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Sustainability Lessons from Kanazawa City, Japan

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Abstract
We have conducted the intensive training fieldwork courses to the environmental and social sectors of the Kanazawa City, and observed how those sectors function in the integrated manners for the sustainable development. Participants were 9 students, from the United Nations University Institute for the Advanced Study of Sustainability and Kanazawa University. Field destinations were divided to the next sectors: renewable energy sectors, urban waste power plants, landfills, recycling facilities, water purification sectors, wastewater management and energy plants, local forestry, city port and fishery, sustainable organic agriculture, traditional crafts and educational sectors of the City. At the end of the course students gave their feedback and recommendations for each sectors. Fieldworks showed the strong interconnection between each sectors, and their sustainable cooperation was clearly observed. Public education was strongly emphasized in each sector. However, several questions were raised after the fieldworks; 1. If such kind of sustainable city model can be implemented for developing countries 2. What will be the main obstacles to achieve sustainability there 3. How can conservation and responsible utilization of natural resources, balanced in sustainable manner. In the future we plan to create the educational fieldwork models for each sustainable sectors, which are practiced in Kanazawa City and implement them as an experimental model in the developing countries.

Keywords: Sustainability, Educational Fieldworks, Environment, Conservation

1. Introduction

Sustainability is not a separate concept, but it is an idea that encompass many interconnected systems and processes which are able to operate and remain stable for a long period of time. The most important thing to notice while studying sustainability is the "interconnection" and "interdependence" of the systems. Each living system that we have in our planet are connected with the rich networks that depends and affects each other's, and continue in sustainable manner for millions of year. Energy and mater are cycling in the infinite way, and outcome products from one system, becomes the inputs or foods for another system, with no waste. This natural cycles continues in a "closed-loop" and keeps the system in the state of infinite dynamic equilibrium. However, in current state of the planet with human activities, new concept like "waste" was created (Robertson, 2014). Humans move the materials in a linear way, when the end product is moved to the waste, with no longer ways to utilize it. This linear system goes in "take-make-waste" model (Hawken, 2010), with the dead point at the end. The more we make, the more waste and pollutants accumulate and the more natural resource diminish, and as all the system are interconnected, degradation of one will lead to the instability of others. In recent years scientists started to realize, that problems like hunger, food and water shortage, poverty, health, political and economical instability, resource depletion

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and many others, cannot be considered as separate issues, because they are all interrelated and has the same source of origin.

Cities are the mayor factor to consider, in the approaches to achieve sustainable development at the local, national and global level. City's sustainability should be made by measuring its environmental, economic and socio-cultural conditions with the integrated approach. However, in practical applications most of the urban sectors are not implemented in the integrated manner, but rather functions as the separate systems, and this is one of the main obstacles that halts the urban sustainable development.

To raise the awareness about the urban sustainable development, we have previously conducted fieldwork activities where we linked the biodiversity diversity with cultural diversity of Kanazawa City, Japan, and monitored about the importance of the human capital for the preservation and management of the natural recourse (Aida, 2016). However, in our previous fieldworks, we didn't apply any social-economical and environmental sectors of the city. In this study we decided to create the sustainable development training course for the international students, and evaluate the sustainability levels of the city's environmental and economic sectors, and monitor how those sectors are depending on each other and functions in the integrated manner. The objectives were to acquire integrative knowledge and skills, through the fieldworks and directly collaborate with local communities to address the environmental, economic and social issues.

Kanazawa City, was chosen as our fieldwork, due to the following factors; the city develops its economy with preservation its environment (ecology) and ecosystem services, thereby stabilizing its economy with traditional and modern culture. The city's population is almost half million people, and the locals for many years cultivated the ability to maintain the lifestyle in harmony with traditional cityscape and crafts, and in 2009 the city was designated as a UNESCO Creative City in the field of crafts. Cultural richness of Kanazawa City is strongly linked with the abundant nature and diverse ecosystems. The city has two main rivers, and surrounded by the mountain ranges on its eastern side, and coast of the Sea of Japan on its western side. The city is also famous for the large amount of snowfalls in winter that brings abundant of water, and the clean water steams are streaming around the city with 55 water channels.

Kanazawa City has been estimated as the city for its endogenous economic development (Sasaki, 2003), where the city uses its own knowledge, capital and industries. The modernization is generated from within the city, with the strong traditional cultural identity of the local people. City's economy avoids the large-scale industrial development and holds a group of sustainable medium- and small-sized companies, with many cultural investments, as a results the city protects its traditional industries, cityscapes and natural environment. Kanazawa city is the second city after Kyoto in Japan, in terms of preserving the traditional crafts with 26 verified industries.

2. Design of the Fieldworks and Practical Applications

The intensive fieldwork courses were conducted for five days. Participants were six graduate students from United Nations University for the Advanced Study of Sustainability and three graduate students from Kanazawa University. International

students had no information about the region, and at the begging of the fieldworks, students were given the basic lectures about the environmental and geological features of the region.

Field destinations were divided to the next sectors; renewable energy sectors, urban waste power plants, landfills, recycling facilities, water purification sectors, wastewater management and energy plants, local forestry, city port and fishery, sustainable organic agriculture, traditional crafts and educational sectors of the City. All sectors provided us with the short lecture or movie presentations following with the field observations. Total time for each field trip including Q&A was around two hours.

Besides, during all five days of the training course students were staying in the Zen Temple, together with Japanese monks, and directly practiced the sustainable lifestyle of the monks with not wasting the water, electricity, food and no access to Wi-Fi.

At the end of the course, all students had a group discussions and presented the final workshop for each sectors.

3. Fieldworks' Outcomes and Further Recommendations

Fieldworks showed the strong interconnection between each sectors, and their sustainable cooperation was clearly observed by the students. Each student chose the particular sector and give the feedbacks and further recommendations. Some students also tried to make some recommendations for the developing countries like Vietnam relying on the studies learned from Kanazawa.

3.1 Water Sector

Seven sustainable categories of water management of Kanazawa were presented: 1. "Institutional arrangement and ownership": facilities are partially self-budgeting and do not rely completely on the governmental support. Water management facilities are strongly interconnected with other facilities such as incineration plant and energy sectors of the city. 2. "Effluent standards" applied at the local level and not national level. 3. Wastewater treatment plant technology with the use of the low cost, where the investment is low but the outcome is high. 4. House connection to the waste water is 100%. 5. Septage management with anaerobic digestion by using the sludge and without dumping to the landfills. 6. "Source findings, financial commitment and cots recovery is high in Kanazawa." 7. Public awareness and education with bottom-up approach towards the behavior change.

The student also presented recommendations for the developing countries, such as Hanoi, Vietnam, as Vietnam is one of the fastest urban developing countries in the Asia-pacific region and the main problem of the government is how to keep the pace of the environmental degradation in the cost of the rapid urbanization. The government seriously considered water management issues and implemented many policies, however financial problems and institutional arrangements with no integrative collaboration, water drainage issues and others are still exist. Kanazawa's water management sector proved that the integrated approach is crucial for the water resource management and the following recommendations were considered;

• National policies should be established with the integrated principles with other sectors

- Strategic planning must be adopted at the city level
- Develop appropriate financial policies for the investments, and operation and management of the sectors
- Apply appropriate technologies for the treatment
- Develop effective institutional and regulatory arrangements at the local level
- Promote the capacity of local stakeholders
- Raise the awareness of sanitation service and water utilization

3.2 Waste to Energy

Production Energy from Waste is the way towards the sustainability, and Kanazawa City's policy of incineration of the solid waste helped to manage the city's energy production in the sustainable manner. The city tries to become the Environmental Friendly City and the management is made in the consideration of the following factors; pollution control and incineration; utilization of the waste heat in free public facilities; automation; provide the training for the environmental preservation and "engage the business and community activities with a commitment to recycling resources".

Incineration Outputs and Processes of Kanazawa City were presented as follow;

- Facility burns mainly the non-recyclable waste, and is even "willing to buy electricity if the energy input exceeded the energy output of the facility"
- Sufficient fund for the establishment and maintenance of the incineration facility
- Generated energy contributes to the municipality's income
- Plant generates its own energy together with the renewable energy sources (solar power, nybrid lighting) and even provides excess power to the electric power companies
- The combustion emission gas level is strongly regulated with the strict environmental standards policies and its level is less than combustion emission standard of Japan.

Students discussed, that why the Waste to Energy is sustainable in Kanazawa, and they came to the conclusion that the model provided by the Kanazawa City incineration as a management option towards sustainability, does not function alone. The City has numerous sources of renewable energy: 5 Hydraulic Power Generating Plants, 84 Solar photovoltaic generator, 13 Hybrid plants, 1 Biomass Generation Plant, which are funtion in the iterconnected ways. Next, is that the incineration facility is the part of an integrated waste management approach which is based on waste hierarchy of 4Rs: Reduce, Reuse, Recycle, and energy Recovery and disposal. Therefore, eventhought that the incineration can be very effective for the energy production, it is not the only one waste management option of the city and the municipality does not heavily relied on it.

3.3 Forestry

In Japan, gradually the number of the people involved in the forestry are decreasing because wood utilization is decreasing. However, in Kanazawa wood is still remains as a promotion of the local economy and plays multi-functional role for the environmental preservation. Kanazawa City has a strong interconnected between the nature conservation and local livelihoods (utilization), which are characterized by the "Forest areas adjacent to human settlements, Functional links between forests and other

components of the landscape, Woodland and grasslands used by people, Healthy ecosystem/environment". During the forest field trips spotted species of frogs, dragonflies, different bird's calls were as indicators for the good environmental habitat for the species. Non timber production of local industry is still abundant in the city such as; charcoal production, mushroom (*shiitake*), rice production and vegetable farming, traditional paper (*washi*) production in the mountain area of the city. Municipality provides the forest subsidies for the local people for the forest management, however problems with the population decrease, out-migration and lifestyle change are strongly felt in the city.

Some recommendations were given for the future forest management in the City

- Empowerment of the local communities to "have the confidence in the local land use"
- Skill transfer through the trainings
- Promotion of non-timber product for the outside market
- Creatively revitalize the interest of wood and non-timber products in youth through the art
- Empowerment of women for the forest management and/or conservation
- Adding the values for the sustainably maintain forest ecosystems in Kanazawa
- Environmental education in forests and citizen-oriented activity
- Involve different stakeholders from different backgrounds
- Continue to promote biodiversity-friendly strategies of forest management

3.4 Fishery

Kanazawa City is facing the Sea of Japan, which is semi-enclosed ocean basin, consisting of Warm and Subarctic currents cold water. The Ishikawa Prefectural Fisheries Research Institute regulates the City's fishery, and also it has the association that is responsible for the fishing marketing.

Students observed that what makes marine and fishing sectors sustainable from the following features;

- Protected marine environment with strict waste mismanagement or littering regulations
- Banned fishing practices that put marine resources and species at the risk of depletion or exploitation
- Market controls to prevent illegal fishing and overexploitation
- Closed fishing seasons and breeding grounds
- Minimized clean water utilization to contribute to the development of waste management technologies
- "Designing, packaging, marketing and recycling" of materials are considered with the purpose to reduce the environmental impact

Even though the fish catches has been stable for the recent years, there is the threats of the decline in the fishery production were due to the lifestyle change and decrease in local demand. Fishery has potential to contribute more to Japan GDP and for the further sustainable fishery practice, some recommendations were suggested as well;

- Exporting more fish to other courtiers
- Secure sustainable small-scale fisheries with more employees
- Reduce the amount of unnecessary mortality of non-target marine species
- Consider the aquaculture

3.5 Agriculture

The agricultural land comprises around 10% (3,925ha) of the city, with paddy fields 3,160ha, the vegetables 645ha, and orchards 120ha (Ministry of Agriculture, Forestry and Fisheries [MAFF], n.d.). Kanazawa city is fostering the sustainable agriculture not by promoting the organic or natural farming, but mainly by producing the local traditional vegetables, putting the cultural values ahead. 15 local vegetables were selected and branded as Kaga-vegetables for their production volume and economical demand, by Kanazawa Municipality and branches of Japan Agriculture Cooperative. These traditional vegetables were carefully selected over the centuries, and they have natural season rhythms for cultivation, stable to the disease and acclimated to the specific landscapes with the different soil, landforms and climate conditions. These deep ecological adjustments to the natural conditions of the land, makes these vegetables to be cultivated with fewer chemical inputs and thus contribute to the soil preservation. Half of the city's vegetables production is accounted for Kaga vegetables production. Moreover, recently consumers wants an assurance that the products that they buy are safe and healthy, and they even want to know who produces it and how it was grown. Recently farmers put their names and photos of the products, to assure the customers about the product safety.

Cultural values are pivotal drivers in the promoting of the city's development, and besides empathizing on the production of the local traditional vegetables, local stakeholder, such as the Association for the Conservation of Kaga Vegetables and the Municipality are promoting the Kaga Cuisine, with the menus inspired from the feudal times. Serving Kaga Cuisine creates the atmosphere of the microcosm with the seasonal natural blessing, and creates the feeling of unity between the culture and nature.

Further Recommendations

- Increase the interest of urban residence in the agriculture
- Promote green economy with the sustainable consumption and production
- Promote urban regeneration with green agricultural spaces
- Increase the local food preparation trainings
- Education and awareness-raising for the benefits of urban agriculture and food safety

3.6 Spiritual practice and rejuvenating humanity

Students emphasized that in the new era humans became the drivers for the environmental changes with many "anthropogenic" activities that created the accelerating socio-economic sectors, with many negative consequences. The traditional culture started to deteriorate, with the globalization and modernization and a big shift in appreciations and likings are now observed in the big cities. Kanazawa city still has preserved its traditional culture, which are practiced by local people such as Zen, Gardening, Crafts, Tea ceremony and many others. Traditional culture of the city teaches about the harmony, respect, purity, tranquility and is strongly connected with the nature appreciation.

Living in the temple, helped the students to understand that the integrative approach for the sustainable development should start at the individual level. Look to everything with more esthetical and spiritual values can change our perceptions. In our daily life Mind, Body and Soul runs in different directions and they connect to the outside world with

their own separate perceptions. First we need to connect human's mind, body and soul together to realize our real needs and how to make the sustainable practices in daily lives.

3.7 Education

One of the strongest points observed for the environmental conservation and sustainability in Kanazawa was the education. Each visited environmental sectors in Kanazawa city, provided the videos for the environmental promotion at the level of the junior school kids. Nature appreciation starts from the kindergarten level, and academic institutions, together with the local government create the local environmental activities through the nature-based and hands-on experiences. Also, the city supports the activity as "Kanazawa school eco-project", which educates the junior kids for the limited resource control and utilization, natural values, energy savings and waste reduction and many others.

Besides, municipality promotes special public educations for the waste reduction and recycling, and due to the local willingness in environmental preservation and their activities the amount of the waste was reduced in entire city. Citizens and private bodies are actively taking parts in the nature observations events organized by the city during all four seasons and make the local monitoring of the local habitats around the city's ecosystem.

4. Future Suggestions and Implications

From the fieldworks it was clearly observed how the integrative urban applications of different sectors are important to achieve the sustainable results in the practice. Besides, urban integrity should not only be between the social, economic and environmental sectors, but it should start from the human itself with the realization of the real human needs for the sustainable lifestyle.

However, after the fieldworks several question were raised such as; 1. If such kind of sustainable city model can be implemented for developing countries 2. What will be the main obstacles to achieve sustainability there 3.How can conservation and responsible utilization of natural resources, balanced in sustainable manner.

To address those questions, in our future studies we are going to develop the integrated educational framework model, which can be applied for each sectors and in future try to implement them as an experimental model in the developing countries to achieve sustainable lifestyle.

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