

Motivation for Contribution to Volunteered Geographic Information in Nepal

By

Yoshiatsu Tanaka

Bachelor of Engineering (Keio University, Japan) 2014

Thesis

Submitted in partial satisfaction of the requirements for the degree of

Master of Science

in

Community Development

in the

Office of Graduate Studies

of the

University of California, Davis

Approved:

Jonathan London, Chair

Heidi Ballard

Sheryl-Ann Simpson

Committee in Charge 2017

Acknowledgements

This thesis would not have been possible without the support of many people. First, my academic advisor, Dr. Jonathan London, has been fundamental to the development of my research from the beginning. Second, my thesis committee, Dr. Heidi Ballard and Dr. Sheryl-Ann Simpson have supported the research process, method, analysis, and recommendation. Third, Dr. Nama Budhathoki has supported the research process and given me academic advice. Additionally, in Nepal, I am so grateful to the staff members, interns, and former staff members at Kathmandu Living Labs for their contribution to this research. In the United States, I would like to express my deepest gratitude to Isao Fujimoto, Karen Watson-Gegeo, Patsy Eubanks Owens, Stephen Wheeler, Janet Lane, and Nancy Erbstein for their support and teachings. Special thank you to Carrie Armstrong-Ruport, Ai Namiki, Brandon Louie, Jeffrey Lee, Mohnish Sen, Yohei Kato, Yuichiro Hattori, and Yuko Nakamura. Lastly, I would like to thank my cohort, family, and friends.

Abstract

Volunteered Geographic Information (VGI) is a geographic information provided by individuals and has drawn increasing attention in various fields. This study presents an examination of motivation for contribution to OpenStreetMap, a site for volunteered geographic information. I investigated Map For Everyone, an OpenStreetMap community building project by Kathmandu Living Labs in Nepal. This study used interviews, participant observation, and a collaborative approach to research. Informed by 13 interviews and 5 observations of mapping workshops, I have created written and video documentaries as tangible products. Results of the analysis of important factors of motivation are presented. In particular, the common motivators of serious mappers are the development of their country and humanitarian purpose. Common motivators of both serious and casual mappers are altruism and meeting their own needs of navigation. This study contributes to the field of volunteered geographic information in examining motivations for contribution to volunteered geographic information in developing countries.

Table of Contents

Chapter 1: Introduction	5
Chapter 2: Theoretical Perspectives	8
2.1. Motivation for contribution to Wikipedia	8
2.2. Motivation for contribution to VGI.....	9
2.3. Motivation for contribution to OSM.....	17
2.4. Motivation for contribution to VGI in developing countries	20
Chapter 3: Methodology.....	21
3.1. Statement of Focus.....	21
3.2. Description of the setting.....	21
3.3. Positionality	29
3.4. Data collection	31
3.5. Data analysis.....	36
Chapter 4: Findings & Discussion.....	38
Chapter 5: Conclusion.....	52
Chapter 6: Recommendation	55
References.....	59
Appendix 1: Interview Questions	62
Appendix 2: List of Interviewees	63
Appendix 3: Report on this project.....	64

Chapter 1: Introduction

Volunteered Geographic Information (VGI) is a geographic information provided by individuals and has drawn increasing attention in various fields [Goodchild, 2007; Budhathoki, Budic, Bruce, 2010]. Contributors are not experts in Geographic Information Systems (GIS), a system that integrate and visualize spatial information, and their actions are voluntary. One example of VGI is OpenStreetMap, an international effort to create a free source of map data through volunteer efforts.

OpenStreetMap (OSM), a project where contributors collectively build an open map of the world, has grown rapidly. OSM was founded in 2004 by Steve Coast, a student at University College London to create a free and editable map of the world [Budhathoki Haythornthwaite, 2012; OpenStreetMap Wiki, 2017]. OSM aims at building a free editable map database of the world in a collaborative manner so that people can use geographical data without payment or copyright [Arsanjani, Zipf, Mooney, Helbich, 2015]. OSM started initially with a focus on mapping streets and roads, but it now contains a very rich variety of geographical objects, including buildings and land use from all over the planet, with thousands of volunteers contributing to the project.

Kathmandu Living Labs (KLL) is a globally-renowned organization developing innovative applications and teaching methods related to OpenStreetMap [Kathmandu Living Labs, 2017]. KLL was founded in 2013 with the aim of creating digital tools and information infrastructure that governments, nonprofits and businesses can use to transform societies. Dr. Budhathoki earned a doctor's degree from the University of Illinois at Urbana-Champaign with a focus on OpenStreetMap. In 2011, he held the first mapping meet-up in

Nepal. Since then, he has been working to build an open mapping community in Nepal. In the fall of 2012, Dr. Budhathoki and Robert Soden met for the first time in Kathmandu. Soden was working for the World Bank in Washington D.C. The World Bank was contemplating starting Open Data for Resilience Initiative (OpenDRI) projects in a few selected countries, which led to the OpenDRI Project being launched in Nepal later that fall. Dr. Budhathoki brought together a group of young people from different universities and led them in mapping various geographic features such as educational institutions and health facilities in Kathmandu Valley. In addition to mapping these important features in OpenStreetMap, the team held mapping workshops for university students, government officials, the tech community, NGOs, and other youth groups. In fall 2013, Dr. Budhathoki and the team established Kathmandu Living Labs.

Map For Everyone is a community building project by Kathmandu Living Labs whose aim is to build a community which contributes to OpenStreetMap [Kathmandu Living Labs, 2017]. This project trains people on OSM, creates awareness about open data, promotes spatial literacy, and triggers innovation around OSM in Nepal. Nepal does not have freely available detailed online maps. Mapping the whole country of Nepal requires incremental contributions from a large number of people. By 2015, Kathmandu Living Labs had delivered a lot of presentations to universities, government agencies and international development organizations and trained over 1400 people in OpenStreetMap through numerous Mapping Parties and actively mapped major places and critical infrastructure in OpenStreetMap.

Two issues are of particular interest here. First, more research is needed on motivation for contribution to volunteered geographic information considering the different level of contribution. Wei Lin (2015), Yang et al. (2015), and Budhathoki et al. (2010) argue that understanding of unequal contribution of less active mappers and active mappers is important for the development of VGI [Lin, 2015; Yang, Fan, Jing, Sun, Zipf, 2015; Budhathoki, Budic, Bruce, 2010]. I argue that to address this topic and deepen our understanding of motivation for contribution to volunteered geographic information, it is important to broaden our conceptualization of the feeling of direct contribution to the society, such as development of county and humanitarian work, and the pleasure of creation in the mapping process. Second, still little is known about motivation for contribution to volunteered geographic information in developing countries. Mahabir et al. (2017) and Glasze et al. (2015) argue that little research has been done to investigate the motivation for contribution to volunteered geographic information in developing countries although mapping is embedded in specific social and political structure of the county [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017; Glasze Perkins, 2015]. Therefore, this work aims to understand the overall motivations for contributions to volunteered geographic information systems in developing countries.

Chapter 2: Theoretical Perspectives

Existing literature shows that people have a range of reasons for getting involved in volunteered geographic information projects, from certain ideological views such as a belief that information should be free to enjoyment of mapping and being part of a community. In this section, I provide an overview of related literature with discussions of participants' motivations in user generated content systems including Wikipedia, volunteered geographic information, and OpenStreetMap.

2.1. Motivation for contribution to Wikipedia

Since OSM is sometimes called the “Wikipedia of maps,” I consider contributor activities in Wikipedia and OSM as related. Nov highlights the idea that fun and ideology are the two most important reasons that motivate contributors to edit in Wikipedia [Nov, 2007]. Among the eight motivation categories of *protective*, *values*, *career*, *social*, *understanding*, *enhancement*, *fun*, and *ideology*, the three categories of *social*, *career*, and *protective* are not found to be strong motivations for contribution. The author analyzes the relationship between motivation and contribution and concludes that *ideology*, such as the idea that information should be free, is indicated as a strong motivation but not significantly correlated with the contribution. On the other hand, *fun*, such as pleasure of creation, is identified as a strong motivation as well as a strong contribution, and significant correlation between motivation and contribution is observed. This study indicates that highlighting the pleasure of creation is effective for recruitment and development of user-generated content. My study extends this study in examining the motivation for contribution to OSM.

2.2. Motivation for contribution to VGI

Volunteered geographic information (VGI) is driven by contributors' collective efforts. This effort to contribute to geographic information without monetary reward or someone's direction is different from traditional geographic information production. This new type of geographic information production resembles the creation of sources such as Wikipedia. VGI has drawn increasing attention in various fields such as academia, business, and government [Budhathoki, Zorica, Bertram, 2008].

A number of studies have provided insight about motivation for contribution to VGI. Researchers have analyzed demographic factors, education, gender, and age and their relationship to contribution to VGI. Although Google Map Maker does not show gender distribution, contributors for OpenStreetMap are mostly male [Monica, 2013]. Most contributors for VGI are non-experts [Bishr Kuhn, 2007]. The majority of data is contributed by only a few contributors [Glasze Perkins, 2015]. Also, the majority of contributors are between 20 and 40 years old [Budhathoki Haythornthwaite, 2012]. A number of research studies classified contributors into different categories. Budhathoki et al. (2012) categorized mappers into serious (heavyweight) mappers and casual (lightweight) mappers [Budhathoki Haythornthwaite, 2012]. Steinmann et al. (2013) categorized mappers based on "action type" and contributor profiles such as: "Premium Creator," "Creator," "Highway Mapper," "Amenity Mapper," and "All-Rounder." My study uses the categorization of serious (heavyweight) mappers and casual (lightweight) mappers provided by Budhathoki et al. (2012) [Budhathoki Haythornthwaite, 2012]. I used Budhathoki et al.'s (2012) categorization of serious (heavyweight) mappers and casual (lightweight) mappers in investigating

motivation for contribution to volunteered geographic information.

Budhathoki et al. (2012) proposed VGI conceptual framework to analyze participants' motivation to contribute geographic information. They adopted the framework with five constructs, including context, motivation, contribution, mechanism, and outcomes [Budhathoki, Budic, Bruce, 2010]. Steinmann et al. (2013) asked "Who contributes what to VGI project?" Using a data centric approach, they examined the relationships between contribution profiles and quality of contribution. They identified typical contribution profiles based on "action type" such as: "Creators," who mainly contribute new features; "Premium Creators," who contribute in a high volume; "Premium All-Rounders," who are very active contributors with every action type; "Highway Mappers," who mainly contribute in mapping highways; "Amenity Mappers," who mainly contribute in mapping amenities. Wen Lin (2015) argued that a broader conceptualization of "interactivity" in the mapping process such as user-to-system interactivity, user-to-documents interactivity, and user-to-user interactivity is required to better capture the making of OpenStreetMap, which is "a highly heterogeneous process and strongly contested in practice." [Lin, 2015; Perkins Dodge, 2008]. The motivation for contribution to VGI is recognized as an important research topic for the development of VGI. Mooney et al. (2013) assert that there is an urgent need for greater understanding of the different use-cases for VGI [Mooney, Rehr, Hochmair, 2013]. Bhudhathoki et al. (2012) examined motivation for contribution to OpenStreetMap using an interdisciplinary frame for understanding volunteered geographic information and concluded that "positive and important motivators were found that accorded with ideas of the personal but shared need associated with contribution to open-source projects, co-orientation to open-source and geographic knowledge, and attention to participation and by the community" [Budhathoki Haythornthwaite, 2012].

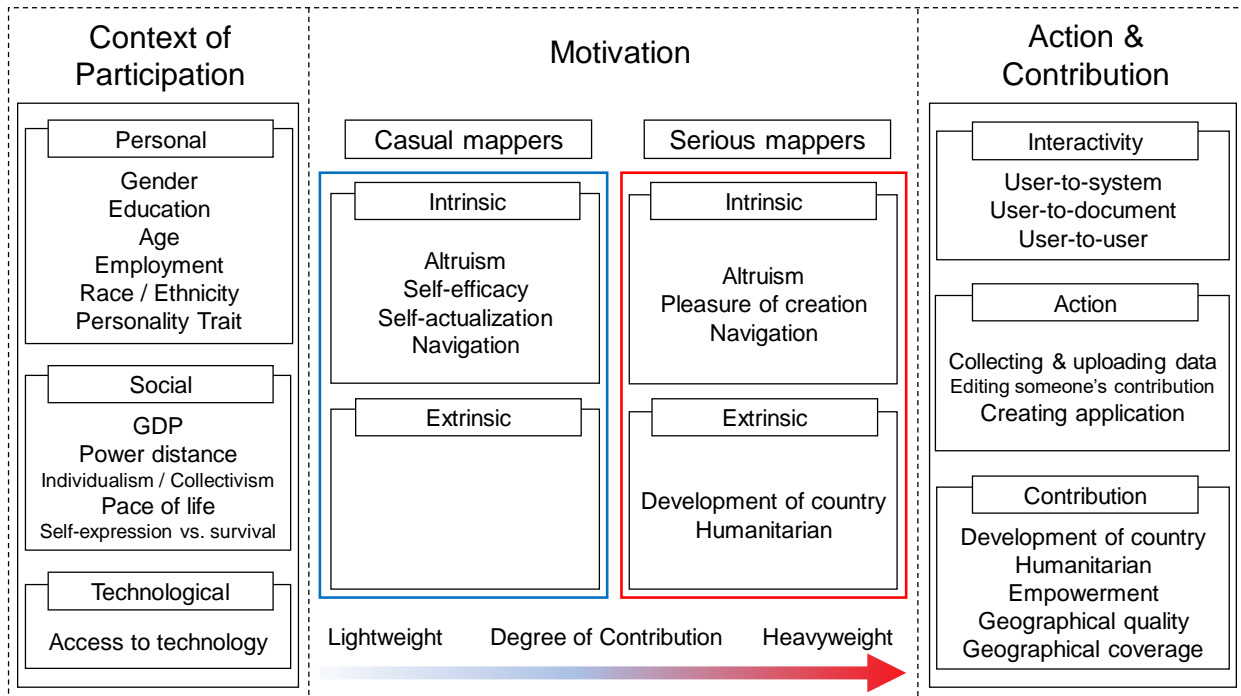


Figure 1. A Conceptual Framework for VGI

[Budhathoki Haythornthwaite, 2012; Lin, 2015; Quattrone, Mashhadi, Capra, 2014; Budhathoki, Budic, Bruce, 2010]

Figure 1 shows the conceptual framework I developed to analyze motivation for contribution to VGI by referring to the articles of conceptual framework for analyzing motivation for contribution to VGI [Budhathoki, Budic, Bruce, 2010], motivation for open collaboration [Budhathoki Haythornthwaite, 2012], cultural and economic influence on mapping [Quattrone, Mashhadi, Capra, 2014], and interactivity of VGI contributors and VGI initiatives [Lin, 2015].

Table 1 shows potential motivators for contribution to volunteered geographic information projects. Motivational area refers to people and the sources of their motivations to contribute to VGI, and this can be classified into intrinsic and extrinsic factors [Budhathoki,

Budic, Bruce, 2010]. “Intrinsically motivated” means that people are motivated with no apparent reward except for the activity itself. For example, people can be motivated by the *pleasure of creation* (profound and fulfilling satisfaction of desires); *self-actualization* (development and application of talents, capacities, potential); *self-efficacy* (belief that contributor has knowledge and skills to meet the expectation of others in the team); *meeting own need of navigation* (collective development of product/service to meet personal need); *altruism* (opportunity to add to the common good); or *navigation* (meet the personal need of navigation). “Extrinsically motivated” means that people are motivated by an apparent reward [Deci, 1971]. For example, people can be motivated by *development of country* (opportunity to engage with development of country) or *humanitarian* (having engaged in helping to improve the happiness of people).

Table 1. Potential Motivators for Contribution to Volunteered Geographic Information Projects
 [Budhathoki, Budic, Bruce, 2010; Nedović-Budić Pinto, 1999; Ostrom Hess, 2007]

Intrinsic Motivation	Extrinsic Motivation
<ul style="list-style-type: none"> • Altruism: Opportunity to add to the common good • Pleasure of creation: profound and fulfilling satisfaction of desires • Navigation: Meet the personal need of navigation • Self-efficacy: Belief that contributor has knowledge and skills to meet the expectation of others in the team • Self-actualization: Development and application of talents, capacities, potential 	<ul style="list-style-type: none"> • Development of country: Opportunity to engage with development of country • Humanitarian: Having engaged in helping to improve the welfare and happiness of people.

Table 2 shows potential contexts for contribution to volunteered geographic information projects. Motivators arise from personal, social, and technological contexts. Personal context is defined as the important personal factors that are closely related to motivation, and it includes *education, employment, age, gender, race* and *ethnicity*, and *personality traits*. Motivations and personal context are closely related. For example, the majority of contributors for OpenStreetMap are highly educated males [Glasze Perkins, 2015]. Motivation can be come from the desire to develop talents, capacities, and potential [Deci Ryan, 1985]. Social context means the important social factors that are closely related to motivation, and it includes *GDP, power distance, individualism / collectivism, pace of life*, and *self-expression* [Quattrone, Mashhadi, Capra, 2014]. For example, in countries that have a particularly high quality of life and subjective well-being (self-expression), OSM edits tend to be made [Quattrone, Mashhadi, Capra, 2014]. Motivation is influenced by access to technology. For example, access to technological tools such as the Global Positioning System and computer storage and processing capacity enable people to be motivated to contribute to VGI. The action and interaction areas address the process of decision making and actually contributing to VGI.

Table 2. Potential Contexts for Contribution to Volunteered Geographic Information Projects

[Budhathoki, Budic, Bruce, 2010; Quattrone, Mashhadi, Capra, 2014; Budhathoki Haythornthwaite, 2012]

Personal Contexts	Social Contexts
<ul style="list-style-type: none"> • Gender • Education • Age • Employment • Race / Ethnicity • Personality Traits 	<ul style="list-style-type: none"> • Power distance: The extent to which people accept power to be unequally distributed • Individualism / Collectivism: The extent to which social relationships are loose as opposed to relationships integrated in strong and cohesive groups • Pace of life: The speed at which we move, the high-pressure at which we work, and the density of experiences and activities we undertake daily • Self-expression vs. Survival: The extent to which subjective well-being and quality of life take precedence over economic and physical security, as captured by the World Value Survey • Gross Domestic Product: A country's standard of living.
Technical Contexts	
<ul style="list-style-type: none"> • Access to technology: Access to technological tools such as Global Positioning System and computer storage and processing capacity 	

Table 3 shows potential action and contribution for volunteered geographic information. Action and contribution can be categorized as interactivity, action, and contribution. Interactivity means the process of encounters between VGI contributors and VGI initiatives, and it consists of *use-to-system interactivity*, *use-to-documents interactivity*, and *use-to-user interactivity* [Lin, 2015]. *User-to-system interactivity* is similar to person-to-machine interaction. *User-to-documents interactivity* enables users to produce user-generated content. *User-to-user interactivity* is similar to person-to-person interaction. *User-to-user interactivity* and *user-to-document interactivity* are important features of interactivity that enable people to be producers of user-generated content [Bruns, 2008; Macnamara, 2010]. For example, participation in mapping parties is helpful for new users to make plans for future activity, network to other users, and learn new things in mapping [Lin, 2015]. Action is defined as a users' decision to contribute to mapping activity, and it includes *collecting and uploading data*, *editing someone's contribution*, and *creating applications*. Action and contribution are closely related. For example, if users enjoy collecting data and uploading it to a mapping platform, they will be more motivated to contribute to mapping. Contribution is defined as something to help produce, achieve, or make something successful, and it includes *development of country* (opportunity to engage with development of country); *humanitarian* (engagement in improving people's lives or alleviating suffering); *empowerment* (sharing power to increase the degree of autonomy); *geographical quality* (opportunity to engage with improvement of geographical quality); and *geographical coverage* (opportunity to engage with improvement of geographical coverage).

Table 3. Potential action and contribution for Contribution to Volunteered Geographic Information

[Budhathoki, Budic, Bruce, 2010; Budhathoki Haythornthwaite, 2012; Lin, 2015]

Interactivity	Action
<ul style="list-style-type: none"> • User-to-system interactivity: Similar to person to machine interaction • User-to-documents interactivity: Activity which enables users to produce user generated content • User-to-user interactivity: Similar to person to person interaction 	<ul style="list-style-type: none"> • Collecting and uploading data • Editing someone’s contribution • Creating applications
Contribution	
<ul style="list-style-type: none"> • Access to technology: Access to technological tools such as Global Positioning System and computer storage and processing capacity • Development of country: Opportunity to engage with development of country • Humanitarian: Engagement in improving people's lives or alleviating suffering • Empowerment: Sharing power to increase the degree of autonomy • Geographical quality; Opportunity to engage with improvement of geographical quality • Geographical coverage; Opportunity to engage with improvement of geographical coverage 	

2.3. Motivation for contribution to OSM

OpenStreetMap (OSM) is a project to build a free geographic database of the world. Its aim is to eventually have a record of every single geographic feature on the planet. The database is built by contributors, usually called mappers, who gather information by driving, cycling, or walking along streets and paths, recording their every move using the Global Positioning System (GPS). Most mappers are volunteers working on the project in their spare time, although both commercial organizations and government bodies have started to contribute to the project [Bennett, 2016]. The OSM community of volunteers contribute to different aspects of the project. Volunteers may contribute geographic information by using GPS, digitalizing on-screen features using satellite imagery, uploading freely available information, or labeling features created by volunteers. Many volunteers build the geographic database and online maps, others help develop and maintain the underlying technical infrastructure, and others participate in chat page discussions that contribute to crucial discussions related to community norms. OSM participants meet for an OSM mapping party in which participants learn how to collect data, upload to JOSM, an editor for OSM, and edit OSM. This is where mappers can socialize and encourage new users in mapping [Budhathoki Haythornthwaite, 2012; Desislava , Giovanni, Mashhadi, Capra, 2013].

Contribution to OpenStreetMap has been discussed in academia. For example, Steinmann et al. (2013) identified different contribution profiles and investigated the relationship with different mapping styles in OpenStreetMap. They have found that a great number of users can be categorized as "Creators," who mainly contribute new features, among

other categorizations such as “Premium Creators,” who are responsible for high volume contributions, “Premium All-Rounders,” who are very active and contributing with every action type, “Amenity Mappers,” who mainly contribute amenity, and “Highway Mappers,” who mainly contribute highways. This study suggests that mapping new things is the obvious contribution style in OpenStreetMap.

One main criteria the researchers investigated in contribution to OpenStreetMap is contribution inequality. User-generated content such as OpenStreetMap attracts two different types of contributor. Budhathoki et al. (2010) assert, “In OSM, a well-developed VGI project, less than 10 percent of the users contribute more than 80% of the content, and about 40% of the users do not return to the site after their first contributions” [Budhathoki, Budic, Bruce, 2010]. Yang et al. (2015) argue, “A further extension is to dive deeper and ask why in the first place the balance between the silent majority and vocal minority shifts” [Yang, Fan, Jing, Sun, Zipf, 2015]. My study investigates motivation for contribution to OpenStreetMap based on two categories, serious (heavyweight) mappers and casual (lightweight) mappers.

Budhathoki and Haythornthwaite studied motivation for contributing to OSM. They concluded that highest motivator is “personal but shared need” [Budhathoki Haythornthwaite, 2012]. Positive and important motivators are “personal but shared need” associated with contribution to open-source projects, co-orientation to open-source and geographic knowledge, and attention to participation in and by the community. They also found that differences in motivation between serious and casual mappers showed that serious mappers were more oriented to community, learning, local knowledge, and career motivations. Casual mappers were more oriented to general principles of free availability of mapping data. They conclude that the highest motivator is a contribution to the OSM community consisting of volunteers,

suggesting that OSM will not succeed in developing a world map without the OSM community. Although this study investigated the volunteers primarily living in Europe (80.2%), my study will extend this study to investigating volunteers living in developing countries in Asia, specifically, Nepal.

Research has reported that most instances of volunteered geographic information in developing countries are driven by disaster management or other humanitarian purposes [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017; Soden Palen , 2014]. For example, in response to the earthquake in Haiti in 2010, the Humanitarian OpenStreetMap Team emerged and rapidly mapped the affected areas to support the aid effort and created a local mapping ecosystem [Soden Palen , 2014]. Developing countries face a challenge of rapid urbanization, which leads to issues of creating slums, poor infrastructure development, and other environmental issues such as air pollution and water pollution. Although the development of spatial information is necessary to address these issues, the cost of creating and maintaining national geographic information is high [Lachman, Wong, Knopman, Gavin, 2002]. Since volunteered geographic information is cheaper than the traditional large-scale project of collecting national geographical information, OpenStreetMap has been considered as an attractive alternative in developing countries [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017]. Overall, humanitarian purposes such as coping with disasters, development of country, and the low cost of creation are the factors which could motivate users to contribute to volunteered geographic information in developing countries.

2.4. Motivation for contribution to VGI in developing countries

Summarizing the above, the motivation for contribution to VGI is recognized as an important research topic for the development of VGI. Mooney et al. (2013) assert that there is an urgent need for greater understanding of the different use-cases for VGI. What motivates both the active and passive contributors in VGI? Where do users want to use VGI? What type of applications and use-case scenarios do users have in mind? Who are potential users? To which applications or domains can VGI make a significant long-term contribution? These are listed as key issues for future research. Although many researchers are primarily interested in the production of VGI, few researchers have investigated VGI motivation [Coleman Labonte, 2009; Mooney, Rehr, Hochmair, 2013]. There is a significant work published by Budhathoki and Haythornthwaite (2012) on contributor motivations in VGI, but informants were primarily living in Europe [Budhathoki Haythornthwaite, 2012]. Considering the emerging needs of open data in developing countries such as Nepal, it is important to study user motivations in developing countries. Overall, understanding motivations for contribution to VGI in developing countries is an urgent need for the development of VGI.

Chapter 3: Methodology

3.1. Statement of Focus

In summer 2016, I entered Kathmandu Living Labs to develop an understanding of the motivations for contribution to OpenStreetMap. In collecting data, I used participant observation, interviews, and collaborative approach to research, informed by the VGI conceptual framework. The research specifically concerns the motivation for contribution to OpenStreetMap, a site for volunteered geographic information, addressing the following question: What are the motivations for contribution to volunteered geographic information in developing countries?

3.2. Description of the setting

Figure 2 shows the political map of Nepal showing names of capital city, towns, states, provinces and boundaries with neighbor countries. I chose Nepal as a research site because of its increasing effort on open government and civic innovation to improve urban planning and management, responding to the rapid political changes during the last two decades [Open Data for Disaster Initiative, 2017]. Nepal was isolated from the world with limited relationship to the world except for few countries such as Tibet, India, and the British Empire until the 1950s. Since then, the country has created a multi-party parliamentary system, a decade-long Maoist insurgency, and the abolition of its monarchy [Central Intelligence Agency, 2017]. Nepal is a home to eight of the world's highest mountains including Mount Everest. As one of the world poorest countries, Nepal's economy relies on aid and tourism. About one-quarter of its



Figure 2. The Political Map of Nepal [Ezilon Maps, 2017]

population is living below the poverty line. Agriculture is the main sector of the economy, providing a livelihood for almost 70% of the population and accounting for about one-third of the GDP. A devastating earthquake in April 2015 killed thousands of people and reduced numerous heritage sites to ruin. Political infighting has delayed much of the reconstruction despite billions of dollars having been pledged. Additional challenges to Nepal's growth include its landlocked geographic location, persistent power shortages, and underdeveloped transportation infrastructure.

The World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR) started working in partnership with the government of Nepal in 2012 with the aim of better understanding of seismic risk in order to build resilience in the education and health infrastructure of Kathmandu Valley. The American Association of Geographers and the United

States Department of State started the 2C Pokhara project, which focuses on the development of disaster resilience and emergency management in the city of Pokhara.

I chose Kathmandu Living Labs (KLL) for this study because it plays a key role in training people on OSM and developing applications to transform societies in Nepal. Kathmandu Living Labs played a key role in the days following the massive earthquake in the April 2015. KLL mobilized thousands of online volunteers in creating rapid digital and paper maps of earthquake-affected areas immediately after the earthquake and contributed to the earthquake relief effort [Kathmandu Living Labs, 2017]. Moreover, they create digital tools and information infrastructure that government, non-profits, and business can utilize to address social issues including disaster preparation, housing reconstruction, disaster management, mapping community building, food security, and open governance. [Kathmandu Living Labs, 2017]. KLL consists of an executive director, about 10 staff, and 8 interns. Their offices are located in Kathmandu and Pokhara. One of their core projects is the OSM community building project called “Map For Everyone.” According to Kathmandu Living Labs, they do the following activities to create communities which contribute to OSM: “1) sensitize students, development agencies and government organizations about OSM through Sensitization Presentations; 2) deliver mapping workshops to train people in mapping; 3) expand coverage and enhance quality of OpenStreetMap data; and 4) stimulate innovations around OSM and OSM data” [Kathmandu Living Labs, 2017].

In the Spring of 2016, I first met with Dr. Budhathoki, a director of Kathmandu Living Labs, at UC Davis Center for Regional Change. Dr. Budhathoki visited UC Davis and gave a presentation about his work on participatory mapping at the Center for Regional Change and the class CDR147: Youth Community Development. I was inspired by his work because his

work connects government and local people to address social issues, and it was the theme I wanted to explore in my study at UC Davis Community Development Graduate Group. A few weeks later, I had a Skype meeting with Dr. Budhathoki and he allowed me to work as an intern during the summer in 2016. I chose and located my research site based on the conversation with Dr. Budhathoki. We have decided my role as primary responsible for documenting the project "Map For Everyone" and create a video and written documentaries to increase a number of contributors to OpenStreetMap, and enhance coordination, cooperation, and communication among the various stakeholders.

Table 4 shows the details of participant observation, Table 5 shows detail of interviews, and Figure 3 shows mapping parties, mapathon, and mapping trainings. Figure 4 Shows maps created in mapping parties, mapathon, and mapping trainings. This study used interviews, participant observation, and a collaborative approach to research. I organized a system of support, including regular meetings with the director and the manager at Kathmandu Living Labs based on dialogue and mutual respect [Minkler Wallerstein , 2008; Averill, 2006]. I conducted 14 video-taped interviews to OpenStreetMap contributors. My interview sample includes 5 staff, 1 fellow, 6 interns, and 2 former staff at Kathmandu Living Labs, a civic tech organization in Nepal. I observed 5 mapping workshops and documented them using photography and videography. I created a video and report based on my interviews and observations as a tangible product to increase the number of contributors to OSM. In the summer of 2016, I stayed at the KLL offices in Kathmandu and Pokhara for two and half months as an intern. I documented mapping workshops including the Summer Course on Youth Mapping (June 24-25), the White House Mapathon (July 7), a Mapping Party (July 11), a Mapping Workshop for AYON (July 31), and the Mapping Training for World Vision International (August 1-4), and I conducted

interviews for KLL staff and interns at KLL Kathmandu and Pokhara office. Documentation was conducted by using photography, videography, and hand-written field notes. Although the White House Mapathon (July 7) and the Mapping Party (July 11) were held at KLL Pokhara office, all other workshops were held at KLL Kathmandu office.

The Summer Course on Youth Mapping (June 24-25) is a summer intensive workshop on Youth Leadership, Open Mapping and Sustainable Community Development facilitated by Dr. Nama Budhathoki, a director of Kathmandu Living Labs, Dr. Jonathan London, a professor at the University of California, Davis, and Dr. Nancy Erbstein, an assistant research professor at the University of California, Davis. Participants of 20 young leaders were selected from the various fields including information technology, sustainable development, and youth development. The White House Mapathon (July 7) is a coordinated mapping event under the initiative of the White House to map the most vulnerable places in the developing world so that local and international NGOs can use these comprehensive maps and data to better respond to crises affecting these areas.

Participants were 5 interns and 4 staff at KLL. The Mapping Party (July 11) is a social event where participants get to know each other, share experiences, and spend time exploring and mapping the community, facilitated by 4 interns, 4 staff, and an executive director at KLL. Participants included 11 students from Pokhara University and Kathmandu University and a professor from the University of Colorado, Boulder. The Mapping Workshop for AYON (July 31) is a workshop to train them on OSM, facilitated by 4 staff and an executive director at KLL. Thirty-two staff members at AYON attended this workshop. Mapping Training for World Vision International (August 1-4) was a four days mapping training for 8 staff members at World Vision International, facilitated by 3 staff members and an executive director at KLL.

Table 4. Participant observation

Mapping workshops and trainings attended	Summer Course on Youth Mapping (June 24-25) White House Mapathon (July 7) Mapping Party (July 11) Mapping Workshop for AYON (July 31) Mapping Training for World Vision International (August 1-4)
Methods	Audio visual documentation Hand written field notes

Table 5. Interviews

Interviewees	4 staff members at Kathmandu Living Labs 1 fellow at Kathmandu Living Labs 6 interns at Kathmandu Living Labs 2 former staff members at Kathmandu Living Labs (now in Land Management Training Center and Nepal Trust)
Methods	Video-taped interviews



White House Mapathon 1



White House Mapathon 2



Mapping Party 1



Mapping Party 2

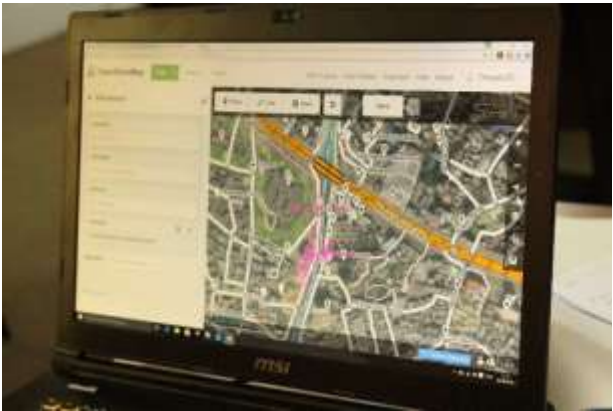


Mapping Training for Association of Youth Organizations Nepal (AYON)



Mapping Training for World

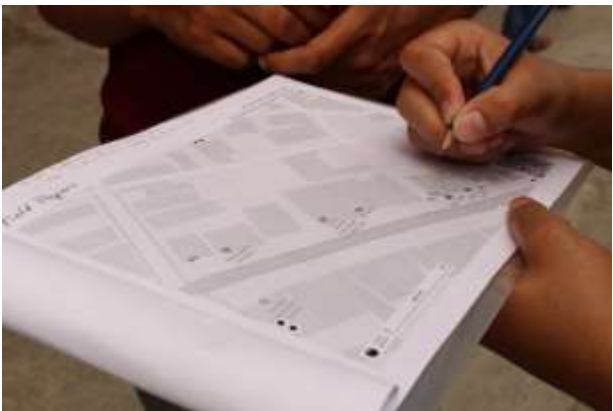
Figure 3. Mapping parties, mapathon, and mapping trainings



Uploading data on OpenStreetMap



Uploading data in Summer Workshop



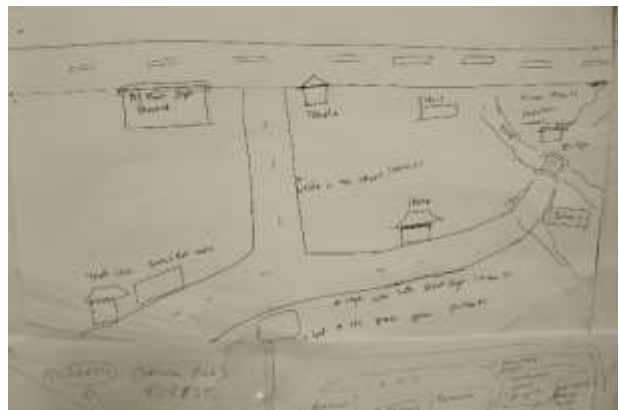
Collecting data using paper map



Editing OpenStreetMap of Swaziland



Drawing a map of a home town



Participant's home town

Figure 4. Maps created in mapping parties, mapathon, and mapping trainings

3.3. Positionality

Originally, I planned to create a project-based thesis based on my written and video documentaries, and it informed my role as an intern who is primarily responsible for documentation. After KLL decided not to use my products as their official products, I decided to write a thesis using written and audio-visual data. This worked as an advantage and disadvantage. The advantage is that it enabled me to regard the staff not as a subject of study but as co-workers. The disadvantage is that I ended up writing most of my field notes after seven months.

I was born and raised up in Tokyo, Japan. My skill of English is at an advanced level, but my Nepali is beginner level. However, most of the staff at KLL speak English very well so language was not an obstacle to conduct my research. Having been engaged in the field of city planning and community development, I chose to conduct research on participatory mapping. Through working with local governments, community-based organizations, and community members in Japan, Malaysia, and Indonesia, I realized that the collaboration among government and community is essential for development. Specifically, I worked with local governments in Malaysia and Indonesia, using the environmental assessment tool “CASBEE-City” to promote policies to assist the drive towards sustainability. I realized that many policies were created by a top-down approach, and community members' local knowledge, needs, and priorities were excluded from the decision making. In Japan, I worked with local governments, community-based organizations, and community members. Some of the advanced municipalities have begun to utilize a bottom up approach for the development, but consistent issues have been a lack of funding, resources, and volunteers. These two

experiences spurred me to create a system in which the local government, community-based organizations, and community members can collaborate to solve social issues. My positionality in this study worked as an advantage. First, as an intern who was responsible for documenting their projects using photos and videos, I was invited to most of the important workshops. Taking photos and videos was a good opportunity to understand the workshops as well as to contribute to the organization. Second, as I worked for two and a half months as an intern, I learned a lot from formal and informal conversations with staff at Kathmandu Living Labs. I was supervised by the director and worked closely with the project manager. All of the staff members were very supportive and willing to explain any information necessary to do my internship.

3.4. Data collection

As an intern with Kathmandu Living Labs for two and half months during the summer of 2016, I had two main responsibilities: 1) document mapping workshops in Kathmandu and Pokhara and 2) create a video and report describing the mapping communities' building project "Map For Everyone." I engaged with KLL members in planning my internship to make my research internship relevant to their needs and interests. Since Dr. Budhathoki mentioned KLL's needs of documentation to promote the use of OpenStreetMap and increase the public understanding of KLL's work, we decided my role was to document the project "Map For Everyone." Schatzman and Anselm assert that "Records become the vehicle for ordered creativity, develop researchers' thoughts about their observations and are a stable source of excitement available for creative constructions" [Schatzman Anselm, 1973]. Mehan states that "Viewing sessions enable participants to see covert aspects of communication and social organization, the most important aspect of the participatory aspects of ethnographic perspective" [Mehan, 1982]. My intention of audio visual documentation was to create a tangible product to contribute to the community, enable staff at Kathmandu Living Labs to see their communication and social organization with participants in mapping workshops, and use them as data for my research. I incorporated feedback about the research project and strategies from Dr. Budhathoki, a director of KLL, Sazal Sthapit, a project manager of KLL, and other members at KLL. I organized a strong support system that included regular check-ins with Dr. Budhathoki and Sazal Sthapit, a progress presentation in KLL, and regular feedback from KLL about my work and final products. This support system enabled KLL members and me to have trust and mutual respect [Parker, 2013]. Table 6 shows internship work schedule.

Table 6. Internship Work Schedule

Date	Procedure
June Week4	Kathmandu – Conduct needs assessment by interviewing staff and a director. Conduct archival research of the project “Map For Everyone.” Develop a work plan and discuss with a director. Document a summer course on youth leadership and participatory mapping
July Week1	Kathmandu – Conduct research on report and video Discuss final products with a director
July Week2	Pokhara – Document a mapping workshop, mapathon, and training on Geo-note. Conduct video recorded interviews for interns and staff. Begin writing a report
July Week3	Kathmandu – Document National Housing Reconstruction Program. Conduct video recorded interviews for interns and staff. Begin creating a video
July Week4	Kathmandu – Write a report and create a video (create a storyboard)
July Week5	Kathmandu – Conduct video recorded interviews for interns and staff. Write a report and create a video (add sound and special effects)
Aug. Week1-4	Kathmandu – Finish writing a report and creating a video Transcribe interviews
Sep. Week1	Kathmandu – Final presentation

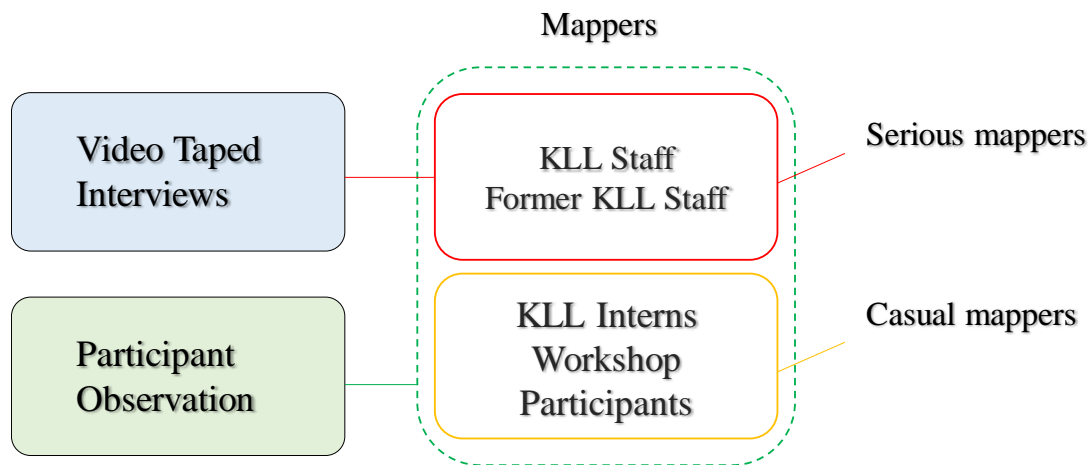


Figure 5. Investigating serious and casual mappers

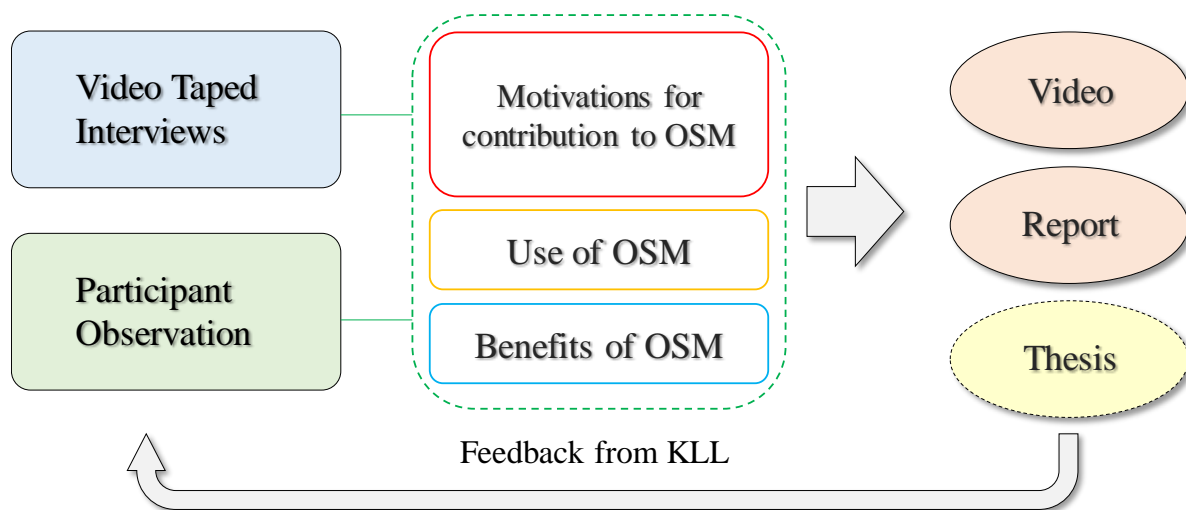


Figure 6. Research internship work flow

Figure 5 shows the internship work flow, and Figure 6 shows the distinction between serious mappers and casual mappers. KLL staff and the former staff are categorized as serious mappers, and workshop participants and interns at KLL are categorized as casual mappers.

Over the course of two and half months during the summer of 2016, I observed mapping

parties, a mapathon, and mapping trainings, and I created a video and report on the project “Map For Everyone.” I obtained comparative data on five different workshops with different participants, purposes, and settings. Having the specific role of documentation allowed me to be comfortable in the workshop. I took field notes about the mapping party on July 11 but was unable to take field notes on other mapping workshops because I did not know how to take field notes very well at that time, and I planned to create a project-based thesis. From February through April 2017, I expanded the field notes of the mapping party and mapping workshops. During the workshops, I needed to focus on documentation, but I was able to take field notes periodically. However, taking photos and videos allowed me to observe participants and facilitators. Facilitators sometimes asked me to provide them with photos I took. They then uploaded the photos to social media. My field notes attempted to capture a wide range of behavior and conversation, including mapping activities, facilitators’ interaction with participants, and participants’ interaction with one another.

In the 4th week of June and 1st and 2nd weeks of July, I documented mapping workshops. On June 24, I documented a summer course on youth leadership and participatory mapping using photography and videography. I walked around the room and took photos and videos. During recess, I talked with participants about their background and their feelings about the workshop. On July 7, I documented the White House Mapathon.

In the 3rd week of July, I was able to conduct videotaped interviews for a total of 7 people (2 staff members and 5 interns) at the KLL Pokhara office. KLL staff offered the empty room and rooftop as the place for videotaped interviews, giving me a quiet and private space in the office. I used a scheduled standardized interview technique across the staff and interns, asking each person the same set of questions but allowing for conversational exchange. The

interview questions were sent out to informants about a week before the interviews so that they could prepare. All interviews were transcribed. These interviews each lasted about 30 minutes. Appendix 1 shows the interview questions. My first challenge was to reduce noise from the footage to create a video. Since I conducted interviews inside the building, footage contained echoes. In order to avoid recording echoes, I bought a small clip-type microphone that could be put on the clothing. I also learned how to use Audacity, a sound editing program, to reduce noise. I then asked 7 staff members and interns at the Pokhara office to retake interviews in the beginning of the 5th week of July.

In the beginning of the 5th week of July I conducted videotaped interviews for 7 staff members and interns at the rooftop of the KLL Pokhara office for the second time. I shot interviews outside the building using a new microphone and reduced noise using Audacity. I was able to record their voices without noise. After coming back to Kathmandu in the middle of the 5th week of July, I conducted videotaped interviews for 5 people (3 staff members and 2 former staff members) at the KLL Kathmandu office in the end of the 5th week of July. These interviews were conducted on the balcony at the KLL Kathmandu office. At the beginning of September, I made a presentation about my research internship, showed a video and report, and described the experience and reflection of my work. Appendix 3 shows the report I created during my internship at KLL.

3.5. Data analysis

In analyzing the data, I expanded my field notes on the mapping party and workshops. I transcribed interviews and indexed them into motivation, action, and contribution. When an informant mentioned “motivation” in his / her answer to my question or any response to the question, “What is your motivation on working on OpenStreetMap?,” I categorized the response as “motivation”. When an informant mentioned “use” in his / her answer to my question or any response to the question, “How do you use OpenStreetMap?,” I categorized the response as “action.” When an informant mentioned “contribute” in his / her answer to my question or any response to the questions, “How were you benefited from using OpenStreetMap?” or “How do you think OpenStreetMap benefit the communities?,” I categorized the response as “contribution.” Table 7 shows the code for data analysis. I coded them into main factors of motivation, action, and contribution such as *altruism, pleasure of creation, navigation, self-efficacy, self-actualization, development of country, humanitarian, access to technology, empowerment, geographical quality, and geographical coverage.*

Table 7. Code for Data Analysis

Code for Data Analysis
<ul style="list-style-type: none"> • Access to technology: Access to technological tools such as Global Positioning System and computer storage and processing capacity • Altruism: Opportunity to add to the common good • Pleasure of creation: Profound and fulfilling satisfaction of desires • Navigation: Meet the personal need of navigation • Self-efficacy: Belief that contributor has knowledge and skills to meet the expectation of others in the team • Self-actualization: Development and application of talents, capacities, potential • Development of country: Opportunity to engage with development of country • Humanitarian: Having engaged in helping to improve the welfare and happiness of people • Access to technology: Access to technological tools such as the Global Positioning System and computer storage and processing capacity • Development of country: Opportunity to engage with development of country • Humanitarian: Engagement in improving people's lives or alleviating suffering • Empowerment: Sharing power to increase the degree of autonomy • Geographical quality: Opportunity to engage with improvement of geographical quality • Geographical coverage: Opportunity to engage with improvement of geographical coverage

Chapter 4: Findings & Discussion

Development of country is a common motivator of serious mappers in Nepal

One common theme that emerged from interviews and participant observation regarding why interviewees contribute to OSM is that it is beneficial for the development of Nepal. Four out of seven serious mappers told me that their motivations were related to the development of Nepal. For example, Nirab Pudasaini told me that he started contributing to OSM because he had realized that OSM was beneficial for Nepal:

OpenStreetMap is very helpful for Nepal so I started contributing to it. So my motivation comes from the notion that it will be very beneficial for a country like Nepal to have a free map data [Pudasaini, Interview, 7.12.2016].

He is now working at Kathmandu Living Labs, hoping to create a robust data set, develop local capacity among people so that people can collect data regularly, motivate young people so that they can observe the community, and develop spatial literacy [Pudasaini, Interview, 7.12.2016]. All of these are important skills for citizens in Nepal to create a democratic society because the country is struggling with the transition from a monarchy to a republic and copes with high levels of hunger, poverty, and natural disasters to develop the country by citizens themselves [Central Intelligence Agency, 2017].

Also, Sazal Sthapit asserted that OpenStreetMap is a digital infrastructure of development that enables government to make informed decisions:

OpenStreetMap is a digital infrastructure of development. Because in development decision you need to make informed decisions. [Sthapit, Interview, 7.28.2016].

This quote shows the importance of informed decisions for the development of country

and the benefit of OpenStreetMap to make informed decisions which contribute to creating a democratic society. Since most problems are local, the government can capitalize on local knowledge provided by local people and address issues that the government cannot solve alone [Budhathoki Haythornthwaite, 2012].

Another example is Manoj Thapa, who intends to use OSM for tourism in Pokhara:

Pokhara is one of the tourist areas. Through using OpenStreetMap we can promote our tourism industry [Thapa, Interview, 7.12.2016].

Manoj Thapa is trying to map hotels and tourism places. Through mapping these places, he intends to promote tourism in Pokhara, the preeminent tourist destination of Nepal. Promotion of tourism is important for the development of Nepal because Nepal's economy relies on aid and tourism [Central Intelligence Agency, 2017].

Moreover, I observed that the projects by Kathmandu Living Labs are contributing to the development of Nepal [Tanaka, 2017]. For example, "Engaging Youth in Mapping Agriculture and Food Security" is the project to create an agricultural map which can increase the visibility of farmers' local products to the market and enhance their income. Agricultural development is essential for the development of Nepal, since it is a major sector of Nepalese economy, contributing about 30 percent of the GDP and providing employment opportunities to about 70 percent of the total population [Government of Naepal , Ministry of Agricultural Development , 2017]. Mapping and Opening Data for Local Governance and Citizen Engagement is a project to create a communication tool between the government and citizens. This two-way communication between the government and citizens contributes to creating an effective and democratic governance that empowers citizens and enables government to capitalize on citizens' knowledge and experience [Budhathoki Haythornthwaite, 2012].

Furthermore, Kathmandu Living Labs contributes to developing Nepal in empowering people. For example, Sazal Sthapit told me that OSM is an empowerment tool that creates a public discourse:

OSM is about empowerment tool. It is because it empowers people to reflect or transform the physical realities in spaces to make it available in digital forms and share it with the whole world. So, it enables people to communicate what might otherwise have been lost. For example, if you do not have roads in your areas, you can create a public discourse about why there is no road in the area [Sthapit, Interview, 7.28. 2016].

This quote illustrates the idea that OpenStreetMap empowers people in providing opportunity to observe their physical realities, ask questions, and create a public discourse. empowerment is an important driving force for realizing effective democratic society [Welzel Inglehart, 2008; Pyakuryal, 2000].

It also raises awareness. So, it engages citizens to look their environment more cautiously and ask questions. [Sthapit, Interview, 7.28. 2016].

This quote illustrates the idea that raising awareness of local issues and asking questions about it are important steps to be an engaged citizen.

Nirab Pudasaini told me that OSM empowers people in developing spatial literacy, which enables them to create maps for the community. He also told me how strong a feeling of empowerment people can get from creating a map by describing a story of a young person. Especially in rural areas in Nepal, many people do not have access to digital technology. Creating maps makes them feel empowered:

There was a farmer and he did not know much about technology and computer. At first he was really confused on how to use the satellite image but when he started mapping he said to me "I can really see the place I am in right now" after he created a map of his community. That feeling that you can do something is empowering. So, it is not just data but it is an empowerment tool that people can create and share maps [Pudasaini, Interview, 7.12.2016].

This quote illustrates how digital technology empowers farmers in rural Nepal where people engage in traditional agriculture with very limited access to modern technologies. Nepal had a long time of feudalistic governance in which the society was run by fulfilling the interests of a few ruling elite. Although the restoration of the parliamentary system of democracy in 1990 opened opportunities for positive actions, the continuation of power and influence of the established interest groups with political uncertainty has resulted in a delay of development of the country, and Nepal has remained one of the poorest countries [Pyakuryal, 2000]. In order to develop a country with democratic societies, human empowerment is important [Welzel Inglehart, 2008]. Thus, Kathmandu Living Labs' contribution to empowering people is beneficial for the development of the country.

Overall, users are contributing to OSM for the development of Nepal by creating a digital infrastructure which capitalizes on citizens' local knowledge so that governments can address issues that governments cannot solve alone. It enables governments to make informed decisions based on the local knowledge, and contributes to the keystones toward the development of Nepal, such as agriculture development, tourism development, and civic engagement. Moreover, OSM users contribute to the development of Nepal in empowering people by making people observe their physical realities, ask questions, and create a public discourse. Wei Lin (2015) argued, "Still little is known about less active contributors who constitute the majority of the contributions or long tail contributors in OSM and many other VGI initiatives." This study suggested that *development of country* is the common motivational factor of active mappers for contributions to volunteered geographic information in developing countries. Highlighting the aspect of *development of country* in the practice and recruitment of volunteered geographic information will be beneficial for the development of VGI.

Humanitarian purpose is a common motivator of serious mappers in Nepal

Another common theme that emerged from interviews and participant observation regarding the motivations for contribution to OSM is that it is beneficial for humanitarian purpose. Three informants told me that they use OSM for humanitarian purpose. For example, Prabhas Pokharel used Quake Map after the earthquake in 2015. Quake Map is a communication tool used between people on the ground and relief providers. It uses OpenStreetMap as a base map:

I have visited the place the people have dispatched from medical visits and installed the OpenStreetMap to few of the medical personnel's phones. We used the map in Quake map in order to figure out where people actually need help. Army used it [Pokharel, Interview, 7.28.2016].

After the earthquake in 2015 in Nepal, the big challenges were coordination and collaboration caused by the lack of information on what kind of help was needed and where. Quake Map enabled people on the ground to upload this information, and relief providers and local governments used the information to provide relief.

Map acted as a key way to know about the new places and where people are, making relief effort more efficient [Pokharel, Interview, 7.28.2016].

This quote illustrates that this system of collaboration made the relief effort more efficient in enabling relief providers to know the geographic distribution of people and specific details about the relief effort.

Also, Prabhas Pokharel explained that being able to see the contribution is important, and humanitarian work is a kind of work in which contributors can see the impact of their work. After the earthquake in 2015, he returned to Nepal and worked with Kathmandu Living Labs.

Prabhas Pokarel saw the impact of OpenStreetMap in his relief efforts after the earthquake in Nepal:

It is often difficult to see the direct impact of this kind of software works because you build tools and people take that tools. The place that we really saw the impact of our work was when launched right after the earthquake. [Pokharel, Interview, 7.28.2016].

This quote shows the importance of being able to see the contribution. Prabhas states “When they (OSM users) make a contribution, everybody can see that contribution that is really important” [Pokharel, Interview, 7.28.2016]. OpenStreetMap is a digital map of the world. When users contribute only to collect data and upload to OpenStreetMap, they are not able to see their contribution except for the creation of the map and benefit of navigation [Tanaka, Field Note on Mapping Party, 2017]. However, users who create applications which use OSM as a base map and use the applications for various purpose such as agricultural development, civic engagement, and disaster management can see the impact of their work such as people’s recovery from the earthquake [Pokarel, 2016]. Although casual mappers use OSM to collect data, train people, and research, they do not create applications to directly solve social issues [Paudel P. , 2016; Paudel R. , 2016; B K, 2016]. For example, in the mapping party and Summer Workshop, participants leaned how to collect data and upload to OSM but did not learn how to use applications which use OSM to address social issues such as agriculture development, disaster management, and civic engagement. [Tanaka, Field Note on Mapping Party, 2017; Tanaka, Field Note on Summer Workshop, 2017]. I argue that this lack of experience of using OSM and its applications to address social issues could lead to lack of feeling of contribution to the society, preventing them from being able to see the impact of their work.

Also, Manoj Thapa is creating a resilient community to prepare for future disasters in

Pokhara, the second largest city in Nepal:

We are right now focusing on creating a resilient community in terms of disaster. We want to be able to be prepared and ability to plan to disaster in Pokhara [Thapa, Interview, 7.12.2016].

Kathmandu Living Labs is mapping all the roads, names, schools, hospitals, health facilities, and places where people gather, including malls and big buildings. They are training people to prepare for disasters [Thapa, Interview, 7.12.2016].

In addition, I observed that participants of the White House Mapathon on July 7 used OSM for humanitarian purposes in Swaziland [Tanka, 2017]. In the White House Mapathon, participants contributed to mapping Swaziland through a Humanitarian Open Street Map Team (hotosm) task. This project is a part of The Missing Maps project which aims to map the most vulnerable places in the world affected by humanitarian crises including disease epidemics and conflict. It illustrates that people use OSM for humanitarian purpose in developing countries.

Humanitarian work is driven by altruism (opportunity to add to the common good utilizing selfless and other oriented behavior) [Krieg, 2013]. For example, Prabhas Pokharel used OSM after the earthquake to help people:

We were able to help so many people with some really necessary work after the earthquake. Map was really a foundation of people's relief efforts. [Pokharel, Interview, 7.28.2016].

This quote shows that OpenStreetMap was fundamental to his relief efforts, and his humanitarian work was driven by altruistic motivation (opportunity to add to the common good). This relationship between humanitarian work and altruism aligns with the Krieg (2013)'s assertion that altruism is the main driving force for humanitarian intervention [Krieg, 2013].

A number of studies have reported that most instances of volunteered geographic

information in developing countries are driven by disaster management or other humanitarian purposes [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017; Soden Palen , 2014]. Since volunteered geographic information is cheaper than a traditional large-scale project of collecting national geographical information, it has been considered as an attractive alternative in developing countries [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017]. Interviews and observations indicated that OSM is used for humanitarian purposes in developing countries, and it aligns with Mahabir et al.'s (2017) assertion that humanitarian purpose is the major drive for the contribution to OSM in developing countries.

Overall, humanitarian purpose is a common motivator of serious mappers in Nepal. This aligns with a number of studies. Humanitarian work is driven by *altruism* (opportunity to add to the common good). Although it is often hard to see the contribution of OpenStreetMap, humanitarian work is a case in which contributors can see the impact of their work. For example, contributors can see people's recovery from the earthquake. Yang et al. (2015) argued, "A further extension is to dive deeper and ask why in the first place the balance between the silent majority and vocal minority shifts" [Yang, Fan, Jing, Sun, Zipf, 2015]. This study enriched the field of VGI in suggesting that seeing the impact of contributors' work motivate less active mappers (silent majority) to active mappers (vocal minority). Also, this research clarified that humanitarian work comes from *altruism* of people in developing countries.

Pleasure of creation enables mappers to actively contribute to OSM

Pleasure of creation is a motivator that enables mappers to actively contribute to OSM. Sazal Sthapit, Manoj Thapa, and Alisha B.K. told me that they have been engaged in using OSM because of the pleasure of creation. For example, Manoj Thapa, who has been involved

in mapping for about five years and is a veteran mapper, told me that he uses OSM in his daily life, and mapping is his hobby:

These days OpenStreetMap is a hobby for me. I use it in my daily life (...) I got involved in mapping because it is fun [Thapa, Interview, 7.12.2016].

This quote illustrates that *pleasure of creation* is a motivator for him to continue engaging in mapping in his daily life. In addition, Sazal Sthapit, a project manager at Katmandu Living Labs, told me that he loves maps because rendering maps reminds him of computer games he used to play:

First, I love maps. Rendering maps remind me of computer games I used to play so much. [Sthapit, Interview, 7.28.2016].

This quote illustrates that *pleasure of creation* is a motivation for contribution to OSM. It also suggests that his preference comes from his childhood experience, specifically, playing computer games. Moreover, Alisha B.K., an intern at Kathmandu Living Labs who studies management and just completed Shree Sidda Higher Secondary School, told me that the process of collecting data and uploading to JOSM makes her happy and it can change her life:

I am very happy. I go to field and collect the data and upload into JOSM. It should change of my life. I did not know many places because I did not know how to search but now I can search where we go and find our places and things. [Thapa, Interview, 7.12.2016].

All of three quotes illustrate that they enjoy experiencing the process of map creation, including observing places, collecting data, and uploading to OSM. These quotes also show that mapping in OSM has become a part of their life. It aligns with the Nov's (2007) assertion that *pleasure of creation* is a factor that shows significant correlation between motivation and contribution, and it would make sense to focus on highlighting *please of creation* in recruitment efforts [Nov, 2007].

Overall, *pleasure of creation* is a factor that enables users to continue being involved in

mapping and make mapping a part of their life. The process of map creation, including observation of places, collecting data, and uploading to OSM, enables mappers to experience a *pleasure of creation*. Highlighting the *pleasure of creation* in a mapping party could contribute to motivating mappers to continue being involved in mapping. Budhathoki et al. (2010) asserted, “In OSM, a well-developed VGI project, less than 10 percent of the users contribute more than 80% of the content, and about 40% of the users do not return to the site after their first contributions.” This study contributed to the field of VGI in understanding what aspect of OSM contributes to mappers to continue being involved in mapping. The process of creating OSM, such as observing places, collecting data, and uploading to OSM, is a pleasing experience for serious mappers, and it makes them continue being involved in mapping. Highlighting the aspect of *pleasure of creation* in the practice and recruitment of VGI will contribute to the development of VGI.

Altruism and meeting own need of navigation are common motivators of both serious and casual mappers

Motivators that are common in serious and casual mappers are *altruism* and *meeting own need of navigation*. Six informants including Sazal Sthapit, Nirab Pudasaini, and Prabhat Paudel told me their primary motivation is related to *altruism*. For example, Prabhat Paudel, an intern at Kathmandu Living Labs, explained that using OSM for the whole community is a precious thing:

If we can use it for the whole community, it would be more happy and precious thing [Paudel P., Interview, 7.12.2016].

Prabhat explained that he would like to use OSM for the benefit of others. It illustrates that he would find value in using OSM for the whole community in Nepal. To be specific, he is

a Geomatics Engineering student, and he is learning about GIS and remote sensing. He lives in a village one hour from the center of Pokhara by bus. His family are farmers and live in the forest area. There was a landslide near Pokhara, and many people died. There was no information about landslide in the area. He told me that he would like to use OpenStreetMap to predict disasters and bring entrepreneurs to maintain the area. It illustrates that OSM provides an opportunity to add to the common good.

Sazal Sthapit also told me one of the motivations for contribution to OSM is its benefit to the people, highlighting how small contributions to OSM by individuals creates a big benefit:

One of the things that got me interested in OpenStreetMap is the phrase "None knows everything, everyone knows something." It is about we can contribute in little thing to online tools and everyone can be benefited [Sthapit, Interview, 7.28. 2016].

During the interview, Sazal Sthapit repeatedly told me that OpenStreetMap is a platform which can capitalize on small contributions by individuals to create a big benefit. This aligns with the notion of *altruism* which provides opportunities to add to the common good.

Another common motivator of both serious and casual mapper is *meeting own need of navigation*. Four informants told me that they use OSM for navigation. For example, Prabhas Pokarel uses Maps.me which uses OpenStreetMap as a base map.

I have Maps.me installed in my phone so it has offline maps. (...) If I go to the new neighborhoods, I look at the map [Pokarel, Interview, 7.28.2016].

This quote illustrates that he uses OSM for navigation. He usually uses Maps.me, an application which has detailed offline maps. He described that Nepal has a culture of oral direction, and he uses Maps.me as a reference that adds to the oral directions that people often use in Nepal. He also points out that Google Maps has a lack of information outside of Kathmandu City:

Especially when I travel outside of Kathmandu city, Google has little information but in OSM we have built a huge repository in pretty far distance areas. [Pokarel, Interview, 7.28.2016].

This quote illustrates that there are information gaps in Google Maps, especially outside of Kathmandu City. Therefore, OSM is useful in rural areas.

According to Benkler and Nissenbaum (2006), *altruism* emphasizes a concern for others over one's own need. An altruistic act aims at benefiting others without any intent to improve one's own situation [Benkler Nissenbaum, 2006]. Most contributions to OpenStreetMap benefit a wide range of people, including citizens who use OpenStreetMap for navigation, people who worked on earthquake relief efforts, and other individuals who use applications which use OpenStreetMap. Many contributions to OpenStreetMap can be categorized as altruistic acts. Mappers who are motivated purely by *altruism* collect data and upload it to OSM without any desire for satisfaction of one's own need. However, although the majority of informants use OSM for altruistic purpose, the motivations of OSM are grounded in *meeting own need of navigation* as well. This aligns with Budhathoki et al.'s (2012) study that an important motivator of OpenStreetMap is “personal but shared need” associated with contribution to open-source projects, co-orientation to open-source and geographic knowledge, and attention to participation in the community.

Overall, many mappers use OSM for both an altruistic purpose and meeting their own need of navigation. Mahabir et al. (2017) argued that studies each country has unique factors that drive the contribution of volunteered geographic information [Mahabir , Stefanidis, Croitoru, Crooks , Agouris , 2017]. This study contributed to the field of VGI in discovering *meeting own need of navigation* to be a common motivator of mappers in developing countries. Considering the need of navigation in developing countries, highlighting the aspect of *meeting*

own need of navigation in the practice and recruitment of VGI will contribute to the development of VGI.

Self-efficacy and self-actualization are common motivators of casual mappers

Self-efficacy is a common motivator for casual mappers. Three out of five interns at Kathmandu Living Labs told me that they use OSM for *self-efficacy*. For example, Roshan Paudel, an intern at Kathmandu Living Labs, told me about the confidence he has gotten from contributing to OSM:

The more I contribute, the more I build confidence in me [Paudel, R, Interview, 7.12.2016].

He is working as an intern at Kathmandu Living Labs and training people on OSM. When he trains people on how to use OpenStreetMap, he builds confidence. I observed that he trained people on OSM by teaching them how to use paper maps and Android applications and uploading data to JOSM during a mapping party [Tanaka, Field Note on Mapping Party, 2017]. It is suggested that this teaching experience enabled him to believe that he has knowledge and skills to meet the expectation of others. *Self-actualization* is another motivator of casual mappers. For example, Gaurab Basnet has developed leadership and speaking abilities:

OpenStreetMap helped me develop leadership and speaking ability [Basnet, G, Interview, 7.12.2016].

Through training people on OSM in communicating with people from various organizations, he has improved his leadership ability. I observed that he trained people on OSM during a mapping party [Tanaka, Field Note on Mapping Party, 2017].

According to Lin (2015), the understandings of “*interactivity*” between VGI contributors and VGI initiatives in the mapping process is important, and it includes *use-to-system*

interactivity, *user-to-documents interactivity*, and *user-to-user interactivity*. Mapping party and mapping trainings are where people are introduced on OpenStreetMap, and the activities include a lot of *user-to-user interactivity*. For example, in a mapping party on July 11, experienced mappers taught new mappers how to use paper maps and Android applications and upload data to JOSM. In a summer workshop, new mappers identified social issues, developed an action plan to use mapping to address social issues, and exchanged their ideas on how to use mapping to address social issues [Tanaka, Field Note on Mapping Party, 2017; Tanaka, Field Note on Summer Workshop, 2017]. These *user-to-user interactivities* enable old mappers to develop leadership skills, speaking skills, and confidence, thus leading them to develop *self-efficacy* and *self-actualization*.

Overall, *self-efficacy* and *self-actualization* are common motivators of casual mappers, and *user-to-user interactivity* is where mappers can exercise these values. Mapping parties and mapping trainings are where “*interactivity*” is utilized. Thus, focusing on developing *self-efficacy* and *self-actualization* of old mappers in mapping parties can facilitate the involvement of casual mappers in mapping. Yang et al. (2015) argued, “A further extension is to dive deeper and ask why in the first place the balance between the silent majority and vocal minority shifts” [Yang, Fan, Jing, Sun, Zipf, 2015]. This study suggests that the understandings of the concept of *user-to-user interactivity* and its relationship to casual mappers' motivation is beneficial for clarifying why and how the balance between the silent majority and vocal minority shifts in volunteered geographic information.

Chapter 5: Conclusion

This study used participant observation, interviews, and a collaborative approach to research to answer the following question: What are the motivations for contribution to volunteered geographic information? I investigated Map For Everyone, an OSM community building project by Kathmandu Living Labs in Nepal. I found that the common motivators for the contribution to OSM of serious mappers were *altruism, pleasure of creation, meeting own need of navigation, development of country, and humanitarian*. The common motivators for contribution to OSM of casual mappers are *altruism, self-efficacy, and meeting own need of navigation*. *Altruism* and *meeting own need of navigation* are common motivators of both serious and casual mappers.

This study showed the significance of *development of country* as the motivation for contribution to VGI in Nepal. In the time of the transition from a monarchy to a republic coping with high levels of hunger, poverty, and natural disasters, the role of volunteered geographic information as an open platform where citizens and government can work together to develop the country is enormous. OSM enables governments to make informed decisions based on local knowledge and contributes to the keystones toward the development of Nepal, such as agriculture development, tourism development, and civic engagement. Moreover, the motivation of *development of country* is related to the contribution of *empowerment*. Users contribute to the development of Nepal by empowering people by making them observe their physical realities, ask questions, and create a public discourse. This study enriched the VGI scholarship by suggesting that *development of country* is a common motivational factor of active mappers for contributions to volunteered geographic information in developing countries.

Highlighting the aspect of *development of country* in the practice and recruitment of volunteered geographic information will be beneficial for the development of VGI.

This study also showed the importance of humanitarian purpose as the motivation for contribution in Nepal, and this aligns with a number of studies. Humanitarian work is driven by the intrinsic motivation of *altruism* (opportunity to add to the common good). Although it is often hard to see the contribution of OpenStreetMap, humanitarian work is a case in which contributors can see the impact of their work. For example, contributors can see people's recovery from the earthquake. This study showed the importance of feedback such as the visualization of contribution and seeing the impact of contributors' work to motivate people to continue involved in mapping. This study enriched the field of VGI in suggesting that seeing the impact of contributors' work motivates less active mappers (silent majority) to active mappers (vocal minority). Also, this research clarified that humanitarian work comes from *altruism* of people in developing countries.

This study contributed to the field of VGI in understanding what aspect of OSM contributes to mappers to continue being involved in mapping. The process of creating OSM, such as observing places, collecting data, and uploading to OSM, is a pleasing experience for serious mappers, and it makes them continue being involved in mapping. Highlighting the aspect of *pleasure of creation* in the practice and recruitment of VGI will contribute to the development of VGI.

Finally, this study highlighted the idea that *self-efficacy* and *self-actualization* are common motivators of casual mappers, and *user-to-user interactivity* is where mappers can exercise these values. Mapping parties and mapping trainings are where "*interactivity*" is utilized. Thus, focusing on *user-to-user interactivity* in mapping parties can facilitate the

intrinsic motivation of *self-efficacy* and *self-actualization* of mappers. Highlighting the aspect of *user-to-user interactivity* will be beneficial for the development of VGI.

Chapter 6: Recommendation

Although this research was carefully conducted, I am still aware of its limitations and shortcomings. First, the research was conducted in two and half months. Two and half months is not enough to observe all of the various mapping workshops in Nepal. Second, the population of the informant's group is small; only fourteen staff members, interns, and former staff members at KLL might not represent the majority of serious mappers in Nepal. In addition, since the analysis of the interviews and mapping workshops was conducted by myself, it is unavoidable that in this study, a certain degree of subjectivity can be found. Moreover, since I do not speak nor understand the Nepalese language, I might have missed out on any essential conversations or information in the Nepalese language.

Community Organizations

- Organize mapping workshops in which participants can experience the feeling of direct contribution to society which includes contribution to the *development of country* and *humanitarian* work. For example, community organizations can involve participants in projects such as local governance and civic engagement so that citizens can be actively engaged in local governance. Community organizations can involve citizens in mapping agriculture and food security to develop agriculture which is crucial for the development of Nepal. These experiences enable participants to see the impact of their work for the development of Nepal, and this feedback will motivate participants to continue to be involved in mapping.

- Making people experience the *pleasure of creation* is important, and several strategies can be suggested. One of them is visualization of contribution to mapping. Visualizing missing places in OpenStreetMap will attract mappers to map the missing place, and filling the gaps will provide mappers with satisfaction [Budhathoki Haythornthwaite, 2012]. Another one is lowering the technological hurdle. Collecting data using Android applications, uploading the data to JOSM, and editing in OSM on computers needs some of the technical skills as well as access to the internet and a computer with some capacity. Making the process of data collection, uploading to JOSM, and editing in OSM as easy as possible will attract more users who have less technical experience.
- Hold a series of workshops to develop practical skills in using OpenStreetMap to develop the country and contribute to humanitarian work. Compared to holding one-day or short-term workshops, a series of workshops will enable participants to develop practical skills to use OpenStreetMap to develop the country and contribute to humanitarian work. For example, after learning how to collect data, uploading to JOSM, and editing in OSM, participants can learn how to create their own map to address local issues, how to use applications to solve social issues and contribute to humanitarian work. Also, long-term workshops will enable participants to interact on a regular basis, which will contribute to create a mapping community. Moreover, long-term workshops will create a habit of collecting data, uploading to JOSM, editing in OSM, and using OSM and its applications to contribute to society. This will lead to support mappers who continue to be involved in mapping for a long time.

Schools

- Include OpenStreetMap in the educational curriculum. This will enable students to be engaged citizens in observing physical realities, ask questions, and create a public discourse. Nepal has undergone political changes, and the demand for creating engaged citizens who have spatial literacy and capacity to transform the local governance is increasing. Including OpenStreetMap in educational curriculum will contribute to raising citizens who have spatial literacy and capacity to transform the local governance. Currently, rural areas are not mapped very much compared to urban areas [Glasze Perkins, 2015]. Since public schools are located in both urban areas and rural areas, including OpenStreetMap in educational curriculum will enable students to map both urban areas and rural areas. This will contribute to solving the issue of unequal contribution to OpenStreetMap in urban and rural areas. Also, including OpenStreetMap will contribute to educational reform since practices of OpenStreetMap include some component of service learning and digital technology learning.

Planning and development agencies

- Provide grants and technical resources to underserved communities outside of Kathmandu and Pokhara. This will allow people in underserved communities to map their own communities and advocate for their own issues. In addition, they will have the ability to inform national policy making based on their local knowledge.

Foundations/ International Donors

- Increase funding for civic technology companies working on OpenStreetMap. Provide funding for capacity-building such as human resources and technical resources. This will allow the company to have a diverse staff and enough technical resources.

References

- Arsanjani, J. J., Zipf, A., Mooney, P., & Helbich, M. (2015). *An Introduction to OpenStreetMap in Geographic Information Science: Experiences, Research, and Applications*. Springer International Publishing Switzerland .
- Averill, J. B. (2006). *Getting Started: Initiating Critical Ethnography and Community Based Action Research in a Program of Rural Health Studies*. International Journal of Qualitative Methods.
- B K, A. (2016, 7 12). Interview. (Y. Tanaka, Interviewer)
- Barbara, I., Schults, A., Parker, E., & Becker, A. (1998). Review of Community-Based Research: Assessing Partnership to Improve Public Health. *Annual Review of Public Health* 19, 173-202.
- Benkler , Y., & Nissenbaum, H. (2006). Commons-based Peer Production and Virtue. *The Journal of Political Philosophy: Volume 14, Number 4*, 394–419.
- Bennett, J. (2016). *OpenStreetMap*. San Bernardino, CA: Packt Publishing.
- Bishr, M., & Kuhn, W. (2007). Geospatial Information Bottom-up: A Matter of Trust and Semantics the European Information Society. *The European Information Society-Leading the Way with Geo-information*, 365–387.
- Bittner, C. (2014). Reproduktion sozialräumlicher Differenzierungen in OpenStreetMap: das Beispiel Jerusalems. *Kartographische Nachrichten* 64(3), 136–144.
- Bruns, A. (2008). *Blogs, Wikipedia, Second Life, and beyond: From production to produsage*. New York, NY.
- Budhathoki, N. R., Budic, Z. N., & Bruce, B. C. (2010). *An Interdisciplinary Frame For Understanding Volunteered Geographic Information*. Geomatica.
- Budhathoki, N. R., Zorica, B., & Bertram, B. (2008). Reconceptualizing the role of the user of spatial data infrastructure. *GeoJournal* 72(3-4), 149-160.
- Budhathoki, N., & Haythornthwaite, C. (2012). Motivation for Open Collaboration: Crowd and Community Models and the Case of OpenStreetMap. *American Behavioral Scientist*.
- Burns, R. (2014). Moments of closure in the knowledge politics of digital humanitarianism. *Geoforum* 53, 51–62.
- Central Intelligence Agency. (2017, 5 13). *The World Fact Book*. Retrieved from Central Intelligence Agency: <https://www.cia.gov/library/publications/the-world-factbook/geos/np.html>
- Clary, G., & Snyder, M. (1999). The Motivations to Volunteers: Theoretical and Practical Considerations. *Current Directions in Psychological Sciences*, 8(5), 156-159.
- Clary, G., Snyder, M., Ridge, R., Copeland, J., Stukas, A., Haugen, J., & Miene, P. (1998). Understanding and Assessing the Motivations of Volunteers: A Functional Approach. *Journal of Personality and Social Psychology*, 74(6), 1516-1530.
- Coleman, D. Y., & Labonte, J. (2009). Volunteered Geographic Information: the nature and motivation of producers. *International Journal of Spatial Data Infrastructures Research, Vol. 4* .
- Cornwell, J. (1995). What is Participatory Action Research? *Soc Science & Medicine*, 41, 1667-76.
- Deci, E. (1971). Effects of externally mediated rewards to intrinsic motivation. *Journal of Personality and Social Psychology*, 18(1), 105-115.
- Deci, E., & Ryan, R. (1985). Intrinsic motivation and selfdetermination. *human behavior*.
- Desislava , H., Giovanni, Q., Mashhadi, A., & Capra, L. (2013). The Life of the Party: Impact of Social Mapping in OpenStreetMap.
- Ezilon Maps. (2017, 6 11). *Ezilon Maps*. Retrieved from Ezilon Maps: <http://www.ezilon.com/maps/asia/nepal-maps.html>
- G, H., Niedner, S., & Herrmann, S. (2003). *Motivation of software developers in Open Source projects: an Internet-based survey of contributors to the Linux kernel Research Policy*.

- Glasze, G., & Perkins, C. (2015). *Social and Political Dimensions of the OpenStreetMap Project: Towards a Critical Geographical Research Agenda*. Switzerland : Springer International.
- Goodchild, M. (2007). Citizens as Voluntary Sensors: Spatial Data Infrastructure in the World of Web 2.0. *International Journal of Spatial Data Infrastructures Research* 2, 24-32.
- Google. (2017, 2 19). *Google Map Maker*. Retrieved from Google Map Maker: <https://mapmaker.google.com/mapmaker?hl=ja>
- Government of Naepal , Ministry of Agricultural Development . (2017, 6 7). *Government of Naepal* . Retrieved from Ministry of Agricultural Development : <http://www.moad.gov.np/en/>
- Haworth, B., & Bruce, E. (2015). A Review of Volunteered Geographic Information for Disaster Management. *Geography Compass*, 237–250.
- Hess , C., & Ostrom, E. (2007). A Framework for Analyzing a Knowledge Commons. *Understanding Knowledge as a Commons: From Theory to Practice*, 367.
- Humanitarian OpenStreetMap Team. (2017, 3 13). *Projects*. Retrieved from OSM Tasking Manager: http://tasks.hotosm.org/?sort_by=priority&direction=asc&search=%232005
- Kathmandu Living Labs. (2017, 4 8). *IIASA KLL PAC Mapping Party*. Retrieved from Kathmandu Living Labs: <http://www.kathmandulivinglabs.org/events/iiasa-kll-pac-mapping-party>
- Kathmandu Living Labs. (2017, 4 11). *Kathmandu Living Labs*. Retrieved from Kathmandu Living Labs: <http://www.kathmandulivinglabs.org/>
- Kathmandu Living Labs. (2017, 4 8). *Map For Everyone*. Retrieved from Kathmandu Living Labs: <http://www.kathmandulivinglabs.org/projects/map-for-everyone>
- Kathmandu Living Labs. (2017, 3 13). *Prepare Pokhara - 2C (Secondary Cities) Project*. Retrieved from Kathmandu Living Labs: <http://www.kathmandulivinglabs.org/projects/prepare-pokhara-2c-secondary-cities-project>
- Kathmandu Living Labs. (2017, 2 28). *Youth and Mapping for Social Change*. Retrieved from Kathmandu Living Labs: <http://blog.kathmandulivinglabs.org/youth-and-mapping-for-social-change/>
- Krieg, A. (2013). National Interests and Altruism. In A. Krieg, *Motivations for Humanitarian Intervention, SpringerBriefs in Ethics* (pp. 37-58). Springer Netherlands.
- Lachman, B., Wong, A., Knopman, D., & Gavin, K. (2002). *Lessons for the Global Spatial Data Infrastructure*. Santa Monica, CA, USA: Rand Corporation.
- Lin, W. (2015). Revealing the making of OpenStreetMap: A limited account. *The Canadian Geographer / Le Géographe canadien* 59(1), 69–81 .
- M, W., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1), 35-57.
- Macnamara, J. (2010). Public communication practices in the Web 2.0-3.0 mediascape: The case for PRevolution. *PRism* 7(3), 1-13.
- Mahabir , R., Stefanidis, A., Croitoru, A., Crooks , A., & Agouris , P. (2017). Authoritative and Volunteered Geographical Information in a Developing Country: A Comparative Case Study of Road Datasets in Nairobi, Kenya. *ISPRS Int. J. Geo-Inf.* .
- Minkler, M., & Wallernstein, N. (2003). *Community Based Participatory Research for Health*. San Francisco, CA: Jossey-Bass.
- Minkler, M., & Wallerstein , N. (2008). The dance of race and privilege in CBPR. In V. Chavez, *Community Based Participatory Research for Health: From Process to Outcomes*. San francisco, CA.
- Monica, S. (2013). Gender and the GeoWeb: divisions in the production of user-generated cartographic information. *GeoJournal* 78(6), 981–996.
- Mooney, P., Rehrl, K., & Hochmair, H. (2013). Action and interaction in volunteered geographic information: a workshop review. *Journal of Location Based Services*, 291-311.
- Moore, D., Gould, J., McGuire, F., & Stebbins, R. (2008). Development of the Serious Leisure Inventory and Measure. *Journal of Leisure Research*, 40(1), 47-68.
- Mordechai, H. (2010). How good is volunteered geographical information? a comparative study of

- OpenStreetMap and ordnance survey datasets. *Env Plann B* 37(4), 682–703.
- Nedović-Budić, Z., & Pinto, J. K. (1999). Understanding Inter-organizational GIS Activities: A Conceptual Framework. *Journal of the Urban and Regional Information System Association*, 11(1), 53-64.
- Neis, P., & Zielstra, D. (2014). Recent developments and future trends in volunteered geographic information research: the case of OpenStreetMap. *Future Internet* 6(1), 76–106.
- Nov, O. (2007). *What Motivates Wikipedians?* Communications of the Acm.
- Open Data for Disaster Initiative. (2017, 2 24). *Nepal Open Data for Disaster Initiative*. Retrieved from Open Data for Disaster Initiative: <https://opendri.org/project/nepal/>
- OpenStreetMap Wiki. (2017, 2 22). *About OpenStreetMap*. Retrieved from OSM Wiki: <http://wiki.openstreetmap.org/wiki/About>
- Ostrom, E., & Hess, C. (2007). *Understanding Knowledge as a Commons: From Theory to Practice*. MIT Press.
- Palen, L., Soden, R., Anderson, J., & Barrenechea, M. (2015). Success & Scale in a Data-Producing Organization: The Socio-Technical Evolution of OpenStreetMap in Response to Humanitarian Events. *CHI 2015* (pp. 4113-4122). Seoul, Republic of Korea: ACM.
- Parker, E. (2013). Developing and Implementing Guidelines for Dissemination: The Experience of the Community Action Against Asthma Project. In B. Israel, *Methods in Community Based Participatory Research for Health*. San Francisco, CA: Jossey-Bass.
- Paudel, P. (2016, 7 12). Interview. (Y. Tanaka, Interviewer)
- Perkins, C., & Dodge, M. (2008). The potential of user-generated cartography: A case study of the OpenStreetMap project and Mapchestermappingparty. *NorthWestGeography*8(1), 19–32.
- Pokarel, P. (2016, 7 28). Interview. (Y. Tanaka, Interviewer)
- Pudhasani, N. (2016, 7 8). (Y. Tanaka, Interviewer)
- Pyakuryal, K. (2000). *Restoration of Democracy and People's Empowerment in Nepal*.
- Quattrone, G., Mashhadi, A., & Capra, L. (2014). Mind the map: The impact of culture and economic affluence on crowd-mapping behaviours. *Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*, (pp. 934-944). Baltimore, MD, USA.
- Schatzman, L., & Anselm, S. (1973). Strategies for Recording. *Field Research: Strategies for a Natural Sociology*, 94-107.
- Shrestha, H. (2016, 7 29). Interview. (Y. Tanaka, Interviewer)
- Shrestha, M. (2016, 7 28). Interview. (Y. Tanaka, Interviewer)
- Soden , R., & Palen , L. (2014). From Crowdsourced Mapping to Community Mapping: The Post-Earthquake Work of OpenStreetMap Haiti. *COOP 2014 - Proceedings of the 11th International Conference on the Design of Cooperative Systems*, 27-30 (pp. 311-326). Nice (France): Springer.
- Sthapit, S. (2016, 7 28). Interview. (Y. Tanaka, Interviewer)
- Tanaka, Y. (2017, 3 10). Field Note on Mapping Party.
- Tanaka, Y. (2017). *Field Note on Summer Workshop*.
- Tanka, Y. (2017). *Field Note on White House Mapathon*. 22: 3.
- Thapa, M. (2016, 7 12). (Y. Tanaka, Interviewer)
- Watson-Gegeo, K. (1988). Reflections on "Ethnography in ESL: Defining the Essentials". *TESOL Quarterly* Vol 22, No.4, 472-474.
- Watson-Gegeo, K. (1992). Thick Explanation in the Ethnographic Study of Child Socialization and Development: A Longitudinal Study of the Problem of Schooling for Kwara'ae (Solomon Islands) Children. *New Directions for Child Development* 58, 51-66.
- Welzel, C., & Inglehart, R. (2008). *Democracy as Human Empowerment: The Role of Ordinary People in the Emergence and Survival*. Center for the Study of Democracy, UC Irvine.
- Yang, A., Fan, H., Jing, N., Sun, Y., & Zipf, A. (2015). Temporal Analysis on Contribution Inequality in OpenStreetMap: A Comparative Study for Four Countries. *ISPRS Int. J. Geo-Inf*.

Appendix 1: Interview Questions

Questions for participants (interns and former staff at KLL)

1. Could you tell me your name and what you do? What does OpenStreetMap mean to you?
2. How do you use OpenStreetMap?
3. How were you benefited from using OpenStreetMap?
4. What was the most surprising experience you have seen through using OpenStreetMap?
5. What kinds of change did occur to you/your organization through using OpenStreetMap?
6. Do you have any other things that you want to share?

Questions for staff at KLL:

1. Could you tell me your name and what you do? What does OpenStreetMap mean to you?
2. What is your motivation of working on OpenStreetMap?
3. What kind of impacts do you hope to achieve through the OpenStreetMap?
4. How do you think the OpenStreetMap could benefit the communities in this area?
5. Do you have any concerns right now? How do you think you will address these concerns?
6. Do you have any other things that you want to share?

Appendix 2: List of Interviewees

Name	Institution
Amrit Karmacharya	Land Management and Training Center in Nepal Government
Helina Shrestha	Nepal Trust in Nepal Government
Manoj Thapa	Kathmandu Living Labs
Nirab Pudasaini	Kathmandu Living Labs
Megha Shrestha	Kathmandu Living Labs
Sazal Sthapit	Kathmandu Living Labs
Prabhas Pokharel	Stanford University (fellow at Kathmandu Living Labs)
Roshan Paudel	Tribhuvan University
Kuber Ranabhat	Tribhuvan University
Gaurab Basnet	Tribhuvan University
Alisha B K	Kaski Scout
Prabhat Paudel	Tribhuvan University
Sagar Karki	Tribhuvan University

Appendix 3: Report on this project

Map For Everyone



**No one knows everything,
everyone knows something**

Contents

Page 2 A foreword from Dr. Budhathoki

Page 3 Accomplishments

Page 4 Our Contribution

Page 5 OSM Contributors

Page 10 Thanks

Page 11 Call to Attention

A foreword from Dr. Budhathoki.

Nama Budhathoki
Executive Director



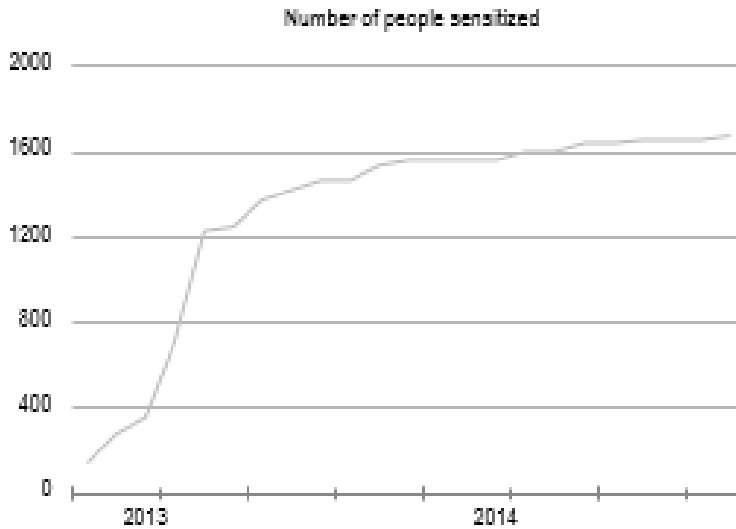
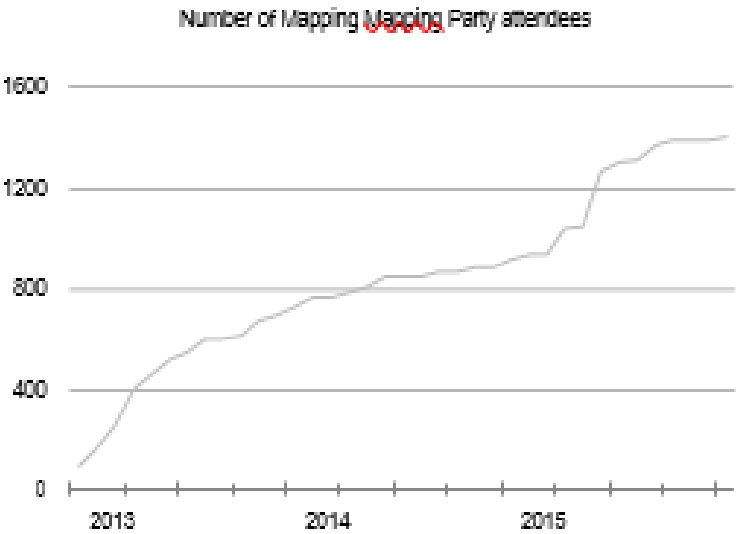
Dr. Budhathoki is the director of KLL and is also a consultant to the World Bank. He plays a critical role in developing OpenStreetMap community and creating an ecosystem around open data in Nepal.

Accomplishments

31 sensitization presentations held

1673 people sensitized

1403 people trained on OpenStreetMap



On July 29, 2011, we held the first mapping meet-up at Brihaspati Vidyasadan, Naxal. Since then, we have been building mapping communities by organizing mapping parties and trainings. Maharajgunj, Kathmandu was almost unmapped in November 2012 but because of the community's continuous effort on mapping, we have a detailed map now.



November 2012

July 2016

Our Contribution

We build a community which contributes to OpenStreetMap.

OpenStreetMap is a free and editable map of the world. It is free to view, free to use, free to edit, and even free to download. It is available on computers and smartphones, and you can use it both online and offline. In creating maps for everyone, we do the following:

- | Sensitize students, development agencies and government organizations about OSM through Sensitization Presentations.
- | Deliver Mapping Workshops to train people on mapping.
- └ Expand coverage and enhance quality of OpenStreetMap data. |
- └ Stimulate innovations around OSM and OSM data.
- | Teach how to use OpenStreetMap.



Participants collect data in the field work organized by Kathmandu Living Labs

We want to map whole Nepal

Maps are always a living document which should be constantly updated. In OpenStreetMap, everyone can edit and put information on the map. Mapping entire Nepal or even Kathmandu Valley is a huge task. It requires incremental contribution from a large number of OSM contributors. We build mapping communities. Let's map whole Nepal.

OSM Contributors

OpenStreetMap is an open community.

Anyone can join. Anyone can contribute.

OpenStreetMap is an open community. We can map all the things like grocery shops, cosmetics, schools, hospitals, and the things around them. If you see maps in other countries, you can see many details in the map. However, in Pokhara, we can see only main roads and highways. OpenStreetMap can change this. With OpenStreetMap, anyone can map the surrounding areas and create a digital mirror of his or her community.

“We can map all the things using OpenStreetMap.”

Prabhat Paudel, a student of Tribhuvan University



Prabhat Paudel, a student of Tribhuvan University, teaches a university student how to use OpenStreetMap

OSM Contributors

OpenStreetMap is a communication tool.

We used QuakeMap to connect earthquake victims to rescue-relief efforts after the earthquake.

After the earthquake in 2015 I was here and realized that all of the organizations used maps made in the 1900s. They told me "We cannot get maps of all of the new places we have to get into. How can we get these information?" I have visited the place where people were dispatched from medical visits, and we installed OpenStreetMap for a few of the medical personnel's phones. We used QuakeMap, which uses OpenStreetMap data, in order to figure out where people need help. It is incredible to see the usefulness of the community we have created. We were able to help so many other people with some really necessary work after the earthquake.

“We were able to help so many other people with some really necessary work after the earthquake.”

Prabhas Pokharel, a graduate student of Stanford University and a volunteer at the time of the earthquake.



Prabhas Pokharel, a graduate student of Stanford University is installing offline maps on responders' mobile devices

OSM Contributors

OpenStreetMap is a contribution platform.

OpenStreetMap enables users to contribute to the broader community. OpenStreetMap is a very much useful map for everyone. For me, it is part of my life. We have been using OpenStreetMap to map things around us to help people know about places so that the people can go by themselves. We have been using OpenStreetMap to help people.

“We have been using OpenStreetMap to help people.”

Gaurab Basnet, a student of Tribhuvan University



Gaurab Basnet, a student of Tribhuvan University, teaches a university student how to collect data using paper map

OSM Contributors

OpenStreetMap is a digital infrastructure for development.

OpenStreetMap is a digital infrastructure for development. Development decisions need to be informed and driven by data. With OpenStreetMap, common people in the field can create data without much effort or technical knowledge and make it available for everyone. Then, we can use these dataset to inform government plans and decision makings that have impact on people's lives. Small, incremental contributions by individuals contribute to big decisions like national policy making.

“Small, incremental contributions by individuals contribute to big decisions like national policy making.”

Sazal Sthapit, Project Manager of Kathmandu Living Labs



Sazal Sthapit, project manager at Kathmandu Living Labs, teaches how to upload data into OpenStreetMap

OSM Contributors

OpenStreetMap is an empowerment tool.

Since map enables people to transform physical reality and share it to the whole world, what happens with OpenStreetMap is it empowers people. In Prepare Pokhara project, our goal is to help the local communities in Pokhara contribute towards open map data and help them prepare for future disasters using applications such as QuakeMap. QuakeMap is a report submission platform in which group of volunteers upload rescue needs from the ground using everyday technology like email, SMS and telephones. People can upload information and other people validate the data by calling to the first people who uploaded the information.

“What happens with OpenStreetMap is it empowers people.”

Nirab Pudasaini, Android developer at Kathmandu Living Labs



Nirab Pudasaini Android developer at Kathmandu Living Labs, teaches a how to use OpenStreetMap.

Thanks

Nepal's mapping communities have been grown because of your support

When we began, Nepal was virtually blank on most maps. Today, a growing community has put our houses and our neighborhoods on OpenStreetMap. It is now possible to get around Kathmandu with a completely offline digital map, and this open map digital infrastructure is serving government, app developers, and businesses. After the 2015 earthquakes, the map was used to provide support to the disaster response. Nepal's mapping communities are recognized as pioneers in the world today.

Special Thank You to Collaborators and Donors

National Volunteering Program, Government of Nepal National Planning Commission, Government of Nepal Central Bureau of Statistics, Nepal Red Cross Society, Government of Nepal National Reconstruction Authority, US. Department of State, The World Bank, Mercy Corps, humanitarian innovation fund, International Federation of Red Cross and Red Crescent Societies

"After the 2015 earthquakes, the map was used to provide support to the disaster response. Nepal's mapping community is recognized as pioneers in the world today."

Sazal Sthapit, Projects Manager, Kathmandu Living Labs



Participants from Prepare Pokhara collect housing information to prepare for the Earthquake

Call to Attention

Join the OSM community

Mapping is easy. All you need is a valid email address. Start mapping in OpenStreetMap. You can also organize a mapping party. We can help you with logistical support. If you are new to OpenStreetMap, you can explore the rich set of beginner's resources from <http://learnosm.org/en/> and <http://www.kathmandulivinglabs.org/downloads>

Support the community

Many of KLL's projects are supported by institutional donors, but individual donors make a large difference in supporting our volunteer mapping community. We use individual donations to support workshops and "mapping parties" to introduce people to mapping. With your help, our community has grown the map in Nepal from very humble beginnings to 135,063 km roads and 2,054,436 buildings mapped today. Get in touch with us at kathmandulivinglabs@gmail.com

Work with us

We are community builders who believe that small actions done by many can bring large-scale impact. We are tech savvy people deeply passionate about improving the society we live in. We tackle tasks that seem impossible, and even have fun while doing it. Please visit <http://www.kathmandulivinglabs.org/get-involved>