examination and promulgation. Differ from laws and regulations, environmental and health standards are not provided for units and individuals

of the rights and obligations, but for the technical description of the steps or something. So the number of standards on environment and health is much higher than that of laws and regulations. The number of standards only in the field of health, for example, is as many as 1,000.

Standards must be made on the basis of scientific research. The extent of standardization is an integrated embodiment of a country's economic, scientific and technological level of development. In terms of medium, the environment and health standards of China can be divided into standards on air, on water, on noise, on solid waste, on hazard identification, and so on.

Among all these standards, environmental quality standards stand at the core. They are the basic references to make emission standards for pollutants, and also the first reference to determine whether or not the environment has been polluted. The following will focus on introducing some environmental and health standards.

#### **4.4.2.1 Air Standards**

Chinese air standards includes: air quality standards, such as: "indoor air quality standards", "ambient air quality standards"; emission standards for air pollutants, such as: "an integrated air pollutant emission standards," and "transportation of gasoline Air Pollutant Emission Standard "; atmospheric monitoring norms, standards methods, such as:" the sampling method of volatile organic compounds and aldehydes and ketones material in cars".

In view of the impact of greenhouse gases on the climate change, China's Environmental Protection Department released "coal-bed methane (gas) emissions standard (provisional)"on April 14, coal mine gas emission of high concentrations is prohibited, the standard prohibited high concentration gas with the methane proportion of more than 30% This is the world's first national mandatory standards for greenhouse gas emission controlling.

"Ambient Air Quality Standard" provides for ambient air quality division of functional districts, the classification standards, kinds of pollutants and the value of concentration limits, sampling and analysis of statistical data and the effectiveness of the requirement for nationwide air Quality Evaluation.

"Ambient air quality standards" divides environmental air quality functional district into three categories: functional district I is for the nature reserve zones, scenic spots and other areas in need of special protection; II is for the district town planning in residential areas identified, district of mixed residential commercial traffic, cultural district, general industrial areas and rural areas; III is for specific areas for industrial areas. And the standards put air quality into three degrees--district I implements first-degree standard, district II implements second-degree standard, and district III third-degree standard. "Ambient air quality standards" limit the concentration of six pollutants, and prescribe the analysis methods of kinds of pollutants.

China's first "indoor air quality standard" put into effect On March 1, 2003. This standard firstly introduced the concept of indoor air quality, and clearly put that 'indoor air should be non-toxic, harmless, no abnormal odors. One of the provisions includes the control of chemical, physical, biological and radioactive contamination. Control provisions of the chemical pollutants include not only more familiar formaldehyde, benzene, ammonia, oxygen, and other pollutants, but also 13 chemical pollutants such a respirable particulate matter, carbon dioxide, sulfur dioxide. "Standard" combined with China's actual conditions, takes into account both developed regions and cities in the construction of wind, temperature and humidity as well as formaldehyde, benzene, and other pollutants, as well as some of the less developed regions based on the use of coal for heating and cooking. Considering all these realities, China has developed Indoor standards of carbon monoxide, carbon dioxide and nitrogen dioxide pollution. "Indoor air quality standards", combined with the "civil indoor environmental pollution control norms "that released

before by National Institute of Standards Committee and ten kinds of "indoor decoration materials harmful substances limited", constitutes a common indoor environmental pollution control and evaluation system.

#### **4.4.2.2 Water Standards**

Water has a close relationship to human life. China has attached great focus to the standards of water. The standards in use mainly include "water quality standard for urban water supply," "standard of quality for drinking water resource", "Sewage sludge discharge standard for City Sewage Treatment Plant," "drinking water standards" and "drinking water quality standard".

The "drinking water standards" (GB 5749-2006) take into effect on July 1 2007, which is jointly issued by the National Institute of Standards Committee and the Ministry of Health. This is mainly a result of economic development as the population increases, water shortages in many areas, some cities seriously polluted drinking water, safe drinking water of life is threatened, "drinking water health standards" (GB5749-85) published in 1985 can not any longer meet the security needs of the people's health. To this point, the Ministry of Health and the Standardization Administration revised the original standard and jointly issued a new mandatory national "drinking water health standards" (GB5749-2006) (hereinafter referred to as "the new standards").

The new standard has the following three characteristics: First, strengthen the quality of organic matter, microbes, water disinfection, and so on. The new standard of drinking water quality standards increases the original targets of 35 to 106, an increase of 71. Among them, Microbial indicators from 2 to 6; indicators of drinking water disinfectants increase from 1 to 4; toxicological indicators inorganic compounds from 10 to 21; toxicological indicators in organic compounds from 5 to 53; traits and the general physical and chemical senses indicator from 15 to 20; indicators remain radioactive 2. Second, unify urban and rural drinking water health standards. Third, pace drinking water

standards with international practice. The indicators of new standards give full consideration to the actual situation in our country, and taking into account the World Health Organization's "Guidelines for Drinking Water Quality", and have a reference to the European Union, the United States, Russia and Japan, drinking water standards.

Among the newly increased 71 indicators of the new standards of water quality, microbiology indicators increase from 2 to 6, newly add the detection of microbes such as *Giardia lamblia*, *Cryptosporidium*, which are difficult to kill by general approach. And indicators for Drinking water disinfectant increase from 1 to 4, inorganic toxicology indicators from 10 to 22, organic indicators from 5 to 53, traits and general physical and chemical senses indicator from 15 to 21. Also, 8 of the original standard of 35 indicators were revised. At the same time, in view of the negative impact of chlorination for water quality and safety, "the new standard" increases related test items. "The new standard" is both applicable to all types of centralized drinking water supply and to distributed drinking water supply.

Due to China's vast territory, the detect items of non-conventional indicators of water and the date to put it in effect will be determined by local people's governments based on the actual situation at the provincial level.

#### **4.4.2.3 Noise Standards**

The noise standards can be divided into three categories, The environmental sound quality standards, such as Environmental quality standard for noise (GB 3096-2008), Environment standard of aircraft noise around airport (GB 9660-88); Environmental standards of noise emission, such as Emission standard for community noise (GB 22337—2008), Emission standard for industrial enterprises noise at boundary (GB 12348—2008); Standard methods for noise measurement, such as Emission Standards and Measurement Methods of Railway noise on the Boundary Alongside Risky

Line (GB 12525-90), Measurement method for noise from construction site(GB 12524-90).

The standards system of noise control has been improved by the three standards: Environmental quality standard for noise (GB 3096-2008), Emission standard for community noise(GB 22337—2008) , emission standard for industrial enterprises noise at boundary ( GB 12348—2008 ) which were enforced in 2008. With the application of the new standards, environmental standard of urban noise, standard measurement method for urban noise was abrogated therefrom.

Environmental quality standard for noise (GB 3096-2008) Provides for the environmental noise limits and methods of measurement of five types of sound environmental areas and is applicable to the assessment and management of sound environmental quality. Emission standard for community noise (GB22337—2008) Provides for the noise emission limits and measurement methods at boundary .to the profit- making cultural and entertainment centers Also to the equipments and facilities that are possibly lead to environmental noise pollution in commercial activities. Emission standard for industrial enterprises noise at boundary ( GB 12348—2008 ) provides for environmental noise emission limits and measuring methods for enterprises noise at boundary and is applicable to the management, evaluation and control of emissions of industrial enterprises, the standard may be implemented by any other entity which has External environmental noise emissions by making reference thereto.

#### **4.4.2.4 Standards for Solid Wastes**

Solid Wastes, especially heavy metals and Solid Wastes that cannot be degraded can cause severe environmental pollution and made great threat to human health. In order to prevent or reduce environmental pollution by solid

waste, the Control and identify of Hazardous Wastes are listed as key research projects, Each of these standards plays an important part in their own fields.

The solid wastes standards which is listed in the a catalog of solid waste can be divided into three categories:28 Standards for Pollution Control,such as Standard for Pollution Control on the Landfill Site of Municipal Solid Waste(GB 16889-2008), Pollution control standard for hazardous wastes incineration(GB 18484-2001), 8 standards for hazardous wastes such as : identification standards for hazardous wastes-Identification for corrosivity (GB 5085.1-2007);Identification standards for hazardous wastes Part 5: Identification for ignitability (GB 5085.4-2007) etc. 16 standards for solid wastes identification such as solid waste-extraction procedure for toxicity of solid waste - Retroflexion method GB 5086.1-1997, and other 25 standards, such as The guidelines for the testing of chemicals(HJ/T 153-2004)etc.

#### **4.4.2.5 Standards for Public Places**

Standards for public places in china can be divided into three categories: the first category is Basic standards such as: hygiene standards for public places ( GB9663 ~ 9673—1996、 GB16153-1996,the second category is monitoring standards such as :technical rules of monitoring for public place ( GB/T 17220—1998 ), the third category is inspecting standards such as :standard inspecting methods for public place ( GB/T 18204.1 ~ 18204.30--2000 )。

In order to better implement the health regulations in public places, strengthen the supervision and administration of the public places, hygiene standards for public placesGB9663 ~ 9673—1996 was issued in 1996, primary supervision organizations can supervise the public places according to the unified criteria.hygiene standards for public placesGB9663 ~ 9673—1996 have 12 standards such as hygiene standards for hotels(GB9663-1996),hygiene standards for cultural and entertainment centers (GB9664-1996),hygiene standards for public baths ( GB9665-1996),these standards have cover large

segments of the public places and are playing an important role in protecting human health. Also, these standards are being revised and will be more scientific and more practicable.

Technical rules of monitoring for public place ( GB/T 17220—1998 ) provides for the requirements on the technology during the sanitation monitoring of public places. The standard has the following main aspects: air quality monitoring, microbial monitoring for hygienic articles and appliances, quality control of On-site sampling operation etc.

In order to implement the health regulations in public places hygiene standards for public places GB 9663 ~ 9673—1996, standard test method for public place ( GB / T 18204. 1--GB 18204. 30—2000 ) was issued in 2000 after being revised or supplemented by the Scientific Institutions that were recognized by the institute for environmental health and related product safety Chinese centre for disease control and prevention. The standard, which provides for the testing methods of the temperature, moisture, barometric pressure, Indoor air change rate, lighting, illumination, noise etc, is of great significance to the monitoring work carried out by the primary monitoring organizations. Also, the stand has been an essential guidebook for the routine monitoring work and the monitoring data will be more standardized and unified.

#### **4.4.2.6 Hazard Determine standards**

Hazard Determine standard of environmental pollution is of great importance in environmental health. China has issued discriminant standard for health hazard area caused by environmental cadmium pollution GB/T 17221-1998, Standard for identification of area of chronic arsenic poisoning caused by environmental arsenic pollution WS/T 183-1999. There are also other standards that are in consultation or drafting stage, these standards contain: diagnostic criteria of chronic cadmium poisoning disease that is caused by environmental cadmium pollution, diagnostic criteria of chronic arsenic

poisoning disease that is caused by environmental arsenic pollution, diagnostic criteria of chronic fluoride poisoning disease that is caused by environmental fluoride Pollution, etc..

Discriminant standard for health hazard area caused by environmental cadmium pollution GB/T 17221-1998, which was put into force in 1998, provides for the determine principles, Observation objects, health indicators and their joint response rate for health hazard area caused by environmental cadmium pollution. The standard applies to the health hazard area that is caused by environmental cadmium pollution and may lead the local people to chronic damage of kidney which uses the food chain as the main route of exposure.

Arsenic is one of the most common pollutants in china, With the development of industry and agriculture and the wide use of Arsenic compounds, The environmental pollution caused by Arsenic is becoming more and more serious, A number of factories and mines arsenic contamination has affected the health of residents. In order to protect people's health and control environmental pollution, Standard for identification of area of chronic arsenic poisoning caused by environmental arsenic pollution WS/T183-1999 was issued in 1999, the standard provides for the determine methods of identification of area of chronic arsenic poisoning caused by environmental arsenic pollution and Individual pathology diagnosis and applies to area of chronic arsenic poisoning caused by environmental arsenic pollution.

#### **4.4.2.7 Other Standards**

Besides the listed standards above, china's environmental protection departments, health departments and other departments issued emissions standards of pollutions and Health protection zone standard etc. According to statistics, since the 11th "Five-Year Plan", China's emissions have been a controlled to a certain extent, for example the weight of dust was 10,950,000 tons, a decrease of 6.0 percent, that of industrial dust was 9,048,000 tons, a

decrease of 17.1 percent, that of industrial solid waste was 17,920,000 tons, a decrease of 43.8 percent. It is clear that pollutant emission standards have played an important role. Health protection zone standard contains Health protection zone standard for oil refinery GB 8195-1987, Health protection zone standard for copper smeltery GB 11657-1989, this kind of standards are issued to prevent the pollution from the oil refinery and copper smeltery and to protect people's health.

#### **4.5 China's Environment and Health Scientific and Technological Support System**

Over the years, our Party and Government have always attached importance to the development of science and technology. The argument of "science and technology are the primary productive forces", the strategy of "relying on science and education to rejuvenate the nation" and "constructing an innovative country" are fully embodied the importance of science and technology promoting the China's all-round development. It is a similar fact that scientific development and information sharing is also vital for environment and health work.

To establish and improve environment and health-related monitoring network, to carry out a series of survey on current situation of environment and health impact, and according to the needs and development of China's environment and health work to conduct researches on safety evaluation and responding measures of environment and health. These activities above, have an important significance in carrying out the real-time, systemic health hazards and environmental pollution monitoring, comprehensively understanding China's environment and health status, sharing information, and further promoting the scientific research and development of environment and health. It is also crucial for improving China's environment and health technical support System.

#### **4.5.1 Environment and Health Monitoring Network and Sharing Information**

Environment and health monitoring is an important and indispensable means of environment and health work and is also the basis of the implementation of environmental protection policies, laws and regulations. According to the needs of the development of China's environment and health work, on the one hand, the Ministry of Health, the Ministry of environmental protection and other relevant departments have established and gradually improved the environment and health -related monitoring networks. In 2005, the Ministry of Environmental Protection set up the Division of Environmental Health and Monitoring under the Division of Science, Technology and Standards so as to improve management and technical support systems of the environmental protection sector. In addition, the Environmental Monitoring of China as the national network center, technology center, information center and training center of environmental monitoring also play a significant role in technical support, technical supervision and technical services of the environmental supervision and management, the improvement of the health and environment monitoring network, and the development of the environment and health-related monitoring researches. In the area of health, China's disease surveillance work has experienced the germinal period, the developmental period, the improved and consolidated period three-phase (Chen et al, 2005), and has gradually established and perfected the comprehensive disease surveillance system, including the management information systems of report, major infectious disease surveillance systems, the surveillance system of the disease media biology, the cause of death surveillance systems, symptom surveillance system and health-related factors surveillance systems etc.. The surveillance system realizes the construction of two-way information transmission network that connects the townships, counties (districts), terra (cities), province, nation five grades health administrations

and health-care institutions(Program compendium for national Health Information"(2003-2010) ,2003 ) and is vital to improving the coverage, accuracy and timeliness of the disease and public health monitoring and organizing the monitoring and management of pollution-related health damage and disease. On the other hand, in order to meet the needs of our environment and health research, the Ministry of Health, Ministry of Environmental Protection and other relevant departments established three Environmental Medicine Research Institutes under common management: Taiyuan Environmental Medicine Research Institutes, Beijing Environmental Medicine Research Institutes, Wuhan Environmental Medicine Research Institutes. In 2002, the Ministry of Environmental Protection also established the Key Laboratory of National Environment Protection and Public Health to carry out the study of major environmental pollution on human health hazards and their prevention and control measures, as well as public nuisance disease etc. It has provided a scientific basis for promoting China's environmental protection and population health.

Over the years, the State has built and improved relevant monitoring network, such as drinking water and health, air and health, soil and health, climate and health, bio-security of public places etc. and carried out a great deal of work. At present, China is carrying out Urban Drinking Water Sanitation Monitoring Pilot Projects in Beijing, Heilongjiang, Shanghai etc. 15 provinces and municipalities. It includes the drinking water quality monitoring in the factory at all levels of municipal water supply units, as well as water-borne disease surveillance. Regional drinking water quality monitoring is synchronized with water-borne disease surveillance, through the infectious disease monitoring network and the urban cause of death and disease surveillance points to collect urban water-borne disease and relevant data, then form the water-borne disease surveillance network to master the situation of water-borne diseases. Water-borne disease surveillance includes: the

monitoring of water-borne gastro-intestinal infections (such as typhoid, cholera, dysentery, etc.), the cause of death of tumor and chronic non-communicable diseases monitoring, acute chemical poisoning caused by sudden water pollution monitoring, the monitoring of endemic diseases caused by drinking water, and other diseases surveillance. At the same time, after efforts of 10 years, China's rural drinking water health monitoring network has been basically established. The network aims at monitoring the type of rural drinking water sources, water ways, water pollution and population to comprehensively grasp the health status of rural drinking water. On the base of a full use of the existing drinking water health monitoring system and water environment monitoring system, studying and putting forward the water pollution indicators, the scope of water-borne disease surveillance and other information of health impact etc. is great significance in developing the national monitoring programs and improving China's sanitation of drinking water.

China's monitoring network of air quality has also been perfected day by day. The network aims to study and determine the monitoring indicators of population health through selecting the major pollutants of direct and indirect impact on human health, and develop national air pollution and health monitoring plans. The project of "air pollution and disease monitoring site" which is responsible by the Institute for Environment Health and Related Product Safety (IEHS) of the China Disease Prevention and Control Center, also has been successfully carried out. The project aims at establishing the air pollution and disease surveillance network in the key cities of our country and predicting the health risks events of air pollution, so as to reduce the air pollution caused health hazards. The project is still in the demonstration phase, so select four different types of cities as pilots and carry out the city and community-based disease surveillance. At present, the smooth operation of the network has already provided a great deal of data for the study of air pollution exposure on human health.

With global warming alarms sounded, the relevant departments of China's come to realize that climate change has affected people's survival and the sustainable development of society. After efforts of nearly two decades, the State has constantly strengthened the building of national climate observatory, regional atmospheric background stations, national climate monitoring network etc to develop the global and regional climate models, has established a number of state-level research institutions of climate change, and has stepped up the education of climate change-related courses and cultured and trained a group science and technology talent who carry out research in the field of climate change. In January 2007, the Experts Committee for Climate Change was officially set up, which showed that there had a specialized institution to provide scientific advisory on China's response to climate change for the government. In 2004, the Institute for Environment Health and Related Product Safety (IEHS) of the China Disease Prevention and Control Center began to carry out the air pollution, climate change and disease monitoring work and established eight monitoring demonstration centers on a national scale. And through collecting and monitoring the meteorological data, air pollution data, as well as the data on the death of residents, the chronic obstructive pulmonary disease and coronary heart disease of elderly patients, the signs and symptoms monitoring of respiratory disease of pupil etc. to establish the dynamic database of China's climate change, air pollution and the health of residents and analyze the relationship between the interaction of different types of weather, air pollution and climate change and the death and acute, chronic diseases of the residents. This is of great significance for establishing and improving the monitoring network of China's climate and health. At the same time, the State have also stepped up the monitoring and forecasting of high-temperature heat waves, floods, droughts, storms, dust storms, cold waves and other extreme weather and climate etc. to improve the climate and health monitoring network.

In addition, according to "Health Regulations in Public Places ", developing the monitoring program of the health of public places and biological safety of site-specific places, setting up the monitoring sites of major locations, carrying out the health and biological safety of public places monitoring, and forming the country's public health and site-specific Bio-security monitoring network are also of great significance of improving China's environment and health monitoring network. In recent years, the Institute for Environment Health and Related Product Safety (IEHS) of the China Disease Prevention and Control Center relies on the national "11th Five-Year Plan" scientific and technological issues " Infectious Disease Surveillance Technology Research in Public Places ", and carried out the preliminary investigation on Legionella of central air conditioning system in more than 100 public places of three cities, including the health surveys of central air conditioning system, the monitoring of environmental factor, the monitoring of Legionella etc.. The investigation lays a foundation for carrying out the bio-safety monitoring of pollution in public places.

Long-term, continuous and systematic environment, meteorology, public health and disease surveillance data is essential to analyze the impact of environment on human health and disease, and the dynamics of change. Making full use of our existing environmental and health monitoring network to realize the informational open and sharing is extremely important for scientific research of environment and health (Liu, 2005) . In 2007, China promulgated the "China National Environment and Health Action Plan "and clearly put forward "to develop national system of information-sharing and services for environment and health" action strategies. Establishing and improving the mechanisms for information sharing and information release system are crucial for China's environment and health decision-making, management, research and information support.

#### **4.5.2 Survey on Current Situation of Environment and Health Impact**

#### **4.5.2.1 Environmental survey on basis of the General Nationwide Surveys on Pollution Sources**

The protection of human health is the ultimate end of the environmental protection work. In order to strengthen the environmental supervision and management and protect people's health rights and interests, the State in the field of protection of the environment and health has done a lot of work. Since the Sixth Five-year Plan period, the Ministry of Environmental Protection has organized many investigation projects, such as "national grain pesticide residues investigation", "soil background value investigation", "national industrial pollution source investigation and research", etc. Since then, arsenic contamination in Yunnan and Guangdong, cadmium pollution in Guizhou, Hebei and Zhejiang and Northeast China, and mercury pollution in Bohai Sea and Huanghai Sea have also been carried out. During the Tenth Five-year Plan period, ecological investigation was carried in West China, Central China and East China; domestic waste pollution investigation, national key pollution source investigation, acid rain investigation, coastline pollution source investigation, investigation on organic pollutants of urban potable water source and soil pollution, etc, were also carried out. On October 12, 2006, the State Council issued "on the first national survey on pollution sources, (The State Council issued [2006] No. 36) ", established the State Council Leading Group of Census that the Deputy Prime Minister Zeng Peiyan as the group leader, and made clear to launch the first national survey on pollution resources in 2008. On February 4, 2007, the Department of Environmental Protection issued the "on the establishment of the Office of first national census of the pollution sources " (the Ministry of Environmental Protection[2007] No. 47), and set up the Office of the first national survey on pollution sources, which is responsible for the specific survey. On April 11, 2007, the first national pollution sources census leading group of the State Council held its first meeting to consider and adopt the "project of the first national survey on pollution

sources", and made the deployment for the next census work. Since then, the General Office of the State Council on May 17, 2007 issued "With regard to the issuance of the first national census program to inform the sources of pollution". on October 9, Chinese Premier Wen Jiabao signed a State Council order No. 508, promulgated and implemented the "National Surveys on Pollution Resources Ordinance " , which provides a strong law protection for the national survey on pollution sources. On December 31, 2007, the national various localities and departments under the guidance of the principle-- "unified national leadership, division and cooperation of departments, local level-by-level responsibility, the parties involved" conducted the first national surveys on pollution sources, which laid a good foundation for the environment and health work.

The first national census of the pollution sources mainly includes: industrial pollution sources, agricultural pollution sources, pollution sources of urban life in the territory of our country, three types. So as to further understand the basic information of various types of enterprises and institutions about the environment and establish and improve the files and information database on various types of key pollution sources. Data of pollution sources is an important basis for environmental data. The general nationwide surveys on pollution resources is an important means of comprehensive understanding the China's environmental conditions. The surveys provide an important basis for environment policy, planning, decision-making etc. and are help to improve the quality of the environment and promote resource-saving, environment-friendly Community-building. In addition, carrying out the environmental investigation on the basis of the general nationwide surveys on pollution sources, and the pollution sources, pollutants and the level of pollution investigations in the pollution source areas of emerged or may be emerging serious health hazards, has an important role in the grip of the status quo of the key pollution sources, pollution ways and major pollutants, and

understanding the distribution, type, nature of the environmental health damage. At the same time, combining with the findings of the health effects of environmental pollution to determine the national and regional prior control list of environmental pollutants is also of great significance for the implementation of environmental impact planning assessment, the governance, control and monitoring of major pollutants, and the further protection of public health.

#### **4.5.2.2 Survey on Health Impact Resulted from Environmental Pollution and Climate Change**

Environment pollution and climate change has caused a rapid increase in incidents of damage to health, environment and health are concerned. At present, concerns in the field of environmental investigation have changed from the sources of pollution to the impact of health caused by the environment pollution investigation. In addition, the investigations on climate change and health effects have been carried on gradually.

Compared to Western countries, the work about China's environment and health is later, so the investigation about the impact of health caused by environment pollution is small. The Ministry of Health has carried out a large number of investigations on the impact of caused by environment pollution. Such as, in last century 70s, the lung cancer related investigation was carried out in Xuanwei city by the Health Department, and Xuanwei city was identified as cancer high incidence area; In 2005, in order to seriously implement the instruction of the State Council leadership " in-depth study of the Huaihe River valley high cancer issues " , and the instruction of the Ministry of Health, according to the "Office of the Ministry of Health on the key areas of cancer incidence in Huai River basin epidemiological investigation, "Chinese Centers for Disease Prevention and Control set up the experts group of the key areas of cancer incidence in Huai River basin investigation project, and carried out the epidemiological investigation. In addition, the investigations on the endemic diseases, drinking water in rural areas and environment sanitation, air

pollution on the health impact of specific groups, etc, are significance for the improve of our residents health level. In recent years, in order to further promote the environment and health survey work, the Ministry of Environmental Protection, in collaboration with relevant ministries and commissions have carried out the special environmental-health investigations in key areas and typical areas. The preliminary information about the human health damage caused by environment pollution in some areas, the emission and the pollution ways of polluted material which may cause the human health damage, has been got. Thereby, the potential hazard of the diseases in key areas has been following-up monitored. The long-term following-up health investigations of the residents in the contaminated areas can strengthen environment monitoring and health management, and protect environmental quality and human health.

In the late 1980s and early 1990s, the international community began to pay attention to climate change and human health studies. As one of the most serious affected countries by climate change, China has carried out the related investigations on impact of the health by environmental pollution and climate change. Such as A series related studies on the impact of climate change on infectious diseases, temperature change on cardiovascular respiratory diseases, and the impact of climate change on water resources, air pollution and food safety, were launched, which are great significance on China's response to climate change.

#### **4.5.3 Research on Safety Evaluation and Responding Measures of Environment and Health**

According to the needs of China's environment and health work, carrying out the research on human health effects of climate change, basic research on environment and health, researches on techniques for evaluation of environmental pollution impacts on health, research on environment-related disease burden assessment systems and analysis of financial requirement of

environment and health, is of great significance for improving the technical support of China's environment and health work.

In the area of climate changing, one of the important principle of our response to climate changing is "relying on scientific and technological innovation and technology transfer", and we think that "technological innovation and technology transfer to address climate changing is the foundation and support"

(*"White Paper: China's Policies and Actions on Climate Change"*, 2008) . As early as mid-1980s, Chinese scientists Participated in the planning international climate and global climate changing research plan and discussion, and adopted national science and technology research program, the state high-tech research and development program (863 Program), National Basic Research Program (973 Program), and organized a series of climate changing-related science and technology projects. Such as the prediction and influence of global climate changing, global environmental changing countermeasures and technical supporting, dealing with global environmental changing technology and demonstrations, Chinese aerosols in the atmosphere and climate effects research, climate and weather in major Chinese formation mechanism and prediction theory, renewable energy development and utilization of new energy technology; In addition, in the basic science of climate changing, to control greenhouse gas emissions and to mitigate climate changing technology development and application, we has also made a series of achievement in socio-economic of climate changing impact analysis, mitigation countermeasure and so on. In 2007, the Ministry of Science and Technology held a series of seminars and symposiums, and Development Reform Commission, Ministry of Foreign Affairs, Ministry of Finance and other relevant departments , and more than 20 departments participated in depth-discussion, and prepared and published the " the special action for Chinese science and technology to deal with climate changing, and put forward to deal with climate changing science and technology in the work of

the "11th Five-Year Plan" period in 2020 and the target of long-term goals, and on the issue of climate changing science, greenhouse gas emissions control technology research and development, adaptation to climate changing technology and measures and address climate changing strategies and major policies for the deployment of response for the changing technology(China's establishment of "technology specific action" to deal with climate change, 2007), meanwhile showed that strengthen the national science and technology to address in the field of climate changing attention; In 2008, the Bureau of Meteorology recommended a special meteorological research industry of the Ministry of Finance, including the climate system model in the development of key technologies, multi-modal comparative study of greenhouse gases and trace constituents Changes in time and space and impact assess, and climate changing on Chinese food production system and so on 44 projects, which in order to further promote our country research in the area of climate.

At the same time, climate changing on the health effects as an important part of climate research area. During "Tenth Five-Year" and "11th Five-Year Plan" period, we carried out a number of special studies, such as climate changing on Chinese schistosomiasis, malaria prevalent Research infection, climate changing effects on cardiovascular, climate changing on human health and measures to adapt to the report of the decision-making, and so on, which played an important role in reducing climate-related diseases occurring and spread, which protect public health for our country. In 2007, on the basis of the Ministry of Health and the Weather Bureau setting up cooperation mechanisms, the environment and the Weather Bureau began to cooperate in extreme weather change such as high-temperature on the health of residents. Over the research carried out, we established the development of climate changing, early warning health systems, response plans and related methods and techniques, the effectiveness of early warning systems to promote Chinese positive response to climate changing, which are of great significance

to protect public health.

In addition, in order to further promote the environment and health area scientific research, the environment and health departments except organized a number of environment and health status of the investigation, and also studied in the atmosphere, water, toxic chemicals, disease hazards, technical specifications and Standards areas. Such as, we have developed "National Environmental Monitoring System in five Chinese cities to monitoring atmosphere" to strengthen the improvement of whole cities' environment. In Water aspect, the different sources of drinking water and incidence of the digestive system cancer, the relationship between mortality studies had proved that the source of drinking water pollution being caused by the human's cancer incidence and mortality increasing, which launched a nationwide survey of organic pollutants in water sources and major cities Water quality survey, and advanced 14 kinds and 68 types of water pollutants in the environmental priority list, and drawn up and promulgated the 4th Amendment of "Surface water environmental quality standard" (GB3838-2002), and so on; In poisonous chemicals aspect, in addition to research on chemical harmful substances, but also established experimental systems in the accumulation of chemicals and environmental degradation; In addition, the "public nuisance disease determination technology research", "public nuisance disease and compensation method", " Acute health emergency environmental pollution accidents response", " Environmental pollution caused by cadmium chronic poisoning diagnosis criteria ", " Environmental arsenic pollution caused by chronic arsenic diagnosis criteria ", " Environmental pollution caused by fluoride of chronic fluorosis diagnosis criteria". These drafting's work had a great impetus to Chinese environment and health work.

In 2000, the State took the research on key technologies of environment and health as key projects in "Tenth Five-Year" plan to tackle key problems in science and technology. And during this period the State also organized the

state key scientific subjects as "study on environmental pollution's damage and its compensatory mechanism", which established the legal frame for rating of health damage and its compensatory mechanism. In 2005, the Department of Environmental Protection in conjunction with the scientific and technological issues, started the establishment of environmental pollution's damage standards of the cadmium, lead, arsenic and mercury four pollutants, and finally completed the mercury, cadmium, arsenic, fluoride, lead the five environmental health damage standards. In 2006, according to the priority themes of "Medium and Long-term National Science and Technology Development Planning Framework (2006-2020)", the Ministry of Science and Technology set up the "Key Technological Research on National Environmental Management Decision-making Support" Key projects in the 11th Five-Year plan supported by the National Science and Technology. In addition, the Ministry of Science and Technology focused on the current situation of the growing serious compound air pollution in key cities and based on the "Medium and Long-term National Science and Technology Development Planning Framework (2006-2020)" and "National 11th Five-Year Development Plan of Science and Technology" and "863 Program and 11th Five-Year Plan Outline for the Development", started a "Air Complex Pollution Control Technology Combined with the Integration of Major Demonstration Projects of Focus Group of Urban" to propose ozone and PM<sub>2.5</sub> health technology assessment model, and other tools. The same year, Institute for Environment Health and Related Product Safety (IEHS), China CDC relying on the Eleventh Five-Year Scientific and Technological Project "China's Key Environmental Health Hazards of Chemical Pollutants Monitoring Technology Research," carried out the research on human exposure to key chemical pollutants and load screening technology, and relevant monitoring, which had an important significance in initial establishment of human biological material load database of key environmental chemical pollutants and early diagnostic techniques of certain environmental chemical contaminants health effects, and

advancing the priority-controlled pollutants. Institute for Environment Health and Related Product Safety (IEHS), China CDC also relying on the National Science and Technology Project "Environmental Health Damage Criteria for Development" and on the basis of the collection of existing lead, mercury (methylmercury), cadmium, arsenic, fluoride, chromium-related health damage standards and relevant research information at home and abroad, chose the scene of typical environmental pollution to conduct the necessary investigations, and developed the diagnosis and determine the classification and that the standards of the six environmental pollutants health damage. In addition, the "Infectious Disease Surveillance and Control Technology Research on Public Place " as an important issues of the 11th Five-Year Scientific and Technological Projects "Environmental and Health Impact Assessment and Control Technology Research", which had a research on the relationship between the biological pollution of air and environment and the health effects of the crowd in typical public places of China, so as to determine the appropriate monitoring and early warning indicators and inspection, monitoring methods and bring forwards to the suitable control technology of biological and chemical pollution in public places. It further promotes the basic research and evaluation of health hazards in China's environment and health.

In addition to the above-mentioned of basic and applied research, we should strengthen the environmental polluted health burden of disease and funding needs of research and analysis, which is also of great significance in understand economic cost of environmental burden of disease, develop environmental issues and their impact on the health of the initial funding requirements Analysis, and in the establishment of environmental pollution caused damaged health in economy cost evaluation method and quantitative system.

In the new era, in the field of environment and health, we should continue to encourage and train professionals, strengthen institution building and develop

monitoring network, carry out in the field of environment and health-related investigations and research work, so as to protect the full effective in the science and technology, which is of great significance in improving the quality of the environment and improve the public health.

#### **4.6 China's Environment and Health Financial Support System**

Financial support is an important aspect of government support, the policy of which directly embodies the intension of the government. With growing global concern paid to the affairs of environment and health, China has increased financial support in this field to adapt to the social development. Also, China has been making efforts to establish a systemized financial support system in the field of environment and health.

Besides the support from policy, from law, from science and technology, financial support is essential to ensure the work of environment and health. To build a resource-saving society and to vigorously develop the circular economy are the inherent requirement of implementing the scientific concept of development. In the year 2005, the ministry of finance use tax policies to promote resource-saving and environment protection, and to offer funds to ensure the object of establishing an energy-saving society and a circular economy.

In the field of environmental protection, in order to effectively implement the relevant work arrangements of the Party Central Committee and State Council, and to protect the smooth implementation of pollution abatement work, in 2007, the Ministry of Finance made innovation in mechanisms to increase financial support, developed a comprehensive system of fiscal and taxation policies and issued the " Notice issued on the budget for the first national survey of pollution sources project in 2007". The State Council Leading Group Office of the first national survey of pollution sources, which developed "guidelines for the preparation of the budget for the first national survey of pollution sources project", made specific requirements that the census funding must be ensured

to be included in the government budget at all levels. That is of great significance to carry out the work of national survey of pollution sources.

Ever since 1993, China's thermal power plants in some areas have paid sewage charges according to the emissions of SO<sub>2</sub>. The Article 14 of the "Air Pollution Prevention and Control Law", which was implemented on September 1, 2000, stipulated that "Our country imposes sewage charges in accordance with the type and quantity of pollutants discharged into the atmosphere, and develops a reasonable standard of sewage fees according to the requirements of strengthening air pollution control and the state of economic and technological conditions ". Accordingly, our country is continuing to improve the existing sewage system.

Almost all OECD member countries impose consumption tax on leaded gasoline, or impose a carbon tax on fossil fuels. Denmark and other 3 countries levy tax of sulfur. Of course, OECD member countries do not impose taxes of sulfur to control SO<sub>2</sub> emissions, but also in order to increase revenue. According to SO<sub>2</sub> emissions and sulfur content of fuel, tax collection of sulfur is divided into two kinds of ways. On the management, the former requires complex monitoring system, while the latter, with collecting and testing in the process of fuel wholesale sales, is much more convenient. At present, China's collection of sewage SO<sub>2</sub> in the "two-controlled areas" is close to a pollution tax.

In addition to the collection of environmental resources tax mentioned above, the Government also adopts other tax measures to stimulate investment in environmental protection and guide environmentally sound production and consumption. For example, in 1992, Thailand adopted the reduction of fuel duty. The excise taxes for leaded and unleaded petrol were reduced by 15% and 20% respectively. Our country has established a tax difference policy too, which reduces or exempts from value-added tax to the "three wastes" utilization projects.

The main foundation of markets includes the tradable emissions permits (pollution-discharge rights) and the tradable environment stock. In the United States the first application of emissions trading was in the pollution control of the heat-engine plant SO<sub>2</sub>, comparing to America, the emissions trading was only implemented in Germany in Western Europe. In 1990 The American's amendment of "Clean Air Act" proposed the "acid rain program", at the same time a nationwide SO<sub>2</sub> emissions trading was implemented. The American's experience shows that emissions trading more than a fine on excessive discharge of waste ensure the realization of the goal. In 1993, China's State Environmental Protection Administration chose Taiyuan and the other five cities as emissions trading pilots, requiring the new enterprises to invest in the old business in order to govern the old, that is, "with the new old." The results showed that SO<sub>2</sub> emission trading pilot had a strong administrative color. The sale of the amount of sewage was in the government's participation. There is no real market. For example, in Taiyuan, the relevant implementations stipulate that all new, expansion, renovation and transformation projects, whose amount of sewage are more than permitted, will pay of compensation on air for implementing environmental compensation. The emissions trading business between enterprises has become enterprises purchasing emission rights to a government.

Financial instruments and financial means include various types of loans, funds, environmental funds, special funds, such as the Global Environment Facility. At the end of 1999, the Global Environment fund provided a grant of 9,617,000 U.S. dollars for our country. In Britain, the country usually give some subsidies for fuel and equipment replacement in the particular area of atmosphere protection. Take London for example, the state will give 70% of the costs if the coal-burning was changed to natural gas (or gas) or electricity. In china In China, the People's Bank of China issued 24 documents in 1995, requires that the loan application of all construction projects must comply with

the provisions of environmental laws and regulations. The bank had veto power, however, the implementation of economic policies is not satisfactory for the absence of relevant supporting measures.

Market failed to act in the field of health, there are a large number of public products or quasi-public products in this field, the Government should take the responsibilities in the health field because the public finance is market economy and government finance. China's health management system is very complex for the health management was dispersed in many departments, such as the Ministry of Health, National Development and Reform Commission, Ministry of Finance, Ministry of Labor and Social Security and so on. As the health problems have attracted increasing attention, the state has increased the inputs in the health area, also, relevant departments participated in and carried out a series of activities, for example, after the Wenchuan earthquake in 2008, the Ministry of Finance increased the input of earthquake relief funds, the number of earthquake relief funds invested by China's financial departments at all levels has reached to 91,182,000,000 yuan, In addition, other relevant departments played an active role in the post-disaster reconstruction. The Secretary for health protecting of national Development and Reform Commission carried out international cooperation actively, exchanged the experiences of post-disaster reconstruction with the World Bank and got support for the reconstruction, The activity safeguarded the interests of the health of people in the disaster areas earnestly.

To respond to climate change actively, in addition to strengthening the policy, science and technology, it is also important to increase the investment of climate change-related science and technologies, the technology inputs to cope with climate change has reached to more than 2.5 billion yuan though The program for tackling key problems, the 863 plan and 973 plan during the 10<sup>th</sup> five year plan period. The input has reached to 4.6 billion after the first project during the 11<sup>th</sup> five year period, nearly doubled of that of 2007. The research

input arranged for energy reduction and climate change has reached to more than 7 Billion yuan as of the end of 2007. It is enough to show that the government has attached weight to climate change. In addition, at the same time of gradually establishing of a relatively stable government funding channel in which the government was the main channel, the state has raised funds through various channels, attracted investment from all sectors of society to the science and technology of climate change and provided Further funding to deal with climate change for china.

#### **4.7 Related Work of the State Under the Management Model of Environment and Health**

In order to promote the establishment of resource-saving, environment-friendly society, to solve the outstanding environmental problems that do harm to people's health, to ensure an effective protection of healthy and environment, the government, enterprises, social organizations and non-governmental organizations, as an important part of the environment and health management system, have done a lot of work in relevant areas, and promoted the harmonious development of environmental and health work.

##### **4.7.1 Concrete Action of the Government in the Environmental Health Area**

In order to promote the country's environment and health work, and to promote the government to play a leading role, the Department of Environmental Protection, the Ministry of Health of China, as the core of the environment and health management, have done a great deal work in the management of health environmental problems, and have carried out a series of related studies. In addition, the Development and Reform Commission, Ministry of Agriculture, the Ministry of Finance and other relevant ministries are also actively cooperate with and respond to environmental and health related activities in the field, which fully reflects the government of China is on the

leading position in the environment and health management system.

China's Ministry of Health, as the health authorities, has carried out a series of activities in both urban and rural areas. The health situation has been improved. Health campaign both in urban and rural areas has been promoted. Health Ministry Disease Control Department, which is the National Patriotic Health Campaign Committee Office, has put health city-building into the town's economic and social development plan, made an overall plan and arrangements, cleared the purpose, improved the measures and carried out the responsibilities, and played an active role in the creation of national health cities (districts) and the town of health (county). The environmental health, environmental protection, public places, drinking water and public health of the city was set as the selection criteria, the environmental regulations on city's face-lift and environmental health was emphasized, the regulations that is suitable to the supervision and management of the environmental health has been worked out and the city's face-lift. Requested the city to have a clean and tidy environment;

The rate of Sanitation facilities and equipments in good condition is more than 98%, the rate of the areas being swept and cleaned is 100%. The management of markets has been Standardized, the health system has been implemented, the organizations of the construction site was sound(("national health standards for the city", 2005) .To the end of March 2008, the country has named a total of 94 cities of the National Health, it is important that only a total of 61 cities was named Health (National Health cities (districts)in 2000, (the National Health in the town (county) list, 2008), The activities has adapted to the needs of the rapid economic and social development of China and effectively improved the sanitation outlook of China's urban and rural areas, mobilized the initiative of the masses to participate in health activities in the practice of urban sustainable development, meet the growing demand of the broad masses on environment and the health, and is of great significance for

further implementing the scientific development concept and building a harmonious socialist society.

At the same time, in our rural areas, the Committee Of National patriotic public health conscientiously implement the strategic plan of CPC Central Committee on building a new socialist countryside, and improve the productive and living environment in rural areas effectively, improve the health quality of the farmers. In 2006, the guidance of strengthen the patriotic public health work in rural areas to promote a new socialist countryside construction was made, in 2008 the committee made a decision that patriotic public health campaign is focus in rural areas. Based on the patriotic health and the build of health city, persist in people-oriented and "prevention first" approach, the Committee continued to carry out extensive and in-depth reform to drinking water and lavatories, promoted the health of millions of farmers and built the sanitation towns and villages, and played an important role in creating a healthy environment and improving the health quality of farmers and further strengthening the rural environment and health work.

In order to sum up and exchange the experience of the practice of the environmental health work in rural areas and discuss the challenges and strategies of the development, the state patriotic Health Campaign Committee and the National Ministry of Health held the "strategy seminar of rural sanitation" in 20<sup>th</sup> October 2008, Minister Chenzhu fully confirmed the achievements of the sanitation work in rural areas in recent years, at the same time he pointed out that to strengthen the management and research of environment and health, to reduce environmental pollution and reduce health hazards risks, to increase the ability and level of Disposal and services, to promote the harmony of development, environment and health are not only a guarantee of sustainable economic and social development, but also the basic requirements to implement the concept of scientific development and to build a harmonious socialist society. The seminar is of great significance to

carry out the further work of environment and health in rural areas.

After the National Environment and Health Action Plan(NEHAP) was put forward ,In order to further implement the NEHAP, The launching ceremony of the first "China Environment and Health Awareness Week," which was hosted by the central committee of Chinese Peasants and Workers Democratic Party, the Ministry of Education, the Department of Environmental Protection, Ministry of Water Resources, Ministry of Health and the state administration of radio film and television, was held at Great Hall of the People in Beijing. Each of the vice ministers of relevant ministries who is in charge attended the launching ceremony and delivered a speech, The Deputy Minister of Health Chen Xiao Wang pointed out that the party and the government have always attached great importance to the safety of drinking water, the State Council have approved the rural and urban water security planning in 2006 and 2007 respectively and will solve the problem of unsafe drinking for a rural population of 320 million, solve the problem of unsafe drinking for the citizens who are suffering from unsafe drinking water before 2015, improve the city's serious situation of unsafe drinking water by 2020.The Chinese environment and health awareness week in response to the call of the international environment year of the united nations in 2008 and to harmony with the NEHAP, has made a positive contribution to the environment and health work of china.

Ministry of Environmental Protection in China, as the main charge of the environment work, has carried out a series of activities to promote the environment and health protection and participated in the cooperation of relevant departments actively. the International Symposium of the health and environmental pollution which was sponsored by the Chinese Academy of Engineering and hosted by Environmental Monitoring Station of Ministry of Environmental Protection was held in Beijing, The experts attending the meeting exchanged their ideas broadly and deeply on the topic of exposure

and measurement, epidemiological research, risk assessment, research and the mechanism of toxicity and gave valuable suggestions for areas of concern of our environment and health issues, practice of scientific research and future development direction and the focus of research. In addition, the ministry of Environmental Protection, in conjunction with other relevant ministries, held "seminar of traffic pollution and human health", "seminar of global warming on human health effects" "conference on environmental pollution and children's health" and so on, In April 2006, the Sixth General Assembly of environmental protection was held in Beijing, It clearly pointed out that environmental protection work should be concentrated to solve the outstanding environmental problems against health of the people. The monitoring and environmental health bureau was set in the ministry of Environmental Protection which Specialized in the management of environment and health and provide further organizational support for China's environmental and health work.

In addition to the Ministry of Health and the Ministry of Environmental Protection, national development and reform commission, ministry of water Resources, ministry of agriculture and other relevant departments have carried out a series of environment and health work in their respective areas, which had a major impact on China's environment and health work. For example: the national development and reform commission held the liaison meeting of the leading Group of emission reduction and energy saving of the state council and developed "the implementation plan of the emission-reduction and energy-saving program by all the people" ,"the work division of promoting the implementation of emission-reduction and energy-saving work" etc. This is of great significance to push forward the reduction of sewage, China's Ministry of Water Resources, as head of the department of water resources, has done a great deal in developing and implementing of drinking water safety plans in rural areas, strengthening the protection of water resources areas and water

environment, protecting water resources and the pollution control, Validation water pollutant carrying capacity, restricting the total amount of sewage, carrying out supervision and management of soil erosion. The Ministry of Agriculture, except held the Conference of Agricultural Environment and Resources Protection Work, participated the activities under the frame work of Convention on Biological Diversity," "Convention on Persistent Organic Pollutants", carried out national census of agriculture pollution source, agricultural production monitoring, evaluation, the building of a gas households in rural areas, constructing of clean villages model, Clean demonstration projects in rural villages, this has greatly pushed forward the environment and health work in the rural areas, protected the interests of the broad masses, state administration of work safety has strengthened law enforcement in protecting the worker's health, as education and publicity are also very important, the Ministry of Education and the state administration of radio, film and television, on one hand, carried out health and environment-related education activities, on the other hand, made propaganda for environment and health-related policies and the achievements through radio and television, and played an important role in the popularizing of environmental health knowledge and common sense.

In the new era, to carry out the overall work of environment and health not only requires each departments to continue to strengthen their respective work, but also requires to intensify the cooperation between these departments, so the environmental health work will enter a new stage.

#### **4.7.2 Enterprises Actively Cooperate with the Environment and Health Management**

Environment and Health Work is not only a government-led public welfare activity but also an economic activities in which the Enterprises are the related main parts, the development of environment and health work rely not only on

the government but on the Enterprises and public participation, it is important to make it possible for the enterprises and public to contribute all they can.

In January 2007, "China • Fund of the Social Responsibility of enterprises " started, the fund was set for the purpose of establishing a exchange platform for the enterprise with the government, academia and the media, which is called "China International Forum on Corporate Social Responsibility", so as to promote the concepts and practices of environmental health for the enterprises and to form a joint public project with a high degree of Enterprises-involving and a wide range of social benefits. Such as environmental protection, public health, medical assistance and other fields, the establishment of this fund provided a reliable channel for the enterprises to join the common good, and added a new dimension for evaluation of the social responsibility of companies, and is of great significance to the whole society.

The activity of "creating a green business" was launched by 69 Chinese enterprises at the 12th "forum of Green China" in September 2007, "Declaration on corporate social responsibility" was issued which promised that at the same to develop the economy, attention should be paid to environmental protection, pollution Governance, adhere to start at the source, do every efforts to achieve the aim of emission reduction and energy-saving and create a pleasant social environment. At the same year, China's emissions have made a positive progress, the Unit GDP energy consumption fell 3.27 percent over the previous year, both of the chemical oxygen demand and total sulfur dioxide decreased for the first time in recent years, dropped by 3.14% and 4.66% (2008)respectively, The data received a solid response of Premier Wen Jiabao's government work report in the 11th National People's Congress for the first meeting, "Communique of the index of the main pollutants in each provinces, autonomous regions and municipalities during the first half year of 2008"was issued by the National Bureau of Statistics and the National Development and Reform Commission, The results showed that

the national total emission of chemical oxygen demand in the first half year of 2008 was 6,742,000 tons, dropped 2.48 percent compared to the same period of 2007(6,913,000 tons), sulfur dioxide emissions was 12,133,000 tons declined by 3.96 percent compared with the same period in 2007 (12,634,000 tons). From the main emission reduction measures, there were 40,600,000 kilowatt coal-fired desulfurization unit has been put into operation from January to June, 8,360,000 kilowatts of small thermal power unit was eliminated at the same time, new urban sewage treatment capacity increased by 6,780,000 tons a day, Structural adjustment has made progress in iron, steel , Cement, paper-making and coke, alcohol, monosodium glutamate and other high energy-consuming and high emission industries, and thus made a positive contribution to our environment and health work.

This shows that China's environment and health work, besides relying on the government, it is also necessary to rely on the enterprises to take their social responsibility and to play its role in the society, Resource conservation, environmental protection, energy reduction should be done as the key work to fulfill the social responsibilities, only in this way can we promote the environmental health work rapidly and entirety.

#### **4.7.3 Participation of Social Groups and NGOs**

Since the beginning of Reform and Opening-up, government organizations, social groups and NGOs has been developed fast on the basis of the effect of Chinese economics, politics, social life and culture. With the establishment of the objective of “small government, big society” in the new century, social groups and NGOs were given more room to develop by shunt of economic system and conversion of government function. With the emphasis of the government maintaining the policy of “supervision and regulation, cultivation and development” which were put the same emphasis on, those social groups and NGOs in the field of environment and health field, as important elements in

our environment and health administration system, contribute much to achievements of environment and health.

In the field of health, CPMA (Chinese Preventive Medicine Association), as a unit directly subject to the Ministry of Health, is a national academic group in the area of public health and preventive medicine which is in charge of these liabilities as follow: organization of a variety of academic communication in the field of preventive medicine; promotion of development and popularization of scientific fruits; generalization and propaganda of medical science and technology, so as to increase national level of consciousness of self health protection and knowledge of health. In order to ensure proceeding of the work, environment health branch, sanitary engineering branch, primary hygiene branch, labor sanitation and occupational disease branch were established under the control of the Association. Focusing on the development of social economy and the need of people's health in different periods and extruding the characteristics of environment health, the environment health branch, as an academic group of environmental health workers since the establishment, developed a variety of academic communication and scientific consultation and then pushed continuous development in the field of environmental health forward positively.

Additionally, in 2008, NDRC (National Development and Reform Commission), MOH (the Ministry of Health), MOWR (the Ministry of Water Resource) and UNICEF (United Nations Children's Fund) initiate a research project of "The Comparison of Supervision and Regulation of Water Environment and Measures and Policies of Investment between Different Areas" which did much research on those main problems of the health of water environment in different country regions. Through the research, the project compared main measures and investment policy of amelioration of the health of water environment in those areas and then put forward the ameliorated investment policy and suggestion on these problems which is significant to the

amelioration of water environment in our country areas.

In the field of environment, the Chinese Society for Environmental Sciences is a comprehensive national environmental research institution, which directly under the management of the Ministry of Environmental. The environmental factors and human health impact have become the hot and difficult spots in the field of environment and health. In 2007, the Chinese Society for Environmental Sciences organized the "Symposium on Environment and Health of 2007 and the Preparations Assembly for China Environmental Medicine and Health Branch of the Chinese Society for Environmental Sciences" in Henan Province. The participants around the theme of environment and health carried out the exchange of their research and experience and broaden the ideas. The symposium have laid a sound foundation for the transition from the Special Commission of Environmental Medical to the Environmental Medicine and Health Branch and promoting the environment and health research. The All-China Environment Federation as another social organization under the Ministry of Environmental Protection, in order to actively cooperate with the relevant government bodies to develop a practical "Eleventh Five-Year" environmental protection plan, launched the nationwide activities of seeking advice from the masses from December, 2004 to June, 2005. This promoted the introduced of environment and health-related policies and played a positive role in promoting the development of China's environment and health.

In addition, a considerable number of social organizations have established cooperative relations with relevant ministries, conducted scientific publicities and academic exchanges, and actively participated in the development of relevant policies, norms etc.. Such as the China Association of agro-ecological environmental protection actively cooperated with the Ministry of Agriculture, and participated in the conferences of agricultural environment Protection, energy saving and emission reduction. In the areas of expertise, the

association has played its due role.

In the process of full realization of China's modernization, the vigorous development of social groups and non-governmental organizations (including those related to environment and health-related social groups and non-governmental organizations) is the requirement of building a new pattern of social management and social progress in the new period. Conforming to the historical trend of development, improving the occasion, adhering to the guiding services and supervision and management, creating a new mechanism and implementing the new measures will lay a solid social foundation for the implementing the scientific development concept and the building of resource-conserving and environment-friendly society and enrich the important social forces.

## **Chapter 5 International Experiences**

The formulation of environmental health policies and practice aims to develop policies and strategies that aim to manage the environment to protect and promote human health. The benefits of improving the way in which national governments manage environment and health has now been widely recognized in terms of health with WHO indicating that 25% of the global burden of disease has environmental links. Also being increasingly recognized are the economic benefits to industry, the service sector and government of promoting economic growth while protecting national and international business and consumers from litigation and financial risks. Climate Change serves as yet another, albeit significant, impetus for all countries to further develop and adapt their effective environmental health systems to reduce vulnerability and increase resilience to environments even more hostile to health, well-being and economic viability.

### **5.1 A Framework for EHMS**

Just what constitutes an 'Environmental Health System' is best discussed in terms of Agenda 21 which called for the establishment of mechanisms for sustained community involvement in environmental health activities, for more environmental health research and for the strengthening of environmental health services by Local Authorities. A major focus was placed on improving the assessment, management and reduction of environmental health risks, recognising that most countries lacked mechanisms to integrate environment, health and development issues and had a clear need to improve planning and management at the local and national levels. The following paragraph captures the essence of the recognition given to the importance of environmental health:

“Basic capacity requirements must include knowledge about environmental health problems and awareness of leaders, citizens and specialists; operational mechanisms for intersectional and inter-governmental cooperation in development planning and management and in combating pollution; arrangements for involving private and community interest in dealing with social issues; delegation of authority and distribution of resources to intermediate and local levels of government to provide front-line capabilities to meet environmental health needs.” (United Nations p 15)

Some of the key elements of any environmental health system can be deduced from the above and include the socio- political space or ‘governance’ within which development policy and decisions are made and the management processes that are available to develop and implement strategies to assess, manage and reduce environmental risks. Together they may be said to comprise the ‘environmental health system’ (EHMS).

A useful framework to support the development and analysis of an EHMS may be presented in terms of four interrelated and dynamic domains of ‘Policy’, ‘Place’, ‘Practice’ and ‘Program’ (Figure5-1). It is against this framework and the international experiences discussed in this chapter an analysis of China’s own system and in turn the development of recommendations on how China’s EHMS may need respond to the impacts of Climate Change.

## The 4P Framework:

Environmental

Health

Repeat cycles with time

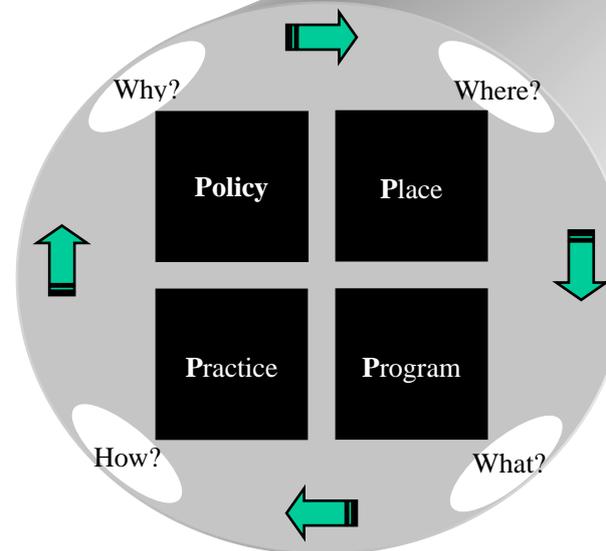


Figure 5-1 The 4P Framework

**Policy:** The policy domains of environmental health reflects the overarching 'definition' of the field ie a more traditional 'protection' / control worldview will produce more of a regulatory/environmental control suit of policies with a strong focus on environmental protection. A more holistic 'sustainable development perspective will address policies related to the more 'upstream' drivers of change, as well as the immediate causation.

**Place:** includes countries environmental health 'governance' ie the social, legal, economic and political structures and processes, which facilitate the development of environmental health policies and intervention strategies. Here such issues as role of community in decision making, level and nature of development , government structures and levels of decentralization and the

ways in which governments at all levels interact are significant considerations. 'Place' also includes the biophysical, social, cultural and economic characteristics of a nation and play a key role in identifying and prioritizing environmental health issues.

Program: includes the specific interventions / strategies developed to implement policy (assessment, management and reduction of risks) and the management tools that are required to implement those strategies. . The EHAPE recognises that:

“Many countries urgently need to create or improve the main tools available to decision makers for environmental health management. To be effective, this requires a shift from the traditional approach (involving the separate consideration of, say, water, air and food quality control and of waste management) to an integrated approach that...improves the ways and means of preventing and controlling environmental hazards and favours actions directed at controlling the source of these hazards” (EHAPE 1994:15).

The main environmental health management tools are:

- an environmental health information system
- the identification and assessment of environmental health hazards and risks
- a framework of enforceable legislation
- additional control measures, including economic and fiscal instruments
- environmental health workforce
- professional education and training
- public information and health education
- public participation

- research and technological development.
- local and national planning mechanisms

Practice: The 'practice' includes the application of environmental health management tools to specific intervention strategies by environmental health professionals to address issues. Here the most visible in many countries is the Environmental Health Workforce – often located at the local government levels as 'environmental health officers' or similar. This service works directly with local communities to deliver the various intervention programs. Practice also refers to the implementation of programs at all levels of government and embraces the work of both 'environmental health professionals' such as EHOs but also professionals working in specialized areas of environment and health.

This chapter will now briefly discuss each of the 4Ps drawing on a meta-analysis of international examples to present a range of opportunities for China to consider in its assessment of its own needs and developing new approaches to address Climate Change. This section of chapter 4 draws extracts directly from a number of recent studies and publications by WHO as cited in text –the reader is referred to them for a more in-depth analysis.

## **5.2 Policy**

Perhaps the best way to explore the policy domain is to examine the approaches taken by many countries in their articulation of the nature and scope of environmental health policy in their National Environmental Health Action Plans (NEHAP).

A review of 40 of these NEHAPs by Powis et al (2002) revealed that the type of policies was very dependent on the specific country in question being dependant on not only the health status of the country but it's history , culture and level of development. Broadly speaking the policy areas could be can be broken into three categories, being promotion, protection and remedial.

- Policies related to Promotion was expressed in term of an educative role of the state or as a more broad based construct aimed at empowerment of community and development of new governance systems which focused on health and well- being.
- Protection Policies were most frequently expressed in terms of the environment. The relationship between the state of the environment being linked directly with the state of human health.
- Remedial Policies were most often seen in countries that were suffering the aftermath of political instability, nuclear disaster and economic hardship. These policies were focused on 'fixing' or 'alleviating' serious problems identified as affecting the health of people in that nation. Often NEHAPs from countries that used largely remedial approaches also exhibited heavy sections on health indicators and epidemiological graphs and maps.

While the majority of national plans included policies that embraced some combination of all three the balance between environment and health is, for most part, a difficult one to negotiate. It would probably be true to say that for most of the NEHAPs reviewed there is a stronger emphasis on health, with environmental issues only articulated in terms of the human health impact. Countries with higher levels of health such as Switzerland tended to focus on the environment as an intrinsically valuable entity, as well as human patterns of consumption and the environmental and social implications. For example the Swiss Plan outlines a farm visit program whereby children are educated about food and the ideals of support for local industry and sustainable consumption patterns are targeted. This does not mean that countries with populations enjoying 'lesser' levels of health are wholly focused on human health over the environment. In Ukraine, which has a background of political instability and nuclear contamination, maintains a large interest in environmental protection activities, within a framework of 'sustainable development'.

### 5.2.1 Identifying Purpose

The review of NEHAPs revealed that development of a national specific vision which embraced the intended purpose of the policy area seemed to be a useful tool in; the prioritization of issues, providing a sense of direction and a guide for the development of goals and actions that suit the particular setting. Such a vision setting process was identified in the Swiss and Fiji NEHAPs as opposed to the majority of countries such as Ireland that chose to draw heavily on the WHO definition viz:

**“Environmental health comprises those aspects of human health, including quality of life, that are determined by chemical, physical, biological, social and psycho-social factors in the environment. It also refers to the theory and practice of assessing, correcting and preventing those factors in the environment that can potentially affect adversely the health of present and future generations”(P8).**

An overarching conclusion was that countries which chose to define EH in their own terms seemed to have plans with a clearer direction and vision, perhaps aiding participants in forming common ideals and improved cooperative relationships.

### 5.2.2 Blurring Boundaries

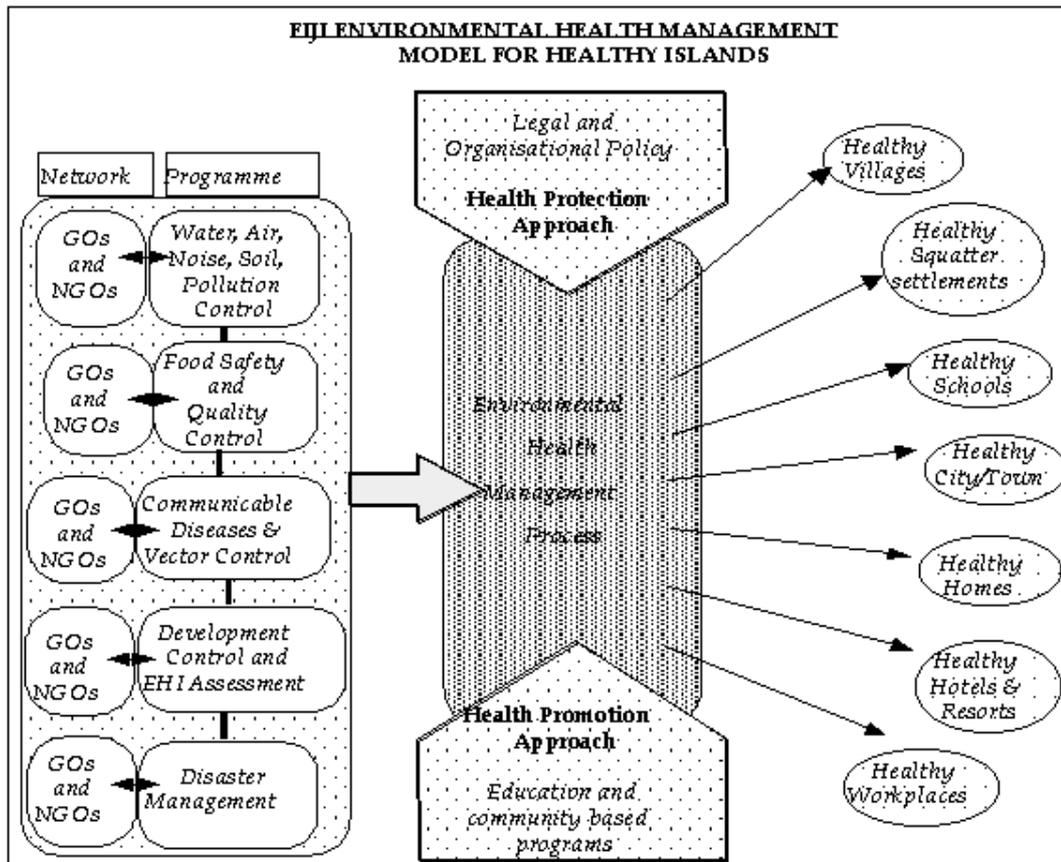
Common in many countries is a more limited and traditional approach to environmental health policy viz a focus on the biophysical environment and its control whereas those with a sustainable development emphasis supported broader more holistic approaches – this included the social dimension – one historically not part of the policy and practice of environmental health. This more ‘biophysical’ approach has for many excluded the use of ‘Health Promotion’ policy and programs as opposed to the more common regulatory “Health Protection” approaches with its focus on legislative management of the more direct environmental determinants of health.

Indeed while environmental health is widely perceived as a 'component of public health' itself consisting of environmental health ,lifestyle disease control, epidemiology , occupational health and health service delivery etc countries regularly blur the boundaries making its position within the public health policy domain at best dependant on country needs at worst ambiguous and homeless. To add to this complexity is the overlap, acknowledged in the Australian National EH Strategy, between environmental health and environmental protection both concerned with the protection and promotion of human health and well- being.

Fiji is one example of an approach to national environmental health policy which serves to integrate health promotion with health protection, within a settings approach as stated;

Recognising the synergy between these two approaches, a new combined approach to health promotion and health protection has evolved within this settings approach, where these two ways of addressing the health of communities are together implemented in the settings where people live, work, learn and play”

The model(Figure5-2) identifies the importance of three major components; the use of individual program areas, the harmonisation of both health protection and health promotion approaches and their application in a settings approach” (Healthy Islands: Regional Implementation Guidelines Draft 5, June 2001: P7).



**Figure 5-2 Fiji environmental health management model for healthy islands**

### 5.2.3 The Social Dimension

'Poverty' and 'Social Justice' are identified by a number of countries as important factors in Environmental Health planning, and though social justice issues feature strongly in documents such as the Australian and Swiss Action Plan, they feature rarely or with little depth in the vast majority of National Environmental Health Plan's reviewed. There are a variety of levels at which social justice can feature in Environmental Health Policy:

1. As a issue area for consideration

2. As an integrated principle within other needs areas.
  3. As a problem within itself requiring additional planning and actioning in order to overcome the disadvantages that result to people or groups effected by them.
  4. As a human health issue itself in that various social problems have an effect on not only physical health, but also psychological health.
- Social justice is a principle upheld in the Swiss NEHAP because everyone has the right to health and well being.

“The way society protects and provides for its children is a measure of its degree of civilisation and development potential. Children should be the first to benefit from mankind’s successes and the last to suffer from its failures. An under stimulating outdoor environment, rundown housing estates and inadequate school buildings do not provide a favourable setting for the young or offer them the best conditions in which to grow up and develop. The fact that children are more sensitive than adults justifies taking children, to an increasing extent, as the norm in determining limit values for substances in the environment and products” (Environment for Sustainable Health Development: an action plan for Sweden, 1996, P25)

Social Justice deals with ‘special needs’ groups who are disadvantaged in accessing reasonable standards of health care, and hence, suffer lower levels of health than the rest of the population.

Australia’s strategy includes a chapter on ‘Environmental Health Justice’:

*“Implementation of Programs in Environmental Health should take into account the social context of the target community and may need to contain components addressing different groups within that community” (The National Environmental Health Strategy, 1999, p22)*

Australia’s strategy addresses;

- Socially and Economically Disadvantaged Populations
- Children and Environmental Health
- Environmental Health Justice for Indigenous Australians

By addressing social justice issues within EH issue areas, a more holistic understanding of health determinants and the role of the 'social' in human and environmental health can be acknowledged and used in planning strategies to improve health.

### **5.3 Place**

#### **5.3.1 Governance and Community Engagement**

Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. (Principle 10, Rio Declaration 1992).

In its review of the importance of good governance the UN (2007) emphasised the critical role to be played by the State in building an enabling environment for civil society and developing decentralised management systems that provide for greater transparency and accountability of government. The need for change is now ever more apparent with driving forces of urbanisation, industrialisation and poverty resulting in a significant health impacts. These environmental threats are clearly threats to human rights. In fact, this link between environmental rights and human rights is reflected in the Aarhus Convention, which reinforces the principle that every person has the right to live in an environment adequate to his or her health and well-being, and as such, public access to both information and decision making is key (Jeffrey 2005).

Increased public awareness of environmental threats such as climate change ironically provide countries with an opportunity to reinvigorate commitment to inclusive governance and address this challenge by developing new strategies for governments to engage the community to adapt and to protect both their

environment and their health (IPCC 2007)

It is now widely accepted in many countries that the community participation is core to good environmental health governance. The system exists to improve health and well-being of the community and at the same time communities have a key role in identifying local EH priorities, adopting sustainable consumption behaviors, and in ensuring that governments and private sector are accountable for their actions.

As outlined in detail by WHO in its review of community participation ( WHO 2002) community participation is not new but policy developments such as Health 21, Local Agenda 21 and Healthy Cities and now the need to address Climate Change has placed it high on the political agenda.

### **5.3.2 Risk Communication**

Recent lessons described by Dora and Pfiffer(2008) identified the advantages of increased community engagement with the health system in addressing health threats such as SARS and now Climate Change. They identified the importance of;

- “Consulting with people to canvass their views and to involve them in policy and decision making, and reporting back to them regarding the use of results from consultation into policy and decisions. Monitoring and mapping out public discourses, frames and assumptions to monitor how people perceive and evaluate different risk related issues.

- Defining a risk assessment policy, established prior to the assessment, in consultation with interested parties, acknowledging that non-scientific assumptions define the types of effects to be assessed or the kinds of evidence

- Establishing mechanisms for sharing information on health hazards, their source, as well as on disease and its spread across countries and provinces.” P108)

And went on to illustrate this with a recent international example;

“The political response to a new health threat can foster public collaboration and solidarity, as illustrated by the experience in Singapore and Hong Kong Special Administrative Region of China (SAR). Control measures were made a political priority in view of its severity, speed of international dissemination, social and economic consequences including disruption on trade and tourism.

The public was considered an essential partner in combating the disease and information as the best way to secure public participation. Reporting on the outbreak as it evolved was frank, open, complete and constant, with daily meetings with the press over an extended period. Authorities recognized the importance to be accessible and responsive to the media. Reporters articulated the concerns of an anxious public, and replies to the media were widely publicized in lay language, promoting the public understanding of the issues. This strategy promoted public confidence that government was responsive, genuinely concerned, and taking every possible action to end the outbreak quickly. The public responded positively, acting on the measures recommended for personal protection (good hygiene, temperature checks, restriction to visiting patients in hospital). Adherence to quarantine measure demanded a sense of community solidarity and shared responsibility to resolve the situation. Mask-wearing served personal protection and was a courtesy to others, and was not considered a sign of panic in either Singapore or Hong Kong SAR” (Dora and Pfeiffer 2008 p 110)

### **5.3.3 Participatory Community Governance**

While improvements to community engagement in managing outbreaks such

as SARS may be handled by improvement to existing governance structures there is an emerging recognition for the need to re-conceptualise governance regimes, reconnect with stakeholders and graft flexibility onto an otherwise inflexible regulatory regime (Durant et al 2004).

The new global environmental governance paradigm (Durant et al, 2004; Lemos and Agrawal, 2006) is more inclusive and participatory. These and other authors point out that the new paradigm is different to previous approaches (eg Indirect Rule, Community Development) which relied on existing structures of authority, in that new structures are formed: community-based groups underpinned by notions of capacity building, local knowledge and the rationality of individuals.

Healthy Cities and Local Agenda 21 has underpinned the emergence of a worldwide movement through either healthy cities or local agenda 21 committees all embracing the need to establish new governance mechanisms to facilitate both multi-sectoral collaboration and community participation.

#### **5.4 Program**

The use of 'management tools' as an important component of any EHMS is rapidly progressing in many countries, as is the development of institutional arrangements to support improved collaboration and planning.

One of the most widely used planning tools for developing an environmental health strategy and action plan at the national and local levels in Europe is the National Environmental Health Action Plan (NEHAP).

The NEHAP process was initiated following the adoption of the Environmental Health Action Plan for Europe at the Second European Conference on Environment and Health in Helsinki (1994). The Helsinki conference is part of a series of Ministerial Conferences which form the cornerstone of the Environment and Health Process in Europe, a primary purpose of which is to strengthen the collaboration between the health and environment sectors in

addressing the human health aspects of environmental problems at the national and international level.

At an individual country level, the overall purpose of the NEHAP process is twofold: 1) to develop a national/regional data information system that monitors environmental quality including the prevalence of environmentally related diseases, and 2) to put in place a process which enables the assessment of environmental health hazards or problems and determines priorities within them

There was widespread feeling among those surveyed in the evaluation that the European Environmental health Process should continue, but that more effort needed to be made to enhance its effectiveness. Just what can be done to improve this process was the subject of recent NEHAP projects in the Asia-Pacific?

#### **5.4.1 Enhancing Effectiveness of Planning**

WHO has explored ways in which many of these issues could be addresses through alternative approaches to the 'planning' premised on 'learning'. In order to move towards strategies that focus on process as much as outcome, strategies need to be akin to what Mintzberg (1995) regards as the art of the craftsman. Mintzberg advocates the use of a two-step approach to planning, using both emergent and more prescribed approaches. Emergent strategies are used to nurture learning to enable all the 'craftsmen' in an organization to be involved, particularly those lower down in the hierarchy who are most in touch with the 'potters clay'. More deliberate strategies are then used to provide some control to the process. In this way, emergent strategies may be seen as patterns of behavior, decision-making and problem-solving and may signify an active learning process.

The use of experiential learning has been extended to establishing 'communities of practice' in which all members share an understanding of

purpose. The assumption is that concurrence of basic underlying beliefs provides a common meta-level world-view of values and meaning (Hendry 1996). This shared meaning can develop as people interact and learn from each other while solving problems; sharing tacit knowledge about work; and experimenting with new work practices.

It was with this theoretical framework that WHO worked with a range of governments in the Asia–Pacific to explore the NEHAP process. The first of these NEHAP processes took place in Fiji in the mid 1990s.

Since inception, the focus of the Fijian NEHAP has been on reorienting basic functions of the government environment and health services to move from that of a highly regulatory nature to one in which there is a strong focus on building capacity within the community for strategic planning. A key focus in the Pacific has been developing community participatory processes which build joint visions and shared responsibility for the management /implementation of decisions (Galea et al 2000). The approach is built on the success of the ‘Healthy Settings’ concept, which provides a social, cultural and ecological context or framework within which systems for health promotion and protection can be more easily defined. Intersectoral approaches and community engagement are also more easily achieved through such an integrated framework.

The Fiji NEHAP, for example, has resulted in the training of all senior environment and health officers in Fiji in areas of community facilitation, policy development and strategic planning, as well as a complete restructuring of roles and operations. The process also involved training of key community leaders in a variety of settings; villages, towns and districts and provided the support for those community leaders to identify priority issues and action and resources necessary for implementation. In this manner, the NEHAP served to facilitate a process of ‘becoming’, with the planning process itself reconstructed in a way that empowers both communities and practitioners to engage in policy

development. The process of 'becoming' works on the action research principle of continual cycle, learning and growth. Using the tools of the health promoter, the strategic manager, and the environmental manager, the NEHAP can strongly facilitate the reconstruction of knowledge in this manner (Powis et al 2002, Powis et al 2006).

In an attempt to transfer many of these ideas across the Asia-Pacific, Vietnam accepted the challenge of applying a similar learning model. A particular feature of this process was the use of change tools of such a metaphor to explore mental models and address the underlying need to link environmental and health policies and practice at all levels of governance. The metaphor chosen for the Vietnam NEHAP is the kite (Figure5-3); a metaphor that reflects the need for coordination and balance at the national level but one in which real people in local settings need 'on the ground' control. The vehicle for the implementation process thus becomes local settings such as cities, towns, and villages. (Powis et al 2003)

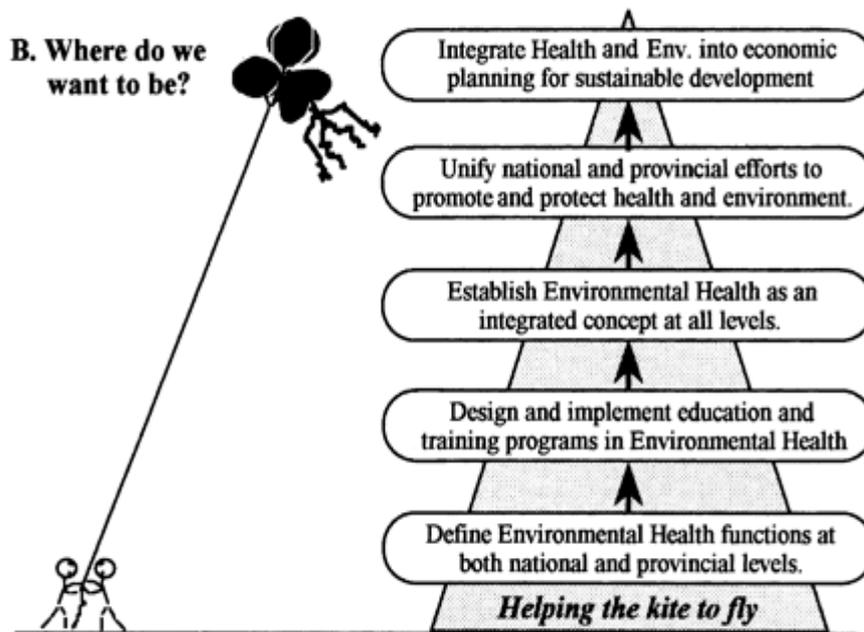


Figure5-3: The Kite metaphor used to drive the process in Vietnam (Powis et al 2003)

The Fijian and Vietnamese planning processes, as well more recent experiences working on NEHAP have served to reinforce the important lessons learnt. Namely that;

- Integration of environment and health within an Agenda 21 mindset does not happen easily. It is difficult to drive such a policy down from the top and have it work out in community.
- Practitioners in the field often find policy documents abstract and confusing. They may respond with written documents to fulfil a mandate, but ownership rarely results and action can be limited.
- Often new policy documents offer a new concept and introduce a language to describe it. Practitioners who are keen to please sometimes re-badge existing practices and change little.

- An agency that promulgates environmental health policies must work with the community to shift work and community culture. The shift must be genuine and engendered top-down, bottom-up and side-ways.
- Change in culture happens best when it is inductive and embedded in a learning-by-doing framework. It can only proceed at the pace that practitioners and community feel comfortable with.
- Change occurs most readily when a team and the community share a common vision. This vision needs to build upwards from immediately attainable goals, and then reach for loftier long term goals.
- Practitioners often need to move out of their comfort zone step-by-step and reflect on past practice as they practitioners assimilate the new (Powis et al 2006).

#### **5.4.2 Identifying and prioritizing environmental health issues**

(Direct extracts from Dora and Pfeiffer p73-)

“Environmental health threats maybe categorized as either traditional or modern. While traditional environmental health threats, such as lack of safe water, inadequate sanitation and indoor air pollution from solid fuel use, are related to poverty and lack of development, modern environmental health threats, such as urban air pollution and contamination of food and drinking water by toxic chemicals are related to economic development taking place without adequate governmental control and environmental safeguards. As such, an extensive amount of knowledge, information, and expertise is required from both public health and environmental management fields in order to successfully deal with those threats. Access to knowledge on EH hazards and protective factors as well as on their source; on human exposure to those factors; and on effective interventions to control hazards and enhance protective factors, are all crucial for EHM. Equally important is the capacity to monitor the trends on those factors and the impacts of protective measures. A

key function of EH risk management is therefore the management of knowledge and information on EH risks and protective factors.

The information on hazards and to a lesser extent on protective factors, involves a number of mechanisms for international cooperation, in virtue of the sheer volume of experiments and research required and their importance in international trade. There are tens of thousands of chemical substances for example that are used, transported and disposed in different parts of the world. International coherence is key for the management of chemicals and other pollutants and some of the mechanisms for sharing information on hazards, their classification and labeling are describe in this section. In addition national capacity such as in poison centres, are essential for the management of the people with poisoning.

While international knowledge may provide insights as to what might be expected from human exposure to different pollutants, EH risk management also requires that health impacts in the local context are assessed to determine the extent and sources of exposure. Local sources of EH hazards, that can be documented in emission inventories or maps of EH hazards.

Estimates of the public health impact of an environmental hazard existing in a specific location and affecting a given population can be developed through "Burden of Disease" (WHO methodology) by combining local information on hazards and human exposure, to results from scientific studies showing the exposure-response between exposure and disease. Estimates of ill health, combined with estimates of economic and environmental opportunity losses are summarized in "Cost of Degradation" (World Bank methodology) analyses. The above methods are useful for identifying national or local priority EH risks, from the perspective of their expected impact on health and environmental costs to society.

Designing interventions to address EH risks require that policy makers and

planners have a clear understanding of the sources or drivers of EH risks in a given context or setting, and how the policy options available are expected to benefit health and the environment. Health Impact Assessment (HIA) is the tool that puts risk assessment and other relevant information into the context of a policy or project decision, in a similar way to Environment Impact Assessments (EIAs). Both can be integrated into Strategic Environment Assessments (SEAS) and Integrated Impact assessments when the focus is to estimate impacts of strategies or high level policy decisions. Their use is described in the latter part of this section.

The following section provides an overview of some of the tools used in different countries to facilitate the identification and prioritization of environmental health issues and to estimate potential impact of policy decisions on health and environment”

#### **5.4.2.1 Health Impact Assessment**

(Direct extracts from Dora and Pfeiffer p73-)

“A Health Impact Assessment (HIA) clarifies the expected health implications of a policy or project. Its application at the planning stage of a policy or project allows changes to be effected so as to avoid negative health impacts and to enhance positive health gain from the project. An early application .of an HIA during the planning process makes for simpler and cheaper adaptations and more efficient use of resources HIA draws on the broad knowledge of causation of health in disease, risks to health and of disease prevention. While most applications of HIA are prospective, and carried out to guide policy making, HIA can also be retrospective, i.e. carried out after decisions are made in order to evaluate their health consequences. Retrospective HIAs may provide useful inputs to future prospective HIAs.

The procedures used to carry out HIAs bear similarity with other such impact assessments including on the environment and on social fabric (EIAs and

SIAs). The screening for potential health impacts involves a review of the health hazards and health promoters of policies or projects of that type, and a judgment on whether a more complete assessment is justified based on the type and severity of health risks involved and of populations to be affected. The assessment proper will involve a mix on qualitative and quantitative assessment methods, ranging from health risk quantification and modeling, to evaluation of opinions and health concerns of stakeholders regarding the proposed policy. This applied knowledge of health determinants and prevention to the specific circumstances of the project or policy, leads to conclusions about the expected health impacts and evidence-based recommendations for how the policy could be modified or adapted so as to avoid risks to health. There are several toolkits that facilitate implementation of HIA. Experience points to the benefits of including stakeholders, considering how different groups of the population will be affected, and being open to public scrutiny as a good basis for a credible and useful HIA”.

“HIAs can be included as part of an Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Social Impact Assessment (SIA), or Integrated Impact Assessment (IIA).

A number of countries in Europe, Canada and Australia have introduced HIA to ensure policies in all sectors avoid creating health risks, and can contribute to public health as possible. Although it has been argued that health issues were included in EIAs and SIAs many important health risks were in fact left out, leading to unnecessary risks to health. In 1997 the Amsterdam Treaty of the European Union, stated that "...a high level of human health protection shall be insured in the definition and implementation of all European Community policies and activities." The European Commission has since adopted integrated impact assessment procedures that include health and environment. Support for HIA is part of the Directorate General for Health and Consumer Protection (DG SANCO) activities, which recently included not only

impacts of health, but also impacts of projects and policies on health systems. Health is also formally part of the UNECE Strategic Impact Assessment Protocol of the Espoo Convention on Environment Impact Assessment. The protocol came into force in 2004. In 2004 a guide to the European Policy Health Impact Assessment (EPHIA) was released, aiming at developing a generally applicable method for HIA in EU policy formulation. One crucial objective of EU strategies is to reduce social disparities in health and the HIA method thus requires assessment of how policies affect different social groups of society. EPHIA is inspired of The Merseyside guidelines<sup>20</sup> for health impact assessment.

Health Impact Assessment can be used in a number of ways. Following is an example of how HIA can be used to identify the potential health impacts of non-health sectors policies, in this case the impact of an environmental tax (economic intervention) on the health and purchasing power of vulnerable populations”.

“Following is an example of how HIA influenced Government Financial Policies with Respect to Vulnerable Groups.

In a debate on Regulating Environmental Tax on Energy (Ecotax) in the Netherlands Government in 1995, parliamentary parties expressed their concern for the income impact on vulnerable members of the population, .e.g. the chronically ill and handicapped. An investigation of possible increases in energy consumption by the chronically ill and handicapped was carried out in relation to the introduction of the Ecotax. The Ministry of Health conducted a health impact assessment as part of this investigation. The findings of this HIA highlighted the financial vulnerability of these groups. As a result, the Government increased tax relief for the elderly and disabled by 50%, allocated additional funds to support the Health Care Services Act and income subsidies for the chronically ill”.

“Institutional arrangements for HIA in European countries have involved a mandate/requirement from government, on the need for submitting projects to an HIA on one hand, and experts that carry out the HIA, usually from universities, consultancy groups, or from government agencies. HIA has been applied to policies, as well to projects, and has been mandated by central and by local governments. For example the Mayor of London required HIA to be included in the assessment of the various development strategies for the city, including for transport, special development, culture and economic development. HIA was included into the Integrated Impact assessment of those strategies, and the tools and human competencies for HIA were developed by the London Health Observatory. The government of the Netherlands had a requirement for HIA of national policies, and that mandate was implemented by the national school of public health. The Welch Assembly mandated HIA to be carried out for policies the Assembly develops, and a specialized unit implements the HIA and feeds results back to the Assembly. In Slovenia the health impacts from agricultural policy changes that would follow Slovenia's entry into the European Union, was agreed between various ministries including Health and Agriculture, and was implemented by the ministry of Health in cooperation with WHO. In Sweden HIA was mandated by local authorities, and implemented by health experts at local level. In Norway IRA is not institutionalized, but implementation of mandatory HIA is currently being assessed. In practice, the Law on Municipal Health Services requires HIA by requiring mandatory health impact assessment in project and policy planning in all sectors. Canada has a long experience of implementing HIA at the project level, in many provinces as in Quebec, it is part of EIA, following an agreement between health and environment ministries. Recently HIA is implemented for policies in Quebec, independent of an EIA or SEA., as part the responsibilities of the Ministry of Health to advise the government about potential public health impacts of policies in all sectors (2002 Public Health Act), the implementation of those HIAs is by the National Institute of Public

Health. As mentioned above, the European Union following the Amsterdam Treaty decision to ensure all of its policies should as much as possible benefit health, has developed tools and methods for assessing health as part of the EU policies integrated assessment (EPHIA), which is implemented by the European Commission (the administrative body that serves the European Union). Australia and New Zealand have recently developed HIA requirements and specialized units for their implementation. The judgment is still out regarding the effectiveness of integrated assessment, but there is overall agreement with the use of HIA as a practical tool for identifying the potential health impacts of policies in all sectors and for informing these policies about how they can enhance health gain, and minimize risks to health”.

#### **5.4.2.2 Environmental Health Indicators** - (direct extracts from Dora and Pfeiffer p89-)

“Most diseases associated with environmental stressors do not have a clear etiology linking the disease to the stressors, alone. On the contrary, most of the diseases and adverse impacts associated with environmental stressors are linked to a multitude of causal factors. Examples are cancers in the digestive system which may be linked to contaminated drinking water, but also to, e.g., genetics, diet and lifestyle factors. Premature death due to cardiovascular diseases are found to be associated with particulate air pollution, but is also closely linked to other factors, as for instance lifestyle. A disease found to have an enhanced prevalence in people exposed to high levels of indoor air pollution from solid fuel burning –chronic obstructive pulmonary disease (COPD) – is also known to be closely associated with smoking. At the same time, one single type of environmental stress can cause a variety of health impacts. An important – and challenging – task in any environmental health management system is therefore to identify the disease burden attributable to the relevant environmental stressors. Those diseases that appear to have a significant environmental causality factor involved may serve as environmental

health indicators. However, such indicators in isolation cannot usually serve the purpose of being a reliable indicator for environmental impacts on health, but have to be seen in context of information about environmental hazards and exposures that pose a risk to human health.”

“Different frameworks for identifying the impact pathways for environmental health effects are developed. These may help disentangling the health impacts of environmental factors and may also be useful in identifying environmental health indicators as such. Using such frameworks one might find that the most useful environmental health indicators are not necessarily the disease end-points in themselves, but may well be indicators of risk, as for instance exposure indicators. Moreover, one might find that exposure data for the causal agent is insufficient or lacking, thus proxy data for the causal agent may in the end serve as the health indicator. WHO (2003) emphasizes that problems of inadequacies in the available data should not be ignored, as any indicator is only as good as the data on which it is based. Through the use of models, or by finding proxies, one may, however, be able to bridge at least some of the data gap.”

“One such framework is DPSEEA (pronounced 'Deepsea'), proposed some years ago by Corvalan and colleagues. This defines driving forces (D), that lead to pressures on the environment (P), which in turn change the state of the environment (S), resulting in human exposures (EI) and thence to health effects (E2). Actions (A) may then be taken at any point in this chain to mitigate or avoid unwanted health effects. The DPSEEA framework is a special case of the more general framework DPSIR (Drivers - Pressures - State - Impacts - Response) often used in interdisciplinary integrated assessment of environmental pollution.”

#### **5.4.3 Economic instruments ((direct extracts from Dora and Pfeiffer p102-)**

“Economic instruments area means of taking account of "external costs," i.e.

costs to the public incurred during production, exchange or transport of various goods and services, generated by specific activities. These "external costs" may include natural resource depletion, environmental degradation, health impacts, social impacts, etc. Taxes or other financial mechanisms that add a cost to activities according to their external costs is a means of "internalizing" these costs."

"Economic instruments are often contrasted to "command and control" policy approaches (legal instruments) that determine pollution reduction targets and define allowable control technologies via laws or regulations. In reality, however, command and control policy and economic instruments frequently operate in tandem. A government may set limits on permitted pollution levels for a region or a country in order to meet a certain health or environment objective. Market-oriented approaches such as tradable permits might then be used to allocate the allowable emissions in an efficient manner. Tax breaks or other financial incentives might be offered to groups, individuals or industries investing in cleaner technologies."

"In order for economic instruments to be successful in curbing environmental pollution and in meeting environmental health objectives, the costs or benefits generated must be set at a level that is greater than the commercial benefit of evasion."

"There are a variety of economic instruments that can be used as part of an overall EHM approach such as:

- Reduction of compliance costs by providing flexibility to polluters or users of natural resources to choose the most cost-efficient and environmentally-effective measures.
- Incentives for investments in innovation and improved environmental technology so that both environmental and financial benefits are generated.
- Allocation of property rights and responsibilities of firms, groups or

individuals in a manner so that they have both the incentive and the power to act in a more environmentally- responsible manner.

- Increasing prices of goods and services that damage health and environment, as well as increasing financial returns in the case of more sustainable approaches that foster more environmentally- friendly production and consumption patterns.

- Implementing tax policies to raise revenue to achieve environment and health objectives.

Taxation schemes used to generate revenue for environmental health services and interventions need to be designed carefully. There is a risk that if the revenue generated using this approach is viewed as a source of income (e.g. to pay for inspection services and salaries or as compensation to affected communities), environmental improvements may be resisted in order to sustain that source of income.”

“Following is one example from the Netherlands that outline different applications of economic instruments to regulate environmental health practices. The first is based on the use of positive incentives and the second describes a tax scheme.”

“The use of positive fiscal incentives is an important characteristic of the Dutch situation. These convey to citizens and companies that the environment is not just about higher taxes, but that there are also rewards for environmentally sound behaviour. At the moment there are four schemes: accelerated depreciation of specific environmental investments (VAMIL), a tax allowance for specific environmental investments (MIA), a tax allowance for energy investments (EIA) and fiscal incentives for green savings and investments. The first three schemes give incentives to the investors in environmentally friendly investments. The last scheme differs from the other three, because it gives a tax incentive to people saving in green funds, set up

to finance environmentally friendly projects. The returns of the projects are usually lower than in the case of 'regular investments'. However, the tax compensation improves the net returns for the people saving in green funds and makes it possible to finance the environmentally friendly projects at a lower interest than the market rate.

#### **5.4.4 The “Programs” of Climate Change**

Within all Environmental Health Systems there is now widely recognized a need to further develop tools and interventions necessary to address Climate Change. In the examples discussed below highlight the need to further develop the recognized suit of EH tools from national and local planning, information management, research and human resource development. Observable impacts upon natural and human environments indicate a need for government to assess regional and local adaptation responses. The IPCC 2007 Health Report states that economic development and growth alone will not ensure adequate protection for populations against climate change related disease and injury. Rather, the manner in which the benefits of economic growth are distributed across health care and public-health infrastructure will critically impact the future health of populations.

Many countries have already begun the process of ensuring their systems are now focused on Climate Change, most of those discussed below already having well developed EH systems giving them a strategic advantage over those still struggling to establish the basic infrastructure of an EHS. Never the less countries seemingly taking the lead; Canada, UK and Australia have important lessons to share all countries.

##### **5.4.4.1 A Framework for Adaptation**

The United Nations Development Programme (Lim, Spanger-Siegfried, Burton, Malone, & Huq, 2004) offers an Adaptation Policy Framework that centres around four major principles;

- an adaptation to short-term climate variability and extreme events that provide a basis for reducing vulnerability to on-going and longer term climate changes.
- adaptation occurs at different levels within society.
- adaptation policies and measures should be assessed in a developmental context
- an adaptation strategy and a stakeholder process through which adaptation planning is implemented are given equal importance.

Impacts upon human and natural environments observed through increasing atmospheric temperatures and seasonal variations have already resulted in various early regional adaptive responses. The IPCC Health Report 2007 briefly outlines early adaptive recommendations for a range of identified climate change related impacts on health in each region. In Australia (Confalonieri et al., 2007; McMichael et al., 2003), the identified national health impacts of climate change relate to deaths from heat-wave; flood related drowning, forecast geographical re-distribution of dengue and malaria, higher incidence of diarrhoea in Indigenous populations, as well environmental refugees from effected nearby Pacific Island communities. As at 2002, there were no adaptive recommendations considered for any of these identified impacts. The most comprehensive review on climate change impacts undertaken in Australia, the Garnaut Climate Change Review, focuses primarily upon mitigating the economic impacts of climate change. The review does acknowledge the cost-saving benefits of adaptive behaviours to climate change, recommending that information sharing through strengthening climate-related research be a primary focus. However, reference to adaptation planning and strategies are cited within a largely economic context that recognises the economic benefits of mitigation planning and policies (Garnaut, 2008).

In contrast, as early as 2001 (Department of Health and Expert Group on Climate Change and Health in the UK, 2001) the United Kingdom had initiated an adaptive recommendation of public awareness-raising for health risks associated with climatic changes. This was in response to the health-related impacts of increased floods, greater risk of heatwave-related mortality and an increase in ozone-related exposure as at 2001. While the recently published Stern Review (Stern, 2006) is framed within an economic context, it nevertheless highlights the need for on-going adaptation planning across a range of sectors, both in the United Kingdom and globally. The review highlights the need to recognise that adaptation planning may be limited in the face of unchecked increasing climate change impacts. It also warns that adaptation planning effectiveness will diminish as climatic impacts continue to increase in severity and speed, particularly for vulnerable human communities. The role of adaptation measures in reducing climate change damages relative to economic cost indicates a higher differential in relation to rising temperatures, while the net benefit of adaptation is predicted to be reduced. However, adaptation is mooted by the Stern Review as a key response in reducing the vulnerability of populations to the effects of climate change.

In Canada (Riedel, 2004), recommendations have been introduced relating to increases in heatwave-related deaths, air pollution-related disease, vector and rodent-borne diseases and allergic disorders, shellfish contamination, and regional impacts on northern Canadian populations. Adaptive recommendations include infectious disease monitoring, emergency management plans, early warning systems, land-use regulation, water and wastewater treatment facilities upgrade, and implementing measure to reduce heat-island effects. The range of systems vulnerable to climatic changes across Canada indicates the need to implement numerous adaptation measures targeting various areas of vulnerability (Lemmen, Warren, Lacroix, & Bush, 2008). These include recognition of risks to human health through a

diverse range of climatic impacts as changes in ice and snow cover, river and sea levels, as well as increases in the number of heat waves, forest fires, storm-surge flooding and coast erosion.

#### **5.4.4.2 Canadian Experiences**

On-going policy development in Canada (Environment Canada, 2006) around an intergovernmental adaptation framework seeks to provide an enabling environment for adaptation planning. This provides access to information and tools needed for an integrative climate change planning process. Aspects included in the development of an enabling policy of adaptation were; developing appropriate adaptation tools, including risk management; integrating adaptation into long-term investment and planning; enhancing industry-government-stakeholder partnerships in the development of adaptive instruments and increasing knowledge and understanding through a research agenda that includes vulnerability assessments of Canadian populations.

The current adaptation response to climate change effects in Canada encompasses planning both anticipatory adaptive activities as well as reactive adaptive activities. Anticipatory adaptation approaches seek to minimise the observed effects of climatic changes, while reactive adaptation responds in a more spontaneous manner to these effects. However, this approach recognises that adaptation will not act in response to climate change factors alone, but inclusive of a range of associated factors (Lemmen et al., 2008).

Early recognition of the sparsity of information relating to adaptation decision making led to the formation of the Climate Change Impacts and Adaptation Program (CCIAP) (Environment Canada, 2006). The primary function of this program was to generate research for the purpose of building a knowledge base relating to climate change impacts and adaptation processes. The program aimed to enhance expertise regarding the impacts of climate change in order to avoid maladaptive practices that might have extended future

implications. Research programs are broad-based, encompassing physical, biological, social and economic components as well as engaging government and other relevant decision-makers. The research also endeavoured to engage with end-use stakeholders in the early stages of research projects. One example of a research project, Reducing Canada's Vulnerability to Climate Change (RCVCC), (Environment Canada, 2006; The Heinz Center, 2007) aims to address national-scale and regional vulnerability through effective adaptation strategies for climatic impacts. The RCVCC project targets policy and decision makers in key economic sectors, in collaboration with communities and at government level.

In recognition of the impacts of climate change across all sectors of decision making bodies in Canada, interdepartmental policy committees have been implemented to focus on the development of climate change adaptation responses. In 2005, a National Climate Change Adaptation Framework (NCCAF) (Environment Canada, 2006) was formulated that encompassed inter-jurisdiction collaboration in order to increase Canada's capacity to adapt to climate change. The collaborative aims of the NCCAF comprises six elements that seek to raise awareness of adaptation; facilitate and strengthen capacity for co-ordinated action on adaptation; incorporate adaptation into policy and operations; promote and co-ordinate research on impacts and adaptation; support knowledge-sharing networks and provide methods and tools for adaptation planning. At a national level within Canada, information sharing across various government jurisdictions has enhanced collaboration and co-operation based on a shared concern regarding the importance of effective adaptation decision-making processes.

A national approach to adaptive decision-making responses in Canada, includes regional provinces and territories implementing, or developing policies and programs that target climate impacts and adaptation. In line with a recognised need for further adaptation studies to ascertain projected risks

(The Heinz Center, 2007), these programs differ in scope and scale in accordance with identified adaptive priorities relevant to their region. In British Columbia, a pilot for a decision-making framework has been enacted that incorporates projected climate variability into risk assessment and management decision-making. Examples of other regional programs across Canada include the British Columbia Provincial Fire Management Program; in Alberta, Water for Life Strategy; in Saskatchewan, the Water Conservation Plan; the Manitoba Crop Insurance Corporation Programs; in Ontario, the Emergency Management Act; and the New Brunswick Coast Areas Protection Policy (Environment Canada, 2006).

Collaborative efforts involving provincial and territorial governments in Canada initiated programs to fund research on adaptation and change impacts that would inform adaptation decision making. One such program conducted collaboratively between the provinces of Alberta, Saskatchewan and Manitoba, and the Government of Canada, is the Prairie Adaptation Research Collaborative (PARC) (Environment Canada, 2006). Issues common to the three provinces are water resource management related to climatic impacts of recurring drought and frequent episodes of severe flooding. Adaptation research has been conducted into non-commercial food supplies, biodiversity and terrestrial ecosystems within the Saskatchewan province.

Indigenous communities within Canada are identified as having unique concerns about climatic changes that impact upon their relationship with the natural environment. While the natural environment often acts as a supply of traditional food supplies, it also yields traditional insights into the impacts of climate changes and adaptive capacity. Short term funding was provided to assist the Inuit organisations and First Nations build awareness amongst their communities, as well as participation in discussions relating to climate changes and its impacts (Environment Canada, 2006). However, it appears that there is opportunity for further program development regarding adaptive policy and

decision-making processes regarding the on-going needs of Canada's indigenous communities.

The following case studies illustrate regional adaptation measures already in place.

#### Case Study 1/ Source-Water Protection in Ontario

Source: From Impacts to Adaptation: Canada in a Changing Climate 2007, p. 245, (Lemmen et al., 2008).

A multi-barrier approach to ensure a safe drinking water supply was enacted in Walkerton, Ontario. This was in response to the infection of a municipal water system with microbiological pathogens (*E. coli* and *Campylobacter*) as a result of extra-ordinary high levels of rainfall occurred over a four to five day period in May, 2000. The identified source of the pathogen was manure spread on a nearby field in accordance with best practices and leaching through a shallow well into the water supply system. As a result, seven people died and 2300 became ill through improper water disinfection treatments. A subsequent public inquiry resulted in provincial water policy shifting towards a multi-barrier approach to ensure safe drinking water supplies. The inquiry report recognised the increasing frequency of extreme rainfall events resulting from climate changes as having long-term impacts for quality and quantity of drinking water sources in Ontario.

Policy response to this event resulted in The Ontario Clean Water Act (CWA) being passed in October 2006. This has enforced the development of source-water protection plans along with reportage that provides an assessment of water quality as well as quantity from every watershed throughout the province. The protection plans are required to identify existing and future threats to drinking water in vulnerable areas. This includes an assessment of vulnerability to climate change impacts based on past, current changes as well as projected changes that include population growth and

intensification changes to land-use.

### Case Study 2/ Toronto's Hot Weather Response Plan

Sources: Adapting to climate change: An introduction to Canadian municipalities (Mehdi, Mrena, & Douglas, 2007); From Impacts to Adaptation: Canada in a Changing Climate 2007, (Lemmen et al., 2008).

Toronto's extreme weather warning system was developed in response to an identified need to improve on an existing heat-health alert system. Based on almost fifty years of meteorological data along with seventeen years of mortality data, researchers identified which conditions coincided with increased mortality rates. The system relies on computer modelling of factors such as humidex, measures of apparent temperature where human discomfort is raised as a result of combination of heat and humidity, cloud cover, wind direction and speed and air mass. As such, the modelling enables health risks to be identified in combination with different air masses and climatic conditions (Mehdi et al., 2007).

The response plan is designed to alert individuals most at risk of heat-related illness and death due to either existing or predicted hot weather conditions. The response plan also advises of the need to undertake precautionary action. Groups identified as high-risk and therefore vulnerable to heat wave conditions included isolated seniors, individuals with chronic and pre-existing illnesses (including mental illness), children, people with low incomes and the homeless. Initially developed in 1998, heat-alerts were based on humidex forecast readings over 40 degrees Centigrade. As a result of rapid changes in humidex levels and co-occurring mortality increases, this threshold was identified as inadequate. An improved alert system was launched in 2001 that provided alerts based on calculations of likelihood of mortality between 65 and 90 per cent. A heat emergency is issued when this exceeds 90 per cent and is preceded by a minimum of a one-day heat alert. On issuing a

heat-alert, Toronto Public Health officials notify the media and community stakeholders. These include child care centres, long-term care facilities and hospitals, local shelters and community agencies. Measures, such as the distribution of bottled water to areas where vulnerable individuals and populations may centre, and asking shelters to ease curfew times are undertaken. A Heat Information Hotline is provided along with ensuring that Community and Neighbourhood Services adequately staff and open four cooling Centres centrally located. As necessary, one centre may remain open for a twenty-four hour period providing bottled water, cots and air-conditioned space.

A Hot Weather Response Committee meets three times a year to monitor, evaluate and update the Hot Weather Response Plan. Changes to the response system include the Red Cross acting to operate the Heat Information Line, including on weekends, and co-ordinate the distribution of bottled water. From 2001, additional partners were recruited resulting in enhanced outreach efforts. These include ensuring drinking water fountains in city parks function properly, extended hours of operation for city pools during heat alerts and free transit tokens issued by street patrol teams to those found to be in need of cooling centres.

Other regional Hot Weather Response Plans based on the Toronto system are being developed with additional air-quality advisory services being included in some (Lemmen et al., 2008).

#### **5.4.4.3 Australian Experiences**

Areas of action for adaptation planning relating to human health within Australia identified by the Framework are 1) research on climate change impacts on physical and mental health, and identify key vulnerabilities, 2) identifying the capacity of the public health system, emergency services and health disaster management policies to plan and respond to vulnerabilities, 3)

incorporate potential climate change health risks into community and public health education programs, 4) develop and implement heat wave warning and response systems, 5) an increased focus on research on climate change and health by National Health and Medical Research Council (COAG, 2006). However, it needs to be noted that these strategies have yet to be fully implemented, although recognition of already existing public health interventions, such as mosquito control and vaccination programs, as well as weather alert systems, are seen as a starting point for adaptive strategies (NCCARF, 2008).

Despite the recognised severity of climate change impact risks to human health in Australia, implementation of adaptation policy is still in initial stages of development across all sectors of government, but particularly at national level. Developed as a four year project, The National Climate Change Adaptation Programme's aim is to commence preparing Australian governments and vulnerable industries on policy issues that support building capacity for the development of adaptation strategies. This includes engaging stakeholders through providing information and tools, and integrating climate change impacts and adaptation considerations into key policies and programs.

The proposed development of tools for use in adaptation planning by policy decision-makers in private and public sectors are, 1) risk management guidelines for factoring climate change into existing management practices, 2) guides for undertaking integrated assessments, 3) specific guidance for key sectors, 4) regionally based climate change information trends and projections, 5) a web-based tool for generating climate change scenarios, 6) models for sector specific impacts, and 7) maps of areas vulnerable to climate change impacts (DEHAGO, 2007).

In line with future projections for climatic impact risks on human health in Australia, a government affiliated research body, the CSIRO, has developed a report projecting climate change scenarios for initial assessment of risk. This

report provides projected climate change impact scenarios to 2030 for ten broad regions across Australia. As such, it targets risk management as a framework for adaptation planning and policy measures and encompasses evaluating decision alternatives in the face of a range of uncertain projected scenarios (Australian Centre for Climate Change Adaptation, 2007; CSIRO, 2006).

The current early development of adaptation planning and policy development at a national level in Australia is reflected in a recent review of climate change impacts targeting Australian conditions, the Garnaut Climate Change Review. The review asserts that although all Australians are likely to be adapting to the impacts of climate change within a few decades, adaptive responses are still framed largely in economic terms. Nevertheless, primacy is given to the development of climate change information dissemination and research, with an emphasis on providing financial support for a cohesive Australian weather information body. The Centre for Australian Weather and Climate Research has been established in response to a historically fragmented approach to climate modelling in Australia. Other adaptation planning measures highlighted in the review include distributing meaningful information to the general public in order for individuals to make informed decisions; addressing urban water supply infrastructure, such as recycling water and purchasing irrigation entitlements; addressing coastal housing and public infrastructure via changes in design and materials, with relocation remaining the most viable response; enhanced research into bio-diversity and ecosystems; and emergency management services (Garnaut, 2008).

A cursory review of a selection of Local Government Areas (LGA) in New South Wales indicates that the overall climate change response is a focus on mitigating the impacts of climate change, with a view to sustainability. One of the largest LGA's in Sydney, and the third largest in Australia, Blacktown City Council, is addressing climate change impacts through sustainability

programs, such as the Cities for Climate Protection programme, (Blacktown City Council, 2007). This initiative seeks to engage local government in developing community awareness regarding the need to reduce greenhouse gas emissions in line with Australia's recent ratification of the Kyoto Protocol (DEWHA, 2007). Another local government initiative by the Local Government and Shires Associations (LGSA) has established the New South Wales Mayors Agreement on Climate Change. Local government Councils who sign the Agreement commit to target the reduction of greenhouse gas at a minimum level in accordance with the Kyoto Protocol targets, or a greater target of 30 per cent or more by 2020.

However, the Australian Greenhouse Office has issued a report, Climate Change Adaptation Actions for Local Government, identifying adaptation actions applicable to the climate impacts risks for Australia (Australian Centre for Climate Change Adaptation, 2007). Developed as part of the Australian Government's National Climate Change Adaptation Programme, the report aims to assist local governments prioritise their commitment to adaptation planning. The report suggests a risk assessment approach in line with the CSIRO risk management approach

as an appropriate framework. This framework allows an assessment of risks specific to a regional or local area in accordance with the Australian and New Zealand Standard AS/NZS 4360 Risk Management protocol. The report highlights the need for adaptation responses to climatic risks to human health. This includes an acknowledgement that without adaptation programs, there are risks of increased mortality related to increased temperatures in some regions such as South East Queensland, particularly for Australia's increasingly ageing population. Proposed adaptation responses to thermal stress include increased community awareness and education programs, shade audits for public recreational areas, development of community heat emergency management plans. Other adaptation responses proposed by the

report are increased surveillance and control programmes for disease-borne vectors in Northern Australian regions (Mackay Regional Council, 2007).

The following regional case studies exemplify current approaches to adaptation planning in regional Australia.

#### Case Study 1/ Mosquito Control in the City of Mandurah

Source: Climate change adaptation actions for local government, (Australian Centre for Climate Change Adaptation, 2007).

Located 74 kilometres south of Perth in the Peel Region, Western Australia, the city of Mandurah is in an area recognised as vulnerable to increased mosquito activity. As a result of recognition of increased risks to human health from viral diseases, such as Ross River and Barmah Forest, control programs attempt to reduce mosquito numbers during the peak disease period between August and April.

Linked to climate vulnerability arising out of the 1999/2000 la Nina event, warmer temperatures and increased tidal levels led to a massive increase in mosquito breeding levels. As many as 1000 mosquito larvae per square metre have been documented at some sites. Spanning an area of approximately six million square metres of saltmarsh, early attempts at controlling the la Nina induced increase in mosquito breeding were unsuccessful.

The current mosquito control program has been undertaken collaboratively with Mandurah, Murray, Rockingham and Waroona municipalities in tandem with the Western Australian Department of Health. Aerial spraying of mosquito-specific larvicide attempts to reduce the population of mosquitoes before they emerge as adults. The control program is however, highly sensitive to climatic changes, such as tidal activity in the salt marshes. If tides are higher than expected the chemical larvicide may be diluted and contact time with larvae shortened, reducing the efficacy of the control

programme overall. Lessons learnt as a result of earlier unsuccessful control attempts include runnelling, where small channels are introduced into the salt marshes to facilitate tidal movement. Proposed adjustments to the control programme include developing larvicide that require shorter contact times with larvae, ensuring greater efficacy during high-tide events.

Similar mosquito control programs have been implemented in northern regions of Queensland, such as the Vector Management Plan in the Mackay region (Mackay Regional Council, 2007). This program aims to reduce the number of disease-borne vectors that impact on the region, as well as promoting community awareness and education with regard to vector management. Community awareness programs include identifying triggers for treatment and types of treatment options currently available.

Future planning must build upon the recognition that adaptation planning needs to accommodate on-going rapid changes incurred through climate change impacts for indeterminate periods of time, from decades to centuries. This differs to previous environmental changes seen as stable or 'normal' that longer provide a benchmark for building future capacity and flexibility to cope with a rapidly changing environment. However, successful adaptation must also recognise that it may not exclude all negative impacts, but rather, the impacts of climate change will be less damaging as a result of adaptation planning. In this scenario, adaptation planning aims to reduce the impacts of climate change risk to human health and the environment (Lemmen et al., 2008).

In addition, adaptive capacity may be one aspect of a system that indicates the ability to effectively adapt to changes as a result of climatic impacts. Therefore, a high adaptive capacity indicates an ability to cope with changes and even, in some cases, to benefit from climatic changes. In contrast, a system with low adaptive capacity indicates a system may suffer greater risks as a result of exposure to climatic changes.

Used less frequently than ‘adaptive capacity and vulnerability’, resilience relates to the level and number of changes a system is able to accommodate without changing its state – used largely in natural systems as opposed to human systems, but has been modified to encompass both systems by referring to ‘eco-social resilience’. Each of these approaches call for integrating adaptation planning into existing planning processes utilising risk management methods that include anticipatory as well as responsive adaptation planning measures (Lemmen et al., 2008). Equally, the involvement of public/private partnerships in anticipating and implementing adaptive planning is a crucial aspect of any adaptation planning measure (Mehdi et al., 2007).

While these lessons have been learnt through Canada’s experience, they provide examples that are applicable to both the United Kingdom and Australia.

#### **5.4.4.4 Barriers to adaptive planning**

Canada has also provided clear lessons in terms of impediments to implementing adaptive policies and planning (Lemmen et al., 2008). These include:

- Limitations in awareness across all sectors of the public/private community;
- Availability of adequate and localised information;
- Inadequate decision-support tools specifically targeting adaptation planning (most relate to mitigation planning);
- Finding a balance between facilitating adaptation planning through regulation and disadvantaging innovation and enterprise;
- Costs to private sector of innovation and competitive disadvantage wrought through stricter legislative codes and standards;

- Lack of integration and co-operation between all sectors of government (local, national and international), private industry, the research community and the civil sector;
- Localised adaptation measures that do not transcend international trade barriers;
- Increasing demand for humanitarian aid (local, national and international) in the face of rapidly changing climatic impacts;
- Greater need for technical and financial assistance to developing countries to assist them in implementing adaptation policies/plans to accommodate changes;
- Higher costs of insurance/re-insurance as a result of greater frequency of cc associated disasters.

Lemmen (2008) advocates overcoming the barriers to adaptation planning through:

- Identifying the specific barriers to adaptation action
- Revising legislative codes and standards to minimise disadvantage
- Maintaining and strengthening the knowledge base
- Synthesising and sharing knowledge
- Reviewing and contributing to international initiatives.

#### **5.4.4.5 Gaps for future research**

Lemmen (2008) also cites the need for future research in areas where a paucity of adaptation planning has been identified:

- An exploration of how much spontaneous adaptation might be undertaken by the private sector and/or individuals as a result of self interest.

- Identifying the type and quality of information about climate change risk – who and how it might be delivered.
- The extent of guidance and promotion required.
- Exploring how responses need to be co-ordinated, including identifying the associated responsibilities and costs.
- The level of adaptation required in terms of public safety.

While adaptation measures are recognised as important in addressing risks to human health of climate change impacts, on-going adaptation planning is still in its early developmental phase in many regions. In Australia for instance, despite its vulnerability to drought, increased thermal events and related water supply and health issues, a national approach to adaptation planning is still in its infancy. However, Canada and the United Kingdom appear to have implemented a more comprehensive approach to adaptation planning. The United Kingdom has responded to climate change impacts by implementing adaptation policies such as building codes designed to withstand extreme weather events. In Canada, lessons have already been learnt from current adaptation planning implementation. This is despite the need to respond to diverse climatic change impacts that range from changes in ice and snow fall impacting Indigenous, fishing and coastal communities, to heat-wave events. Barriers to adaptation planning have also been identified from the Canadian experience, exposing gaps for future research. In line with the Stern Review, adaptation planning is an integral aspect of coping with current and projected climatic change risks to human health.

## **5.5 Practice**

Practice relates in the main to those services which implement environmental health problem solving strategies outlined in part above. This practice includes both the 'environmental health professional' typically those trained specifically in environmental health and who's role includes surveillance and regulatory

functions typically at the local level and employed as health inspectors, environmental health officers . In addition this 'Practice' includes' Professional working in the environmental health field including nurses, physicians, safety inspectors, environmental scientists, environmental economists and epidemiologists etc.

### **5.5.1 Roles and Levels**

An international review of EH functions by Peralta (2003) classified them into three broad groupings (Basic / Intermediate and Advanced) each level expanding roles according to the level of modernization/ development in the country.

Starting with the Basic these include:

- Water quality inspection
- Wastewater management
- Excreta management
- Solid waste management
- Vector Control

The Intermediate levels add the following'

- Food hygiene and safety
- Communicable disease management
- Water and air quality management
- Industry: air, water, noise and workplace control
- Health Promotion
- Building Code Enforcement
- Disaster and Emergency Response

The final level of function in most developed countries include;

- Community health planning
- Environmental health risk assessment
- Health Impact assessment
- Integrated pest management
- Chemical hazard management
- Cleaner production
- Community Health planning
- Sustainable development
- Climate Change mitigation and adaptation

#### **5.5.2 Nature of Environmental Health Services** (Extract from Peralta 2003)

“The kinds of environmental health services delivered and monitoring done, such as those listed above in the “Lower levels’, is largely consistent and much of it is based on internationally accepted standards, such as the WHO guidance on air, water, and noise and the WHO/FAO guidance on food safety (Codex Alimentarius). As such, environmental health services delivery is not so much a technical challenge as it is an operational one. This is in contrast with the non-inspectorial functions particularly those associated with ‘management and planning function’ all requiring higher level technical and management and planning approaches”.

“The work of the EHO varies from country to country and from town to town. It involves checking hygiene and safety of food and beverages produced in factories or served in restaurants, hospitals, and other institutions. EHOs examine places where pollution is a threat, test for pollutants, and collect air or water samples for analysis with a view to controlling it. They check the potential breeding sites for vectors such as mosquitoes, rodents and

cockroaches. Occupational safety and health inspectors visit places of employment to detect unsafe machinery and equipment or unhealthy working conditions.”

“Useful experience for health and safety inspectors that can give them more leverage includes health and safety management, compliance, investigation and enforcement work, first aid work, occupational health, for example, occupational nursing or occupational hygiene nursing, engineering (chemical, civil or mechanical), technical or scientific work, and trade experience. Any prior experience related to these occupations would definitely be an asset.”

“In Canada, the public health inspector or environmental health officer is a vital member of the public health team and delivery system. The role of the inspector includes preventing disease, promoting health and improving the environment through the use of education, consultation, inspection and monitoring techniques and, if necessary, by the enforcement of health legislation. The scope of interest covers food hygiene, insect and rodent control, communicable disease investigation, public accommodation, community care facilities, public recreational facilities, water supply and waste disposal systems, occupational health and safety and environmental pollution - air, water, soil and noise. (Ref, BCIT, Canada)”

“In New Zealand, there is a distinction between the tasks of environmental health officers, and health protection officers, and health and safety inspectors. Environmental health officers monitor and investigate the health and hygiene of registered premises, such as food or liquor outlets, camping grounds, beauty salons, swimming pools and mortuaries, and grant licenses to them. They also investigate environmental problems or conditions that could endanger people's health or well-being such as monitoring noise in industries, overcrowding in housing, contaminated water, air quality and littering. As well as environmental health officers, there are also health protection officers that work within and advise central government and district health boards of ways

to prevent public health hazards. Their focus is aimed at community health with regard to food safety, disease control, public health issues as well as researching, educating and developing policy for the public. Health and safety inspectors investigate incidents, accidents and complaints at workplaces. They also advise workers and employers on safe and healthy work practices and ensure compliance with legislation. (Ref. Kiwi Careers).”

“In the United Kingdom, the sanitary inspectors were the first responders to investigate sanitary diseases with some medical basis. Thereafter public health inspectors responded with engineering basis for treatment or control of water, air or land contamination to protect the public from environmental and lifestyle diseases. Soon after, the environmental health officers evolved as a profession with more broader scope of social and management basis.”

“An important role of the EHO is to make sure public health regulations are enforced.... In addition, they also carry out inspections to issue permits or license to operate such as for example restaurants or hotels. They use a range of tools from basic common sense to portable equipment. EHOs in the advanced hierarchy in ..use portable scales, cameras, ultraviolet lights, container sampling devices, thermometers, chemical testing kits, radiation monitors, and other equipment to ascertain violations. They send product samples collected as part of their examinations to laboratories for analysis.”

## **5.6 International ‘Best Practice’ for EHMS**

The work summarized above highlights the need for countries like China to adapt and evolve all elements of their environmental health system in ways which reflect the uniqueness of ‘Place’ while at the same time recognizing that many lessons can be learnt from past international experiences.

While no one country has yet to successfully develop and implement the perfect system, experiences described above suggest strongly that policies, governance systems, tools and service delivery need to be developed to equip

China for existing and emerging environmental health risks.

Key lessons learnt include;

Policy – needs to be holistic and reflect the principles of sustainable development- here due regard needs to be made to both protecting and promoting health. Government leaders and community need to become aware of the health impacts.

Place – needs to include institutional capacity for intersectoral collaboration and community participation as well as to clearly understand and quantify the nature and impact of environmental health risks.

Program – needs to develop a full suit of tools to support policy and practice including national and local EH planning, economic instruments , health risk assessment and indicators ) as well as explore the potential for both legislative /regulatory improvements as well as health promotion strategies. National, Regional and Local Adaptation Plans and strategies to address Climate Change impacts on health are critical.

Practice – here there is a need to ensure policy is able to be implemented through effective local environmental /public health service through a well equipped and appropriately trained workforce.

## Chapter 6 Gaps Analysis

For a long time, environment and health always were considered as one part of environment or health department and managed respectively. Even in such a management background, a great deal of effective measures were still carried out by government and the whole society in the field of environment and health, and a wealth of practical experience on the management of environment and health also has been accumulated. "National Environment And Health Action Plan" issued in 2007, which manages the environment and health as a whole factor, means the establishment of true environment and health management system. China's long-time practical experience in the field of environment and health, as well the new define of "environment and health" in the "National Environment and Health Action Plan", are both to lay a strong practical foundation and supply a theoretical basis for the better development of environment and health management system.

There is no doubt that environment and health management even is a newborn management field in China. Although a scientific blueprint of China's environment and health management has been drawn in "National Environment and Health Action Plan", some contents in it are still not been implemented due to many factors, such as no enough policy, no a sound legal, no comprehensive scientific and technological support and so on. Especially, the foundation of the work related climate change and impact on health is more weak, and environment and health management system needs to be improved yet. Though NEHAP has the climate change and health as a priority field, demands to improve the level of work related to environment and health, and enhance the ability to cope with climate change. Face to this absolute new field, however, the practice of coping with climate change and impact on health in China is so lack to need to advance related work in the future. So, many

challenges are in front of China both in the aspects of perfecting the environment and health management system, and merging climate change and health into the environment and health system. According to China's present situation of environment and health management and the climate change and health, combination of a detailed analysis of some examples and data, as well through contrasted with the foreign management experience, this chapter points out the barriers which hampered the development of management system at present and the problems existed in current management.

## **6.1 Gap analysis overview**

### **6.1.1 The relation of stakeholders in the management system**

According to the relation network of different stakeholder groups (figure.6-1), and the situation of environment and health management described in the chapter 4 was tested. The result shows that government initiative mechanism(eg. Management and education) is more stronger in the China's environment and health management system at present, and the mechanism of public and private sectors participation(eg. Supervision and suggestion)is more weak, also lack of mechanism related social groups(eg. Government supervision, social groups participation and public participation). As shown in the figure 6-1, the real lines between the stakeholder groups mean the more strengthen mechanism now, and hidden lines represent the current mechanism even exists some problems in it.

#### **6.1.1.1 The mechanism of giving full play to the initiative by government**

As a leader of the whole environment and health management system, China's government set out a more strengthen initiative mechanism embraces the public and private sector (eg. Management and education), and played a positive rule in the environment and health management. Series of activities and practices emphasized on the duties of management, education and

service were carried out among public, such as "health cities", "to change the drinking water and lavatories", "public week of environment and health" and so on; Series of supervision and education actions were implemented among the private community, such as "saving energy and reducing emissions", "Health and safety product testing", "Health supervision of public places" and so on.

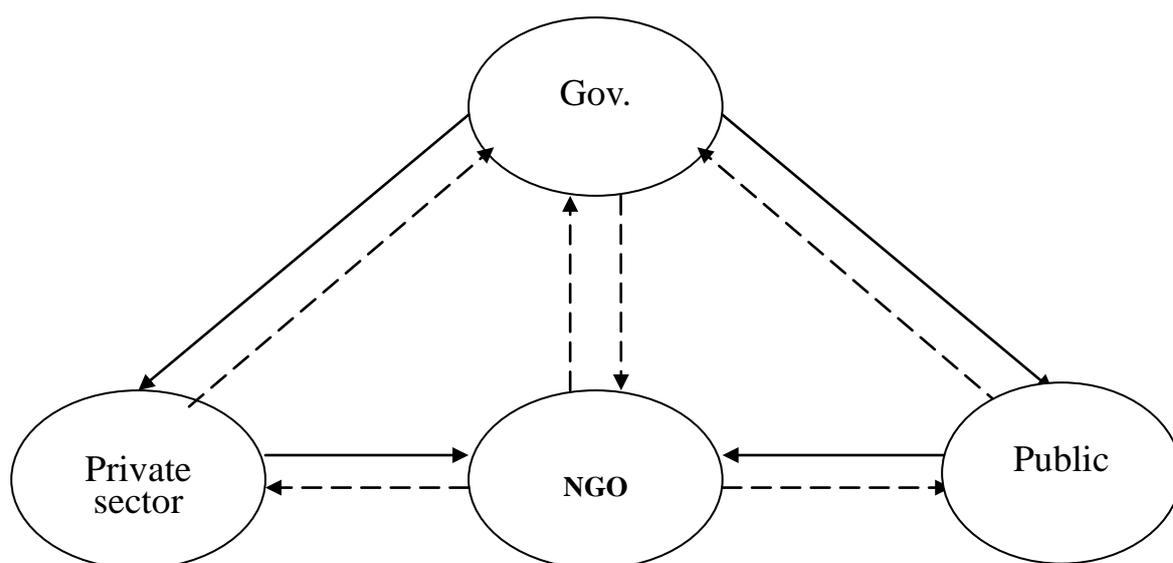


Figure 6-1 Stakeholder Relationship

### 6.1.1.2 The mechanism of society participation need to be improved

According to the initiative relation of the enterprise and public, i.e. the participate relation of the enterprise and public, the mechanism of social participation is less regular in China's environment and health management system at present. "CPC Central Committee's decision on strengthening the Party's ruling capacity-building" advance that, "A society with people are from each according to his ability and are properly provided for, as well to live in harmony should be build.";"Triggering events being bound up with the interests of the people should be implemented with the institution of public and hearing , and so the degree of people's participation is enlarged". In fact, the public and

business have different levels of requirements of supervision, demands and advances on the work related to environment and health, such as public have the needs of accessing to the information of environment and health, and then supervise the work of the government; When some of problems and events of the environmental impacts on health take place, public have demands and suggestions on development of related polices. According to the current situation of environment and health management in China,however, a problem was discovered that the enterprises lack the necessary paths and mechanisms of participating the work related to environment and health,except the single participated way of public and enterprises actively cooperate with the government on related work. The result is that public and enterprises actively demand to participate in the work related to the environment and health, however, they lack the participation channels.

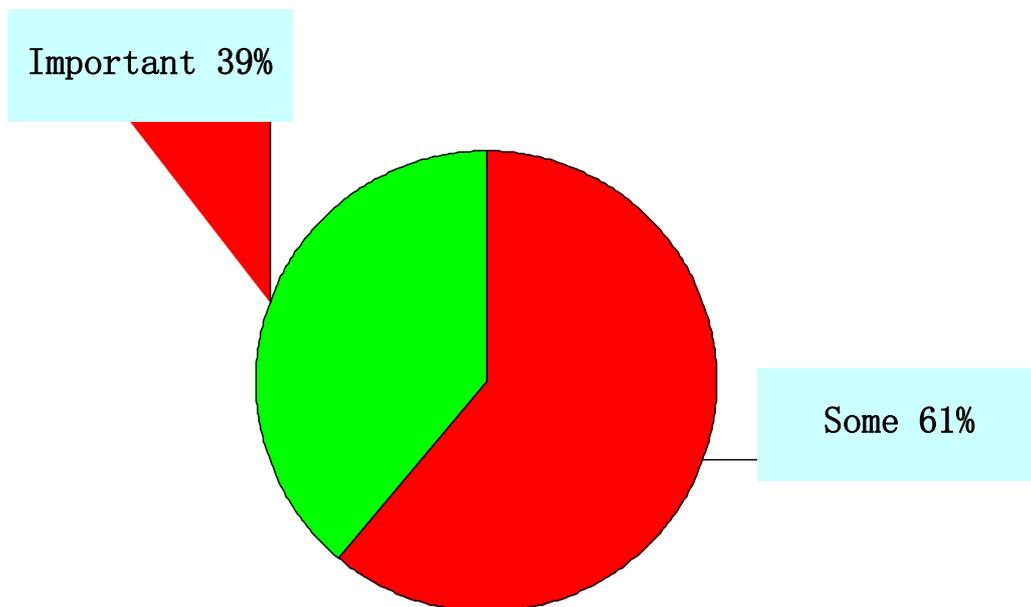


Figure 6-2. The survey result of importance of social groups and NGO in the work of Ministries

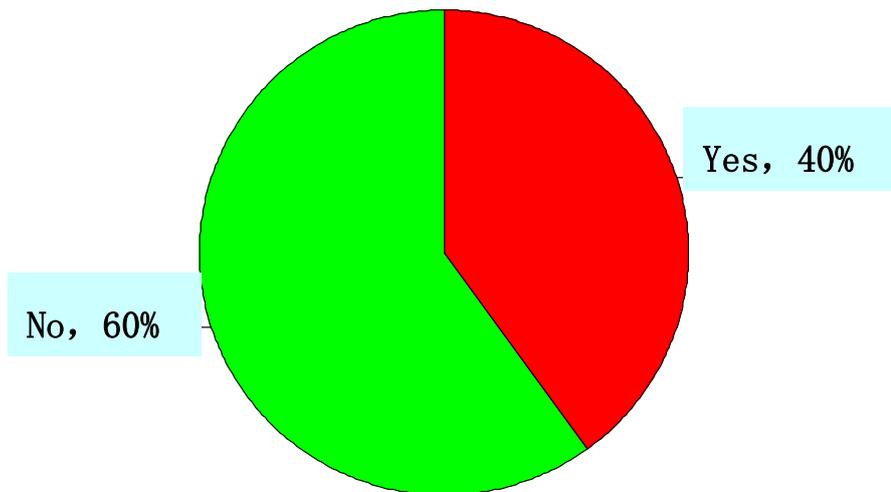


Figure 6-3. The survey result of existing participation mechanisms of social groups and NGO

### 6.1.1.3 The lack of related mechanisms of social organizations and NGO

A survey at the national level for the environment and health was carried out among the responsible officers of every ministries participating in the NEHAP. In the 16 questionnaires of clearly answering the society participation mechanisms, 39% of people think that the participation of social organizations and NGO in the management work of ministries is very important, and 61% of people think it is some important.(figure 6-2) This result shows that the importance of society and NGO participation was affirmed at the national ministry level, they also fully affirmed the rule of NGO and social organizations as a bridge in the management work. But another investigation about the existence of society participation

mechanisms in the various ministries suggested that only 40% of the people have choosed "Yes"(figure 6-3). From the questionnaire, a problem was found that all the participation mechanisms are focus on the social organizations with the background of the government, i.e. The institutes of having direct relation with the ministries, and lack of participation mechanisms and supervision

mechanisms aimed at other groups such as NGO.

At the same time, according to the situation research of the social groups and NGO, some outstanding problems was found to still exist in the social organizations and NGO, although they played a role as a bridge to some extent. The social organization with a background of government have better contact with the government, while the national or international NGO keep better company with the public and enterprises, both of them do not play a real role of connecting the government and public,enterprises as a bridge.

### 6.1.2 The gap analysis based on the international experience

The framework of environment and health management evaluation considered police,place,programme and practice as critical factors has been described in the chapter 5 of environment and health international experience. A gap analysis of the whole situation of environment and health in China will be introduced with the framework in this part.

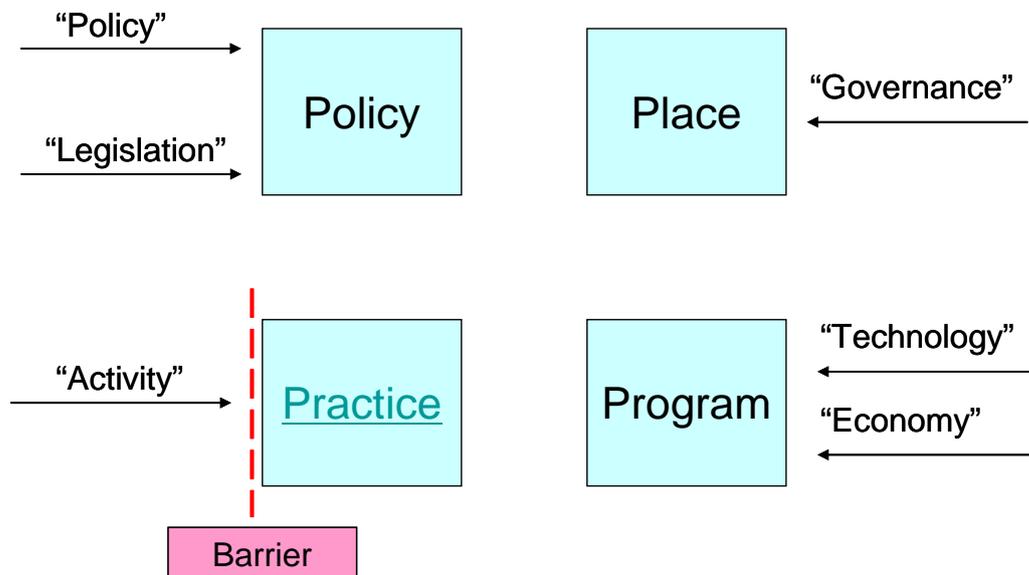


Figure 6-4. The compare of China's environment and health management and foreign experience

### **6.1.2.1 The gap analysis of environment and health management**

As shown in the figure 6-4, in the framework system of foreign management experience, the broad concept of "policy" refers to policies, laws, regulations and other related content, which is equivalent to the policy support and legal support in the environment and health management model of China. The broad concept of "Place" refers to the contents related to duty and cooperation of government and various of social sectors, which is equivalent to the management support in the environment and health management model of China. The broad concept of "programme" refers to that some technological and economical measures are carried out by government to promote the implement of policy and the development of related work, which is equivalent to the technological support and economical support in the environment and health management model of China. "Practice" refers to the concrete problems in the implement of concrete work.

In the current policy system of environment and health in China, the development of NEHAP have provided a good policy direction to the work of environment and health, however, the specific policy documents matching with the goals listed in NEHAP have not yet been set out. While for a long time, the splitting situation of environment and health led to the lack of a true law of environment and health in China at present. Although many problems of environment and health management have been solved through an amount of regulations and standards in the field of environment and health. However, a entire legal system of environment and health still need to be build in China, as the result of the current legal system in China even can not play a better role of supporting. So compared with the broad concept of "Policy", some gaps still exist in the legal and policy system of environment and health in China. Although the environment and health management is still newborn in China, some good examples of cooperation have been exist at the national level, such as the "State Environment and Health Forum" jointly organized by the

Ministry of Health and the Ministry of Environment Protection, "NEHAP" signed by 18 ministries, but the perfect mechanism of cooperation has not yet been formed. The duty of every department have been clearly identified in NEHAP, and the coordination mechanism established in future in China also be described in detail, and NEHAP called to set up a comprehensive cooperation mechanism of environment and health until 2010. A good collaboration mechanism is an important support of environment and health management, however, the implement of all mechanisms need to be completed step-by-step. At this stage, the direction of cooperation mechanism is very clear, but most of the mechanisms are still in active preparation, so the current management situation indicated that the gap between the environment and health management in China and the concept of "Place" is still exist. The long-term scientific study in the field of environment and health has laid a good foundation for the system of the technological support. But as a result of the lack of a comprehensive technological support system in China, the disease monitoring network is still building, the evaluation of impact on health has not yet been popularized, the less sharing of information, and the applying of some economical tools in the field of environment and health in China even is not enough, so these factors led to the gap of technological and economical support system in China in the field of "Programme". In a word, the gaps in the fields of "Policy", "Place", and "Programme" cause the current barriers existed in the course of resolving the problems of environment and health in China. For example, because of the lack of the legal support, many problems were not been solved satisfactorily in the course of resolving the event of impact on health caused by environment pollution. The policy of Health impact assessment has not been implemented smoothly, and the methods of health impact assessment have not been popularized, which resulted in the important factor of impact on human health is not considered in the development of policy and the existence of obstacles to the policy-making. Central air conditioning in public places led to a series of serious health problems, but

there are still some resistance in the full implementation of the management of central air conditioning in the public place, as a result of the basis of management, such as norms and standards, is not enough.

#### **6.1.2.2 The gap analysis of climate change and health**

The impact of climate change on health was merged into the system of environment and health as a management factor, it is bound to use a serious of the support systems in the model of environment and health management, especially need to dependent on the management support, technological support and scientific support. The reason is that most of the basis and tools on which the implement of climate change and impact on health management dependent are come from the management, basis and scientific technological support systems in the environment and health management system. Therefore, there is no substantive difference between the climate change and impact on health and the environment and health management in the content of "Place" and "Programme", such as cooperation mechanism, duty, economical tools, monitoring network, evaluating tools can be applied in the management of climate change and impact on health. An investigation at local level indicated that the practice of climate change and impact on health in the local department is not enough in the aspects of carrying out scientific study, organizing conferences and cooperating with other departments.(figure 6-5,6-6,6-7) And the investigation at the national level shows that there are not any work related to climate change and impact on health been carried out in the other ministries except the Ministry of Health. As shown in Figure 6-8, in the broad concept of "Practice", the work related to climate change and impact on health has not yet been developed, which clearly indicated that more barriers exist in the "Practice". The reasons can be shown as following. First, the management support and technological support in the "Place" and "Programme" are not improved, which is basis of the work related to climate change, so that the study on climate change can not been carried out smoothly

dependent on the current basis and tools.

The second but the more important is that China has not yet issued the policy related to the climate change and impact on health, although a "National Climate Change Program" has been issued, the content involved impact on human health was not been mentioned in it. It can be seen that the policy-oriented to climate change and impact on health at national level is still not enough. Of course, this situation is active improved at present, the Ministry of Health has considered the impact of climate change on human health as an important content of future work, ready to carry out related work and develop related policies to actively against the climate change. These activities are all in ready, the introduction of them still needs more time. Therefore, the "vacuum" existed in policy is the important reason of less practices now.

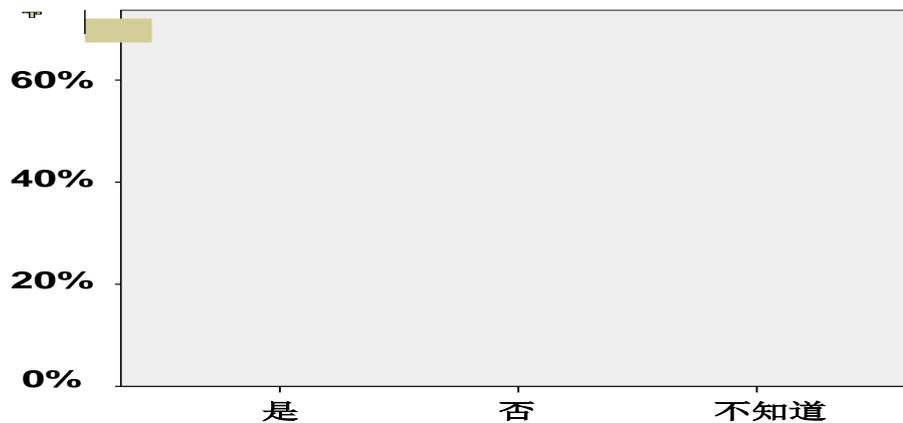


Figure 6-5 the situation of carrying out the study on climate change and impact on health (local level)

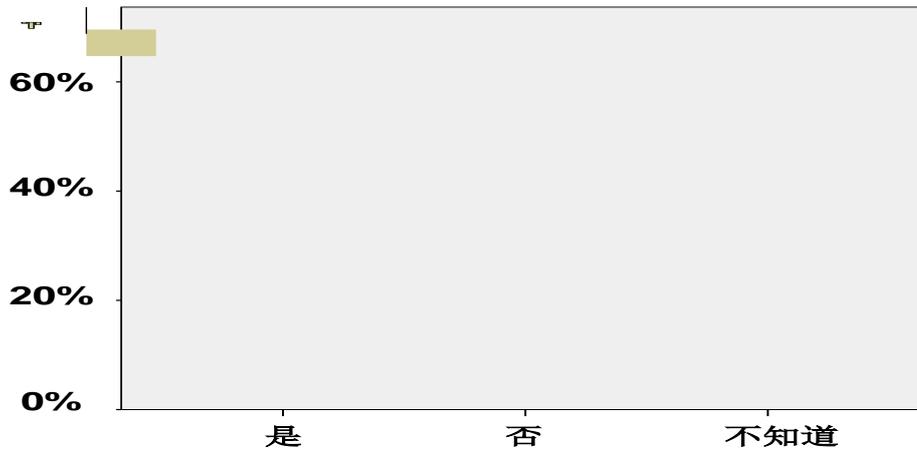


Figure 6-6 the organized situation of conferences related to climate change and impact on health (local level)

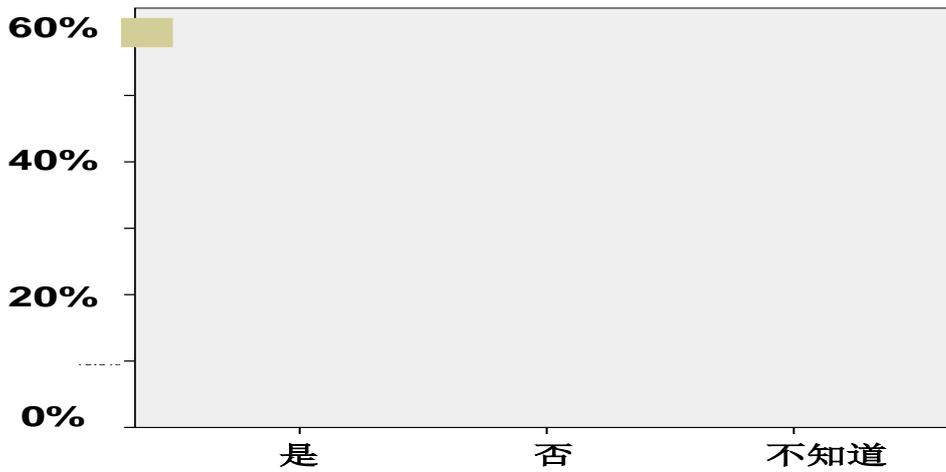


Figure 6-7. The situation of cooperating with other departments about climate change and impact on health (local level)

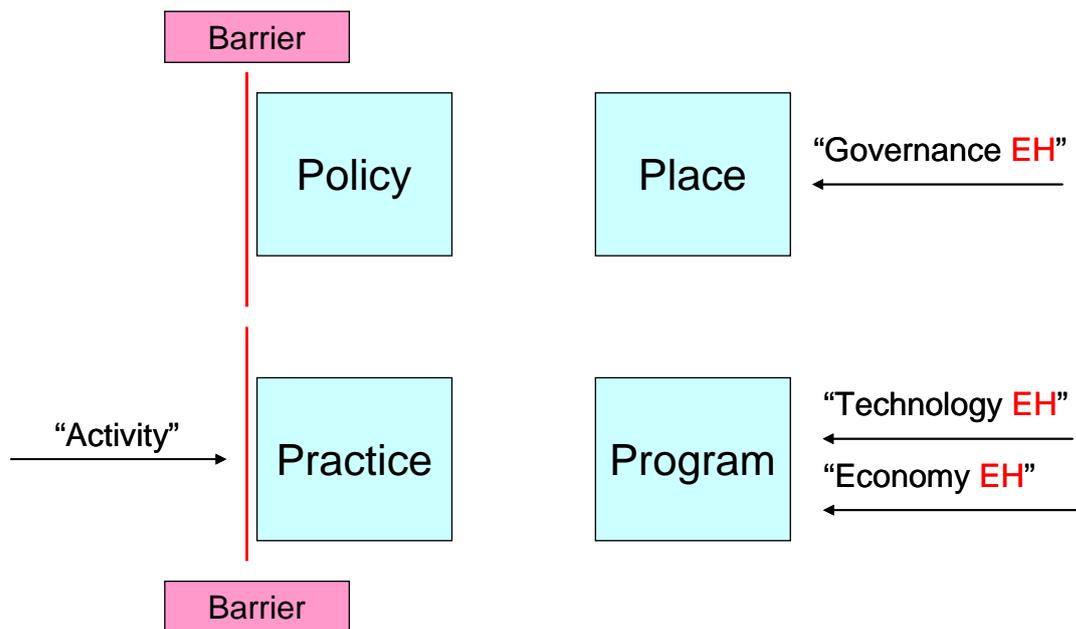


Figure 6-8. The compared of climate change and impact on health with foreign experience

## 6.2 The analysis of coordination mechanism in environment and health management

Environment and health management coordination mechanism is the important support and guarantee for the smooth development of the work related to environment and the health. As a result, the compare with international experience and in summing up China's experience and absence of environment and health management co-ordination are so important that strengthen China's advantage in the field of environment and health management, improve relevant working mechanism, and play a full role to the environment and health management.

### 6.2.1 The cooperation among the various of government related

## **ministries**

Many measures have been taken to environment and health management by China government, such as the establishment of institution, the equipment of staff and instrument and the development of policies and so on. But at the same time the work related environment and health protection which is still newborn needs to be improved and perfected combined with the international experience.

In recent years, according to the foundation and characteristics of China's environment and health management work, fully combining the functions of the ministries and the foundation of the work, the government of China established the basic principles of "Interdepartmental cooperation and comprehensive arrangement", clearly identified the duty of 18 Ministries which participated in the work of national environment and health, set up the coordination agencies of environment and health work in China, and established a series of corresponding coordinated system to make full use of existing resources of various ministries and to strengthen the coordination and cooperation of the Ministry of Health, the Ministry of Environmental Protection, and other relevant ministries, and finally to promote the implement of China's environment and health work fully and effectively. In addition, the 18 ministries which participated in NEHAP identified the special departments or offices to be responsible for the environmental and health-related work, so that the department at every level clearly denfinited their specific details of the implementation of the work,and then to ensure a healthy environment and work can implement effectively. The related survey showed that there have been 9 ministries to carry out NEHAP-related work clearly, included Ministry of Health, Department of Environmental Protection, Development and Reform Commission, Ministry of Science and Technology, Ministry of Agriculture, Ministry of Water Resources, Bureau of Meteorology, the Ministry of Education, the General Administration of Radio, Film and Television. Among them, as a

result of climate change and health-related work is closely related to the environment and health , the Bureau of Meteorology National Climate Center, and other ministries set up special departments responsible for the climate change-related work, including to monitor climate change and to evaluate the climate change and impact on human health. In the result of this investigation, 85.7% of all departments were surveyed think that it is important or some important of climate change and impact on health-related work, this result indicated that the awareness of the importance of participation in environmental protection in various ministries is more stronger. To identify the functions of the ministries and to improve the awareness of the relevant ministries in the field of environment, climate and health and so on, has no doubt laid a solid foundation for the management of environment and health work in China.

As the leader and core departments of the work related to environment and health management, the Ministry of Health and the Ministry of Environmental Protection Environment and Health carried out a series of co-operation and has made a series of relevant results in the aspects of giving full play to their own advantages and promoting the national environment and health work, but as a result of limited to the history, structure, and other conditions, there are still some problems. The environment and health questionnaire results which issued by the Ministry of Health showed that in the survey at national level, only 10 ministries of all 18 ministries and commissions involved in NEHAP responded to the questionnaire (response 18), response rate was 58%, of which the Ministry of Environmental Protection, Ministry of Science and Technology and the State Council Legislative Affairs Office, Ministry of Land and Resources, Ministry of Construction, Ministry of Communications and the Chinese Medicine Council did not responded to the questionnaire as a result of various of reasons; In the survey at local level, the response rate of health departments in all provinces, municipalities and autonomous regions was 97%

(all 30), the response rate of the environmental protection departments was only 20% (all 6). The results above all showed that, compared to the patterns of developing environment and health-related work in some overseas countries, such as to establish the special institutions authorized by national or local government and to implement related policies by specialists (from university, consulting groups and institution of government), the outstanding problem in China is the lack of a leadership which can co-ordinate the environment and health-related work between the Ministry of Health and Ministry of Environment Protection at higher level(eg. At the level of State Council of China), which lead to that related ministries could not motivate their people in environment and health-related work, and hinder the effective development of environment and health management in China; In addition, although the Ministry of Health is one of leaders of the ministries participated in NEHAP, but as a result of the absence of leadership, the pathway of issueing the questionnaire also is limited, and so on, which may lead to a low response rate. Second, a series of ministerial-level conferences are carried out regularly in Europe to strengthen the cooperation between health department and environmental department, and to promote human health related to the environment issues at national and international levels, such as Helsinki Conference. While in the 18 feedback questionnaires at national level in China, only 4 departments (22%) have been organized the regular negotiation, and 13 departments(72%) have been organized the aperiodic negotiation. This result showed that the efficiency of cooperation in various department need to be improved. Thirdly, there are 18 ministries at national level to participate in NEHAP of China. Although the multi-sectoral participation in the environment and health management of China is as one of the advantages, the following situation is some problems, such as too many ministries involved in, not to highlight key ministries exception of the lead ministries, the main responsibility is not clear, and so on. Therefore, a lot of inconvenience also appeared in the department's management. Related data indicated that the effective work has

not yet been carried out in a few ministries. The last, although the system of responsibility tracking and evaluation has been proposed in NEHAP of China, but the implement of it is lagged, which affected the development of the environment and health-related work in China.

### **6.2.2 The cooperation between the government and public, enterprise,NGO**

As the concern of public to the environmental and health problems growing, at the same time of the Government stressed the cooperation of the relevant ministries, the government also more and more pay attention to the participation of the whole society, and actively promote the the cooperation of various ministries and social organizations, NGO, enterprises, and broaden the channels for public participation, improve the mechanism for participation and encourage public participation to promote the smooth development of the work related to the environment and health in China. In view of the characteristics of China's management system, social groups and non-governmental organizations in the field of environment and health in China with a certain degree of government,therefore,often are more positive in the implementation of relevant policies issued by the government, which ensure the development of government related work.

This investigation also showed that, the rate of ministries with sometimes receiveing the proposals about environment and health from the social groups is 55.6% (10) and the rate of often receiving is 38.7%(7), only 5.6%(1) of questionnaires showed never received any proposal. This showed that China have been made some progress and achievements in actively promoting community-related organizations to offer advice and suggestions of environment and health-related work, which will use for the comprehensive and effective development of the work related to the environment and health management. Similarly, in the aspect of business and public participation, with the philosophy establishment of "people first" ,governance will be fully

mobilized social groups and non-governmental organizations in the related fields at the same time of formulating relevant policies and planning, and will focus on the responsibility of enterprise and public, also carry out investigations in the enterprises and public, seek their views to emphasize the participation awareness of business and public, the evaluation of national healthy urban and the town is a good example.

Public participation as a good management of environmental health at the core, which has been recognized in many countries. How to ensure that non-governmental organizations, such as public access to information is key to our urgent problems.

### **6.2.3 Health system coordination**

As an important part of environment and health management system, the health system plays an important role in the field of environment and health management, special in the implementation process of the work related to the adaptation and mitigation of climate change and impact on health.

Some Studies of the process of NEHAP in Belgium, Denmark, Germany, Britain and other European countries have shown that the cooperation of national government and local authorities is one of the key steps to complete the NEHAP goal. In recent years, China's health system has also launched a series of related activities in the field of environment and health, and the departments at all levels are actively involved in these activities to laid the foundation for the work related to environment and health and climate change and impact on health. This survey data of environment and health management indicated that the local health departments positively responded the environment and health-related work.(the provincial health department, the recovery rate reached 97%). In addition, the survey results also showed that the score of requirement to sharing the information related to environment and health in the provincial health system staff reached 9.21(full credit is 10, means

highly need), the score of demand to sharing the information about climate change is 8.79, and the score of demand public to participate in the environment and health management, the requirement of think need to establish the cooperation mechanism of enterprise and social groups is 8.81, and proposed many very useful comments and suggestions for the work related to environment and health in China, the formulation of policy and the implement of plan about adapting climate change. This showed that with the environment and health as well as climate change have become increasingly prominent, the awareness of public health staff also has gradually improved, and the needs of knowledge and measures have been increased.

For a long time, however, the work of environment and health in China belonged to different departments to management, and the work of adapting to climate change is still in its infancy stage, so there are still some obstacles in the implement of related work. First of all, on whether climate change is an important aspect of the day-to-day work in the health system, the awareness of local health system staff is uneven. The data of this survey showed that in the the provincial-level health workers, 53.7 percent of people think climate change is not the important work of the unit, even a small number of staff think that climate change does not belong to the content of disease prevention and control. The contrast is only 7.2 percent of the staff consider the climate change as an important aspect of their work, and think the climate change is closely related to the health, just have not yet been brought into the day-to-day work schedule. This showed that the realization of impacts on health caused by climate change in health system staff is not enough and needs to be raised; Second, the degree of local health departments to carry out the work of climate change is varying. Only 30 units of the 134 local health units which were invested (22.4 percent) have a clear sector of the climate change-related work, the vast majority of local health departments did not carry out related work; Third, in the whole health system, a certain lack of integrity and cooperation in

the organization of environment and no full understanding and exchanges of the emerging problem just like the climate change and health impact the smoothly progress of the work related to environment and health. In the provincial health units being surveyed, only 13.8 percent of them have been involved in conferences related to climate change and its impact on health, and 55.4 percent of the units at the provincial level do not participate in relevant meetings, which further indicated that the organization of climate change-related activities in the local health system still needs to be strengthened.

### **6.3 The analysis of policy and regulation problems in environment and health**

#### **6.3.1 The support degree of environment and health policy need to be increased gradually**

After development of a short period, the efficiency and coverage of China's environment and health management policy are greatly improved, and there are the corresponding policies and measures to cope with the environmental issues being closely connect with the people's lives, but the current policy can not fully meet the needs of environmental and health management, and some areas are still exist policy lagging and policy gaps. A careful analysis of problems existed in China's current policy of environmental and health contributes to policy-makers to develop more scientific and effective policies. Some problems in our environment and health management can be described as following:

The problems of overlapping management and low efficiency exist in environment and health management. This is a frequently asked problem of China's administration system. There are nearly 20 ministries related to the environment and the health in China, each of the ministries responsible for one aspect of environment and a healthy, they played a role for China's

environment and health work.

At the same time, however, such a decentralized management style also has some problems. On the surface, China's environment and health has been covered a lot of fields, and there are many ministries in charge of this work, there are also many investments of human resources, capital, technology. But in practice such a system will inevitably arise duplication of functions, resulting in a total investment of the same circumstances, in equal shares to a single sector funds, a relatively small human, not an in-depth research carried out, lower efficiency, waste of resources and other issues. Take the environmental monitoring for example, due to historical reasons, the environmental monitoring to various degrees were carried out by many departments, such as land, construction, water conservancy, agriculture, health, environmental protection, forestry, meteorology, marine and other departments. At present, various departments and regions have been formed a monitoring group with nearly 1000 agencies, more than 30 million members. As a result of the lack of unified supervision and management, there is a big difference in the distributing of monitoring sections, monitoring, technical specifications, evaluation criteria. The environmental monitoring report, not only overlapped in the monitoring region and had cross-content, but also existed more controversial to the results of monitoring, which led to confusion of environmental monitoring information. Environmental monitoring data is the basis of carrying out environmental protection work. Confusing of information, not only make the Government and relevant departments can not fully and accurately grasp the state of the environment, create difficulties for the decision-making and macro-control of government, but also affect the government's public authority and credibility. If the co-ordination to achieve a result, but also China government need to further improve the environment and health management system and as soon as possible issue corresponding policy.

Management experience, sharing of research results and exchange mechanisms need to be further enriched. With the reform of "Super -Ministry system" in China, the problems of cross-functional, policies coming from different departments, overlapping management in government have been improved, however, such reform can not be completed overnight, so a set of resources, information, sharing mechanism of research results, to a large extent, will ease the current status of overlapping management. And in the field of environment and health in China , China lacks an effective system of cooperation and information sharing platform. To address this issue, China has taken certain measures. For example, Ministry of Environmental Protection and Ministry of Health reach a consensus on the establishment of coordination mechanism of environment and health, and in 2006 established the "environmental and health coordination mechanism in Ministry of Health, Ministry of Environmental Protection", and set up organization mechanisms at 4 levels, including the a national environmental and health work leading group, the Joint Office, the experts advisory committee, theme Working Group. Departmental coordination mechanism has played a positive role for strengthening the management of the environment and health, and the conduction of NEHAP is the consequence of cooperation between the two sides. In order to further strengthen the cooperation among sectors, NEHAP specially emphasizes on the importance of coordination among various departments and relevant departments.

And according to the functions and powers of department's administrative, the responsibility of 18 departments of health and the environment supervision and management has been clearly divided. The development of NEHAP makes an example of cooperation in China's environment and health departments, and the ways and means of cooperation will be continued to explore in the future.

The roles of NGO have not yet highlighted in environmental and health. China's NGO have not yet give full play role as a "third sector", the reasons of

this phenomena can be described as follows. The first is social environment: as the social transition, the impact of the old system still exist, the transformation of government functions are still in the process, the lack of independence of the community, the support strength to NGO needs to be strengthened sense of civic responsibility, sense of participation, public spirit are still not enough. The second is the legal system: The legislation related to NGO needs to be improved, there is a gap in law-based management comparing with developed contries, and there are some problems in the management mechanism of NGO. At present, China has no a unified, complete law of NGO, only a few scattered administrative regulations, and has a wide gap between the legal system in developed contries. The last one is the problems of strong dependency, weak independency, a lack of special workers and decision-making mechanism and policy, the absence of long term stable institution in NGO. The reasons above-mentioned made that the independency, self-management ability and public welfare need to be improved.

### **6.3.2 Environment and health laws and regulations need to be further improved**

China lack the special laws in sovelving Environment and health problems at present. The current legal system of environment and health security consist of some relevant substantive and procedural laws in the civil law, administrative law, criminal law, environmental law and the Civil Procedure Law, Administrative Procedure Law and Criminal Procedure Code, and have not yet formed a sound system of laws and regulations. Compared with the goals of protecting the human health, China's legislations of environment and health protection can not fully meet the actual needs.

Take the system of compensation for damages on health caused by environmental pollution for example, "Compensation and prevention law of impact on health related to environment pollution", Hereinafter referred to as "compensation", has been established in Japan in 1974. The law combines the

real concept of responsibility for the compensation, and applies to diseases, including the "specific disease" had a causal relationship with polluters, and "non-specific diseases" with no clear cause and effect (such as bronchial asthma caused by air pollution). This law demands polluted factory to payment damages about "special disease", and all national polluted factories to bear the cost in proportion about "non-special diseases". A dispute settlement institution- Environmental Dispute Mediation Committee has been set up according to the "Law of solving Pollution Dispute", to resolve the pollution dispute through confirming the requests of submitting documents and conducting on-site inspection without court. EU developed the "EU Environmental Liability Directive" for the collective damages, which was on the basis of the polluter-pays principle (PPP). Some developing countries, such as Uzbekistan, are formulating their own "environmental damage compensation law". Faced with an increasing number of pollution-related health damage case, there is few related laws and regulations and compensation mechanism in China, and there is also no standards for the use of the court, which led to the plaintiff in the action rarely win. Therefore, in accordance with the polluter-pays system, a compensation mechanism for environmental and health should be established, the financing mechanism for compensation should be addressed. At the same time, during the court proceedings, there should be an appropriate dispute settlement mechanism to protect the public interest.

In the aspect of information publication, the United States has been established "The bill of emergency planning and the right to know of community". The bill requires companies to report the emissions situation of dangerous substances to the EPA, and then public the report. The result is that "the list of release toxic" was issued on the Internet each year, community can comment the polluted problems existed in their areas, and national authorities can inspect the environmental performance of some companies and

investigate the quality and density of some chemical emissions into the air or water.

"Law of Safe Drinking Water" also called for public water suppliers to open the quality and density of contaminants in public drinking water, and they also need to hand this information report to customers together with the fee notes. The results is that since October 1999, the 55,000 local water management agencies in United States began to report the information of drinking water contaminants to consumers. In the EU, "the convention of information public, public participation and decision-making and accessing to fair of United Nations Economic Commission" provides that "Every one have the right to live in a suitable environment to his health and well-being." and the pathways of public access to information, and the right of public participation in decision-making and access to justice are guaranteed. In the EU, "the 2003/4EC instructions on public access to environmental information" has been developed to ensure that Government can master the route of environment information transmission and acquiring, and in principle the results of environmental quality tested by the member countries and other information must be opened to the public through the web site of national and the European Environment Agency. At present, China's law on public information has yet to be improved. Experience of the United States has provided us a reference model, and China may improve the legal system on the basis of according to legislation of United States as well in accordance with China's national conditions, other similar unimproved legal systems are: Assessment system of damage on health caused by environment, Insurance scheme of damage on health caused by environment, Funding system of damage on health caused by environment.

### **6.3.3 Environment and health standards need to be improved**

The standards system of environment and health in China have been covered the fields of air, water, soil, noise and other areas in environment and health,

and has played an important role in the aspects of protecting human health, assisting the implementation of the law. With the rapid development of China's economic, public awareness of environmental and health gradually improved, their legal rights activities are more and more, the requirement of relevant standards is improved, so the standard system of environment and health in China has yet to be further improved.

Lack of standards for environmental and health is the primary issues of the environmental health standards system in China. At present, many laws provide the content of protecting human health, the common law model in China is "in order to protect human health," mentioned in the purpose of the legislation. The absence of legal provisions is that the determine standards and principles to the damage on health caused by environmental pollution, the ways and means of relief after body was damaged and so on. As the result of the lack of determined standards about damage on health caused by environmental pollution, and we have not enough technological basis to determin and deal with the problem of environmental pollution, so in practice the related officers often enforcement according to related regulation conducted by themselves even to the individual determine of law enforcement official, which easily cause the phenomenon of law enforcement too strict or too loose. China's corresponding lack of standards, both for historical reasons, and technical reasons, the research of environment and health in China is not only a late start, but also is very weak on the technology and research funds, and has been confined in the field investigation, thus it is difficult to master the all kinds of data on environment and health. At the technological level, the uncertainty of causality about the impact on health caused by environment always has always been a difficulty of researches at home and abroad, and it is difficult to develop standard in this aspect. The current Jique standards of environment and health in China can be list as following: the assessment and determined of polluted impact on health, monitoring of impact on health

caused by environment pollution, environment health risk assessment and impact evaluation, health evaluation of drinking water, indoor air and electromagnetic radiation, soil Biological pollution, the testing of environmental pollution and health impact indicators, Emergency Response to the environmental pollution events.

Environment and health-related standards are not suited to China's development situation of economic and social, which is another issue in the field of environmental health status of China. At the beginning of the environment protection standards was issued in China, it played an important role in prevention of environment pollution and protecting human health. As time goes by, some of these standards no longer meet practical needs, and some numerical standard have been proved unreasonable as an in-depth study. For example, some indicators in the "Ambient Air Quality Standard" of China developed in 1996(GB3095-1996) can no longer meet the needs of the protection human health, and have been modified in 2001, including the standards of NO<sub>x</sub>, NO<sub>2</sub>, O<sub>3</sub>. The revision of the standard have the same significance as the setting. The Ministry of Environment Protection said that in the period of the "11th Five-Year Plan", the amendment of more than 1,000 national standards of environmental protection will be completed, which indicates the government on the revision of the standard of great importance.

## **6.4 The role of science and technology**

### **6.4.1 The monitoring system of impacts of environmental and climate change on health**

At present, many countries around the world have been established monitoring network of environment, climate change and health. The European Commission and European department of WHO co-funded "European Environment and Health Information System." "European Environment Information and Observation Network" (Eionet) established by European

Environmental Protection includes the fields of water, air, climate change, biological diversity, resources and waste management, water and the use of land and so on. (the Report of ICDF, 2008) Climate change has become a recognized environmental factor impacting on human health, a well-functioning environment and health monitoring system provide a basis for monitoring the climate change and impact on health. The health effects of climate to a certain extent, can be prevented. As the people's adaptability to local climate and other reasons, the role and impact of them have significant regional characters. Thus, it is significantly important to develop the work related to climate change and disease monitoring, and to establish a climate indicator system and prediction model about human health. The most accurate weather information should be conveyed to the public at a fastest speed, and appropriate preventive measures should be taken, which minimize the loss of the public. For example, in order to reduce the health hazards of heat waves, many countries have established a hot early-warning forecast system (HHWS), greatly reduces the heat-related disease mortality and morbidity.(Climate change and human health in China, 2006) Combining meteorological monitoring data in the last 50 years and monitoring data on the cause of death for 17 years, Toronto of Canada studied the mathematical model of impact on health caused by meteorological factors and the established the extreme weather warning system. When heat wave struck, through the media, child care center (child care centers), hospitals, community services (community agencies), and other groups to issue a warning (see Chapter V).

The Ministry of Environmental Protection of China set up automatic air monitoring system (113 cities), Sandstorm monitoring network, acid rain monitoring network, surface water environment monitoring network and near-shore marine environment monitoring network. The Ministry of Health of China set up disease prevention and control system for infectious diseases, the cause of death, public health emergencies, high-temperature heat stroke

cases, health hazards, disaster prevention information network to monitor and report. China Meteorological Administration monitor weather conditions, climate change and extreme weather events and so on. The integration of Environment, health and meteorological monitoring systems will in favour of clarifying the impact on health caused by environmental pollution, climate change, providing a scientific basis for decision-makers of environment and health management. The "diseases of air pollution monitoring stations" established by institute of Environmental Health of China CDC in 2004 are running in 8 cities, in the collection of air monitoring, meteorological data, at the same time to carry out the respiratory tract, cardiovascular diseases and symptoms to monitor, dynamically monitor the air pollution and the impact of climate change on the health. But the monitoring technology and methods are continuing to explore, in particular the the mechanism of multi-sectoral cooperation needs further to be improved. China is a vast, complex weather conditions, the influence on China of global climate change is different. "Air pollution monitoring disease" is a good start, however, the situation in the country on behalf of the 8 cities is far from sufficient. Therefore, learning to monitor the work of foreign advanced technology and methods, learning from the experience of foreign multi-sectoral cooperation, the establishment of ministries and national level, long-term cooperation mechanism can ensure the smooth carrying out of monitoring work and to promote the country.

At the same time of monitoring, to conduct the early warning of climate change and impact on human health is an important aspect of adaptation to climate change. The weather bureau will release the high-temperature weather forecast. Some cities in China have tried to adopt multiple regression method to forecasting the index, forecast the situation of impact on human health according to weather conditions. Meteorological departments of some cities, such as Hangzhou, Nanjing, Nanchang and Beijing and so on, forecast the living index and health index every day, including: disease risk index,

cerebrovascular disease trends, predict the incidence of respiratory diseases, the concentration of pollen and the fact the trend, dressing Index, morning exercises Index , the climbing index , the swimming index and so on to educate the public to adjust their daily needs met, change clothes, according to the weather changes, in order to reduce the weather conditions on the adverse health effects. However, because of the study about climate change on human health carried out later, the basis of study is relatively weak, it is necessary to carried out further research to release more accurately early-warning; To strengthen international cooperation, make full use of the resources at home and abroad meteorological satellite data, combined with information on diseases, the development of climate change and its impact on health-related scientific research-based data sets (Treasury); To improve the early-warning of climate change(including extreme weather phenomenas and disasters) and impact on health; To establish the public services and information products manufacturing and distribution system; To provide rich, accurate, timely and authoritative all kinds of services of disease monitoring, assessment , Predicted that early warning, as well as disease prevention to public.

Research of monitoring technology are the basis of the health effects monitoring. Through the monitoring of the biomarkers in crowd biological samples, biological monitoring can assessment the exposure level of human to the environmental toxic and health effects. After years of research, biological monitoring methods developed rapidly, in some countries and regions are being applied to health monitoring. Since the year of 1999, the U.S. CDC investigated into a population of about 5,000 people in 15 regions across the country each year. Collection of human biological material (blood, urine) used for studing the exposure density of the United States population to chemical pollutants, and to regularly inform to public through "the report of Environmental Chemical pollutants exposure of the United States". "2004-2010

European Environment and Health Action Plan" put forward the biological monitoring through cooperation among the member countries. At present, the lack of exposure data of typical population to pollutants has become development bottleneck of environment and health research in China. China need to learn and study the advanced analysis methods and sample technology of biomaterials. As the national technological support programme in "11<sup>th</sup> five-years plan", "the research of key environmental health hazards of chemical pollutants monitoring technology in China" will use modern technology to monitor the biological evaluation of chemical pollutants and exposed to health hazards. Biomonitoring is the future direction of development of Chinese environmental health, but still need to pay more efforts to carry out basic research and exploration for the future implementation of the monitoring on a regular basis to provide technical support.

#### **6.4.2 Environmental health impact assessment and its application**

Environmental protection's final goal protects the crowd health, many countries establish the environmental pollution positively to the health influence assessment method or the system; In related decision-making process full consideration environmental pollution to health influence; And establishes the environment healthy bulletin, makes the public to understand that the environmental pollution the influence which creates to the health, thus takes the measure to reduce or to avoid the environmental pollution on own initiative to the health the harm. The health influence appraisal emerged in the 1970s several industrially advanced countries. The US National Academy of Science proposed that the health influence appraisal is composed of four parts, is called the health influence appraisal "four steps" is the harm distinction, a dosage effect relations appraisal, the exposed appraisal and the risk attribute. And has made the explicit definition to various part. Based on this, American EPA formulated and has promulgated related health influence appraisal a

series of technical document, the criterion or the guide. For example, in 1986 had issued the carcinogenicity risk assessment, sends is unbalanced the risk assessment, chemistry mixture health influence appraisal, growth poison health guides and so on influence appraisal, exposed appraisal. in 1988 had issued in attracts poison (systemic toxicants) and the men and women reproduces appraisal guides and so on performance poison. American EPA established has used in the environment chemical material risk factor appraisal the IRIS database, the database contains the harm appraisal and the dosage - reaction relation appraisal main parameter. WHO has also established many kinds of environment chemical material healthy datum series, has the very high reference value to the environment health influence appraisal.

The health influence appraisal's scientific system forms gradually, and develops unceasingly and consummates, receives many national environmental protection organization and the related international organization's value more and more, the health influence appraisal is widely applied in these national making policy and the economic development. in 1997 European Union "the Amsterdam Joint pledge" expounded that "in possesses the European society the policy and active UK resolute and in the execution should guarantee one kind of high level the human health protection."The EU commission has used the synthesis influence appraisal procedure, includes the health and the environment. in 2004 became effective "the United Nations Economic Commission for Europe To appraise the ESPOO Joint pledge about Environmental effect Strategic Influence Appraisal Protocol" the health protection is also the important content. "European Policy Health Influence Appraisal (EPHIA) Guide" the goal is proposes the HIA universal application method in the European Union policy making. A European Union strategy's critical target is the reduced healthy aspect society is not equal, therefore, how the HIA method request does affect the different

community to the policy to carry on the appraisal. Sweden has released "Municipal administration Health Service Law", legislates form request when policy plan and making plan must carry on the health influence appraisal. The British London requests in the urban each development project to consider that the health influence appraisal, proposes the HIA method, and carries on the qualifications authentication to the HIA personnel. Canada implemented the health influence appraisal in the environmental effect appraisal already to have the very long time history, the medical department to the government proposed that about various domains policy's latent public health influence's suggestion, the medical department and the environmental protection bureau reached the agreement finally. (country mutual economic assistance organization reported that 2008)

China "(2007-2015) proposed in the National Environment And the Health Planning for action": "establishment environment and health risk management mechanism, perfect environment and health risk appraisal method, appraisal procedure. According to the environmental pollution and the health influence condition, the present regulatory policy, the available resource and prevention and control ability and so on, determined reasonably the acceptable risk factor level, making country environment and the health risk rank regionalization, enhances to may control the environment adverse factor and the health danger forecast and management decision ability, realizes the environment and the health risk cost control gradually. "possibly in the environment and the health monitor and in the risk assessment foundation, to the serious environmental pollution which and the health danger occurs carries on the early warning, proposed that the management and the technology counter measures, realize the macro-scientific policy-making. The establishment environment and the health risk early warning working mechanism, the environmental pollution and the health damage report system and the early warning issue system, consummates the early warning method, achieves

analyzes early, forecasts early, intervenes early, prevents the significant environmental pollution and the health harm event occurs; Take controls the key environmental pollution and the health harm as the object, the research environmental pollution and the health harm response relation, the reasonable making different risk rank early warning and the treatment plan, enhance the guard significant environment and the health risk level unceasingly."("National Environment And Health Planning for action (2007-2015)", 2007)

In the application overseas method and in the technical foundation, our country has also carried on the discussion to the environment health influence appraisal, has done the massive work, but "Planning for action" determined with the advanced countries the goal, also has many disparities obviously. Although China not yet officially releases the related standard at present, but other country's practice and the experience established own environment health influence evaluation criteria for China to provide the very valuable reference. In unifies our country national condition, summarizes the overseas experience and in the domestic research foundation, our country Related Department already started to draw up the health influence appraisal the technology standard, the medical department is drafting "Environment Pollutant Exposition And Risk assessment Leads", the environmental protection department also proposed that draws up "Environmental effect Appraisal Technology To lead - Human body Health". The Medical department and the environment department had the technical superiority in the respective domain, the Medical department in the crowd epidemiology investigation, the hygiene appraisal, the environment pollutant body burden, aspects and so on pollutant crowd health influence once carried out the massive research and the standard making work, the environment department accumulated the rich data and the experience in recent years in the environmental effect appraisal. The environment health influence evaluation criteria's making and the consummation need the environment and the hygienic domain policy-maker

and the expert fellowship. The environment health influence appraisal cannot pause in the theoretical level, the appraisal technology, the method and the standard should apply in as soon as possible the social development and the economic development. The environmental effect which possibly the environmental effect appraisal already the form which legislated in our country enforced, requests to plan after items of basic construction implementation creates to carry on the analysis, the forecast and the appraisal, proposed that the prevention or reduced the adverse environmental impact the countermeasure and the measure, carried on the track monitor, but in 2002 through "the People's Republic of China Environmental effect Appraisal Law" not yet set the request to the health influence appraisal. ("the People's Republic of China Environmental effect Appraisal Law", 2002) integrates the environmental pollution to the human body health influence's appraisal in the control system which the link comments, is "humanist" governing plan concrete manifestation. Strengthens the prevention and control of pollution to our country, carries out "the prevention primarily comprehensive program of public order", strengthens from the source prevention pollution, the protection environment and the people health policy, as well as the supplement and the consummation related laws and regulations and the standard system, have important realistic and the long-term significance.

The environment health influence appraisal is the specialized very strong work, not only involves many environmental risk factor, involves many kinds of ambient media, for example air, water and soil and so on, moreover needs the public health the specialized knowledge and the skill. Therefore, to the personnel who is engaged in the human body health influence appraisal requests high, some countries proposed to appraises personnel's intelligence to carry on the authentication. Because the Chinese health influence appraisal not yet unifies with the environmental effect appraisal, did not have the authentication legal health influence appraisal authoritative organization,

therefore to is engaged in the human body health influence appraisal the personnel intelligence authentication also with difficulty to develop. The domestic prophylaxis control mechanism, department's and so on medical research organization, university environmental sanitation personnel are not deficient, the full use related International organization carries on training to the domestic concerned personnel, carries out the environment health influence appraisal using our country environmental sanitation domain's researchers is fully feasible. Along with the health influence appraisal in the domestic application and the development, will form own system and the scale gradually, to is engaged in the human body health influence to appraise the personnel to carry on the unification to train and to inspect, the development appraisal organization and personnel's qualifications authentication will become future development direction.

#### **6.4.3 Information managements and sharing**

Along with social, the economical and the technical development as well as the humanity life style's change, the environmental factor are day by day complex to human health's influence, the environment and the healthy science involve the discipline scope is more widespread. Must promulgate between the environment and the health relations, not only needs the multi-disciplinary cooperations, moreover needs essential data and the information and so on environment and population health. Long-term, continual social economy material, meteorological data, environmental monitoring material, population data, public health and disease monitoring data, is very important regarding the analysis environment to the crowd health and disease's influence and the dynamic change, realizes these information public and sharing, has the extremely vital significance to the environment and the health scientific research.

In any country, environment and health information management and data sharing great importance. Many country's examples indicated that because

lacks the scientific information, the health harm widely spread and causes many people to be in the danger. In 1984 the Indian Bhopal (Bhopal) the pesticide factory one time divulged at night the pitiful accident has taken away many person of lives, this indicated that because lacked the information to be public, the accident scale will expand. In Japan, the health harm which the factory hand and the nearby resident exposition and the asbestos received hid the quite long time, starts with 2005 to appear gradually. Related to the measure which at that time adopted has carried on the inspection. The result indicated that adopted the response based on scientific knowledge is suitable, but to precautionary approach understanding insufficiency, moreover the related department coordinated insufficiently also caused the prevention and the control work comes under certain influence. (country mutual economic assistance organization reported that 2008) in 1994 issued the European environment and the health planning for action through the research environmental sanitation target, establishes including food the environment exposition monitor pattern, the establishment continual biology monitoring method, strengthens environment and healthy domain ways and so on cooperation comes the conformity environment and the healthy information, strengthens the information chain construction. (The European Environment & Health Action Plan 2004-2010) the data informationization and multi-disciplinary, trans-departmental data sharing is carries on the environment and the health scientific style management premise. China in recent years department's and so on health, meteorology and environmental protection informationization constructions obtained remarkable result. Since the Chinese illness sickness anticipatory control center 2003, has depended on the national public data network establishment the Chinese illness sickness anticipatory control system to contain the infectious disease epidemic situation observation system, to arise suddenly the public health incident report management information system, the cause of death registration report information system, the health danger factor monitor information system small

steelyard system. At present has established the cover all levels of illness sickness anticipatory control center, the Medical establishment and so on highly effective, fast, the unobstructed information network system, the antenna extends to the city and countryside community. At present is strengthening the legal system and the standardized construction, the standard and the consummation public health information collection, the reorganization, the analysis, improves the information quality. The Chinese Meteorological bureau promotes the developing country scientific data as the United Nations to share and to apply the global alliance plan the experiment site, basic solution domestic scientific and technical circles to meteorological data gain prominent question. The Chinese scientists may click register, on-line visit, gains the rich meteorological data; Moreover, the meteorological data free provide face the public welfare user, the user does not need to pay the soaring expense again. China environmental monitoring main terminal also already the key urban atmosphere, the national water environmental monitoring's partial informations issued through the website and the media to the society.

However the present our country is away from realizes the environment and health data sharing also has certain disparity. The multiplex management system causes the massive data message to grasp in the gathering data department hand, the basic data and the data are at the dispersion, department all conditions, the precious scientific data not yet obtains the full use. In many situations, the people to obtain the information, but can not but carry on the repetition work, not only has created the resources and the financial resource waste, moreover enables the data the standardization, the confidence level, the integrity, the authority not to be able to obtain the guarantee. Information impeded to environment and health management prominent question. China needs more trans-departmental, the interdisciplinary scientific research cooperation, the promotion different domain

scientist's cooperation and the exchange, promotes scientific research data sharing. The environmental protection, meteorological and the Medical department respective establishment's observation system data needs to go a step further conformity, expounded that the environmental pollution, the climatic change to the crowd health's influence, provide completely, the accurate scientific basis to the policy-maker. The Chinese Center for Disease Control and Prevention environment and the health related product security started the air pollution and disease in 2004 monitor the work, in Taiyuan, Wuhan, Nanjing, Zhangjiagang, Shanghai, Qingdao, Shenzhen, the Harbin eight city development monitor, the conformity health, the environment and the meteorological monitor data's informationization data platform was establishing, and gradually to national promotion. The collection environmental protection, the meteorological data are monitor the plan the important content. But because between some Regional sector the data sharing mechanism was still imperfect, has certain difficulty in the data collection process, along with test point city's gradual increase, the data collection question will be specially more prominent. The environmental protection department and the medical department are the national environment and the health planning for action coordination unit, has done the massive work respectively in environment and in the healthy domain, accumulated the rich data, the establishment and the consummation country stratification plane environment and the healthy data sharing mechanism will enhance the scientific data effectively for the supervisory service potency.

The information is the society is now livelihood and development capital stock. Realizes the information sharing, causes the government, the scientific circles and the public understands the national condition, is enhances policy-making the validity and the scientific nature, realizes the sustainable development important basis. Only the information sharing, only then possibly reduces the redundant investment and the building redundant project, breaks data barrier

which forms for a long time, enhances the resources the use efficiency. Only then breaks the region, the profession, the department, the organization and the discipline boundary, strengthens the crosswise relation, realizes the information sharing, only then possibly realizes surmounts the time, spatial, the physical barrier resource sharing and the joint operation. Therefore the promotion information and the resource sharing, strengthen trans-departmental, trans-regional, the interdisciplinary cooperation exchange appear especially important to the environment and the health management.

## **6.5 Financial supports**

At present, our country is being from the tradition the historical period which accelerates to the modern age to reform, the economical sustained growth, the marketability reform degree deepens, from this also causes to the natural resource development degree to enlarge, pollutant discharge amount rapid rise. in 2000 "China Environmental aspect Bulletin" pointed out that the national city air pollution is still serious, the air quality achieves the national primary standard the city only to occupy 1/3. Along with environment pressure's unceasing increase, the traditional atmospheric environment management system the date obviously ossifies in front of the market economy, the deficient efficiency. Regarding this, the State Council pointed out explicitly: "along with economic restructuring's thorough, the market mechanism is getting stronger and stronger in our country economic life's control action, the enterprise operating mechanism gradually is also changing, therefore, all levels of the government should more utilize the economic means to achieve the protection environment the goal."

### **6.5.1 Application economic means necessity**

The early 20<sup>th</sup> Century, the British economists shield ancient propose the environment question economic means. He proposed that exterior cost which creates by the factory free emissions pollution, (i.e. shields ancient tax by the

government taxation's way to cause its enterprise internalization usually called) the tentative plan. Generally, when some method may affect the polluter behavior the cost and the income estimate, this method may call it "the economy" the method. The concrete manifestation for presents the financial payment shift between the polluter and public or produces a new actual market, like each kind of tax revenue and charge, fiscal subsidy, pollution discharge permit trading market and so on. Face the market economy, the utilization economic means strengthening atmospheric environment management's necessity mainly manifests in the following several spots.

1) the traditional direct control method exposes the overhead charge to be soaring day by day, the execution difficult, does not favor the large scale reduction environmental damage the flaw. Our country environmental management system is establishes under the planned economy system, mainly by the administration, the laws and regulations and so on direct control method primarily, its typical characteristic is the without a clear line between the functions of the government and enterprises, the administrative intervention are excessively many, the environmental protection Functional departments function attenuation.

2) economical marketability request atmospheric environment management marketability. Since continuously, the people thought that environment resources dereliction priceless, is inexhaustible, is inexhaustible, to the environment resources' scarcity and finiteness understanding insufficiency, the environment resources' property right is unclear. All these barriers cause "the market malfunction finally. This is also the atmospheric environment question day by day serious economical root, simultaneously also provides the opportunity and the reason for the government by the suitable economic means intervention.

3) economic means' substantive characteristics is the environment question exterior internalization, it has some to surpass the direct control method the

characteristic. If the economic means can let the environment responsible party through the market mechanism undertake the protection and the environmental enhancement responsibility; The macroeconomic regulation and control, transparent fair, easy to carry out emphatically; Through changes the market signal to affect polluter's economic interest to guide its change behavior by this, reduced has carried out the cost, caused the environmental management to be more nimble; For environmental protection project raising fund

### **6.5.2 Service conditions introduced**

Various countries (including our country) in environmental management application economic means great variety, following on some commonly used method classification introduction.

#### **6.5.2.1 Charge system**

The Western Europe country quite widely uses the pollution charge and the user collects fees the system. Germany took the lead in 1904 in the Ruhr heavy industry area to practice the fee-levying for pollution discharge. Poland gets a light from another light power plant emissions SO<sub>2</sub> to implement the total quantity charge, the charging criterion partition execution differentiates the emissions behavior which the standards and does not attain a designated standard, has manifested continues to the enterprise standards emissions stimulation and under the standards premise to reduce the pollutant discharge to encourage the function. Our country some areas' thermoelectric power station, started from 1993, paid the SO<sub>2</sub> effluent fee according to the emissions total quantity. On September 1, 2000 applied "Air pollution Prevention law" in our country the 14th stipulation: "the country implements according to the atmosphere emission pollutant type and quantity collection effluent fee system, according to strengthens the air pollution prevention the request and the national economy, the engineering factor reasonable

formulation effluent fee collection standard.” According to the above, our country is continuing to consummate the present fee-levying for pollution discharge. At present proposed reform plan primary coverage including aspect and so on pollution charge standard system, effluent fee fund use and regulatory policy. And, the pollution charge standard system reform mainly realizes by the exceeding the allowed figure charge transforms, the sole density charge to the pollution charge the charge which unifies to the density and the total quantity control to transform, the single factor charge to transform, the static charge to the multi-factor charge to is higher than the government cost to the dynamic charge transformation and by the low-charge standard the charge transformation, simultaneously the new charge basis will change the pollution equivalent, simplifies the charge method. The effluent fee administration of the fund reform includes: Integrates the budget management the effluent fee, principle which after cancelling the effluent fee receives first, uses; Insisting that the effluent fee possession collection, establishes the level-to-level administration system; Central centralism certain proportion effluent fee fund, enhancement country macroeconomic regulation and control ability and so on.

#### **6.5.2.2 Tax revenue method**

The nearly all OECD member nation to the leaded gas collection excise tax, or to the fossil fuel collection carbon tax, and has Denmark and so on 4 national collection sulfur tax. Certainly, the OECD member nation collection sulfur tax not completely controls the SO<sub>2</sub> emissions, is also to increase the tax revenue. The collection sulfur tax divides into according to the SO<sub>2</sub> withdrawal and according to the fuel sulphur content 2 ways. Speaking of the management, the former request complex supervision system, the latter is much simpler, carried on the examination and the collection in the fuel wholesale and the sales process may. At present our country in “two controls the area” the collection SO<sub>2</sub> effluent fee, already close was one kind of pollution additional

tax. Besides above collection environment resource tax's situation, the government may also through other tax revenue method, the stimulation environmental protection investment, the guidance environment harmless production and the expense. If Thailand in 1992 reduced the gas tax, to contained the lead and the unleaded gasoline excise tax reduces 15%, 20%]separately. Our country has also established the difference tax policy, right "the three wastes" the comprehensive utilization project reduces drafts, the exemption increment duty

### **6.5.2.3 Establishes the market**

Establishes pollution discharge permit which the market mainly includes may trade (pollution discharge power) and environment stock and so on. Capital transport business is fastidious about the investment with to deliver, must according to the economic law management, the water conservancy facility which cannot pass likely often only speak the investment not to strive for to deliver, it is well known, has no benefits to be gained is attracts the society funding invested water resources project with difficulty the construction. At present under the socialist market economy condition, definitely may have on the water resources investment delivers, has the income, some may also have the profit greatly, obtains the huge economy and the social efficiency. To be listed raw water Joint-stock company, in 2003 obtained each income 0.228 Yuan, the net assets returns ratio 7.88% good achievements, the origination Joint-stock company, the stepping in water resources management time is not long, but in 2003 has obtained each income 0.3668 Yuan, the net assets returns ratio 9.08% arrogant person achievements. American New York's investment strategy expert Bell Stille Ness is called the water "the 21st century best investment field". The US most as early as applies the pollution discharge power transaction in the thermoelectric power station SO<sub>2</sub> contamination control, present only then Germany implements the pollution discharge power transaction in Western Europe. The US 1990 "Clean Atmospheric Law" the bill

for amendment proposed “the acid rain plan”, simultaneously determined around the country carries out the SO<sub>2</sub> pollution discharge power transaction. US's practice indicates the pollution power transaction compared to exceeding the allowed figure fine change guarantee pollution discharge total quantity goal realization. in 1993, Our country Country Environmental protection Bureau chose Taiyuan and so on 6 cities to carry on the atmosphere to dump pollutants to trade the pilot work, requested the new investment in enterprise to govern the old enterprise, was also “is old by the new belt”. The result indicated that SO<sub>2</sub> dumps pollutants to trade the experiment site to have the very strong administrative color, pollution discharge quantity business is carries on under Government department's participation, has not formed the true trading market. If Taiyuan's related implementation means stipulated: All additional, the extension, the reconstruction and the technical innovation project, the addition or surpasses the permission pollution discharge quantity, implements the environment compensation, the payment atmospheric environment compensation. Between enterprise's pollution discharge power transaction turned the enterprise to purchase the pollution discharge power to the government.

#### **6.5.2.4 Finance, financial method**

Financial method and financial method including each kind of loan, allocation, environment fund, special fund and so on, like global environmental fund. at the end of 1999 global environmental fund has provided 9,617,000 US dollars granting aid for our country. In Britain, in the atmospheric special protectorate's fuel replacement and the equipment transform, the country mostly gives certain subsidy. If in London, everything burns coal to change the natural gas (either coal gas) or changes uses electricity, national subsidy 70% transformation expense. In our country, the People's Bank of China in 1995 issued the 24th document, the request all items of basic construction mortgage application must conform to the environmental protection laws and regulations

stipulation. The bank had veto in the examination project. However, because does not have the related coordinated sets of measures, this item of very good environment economic policy carries out the effect not to be actually ideal.

#### **6.5.2.5 Responsibility compensation**

In June, 1973, Japan promulgated "Environmental damage Health danger Compensation method", carried on through the legal means to the victim recognized, and must compensate. Our country newest "Air pollution Prevention law" the 62nd stipulation: "causes the air pollution harm the unit, has the responsibility to remove the harm, and to suffers the loss directly the unit or individual compensation loss."

#### **6.5.3 Economic means the question which and the prospect exists in our country atmospheric environment management**

The present stage, our country in the utilization economic stimulus method protection atmospheric environment's practice, mainly meets the following 3 questions:

- 1) government environmental protection Functional departments's administration ability is short, the public to the market mechanism, the environment economic means is not familiar.
- 2) the growth of the market is not perfect, is not strong take the market mechanism as the foundation economic stimulus function.
- 3) in concrete system design question. Take the environment tax as the example, as a result of the tradition planned economy's influence, the collection system is too tedious, lacks the effective monitor and the appraisal, levies has not been able to relate directly with the actual pollution discharge, stimulation function not strong. Designs item of effective environment economic means to consider its principles and so on efficiency, equality and acceptability. This is because, economic stimulus method through market

signal (price), but the non-administrative control realizes the regulation, promotes the superintendent to consider the environmental costs in the respective decision-making. Its application needs some basic conditions: Market main body independent benefit and decision-making power, consummation market and competitive system, unimpeded information channel and enough technical knowledge and ability. Therefore, the economic stimulus method has the superiority freely theoretically, but implementation effect existence uncertainty. At present various countries have not presented the economic stimulus method hold environmental management dominant position the condition, the economic means are only take the direct control the important supply to form so-called “the mixed type” the pattern. Along with our country socialist market economic system's thorough development, facing atmospheric environment's stern pressure, uses the market economy method in the atmospheric environment management already is imperative positively. Not only this can guide the enterprise and public's production, the consumer behavior effectively, the promotion Enterprises and institutions prevents and controls the air pollution, moreover can reduce the environmental protection administration the complexity, plans the public environmental protection fund, forms adapts the sustainable development environmental management system.

## **Chapter 7 Recommendations**

### **7.1 Improve our country's cooperation mechanism of environment and health management**

To improve our environment and health management system, we need to summing up the management of their own advantages and draw on international experience and carry out efficient on the basis of management of our environment and health, so that we can better push forward China's environment and health management.

#### **7.1.1 Strengthen the government related department's cooperation**

In view of our country environment and the healthy domain existence's above question, profits from the international experience, must improve the government related department's cooperation:

First, should abandon the existing even level management pattern, the establishment higher stratification plane management structure, like the State Council rank's national environment and the health Working committee, is responsible to be coordinated specially the medical department and the environmental protection department environment and the health supervisory work, carries on the overall plan, the regulation to the entire environment and the health supervisory work, causes the environment and the health management realizes the vertical management, soon has take the medical department and the environmental protection department coordination environment and the health work coordinated working mechanism promotion coordinates as the State Council, the medical department and the environmental protection department organization are coordinated, each related department participation the working mechanism impels national the environment and the health work makes a bigger progress.

Next, in the national stratification plane, consummates between various departments' cooperation system, develops between the department regular and the non-periodical consultation, the establishment, the perfect responsibility recognized that with the restraint mechanism, to coordinated each related ministries and commissions the work and raise its operation efficiency also have the important meaning.

### **7.1.2 Strengthen the cooperation between government, the public, the enterprise, and Non-governmental organizations**

Refers to the international society to Belgian, Danish, German, Swiss, Britain's NEHAP advancement research, which indicated that the National government and the development facility, the Non-governmental organizations and so on cooperation is the goal key of NEHAP completion, thus it can be seen:

First, in view of the question that the cooperation between Our country Government and the Non-governmental organizations, the social group, the public cooperates needs for enhancing, must profit from other countries to establish the multi-department linkage mechanism, uses the social group fully and so on function, arouses various departments enthusiasm, establishes the science the achievements evaluation system.

Next, in view of the Non-governmental organizations, the social group, the public and so on, which information demand is unable to obtain, to contrast international experience, must break the information isolated island in our country, creating the message conformity and the sharing mechanism, including health danger's information, the sources of information, disease information as well as disease surmounts national and the province dissemination information and so on, and the full use of news media and NGO, strengthen the related knowledge's propaganda and popularization, which is not only advantageous to the strengthened enterprise, the social group and public's cooperation consciousness, moreover is also advantageous to

enhance the related main body the participation enthusiasm.

In addition, the existing cooperation between the parties on the basis of improving the social organizations, enterprises and the public to take part in the mechanism, establish and improve the feedback mechanisms are also important. It is worth noting that the environment and health-related research results published abroad, it also should pay attention to the domestic public or be released.

### **7.1.3 Strengthen the internal cooperation of health system.**

Strengthen the internal cooperation of health system, which has great significance on promoting the health of our environment and the management, thus:

First of all, the local department for the health sector has not started with the climate change and health effects's related work of the current situation, it is necessary to the health and the environment and climate change-related work step by step into the health units at all levels of the work schedule and put forward the work, Further clear at all health units in the climate change in duties, which will be actively involved in the health system to deal with climate change is of great significance.

Secondly, should be in efforts to improve the work of the initiative relevant organizations on the basis of a clear impact on climate change and health functions, to carry out the relevant knowledge and skills training, to make full use of their own professional advantage, the positive impact of climate change, the organization's activities, not only Environmental organizations, health professional meetings, and has the responsibility to the environment and health as well as the impact of climate change on human health effects of knowledge on effective public awareness and education, will help improve the environment, climate and the health of the overall work.

## **7.2 Further improve our environment and health policy legal system**

### **7.2.1 Identify key areas , to provide policy support priority**

As the country's limited financial and human resources, the environment and health of the investment can not increase indefinitely, so the environment and health management should be a clear need to give priority to the development of the area, in a targeted manner to strengthen the key areas of the building. First is the issue of cooperation, environment and health management involves a number of departments, the complexity of the problem and the task is arduous, the department alone can not solve the current efforts of the environment and health development of the cause of the difficulties and problems, it is necessary to strengthen the sector between Communication and collaboration, it is necessary for the prevention, early warning as the core content of the work, and gradually set up departments in charge of the division of labor, in close collaboration with the health of the environment supervision and management system and working mechanism to carry out scientific management and decision-making. The second is the funding issue, it is necessary in the environment and health policies, particularly scientific research, standard-setting work in the financial and personnel be assured that the health of the environment in the Chinese scientific research has made some achievements, but also strengthened in Staff, not only in number to be met, the structure of the staff is more important, it is necessary personnel to carry out structural adjustment, the establishment of database of experts to ensure that adequate environmental health work force in scientific research. In the education and training, people involved in the cultivation of an awareness, the participation of enterprises, scientific research carried out also need to support the policy.

### **7.2.2 Improve the environment and health laws and regulations**

China's environmental and health laws and regulations should be building a comprehensive assessment of existing laws and regulations to implement the effectiveness of the current work of the glaring contradictions made to improve

the environment and health-related laws and regulations of the overall program.

China's environmental health laws and regulations need to focus on the areas: to carry out the legal basis for research the environmental pollution damages; The study and formulate the environmental damage appraisal, compensation procedures and the scope of the specific method of compensation to victims of pollution and legal aid approach; Improve the environmental impact assessment laws and regulations' construction, environmental health effects of environmental impact assessment as a necessary element; strengthen health prevention and control, start drinking water hygiene and safety study of the drafting of laws and regulations to guarantee safe drinking water; the development of Release environmental health impact assessments, indoor air health management, environmental emergencies and other public events regulations to deal with emergencies; to promote and standardize the work related; Establish the environmental damage to the health fund system, draw lessons from the United States from a "super fund", Japan "health hazard victims compensation law" and the European Commission "to remedy environmental damage," Green Paper on the report of the relevant provisions of the theoretical and practical experience, the establishment of China's pollution Fund system; construction of China's environmental liability insurance system, damages the environment should be clear in the legislative environment for liability insurance system to be when the time is ripe to develop "insurance law", to amend the relevant laws and regulations, such as "Insurance Law" clearly provides that environmental liability insurance ; To amend the "Environmental Protection Law" to prevent and control pollution and other relevant laws and regulations, there are clear environmental risk business environment should be insured for liability insurance.

### **7.2.3 Increase investment and improve the standard system**

To China's standard system construction, the next step duty and the goal is

according to the environment and the health job requirement, unifies the Chinese national condition, the overall plan coordinated standard system revision work, the consummation standard system, the push formulation environment and the health key field urgently needed primary standard, solves the present standard engagement problem as soon as possible, the guarantee environment and the health work smooth development.

Enlarges the scientific research strength and the investment. In the standard each technical nature stipulated that is as rests on, factors and so on mixed economy technical feasibility take scientific experiment's result to be definite; At the same time, the standard implementation will also promote the related domain scientific research development and the technical level enhancement. Therefore, the standard work and the technical work are the relations which depends on each other mutually, complements one another, complements each other. Without the preliminary scientific effort foundation, the related standard's system revision work is difficult to sustain, completes smoothly with difficulty in the stipulation action cycle, the environmental protection technology laws' and regulations' essence was still the technical document, like the environment quality standard is take the environment datum (i.e. pollutant biggest enable bit or intensity) as the basis formulation, but each item of pollutant environment datum's determination, needs in long-term, the massive toxicology experimental study foundation to be able to complete, therefore consummates our country's standard to from enlarge the scientific research to obtain.

Profits from the related international standard fully. Compares with China's environment and the health standard level, the overseas developed country has more experiences, the scientific research strength relatively is also strong, profits from, the reference overseas developed country mature standard to be possible fully to enhance the standard development the efficiency, but must consider fully China's national condition, considered uses the international

standard to be able maximum limit to display in China its should have the function. Simultaneously must widely solicit the suggestions particularly to public law enforcement officials, has the citizen Uygur power and the law enforcement officials the standard which is urgently needed in the law enforcement process, has with emphasis carries out these standards as soon as possible to appear, safeguards the law and the laws and regulations earnestly obtains the effective implementation.

### **7.3 Adopt a variety of measures to mitigate climate change**

In the IPCC fourth assessment report pointed out that the climate warming does not struggle the fact, a past 50 year temperature elevated approximately has 90% to attribute to the greenhouse gas the emissions. China domestic day by day serious and the urgent environmental pollution question and the energy resources supply scarce question takes as the developing country the solution the driving influence and the breakthrough point, the advancement slows down the climatic change strategy the implementation, and will reduce the carbon emissions to take the national energy strategy the profitable target. Therefore in the full consideration country long-term socio-economic development needs under the premise, causes to slow down the climatic change strategy and the country sustainable development is coordinated. Slows down the climatic change the countermeasure to include: 1) insisted that slows down the climatic change the core technologies achievement to give priority to the domain, expands the research and development investment, speeds up the vanguard technology industrial production step; 2) implements the energy conservation first energy policy, to the energy production, the transportation, the processing, transforms to finally the use entire process implementation energy conservation management; 3) develops the renewable energy source technology, the advanced nuclear energy technology positively as well as highly effective, pure, the low emissions coal use technology and the hydrogen can the technology, breaks through the renewable energy source power

technology, the solar-powered structure integration technology with emphasis as well as lives the material to liquefy, the gasified technology, researches and develops the solar energy light to bend down positively the power technology; 4) transforms the economic growth pattern, insisted the technique content high, the economic efficiency is good, the resources consume lowly, the environmental pollution are few, the human resources superiority obtains the full display new industrialization path; 5) improves the land utilization way, strengthens the forest resources the protection and the management, the union country key ecological building comprehensive program of public order project, advances the afforestation vigorously.

#### **7.4 Strengthen the scientific research of health effects of climate change**

The global climate change is one which of most complex questions the contemporary scientific circles faced, but also many uncertainty question has not solved. The global climate change question will also be relates our country in the future the national security latent factor, if didn't deal properly will possibly give the country social economy sustainable development to bring the serious negative influence. The development climatic change health influence's scientific research is thoroughly formulates the compatible measure premise, the country needs to increase foundational and the forward-looking research support intensity, deepened, the quantification climatic change to the human health influence aspect research, with the aim of forecasting that the climatic change to the human body health's influence, compared with the definite change tendency, takes the adaptation measure early.

##### **7.4.1 Establish a perfect climate change and health monitoring, early warning systems**

To our country meteorology, the environment and the health monitor data carries on the system to gather and to reorganize, the development and the climatic change and the influence related scientific research foundation data

set (storehouse), establishes the state-level the trans-departmental data and the information sharing mechanism. Public health information gathering way in original legal infectious disease epidemic situation observation system's foundation, but should also set up the new disease in view of the new disease to monitor the reporting technology system mobile nimbly. Strengthens with other Departments concerned, unit's cooperation, the perfect health dependent event's observation system, like the meteorology environmental factor monitor, 120 call for help the symptom monitor, the hospital emergency patient to monitor, the medicine sale monitor, the student to be absent from class, the worker to absent from duty systems and so on monitor. Carries on the conformity collection analysis after each kind of information like discovery exceptionally prompt issue epidemic situation early warning forecast information. Had promptly, the accurate information, can the early discovery epidemic situation symptom, start the early warning system promptly, seizes the best opportunity, epidemic situation control in the smallest scope. The perfect early warning system needs to use the existing infrastructure fully, expands the public health investment, carries on the optimized reorganization to the existing public health organization's personnel, introduces the outstanding talented person, and carries on training to the existing human resources, strengthens to the epidemiology, hygienic statistics and computer knowledge grasping, increases carries on the early warning using the monitor data the principle and technical training, enhances the staff to arise suddenly the public health event's early warning ability. While the perfect monitor, early warning system's, should profit from the overseas advanced experience, strengthens to monitors with the early warning technology research, the development and the application, expands the investment to monitor methods and so on biological monitor to carry on the consummation. Should further strengthen the prophylaxis control mechanism laboratory on the hardware the construction, disposes the advanced equipment, enhances the fast screening diagnosis ability and public health laboratory monitor ability. The government

should mobilize the related department to strengthen the critical materials reserve, perfect emergency recovery system.

#### **7.4.2 Carry out risk assessment of climate and climate research division on major epidemics, infectious diseases**

Research disease multiplies, the dissemination, the eruption process and the climate relations, the determination advantageous and the disadvantageous weather, the climatic conditions; Research disease climate appraisal pattern; The application geographic information system technology, the integrated epidemic situation, the climate and other environment database, carry on disease climatic regionalization, determined various seasons, various local infectious disease prevents and controls key point. Also lacks about the regional climatic change and the health relations analysis.

#### **7.4.3 Meteorological and health relations epidemic disease and mechanism research**

The development climatic change and the health relations' basic research is the formulation and implementation climatic change adaptation strategy, reduces the health danger the premise. At present are most the topic to pause uses the toxicology method in the laboratory stage to conduct the research. Meteorological and the climatic change also needs to strengthen the crowd epidemiology and the influence mechanism aspect research to the human body influence. Must obtain this aspect the great achievement, develops vigorously multi-disciplinary studies imperative alternately.

#### **7.4.4 Health Risk Assessment on Climate Change**

The development health risk appraisal, may cause meteorological and the health research vigorously lands on feet, realizes the social efficiency, the environment benefit and the economic efficiency unification truly. But the climatic change health risk appraisal is a cross science of medicine, the biological science, the environmental science, the demography and the

management science multi-disciplinary overlapping comprehensive work. How to cause the scientific research evaluation exercise and the supervisory work organic synthesis, is question which is worth taking seriously. The climatic change health risk appraisal needs while to consummate the existing environment health influence assessment method, carries out a series of research, establishes the climatic change health influence indicator system.

## **7.5 Flexible application of economic means to increase financial support**

### **7.5.1 Through economic means to control the enterprise sewage**

Face the market economy, our country must continue from now on to utilize and the strengthened economic means protects, the improvement atmospheric environment. Our country reformed the charge system initially, from now on must continue to consummate the charging criterion, the attribute, the fund use and the regulatory policy. Looking from our country present atmospheric environment pollution condition and the enterprise actual situation, the implementation tax revenue, the finance, the finance and so on economic means support the environment harmless industry and the environmental product are essential. From now on must introduce the pollution tax or the environment tax gradually, may consider that changes part of effluent fees in raw material and the product link collection pollution additional tax. Is implementing the pollutant total quantity control the region, may develop the pollution discharge power transaction gradually. At present may advocate that between the neighbor, the situation similar enterprise or the new old enterprise implements the union anti-pollution.

### **7.5.2 Establish the research projects of environmental pollution, climate change and its impact on human health and research funding input**

Widely develops the environment and the healthy domain academic exchanges and the technical deliberation activity, renews the knowledge and the information promptly, the exercise raise leader and the service technology

backbone, the promotion scientific innovation, provides the powerful technical support for the environment and the health work. Participates in international and the region environment and the health motion positively, knows the international tendency, the absorption environment and the health work advanced experience, the development project cooperation, studies the new technology and the new method, enhances our country environment and the health work level unceasingly, the advancement country environment and the healthy enterprise scientific progress.

## **7.6 Environment and health management and technical staff capacity building**

### **7.6.1 Environment and Health to strengthen the management team building**

The environment and the healthy question are the environmental management new domains, needs to strengthen the corresponding management troop construction. Therefore the suggestion government "China Deals with Climatic change Program, country" regarding "National Environment And Health Planning for action" holds each kind of seminar and the training class, strengthens managerial talent's raise work, enhances the central committee and the place environmental protection, the meteorology, the health and so on related department environment and the health managed capacity as well as climatic change dealing with ability.

### **7.6.2 Strengthen the technical team building of environment and Health**

The environment, the climate and the healthy question interdisciplinary, the trans-departmental characteristic, is urgently needed in the technical support organization and the technical expert disposes the aspect to have the progress, provides the scientific basis for the decision-making. Therefore, must strengthen the related domain at present the discipline construction, the full use existing enlarges the talented person troop the construction and

conformity dynamics, full use many kinds of channels and the way enhancement research level and independent innovation ability, form have the relative stabilization the technical management troop and the research and development troop, and encourages with the recommendation science and technology administrative personnels and the technical personnel participates in the related domain international scientific research plan.

1) displays department scientific research courtyard institutes and university's and so on Chinese environment, meteorology, health technical support function fully, strengthens the Chinese Center for Disease Control and Prevention, Huazhong University of Science and Technology, China Radiation shield Research institute to set up "the country environmental protection environment and the health key laboratory" together the equipment and the technical force, the organization Scientific research Unit and the university develops the related environment and the health management, the investigation, the basic research project and the international cooperation.

2) establishes the environment and the healthy expert storehouse, the conformity nation technical force, including environmental monitoring, environmental medicine, clinical medicine, clinical examination and oncology as well as environmental law, environment economy and policy and so on.

3) when the conditions are ripe, founds the country. The environment and the health recognize the center. Recognized that the central primary cognizance manages technically, is coordinated and recognized the environmental pollution result the health harm, the organization formulates the correlation technique standard.

4) establishes the stable environment, the climate and the health monitor troop, studies the existing monitor technical force earnestly the conformity and the development, the full use existing technical personnel, cause the central committee and the place through training monitor the personnel to master the

corresponding monitor technology and the method, strengthens the different department technical personnel's cooperation and the exchange, establishes a stable monitor troop. According to the environment and the health monitor network function, the test point establish the research work need which as well as urgently awaits to develop, further strengthens the laboratory facility, the equipment and the scene monitor method construction, enhances the key control pollutant and human body health key indicator monitor ability, the safeguard sampling inquiry research work smooth development; The adjustment enrichment specialty technical team, the promotion related discipline's development, the improvement university education and the personnel training, provide the personnel and the knowledge reserve for the environment and the health work, the whole enhance the environment and health work technology support ability.

5) key strengthens the climatic change and the health management and studies the talented person troop construction. The climatic change and the influence question involve to the natural sciences and social sciences many domains. Conduct the research and the management to the climatic change and the influence, depending on the sole discipline domain's scientific knowledge is not enough, must pay great attention to train the synthesis high level talent (including scientific research, management). Must use all channels, including both sides, multilateral, region and International organization's channel, promotes the development climatic change and the influence domain education training exchange event. Must select the study abroad personnel to return to homeland according to qualification the work, attracts a part of foreign outstanding scholar to come to China to be engaged in the research, the full study, the absorption, the use overseas advanced managerial experience and the technology, promote our country climatic change domain scientific research to advance to the world advanced level.

## **7.7 Strengthen the climate change and its impact on human health,**

## **education and training and outreach activities**

Strengthens the propaganda, the education and the training work. Using mass medias and so on books, publication, audio and video, carries on the climatic change aspect to the social various social strata public the propaganda activity, encourages and initiates the sustainable life style, initiative economize on electricity, the water used, the growth trash circulation use and refuse classification aware consciousness and so on; In the elementary education, the adult education, the higher education integrate the content which the climatic change popularizes and educates, causes the climatic change to educate into the education for all-around development a part; Runs each kind of special training class, on related climatic change each kind of question, in view of different targeted trainee development topic training, organization related climatic change popular science academic seminar; Using the information technology, further enriches the existing climatic change information website fully the content and the function, causes it to become the gain information, exchange communication truly fast and the effective platform. Encourages the public to participation. Establishment public and business community participation incentive mechanism, display enterprise participation and public scrutiny's function. The perfect climatic change information issue's channel and the system, expand the public participation and the surveillance channel, displays the news medium fully the supervision of public opinion and the guidance function. Increases the related climatic change decision-making the transparency, the promotion climatic change domain management scientific style and the democratization. Gives full play to the civil society association and Non-governmental organizations' function, the promotion general public and the community participation slows down the global climate change the motion. The development public propaganda and the wide-ranging exchange, the enhancement society to the climatic change and the health work's universal cognition, strives for various aspects the powerful support,

guaranteed that the climatic change and the healthy special operational policy measures implement effectively. Through media widespread propaganda related laws and regulations and so on television, broadcast, newspaper and network, propagandizes our country to deal with the present situation which, the situation and the challenge the climatic change faces, enhances the community the value, the promotion social group, the non-government apparatus, the scientific research and the academic unit, the enterprise as well as the media and so on aware fulfillment responsibility and the duty. Vigorously the development environment, the climate and the healthy knowledge propaganda and the public education, enhance all the people environmental protection and health protection consciousness, promotes individual and the entire social good behavior formation, builds the entire social protection environment, the maintenance health positive atmosphere. Enhances the citizen to protect the global environment and climate consciousness, understood that the climatic change to the human health direct and the indirect influence, the guidance public establishes is helpful in reduces the greenhouse gas emissions the life style and the expense pattern.

### **7.8 Multi-sectoral, multi-field of participation and extensive international exchanges and cooperation**

The climate warming is the global question, slows down the climate warming, to maintain the global environment the sustainable development is the global people's common responsibility, deals with the climatic change to involve the economic society, the internal affairs diplomacy, must strengthen both sides and the multilateral international cooperation research, profits from the international experience positively, the consummation domestic related work. Strengthens with the World Health Organization, the UNICEF, UNEP, UNDP and so on International organization's contacting, the development management and the technical stratification plane exchange. Develops positively with various countries about the global climate change

communication and the exchange, establishes the material database, for domestic inquiries, the understanding climatic change related information and so on unit concerned, development facility, College provides the service. Encourages and supports our country scientists to participate in the international recreational activities positively, promotes the Chinese and foreign academic exchanges, enhancement research ability, enhances our country in the climatic change to the health influence research ability and the level. The meteorology and the health are a multi-disciplinary comprehensive question, needs the atmospheric sciences, the environmental science, the medicine and even the social scientific circles broad cooperation. Must pay great attention to train the synthesis high level talent (including scientific research, management). Must study, the absorption, the use overseas vanguard technology fully, carries out the multi-disciplinary overlapping research, promotes our country climatic change domain scientific research to advance to the world advanced level.

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