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Open Data in Urban Planning : Unveiling Perspectives from Planners and Stakeholders in Kathmandu Valley

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Abstract
With the majority of the world living in urban areas, there is a necessity to deliver services to cater to their needs, which requires urban planners to become aware of, adopt, and harness data literacy. Open Data is a form of data that is publicly available for re-use and redistribution, and it has various economic, performance, and societal benefits. Kathmandu Valley, being the hub of urban development in Nepal is a good place to review the state of use of open data in planning in Nepal. To understand the state of use of open data in planning cities in Kathmandu Valley and how the planning fraternity is using open data, a mix of qualitative and quantitative methods has been adopted. Engagement of stakeholders through key informant interviews, expert consultations, online data/documents search, and planners' survey has been carried out in addition to review of relevant literature. It has been found that planners are using open data mostly available in PDF form and derive many benefits including saving time and resources in primary data collection. Challenges of lack of a guiding open data policy, lack of coordination between stakeholders and government authorities, and lack of awareness about importance and use of open data are revealed. With the help of existing national efforts as well as international examples, an open data policy and city level open data portals could help develop and promote the open data ecosystem for urban planners in Nepal.

Keywords
Open Data, Data, Open Data Portal, Governance, Transparency, Urban Planning, Informed Decision-Making

1. Introduction

By the year 2050, it is expected that 68.4% world population will be living in urban areas [1]. With a greater proportion of people living in urban areas, the demand for improved living standards and urban services has increased significantly. In order to properly understand the needs of increasing population and deliver services to cater their needs, traditional systems of data keeping, and analysis are becoming obsolete. In the wake of the digital revolution, the field of data has become far too important to leave only to data scientists. Urban Planners need to become aware of the data they use, their sources and how they are generated. While there are various types of data available in the world, Open Data is an important type of data in the field of urban planning. Open Data or Open Government Data is information gathered, produced, or paid for by public agencies and made freely available for re-use for any purpose, and the terms of use is included in the license [2].

The meaning and scope of open data may vary in different countries and different sectors. In the context of urban planning in Nepal, open data is available and used in form of data from National Statistics Office (formerly CBS), Open-source mapping, PDFs of various reports in various government websites, freely available survey department data, etc. The use of google earth and google maps data has been instrumental in various urban planning projects in recent years. There are high expectations for Nepal, which is currently decentralizing to a new federal system, to advance an open government agenda and create a culture of more accountability and transparency [3]. There is a famous sloka in Sanskrit "Vidya dhanam sarba dhanam pradanam" equivalent to Nepali saying "Jñāna jati baḍyō tyatī baḍhcha" which translates to "The more knowledge we share, the more it grows." This philosophy helps to validate the need and support for open data ecosystem in the Nepalese context.

There are limitations in the field of open data in Nepal, including a lack of empirical research and systematic analysis that specifically focuses on the use of open data in urban planning. Limited research on setting up infrastructure for open data and caution against misuse of open data makes discussion on open data difficult in the Nepalese context. In such a context, this research intends to answer the question "What is the state of use of open data in the planning of cities in Kathmandu Valley and how is the planning fraternity using open data?" with objectives to define and explore the availability, use, benefits, and challenges of open data in the context of city planning in Kathmandu Valley, to investigate how the planning fraternity is using open data, and to review relevant policies to provide recommendations for effective implementation of open data ecosystem.

Because of its high population density, urban development issues, availability of open data projects, technological improvements, and policy importance, Kathmandu Valley is an appropriate research location for evaluating the use of open data in Nepal. The research has been carried out in the context of Kathmandu Valley- meaning the key stakeholders that are interviewed and/or surveyed are linked to planning of Kathmandu Valley in one way or the other. It is expected that the learning and recommendations from this research can be extended to use of Open Data in Planning of cities outside of Kathmandu Valley. The research is expected to encourage

more research and discussion about open data in urban planning.

2. Methodology

The conceptual framework of the study incorporates gathering knowledge about open data, use of open data in urban planning and benefits of use of open data in the realm of urban planning. While examining these, the right to information and privacy of the citizens are also to be considered.

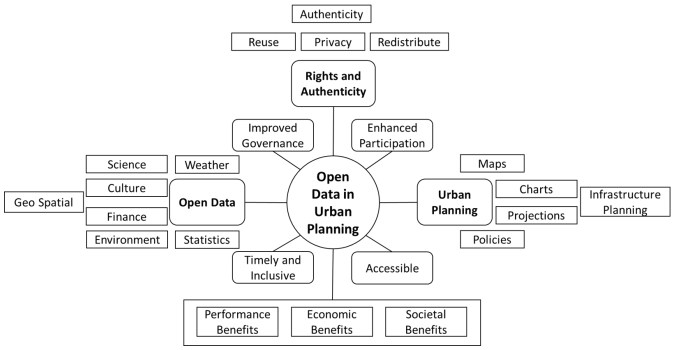


Figure 1: Conceptual Framework of the study

This research belongs to the pragmatist's paradigm which Uprety [4] describes as being a paradigm where the researchers believe that the reality needs to be constantly negotiated, debated, and interpreted.

The ontological claim of this study is Open data integration in urban planning of cities in Kathmandu Valley encompasses a variety of sources, stakeholders, and challenges, with potential benefits for informed, participative, and geospatially informed urban development.

Epistemologically, the valid source of knowledge for this study is the study of social process and direct interaction with the experts which requires adoption of various methods and strategies for the generation of the knowledge out of the literature study, case study, cross case analysis, and survey.

This research utilizes mixed methodology as a research strategy. Descriptive strategy within the post positivist paradigm, inductive logic system within the interpretivist paradigm, as well as abductive logic within the interpretivist and pragmatic paradigm is utilized to address the objectives of the research. It is important to note that this is not an intermix of paradigm but use of two different paradigms for different objectives. The overview of the research strategy for the research can be summarized with the help of following diagram:

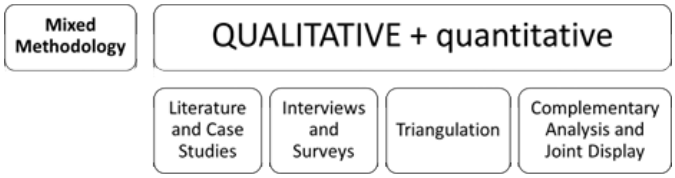


Figure 2: Overview of the Research Strategy

A data collection plan was made to collect data by addressing the key objectives of the research. The summary of data collection methods is shown in Table 1.

Table 1: Data Collection Methods

Method	Purpose	Remarks
Literature and Policy Review [S]	Definition and decoding Open Data, Gaps in policies [Convenience Sampling]	National and International documents reviewed
Key Informant Interview (KII) and Expert Consultation [P]	Open Data Availability, Use, Benefits, and Challenges, Gaps in Policies [Expert Sampling and Snowballing]	8 Senior Planners in Kathmandu Valley from Government and Private Institutions. 13 other Expert/Key Informants in the field of data, statistics, survey, information, and IT
Survey [P]	Use, Benefits, and Challenges [Expert Sampling and Snowballing]	Online Survey of 25 Urban Planners practicing in Kathmandu Valley
Case Study (National, International) [P+S]	Availability, Use, Benefits, and Challenges [Convenience Sampling]	National: Madhyapur Thimi, Budhanilkantha, Changunarayan International : Barcelona, Pune
[P]- Primary [S] - Secondary		

The planners for the Key Informant Interviews were Deputy Development Director at Kathmandu Valley Development Authority, Deputy Director General of Department of Urban Development and Building Construction, Project Director at New Town Project Coordination Office of Department of Urban Development and Building Construction, Deputy Director of ICF Nepal, Urban Planner and Board member of National Institute for Urban and Regional Studies, Director of Picasso Consultants, Director of Urban Planning and Design Consultants, Professor of Lovely Professional University. 13 other Key Informants or Experts for consultation included Founder and CFO of Kathmandu Living Labs, IT Officers of Budhanilkantha and Changunarayan Municipality, CEO of Open Knowledge Nepal, Offiers of National Statistics Office, Joint Sectretaty of Ministry of Communication and Information Technology, National Information Commissioner of National Information Commission, and Director of Survey Department.

The study interviews and surveys were conducted in a convivial environment, without any intimidation or discrimination based on race, ethnicity, sexuality, gender, religion, disability, age, or any other base. In this research, the focus has been on the process rather than the ultimate result.

3. Literature Review

According to the International Open Data Charter [5] "Open data is digital data that is made available with the technical and legal characteristics necessary for it to be freely used, reused, and redistributed by anyone, anytime, anywhere". Open data empowers governments, citizens, civil society organizations, and private companies to make more informed

decisions. For data to be open, the data itself should be publicly accessible over the internet, such as through websites, or data portals; the provided data should be useful and reusable without regard to legal constraints, using and conducting actions on data to create value through analysis, visualization, application development, and other means should be free; and the information must be freely and publicly given [6].

Open data is still a relatively new concept in Nepal, and it has only been a few years since momentum for open data has grown. Initiatives such as the large-scale mobile data collection to determine the extent of the earthquake's damage, the National Planning Commission's self-assessment of data gaps in measuring progress toward the Sustainable Development Goals (SDGs), the Public Procurement Monitoring Office's launch of the Public Procurement Transparency Initiative in Nepal (PPTIN), the sharing of registered business data by the Office of Company Registrar, and the submission of the Open Government Data show the presence of Nepal government in open data – mostly aided by civic space [6].

The use of Open Data in the public sector increases transparency and integrity by allowing for the tracking of public finances and throwing light on market trends that intersect with social, political, and environmental contexts [7]. For urban planning and development, urban data provides environmental (geographical, architectural) and societal (economic, social) information. Furthermore, urban data improves city intelligence by providing applications for healthcare, transportation, housing, and social life. It contributes to the creation of a sustainable and resilient urban environment, as well as the design of efficient public services for the well-being of inhabitants [8].

According to the Open Data Charter [5], following are the six principles of open data: Open by default, Timely and comprehensible, Accessible and usable, Comparable and interoperable, For improved governance and citizen engagement, and For inclusive development and innovation.

As open data evolves, the quality and breadth of datasets increase, and cities generate more insightful knowledge about open data performance assessment and impact. As a result, the quality of open data offered and its use are the most important success elements for open data efforts [9].

The open-platform geospatial information could be crucial during emergency situations, and could also greatly enhance disaster preparedness, quick responses, and early recovery [10].

In 2010, Sir Tim Berners-Lee suggested a 5-star deployment scheme for Linked Open Data, starting at one star with data getting more stars when proprietary formats are removed, and links are added [11].

An Open Data Portal is a collection of systems set up to make Open Data used and useful [12]. To make data usable, it must be adequately documented and tools for re-users must be available. The data must be of high quality for others to translate it into knowledge and make it valuable.

An open license permits others to do things like republish the contents or data on their own website, derive new content or data, make money by selling products that use one's content or data, republish the content or data while charging a price for access, and so on [13].

Metadata is essentially structured information that facilitates the retrieval, usage, or management of an information resource [14]. In practice, metadata explains a dataset and its structure while also assisting users in discovering it . The data often contains the following basic elements: title, who published the dataset, when it was published, how frequently it is updated, and what license is linked with the dataset.

The ten building blocks of Open Data Initiative as proposed by Davies [**?**] helps to understand what are the items that need to be considered while thinking about an open data ecosystem:

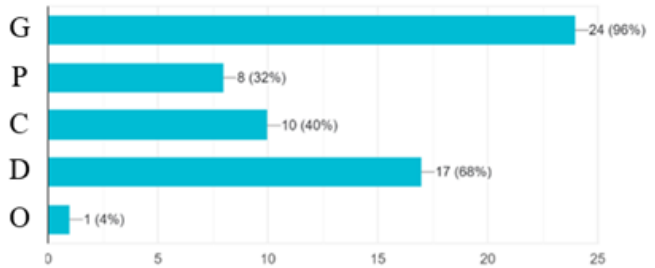
Block 1: Leadership and Bureaucratic Support
Block 2: Datasets
Block 3: Licenses
Block 4: Data Standards
Block 5: Data Portals
Block 6: Interpretations, Interfaces, and Applications
Block 7: Outreach and Engagement
Block 8: Capacity Building
Block 9: Feedback Loops
Block 10: Policy and Legislative Lock-in

4. Findings and Analysis

4.1 Open Data Availability in Planning of Cities in Kathmandu Valley

4.1.1 Sources of Open Data

The awareness about open data has been in Nepal for more than a decade now with engagement of civil societies and data enthusiasts actively promoting an open data ecosystem. The key informants consulted during the research as well as the survey conducted reveal that various government, as well as non-government agencies produce a plethora of data in Nepal, but they are shared mostly in PDF form, and mostly via government websites.



G - Government websites, P – Private companies, C – Civil societies, D – Development partners, O - Others

Figure 3: Sources of online data in Nepal according to survey respondents

4.1.2 Open Data Initiatives

Several efforts have been made to make various kinds of data open. The survey revealed that urban planning practitioners confidently believe statistical data related to the census is

openly available. The National Statistics Office (NSO) was able to create an interactive open data portal to provide demographic data to the people. Efforts of Open Data enthusiasts and open data activists advocating for Open Data in Nepal and raising awareness among the key stakeholders at the NSO of the technicalities associated with Open Data made the data portal successful and open. An interview with the officials revealed that the office plans to publish any future data via an open data initiative as supported by their National Strategy for Development of Statistical System [15].

Another good example of open data initiative in the field of planning is BIPADportal [16] managed by NDRRMA under the Ministry of Home Affairs. The portal brings together digital and spatial data from various governmental, non-governmental, academic and research institutions on one platform and help in evidence-based planning by providing data in machine readable formats.

Similarly, open geo-spatial data is available for use in planning in cities of Kathmandu Valley in the Open Street Mapping (OSM) repository. OSM is a mapping system that is built by a community of mappers that emphasizes local knowledge and use of aerial imagery, GPS devices, and low-tech field maps to verify data. OSM data includes at least 29 primary features that could be helpful in geospatial analysis. Research reveals that about 80% of data used for urban planning are geo-referenced. It is important to have open data in spatial form in urban planning. Nepal was the leading country in OSM in South Asia when it was first introduced. There are more data in OSM than in google maps for many places of Nepal. India has dominated the OSM movement in the region now.

Other initiatives have also come up, but most of them became unrealized due to various issues like loss of institutional memory as someone leaves the institution or hurdles in bureaucratic processes. Looking back a decade in the field of data in Nepal, local bodies have shown interest in maps and are preparing maps (which requires data). A lot of visualization exercises are being done but their implementation for decision is still not explored/utilized.

4.1.3 Open Data Availability for preparing an IUDP

Preparation of Integrated Urban Development Plan (IUDP) is a popular planning practice amongst the survey participants which includes an integrated planning of all various developmental sectors like physical, social, economic, environmental, disaster risk reduction, financial, and institutional.

A study of availability of online data was carried out for a municipality in Kathmandu Valley. The search of online datasets for preparing an IUDP of Madhyapur Thimi Municipality revealed that the percentage of data available openly for planners is around 51 %. The survey of planners revealed 29% of data to be available online. On average, 40% of data for planning is openly available- considering the average (mean) of values from search for datasets and survey of planners.

4.1.4 Type or Format of Available Data

It is also important to consider what kind of availability is present and to assess if the data shared is truly accessible. A report [17] on assessment of effectiveness of data sites in Nepal revealed that 85% of the sites have the most basic machine-readable formats. This is a good percentage considering Nepal is a developing country and most of the work is still carried out in pen and paper. However, when it comes to urban planning open data, the story is different. Experiences from the survey participants indicate that most data for planning purposes are still available in pdf form, or non-machine-readable formats.

The survey also revealed that most of the planners are either unaware about whether the data they produce have been shared online, or do not share the data online at all. Because planners are hired as consultants and do not have access to data portals and follow up regarding the upload of data online is not practiced, this scenario has been created. Even the planners who have shared their data online are primarily sharing data in PDF or scanned report forms, resulting in most data available in the same formats.

Two KIIs informed that there is a mindset of considering PDF as an easy to upload, download, and use format. This is a probable reason for most data being shared in PDF format. This indicated that most data are present in one star data format.

On a positive note, this scenario is likely to improve in the coming years. Local and federal level institutions are engaging in conversations about data portals. KII with officers at Budhanilkantha Municipality, Changunarayan Municipality and the NSO reveal that they have been working actively to promote culture of open data and providing data in machine readable format- moving towards a paperless era.

Table 2: Online Availability of Datasets for preparation of IUDP of Madhyapur Thimi Municipality

DT	O/PO	U	T
Physical	13 (45%)	16 (55%)	29
Social	10 (59%)	7 (41%)	17
Economic	14 (45%)	17 (55%)	31
Environment and Disaster	14 (47%)	16 (53%)	30
Financial	7 (100%)	0 (0%)	7
All	**58 (51%)**	**56 (49%)**	**114**
D = Data Type, O = Open, PO = Partially Open (pdf form) U = Unavailable, T = Total			

Table 3: Percentage (averaged) Availability of Open Data of various sectors as per Survey Respondents (Urban Planners in Kathmandu Valley)

DT	O/PO (mean)	O/PO (mode)
Any	32.7%	37.5%
Physical	20.6%	5%
Social	34.1%	17.5%
Economic	28.3%	17.5%
Environment and Disaster	25.4%	5% and 17.5%
Financial	36.6%	37.5%
Mean	**29%**	-
DT = Data Type, O = Open, PO = Partially Open (pdf form)		

4.1.5 Making all Data Open

It is important to note that not all data can be made openly available. Some data that contain sensitive information related to certain individuals and organization, issues related to national security, and information that can be used to harm someone or some institution cannot be made openly available by the government bodies.

4.2 Cross Case Comparison and Analysis of Availability of Open Data for Planning

The cross-case comparison and analysis of Open Data portals of Barcelona, Pune and Nepal shows that some attributes of Nepal's data portal are quite better than Pune's. The analysis reveals that the open data portal in Barcelona is quite mature. Both India and Nepal can learn a great deal from the quality and standard of open data portal of Barcelona. Nepal has an advantage of contribution from civil societies in the field of open data.

4.2.1 Open Data Portal of Barcelona

Open Data BCN [18], a data portal under the Barcelona city council, was launched in 2011. There are 571 data sets in the portal shared with the help of open data policy. The data in the portal are categorized into 5 major themes – territory, population, city and services, administration, and economy and business. The data are timely updated as per the need of data types. The most prominent data formats are csv, json, and xml. A total of 22 shapefiles were present in the portal. The datasets are shared under creative commons attribution 4.0 license. Metadata are provided for all datasets and a clear "contact us" button is present at the bottom of the portal for easy feedback. The datasets available in the portal are also categorized according to the Sustainable Development Goals (SDGs).

4.2.2 Open Data Portal of Pune

PMC Open Data, a data portal under the Pune metropolitan city, was launched in 2016. An open data policy for the city of Pune [19] was developed in the year 2019. The policy discusses the lifecycle management of data, identified key stakeholders and collaborators, and implementation plan including components of initiation, planning, execution, and continuous improvement. There are 559 datasets in the portal. The data are categorized according to the departments like traffic, water supply, bhavan rachana, and social development. A total of 29 departments have been listed. Xls, xlsx, and xml are the most popular formats available on the site. There are no shapefiles present, and the licensing of datasets is not clear. Clarity about the metadata about datasets is also missing. There is a small "feedback" link at the bottom of the portal and no datasets have been linked with the SDGs.

4.2.3 Open Data Portal of Nepal

Open Data Nepal, a data portal under Open Knowledge Nepal, was launched in 2019. There are 629 datasets available in the portal for Nepalese context. The datasets are categorized into 12 themes like agriculture, census, education, finance, health, and geodata. Most datasets are timely updated. The most prominent data formats in the portal are csv, xlsx and xml. There is 1 shapefile available on the site. The portal shares data via creative commons attribution 4.0 licensing but the information about metadata is not very clear. A "suggest data" links are present at the top and at the bottom of the site for feedback. No data has been linked with SDGs in the portal.

4.2.4 Key Learning

It can be learnt that city level portals for needed to share data openly. For urban planning, it is essential to have geospatially linked data that are provided under reusable licensing. It is imperative to share the data under open data licensing and provide metadata to improve authenticity of data. It is a high time cites in Kathmandu Valley started to establish data portals and catch up with the international trend. For that, a national open data policy is required. A national open data portal already exists (although it is not updated). The data portals of cities could be linked to this national portal operated by the National Planning Commission. In the context of SDGs, it is important to link data categorization with SDG targets.

4.3 Use of Open Data in Planning of Cities in Kathmandu Valley

Data, in general, is an important asset in the field of urban planning. From the KIIs conducted, it was established that planning relies heavily on the use of data. A KII mentioned that planning is supposed to be a fact-based practice that involves projection using existing archives and similar case studies. Data is, therefore, an important aspect of planning. It is also important for the planners to have knowledge about availability of the data- where and how they are available. Another KII mentioned that Urban planning can become a very good tool only if data and GIS are effectively used.

From the literatures [5, 8, 9, 10, 20, 21, 22], it is clear that Open Data has a vast potential of use in the field of Urban Planning- ranging from geolocating data, enabling cross-sector collaboration, and monitoring impact to disaster response, increasing government efficiency, and corruption prevention. Use of Open Data ultimately culminates in the outputs of any planning process- reports, maps, charts, projections, action plans, etc. Use of Open Data adds value by increasing the efficiency and accessibility of the project.

4.3.1 Post-Earthquake Humanitarian Data Collection

A good example of use of Open Data in planning in Nepal is the use of a real-time open data portal in the aftermath of the 2015 Nepal earthquake. The national planning commission, with the technical support of the Kathmandu Living Labs [23], made an open data portal to explore real time data for severely affected areas. This initiative helped save many lives as well as make a remarkable documentation of earthquake effects on lives and property of people.

4.3.2 Awareness about Use of Open Data amongst Planners

Open Data is an important type of data in the field of Urban Planning. Almost every urban planner in Kathmandu Valley accesses open data (maybe in PDF form) from at least one of

the following sources: the NSO (formerly CBS), municipal websites, and OSM via GIS applications. However, the awareness about them being Open Data is not 100%, as shown by the result of the survey. 48% of respondents said they were aware of open data and its use in urban planning, while 32% responded that they were not aware of open data but have been using it in their planning practice. A KII also indicated that some planners in Nepal are not even aware about Open Data Portals. Nevertheless, Urban Planners in Kathmandu Valley, when made aware about definition of Open Data, are clear that Open Data is important in urban planning. This means that there is a need for planners to be made aware that they are using open data and realize that open data and open data portals are important for planning. This way, they may be encouraged to start producing and sharing open data via open data portals.

4.3.3 Results Generated using Open Data

The results or outputs for different sectors of planning may be different. The top four results generated using Open Data in different sectors, as per the survey are shown in the following table:

Table 4: Top 4 Results generated using Open Data in different Planning Sectors

Sector	Top 4 Results Generated
Physical	Maps, Charts, Strategic Action Plans, SWOT
Social	Charts, Maps, Need Assessment, Policies
Economic	Charts, SWOT, Policies, Maps
Environment and Disaster	Maps, Charts, Strategic Action Plans, Need Assessment
Financial	Strategic Action Plans, Policies, Charts, Need Assessment

4.4 Benefits of using Open Data in Planning of Cities in Kathmandu Valley

A World Bank webpage [24] highlights the benefits of using Open Data that includes use of open data in tracking of government actions like budget spending, improving transparency of government activities, improving participation of citizens in public planning, creating new data driven solutions, and making it efficiently less expensive to locate and access government data by reducing acquisition costs, redundancy, and overhead. These benefits are not limited to one field or the other- which means that Urban Planners can also reap them. The result of the survey of planners reveals that urban planners do appreciate the idea that Open Data makes the planning process easier. 96% respondents agreed that Open Data makes planning process easier.

4.4.1 Increased Efficiency of the Planning Process

A key informant, with over a decade of experience in the field of Open Data, revealed that Open Data promotes evidence-based, and data-driven planning while preventing duplication of work that wastes a lot of resources. Another key informant, with many years of experience in urban planning, shared that different duplication of data by undertaking different unnecessary surveys could be avoided if there was a good system of Open Data. The informant added "Development work at local levels is not guided by data. A Fact/Data driven approach needs to be developed from local levels."

4.4.2 Informed Decision and Innovation

The collaboration of the open data ecosystem and crowd-sourced support in urban planning is a powerful driver of innovation and accuracy. This approach not only develops innovative ideas but also enhances data precision through collaborative validation by using the collective intelligence of citizens, researchers, and professionals. This integration enables data-driven decision-making, substantiating plans with evidence, and fostering civic engagement – making an ecosystem where data supports everything from infrastructure to policy. The result of the survey also suggests that use of open data helps to make informed decisions – validating the claims of key informants. 88% respondents answered "Yes" to "Do the use of Open Data help make informed decisions?"

4.4.3 Saving Time and Resources

In any municipality, requests for data-sets may be repeatedly made by an array of people and institutions. A key informant informed that municipal officials lose a lot of time and effort in repetitive sharing of same resources and a one portal- one platform solution for sharing Open Data helps to utilize time of municipal officers in other meaningful engagements.

4.4.4 Other Benefits

The survey participants also added that Open Data initiatives can help in maintaining data consistency- making it easier to conduct desk study for any planning project. One of the participants added that Open Data adds credibility and authority to planning proposals and helps attain measurable goals by improvement in strategies based on data-analysis. Another believed that the use of Open Data can provide a quick overview of the situation. This can help the planners in aligning themselves with the actual needs of the planning process. A participant mentioned that Open Data helps to provide a proper direction for socio-economic development and contributes towards policy reform.

4.5 Challenges in using Open Data in Planning of Cities in Kathmandu Valley

There are many challenges facing the Open Data ecosystem for planning of cities in Kathmandu Valley. The survey of planners revealed that scientific data, public safety data, mobility related data, geo-spatial data, and environmental data are the most challenging to get online.

4.5.1 Lack of Data Sharing Mindset

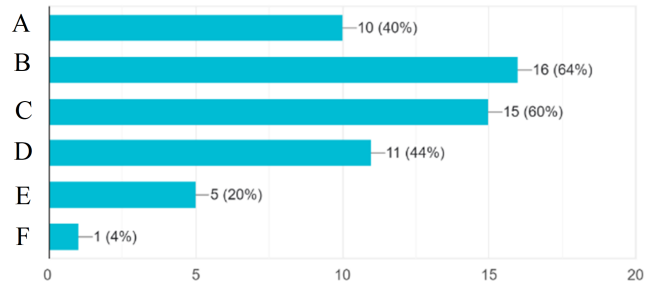
The KIIs as well as the survey both reveal that the institutions that should be sharing data are not enthusiastic about sharing data to public. The concept of data sharing is not well developed in the mindset of concerned stakeholders. One of the KIIs mentions that even in the age of data and information, there is no realization among the concerned stakeholders that data should be integrated into one platform and shared for

effective planning. Oftentimes, the data producers are not aware about why data is required, and for what purpose.

KIIs also reveal that when it comes to data sharing, the consultants as well as government bodies are focused on getting monetary gain out of it. Data has been taken as assets, and even the public institutions that are supposed to share data freely take fee for data sharing – an example of this is the fee levied on spatial data provided by the survey department. Another concerning issue is the prominence of the concept of "Data/Information as power". This has challenged the ecosystem of sharing data openly, for there is no tendency to devolve the power.

4.5.2 Reliance on Personal Networking and Rapport to Obtain Data

Due to the reasons discussed above, there is difficulty in obtaining data and information for planning purposes. This is supported by the result of survey as well. 40% of the participants had to rely on their network with the people in power to get the data they needed, while 64% had to go through a long and tedious process to obtain data that could have been made freely available on the internet.



A – Good rapport with the authorities, B – Bureaucratic hassle, C- Easily available on the internet, D- Self Preparation, E- Primary Data, F- Others

Figure 4: Survey Respondents' response to process of data collection for planning purposes

The result is a clear indication of issues that are present in the data management system of institutions.

4.5.3 Lack of Technical Resources and Manpower to Digitize Data

An officer at the NSO said that historical data is not in format that can be shared online. While the institution is working towards digitizing them, this is an example of lack of government initiatives in digitizing past archives which hold a lot of learning opportunities. Another issue, as mentioned by one of the KIIs, is that the technical staff of municipality or other government offices are not aware about open data ecosystem. Another KII added that it is difficult to get the government officials on-board to digitize data – they are willing to perform repetitive actions but do not want to engage in entering data into data portal.

KII of IT officers of municipalities suggest that there is difficulty in uploading large files into government server. Limited server and lack of dedicated server to host data are other challenges IT officers face while trying to upload data into municipal websites.

4.5.4 Data Silos, System Silos and Upward Reporting

One of the biggest threats when it comes to data sharing is the presence of data silos and system silos- meaning that the access and use of data and systems are limited to certain groups of people or systems. At the same time, there is a practice of "upward reporting" system which leads to the local system not being able to access their own data – this negatively impacts decision making.

4.5.5 Insufficient Truly Open Data

It is also important to note that the data that can be considered Open are not truly open in the context of planning in Kathmandu Valley. The data shared by government institutions, development partners, or private entities are rarely within the global definition of open data. The data shared for planning does not follow the principles of open data as outlined by the International Open Data Charter [5]. The data/datasets are:

- Not Open by Default
- Neither Timely, nor Comprehensible
- Not Fully Accessible and Usable
- Not Comparable and Interoperable
- Devoid of proper Feedback Mechanism

4.5.6 Mindset of Data Producers

In the absence of an Open Data policy, and lack of willingness or enthusiasm to open data, as suggested by the KIIs, most of the data related to planning of cities in Kathmandu are closed. The notion that open-data could violate privacy is cited by bodies like the Survey Department, preventing them from sharing data openly. It should be well established that private or personal or sensitive information can be anonymous.

4.5.7 Lack of Reliability, Timely Update, Accessibility

KIIs and survey results reveal that there is lack of reliability and timely update of data produced by various institutions. At the same time, the data that the institutions share lack metadata – data about data. It is essential to share metadata along with open data because metadata provides information about completeness, accuracy, and history of data. The data-sets shared do not follow any standard (example ISO standard for open data).

There is availability of open data, but their accessibility is questionable. There is a lack of awareness about the concept of Search Engine Optimization- which leads to users or researchers not being able to find data easily from government websites. We can take an example of municipal profile of municipalities in Kathmandu Valley – profiles in PDF form are deep into the website of municipality.

4.5.8 Issues with Licensing of Shared Data

There is also a lack of clarity of licensing in data shared by government bodies. The concept of licensing for reuse and redistribution is largely ignored in sharing data. Open Data

is typically shared in creative commons licenses as suggested by the literature [13, **?**]. KII with NSO officers revealed that while there are no clear written licensing related rules in the NSO, the data can be used by anyone, free of cost, by providing attribution to the NSO. However, the user is responsible for any output produced by manipulating the data provided by NSO. A national open data policy can solve this issue of confusion in licensing.

4.5.9 Issues with Inter-Operability of Data

One of the important and challenging parts of open data is that the data collected by one project should be usable by another project – data needs to be inter-operable – then the actual use of data is achieved. Inter-operability of data helps to create 4-star Open Data.

4.5.10 Issues with National Data Portal Initiative

From the KII with NSO officials, it was discovered that there is a national open data portal: Nationaldata.gov.np. This was started by a team in the national statistics office to decentralize data. A standard was set by the office (when it was under the National Planning Commission as Central Bureau of Statistics). Around 753 personnel were trained to use the portal and feed data into it. IT Officers and IT Consultants of local levels took part in the training. This was verified by KIIs with IT Officers of Budhanilkantha and Changunarayan municipalities. However, all the trained manpower were not retained by the local bodies – creating inadequate human resources to feed data into the portal. There has also been no regular monitoring and evaluation of the system. Due to various reasons like pressures from development partners, several local bodies have started to create their own portals- leading to duplication of work and inconsistency in delivery of database system in the country – which is likely to lead to a financial burden for the country.

The issue with the data sets available for planning is that good quality and quantity of data-sets are not received from concerned departments for uploading into websites. An informant claimed that issues of negligence and reliability are prevalent in data which necessitates crosschecking of data before use. This is also substantiated by the result of the survey question regarding the quality of data in planning where over 75% participants confirm confronting data quality issues.

It is worthwhile to note that in absence of true open data that follow principles of open data, primary data from sources like ground-based field surveys become highly important and necessary, even for baseline data.

4.6 Gaps in Policies for Open Data for Planning in Kathmandu

The Constitution of Nepal 2015 [25], under article 27, provides right to information. It states, “Every citizen shall have the right to demand and receive information on any matter of his or her interest or of public interest. Provided that no one shall be compelled to provide information on any matter of which confidentiality must be maintained in accordance with law”. The constitution provides a strong foundation for sharing data Openly.

The Right to Information Act 2007 [26] provides the citizen of Nepal with access to the information held in the public bodies. The act also makes public bodies responsible for timely classification, publishing, and update of information. The act also provides provision for an independent National Information Commission for the protection, promotion, and practice of the right to information. However, the act needs to be updated to include digital data and information. This will cause the public bodies to share their data and information online without any confusion.

The National Information Commission has submitted the Government of Nepal with the National Action Plan 2017 on Open Government Data (OGD) [27]. The plan emphasizes the international significance of Open Government Data and advocates for its incorporation into Nepal’s policies and practices. The plan underlines the importance of translating laws, implementing OGD into national policies, and coordinating among many stakeholders such as government agencies, professionals, researchers, and civil society leaders. There is a clear need to draft a National Open Data Policy to support Open Data Ecosystem in the country- that can greatly help the planning practices.

The National Strategy for the Development of Statistical System 2019 [15] has a strategic objective to manage regular supply of statistics by providing reliable and quality data for evidence-based policy formulation, development management, and addressing the demands of users. To produce and supply quality statistics, the concept of Open Data has been adopted for easy access to statistics. Other government bodies that produce data for planning also need to adopt the concept and principles of Open Data to sustain a healthy Open Data Ecosystem for planning in cities of Kathmandu Valley.

The National Urban Development Strategy 2017 [28] is clear about the need for and importance of good database management system and accessibility to data. But the strategy fails to consider the concept of Open Data. The strategy needs to be revised by including the use of open data in planning cities.

The topic of Open Data has been limited mostly to conceptual talks. There is an unwritten assumption that the data and statistics available in government bodies are secure and correct. And, if data is kept in government bodies, the public can easily access data. This is not always the reality.

In absence of an Open Data Policy, there have been no significant efforts to build capacity of planners in Kathmandu Valley to utilize Open Data.

5. Conclusion

Open Data plays a significant role in planning practice. In the context of planning of cities in Kathmandu Valley, the Open Data Ecosystem is still in an infant stage. Most of the data available is in PDF form via the government websites are not interoperable between data-sets and systems.

The issues of mindset of planners and stakeholders not open

to sharing data, inclination of consultants to use public data for monetary gain, and presence of data silos and system silos were brought forth by the research. The lack of an Open Data Policy has been clearly highlighted in the research. With the help of an Open Data policy, the planning field can harness the real power of truly open, standard, and interoperable data-sets that follow open data principles and are aligned with international open data practices.

The world is undergoing a digital revolution and the field of data is far too important to be left only to data scientists. Urban Planners need to rightfully own research and practice in the field of urban data to enhance informed decisions.

6. Recommendations

Based on the literature reviews, case studies, findings, and analysis, following recommendations are made to improve the Open Data Ecosystem to aid planning of cities in Kathmandu Valley

- Promote Open Data Ecosystem for Urban Planning
- Create a set of open data indicators that will be used to determine budget allocation for local governments based on successful implementation.
- Ensure that urban planning data is not isolated but geographically integrated for full insights. Establish proper coordination between NSO and Survey Department. Integrate National Statistics Office data with survey department spatial data.
- Draft and implement a National Open Data Policy to promote a healthy Open Data ecosystem and pave ways for legal basis to share data openly.
- Promote Open Data Portals initiative to operationalize the Open Data Policy. Open Data Portals provide users with datasets that are easily accessible and reusable.
- Conduct extensive study to identify and assess available data sources for urban planning requirements. This research will aid in the identification of gaps and the improvement of overall data collection tactics for effective planning.

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