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研究課題名(和文) Human Development Impacts of Infrastructure in developing countries: A Case of Nepal and Cross-country Studies

研究課題名(英文) Human Development Impacts of Infrastructure in developing countries: A Case of Nepal and Cross-country Studies

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研究成果の概要(和文)：主な研究成果は以下の通りである。1、中国とアルゼンチンで開催された2つの国際会議において、クロスカントリー分析による論文を発表した。2、後日、これらの論文はJICA研究所から出版される書物の一章として収録されることになっている。3、現地での世帯調査で収集したデータを分析し、現在、分析結果をまとめた雑誌論文の最終校正中である。4、シンガポールで開催された国際会議において論文を発表した。5、現在、関係する学術雑誌に投稿する準備を進めている。6、研究成果のすべては、世帯調査を実施したシンドゥパルチョク県の関係者に提示し、還元されている。

研究成果の概要(英文)：Main research achievements are summarized as follows. 1, A paper from cross-country analysis was presented at two international conferences in China and Argentina. 2. The paper was later published as a book chapter by JICA Research Institute. 3, Data collected from the household survey was analyzed and a journal paper is under revision. 4, The paper was presented at the international conference in Singapore. 5, The final version of the paper will be submitted to a suitable academic journal as soon as possible. 6, The overall research output was presented to the local stakeholders in Sindhupalchok district where the household survey was conducted. Local stakeholders, such as community workers, village development officers, district development officers, NGO workers and villagers highlighted the usefulness of this research and requested to extend the coverage of the research in future.

研究分野：開発経済学

キーワード：経済発展論 交通経済学 経済政策論 資源経済学 計量経済学

1 . 研究開始当初の背景(Study Background)

(1) It is a huge contrast in this rapidly advancing 21<sup>st</sup> century that there are a significant number of people around the world lack access to basic infrastructure. According to the World Bank (2015) estimates, there are 1.2 billion people do not have electricity and about 2.8 billion use solid fuel, such as wood for cooking. While 748 million people have no access to safe drinking water sources, nearly one billion people live more than 2 kilometers far from the motorable road, and internet access is limited to 60% of global population. Lack of access to the basic infrastructure itself can be defined as “infrastructure poverty” because basic human needs can be very difficult to fulfill without having access to infrastructure services in the contemporary world. Of course, there is a question of affordability and capability of utilizing the services (Hosono 2012); however, having access is the prime necessity (Briceno-Garmendia et al. 2004).

(2) Despite extensive policy discussion, there is limited empirical literature on the impacts of infrastructure variables on human development (HD) (Kusharjantoa and Kim 2011). Surprisingly, cross-country empirical works are quite rare. Thus, this study contributed to narrow down this research gap by exploring the impacts of access to different infrastructure services on HD using both cross-country data and micro investigation of households of remote areas of Nepal.

2 . 研究の目的 (Purpose of research)

(1) The main purpose of this research project was to find out the impacts of access to various infrastructure services on human development in developing countries.

(2) Apart from its scholarly contribution, this provided timely inputs to international development policy making. Because, the deadline of the current Millennium Development Goals (MDGs) is 2015 and international development stakeholders, led by the United Nations, are intensively engaging in formulating new international development framework with new development goals.

(3) In addition, this research is useful to the international aid agencies; such as Japan International Cooperation Agency (JICA), which has long been advocating for the key roles of infrastructure on development, and implementing aid

policies that put due priorities on infrastructure. Furthermore, the research findings are useful for policy makers of developing countries and donor communities alike to use their limited resources efficiently.

3 . 研究の方法 (Research Method)

(1) To achieve this objective, the study followed the multidisciplinary approach that considers theories and practices of various branches of social sciences. The study employed both quantitative and qualitative methods conducting a case study of rural Nepal through direct field work and the cross-country study of developing countries. It made an original contribution in the field of socioeconomic impacts of infrastructure; because there is rare cross-country empirical study and there is no country case study of Nepal of this kind.

(2) In case of cross-country investigation of the impacts of infrastructure on human development, the dynamic panel data estimation of General Methods of Moments (GMM) implemented by Kusharjantoa and Kim (2011) was used with some improvement. The panel data covered the period of 1995 to 2010 and 91 developing countries.

(3) In case of micro-analysis, the data was collected through the household survey of randomly selected 100 households of purposefully selected three remote villages and ten communities of a hilly mountainous district, Sindhupalchok, Nepal. Figure 1 shows the sample distribution by Caste/ Ethnicity and VDC, 2014. The survey followed the third Nepal Living Standard Survey (NLSS) questionnaire with some improvement to match the objectives of this study.

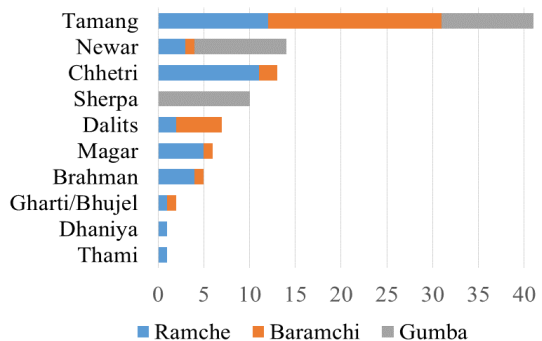


Figure 1. Sample distribution by Caste/ Ethnicity and VDC, 2014

Source: The Author

#### 4 . 研究成果 (Results)

(1) The cross-country analysis resulted that all the three infrastructure variables have significant positive impacts on HDI. However, access to electricity and access to water have positive and significant effect on education and health indexes only. On the other hand, road density is highly significant to increase the income index.

(2) These results clearly indicate the importance of infrastructure for the human development process. However, current UN lead discussion on post-2015 development agenda failed to incorporate infrastructure comprehensively, although energy and water are included among the 11 themes for discussion.

(3) Therefore, it is argued that only integrated goals and targets with interlinked strategies and policies, which should be based on a comprehensive assessment of the whole infrastructure sector (not the isolation of its sub-sectors), can contribute poverty reduction and inclusive development efficiently. It is because, without elimination of all types of infrastructure poverty (defined as “lack of access to infrastructure services”), it is almost impossible to eliminate human poverty, sustainably.

(4) Poverty headcount rates and inequality measure are calculated using the consumption data. The national poverty line of NRs. 19261 which is reported by CBS (2011) is used as the cut-off line to calculate the percentage of poor household. The poverty headcount rate and Gini coefficient by VDC are shown in Table 1. The overall poverty rate for sample household is found 28%. It is about 3% higher than the national poverty rate of 25.16%, but 1.4 % less than the rural hills of mid-Nepal as reported by CBS (2011). However, the poverty rate highly differs across the villages: 12.5% in Ramche, 33.3% in Baramchi and 43.3% in Gumba VDCs. Clearly, the poverty situation is alarmingly higher in more remote villages.

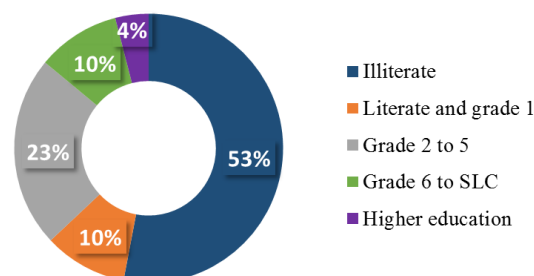
**Table 1.** Poverty and inequality using consumption data by village, 2014

VDC	Poverty	Gini
Ramche	12.5%	0.47
Baramchi	33.3%	0.55
Gumba	43.3%	0.52
Overall	28%	0.52

Source: The author.

(5) The level of educational development is shown in Figure 2. It shows that 53% household heads are illiterate, 10% are just

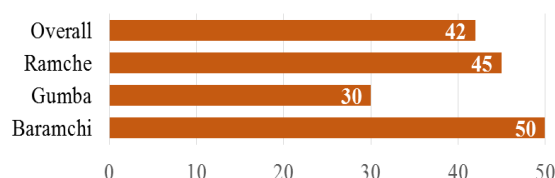
literate, 23% completed grade 1 to grade 5, another 10% completed grade 6 to high school level education and remaining 4% have higher level of education. It indicates the high level of educational poverty is persisting in the remote areas.



**Figure 2.** Educational attainment of the sample households, 2014

Source: The Author

(6) In terms of health condition, Figure 3 shows that 50%, 45% and 30% sample households have at least one chronically ill person in Baramchi, Ramche and Gumba villages, respectively.



**Figure 3.** Percentage of chronically ill people by VDC, 2014

Source: The Author

(7) To find the level of access to infrastructure, the respondents were asked how long (in hours) it takes to reach different infrastructure services and other facilities. The summary statistics of their answers for selected infrastructure services and facilities are given in Table 2. Market and agriculture service center are the farthest as the average time to reach there are 4.49 hours and 4.37 hours, respectively.

**Table 2.** Summary statistics of access to different infrastructure (hours), 2014

One way walking time to nearest...	Obs.	Mean	Std. Dev.	Min	Max
Motorable road	100	2.89	7.14	0.02	24
Bus station	100	3.87	6.85	0.05	24
Drinking water	100	0.17	0.22	0.00	1
Prim. school	100	0.35	0.29	0.03	1
Sec. school	100	3.84	6.85	0.08	24
Health facility	100	3.76	6.83	0.03	24
Market	100	4.49	6.62	0.00	24
Local shop	100	0.39	0.57	0.00	2.5
Ag.-Vet. center	100	4.37	6.66	0.02	24

Source: The Author

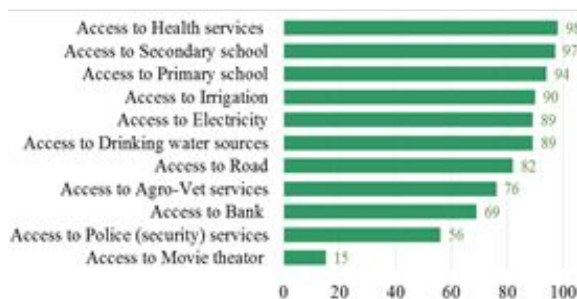
Similarly, secondary school, health facility, bus station are within the 3 to 4 hours walk. While the road can be reached in nearly 3 hours walk, drinking water sources, primary school, and local shops can be reached in less than half an hour on average. The results clearly indicate that many households lack most of the basic infrastructure services. The access differs significantly as shown in Table 3.

**Table 3.** Average time to different infrastructure (hours) by VDCs, 2014

One way walking time to nearest...	Ramche	Baramchi	Gumba
Motorable road	0.08	0.28	9.26
Bus station	1.64	1.00	9.70
Drinking water	0.10	0.27	0.15
Primary school	0.39	0.48	0.16
Secondary school	1.14	1.33	9.97
Health facility	1.62	1.08	9.29
Market	1.78	2.34	10.27
Local shop	0.51	0.39	0.22
Agr.-Vet. center	1.70	2.13	10.17

Source: The Author

(8) The impact of access to different infrastructure services is assessed based on the perception of respondents. Rural people's perception is very useful to understand the local demand and their priority of infrastructure services so that local policy makers and development workers can design local development plans and program more effectively. Thus, respondents were asked to rate the level of impacts of each type of infrastructure on their life including their family and community's well-being. The level of impacts was divided into "very high impact", "high impact", "some impact", "no impact", and "don't know". Figure 4 shows that health service got the top importance with 98 score for combined ratings of "very high" and "high" impact. Then, secondary school, primary school, irrigation, electricity, drinking water source and road with the combined score of 97%, 94%, 90%, 89%, 89%, and 82%, respectively.

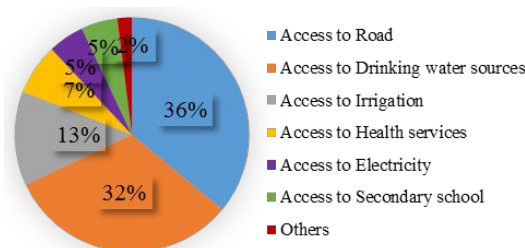


**Figure 4.** "Very high" and "high" level impact of infrastructure access on HD, 2014

Source: The Author

It indicates that respondents give high importance on social infrastructures, such as health and education than economic infrastructures, such as irrigation, electricity, and road if they are allowed to rate the infrastructure independently.

(9) The respondents were also asked to choose three most important infrastructure services for them and their community. Figure 5 shows that 36% of the respondents ranked road access as the 1st priority, followed by access to drinking water sources 32%, irrigation 13%, health services 7%, electricity and secondary school 5% each, and others 2%.



**Figure 5.** Score of access to different infrastructure as the first priority, 2014

Source: The Author

(10) Results from both the cross-country study and the case study of Nepal clearly indicate a crucial importance of access to infrastructure for the human development process. To the author's knowledge, both studies are the first exploration of this kind, which are useful for local government agencies, NGOs, development planners and policy makers and the donor communities alike. The result has a significant policy implication indicating that a holistic assessment is necessary for the most effective decision. The most realistic conclusion can be drawn only when all the available alternatives are assessed together. Thus, it is argued that only integrated goals and targets with interlinked strategies and policies, which should be based on a comprehensive assessment of the whole infrastructure sector (not the isolation of its sub-sectors), can contribute poverty reduction and inclusive development efficiently. Because, without elimination of all types of infrastructure poverty (defined as "lack of access to infrastructure services"), it is almost impossible to eliminate human poverty, sustainably.

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5. 主な発表論文等(The main papers, etc.) (研究代表者、研究分担者及び連携研究者には下線)

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〔その他〕

ホームページ等

<http://www.trios.tsukuba.ac.jp/en/researcher/0000003362>

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