Exploring Possible Cooperation for Climate Change Adaptation: How Can Civil Society Work With Governmental Strategies?

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Abstract

This paper aims to explore possible cooperation in response to climate change impacts and solutions to be shared among countries from the viewpoint of civil society. The premise of the paper is, therefore, to identify the potentiality of civilian initiatives that could reinforce governmental intervention and market mechanisms. In doing so, it is necessary to discuss an overview of the climate change adaptation strategies being implemented by government bodies in different countries.

With these objectives, the paper first sketches some of the local adaptive needs in Asia on floods, erosion, food security, and diseases that arise from climate change. Accordingly, it introduces individual adaptation strategies in several Asian countries on water resources, agriculture and food, forestry, disaster prevention, urban transportation, and public health. Particularly, it describes decisions in Japan as well as Thailand in detail as a reference in considering interactivity among countries.

The second part of this paper focuses on a discussion about cooperation. It starts with taking a look at different forms of cooperation, namely *governmental and sectoral* approaches. Also, a unique initiative dependent on *city-based alliances* is introduced. It is then argued that the traditional approaches depend on "vertical" segments within society in which information flow is limited to a particular group of people and not shared effectively. The paper suggests that the success of cooperation depends on how networks are designed and utilized, and refers to a "*transnational network*," in which the citizens also share mutual interests and know-how with each other. Finally, the suggestion is made that some non-governmental organizations could contribute in connecting fragmented information in Asia to serve as a "hub" of citizen-based society.

Keywords: Climate change, Adaptation, Urban Cities, Cooperation, City Network,

1. Introduction

As is well-known, the Intergovernmental Panel on Climate Change (IPCC) published its 4th report in 2007 [IPCC 2007[1]]. The report described changes in air temperature, sea level, and other meteorological phenomena, as well as their impacts and consequences in floods, droughts, tropical cyclones, diseases, etc. Then, the task entailed the need for adaptation, or the responses to the consequences of global warming, in addition to mitigation, or measures to slow down the rate of GHG emissions.

The IPCC report was prepared based on estimations on a global-scale. According to the report, the global average sea level has risen at an average rate of 1.8 millimeters per year since 1961, and the rate accelerated to 3.1 millimeters per year after 1993. Under the IPCC Special Report on Emission Scenarios (SRES), or A1B Scenario, it was estimated that the global sea level would reach 0.22 to 0.44 meters above the 1990 levels by the mid 2090s. It was also pointed out that the sea level would not rise uniformly around the world; it might be faster in some regions, and slower in others. According to local research in the southern and eastern part of Thailand, it was previously said that the sea level in the Gulf of Thailand had been falling slightly or not changing [Vongvisessomjai 2006[2]]. The researcher claimed that the analysis result contradicted the global trend of sea-level rising because Thailand is located in low latitude. However, the analysis may need re-examination in accordance with the forecast by IPCC report. This indicates that it is necessary to look at the figures in more detail locally.

In Asia, it is generally common that major cities are located alongside the coasts. This, in turn, means that they may experience similar types and levels of impact from and vulnerability to climate change. For example, inundation and erosion due to sea level rise, as well as other negatives such as pandemic disease and food insecurity, are common concerns. Japan, the Philippines, Singapore and Taiwan are island countries, and in Indonesia, China, Thailand, Myanmar and Cambodia, coastal areas account for 95, 40, 40, 25 and 15 percent, respectively, of their land boundaries (Table-1).

Table-1. Length of Coastline and Land Boundaries in Countries

Country	Total Area (km2)	Boundaries (km)	Coastline (km)	Total Territory (km)	Coastline/Total Territory (%)
Australia	7,686,850	0	25,760	25,760	100
Cambodia	181,040	2,572	443	3,015	15
China	9,596,960	22,117	14,500	36,617	40
Indonesia	1,919,440	2,830	54,716	57,546	95
Japan	377,835	0	29,751	29,751	100
Laos	236,800	5,083	0	5,083	0
Myanmar	678,500	5,876	1,930	7,806	25
Philippines	300,000	0	36,289	36,289	100
Singapore	692.7	0	193	193	100
Taiwan	35,980	0	1,566	1,566	100
Thailand	514,000	4,863	3,219	8,082	40

Source: [CIA 2008[3]]

Approximately 20 percent of the global population lives within 30 kilometers of the water. In these countries, human settlement is particularly concentrated along the seaside. It is estimated that population will double due to rapid economic growth by 2025 [Dutta and Niu 2005[4]].

In these regions, the sea-level rise exacerbates the influence of tsunamis. Taking Thailand as an example, the number of deaths, injuries and missing persons reached 5,395, 8,457 and 2,932 respectively in the country after the Indian Ocean tsunami on December 26, 2004. The property and livelihood damage reached at least 14,491 million baht (415 million USD), whereas public utilities damage was 1,000 million baht (28 million USD) [RICB, 2006]. Similarly, disaster preparedness in Thailand prioritizes flooding [RICB 2006[5]]. It is estimated that the Bangkok area is sinking at a rate of approximately 10 centimeters annually due to the intensive use of underground water by 10 million people. While this number can be reduced to around 3 to 5 centimeters by regulatory measures by the government [Tantiwittayapitak 2007[6]], it is said that the city might disappear within 20 years due to sea-level rise associated with climate change [Gray 2007[7]; Margolis 2007[8]]. A simulation has shown that 50% of Bangkok will be flooded if the mean sea level rises by 50 centimeters. Similarly in Japan, the inundated area would increase by approximately 50% in Tokyo and Osaka Bays if the mean sea level rises by 59 centimeters [MLIT 2008].

Erosion is also accelerated in some coastal zones, leading to smaller land area. According to the Ministry of the Environment [MOE 2001[9]], 93% of seashore will disappear in Japan if the sea level rises by 1 meter. The population in lower basins will increase from 2 million to 4.1 million, and additional construction of higher levees would be necessary, increasing by 2.8 to 3.5 meters to protect the inland areas. Similarly in Thailand, approximately 23 percent of the coastline suffers from erosion, and 375 spots around the gulf have been identified as risky [DMCR, 2009[10]]. Coastal erosion affects loss of not only usable land and human settlements, but also tourism, fish production, biodiversity, and other areas. The impacts are seen in rural areas as well as cities. It should be known that it is always the poor who suffer from this damage in many developing countries, and people may be forced to move to different places.

Figure-1. Coastal Erosion in Kalimantan, Indonesia

Temperature changes and increased air pollution change human disease patterns, and spread trans-boundary diseases accompanied by pathogens. It is known that the risk of cholera increases in accordance with higher temperatures. In the past, cholera was found in summer only; however, recent research has revealed that vibrio chlolera (the bacteria causing this disease) is found in every river throughout the year. With the increase of 0.5 degree Celsius of water temperature, the bacteria are transformed into the infectious kind that causes cholera. Flood also increases the risk of leptospirosis when broken human skin is exposed to contaminated water that contains animal urine. Both higher temperatures and flooding also increase the risk of dengue fever and malaria because they enable mosquitoes to have more room for breeding [Tantiwittayapitak 2007]. The impact of these diseases, as with other pandemics such as bird flu, is not limited to individual countries because they are transmitted through the movement of people. Airplanes could become "villages" for transporting diseases, and megacities could become the gates for transmission, thus indicating the interconnection among cities.

Agricultural production is adversely influenced by droughts as well as floods, plant diseases and insect outbreaks due to uncertain precipitation. In Thailand, for example, 50-70 provinces have already suffered from this, the losses of which range from 174 to 71,962 million baht (5 to 2,000 million USD) annually [DDPM 2009; RICB 2006]. Decrease in agricultural production results in food shortages and high prices, causing food security problems. For example, rice production in Thailand accounted for 4.4 percent of world production in 2007: Thailand produced 28 million tons of rice as the largest exporter out of 636 million tons worldwide [IRRI 2007[11]]. A preliminary result also reveals that the rice production in Thailand will decrease 14.2 percent in 2050 compared to base years 1980-1989 [Buddhaboon et al, 2008[12]]. Vietnam also had bad harvests in 2007. Rice is a staple food for most Asian countries. The Philippines, for example, consume 12 million tons of rice every year, while importing 2 million tons. This amount is larger than that of Japan, where annual consumption is 7.5 million tons. Since most countries started to limit their export of rice, some countries already began to face shortages in 2008.[13] This kind of situation reinforces the argument that climate change is a threat to increase hunger, particularly in developing countries.

2. Adaptation Strategies

In this section, some adaptation strategies in different countries are examined. According to a report by OECD [OECD 2006[14]], some "developed" countries have started adaptation planning and set up strategies. In Australia, for example, rainfall has decreased by 15% since the mid-1970s, and is estimated to decrease by 60% in 2070. Adaptation strategies include the reuse of drainage water, desalination of seawater, innovative water resource management, trade, etc. Similar consequences are anticipated in Europe, the US, and Canada, due to the decrease of rain and snowfall [MLITT 2008[15]].

Climate change adaptation has already been considered in Asia as well, according to social development. Thailand's Strategy on Climate Change was approved by its cabinet in 2008. It comprises six strategies: (1) building capacity for climate change adaptation and reducing vulnerabilities; (2) promoting Greenhouse Gas mitigation activities based on sustainable development; (3) research and development on adaptation and mitigation; (4) awareness raising and public participation on climate change; (5) building institutional capacities and coordination; and (6) supporting international cooperation to achieve the common goals of climate change mitigation and sustainable development. Summaries are shown in Table-2.

Table-2. Thailand's Strategy on Climate Change 2008-2012

Strategies, Goals & Approaches
Strategy 1: Building capacity for climate change adaptation and reducing vulnerabilities (Goal: Protect, conserve and add value to natural resource base, and protect, conserve and improve environmental quality and the quality of life from climate change impacts)
Strategy 2: Promote Greenhouse Gas mitigation activities based on sustainable development (Goal: Reduce greenhouse gas emission and promote clean technologies)
Strategy 3: Research and development on adaptation and mitigation (Goal: Support R&D and climate change knowledge management and develop knowledge base to provide useful information for policy-making)
Strategy 4: Awareness raising and public participation on climate change (Goal: Better public awareness and understanding of their roles and contribute in a responsible manner to their roles and duties)
Strategy 5: Building institutional capacity and coordination (Goal: Better coordination and integration among personnel and agencies involved in climate change implementation)
Strategy 6: Support international cooperation to achieve the common goal of climate change mitigation and sustainable development (Goal: Build capacity of relevant personnel and agencies to create better coordination and integration to support and promote international cooperation relevant to climate change at global and regional levels)

Source: [Thaweema 2008[16]], summarized by the author.

Similarly, Vietnam is currently considering initiatives, including saltwater intrusion, in the Red River Basin. It intends to implement changes in land use, crop patterns, and the construction of dams [Tuan 2008]. Some of the initiatives even include a "soft approach." There are, for example, micro-finance mechanisms through special insurance schemes to cope with increasing flash-floods in Nepal, risk communication on climate change issues on multiple levels in Mongolia, and community-based practices to survive in changing ecosystem conditions such as permanent floods (water logging) in Bangladesh [Chinvanno 2009]. Table-3 shows some of the actions being taken in these countries.

Table-3. List of Climate Change Adaptation in Asian Countries

CC Impacts	Strategies
Inundation / Floods	- Building forecasting capacity and building an adaptation strategy for the Mekong Delta - Balancing agriculture and fisheries through sluice gates (India) - Hydroponics (Bangladesh) - Flood-resilient aquaculture (Bangladesh) - Micro-finance mechanism through special insurance scheme to cope with increasing flash-flood (Nepal)
Erosion and loss of land	- Replanting and rehabilitating corals (Fiji) - Installation of prevention structure "Khunsamutjin 49 A2" (Thailand) - National Plan for Protection and Correction of Coastal Erosion (Thailand)
Intrusion of saline water	- Appropriate crop selection (Vietnam) - Construction of dams (Vietnam) - Cultivating maize and fodder grass during the dry season (Bangladesh)
Storm / Tsunami	- Community-based disaster preparedness (Philippines) - Dyke management and mangrove restoration (Vietnam) - Disaster Early Warning Systems (Vietnam) - Storm Resistant Housing (Vietnam) - A tsunami warning system along the Andaman Sea (Thailand) - Plantation of mangrove forests (Thailand)
Biodiversity	- Replanting and rehabilitating corals (Fiji) - Plantation of mangrove forests (Thailand)
Human Diseases	- Dengue-fever prevention (Vietnam) - Dengue-fever prevention (Thailand) - Promoting knowledge on diseases (Thailand)
Water supply shortage	-Water resource management (Thailand)
Food security	- Appropriate crop selection (Vietnam) - The King's technology to create artificial rain (Thailand) - Mid-range weather forecasting capacity (Thailand)
Higher Temperature	- Cheong Gye Cheon River Restoration Project (Korea) - House interior design for coping with global warming (Thailand)

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Source: [Chaudhry and Ruysschaert (2008)[17], Chinvanno (2009)[18], Kisner (2008)[19], PID (2008)[20], Tridech (2009)[21], Tuan (2008)[22], UNFCCC (2009)[23]]

On the other hand, climate change adaptation may also need consideration of local conditions. There is no one-size-fits-all solution for every country. For example, floating gardening is an indigenous cultivation practice in southwestern Asia such as Bangladesh, Myanmar, etc. The garden is usually made of water hyacinths and rice paddy straw along with duckweed and other aquatic plants. The hydroponics is adaptable to climate change impacts in the sense that it is a replicable practice in the permanently flooded areas. On the other hand, it is also known that the method causes environmental degradation and health risks [Oo 2008[24]].

Japan's adaptation measures have been planned "*organization by organization.*" For example, the Tokyo Metropolitan Government set up strategies for "Tokyo in 10 Years" in

2009. It included more than forty strategies in accordance with eight goals or objectives of a green city: infrastructure stock management, low-carbon society, disaster prevention, a new model for an aging society, a creative urbanity, challenging society, and promotion of sport activities. As part of the plan, adaptive measures were also considered. It was also emphasized that utilization of the most advanced technologies, personnel training, and collaboration/solidarity among Asian cities are important. Table-3 shows a summary of those actions by individual governmental bodies.

Table-3. Japanese Adaptation Strategies by Governmental Bodies

Organizations	Strategies
Ministry of the Environment	Cool earth 50, Clean Asia Initiative, - Observation and Monitoring system for water quality, air pollution, sources of bird flu, virus, biodiversity, etc., and risk map. - Personnel development for ESD - Development of ecology network
Ministry of Land, Infrastructure, Transport, and Tourism	Drought and flood risks, - Better utilization of existing dams - Construction of levees and dams - Subsidy and regulation on facilities for rainwater storage, infiltration and run-off regulation - Water stockpiles, underwater management - Maintenance of existing facilities, sediment management policy - Promotion of "soft measures" by scenario analysis - Promotion of flood control in step with land use regulation and guidance - Alert system
Ministry of Agriculture, Forestry, and Fisheries	Biodiversity, - Infrastructure for biodiversity - Development of biodiversity index.
Ministry of Education, Culture, Sports, Science and Technology	Information, -Integration of climate change database -Assistance to developing countries in personnel development
Japanese International Cooperation Agency(JICA)	Internal Cooperation, -Water resources, Agriculture/Food, Forestry, Disaster Prevention, City/Transportation/Rural Development, and Public Health
Tokyo Metropolitan Government	Flood, Water shortage and quality, Infectious Diseases, -Identification of warning areas -Information system for early evacuation -Flood forecast system, (Re)organization of firefighting units -Maintenance of rivers, Flooding measure for downtowns -Shelters, Infiltration squares

Source: [MOE 2008[25]; MLITT 2008[26]; MAFF 2009[27]; MECSST 2009[28]; JICA 2007[29]; TMG 2008[30]]

Some official development assistance projects for developing countries have been implemented by the Japanese International Cooperation Agency, or JICA. The projects are

classified by sector and include Morocco, Yemen, and Ethiopia for water resources; Cambodia, Uganda, and Mari for Agriculture/Food; Mexico, Palau, China, and Nicaragua for forestry; the Philippines, Maldives, and Bangladesh for disaster prevention; Cambodia and Bangladesh for City/Transportation/Rural Development' and Tanzania and Zambia for public health. The scope of those projects not only includes social development, but also considers adaptation as means to avoid the impacts of climate change. The description of individual sector projects is shown in Table-4.

Table-4 JICA adaptation projects by sectors

Sectors	Description
Water resources	Water, management, development, and utilization, -interest adjustment policy among stakeholders -support for planning in infrastructure development against drought -security for drinking water
Agriculture/Food	Irrigation, public participation, climate anomaly -maintenance of irrigation facilities -infrastructure and education on climate change adaptation -prevention of forest fires -stockpiles for agricultural products, resource management
Forestry	Pest resistance species, mangrove preservation, forestry disaster, and personnel development -reforestation, preservation of coral reef -restoration of degraded lands, measures against desertification
Disaster Prevention	Coastal, river, land disaster, planning and personnel education -planning against coastal erosion, storm surge, etc. -construction of levee, drainage basin, etc. -alarm system -capacity and institutional building
City/Transportation/Rural Development	Infrastructure, -assistance in developing master plan
Public Health	Malaria, infectious diseases due to water, animals, etc., -vaccine, access to clean water -surveillance system -development of cooperation projects due to climate change, particularly in the areas that have high probability of diseases due to animal transmission, bad public health, frequent floods, etc.
Others	Weather observation, policy development, community building, personnel education -early circulation of information and evacuation system -city planning, coastal management, biodiversity preservation -pilot project for citizen initiatives for adaptation -training and seminars for government personnel

Source: [JICA 2007], summarized by the author.

In general, climate change adaptation could be categorized into three steps of strategic actions: "assessment, awareness, and implementation." Assessment includes developing databases and forecast models, identifying objects vulnerable to climate change,

and setting priority on actions. Awareness, then, can be formed among stakeholders to recognize their roles, responsibilities, and possible contributions for implementation. It includes, for example, organizing public campaigns and outreach activities, supporting continuous training and skill development, or creating adaptation capacities among all stakeholders of society. Implementation is the final action related to capacity building. It includes, for example, developing mechanisms to be executed by actors, coordinating and integrating international cooperation, and sharing relevant knowledge and skills among societies. According to the UN Framework Convention on Climate Change (UNFCCC), the costs of adaptation for developing countries are estimated to range from $49-$171 billion each year, for agriculture, forestry, fisheries, water supply, human health, coastal zones and infrastructure [SOP 2008[31]].

3. Forms of Cooperation

The Kyoto protocol set quantified GHG emission reduction targets for major industrialized countries based on past output levels, and only Annex I countries were required to reduce CO_2. It was clear that the ***governmental approach*** did not work according to expectations, because the highest emitters of CO_2, such as the US, China, and India where there are massive CO_2 emissions, as well as other developing countries, did not play their roles effectively.

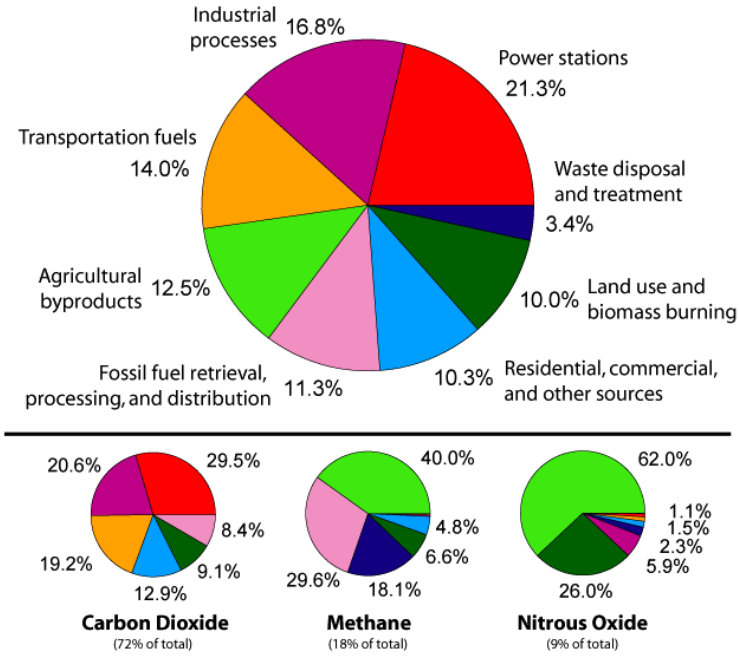

Figure-2. GHG Emissions by Sectors[32]

Project-based cooperation is one form of governmental approach, as shown in Table-4 by JICA. It consists of independent projects, such as the construction of facilities conforming to local needs and the supporters' intentions. There are occasions, however, when this approach faces problems associated with resource allocation. For instance, a

reforestation project in a country may follow national policy, but local people may want the authority over it or call for public participation to make decisions in resource management, thus causing conflicts between the government and its citizens.

Rather than leaving the responsibility to governments, another way would be promoting movement in global industrial sectors. A s***ectoral approach*** is one such option to optimize energy use. It specifies the technologies that could be used to reduce sector-specific emissions such as those resulting from consumption, production, transportation, etc., and allows for transfering advanced technologies to developing countries as well. This approach was incorporated in *Cool Earth 50*, a vision to reduce GHG emissions by 50% by 2050. It was proposed by the Japanese government, and was aimed at creating a new international framework for climate mitigation with innovative technologies for government initiatives. Figure-3 shows the key technologies listed in the vision.

Figure-3. Innovative Energy Technologies [METI 2007[33]]

With the sectoral approach, however, the transfer of innovative technologies may not be easy because technologies are basically commercial in nature and there are no incentives for the companies to share them without receiving any direct benefits.

Another form of cooperation is possible other than governmental intervention. A ***city-based approach*** is unique in the sense that it could enhance synergy through inter-city alliances. It may facilitate the dissemination of successful knowledge and information in technology transfer, resource sharing, capacity building, and co-financing, etc. Roughly 75

percent of GHG emissions is said to originate in cities, and this approach may be promising because decisions by cities could be relatively independent from national-level policy, which faces many political obstacles.

For example, the Clinton Climate Initiative (CCI) applies a business-oriented approach by recognizing the opportunity to fight climate change in the world's cities. CCI works with 40 of the world's largest cities to reduce their GHG emissions through sharing best practices, with measurement tools to track progress. In 2006, the foundation entered into a partnership and agreed to provide resources for participating large cities around the world.

Another example is the Kitakyushu-Dalian cooperation for environmental protection in the East Asia region. As one of Japan's four major industrial areas, which suffers from severe pollution by heavy and chemical industries, the city was able to transform from "a smoke-filled sky and sea of death" to an "environmental city" with cutting-edge technologies. Then it started to share these experiences with other cities through environmental cooperation in the 1970s. The city also initiated formal international cooperation with Dalian, China, in 1996. The local government played a significant role in drawing funding from not only the central government, but also affiliated agencies such as JICA, and also organized the participation of private firms by addressing plausible technology transfers for the Dalian Environmental Model Zone Project. The project was successful in the sense that a master plan for environmental improvement was created, and Dalian became the first city in China to receive the "Global 500" award from the United Nations Environmental Programme in 2001 [CLAIR 2003[34]; OIECEB 2007[35]].

The attempts made by Kitakyushu have demonstrated that the city-based approach could help to reinforce government intervention (or intergovernmental environmental cooperation) and market mechanisms (or a production network of firms). In addition to Dalian, Kitakyushu has been developing environmental cooperation with other cities in the East Asian region, such as Incheon, Busan, Tianjing, Ho Chi Minh, Cebu and Surabaya, as shown in Figure-4.

The number of sister cities that share common environmental concerns in this region has been increasing. Particularly in China, the State Environmental Protection Administration (SEPA) has encouraged local authorities to implement their own environmental policies through cooperation with cities in other countries [Shin 2007[36]]. At present, there are more than 200 local private firms and civil organizations supporting international training courses. From 1980 to 2005, 4,117 persons from 118 countries had been accepted as trainees; whereas from 1986 to 2005, 108 experts from 25 countries had been dispatched in this cooperation.

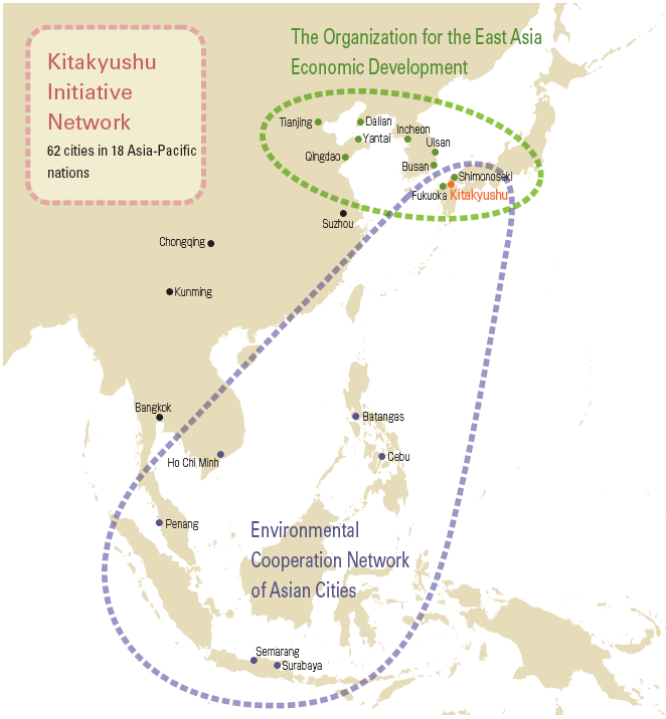

Figure-4. Kitakyushu Initiative Network [OIECEB 2007]

The success of cooperation depends on how the network is designed and utilized. As seen in the previous paragraphs, the traditional approach depends on “vertical” segments such as country or sector, in which the information flow is limited to a particular group of people and not shared effectively among others. Local societies sometimes have invaluable, although fragmented, know-how. For example, the prefecture of Shizuoka has been the leader in earthquake damage prevention in Japan, accumulating practical knowledge over the past decades.

In designing networks, therefore, it is important to provide information from a grassroots viewpoint, so that citizens actively participate in public decision-making. The information flow may not be limited to the vertical segments. Moreover, it should be “transnational” so that those citizens groups in different countries can share the same interests and share know-how with each other according to their interests and needs. In other words, networks should include a “horizontal” connection between large and large, small and small, and large and small. If so, the network then can provide value in several ways. It becomes easier to find the answer for questions, such as who should cooperate with whom and on what issue. It could even become possible to rate city activities in planning, post-disaster management, etc., with regard to climate change adaptation. The network can provide linkages among citizen societies on types of climate change impacts, initiatives of the adaptation applied, and so on. Then, some non-governmental organizations could find their contributions in connecting and even integrating fragmented information. This could include a contribution to serve as a “hub” of citizen societies by providing “transnational unity” among citizen societies.

4. Summary

This article started by describing some local adaptive needs and strategies in Asia, such as water resources, agriculture and food, forestry, disaster prevention, urban city/transportation, and public health. Particularly, it illustrated decisions in Japan as well as Thailand in detail. Then, the first part of the article summarized climate change adaptation in three categories of strategic actions: "assessment, awareness, and implementation."

The second part of this paper focused on discussions about cooperation. It classified the forms of cooperation into *governmental and sectoral* approaches. In addition, unique initiatives depending on *city-based* alliances were also introduced. The message in this section was that traditional networking is vertical, and there is room for the further development of networks in such a way that local information could be also integrated into the system. Such networks could be transnational, thus facilitating the dissemination of information and enabling unique forms of cooperation. It was also discussed briefly that some non-governmental organization could position itself to be a hub for such networking.

The author's interest in this article was how to share "common information." This view was different from the traditional way of thinking, in which people seek "differences" from others. Therefore, sharing is the important underlying mind-set here. In considering it, however, the article is still in a draft level, and there are many issues to be considered for further development.

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