

Identifying land use changes and the related problems in northern states of India Identifying land use changes and the related problems in northern states of India

氷見山 幸夫^{1*}
HIMIYAMA, Yukio^{1*}

¹ 北海道教育大学
¹Hokkaido University of Education

India has been experiencing an accelerating rate of socio-economic changes in the last three decades and their interaction with the land and its changes to date and in the near future are a great concern of this rapidly growing country. However, the study of the change of the use of land and land-related problems has not been sufficient, particularly for the period including 1980s. The present study is to identify land use changes and the related problems in some selected areas in northern India from the 1980s.

キーワード: India, land use change, socio-economic change
Keywords: India, land use change, socio-economic change

ボルネオにおける住民の生態系サービス利用を決める社会的・生態的要因 Variation in the use of ecosystem services by local people in Borneo: Social and ecological factors

酒井 章子^{1*}; Choy Yee Keong²; 小泉 都³; 岸本 圭子⁴; 高野 (竹中) 宏平⁵; 市川 昌広⁶; 鮫島 弘光⁷; 加藤 裕美⁸; 祖田 亮次⁹; 潮 雅之¹⁰; 西前 出¹¹; 中静 透⁵; 市岡 孝朗¹²
SAKAI, Shoko^{1*}; CHOY, Yee keong²; KOIZUMI, Miyako³; KISHIMOTO-YAMADA, Keiko⁴; TAKANO, T. kohei⁵; ICHIKAWA, Masahiro⁶; SAMEJIMA, Hiromitsu⁷; KATO, Yumi⁸; SODA, Ryoji⁹; USHIO, Masayuki¹⁰; SAIZEN, Izuru¹¹; NAKASHIZUKA, Tohru⁵; ITIOKA, Takao¹²

¹ 京都大学生態学研究センター, ² 京都大学大学院経済学研究科, ³ 京都大学大学院農学研究科, ⁴ 東京大学大学院総合文化研究科, ⁵ 東北大学大学院生命科学研究科, ⁶ 高知大学農学部, ⁷ 京都大学東南アジア研究所, ⁸ 京都大学白眉センター, ⁹ 大阪市立大学文学部, ¹⁰ 龍谷大学理工学部, ¹¹ 京都大学大学院地球環境学堂, ¹² 京都大学大学院人間・環境学研究科

¹Center for Ecological Research, Kyoto University, ²Graduate School of Economics, Kyoto University, ³Graduate School of Agriculture, Kyoto University, ⁴Graduate School of Art and Sciences, The University of Tokyo, ⁵Graduate School of Life Sciences, Tohoku University, ⁶Fucluty of Agriculture, Kochi University, ⁷Center for Southeast Asian Studies, Kyoto University, ⁸The Hakubi Project, Kyoto University, ⁹Graduate School of Literature and Human Sciences, Osaka City University, ¹⁰Faculty of Science and Technology, Ryukoku University, ¹¹Graduate School of Global Environmental Studies, Kyoto University, ¹²Graduate School of Human and Environmental Studies, Kyoto University

非木材林産物は、森林によって供給される重要な生態系サービスの一つであるが、その利用は、世界のいろいろな地域で減少傾向にある。森林生態系の減少や劣化などがその潜在的要因の一つだが、貨幣経済の拡大など社会・経済的要因も深く関連していると考えられる。森林の減少・劣化が住民に与える影響を評価するためには、定量的なデータを用いて、生態的要因と社会的要因を同時に検討する必要がある。

本研究では、ボルネオ島マレーシア・サラワク州における住民の非木材林産物利用の有無や頻度のばらつきがどのような要因で説明できるのかを分析した。総合地球環境学研究所プロジェクト「人間活動下の生態系ネットワークの崩壊と再生」では、サラワク州の主要河川であるバラム川・ラジャン川流域の89村において質問票調査を行い、各村16?20世帯の非木材林産物利用などを調べたほか、村の代表者から村の社会的環境や状況についての情報を得ているので、このデータを利用した。周辺の森林の状況については、すでに公開されている衛星データに基づく土地被覆図から森林の割合を算出した。

空間的自己相関を考慮したベイズモデルを用いて分析した結果、森林が減少すると利用が減ることが、いくつかの林産物で示唆された。また、経済的な要因も重要であったが、その影響は林産物の種類によって異なっていた。例えば、経済的に豊かな世帯では狩猟動物、野生果実の利用は増えるが、薪の利用は減る。このような違いは、住民にとっての林産物の価値と関連していると考えられる。

この研究では、林産物利用に、社会的・生態的要因双方が影響を与えていることを明らかにした。このように、生態系の改変や劣化が住民に与える影響を評価するには、社会学者、経済学者など異分野での共同研究が必要であるが、そのような試みはまだ始まったばかりである。

キーワード: 生態系サービス, ボルネオ, 熱帯林, 非木材林産物, 土地被覆
Keywords: Ecosystem services, Borneo, Tropical Forest, NTFP, Land cover

中山間地域の土地利用変化と集中豪雨による水害 —大分県竹田市の事例— Land-use change and flood disaster of semimountainous region -A case of Taketa City, Japan-

土居 晴洋^{1*}
DOI, Haruhiro^{1*}

¹ 大分大学
¹Oita University

1. はじめに

2011年3月に発生した東日本大震災による巨大な津波は、防波堤などの津波に対する備えがあった地域でさえ、大きな被害を発生させた。日本はこのような大地震ばかりでなく、その歴史において梅雨前線や台風による大雨による洪水と土砂災害を繰り返し経験してきた。本研究で考察する大分県竹田市では、この30年間に4度の大雨を経験し、そのたびに洪水と土砂災害が人的被害と住宅損壊、農地被害が発生した。竹田市は日本の西部にある九州島のほぼ中央部に位置する山間地域に位置する。竹田市は人口が減少し、高齢化が進展しているという点で、日本の典型的な山間地域の特徴を備えている。本研究の目的は、大雨による自然災害のうち、洪水に注目して、2012年7月に竹田市で発生した水害を事例として、その浸水状況と地形的条件、社会的条件の変化、土地利用変化との関連を考察する。

2. 2012年7月九州北部豪雨災害による竹田市の水害

本研究で考察する2012年7月九州北部豪雨は、7月3日から14日の間に大分県を含む九州北部地域に梅雨前線の活発化によって各地で斜面崩壊と河川氾濫が発生させた豪雨である。2012年7月九州北部豪雨において、竹田市は再び大きな洪水被害を受けた。7月は梅雨であるため、月初めから1日あたり数十ミリメートルの降水があったが、総雨量は大きくなかった。しかし、12日の3時から9時にかけて1時間あたり30?40ミリメートルの降水が続いた。わずか6時間ほどで、250ミリメートルに達する降水があったことから、稲葉川・玉来川両者ともに水位が上昇した。

ダムが完成していた稲葉川では堤防上端近くまで水位は上昇したが、幸いに越流することはなかった。しかし、玉来川では拝田原地区を中心に数カ所で洪水が発生した。拝田原地区では堤防上端から2.5メートルまで水位が上昇した。この災害においても、河川の上流域において多数の斜面崩壊が発生した。水位が上昇して、越流したことに加えて、これによる流木が河川に流れ下り、橋梁にかかって越流した。

3. 竹田市における水害と近年の土地利用変化

竹田市においては、河谷低地はこれまで水田を中心とする貴重な農業地帯であったが、近年の住宅や商業施設、公共施設は、河谷低地に立地する傾向がある。一方で、山間地域の農地は、人口減少と高齢化による農業の担い手不足のため、農地に植林を行うという土地利用変化も一般的である。竹田市においては、水害発生の原因や背景につながると思われる土地利用や社会的変化が進行してきた。

しかし、既にできあがった住宅の移転といった、既存の土地利用の変更を制度的に誘導することは、現在の日本の法制度では十分に行うことが困難である。特に、本研究が対象とするような中山間地域では、都市的土地利用に適した平地は非常に少ない。竹田市は災害が発生した7月12日を「竹田防災の日」と定め、市民に対する防災・減災意識の涵養にも力を入れ始めた。平地が乏しく、高齢化と人口減少が進行する竹田市においては、今後の防災・減災を実現するためには、市民の防災意識の向上を基礎として、市民生活の基盤となる流域の平地における土地利用のあり方について、これから議論が進められることが期待される。

キーワード: 中山間地域, 浸水範囲, 都市的開発, 人口減少

Keywords: Semimountainous region, Flooded area, Urban development, Population decrease

ラインタヤー地区の土地利用変化 Land use change of Hlaingthayar township, Yangon

春山 成子^{1*}
HARUYAMA, Shigeko^{1*}

¹ 三重大学大学院
¹ Mie University

This study is an attempt to highlight the land utilization development of Hlaingtharyar Township, one of the recently-built new towns in the suburbs of Yangon City and to check the drinking water quality condition for the new housing development area and industrial zones. Based on the assessment with relevant statistical methods and Geographic Information System, the resultant values are presented with diagrams and maps. The chief finding of this research work is the rapid development of the study area among the new towns of Yangon City because of its advantageous of geographic location and the presence of relatively larger industrial zones. The chief finding of this study is the rapid land use changes of the study area among the new towns of Yangon City because of its advantageous of geographic location and the presence of relatively larger industrial zones. When Hlaingtharyar Township was constituted in 1989, it had only 2,765 persons. After residential land plots were allotted, the population increased rapidly from 148,898 in 1994 to 391,765 in 2009, but slightly decreased to 374,698 due to the exclusion of people eligible for voting living outside the township. Comparatively the growth rate and the number of population of Hlaingtharyar Township are much greater than all the other newly built townships on account of locational advantage linking Yangon City and Ayeyarwady Division by the newly constructed bridges and roads. The rapid population growth implies to some extent, the improvement in the land use conditions of the study area. All the nine major types of land use including land use for primary production exist in this township. Unlike most other townships, the proportion of land use for industry is relatively high with 26.54 % due to the presence of industrial zones. Consequently 63.97 % of workers are engaged in the manufacturing sector, compared with 3.95 % in the government services sector and 10.47 percent in the trade and commerce sector. The average per capital income is Ks. 4,816 which is equivalent to a little over US \$ 5. With this indicator, it is well above the level of poverty measured by the UN's indicator of poverty. Although the township has more modern style multi-story residential buildings due to the presence of several housing projects, a greater proportion (43.63%) of houses are huts which appear slummy. Generally the pace of land use development is fairly high for a new township in the vicinity of Yangon City because of the presence of industrial zone which is the largest in Myanmar and due to its advantageous location as a gateway from Yangon City to the Ayeyarwady deltaic region. In this study, the large amount in calcium Ca²⁺ and sodium Na⁺ concentrations in the groundwater samples from the study may theoretically reflect local mineralogical changes in the sediments and in the carbon dioxide produced by biological processes in their surface layers. The high nitrate NO₃⁻ concentration in the water samples indicates that the shallow aquifer near industrial zone is already challenged by the problem of pollution. The high EC value is directly affected by tidal effect of river water from Panhlaing River.

キーワード: 土地利用変化, 人口増加, 都市化
Keywords: land use change, population growth, urbanization

流域レジリエンスの定量的評価：中国西北地方の黒河流域における事例 A Quantitative Assessment of Watershed Resilience: A Case Study of the Heihe River basin in Northwestern China

秋山 知宏^{1*}; カラジアリ²; 李佳³
AKIYAMA, Tomohiro^{1*}; KHARAZI, Ali²; LI, Jia³

¹ 東京大学大学院新領域創成科学研究科, ² 東京大学公共政策大学院, ³ 新潟県立大学国際地域学部

¹Graduate School of Frontier Sciences, The University of Tokyo, ²Graduate School of Public Policy, The University of Tokyo,

³Department of International Studies and Regional Development, University of Niigata Prefecture

The Heihe River Basin has been through significant transformation and the sustainability of its water network has been significantly altered by mankind as a result of historical agricultural activity and the more recent water infrastructure investments. While there are many studies examining the sustainability of the Heihe River Basin, most studies focus on single issue criteria and do not have a holistic system-level perspective. As sustainability is a system-level trait a system-level analysis is warranted. The objective of this study is to investigate sustainability of the Heihe River Basin through the ecological network analysis (ENA). We established a framework of the ecological network analysis that can be used to examine sustainability of a river basin. We collected detailed data from the flow network, such as precipitation, river discharge, groundwater storage change in the Heihe River Basin from 2000 to 2010. We also estimated evapotranspiration from different land uses based on the heat balance at the surface using the daily mean air temperature, relative humidity, and wind speed. Compared to previous studies (Li et al., 2009; Li and Yang, 2011), our study successfully combined hydrological model into the existing method of the ecological network analysis. The system-level metrics of the basin were measured and through these metrics the evolution of the basin was examined. Specifically through the metrics of efficiency, resilience, redundancy, cycling, and robustness, the long term effects of agricultural development and the more recent effects of water infrastructure investment in the Heihe River Basin. The proposed ENA methodology is significant in terms of ability to examine sustainability from several different key concepts such as efficiency, resilience, redundancy, cycling, and robustness. This method can be incorporated into existing decision-making support system for integrated water resources management in the river basin. We highlight the importance of combining the proposed ENA methodology into a framework of multi-criteria decision analysis, so called MCDA.

Keywords: Ecological Network Analysis, Sustainability, Resilience, Efficiency, Robustness, Water Resource Management

統合的アプローチによる乾燥地における人間活動と水循環との相互作用に関する研究
Integral Approach to Historical Interaction between Human Activities and Hydrological Cycle in Dryland

秋山知宏^{1*}; 李佳²
AKIYAMA, Tomohiro^{1*}; LI, Jia²

¹ 東京大学大学院新領域創成科学研究科, ² 新潟県立大学国際地域学部

¹Graduate School of Frontier Sciences, The University of Tokyo, ²Department of International Studies and Regional Development, University of Niigata Prefecture

This article proposes an alternative approach in sustainability assessment. The conceptual framework was developed by modifying Ken Wilber's All Quadrants, All Levels (AQAL) approach. To look at how our framework can facilitate the practice of sustainability assessment, we apply the framework to examine interaction between humanity and environmental changes in the Heihe River basin.

Historically, nomadic grazing was practiced in the arid areas of the basin and agriculture was practiced in the water-rich oases. Since the 1940s, however, large-scale development has been carried out for irrigation agriculture. However, the large-scale irrigation agriculture dried up the river and caused groundwater level decline in the lower reaches. In the 21st century, the Chinese Government has implemented water saving policies. The policy proposed several water efficiency measures, such as restriction of river water intake, more efficient water supply, introduction of more water-efficient crops, and prohibition of the reclamation of new farmland. However, problems have since emerged, such as disparity in the efficiency of water use attributed to economic inequality among farmers, a decrease in the groundwater recharge due to irrigation, and water saved by farmers being diverted to farmland newly reclaimed by agricultural corporations. It was reported in July 2002 that water had returned to the dried-up terminal lake of the river. Water balance analysis shows an increase in river discharge released to the downstream, but this was due to greater rainfall in upstream reaches. On the other hand, in downstream reaches where livestock farming has been practiced, vegetation conservation policies have been promoted, such as fencing of riparian forests, "ecological migration," and construction of feed bases. On grazing land, biomass has increased as a result of declining grazing pressure; and has also increased in the downstream areas as a whole, but due to farmland development and plantations rather than as a result of these policies.

The history of human/ecological interactions in the oases of the Heihe River Basin indicates that water deficiency resulting from increased human activities has traditionally been solved by sourcing water from outside the living sphere of the local people. In other words, people have solved the problem by expanding their system boundaries. It would be no exaggeration to say that advancements in civil engineering and other technologies have enabled this. However, globalization has expanded the current system to the limits of the closed system we call the Earth. Historically successful methods can no longer be used, and limiting our efforts to simply pursuing efficiency would only create new problems. It therefore is crucial to find new solutions.

The proposed approach enables us to investigate the environmental problems of the Heihe River basin in a four-quadrant framework, and combine the empirics of quadrants obtained from traditional disciplinary methodologies. The four-quadrant framework adopted in this study illustrates the interlocking relationships among various perspectives of environmental issues in the Heihe River basin, namely, physical perspective, personal perspective, cultural perspective, and social perspective. In particular, the protruding development (evolution) of the lower right dimension is the fundamental cause of the environmental degradation and its related social problems in the Heihe River basin. Compared to other established approaches in literature that emphasize on the tradeoffs of various perspectives of sustainability, our findings indicate the potential contributions of four-quadrant framework to sustainability assessment through its focus on the inter-relatedness/inter-connection of different perspectives.

Keywords: AQAL, Integral Studies, Sustainability assessment, Irrigation agricultural development, Water resources management, Culture

Administrative Discrepancies of Karnataka State Forest Department India, and its consequences at a Village level
Administrative Discrepancies of Karnataka State Forest Department India, and its consequences at a Village level

DAS, S. arun^{1*} ; KIMOTO, Koichi¹
DAS, S. arun^{1*} ; KIMOTO, Koichi¹

¹University of Mysore, ²Faculty of Foreign Studies, Setsunan University, Japan.

¹University of Mysore, ²Faculty of Foreign Studies, Setsunan University, Japan.

The administrative divisions to manage forest area in India are complex which is out of the understanding of the general public. There are overlapping administrative controls which are a good means of escapism from accountability and responsibility. There are three main divisions of forest which can be seen throughout India, such as Reserve Forest, State Forest and Social Forest. The social forest is developed out of the actual forest area and it is developed in the villages as village level forest. Whereas the Reserve forest and State forests share their boundary within the natural forest. The confusing and complex aspect of the reserve and state forest are, they also hold protected forest National Park Wild Life Sanctuaries and Tiger reserves. The real jargon is that, how all these sub divisions share their boundaries and also accountable is a matter of debate. In this context, the present paper focus on a micro level situation, where a village bounded by the Reserve forest, State forest and wild life sanctuary is a victim and is also a place of conflict in all respects, The complex administrative structure has been revealed in this paper and how to overcome these issues has been discussed.

キーワード: Forest, Administration, Management, Village, Wild Life, Karnataka
Keywords: Forest, Administration, Management, Village, Wild Life, Karnataka

The use of maps for disaster prevention - some lessons of the Great East Japan Tsunami Disaster
The use of maps for disaster prevention - some lessons of the Great East Japan Tsunami Disaster

氷見山 幸夫^{1*}
HIMIYAMA, Yukio^{1*}

¹ 北海道教育大学
¹Hokkaido University of Education

The increase of large scale disasters is becoming a major threat to our sustainable future, as the Great East Japan Tsunami of 11th March 2011 mercilessly showed. The paper discusses how the damages can be reduced by carefully making, reading and using relevant maps based on the lessons of the Great East Japan Tsunami Disaster.

キーワード: Great East Japan Tsunami, map, Future Earth, disaster, land use
Keywords: Great East Japan Tsunami, map, disaster, Future Earth, land use