HSC003-01   Room:201A   Time:May 26 14:15-14:40

Collaboration of Human Geosciences and IHDP-Japan for the Grand Challenges of ICSU

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ICSU (International Council for Science) announced an international decadal research guideline for global sustainability called Grand Challenges in October 2010. An important feature of the Grand Challenges is its strong emphasis on the collaboration of natural and social sciences in its five proposed challenges, namely forecasting, observing, confining, responding and innovating. IHDP (International Human Dimensions Programme) is expected to play a major role in these challenges, as it has been the core of the socio-economic studies related with global environmental problems from its start. The present paper discusses what IHDP-Japan should do for the successful implementation of the Grand Challenges in cooperation with the human geosciences community in Japan.

Keywords: IHDP, Grand Challenges, sustainability, ICSU, human dimensions, human geosciences

HSC003-02   Room:201A   Time:May 26 14:40-14:55

Resilience of farming households to the Indian Ocean Tsunami Disaster in Tamil Nadu, India

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   In the morning of 26th December 2004, a large scale earthquake that occurred in Indian Ocean and caused tremendous damage to the eastern coastal area of India. In India alone, the earthquake casualties reported were more than 16,000. Most affected coastal areas were Tamil Nadu, Kerala, Andra Pradesh, and Andaman and Nicobal Islands. In Tamil Nadu state, four districts were mostly affected, namely Nagapattinam, Cuddalore, Kanniyakumari. Among three districts, the damage by tsunami in Nagapattinam was largest with more than 7,000 casualties and 5,000 hectares of agricultural lands. It is of primary importance for government and communities to consider how and in what way the affected people and communities in coastal ecosystems recover from a huge disaster such as tsunami.

   This paper investigates the magnitude of income shocks and their recovery of tsunami affected households during the post-tsunami period 2005-2008 in Nagapattinam District, Tamil Nadu, India. We focus more on mid-term recovery and changes rather than short-run recovery immediately after the tsunami. Most farmers suffered from decline of income and assets immediately after tsunami. During the 2004/05 planting season, our estimate indicates that farming households saw their income drop by as much as 30 percent. By 2007/08 agricultural season, households showed a near complete recovery of their incomes. After tsunami, there is a major transformation of the livelihood from agricultural production to wage labor. The major coping strategies dominated by receiving aid, borrowing money for most households. Other coping strategies included consumption reduction followed by removing children from school.

   Our empirical approach is inspired by Carter, Little, Mogues and Negatu (2007) asset growth model that allows transitional dynamics and shocks to play explicit roles in determining the growth of household wealth. The empirical results showed strong growth convergence during post-tsunami period. During the post-tsunami period, nearly in all categories of nominal incomes, the recovery was observed. However, when the price increase is taken into account, the effect of the recovery become less obvious. Shock sensitivity analysis indicated that the access to factor markets such as aid received, access to credit market and access to labor market are an important household resilience enhancing factors in terms of income shock recovery. As the results, the speed of the recovery was different in biophysical environment and in social environment in tsunami affected area. Government needs to carefully monitor soil and water to suggest recovery of agricultural production and support disaster affected people by providing access to factor market so that they can recover from income loss quickly.

Keywords: Resilience, Tsunami, Factor Market Access, Sustainable Livelihood Approach, Social-Ecological System, India

HSC003-03   Room:201A   Time:May 26 14:55-15:20

The Inconsistency on Land use/cover and Spatial Plan: The Case of Jabodetabek Region, Indonesia

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The Jabodetabek Region is now known as a megapolitan region of Greater Jakarta. It is both demographically and physically the largest urban system in Indonesia. Although the central government has formulated a metropolitan Master Plan, but the spatial growth of Jabodetabek has generally been influenced greatly by the dynamic market and myopic view of sectoral government institutions. Furthermore, relatively fragmented spatial plans among the eight autonomous regions of Jabodetabek have made it difficult to solve collective problems and interests.

The spatial planning in Jabodetabek in the future will face a number of threats such as the lack of cross-regional, cross-sectoral, and cross-operator system of integrated spatial planning, low capacity of planners in predicting social tendencies and in understanding the interrelationship of bio-physical, social, economic, and political phenomena in spatial (interregional), vertical (global-national-regional-local), and structural dimensions.

This study aims to: (1) describe recent land use/cover in Jabodetabek Region, (2) Identify various types of land use/cover inconsistency compare to spatial plan, and (3) investigate institutional dimensions causing land use/cover inconsistency. Satellite images and GIS analysis were employed for LUCC analysis. Field and institutional factors investigation have been conducted. The land uses inconsistency have been common fact and technically becoming easier to be detected, but national and local authorities tend to fail to conduct concrete actions.

The land uses inconsistencies are not rooted from proverty issues (encroachment by the poor) but due to greedy elites groups, real estate developers (middle-higher class settlement developers) and weak law enforcement. Many of the conflicting areas are the areas under the authority of central government (forest areas and land use permits for large plantation). The local government has very limited authority on spatial arrangement (land use management) and have low capacity on implementing spatial plan and fail to conduct effective monitoring and controlling system.

Keywords: land use/cover change (LUCC),, spatial plan, Jabodetabek megapolitan., inconsistency

HSC003-04   Room:201A   Time:May 26 15:20-15:35

Characteristics of Urban Expansion in the Yangtze River Delta in a High Economics Growth Period

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In this thesis, the comparison of Wuxi and Kunshan is studied as a horizontal relation and commonality and heterogeneity of urban expansion patterns are clarified. To be more specific, regional and interannual characteristics of the entire Wuxi and Kunshan area are classified through a cross functional comparison and each characteristic of the new city and development zone types are further emphasized. First, it is quantitatively analyzed by dividing it into four time periods and four quadrants to see how developments focusing on housing and industry are reflected into land. Next, suburban areas are extracted from the entire city area, its expansion process is revealed, and then the land use change is quantitatively elucidated based on the composition ratio of water area, agricultural and forest sites, and land for urban use. The background producing heterogeneity is analyzed with statistical data and the background peculiar to both cities is also sought. Furthermore, common characteristics between both cities and the background of common social systems and economic development are extracted.

Keywords: Urban-rural coupling regions,, New city, Industrial estate, Land use change

Rainfall Variability and Farmers' Resilience in Semi-Arid Tropics of Zambia

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Risk coping and consumption smoothing in rural areas of developing countries, where people's livelihood is often subject to various risks, have been well documented. However, the literature has not properly considered the time required for households and/or individuals to recover their level of consumption. To address the lack in the literature, we have incorporated the time dimension in the process of recovery from a shock in this paper. For this purpose, we have adapted the concept of resilience from ecology and define it in the context of consumption smoothing. Moreover, unlike most previous studies on consumption smoothing, we utilize weekly data collected before and after a covariate shock so as to provide empirical evidence of resilience.

In this paper, we provide an empirically workable definition of "resilience" at the household level. Resilience is based on the measurement of household food consumption per capita and is defined by the speed of the recovery of food consumption from a shock. Then, following the definition, we empirically estimate resilience using data collected in a rural area of Zambia, where its rain-fed agriculture is highly affected by rainfall variation. In this particular dataset, a heavy rain took place in December 2007. Resilience is measured as the speed of consumption recovery after the heavy rain shock.

Our panel data analyses reveal that the heavy rain caused a shock, i.e., reduction of food consumption, among the sample households, and it took almost one year for them to recover from the shock. Our analyses also show that household assets, such as land and livestock, have a positive effect on enhancing resilience. Then, dividing the sample into rich and poor groups based on the value of cattle holdings, we conducted similar analyses for each group separately and found that households in the rich group were more resilient than those in the poor group. The results indicate that some poor households that lack sufficient assets may not be able to recover consumption. Moreover, it is found that households in the poor group were more sensitive to the rainfall shock: they reduced consumption more quickly after the shock than did those in the rich group. We do not indicate in this paper how the sample households recover their consumption from the shock such as labor supply and livestock sales. Incorporating those coping behaviors is our next research topic as we have enough data to do it.

Keywords: rainfall variability, shock, resilience, farm household, sub-Saharan Africa, Zambia

HSC003-06 Room:201A Time:May 26 16:00-16:15

Land use cover and change in counter-urbanization region in India

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Rapid urbanization in India has moved from the large (Class I) cities to Class II cities (between 100,000 and 1 million inhabitants) such as Mysore in Karnataka. Those cities experienced a steep growth in population between 1991 and 2001. It has triggered a diverse structural growth at the fringe, the suburbs and also in pockets beyond the city limits. Mysore serves as an example to highlight urbanization trends of a Class II city. It is a case study to understand the impact on land use and urbanization beyond the city limit. *Land grabbing* and out-migration of city people is gradually causing a process commonly termed as a *counter urbanization*. Relationships and conflicts that develop between the various players in such counter urbanization are the main points of discussion.

In this study, we would like to describe the land use cover and change in suburban area in Mysore, Karnataka, India as a counter urbanization.

Keywords: Land use cover and change, counter-urbanization, Mysore, India

HSC003-07   Room:201A   Time:May 26 16:30-16:55

Risk analysis of impacts of a cyclone disaster on rice-fish farms in Bangladesh

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Scale expansions and route changes of cyclones are part of extreme events caused by global warming. The simulation analysis of overflows of dikes using exceedance probability is a typical example of impact analyses of high tides by cyclones on infrastructures. In this research, risks of cyclone disasters on rice-shrimp cultivation farms and rice-open fish farms are analyzed by Value at Risk (VaR). If a person owns a portfolio for a certain period, the VaR is the maximum loss value of the portfolio under a given probability.

Cyclone Aila landed near the border between India and Bangladesh causing a major catastrophe for residents in the region. Farm surveys were conducted in the Koyra upazilla of Khulna region in Bangladesh for evaluation of impacts of cyclone disasters on rice farmers. The data of costs and quantities of rice cultivation in the dry season (Boro) and incomes of side-jobs in 2009 were collected through the farm surveys. The total number of surveyed farms was 84 and 23 of these farms were damaged by the cyclone. Farms which were not damaged by the cyclone also have not cultivated rice by the dike breaks since rainy season in 2009.

First, basic statistics such as averages, standard deviations and correlation coefficients of incomes of in the rice and fishery sectors are calculated. Furthermore, VaR of 95% of the rice-shrimp cultivation farms and the rice- open fishing farms are calculated based on the standard deviation of the portfolio, i.e., joint income, of the two sectors. These statistics and economic indices show that average income of rice-shrimp cultivation farms is negative, and the risk of the rice-shrimp cultivation farms evaluated by VaR is greater than that of the rice-open fishing farm.

Second, weighted averages, standard deviations, correlation coefficients, and VaRs are calculated due to considering the case without the cyclone disaster on the farms. The production is the weight of the rice sector and the income is the weight of the fishery sector in this calculation under the data limitation. The ratios of the simple value of the VaR by the weighted value of the VaR are 3.69 for the rice-shrimp cultivation farm and 5.16 for the rice-open fishing farm respectively.

The absolute value of the VaR of the rice-shrimp cultivation farm is larger than that of the rice-open fishing farm; however, the joint income risks faced by the rice-open fishing farm evaluated by the VaR expanded under the impacts of the cyclone disaster due to the higher correlation between rice and fishing sectors. Currently, some NGOs are promoting shrimp cultivation to rice farmers which incurred damages by from the cyclone. The further dissemination of shrimp cultivation in the coastal region is important for the dispersion of the risk caused by climate changes.

Keywords: Cyclone, Risk, VaR, Rice-fish farm, Bangladesh

Land-use change detection using characterizing temporal vegetation dynamics in Java Island, Indonesia

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Land-use and land-cover change is recognized as one of major drivers of global environmental change through its interaction with climate, ecosystem processes, biogeochemical cycle, biodiversity and human activities. Improving the understanding of land-use and land-cover change is a major research challenge for the human-environmental sciences and is essential for many aspects of global environmental research.

Monitoring land surfaces in both space and time, at appropriate seasonal and inter-annual scales, allows characterization of temporal vegetation dynamics, and it leads to a broader view of land-use and land-cover change. In tropical regions, e.g. Java Island, agricultural lands might undergo a sequence of covers through the year, where the sequence is repeated year after year following the seasons. They are eventually describing the characteristic of the lands which could be reflected by variation of the vegetation attributes, either the vegetation index (VI) or leaf area index (LAI). In that example, attributes of the land surface are: vegetated, bareland, and inundated, which is defined as land-cover. On the other hand, land-use type in which describes the purpose of land is the paddy-rice field.

The study explored the use of multi temporal MODIS product, MOD13Q1, 16-day composite data from 2001 to 2007. Even if, an issue about the availability of sufficient quality of data sets had been arising out of the time-series analysis of MODIS data, but wavelet function application was successful to decompose and de-noise the vegetation index profiles, so that the planting, heading and harvesting dates of some land covers can be obtained.

The characterizing land surface in this study based on available imagery which was not necessarily coincident with temporarily land-cover when employ a single date image. Temporal vegetation dynamics would provide sufficient information of the use of land; meanwhile the single date image interpretation is not sufficient to identify the actual land-use change type because of insufficient change event documentation.

We identified many significant changed patterns during 7 years, and then discriminated into several types. Hereafter, those significant patterns are defined as a land-use change. The temporal pattern analysis was able to detect the actual timing of change event, either by conversion of land-use or vegetation growth; however, such outstanding capability of the method in this research was limited due to mixtures of land covers in MODIS data of which spatial dimension are 250m by 250m.

The results showed the need to evaluate effectiveness of the method in several sites where changed pattern were detected, but actually land uses have not changed, e.g. the changed pattern in paddy-rice fields. In that case, the cropping system changed, from triple cropping system to double cropping system, and delaying of seedling stage have caused the change of the temporal patterns and identified as a land-use change.

The land-use change in Java was successfully detected by temporal pattern analysis; nevertheless, the results were still included the temporary changes of phenology phenomena, particularly as an impact of the long-term dry season. However, the calculation of land-use change excluded the trajectories of phenology could increase the accuracy of results. The result showed the rate of the land-use change in Java about 3467.11 ha per year. The next stage of research, we will perform a field survey with more attention to the kind of social-economic aspects and the mechanism of those changes.

The understanding of the important transition rules of land-use change will assist further research in understanding the dominant process of land-use change allocation and to take it into consideration when land-use change models are made.

Keywords: land-use change, temporal vegetation dynamics, MODIS, wavelet transform, Java Island, Indonesia

HSC003-09   Room:201A   Time:May 26 17:10-17:35

CLIMATE CHANGE AND URBAN HEAT ISLANDS IN KOLKATA METROPOLITAN REGION

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Climate in Kolkata has changed in the last fifty years. After examining the different parameters, the study found the decadal and long term changes in the micro-climate. The surface air temperature over Kolkata has shown an increasing long term trend. The change has been first noticed when an unprecedented growth of population was observed after the independence. In 1951, the number was 2, 544, 677 which has increased to 4, 580, 544 in 2001. More the population means more the need of land. This led to the encroachments of open green spaces for the development of settlements. Subsequently, the land use pattern keeps on changing and the green city turned into concrete city. To support millions of livelihood, industrial development brought a new era of urban expansion. The residential area increased from 79.87 in 1991 to 90.23 percent in 2001. As the city expands in one hand, 83.56 sq. km in 1951 and 187.33 sq.km. in 2001, it degrades environment on the other. Metro city becomes more problematic with growing motor vehicles and public transport on road which is about 9,48,000 registered vehicles in 2006. The speedy growth choked the city environment with black smoke. Pollution levels increased in last decade in a tremendous and uncontrollable way. Limits of SPM concentration in residential region have crossed the annual average. Thus, this increase in pollution level reinforced the local climate to vary substantially. This sign of climatic variability becomes visible when survey was undertaken. Climatic data from 1951-2010 and pollution data of last fifty-five years 1951- 2005 has been examined to get the trend of climatic change with increase in pollution level. The GIS technique has been applied to derive the heat island intensity map. By considering these trends and map, a difference can easily be delineated between the diurnal and monthly temperature of the city with its surrounding regions. The formation of heat island in the localities of Kolkata like, Behala, Dunlop bridge, Cossipore etc. proves the change of climate in Kolkata Metropolitan Region. The ultimate consequence of this change is the environmental degradation. With a wide ranging potential impacts of climate change, a precautionary approach have been taken that seeks to decrease greenhouse gas emissions substantially, including the introduction of energy efficient and renewable energy technologies. The perturbations and disturbances occur across space and time. Thus, the study attempts to make Kolkata as carbon resilience mega city.

Keywords: Climate change, Urban pollution, Urban Heat Islands, Carbon resilience, Kolkata mega city, India

HSC003-10   Room:201A   Time:May 26 17:35-17:50

Desertification control and sustainable use of ecosystem services in drylands of the Northeast Asia

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People's livelihoods in drylands rely highly on ecosystem services to provide their basic needs. Dryland ecosystems, however, are extremely vulnerable to over-exploitation and inappropriate land use. Poverty, political instability, deforestation, overgrazing and bad irrigation practices can all undermine land productivity. Recently it has been also emphasized that desertification is deeply associated with biodiversity loss and contributes to global climate change. As the causes, effects and possible policies are strongly interlinked among those issues, multiple benefits could be obtained with increased effectiveness through joint implementation of the three Rio Conventions and further strengthening of synergies based on environmental management approaches. One of the key findings of the Millennium ecosystem assessment scenarios was the importance of a proactive management approach to coping with desertification. Applying desertification early warning systems based on land vulnerability assessments may be one of the most effective preventive actions at both fine and broad scales. However, at degraded sites where land conditions have already shifted to alternate states, it will still be necessary to apply rehabilitative measures and promote restoration processes as a reactive approach. Recent studies have tried to develop methodologies to support decisions of local people on their "best choice" of most effective restoration measures based on both scientific evidence of restoration processes and careful consideration to re-construction of future sustainable land use, especially in Northeast Asia.

Keywords: desertification, ecosystem service, sustainable use, Northeast Asia, drylands

HSC003-11 Room:201A Time:May 26 17:50-18:15

Web-GIS based Outdoor Education Program

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Urbanization in recent years has reduced opportunities and places for children to play in their daily life while contacting with nature. Three ministries of Ministry of Education, Culture, Sports, Science and Technology, Ministry of Agriculture, Forestry and Fisheries, and Ministry of Internal Affairs and Communications started "Project for Interaction in Farming and Fishing Villages" (2008) where elementary and junior high school students stay for one week or more at farming or fishing villages for outdoor activities. Based on the background mentioned above, this study, focusing on the importance of encouraging outdoor activities for children, aims to propose and implement a Web-GIS based outdoor education program especially for elementary schools, which will then be evaluated by users.

The example taken by the study is the second school for fifth graders (45 students in FY 2009) at Honjuku Elementary School in Musashino-shi, Tokyo that kindly gives cooperation to the study. The elementary school provides seven-night outdoor activities called second school for fifth graders, and two-night activities called pre-second school for fourth graders as preparation for the second school. In 2009, the second school for fifth graders was given mainly in Iiyama-shi, Nagano from September 29 to October 6. A survey conducted on the usage of the Web-GIS found that the computer room was well equipped and available to 40 students a class, while many of teachers in charge had not used the GIS and Web-GIS before.

The study proposes implements and evaluates the outdoor education program in the eight steps. As a part of the study, the authors had participated, as an instructor, in the second and pre-second schools organized by Musashino-shi since 2008, and accompanied fourth graders to the pre-second school in 2009. Based on these experiences, main objectives of the outdoor education program are "conducting a class related to experiences during the second school", "operation of outdoor activities (risk management)" and "briefing for students' parents about outdoor activities", for which the Web-GIS was used. Specifically, the usage of the Web-GIS includes preparation of teaching and briefing materials and description of how to operate, and operation of the outdoor education program was done. Learning and briefing materials, of which example were prepared with chiefly using the Web-GIS.

The outdoor education program proposed was evaluated by its users (teachers, instructors, students and their parents) after its operation. Specifically a face-to-face interview for teachers and questionnaire survey for instructors, students and their parents were conducted between September and November 2009 for the evaluation of the program. The questionnaire surveys of students and their parents were implemented both before and after the second school. Though the program generally received a good evaluation, the results of evaluation by the users (teachers, instructors, students and their parents) provided clearly show issues to be solved from the viewpoint of teachers in particular. These include:

(1) Establishment of the GIS and Web-GIS that will easily represent teaching materials developed by teachers

1) Establishment of facilities/system that allow quick use at a classroom

2) A written guide for learning about the GIS and Web-GIS, as well as widespread of packaged software providing easy accessibility

(2) Improved significance of the use of the GIS and Web-GIS for their widespread

1) Increased number of examples of actual use in a class

2) Training session given to instructors-to-be, and technical guidance provided to teachers

3) Development of personnel with capabilities to give a briefing on the purpose of introducing the GIS and Web-GIS to chiefs (principal and chairman of a school board)

Keywords: Outdoor Education Program, School Education, Elementary Schools, Web-GIS

HSC003-12   Room:201A   Time:May 26 18:15-18:30

General Discussion on IHDP Research Strategy

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A general discussion is held on IHDP Research Strategy based on the presentations in the IHDP International Session.

Keywords: IHDP, Grand Challenges, sustainability, ICSU, human dimensions, human geosciences