Six Years from the Great East Japan Disaster –Achievements and Regrets in GLP Context

*Yukio Himiyama[1]

1. Emeritus Professor, Hokkaido University of Education

The Great East Japan Disaster triggered by the M 9.0 earthquake and the subsequent gigantic tsunami of 11th March 2011 has left huge changes on the land, its use and the environment, as well as many other things, and there have been a lot to be learnt, discussed and practiced. The paper discusses what have been actually achieved and what haven’ t in the context of GLP (Global Land programme) core project of Future Earth.

Keywords: Great East Japan Disaster, GLP, Future Earth

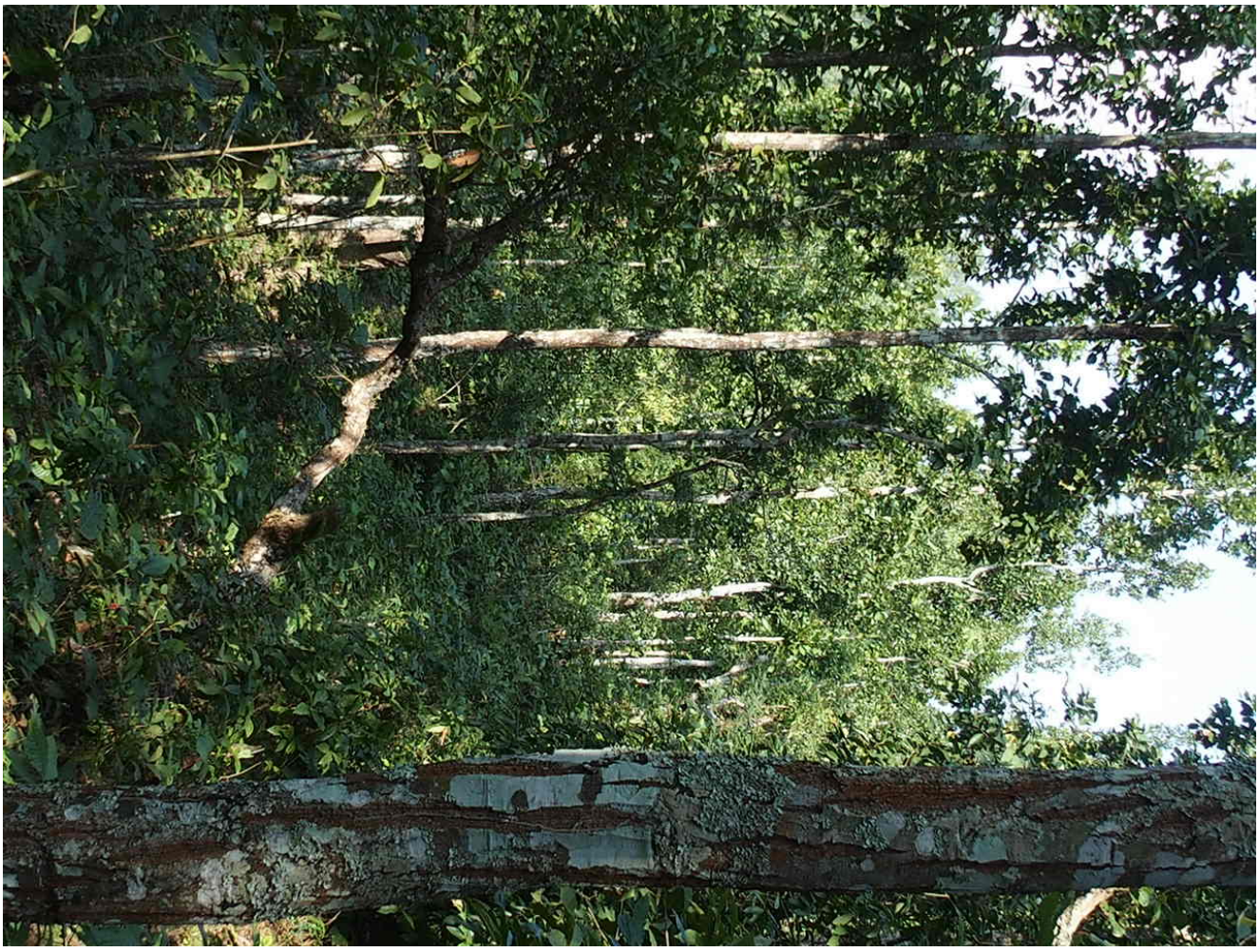
Has Community-based Management Improved Natural Resource Condition? Evidence from the Forests in Nepal

*Towa Tachibana[1]

1. Chiba University

Does community management improve the condition of local natural resources? Do interventions by official agencies enhance the functions of voluntary communal management? With 101 randomly-sampled natural forests in the Middle Hills of Nepal, we address these questions. Forest condition was evaluated by forest inventory conducted in 1997-1999 and 2014-2016. One of our major interests is whether the improved regeneration under the community management, which was found in 1997-1999 survey, has resulted in improved forest resource stock in 2014-2016. We will also show the impacts of civil war from 1997-2006 on natural forest conditions.

Keywords: community management, natural forests, Nepal



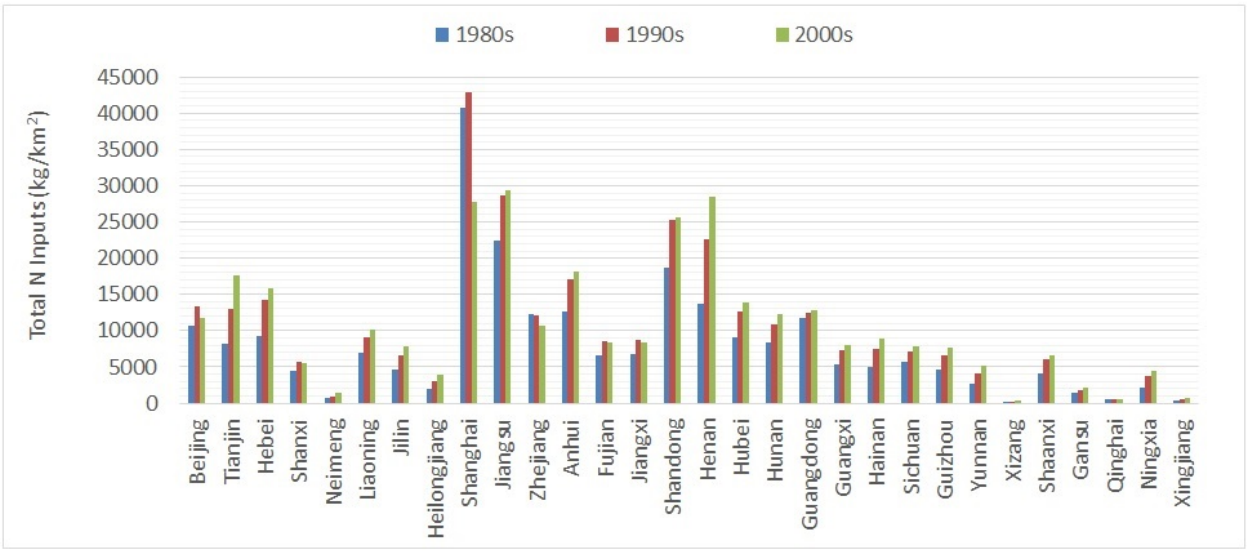
Spatial and Temporal Variation of Anthropogenic Nitrogen Inputs to the Agricultural Lands in China

*Qinxue Wang[1]

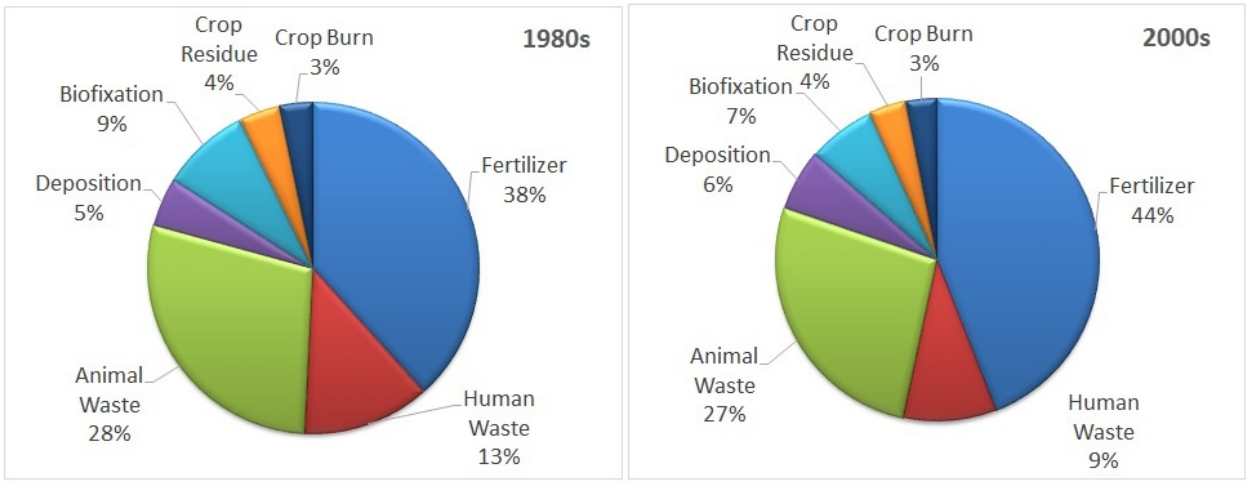
1. National Institute for Environmental Studies

The anthropogenic nitrogen (N) inputs to the agricultural lands are the major non-point sources of water eutrophication. In order to make clear both spatial and temporal variation of the anthropogenic N inputs in China, we collected the statistical data of agricultural land use, crop production, population and livestock from 1980 to 2010. Based on these datasets, we estimated both spatial and temporal variation of N inputs to the agricultural lands, including the atmospheric deposition, synthetic N fertilizer, biological N fixation and recycling reactive N inputs, such as N from human waste and animal excrement, crop residue recycled as manure, and N emission from burning crop residue.
The results showed that the annual total N inputs increased by 1.5 times from 3,550 kg/km^2 in the 1980s (1981-1990) to 5,281 kg/km^2 in the 2000s (2000-2010). The synthetic N fertilizer dominated the N source and showed a 1.7 times increase from 1,361 kg/km^2 in the 1980s to 2,328 kg/km^2 in the 2000s. The animal excrement was the second important N source and showed a 1.4 times increase from 1,007 kg/km^2 in the 1980s to 1,415 kg/km^2 in the 2000s. The third important N source was human waste, which increased by 1.1 times from 443 kg/km^2 in the 1980s to 491 kg/km^2 in the 2000s. The most rapidly increased N source was the atmospheric deposition, which increased by 1.9 times from 170 kg/km^2 in the 1980s to 325 kg/km^2 in the 2000s.
Regionally, some provinces in the eastern part of China like Shanghai, Jiangsu, Henan, Shandong, Anhui, Tianjin and Hebei, where the total amount of N inputs was over 15,000 kg/km^2 in the 2000s. However, those provinces in the western part of China like Xizhang, Qinhai, Xinjiang, Neimeng, Gansu and Ningxia, where the total amount of N inputs was less than 5,000 kg/km^2. The spatial distribution of its change rate during the last 3 decades shows that, some provinces like Tianjin, Neimeng, Henan, Ningxia, Xinjiang and Heilongjiang, where the total amount of N inputs increased by more than 2 times, only 3 provinces: Shanghai, Zejiang and Qinghai, where the total amount of N inputs decreased. In most part area of China, the total amount of N sources increased more than 1 to 2 times. According to the theory of the mass balance, we could make sure that the nitrogen outputs to the environment, such as water bodies, atmosphere and soils might increase by more than 1 to 2 times from 1980 to 2010 in the most part area of China.

Keywords: Nitrogen input, N fertilizer, Atmospheric deposition, Agricultural lands, China



Changes in the total amount of N inputs at the provincial level during last 3 decades



Changes in the percentage of each component of N input from the 1980s to 2000s

Evidence of Intitutional Bias against Flatland Forests in Suburban Tokyo: The Analysis of Long-term Plot-level Panel Data

Yuki Nogami[2], Takao Yurugi[1], *Takeshi Sakurai[1]

1. Graduate School of Agricultural and Life Sciences, The University of Tokyo, 2. The University of Tokyo

This study analyzes the factors affecting the conversion of agricultural land (i.e. forest land or crop field) into non-agricultural land (i.e. commercial or residential land) in suburban Tokyo. We take the case of Santomi area, which was created as an agricultural settlement about 300 years ago on flatland located about 30km away from the center of Tokyo. Since the flatland was infertile, settled farmers planted trees and converted barren land into fertile crop field using leaf litter to produce compost. Thus, a sustainable agriculture system was established in the Santomi area in the long run. The planted trees became flatland forest, which was an indispensable part of this agricultural system. In addition, the combination of forest and crop field makes a unique landscape that attracts visitors.

However, during the last 60 years, many parts of the Santomi area have been converted into non-agricultural land. This study constructs a plot-level panel dataset of 381 plots using aerial photos taken 7 points of time from 1956 to 2016. Then, fixed effect regressions reveal that the differential taxation between forest and crop field, which was intended to protect agricultural land from conversion, promoted the conversion of flatland forest into commercial land. As a result, the sustainable agricultural system that depends on compost from forest is no more practiced much and the value of the unique landscape has been reduced.

There is demand for the conserving the unique agricultural landscape of Santomi area and discussions are going on. But so far there is no agreement as to how to protect the flatland forest.

Keywords: land use, flatland forest, sustainable agriculture, Santomi

Trend of graveyard development in Beijing City

*Haruhiro Doi[1], Yanwei Chai[2]

1. Oita University, 2. Peking University

An urban spatial expansion by the residential house and industrial development is active in Beijing City advanced by economic growth and a population increase. And, the city has a lot of graveyard development for the dead by using the farmland and the forest in a few decades. In a word, the area of land used for the dead in addition to the land for the population of this world has increased in Beijing City.
The graveyard as the place in which it holds a funeral for the dead strongly reflects people's sense of values. The sense of values is strongly related to the religion and the culture in the region and the country. Therefore, the mode of the graveyard and the usage condition of land are different according to the country and the region. The Feng Shui thought has traditionally influenced the location of the graveyard, and the thought was displaced as a superstition as the socialist state in the latter half of the 20th century in China, but it is said that it influences again with the rise in richness.
As a result, the control of the expansion and maintenance of the graveyard area becomes a serious problem as part of the management of the land resource for the increase in the demand for the citizens who request a better graveyard. The present study aims to clarify the formation mechanism and the sustainability of "Land use for the dead" indispensable for the human race by understanding the area of land of the graveyard, the form of the burial and relating social and cultural factors.

Keywords: Graveyard, A population increase, Economic growth, Feng Sui

Bridging across scientific disciplines and societal sectors: Examples for actionable knowledge generation from Future Earth's Knowledge-Action Networks

*Thorsten Kiefer[1]

1. Future Earth Secretariat, Global Hub in Paris

The global socioeconomic transformation to sustainability is not an option, but an essential need for humanity's wellbeing. It is also evident that this transformation can only succeed if based on sound scientific knowledge that integrates the many different aspects that are inherent to the complex and interconnected processes underlying all sustainability challenges.

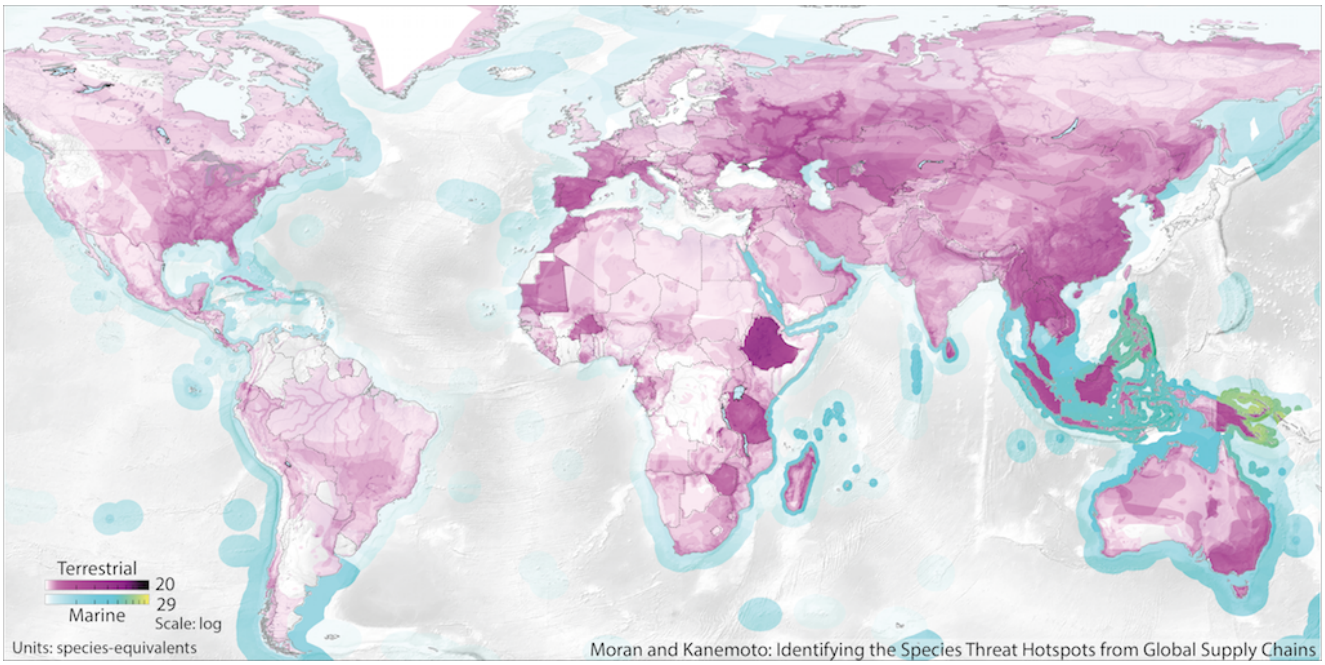
My presentation will feature examples how the integration of the broad scientific spectrum such as across natural sciences, social sciences and law, and the involvement of relevant stakeholders, can provide knowledge that is useful for decision making and for implementation of solutions on sustainability issues. Examples will be drawn from some of Future Earth's existing and emerging Knowledge-Action Networks such as those on ocean sustainability, the food-water-energy nexus, extremes and disaster risk reduction, decarbonisation, and the sustainable development goals.

Mapping the carbon, air pollution, and biodiversity footprints of nations: A GIS + global supply chains

*Keiichiro Kanemoto[1], Daniel Moran[2]

1. Shinshu University, 2. Norwegian University of Science and Technology

"Spatial footprinting" is an approach for locating the actual hotspots where impacts driven by consumption occur. Spatial footprinting offers the potential to link any remote sensing or earth observatory GIS data that is tagged to an economic sector to any MRIO-based economic model. We present new method for locating at a subnational level the environmental emissions induced by global supply chains. As the world economy becomes more complex it is increasingly difficult to connect consumers and other downstream users to the origins of their GHG emissions and other impacts. Given the important role of subnational actors in GHG abatement and other environmental protection efforts, it is advantageous to connect consumers to the locations where their purchases are driving environmental pressure. We present spatial footprint results for 187 countries showing the footprint of GHG emissions, air pollution hotspots, and biodiversity threats, and discuss our spatial footprinting methodology.



The El Niño –La Niña cycle and recent trends in supply and demand of net primary productivity in African drylands

*Abdulhakim Abdi[1]

1. Department of Physical Geography and Ecosysetm Science, Lund University

The human-environment connection in the mostly rural drylands of sub-Saharan Africa forms a complex, interlinked system that provides ecosystem services. This system is susceptible to climatic variability that impacts the supply of its products, and high population growth, which impacts the demand for these products. When plants remove carbon dioxide from the atmosphere through the process of photosynthesis, they use some of this carbon to maintain plant cellular structure. The rest is stored as plant tissue and forms plant biomass. The annual accumulation of this plant biomass is called net primary production (NPP). On an annual basis, NPP supplies the provision of crops, animal feed and pasture. The societal implications of reduced NPP can be severe, possibly leading to crop failure and eventual food insecurity. The trends in NPP supply trends over sub-Saharan Africa 2000 –2013 are significant in 32% of the area (4.7 million km^2). However, these trends are concentrated in three distinct areas: the western Sahel (2 g C m^{-2} yr^{-1}), central Africa (30 g C m^{-2} yr^{-1}) and parts of Zambia, Malawi and Mozambique (-25 g C m^{-2} yr^{-1}). In contrast, the mean overall trend in NPP demand is 3.5 g C m^{-2} yr^{-1}, though in urban areas it averages approximately 50 g C m^{-2} yr^{-1}. The tradeoffs between NPP supply and demand trends (i.e. change in one quantity relative to another) are locally constrained and linked to the prevailing climate, population growth and net migration. The demand-supply balance of NPP is influenced by climate, such as the variability caused by El Niño –Southern Oscillation. The greatest sensitivity to El Niño occurs in Southern Africa. Here, a +1°C shift in the Niño 3.4 index (as a measure of El Niño) causes a mean change in the NPP supply of -6.6 g C m^{-2} yr^{-1}. Despite the fact that there were more La Niña events than El Niño events during the period of this study, the negative impact of El Niño on Southern Africa is strong enough to tip the balance toward the negative.

Keywords: African Drylands, Net primary production, El Nino - Southern Oscillation

Spatio-temporal characteristics of water budget due to the paddy field expansion in Naoli River Basin

*Guoping Lei[1], Hao Zhou[1]

1. Northeastern University

Since early 1990s, the agricultural structure of Naoli River Basin had been greatly changed with large amount of dry land transformed into paddy field. This resulted in serious water resources insufficiency. We were trying to reveal the water profit and loss situation under the cultivated land resources variation in this river basin, so as to predominate the overall spatial and periodical situation of water budget in Naoli River Basin and provide scientific basis for adjusting the layout of farmland. We analyzed the condition of Naoli River basin by using related model to compute the actual evapotranspiration (ET), and calculated the farmland water needs of the cultivated land in this basin by modeling the rice planting proportion coefficient which could show the cultivated land structure. Also through using the established water profit and loss degree evaluation model, which could reflect the potential shortage of water budget, it structured the order of evaluation standard to analyze the variation of area changes at different levels of moisture shortage. We discussed the water profit and loss situation of cultivated land resources in Naoli River Basin under the situation where the cultivated land was constantly changed in the basin between 1990 and 2014, and modeled future scenarios by using the CA-Markov model. All above analysis used the remote sensing image data, the long-term sequenced meteorological data and the DEM data as its fundamental data resources. Results showed that the changes between the paddy field and the dry land in Naoli River Basin were incredibly violent. The growth rate of cultivated land decreased gradually from 1990 to 2014, and different periods showed different changing characteristics. During the period between 1990 and2002, the paddy field area increased dramatically, while the dry land increased slightly. From 2002 to 2014, the growth rate of paddy field area showed significantly decreased characteristics and the total dry land area decreased in a certain degree. The changes of the cultivated land’s water profit and loss degree were obvious and the spatial distribution differences of the profit and loss index evaluation grades were great. The change magnitude was also not the same in different periods. From 1990 to 2002, the farmland types, which were evaluated by the cultivated land’s water profit and loss grades, were dominated by moderate and serious moisture shortage in this river basin, and basically, there were no severe moisture shortage farmland types. In the period between 2002 and 2014, the biggest change happens to the mild moisture shortage types. On the other hand, the severe moisture shortage area decreased slightly. Among them, the proportion of farmland with normal water shortage was the biggest during these two periods. We also concluded that the water deficit of the farmland in this river basin would be further intensified, and the area with the higher grades of MPLD was more centralized, and partial high evaluated grades for the moisture shortage would expand in future. Except for the slight increase of the farmland with mild moisture shortage, the rest four evaluation grades farmland area all kept increasing, and the area of serious moisture shortage evaluation grades increased intensely. These research results can be used as references and consultancies for the farmland irrigation schemes in Naoli River Basin.

Keywords: farmland, moisture budget, simulation, Naoli River Basin

Urban flood risk and land use change after circle levee in Dhaka down town

*Shigeko Haruyama[1]

1. Department of Environmental Science, Graduate School of Bioresouces,Mie University

Dhaka Flood Control Project has several stages of land use changes with different social economic levels in this metropolitan area. The circle levee has constructed along the western perimeter of Dhaka and embankment along the eastern perimeter stretching to the Shitalakhya River after the memorial floods attacked by cyclone. The 1988 huge flood was the important epoch of regional planning and river management planning with mitigation, however, the second stage of land use change has be guiding the large floods in 1998, 2004 and 2007 again. Under the rapidly urban sprawls, the changing social structure has been pulling the other resilience of urban floods. The socio-economic data provided the information related to flood inundation risk on the basis of various land cover units. The temporal and spatial land use change has been revealed and was one of driven factors of flood risk with population growth and economic activity. Compared with satellite data and DEM, the inland enclosed circle levee has been transfiguration of surface with settlement and built-up zones in the low lying hazard zones. Also, built up area have been developed and have been showing high flood risk area. Towards to secure city, the land use planning should be desirous of flood mitigation understanding landform feature which is mostly related with flood history.

Keywords: urban flood, mitigation, land use change

