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阿蘇地域における農村コミュニティの変容と災害レジリエンスに係わるウィーン大学との共同調査

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Kumamoto.
Imoto, I., Ichinose, T., Itagawa, S. and Yamada, Y. (2018) Land use change in 100 years and increased disaster risk - flood disaster in Joso city, on the Kinu River caused by Kanto-Tohoku heavy rainfall in September 2015. Pages 39-40 in Committee of International Affairs Association of Rural Planning, Japan editor. 2017 Japan-Korea rural planning seminar. Association of Rural Planning, Japan, Kumamoto.
Morisaki, M. and Ichinose, T. (2018) Economic evaluation of green infrastructure at Higashio ¯ mi city, Shiga prefecture. Pages 43-44 in Committee of International Affairs Association of Rural Planning, Japan editor. 2017 Japan-Korea rural planning seminar. Association of Rural Planning, Japan, Kumamoto.

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Preface

Resilience and Sustainability of Rural Areas

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There are many kinds of natural disaster in Japan due to its climate and geographical condition, namely earthquake, tsunami, flooding, typhoon, storm surge, landslide, avalanche, tornado, forest fire, eruption and so on. The Chuetsu earthquakes occurred in Niigata Prefecture on 23 October 2004 which mainly stuck rural areas by shocks and landslides. Most of researchers and planners for rural area realized the difficulty of reconstruction in the situation of depopulation and aging status. The 2011 Tohoku earthquake and tsunami, and the accident of Fukushima Daiichi Power Plant damaged huge areas in the east part of Japan. Many municipalities affected by the tsunami and radiation lost their population by the disasters. Nobody can still return to most of three towns located close to the nuclear power plant, namely Namie, Futaba, and Okuma. Onagawa Town located in Miyagi Prefecture and few affected by radiation lost 37% of its population for four years because reconstruction in the rural areas took a long time and some people wanted to move from remote areas to more convenient ones. Most of the rural area had depopulation and aging problem before the 2011 disaster. It accelerated depopulation. In April 2016 two massive earthquakes caused in Kumamoto Prefecture and damaged rural areas again. 249 people died, and 8,674 buildings and houses were collapsed. Approximately 43 thousand people still live in temporally houses (statistics at the end of November 2017). On the other hand, Korea has less disaster compared with Japan. Despite the condition, there were some earthquakes in 2016 in Korea. Korea also faces depopulation and aging problem. Regarding not only disasters but also depopulation and aging, resilience and sustainability are one of the most important issues for rural areas in both of countries.

Japan-Korea Rural Planning Seminar has more than 15 years history. Every year we have the seminar in turns in Japan or Korea. After the earthquakes in Kumamoto the Committee of International Affairs, Association of Rural Planning, Japan decided the theme and location of the seminar through discussion with Korean association. Both presidents of the Japanese and Korean association will sign a memorandum of understanding during the seminar to keep exchange and collaboration. Also, we invite Chinese, Taiwanese, German and Austrian researchers as a guest. Kumamoto City, especially Institute of Policy Research, cooperates the seminar. Financial supports from Kumamoto City (convention grant), the Environment Research and Technology Development Fund (4-1505) of the Ministry of the Environment, Japan and Keio Research Institute at SFC are gratefully acknowledged.

2017 Japan-Korea Rural Planning Seminar

Planning in the Danube Delta

Sfiştofca village in C. A. Rosetti municipality, Romania

Meinhard BREILING*

Sfiştofca is a remote village in the Romanian Danube Delta. It is reported to be established around 1800 by Russian fishermen from Vilkovo (Vylkove in Ukraine and Valcov in Romanian language) in the Ukrainian Danube Delta less than 15km away from Sfiştofca. The establishment of the wooden church in 1827 can be taken as an official founding date of the village. That time favourable situated at the mouth of the Kylia arm of the Danube Delta the village generated prosperity for up to 1000 people in 1900 (History of Dobrodgea, 1904). The peripheral position was a consequence of the land locking of the place by the sediments of the Danube River. The water based traffic had to be substituted by land based traffic. During the 1950ies and early 60ies, the Sfiştofca (also named magistral) channel was built by political prisoners from Periprava with the aim to better access the reed and fish resources of the Danube Delta.

A relative high number of inhabitants of several hundreds of inhabitants can be found until the 1970ies. According to local sources, the major retreat from Sfiştofca started after a flooding during the 1970ies. Then the population of Sfiştofca gradually decreased due to the utmost peripheral position of the village in the Danube Delta. The better valorisation of fish and agricultural resources was aimed during the 70ies and 80ies and particularly targeted in the 6th (1976–80) to 8th (1981–85, 1986 to 1990). national five year central economic plan for Romania. The communist leader Nicolae Ceausescu had visited Netherlands and the Rhine Delta and wanted to stimulate a similar development and prospering in the Danube Delta as well. The wetlands should be turned into agricultural land and with increased profitability other economic sectors should manifest here. The increased level of state investment counter acted the trend of outmigration of the Danube Delta. However, while in many other locations of the Danube Delta the population increased due to better economic possibilities the population of Sfiştofca declined. The prime economic asset of the village, the access to the Black Sea and the mouth of the Kylia arm as a habitat for sturgeons got lost at the beginning of the 20th century by large quantities of transported sand.

The fall of the communist system in 1989 brought a new environmentally minded regime during the 90ies. The Danube Delta was declared a UNESCO world biosphere heritage site. A governor for the Danube Delta Biosphere Reserve Administration DDBRA was put in place and a set of ecological benign measures was established with the aim to ecologically restore the delta. The DDBRA is a state agency under the rule of the Ministry of Environment and Climate Change. More than 80% of the land is under its rule. But the 20% economically most attractive lands are owned by the provincial government of Tulcea and the 10 municipalities of the Danube Delta. The ecological regime as proposed by the government was often opposed by the local planning authorities. They need income to run their administration. The most profitable assets in possession of local authorities were licenced to rich strangers that got access to aquaculture ponds and the most productive reed harvesting areas. Despite the devotion as ecological restructuring areas the outtake of natural resources during the 1990ies was over proportional. The huge differences of interests between rich outside investors and poor local inhabitants led to severe tensions. While few locals could profit from this situation most other people lost their - mainly informal - rights like fishing or harvesting reed for family use which they had during communism. Due to lacking perspectives, many villagers, in particular the well educated ones, left the Danube Delta to economically more prospering places.

The remaining poor local population had high expectations when Romania entered the EU in 2007. In particular all kinds of eco-tourism were targeted as a means to develop. The two primary goals of the Danube Delta Regional Development Plan were poverty elimination and economic growth could not be reached (Nichersu 2015). The economic situation is worse within the Danube Delta than within the adjacent regions of Tulcea County. In Tulcea County the economic situation is again worse than in the rest of Romania and Romania is far behind the average

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GDP of the European Union (Worldbank 2014). The economic problems even aggravated during the first period of the European Union from 2007 to 2013 and most localities did not receive any project support from programs of the European Union Cohesion Fund or within the Territorial Cooperation programs (Danner et al. 2014, pp. 43, 44). The non inclusion or insufficient inclusion of locals was observed (van Asche et al., 2011). This is in line that two thirds of the allocated money of these funds in Romania was not called for projects. However, the ministers of the EU reconfirmed that a territorial cohesion of EU member states is a common goal and all of them signed the "Territorial Agenda of the European Union 2020". This led to a new instrument for the program period 2014 to 2020, a so called Integrated Territorial Investment Program, ITI. The Danube Delta is thereby a selected case study (EC 2015). ITI aims the joint implementation of several EU programs and a combined investment of one billion Euro is foreseen in the Danube Delta. However, Sfiştofca village as well as the larger unit of C.A. Rosetti municipality do not qualify for EU funding as the minimum population is not reached.

While in principle we have a lot of money available, local people in remote villages and municipalities remain poor. The scale of programs and projects do not fit to practical circumstances or informal procedures at the place. There is money for large scale projects and initiatives but no money for small scale local improvement projects. Private investors can get almost every investment back if they follow the EU project guidance. But control and reimbursement procedures can stretch over many years, so that it remains still unattractive to invest. In addition many projects a business plan for the profitability of projects.

In case of Sfiştofca , the village was even considered too remote to be visited by a fact finding team of the World Bank. No one from the village or the larger municipality was involved into a broadly managed public participation process with regard to the Danube Delta Strategy. The travel to another village is considered as a high cost when the average yearly income per household is € 1.500.- with many persons far beyond this amount. Public transport worsened or does not exist any longer due to fewer people that still remained. The only remaining small store in the village closed in 2015 when the woman in charge became ill. The elementary school closed already many years before indicating that the village is slowly dying.

While all descriptions so far point to a neglect and a desperate situation Sfiştofca has several particularities that few other places have. It belongs to the religious minority of Russian Old believers - a group of believers scattered around the world - which has plans to make Sfiştofca a holy place of pilgrimage even if the remaining population should have left the village. Another hopeful initiative came from artists living in Tulcea, Bucharest and abroad, forming the Sfiştofca Art Association. They discovered the remoteness of the place as a source of inspiration and use the place for workshops. During the last 10 years art films and photos or documentations were produced and brought the place some fame in insider circles (Gheorghiu 2014). Annual workshops that involve the local population of the municipality are held in Sfiştofca . Yet another initiative is university cooperation to support the local population by student projects. Several universities, such as Ion Mincu University of Architecture and Urban Planning Bucharest, the National University of Arts Bucharest, Ovidius University Constanta, Technische Universität Wien started a fruitful cooperation since 2009. Occasionally this nework is supported by members of other universities from outside Europe, under them Keio or Kobe universities from Japan. The direct relation of students, locals and local decision makers is fruitful for all parts. The student projects are freely chosen by students and inspired by the locals in need for it. Under them a small scale freshwater supply in response to the observed salinization process with a ground water pump; plans to marketize medical plants, horticultural products, honey from the Danube Delta; plans for youth camp and nature outdoor learning exercises; design proposals for nature near designs of tourist shelters and fishermen cottages (Voica et al. 2015).

References:

1) Danner K., B. Gugarell, L. Gerold, I.Paschinger, L.Schilling, C. Schmidt, Siquans (2014) . Analysis of C.A.Rosetti Municipality http://www.breiling.org/lect/euamende/r1/Analyse_FINAL.pdf

2) Nichersu I. (2014). Towards a Master plan: Support for Sustainable Development in the Danube Delta Biosphere Reserve

3) Van Assche K., R. Beunen, J. Jacobs, P. Teampau (2011): Crossing trails in the marshes: rigidity and flexibility in the governance of the Danube Delta, Journal of Environmental Planning and Management.

4) World Bank (2014). Vision Statement Danube Delta Region (2030) Danube Delta Integrated Sustainable Development Strategy

5) European Commission (2015). Territorial Agenda 2020 put in practice - Enhancing the efficiency and effectiveness of Cohesion Policy by a place-based approach.

6) Gheorghiu D. (2014). Time Maps Website of Sfiştofca. www.timemaps.net/sfistofca

7) Voica M., C.Varzaru, C.Mandrescu (2015). Sfistofca, Danube Delta. Understanding traditional build heritage. DDNI, May 2015.

2017 Japan-Korea Rural Planning Seminar

Aspects of social vulnerability as seen in three hamlets of northern Tōhoku and central Kyūshū

Johannes WILHELM*

1. Introduction

While Japan is known as a "disaster prone country" the demographic change – that has been discussed at the 2015 Japan-Korea Rural Planning Seminar in Ishikawa – represents another factor that needs attention when talking about vulnerability, that is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor. (Turner et al. 2003:8074) Thus I refer to "social vulnerability" by meaning a setting (structure, process etc.) that makes a social system likely to experience harm due to exposure to stressors. The latter stressors can be natural disasters, but also demographic or ecological factors due to socioeconomic change are possible. It should be noted that vulnerability represents a dynamic concept and depends largely on the embedding of a given society and the complex processes occurring therein and its frameworks, such as the structural differences of social, cultural or institutional resources available. Because of this processuality, there are always shifting states of vulnerability. Resilience, on the other hand, refers to the ability of an individual or a group to overcome a vulnerable state. It arises from the (individual and collective) ability to mobilize resources to address more or less possible or imminent threats or calamity in order to compensate for (possible) damage and to restore lost functionality or adaptively respond to emerging conditions. This, for instance, can be adaptive institutional actions such as an affirmative adaption to expected situations as we will see later.

In my paper I will look at three case sites in two regions, Oshika peninsula in Miyagi prefecture and Aso in Kumamoto prefecture, to show some adaptive strategies undertaken by residents – both individually and as a community – to overcome a present or expected state of social vulnerability. I will also ask, if institutional adaption to challenge vulnerabilities is a top-down (administration driven) or rather a bottom-up process.

2. Cases

2.1 Case 1: Oshika peninsula

I start with the case from Oshika peninsula, a region severely hit by the 2011 tsunami (3.11), that I've been studying long before disaster. (Wilhelm 2005, 2009, 2013, 2016, Wilhelm & Delaney 2013) Although I could go very much into detail, however, as time is short, I have to be cursory. The Oshika peninsula represents the southern end of the Sanriku coast at the Pacific Eastern side of Tōhoku with her myriads of ria bays which provide excellent conditions for marine aquaculture such as oyster, scallop or sea-squirts, i.e. ascidian. Today, the coastal fishery sector in Sanriku is characterized by many small-scale operators – most often family-run and thus with a relatively high share of female and/or seasonally employed labor – which are organized within the local Fisheries Cooperative Association (FCA) branch. The impact of destruction after the quakes on 3.11 hit the Sanriku region severely. Virtually all fishing vessels and fishery facilities (ports, rafts for cultivation, etc.) had been destroyed by multiple tsunamis and most gear and facilities were lost. Further, the entire coastline subsided up to 1.2 meters (in Ayukawa at the tip of Oshika Peninsula) that is why wharfs had to be lifted to enable fishing and landing operations. In addition, the debris drifting in coastal waters as well had enforced a long-term interruption of fisheries operations.

My main focus will be laid on two coastal communities of Oshika Peninsula (Miyagi Prefecture), Yoriiso and Momonoura, respectively. Yoriiso, because I've studied this hamlet for more than 15 years, and Momonoura, because it is the only place where the so called Fisheries Special Zones (suisan tokku), a different fishery rights allocation that opens the local fisheries management for outside investors have been installed after disaster. We will see why the introduction of the Tokku seemed inevitable for Momonoura when looking at demographic details and different settings after disaster of the two hamlets.

Yoriiso has had a rather stable and balanced population before disaster whereas in Momonorura an out-migration of younger generations was observable. The latter might be owed to the relative vicinity of the urban area of Ishinomaki. The damage cased by disaster also differed considerably. Momonoura was virtually completely spilled by the waves, while in Yoriiso only the area at the harbor was affected. In 2013, however, we see a drop in overall fisheries population in both hamlets, but, in Momonoura the 'productive ages' are missing. When looking at the migration pattern observable on the regional meso-level we see that many residents within

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Ishinomaki moved from the remote coastal areas to the urban centers around Kanan and Kōhoku, especially from the Ogatsu and Oshika areas. This trend is also observable in Yoriiso, yet, not as intense.

Fisheries in both, Yoriiso and Momonoura, is mainly aquaculture, oyster in the latter and ascidian (sea-squirt) in the former. Whereas oyster cultivation could be resumed within a year after disaster, ascidian needs more than two years to grow. The producers of ascidian in Yoriiso thus carefully kept an eye on business partners (wholesalers) in the ascidian industry until summer of 2013, when the first products were ready for delivery. In 2010, seven of ten ascidians had been sold to South Korea, yet, in September 2013 the South Korean government imposed an import ban on marine products from Fukushima, Miyagi and Iwate prefectures. Since this the ascidian industry suffers from overproduction, and since 2016 about 10.000 tonnes of ascidian are being scrapped in Miyagi prefecture only to maintain prices. A case of a shifted state of vulnerability. On the other hand, it is interesting that the out-migration led to an increased share of accessible cultivation waters for the remaining shareholders, and many aged fishermen (in locally influential positions) have refrained to reconstruct their fishery activities since disaster, hence disaster led to an overall rejuvenation at least in Yoriiso. This is perhaps one factor why residents from Yoriiso refused to move out.

2.2 Nishiteno, Aso (Kumamoto)

I am conducting studies on social vulnerability in Aso since early 2016, thus before the earthquake. At that time I was member of the Institute for Japanese Studies at the University of Vienna (Austria) where village studies had been conducted in the Aso area in 1968/69. Based on household surveys on the family structure collected in the hamlet of Nishiteno half a century ago, I started to trace the residential changes since then. to find out more on spatial changes in kumi neighborhood mutual help organizations and changes in social life. Nishiteno was hit by several severe, yet, spatially isolated earthquakes in 1975, and was severely hit by two typhoons in the first half of the 1990ies. The spatial dissolution of the kumi groups had more to do with these physical events rather than by weakening social ties as far as I could observe during several stays since then. However, an institutional document (community rules) for members of the village revealed an interesting aspect in a combined view with statistics from the World Agricultural Census.

In the mid of the 1980ies a relative increase of the aged population was expected. Simultaneously, the community ruled were changed in 1986 in which stated, that male high-school students are to become full members of the community with all rights and responsibilities. Obviously, this institutional change represents an adaption to an expected vulnerable state, i.e. an ageing local population that is feared to loose its ability to conduct mutual help (in street construction, emergency etc.).

3. Conclusion

To conclude, local residents are able to cope with changed local situations due to natural harzards or socioeconomic factors. However, as we have seen in the case of post-disaster ascidian aquaculture, the local setting is embedded in a global web of relations, which, in turn, is difficult or virtually impossible to challenge by local actors. Furthermore, disaster does not unconditionally mean the breakdown of local society, but, rather needs to be seen in larger contexts at least beyond the physical level of construction. Disaster or external factors such as economic/social/technological etc. development can trigger further vulnerabilities or even lead to a de facto loss of local autonomy if a social system loses its basic functions.

References:

1) Turner, B. L. II, Roger E. Kasperson, Pamela A. Matson, James J. McCarthy, Robert W. Corell, Lindsey Christensen, Noelle Eckley, Jeanne X. Kasperson, Amy Luers, Marybeth L. Martello, Colin Polsky, Alexander Pulsipher, and A. Schiller, 2003, A framework for vulnerability analysis in sustainability science, Proceedings of the National Academy of Sciences (USA) 100:8074-8079.
2) Wilhelm, J. H., 2005, Traditional Ecological Knowledge in the Beliefs of Japanese Fishing Villages. With Special Reference to Yoriiso (Miyagi) and the Sanriku Region, Japanese Religions 30:21-53.
3) Wilhelm, J. H., 2009, Ressourcenmanagement in der japanischen Küstenfischerei, PhD thesis, University of Bonn.
4) Wilhelm, J., 2013, Der Wiederaufbau der Fischerei Sanrikus zwischen Sonderzonen und Fischereigenossenschaften, Pages 625-650 in Verena Blechinger-Talcott, Christoph Brumann, and D. Chiavacci, editors, Ein neues Japan? Politischer und sozialer Wandel seit den 1990er Jahren, Peter Lang, Bern, Berlin, Brüssel, Frankfurt a.M., New York, Oxford, Wien.
5) Wilhelm, J., 2016, Schools in remote areas of Japan. Challenges for youth, parents and community, Pages 19-34 in Assmann, S., editors, Sustainability in Contemporary Rural Japan. Challenges and opportunities, Routledge, London, New York.
6) Wilhelm, Johannes, and A. Delaney, 2013, No Homes, No Boats, No Rafts: Miyagi Coastal People in the Aftermath of Disaster, Pages 99-124 in Gill, Tom, Brigitte Steger, and D. H. Slater, editors, Japan Copes with Calamity: Ethnographies of the Earthquake, Tsunami and Nuclear Disasters of March 2011, Peter Lang, Oxford, Bern, Berlin, Bruxelles, Frankfurt am Main, New York, Wien.

2017 Japan-Korea Rural Planning Seminar

Land use change in 100 years and increased disaster risk.

Flood Disaster in Joso city, on the Kinu River caused by Kanto-Tohoku heavy rainfall in September 2015.

Ikuko IMOTO*, Tomohiro ICHINOSE**, Satoru ITAGAWA***, Yumi YAMADA*

1. Introduction

In September 2015, Kanto-Joso area by the Kinu River had experienced a widespread flood inundation, caused by overflow and levee breach, after a severe rainstorm in northern Kanto area, nearly 650mm from Sep 7th to 11th. By that flood of the Kinu River, claimed the life of 2 persons and caused about 4,400 houses to have floor level inundation, and also 6,600 houses under floor inundation.

Joso area, placed about 30 to 50 km from Tokyo, was a flat agricultural region with paddy rice fields, before 1960th. Historically, the Kinu River flooded many times, so that villages and roads were placed on the natural levees and river bank dunes. However, in late 20th, after reinforcement of the river control and development of Tsukuba New Town in the adjacent area, this area has become a suburb of Tokyo and Tsukuba city. We examined the change of the land use and the estimated amount of damage by the natural disaster.

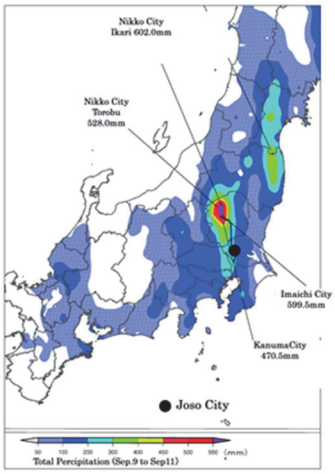

Fig.1 Total rain fall amount, from 9th to 11th Sep. Heavy rain fall at Upper basin or the Kinu river . (The Meteorogical Agency[6])

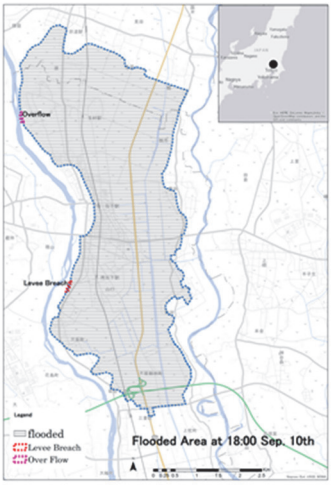

Fig.2 Flooded area at 6pm. 10th Sep. (Traced from the flooded area map by Geospatial Information Authority of Japan [2])

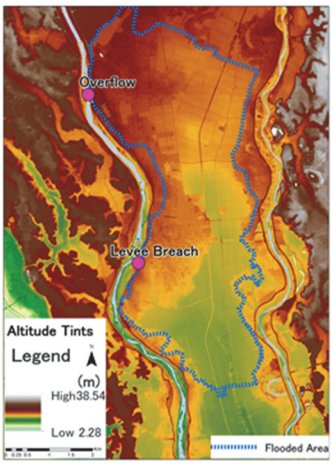

Fig. 3 Landform of the area, (Made from 5m DEM data by Geospatial Information Authority of Japan)

2.Methods

We analyzed land use changes in the flooded area of Joso City from 1907 to 2015 using old topographical maps and vegetation maps. The publication year of the topographical map is 1907 and 1953, the oldest one and the one just after the World War II. For recent land use change, we used the vegetation map published by Ministry of the Environment, since 1973. There are two vegetation maps in the area, namely the old one drawn on a scale of 1:50,000 in 1981 and the new one on a scale of 1:25,000 in 2000. We classified nine land use types from these maps. As for estimation of the disaster-affected area, we used the flooded area of Sep.10th 6 pm, to know the direct influence of the breach and overflow, while the inundated area of Joso City changed within 3 to 4 days according to elevation and drainage of the area.

3.Results and Conclusion

Fig-4 showed that urban land use of the area had not increased much from 1907 to 1953. Also, in those days, the Kinu river was an essential element for ship transportation. Therefore, the towns and villages were placed near the river and on natural dikes or sand hills. Paddy rice field placed at low elevation flat in those time. The dry fields of the area were for many kinds of crops, wheat, barley, mulberry, and upland rice[4].

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After the high economic growth periods of 1960's, urban land use of the area increased and spread widely to the dry fields. Moreover, rice field also spread into the dry field area following the improvement of the cultivation and the irrigation system of rice field.

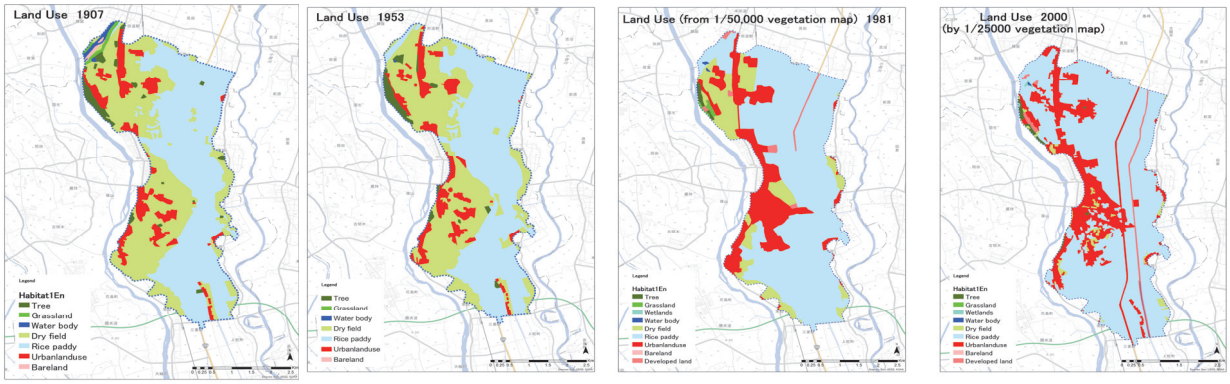

Fig.4 Land use transition from 1907 to 2000

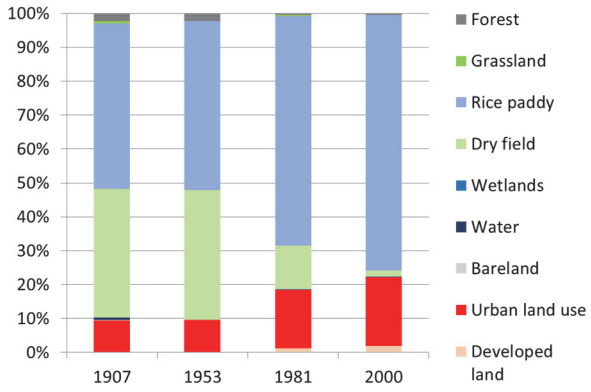

Fig.5 Land use ratio from 1907 to 2000

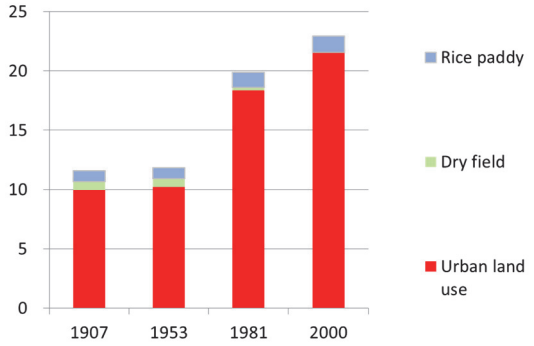

Fig.6 Disaster damage, estimated from land use of the flooded area, in 2015

We estimated the economic loss of the disaster from the flooded area in 2015 and the land use of each year. Fig. 5 shows the land use ratio of the four years. Urban land use was only 9%, 10%, 17%, and 20% in 1907,1953, 1981, and 2000, respectively. Conversely, agricultural use (rice paddy and dry field) decreased after 1953. Then the estimated total disaster damage increased from about 11.6 billion yen in 1907 to 22.9 billion yen in 2000 (Fig.6).

References:

1)Geospatial Information Authority of Japan (ND): Information of the Kanto-Tohoku heavy rain disaster. Retrieved Nov.9, 2017 from<http://www.gsi.go.jp/BOUSAI/H27.taihuu18gou.html>

2)Geospatial Information Authority of Japan (ND): Estimated flood area by Kanto-Tohoku heavy rain in Joso area(18:00 10th Sep.2015), Retrieved Apr. 6, 2017 <http://www.gsi.go.jp/common/000107660.pdf>

3)Ichinose, T. (2016): 2011 Tsunami Disaster and Ecosystem-based Disaster Risk Reduction, Keio SFC Journal, Vol.16, No1,8-25

4)Ishige Cho-shi Hensan Iinkai (ND): Ishige town history (in Japanese), Retrieved Nov.9, 2017 from Digital museum of Joso City,<https://trc-adeac.trc.co.jp/WJ11D0/WJJS05U/0821105100/0821105100600030?dtl=all>

5)The Meteorological Agency (2015): Report of Kanto-Tohoku heavy rainfall, Sep. 2015, Retrieved Nov.9, 2017 from<http://www.data.jma.go.jp/obd/stats/data/bosai/report/2015/20150907/jyun_sokuji20150909-11.pdf>

6)The Meteorological Agency (2015): The meteorological report of the disaster, 2015, Vol.1, Retrieved Oct 31, 2017. from<http://www.jma.go.jp/jma/kishou/books/saigaiji/saigaiji_2015/saigaiji_201501.pdf>

7)Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism (ND): Flood Disaster Statistics 2015; Retrieved Aug.8, 2017 from <https://www.e-stat.go.jp/SG1/estat/GL08020103.do?_toGL08020103_&listID=000001176624&requestSender=estat>

2017 Japan-Korea Rural Planning Seminar

Economic evaluation of Green Infrastructure at Higashiōmi city, Shiga prefecture.

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1. Introduction

In recent years, environmental concerns such as global warming and air pollution have been widely taken up worldwide and at the same time their interest is rising. In Japan, the concept of taking nature as capital and the concept of green infrastructure, which is multiplied by the growing interest, has attracted attention. In the first place, green infrastructure is a concept developed in the latter half of the 1990s in Europe and the United States. Although there are various definitions of it, "efforts or concepts of social capital development, land utilization and disaster prevention using nature's forces and mechanisms" is general. In Japan as well, it is used in "government planning plan" etc. in the government plan in 2015, and it is getting more general.

In addition, Eco-DRR, which is one of the functions of the green infrastructure, has also garnered worldwide attention. This is a generic term for functions that mitigate the risk of people and their property being put at risk by preventing disasters and acting as a buffer zone for the impact from disasters. In response to unprecedented natural disasters frequently occurring due to climate change, there is also pointed out that green infrastructure is superior to gray infrastructure such as embankment in terms of its disaster reduction function and maintenance and maintenance expenses. In Japan, with her declining population, various discussions are also being done on land use laws to minimize disaster damage.

From the background as described above, the green infrastructure has attracted attention. However, the economic evaluation of green infrastructure has not been done much in Japan yet.

In this research, we will focus on Higashiōmi City in Shiga prefecture where floods occur frequently. Based on the concept of Eco Disaster Risk Reduction (Eco-DRR), we calculate the reduction rate of the damage caused by disasters when developing the green infrastructure in affected areas. In addition, we evaluate the reduction rate of disaster damage when people living in a high- risk areas migrate to areas with less disaster risk.

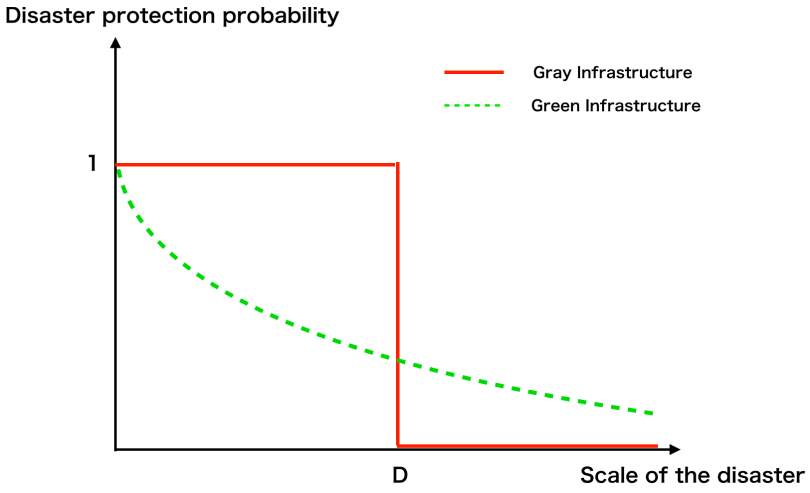

Fig.1 Assumption about disaster protection probability of both infrastructure

2. Methods

Regarding the survey method, we start from creating a habitat map, a hazard map, and a population forecast map on a mesh basis. First, we will prepare a Habitat Map (Land Use Map) for each age of Higashiōmi City based on an older topographic map and the vegetation map of the Ministry of the Environment to clarify the

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transition of its Habitat type (usage method). Also, for the Habitat in the hazard area, we will apply the same work using flood area and hazard map etc.

Then, we will combine them with figures of population estimation to infer the mesh where the hazard potential is high but the population is densely populated in the future. By doing so, we will know the mesh that will suffer damage in the future, so we will be able to create a Habitat map that can minimize the amount of disaster damage.

Also, in Shiga prefecture, since three kinds of maximum flooding depth data of flooding are indicated by probability for 10, 100 and 200 years, respectively, we can know changes types of hazard change by probability.

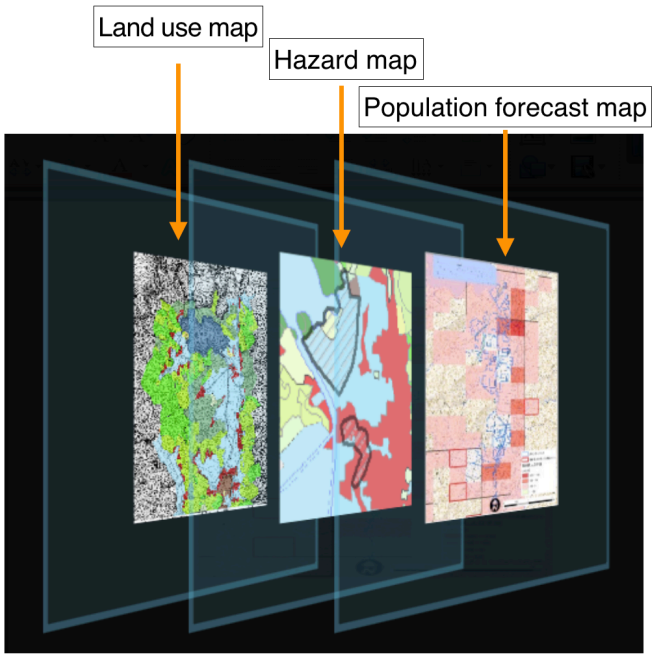

Fig.2 Research image

3. Expected results

Our hypothesis for this research is that the amount of disaster damage decreases in Higashiōmi City by introducing measures of green infrastructure instead of gray types. It is expected that this will be possible by setting the indicator of whether land use is appropriate based on the amount of disaster damage. Also, it is expected that comparison with gray infrastructure can be done on the basis of damage amount.

In addition, establishing this economic evaluation method increases the possibility that green infrastructure is actually used. If so, even if an unprecedented disaster occurs, the scope of its impact will be small.

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References:

1)Takaaki Nishida (2016) Regional creation with green infrastructure. Financial and financial business,14-18.
2)Takaaki Nishida et al. (2014) Trends and Issues in Economic Evaluation of Value by Natural Capital, Policy and Management Research vol.3,51-64.
3)Tomohiro Ichinose (2016) SFC journal, vol16.
4)Takaaki Nishida et al. (2015) Toward the development of green infrastructure in our country, Policy and Management Research vol.1,46-55.
5)Ayumi Ohnuma (2017) Economic aspects of ecosystem infrastructure, unpublished
6)Kentaro Taki et al. (2010) Design of flood disaster-reduction system in a floodplan of small-medium sized rivers, River technical papers, vol.16.
7)Wang et al. (2017) Eco-DRR evaluation in Mikata Lake, Keio University Graduate School of Media and Governance, master's thesis, unpublished.
8)Tomohiro Ichinose (2015) Disaster risk reduction based on green infrastructure in rural landscapes of Japan amid population decline, Rural Planning Society,Vol.34, No.3.