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# Identifying Strategies for Geo-Information Utilization – A Case Study of Ratnapura Municipality of Sri Lanka

H. Divithura[1]

[1]*Faculty of Geomatics, Sabaragamuwa University of Sri Lanka, Belihuloya, divithura@sab.ac.lk*

## Abstract

Many organizations in Sri Lanka have been involved in spatial data collection and distribution. However, most of the local authorities have not been using the available spatial data optimally. This can be identified as one of the major reasons contributing to poor performance of the local authorities in the country.

The major functions of local authorities fall within the categories of public health and environmental sanitation, public thoroughfare and public utilities. But, at present, the effectiveness and efficiency of local authorities operating under these fields are not up to the expected level. Problems/constraints that come up regarding the usage of Geo-information within the local authorities are one of the identified reasons for the inefficiency and the non-effectiveness. It also has major implications on the current operational practices within the local authorities. This paper discusses this issue in detail by considering Ratnapura Municipality as a case study.

The data was collected by using questionnaires, interviews, physical observations and available supported documents. Data analysis aims to identify Geo-information providers related to the Ratnapura Municipality and District Planning Office and compare the requirements, perceptions and activities in acquiring Geo-information between the above two organizations. Comparison between these two administrative levels will help to identify the improvement strategies to utilize Geo-information within the Municipality. This analysis utilizes a technique of Strategic Grids, including grids with Interest vs. Awareness. Such grids identify the improvement strategies for effective and efficient process of Geo-information exchange, targeting to improve present Geo-information usage in the Ratnapura municipality. Major findings can be summarized as: (a) lack of the required capacity of the municipality to cope with Geo-information related work; (b) lack of motivation of the municipality staff from the management level for Geo-information related activities. This situation has been further aggravated due to the lack of an effective linkage between the major Geo-information providers and the municipality.

Key Words: Geo-information Management, Capacity Building, Local Authorities, Disaster Mitigation

## Introduction

The Government and the private sector need geo spatial data for effective decision-making in planning and management. Examples include legislative and policy development, allocation and management of natural resources, defense and public safety, project planning etc. Many organizations in Sri Lanka have been involved in spatial data collection and distribution. However, most of the local authorities have not been using the available spatial data optimally. This can be identified as one of the major reasons contributing to poor performance of the local authorities in the country, "Over time, many organizations and governments have made major investments in collecting spatial data. This data is a national resource that is fundamental to good decision-making. Managing this type of information, and maximizing its use, has become a focus for both developed and undeveloped countries around the world" (ASDI, 2009). Geo-information sharing or exchange becomes vital in this context. This paper discusses the Geo-information exchange process from the users' point of view by considering the Ratnapura municipality as a case study.

The Ratnapura district, being the most vulnerable area in the Island for frequent flooding and landslides, was affected by the major flood that occurred in 2003 with the highest damages reported, and was selected as the most suitable area for the study. In addition to this, the Ratnapura Municipality can be identified as one of the organizations with high potential for Geo-information usage as it is the responsible agency for overall management of the Ratnapura Municipal area. Main focus of this study was to identify the problems faced by the Ratnapura Municipality regarding Geo-information usage.

## Problem Formulation

The Survey Department of Sri Lanka can be identified as the main spatial data provider in Sri Lanka. Irrigation Department, Land use planning Department, Urban Development Authority, Geological Survey and Mines Bureau, National Building Research Organization, National Aquatic Research Agency, etc. can be identified as some other specific geo-information providers in Sri Lanka. However, at present, the available geo-information from the providers' side is not utilized among different geo-information user communities. This can be identified as one of the major reasons for the poor performance of the local authorities in the country.

Therefore, the research problem is the lack of understanding of the factors and conditions that govern the relation of the users with producers of Geo-Information. This relationship is reviewed by considering following major areas on the basis of the Ratnapura Municipality.

- Identify Geo-information providers related to the Municipality
- Level of awareness for accessibility and availability of nationally available Geo-information among municipal Geo-information users
- Level of interest for the Geo-information among municipal Geo-information users

## GI providers related to the Municipality

The Geo-information needs vary in nature from local authority to local authority according to their geographical, social, economic, institutional, legal and technical environment. When considering the geographical location, the municipal area is highly vulnerable for disasters such as frequent flooding and landslides. Therefore, priority has to be given for Geo-information related to the flood and landslide disasters when identifying Geo-information providers related to the municipality. "Some of the lessons learned in the last several years give clear indications that availability, management and presentation of Geo-information play a critical role in disaster management" (Oosterom and Zaltanova, 2005).

The Ratnapura Municipality has some computers but they are not been used for any Geo-information related work. In addition, Internet facilities are not available in the municipality; therefore, the second priority has been given for the analogue products related to the Ratnapura municipal area than that of the available digital products.

Further, when considering the legal background, powers and duties of the municipality, close relationship with the Urban Development Authority (UDA) is visible. In general Urban Development Authority has been responsible to prepare development plans related to the municipality and the municipality has the responsibility to implement these plans. The economic situation of the municipality elaborates the fact that the municipality is not in a position to allocate enough funds to purchase detailed and descriptive geo-information products.

By considering the above facts and further investigations done in the municipality, four Geo-information providers were identified as Geo-information providers related to the Ratnapura Municipality as follows;

- National Building Research Organization (NBRO)
- Survey Department of Sri Lanka
- Urban Development Authority (UDA)
- Meteorological Department

In practice, the hazard mitigation program conducted by the municipality deals with NBRO and UDA through the Land Slide Hazard Mitigation Program and the Works Department in the municipality deals with the Survey Department, UDA and Meteorological Department.

## Level of awareness for nationally available Geo-information among municipal GI users

Level of Awareness for the accessibility and available possibilities of the Geo-information was identified by considering the following factors.

- Number of Geo-information products identified by the providers as highly appropriate for the Ratnapura municipality
- Number of Geo-information products that municipality is using for their work
- Number of Geo - information products of which the municipality staff did not know its availability or which were totally neglected

Four Geo-information providers were identified and eight of their products were found to be highly appropriate for the municipality. A total number of four products were used by the Municipality for their work occasionally. Only three products were matched with the providers' identified products, meaning, that apparently the municipal Geo-information users know the availability and accessibility of those products.

The only two sections that incorporate Geo-information for their work in the Municipality are the Municipal Works Department and the Municipal Hazard Mitigation Programme. Awareness of availability of Geo-information products among these components was identified for the purpose of comparison. The Municipal Hazard Mitigation Programme has used only one product while the Municipal Works Department has made use of three products. The latter also knew about the availability of an additional product but has not made use of it.

By considering this, it can be concluded that Geo-information users in the municipal works department are more aware of the available Geo-information than that of the municipal hazard mitigation program.

Interviews and discussions held with strategic level workers in the municipality indicated that their awareness of the available Geo-information was at a very low level. "What need to happen? First and foremost, awareness amongst those in charge and major decision making must be created. Unfortunately, practice reveals that creating awareness among the rulers of the world is a tough endeavor" (Lemmens, 2004). Interviews held with Geo-

information providers' organizations highlighted this fact that the municipality does not have an adequate interest or awareness for the available Geo-information products. This was further confirmed by the interview held with the Sri Lanka Urban Multi-hazard Disaster Mitigation Project (SLUMDMP) officials. By considering the above results, interviews, discussions and background observations etc. it can be concluded that in general, the Ratnapura municipality has a low level of awareness of the nationally available Geo-information from different providers.

Awareness on availability and accessibility of high potential Geo-information in Ratnapura Municipality was identified against each provider related to the functions of the municipality by considering the above-mentioned 3 major factors. These results show that users have a high awareness for the Geo-information available from the National Building Research Organization (NBRO). Surprisingly, users did not have an adequate awareness for the Geo-information available from other providers' organizations, especially Geo-information available from the Survey Department of Sri Lanka ( Table – 1).

**Table 1:** Municipal Users Awareness for the available GI

| GI product used in the municipality | High potential GI product | Works Department | | Hazard Mitigation Programme | |
|---|---|---|---|---|---|
| | | Know availability | Know accessibility | Know availability | Know accessibility |
| Land Slide Hazard zonation map | X | X | X | X | X |
| 1:50,000 map (Sur.dept.) | X | X | X | | |
| 1: 10,000 map (Sur. dept.) | X | X | | | |
| 1:5000 map (Survey dept.) | X | | | | |
| Land Use map (UDA) | X | | | | |
| Infrastructure map (UDA) | X | | | | |
| Flood prone area map (UDA) | | | | X | X |
| Digital data (UDA) | X | | | | |
| Meteorological data (met.dept.) | X | X | X | | |

Awareness for available Geo-information products, among municipality and Ratnapura District Planning office was identified for the purpose of comparison of Geo-information usage at different administrative levels. Four maps were identified by the providers as highly appropriate for both levels of administrative authorities considered.

1. Landslide Hazard Zonation map (NBRO)
2. 1:50,000 Topographic map (Survey Department of Sri Lanka)
3. 1:10,000 Topographic map (Survey Department of Sri Lanka)
4. 1:5000 Town map (Survey Department of Sri Lanka)

These four maps were used to compare the awareness about availability and accessibility of Geo-information between the Ratnapura District planning office and the Ratnapura municipality. "However, most of the geomatics resources available are unknown by managers and users, and then they are not much used" (Caron, 2005).The result shows that:

- All Geo-information users in both local levels of administrative organizations were aware about the availability and accessibility of the landslide hazard zonation map available from the NBRO.
- Municipal level Geo-information users (in both sections) have a low level of awareness of the availability and accessibility of the available products from the providers' side, compared to the users at the district planning office
- Surprisingly, all the users in both administrative levels did not have an adequate awareness of the 1:5000 town map available from the Survey Department. This map can be identified as one of the latest products available from the Survey Department of Sri Lanka.

## Level of interest for GI among municipal GI users

The Municipal interest Level for the available Geo-information from the providers' side was evaluated by considering five major criteria:

1. Level of identified high potential Geo-information usage
2. Level of Geo-information incorporated in the municipal works
3. Level of available technology used for the Geo-information related works
4. Level of interaction with the providers side
5. Level of contact media used to communicate with the different Ge-information providers

### 1. Level of identified high potential Geo-information usage

Out of the considered eight Geo-information products, the municipality only used three products for their work: 1:50,000 topographic map, land slide hazard zonation map and meteorological data. Apart from these products, the municipality used Flood prone area map available from the UDA. A result shows that the number of identified high potential Geo-information usage is remarkably high in the district planning office than that of the municipality. This shows the low level of Geo-information usage in the Ratnapura Municipality when comparing with the District Planning office.

### 2. Level of Geo-information incorporated in the municipal works

Only two sections in the municipality incorporate Geo-information for their work. The observation shows that the municipality does not fully incorporate this available Geo-information for their work extensively. The number of staff who utilizes Geo-information for their work and the number of sections incorporating Geo-information for their work are remarkably low. Compared to the District Planning office, the number of people working with Geo-information is proportionally high in the district planning office but both levels seem to incorporate Geo-information for their work infrequently or only occasionally.

### 3. Level of available technology used for the Geo-information related work

There were four computers available within the municipality but they did not use any of these computers for the Geo-information related work. Apart from not using what is available from different sources, the Municipality is currently not in a position to use the dedicated technology which has been given to them in the recent past by the SLUMDMP project for Geo-information related work (ADPC, 2004). This shows that a low level of available technology is used for the Geo-information related work in the Ratnapura municipality. Ratnapura district planning office used available technology for Geo-information related work (such as computer, printer and scanners) even though they have GIS software and planning to use this software for their future work.

### 4. Level of interaction with the providers' side

All considered providers indicated that the municipality and the district planning office Geo-information users interact with their organizations rarely. Also, identified users in municipality and district planning office

indicated that they incorporated available Geo-information from the provider's side rarely or else occasionally.

### *5. Level of contact media used for the initial contact with the Geo-information providers*

All considered providers indicated that the main access to available products from these organizations is by visits and collection of relevant products, the municipality users indicates that they access available Geo-information only by using office visits but district planning office indicates that they used office visits, telephone calls and normal post to buildup contacts with the different providers initially.

By considering the above, it can be concluded that the Municipality shows a low level of interest for the nationally available Geo-information while, comparatively, the District planning office shows a higher level of interest than that of the Municipality.

## Strategies towards improvements

To identify strategies towards more Geo-information usage in the municipal works, the obtained results were arranged in strategic grids named User awareness for availability and accessibility of nationally available Geo-information and User interest for availability and accessibility of nationally available Geo-information.

## Users' awareness vs. Users' interest for the available high potential Geo-information

Figure 1 illustrates the users' awareness vs. users' interest in a matrix. Each user is plotted and analyzed based on the grid in which they exist. Each quadrant of the grid describes the possible reasons for this occurrence. This technique helps to determine the possible actions that need to be taken in order to improve the Geo-information usage among the municipality.

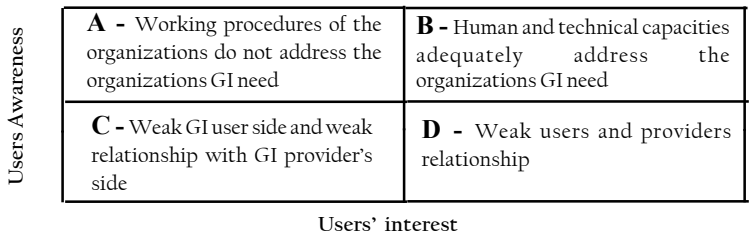


**Figure 1:** Users' Awareness vs., Users Interest for the Nationally Available High Potential Geo-information

**A:** A possible reason for this is that the working procedures of these sections/ organizations are not prepared to incorporate Geo-information for their work. Less Geo-information related technical capacities and enough human capacities to address the Geo-information related problems.

**B:** Human and technical capacities adequately address the organizations Geo-information need and organizations working procedures are prepared to address the Geo-information needs of this organization, more efficiently and effectively.

**C:** Human and technical capacities are not enough to deal with the organizational Geo-information needs and organizational working procedures do not adequately address the organizations Geo-information need. Weak Geo-information providers and user relationship are visible.

**D:** Providers are not aware of the users' side. Providers need to address the users and their needs. More actions are needed from the provider's side to improve awareness among Geo-information users for their products. Possibly, this situation can be improved by strengthening the human capacities to address the organizations Geo-information need.

For each of the axes ("Awareness" and "Interest") the following criteria were used to calculate the degree. The indices **W, H** and **D** stand for Municipal Works Department, Municipal hazard mitigation program and District planning office respectively.

- *Awareness*

The level of awareness for availability and accessibility of nationally available Geo-information was accessed by considering the above mentioned three major factors:

Four maps, identified by the different Geo-information providers as highly appropriate to both levels of local authorities, were used to compare the awareness of the availability and accessibility of available Geo-information in Ratnapura District planning office and Ratnapura municipality.

These results show that the awareness level of the availability of Geo-information in Municipal Works Department is 75% (Percentage that the mentioned users know of the availability from the above identified four Geo-information products) and accessibility is 50% (Percentage that the users know the accessibility from above identified four products). Also the level of awareness for the availability in Municipal Hazard Mitigation program is 25% and accessibility is 25%. Awareness for the availability in district planning office is 80% and accessibility is 65%.

- *Interest*

The Municipal interest level for the nationally available Geo-information from the providers' side was classified into five major categories. A table was generated with each factor as a column and each user assessed by the use of weights. The weights were given three values, 0 being lowest to 4 being highest. For a more critical analysis, a Multiplication Factor (MF) was introduced to provide a greater emphasis to specific factors deemed more important. The MF's used 1, 2 and 4 according to the importance of the fact considered.

The results show that interest for the available Geo-information among municipal hazard mitigation program is 24% and municipal works department it is 32%. Interest for the available Geo-information in district planning office is 46%.

Figure 2 shows a clear relationship between users' interest for the Geo-information and their awareness of the available Geo-information, such as Users awareness level being proportionate to the users' interest in relation to Geo-information. It is an important to consider about the factors that effects to reduce the interest for the Geo-information in the Municipality.

All the considered users show a low level of interest for the available Geo-information. The district planning office shows relatively high interest and municipal hazard mitigation program shows a remarkably low level of interest and awareness. When considering the human and technical capacities available within the municipal hazard mitigation program, those are not adequately addressing the Geo-information needs of this program. When considering the working procedures and insight for the Geo-information among strategic persons in the considered two sections of the municipality and district planning office, it was clear that the working procedures and insight for the Geo-information among major decision makers in the district planning office are at an advanced level than that of the municipality.

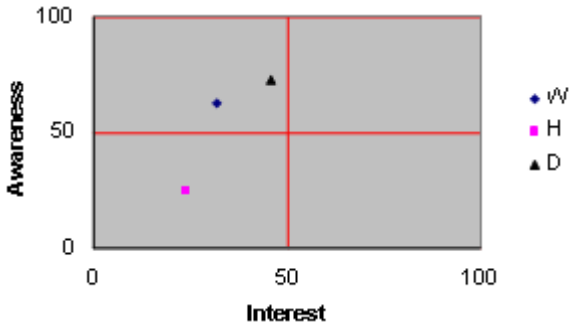


**Figure 2:** Awareness vs Interest

By considering these factors there were few strategies identified in order to improve the Geo-information usage within the municipality.

Human and technical capacities need to be improved in order to improve the interest for the available Geo-information among the users in the municipality. Organizational working procedures need to be improved towards more Geo-information incorporated situation. It is important to improve awareness for Geo-information related matters among major decision makers group in that organization. Last but not least, related national Geo-information providers' organizations need to be correctly identified and address the Geo-information needs of these local level Geo-information users. "The user is in the centre of interest and drives the process of defining usable products. This reverses the traditional producer-oriented perspective on bringing geographic data to users." (Riedemann and Kuhn, 1999).

## Conclusion

It is important to improve the interest for Geo-information to utilize nationally available Geo-information among local authorities in the country. This Paper investigated some major factors that effect the reduction of the Geo-information usage in local authorities in the country by considering Ratnapura Municipality as a case study. Major findings can be summarized as: (a) lack of the required capacity of the municipality to cope with Geo-information related work; (b) lack of motivation of the municipality staff from the management level for Geo-information related activities. This situation has been further aggravated due to the lack of an effective linkage between the major Geo-information providers and the municipality.

## References

ADPC, (2004) Sri Lanka Urban Multi Hazard Dissaster Mitigation Project, Asian Disaster prepaired centre, Project Completion Report. www.adpc.net/AUDMP/library/project_rpts/lk1.pdf›, Accessed 7th of February, 2009.

ASDI, (2009) Australian Government, Geoscience Australia, Australian Spatial Data Infrastructure [ASDI] Web Page. www.ga.gov.au/nmd/asdi/ ›, Accessed 8th of February, 2009.

Caron, C. (2005) "A New Visual Modeling Tool to Describe Municipal Geomatics Resources." Earth observation magazine, v. 12(4), www.eomonline.com›, Accessed 10th of June, 2003.

Lemmens, M. (2004) "Geo-information and Sustainable Development." GIM International, Durk Haarsma.

Oosterom, P.V. and Zlatanova, S. (2005) "Geo-information for Disaster Management", www.directionsmag.com/author.php?author_id=265›, Accessed 5th of March, 2005.

Riedemann, C. and Kuhn, W. (1999) "What Are Sports Grounds? Or: Why Semantics Requires Interoperability. Interoperating Geographic Information Systems, Second International Conference, INTEROP '99, Zurich, Switzerland, Springer, pp. 199-200.