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Exploring Digital Tool for Participatory Rural Appraisal

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Abstract

The study mainly focuses on the application of a digital tool in mapping the assets of MGR Colony (also known as Nandhikovil) in Pichanoor Panchayath in South Coimbatore in Tamil Nadu. The main objective of the study is to find whether a digital tool like an android application can be an alternative to the conventional mapping method like a sketch mapping on a chart paper. The Android Application is the digital tool developed by the 'AMMACHI Labs' exclusively for mapping the assets in and around the rural community using GPS coordinates. The study attempts to find how the digital tool helps in participatory asset mapping among the villagers rather than the memory, the only driving factor of the conventional mapping method. The sample size of the study is six respondents who qualify the functional literacy assessment. The functional literacy assessment in this study focuses on English and is able to understand and

handle the features in the android application. Semi structured interviews were conducted to understand the experience of the respondents after the participatory asset mapping exercise. The study is exploratory in nature as it attempts to find whether a digital tool can do simultaneously mapping as well as transect walk. A feature which has not yet offered by any of the PRA tools. This pilot study proposes the further developments in the area of digital mapping with more additional features, user friendly in nature to identify and tap the possibilities in the era of digital world.

Key Words: Asset Mapping. Participatory Rural Appraisal, Digital Mapping, Android Application, Community assets, Resource mapping.

1. Introduction

Digitalization has become ubiquitous in all the aspects of social life. This impact of digitalization is apparent even in the remotest of areas in the rural and tribal parts of India. No country in the world can pursue development ignoring the benefits offered by the digital technologies. This quest for digital life can be witnessed at the micro level in the form of using smartphones and android applications, irrespective of the socio-economic and cultural backwardness, a distinguishing characteristic commonly found in the typical rural areas of India. This study explores the application of a newly created digital tool in mapping the assets of a rural community in TamilNadu in the southern part of India. Nandhikovil, the village, is situated (Coordinates-10.8595°N and 76.8687° E) in Pichanur panchayath in South Coimbatore district of TamilNadu. The study attempts to test the digital mapping exercise in Nandhikovil by creating a database and satellite image of all available assets with the digital tool.

Assets are those entities that give a positive and safe environment for the people to live in their habitat. It can be an individual, formal institution and citizen association .(Kretzman and McKnight,1996) The study focuses on the testing of a newly developed tool- 'Where Am I' for mapping the biophysical assets precisely and accurately with the help of GPS coordinates.

The study attempts to answer the following research questions

1. Can the digital mapping tool be considered as an alternative to the conventional method of mapping?
2. Response of the community while using the new way of asset mapping
3. Differences in mapping of assets in participatory and non-participatory method?

In summary, the digital tool has been developed as an exploratory study to find an alternative for the conventional participatory asset mapping exercise for gathering the baseline information related to a community.

2. Literature Review

The Participatory research is the process of exploring new horizons of knowledge by ensuring the active involvement of the local people in pursuit of education, social change or other varied purposes, which are usually beneficial to the community (Macaulay, A. C.1999.et.al). This Bottom Up approach thus upholds and emphasizes the perspective of the local people in the community.. (Manderson, L., & Aaby, P, 1992).Other research studies, non-participatory in nature, give no ample space for such priorities and needs of the local people.

(Tumwine J.K, 1989).Participatory research (PR) envisages a wide range of methods and approaches (Manderson, L., & Aaby, P. 1992). It is not these methods and approaches that make the Participatory research a unique and different from other conventional research studies, instead the methodology that the researcher chooses for his study makes the PR a unique and distinctive nature. (Cornwall.A. 1993). This study,focusing on asset mapping, is a participatory research in which the methodology is purely personal.

PR is more depended on the attitude of the researcher rather than following a standardized and structured methodology. It ensures flexibility and can be formulated and changed according to the needs of the study. (Cornwall. A.& Jewkes. R.1995).PR fosters not a rigid or a linear research design rather it is reflexive and contemplative and gave ample space to deliberate upon the community needs(Chambers.R.1992). It encourages greater adaptation of the methods that are commonly used in the non-participatory research. It also promotes innovations from the part of local people or the participants involved in the research, especially during the sketch mapping activities of an area or a geographical location (Gould, P., & White, R. 1974).There are four levels of participation in PR and degree or extent of participation will vary according to the stages of research and the actors involved in doing it (Woelk, G. B. 1992). The four levels of participation are - contractual, consultative, collaborative and colligative (Biggs.S.1989). This study on the asset mapping with the digital tool is entirely collaborative in nature as the respondents and the researcher works together on the study, following a methodology that was exclusively designed and formulated for it.

The participatory research is one of the requisite aspects for pursuing the concept of community development(Cornwall, A., & Jewkes, R. (1995). Participatory research can also contribute to community development and to instill the inherent capacity to solve problems thorough digital methods and techniques like gamefication. (Kongeseri.S,et.al .2018). The notion of community development perceived by underdeveloped and the developing countries are mainly based need based approach for a comprehensive and grass root level development. However, this conventional approach focused on the deficiency of the community accentuated the dependency and augmented the fragile nature of the community (Goldman, K. D., 2005). Dependence on the external sources as mentioned in the case of need based assessment approach only nullify the inherent capacity of the community to intercept and tackle a common issue when it arises. On the other hand, the assets based assessment approach concentrates on the capacities and potentialities within the community, which can be enriched through proper participatory exercises, rather than focusing on the deficits or shortcomings (McKnight, J. L., & Kretzmann, J. 1996)

Assets can be these capacities or potentialities in a community, that create a positive and safe environment for the people. Assets based assessment model of Kretzman and McKnight encompasses identifying, modifying, supervising and monitoring of the inherent resources in the community to ameliorate their understanding for a collective vision. Assets based assessments can be done through many ways –depth interviews, focused group discussions, asset mapping, creative assessments, windshield and walking tours are some of them (Woelk, G. B., 2000). This study also attempts to render a participatory asset mapping as part of assets based assessments.

Participatory asset mapping is the process of preparing a database of assets in the form of maps by the community members itself through sharing of information and knowledge on the entities to which they are depended. (*PAM Toolkit*, 2012 page 7). It helps to develop the skills, attitude, and decision making capacity of the community in a broad sense. Thus the mapping process can be conveyed as an empowering tool for both the community and for the groups who have been deprived of or denied access to community resources which are presumed to be considered as assets. (*Participatory mapping as a tool for empowerment* 2008). Participatory Action Learning, an important approach to asset mapping has its roots in the Participatory Rural Appraisal (PRA).(Kramer, S., Amos, T., Lazarus, S., & Seedat, M. 2012). PRA, a method to collect baseline information of the rural community, is based on the principle that the people, who have an understanding of their own problems also have the capacity to find a solution to it.. PRA may be often applied in a pilot study to collect a detailed information regarding the available assets in the community (Nicolau, M. D., & Delport, C, 2009). PRA techniques like resource mapping, social mapping and other have a wide range applications in different phases of mapping the livelihood assets to get a baseline information regarding the perception of the community about the resources to which they are depended (Kirsopp-Reed, K, 1994).

Sustainable Livelihood is also another asset mapping approach besides the PAL and ABCD. The sustainable livelihood approach is focused on mobilizing household assets that are classified mainly into – physical, social, financial, natural and human resources. It is an approach that developed as part of addressing the importance of assets in the poverty alleviation initiatives (Marley, N. A., & Cunningham, M. M, 2008). The present study attempts to focus onthe natural and physical assets in the community. The assets mapping can also be better useful mechanism in a post disaster scenario to find out the gaps in the availability of the assets and to interrogate the delay occurred in the procurement of the necessary resources. An analysis of the communication of key professionals through the social media like whats app, instagram, Facebook

and messenger helps to give a broad view of all the assets available in the community and also helps to find out the deficiency to combat such incidences in the near future in a different community.(Majumdar, M., & Basu, P., 2015),

The advanced asset mapping through the digital methods are mainly based on the computer mapping techniques like Geographic Information systems (GIS). This software analysis gives accurate and detailed spatial knowledge about the features of the area. However the software analysis hinders layman as it requires high expertise in digital mapping, especially during emergency situations (Zerger, A., & Smith, D. I. (2003)This contingency can be addressed through the Participatory GIS (PGIS) or Volunteered Geographic Information (VGI) as it map down the features in the community digitally by ensuring their representation and participation by taking them into confidence. VGI involves voluntary collection, organization and dissemination of geographic information. (Elwood, Goodchild, & Sui, 2012; Goodchild, 2007; Tulloch, 2008). Participatory asset mapping not only enables to record information but it contributes for a progressive change and an enhanced community connectedness. Thus it fosters trust, community participation, decision making capacity and social networks among the community members for cultivating a shared interest and attitude (Hausman, 2007).

The VGI mechanism, an extension of GIS, though ensures inclusiveness and community participation in creation, modification and proliferation of spatial knowledge, often compromise the standard and quality as guaranteed in professional mapping, thus limits its usage in high emergency situations like a hazard or similar high risk scenarios. Issues like bias, lack of credibility, privacy issues, misleading information and misrepresentation may also reflect upon the spatial data generated through this participatory approach. (Bird, 2012; Gupta & Kumaraguru 2012;Hung, K. C., Kalantari, M., & Rajabifard, A, 2016).

The most important and best example of VGI is the ‘Wikimapia’, it has the same application and features as that of the ‘Wikipedia’ exceptthe purpose for which it is created. Anyone who has an internet connection can select any part of the world can edit and add geographical information of the selected area or location as similar to the data entries in Wikipedia and encyclopedia. Another example of the VGI is the ‘Flicker’ site, which allows the users to upload photographs of a particular location or area along with the GPS coordinates. Another site named ‘misspronouncer’ helps people an opportunity to pronounce the names of 2000 places in the Winsconsian state of USA. The concept of VGI however was democratized and popularized with the introduction of Google Earth viewer, commonly known as Google Earth. The concept of ‘mash up’ or combining different geographic information’s from diverse and different

sources were actually developed and flourished with the trend created by the Google.(Goodchild, M. F. (2007).

VGI has made a revolution in the cartography as it enables representation of the people's perspective of the spatial features of the particular area. VGI can be in the form of Geo-tagged photos, GPS tracks, topographic maps, synchronous microblogging and other social networking sites like Facebook, blogs.etc. The creation of the volunteered geographic information can be either deliberately or unwittingly. In the first case, georeferenced footprints are marked when the users knowingly interact with the technologies. But in the latter case the user don't have any awareness that the interaction with the technology have a history in the cyberspace, especially the social media (Capineri, C. R. I. S. T. I. N. A., & Rondinone, A. 2011). The VGI is mostly known for the online portals like wikimapia, open street maps, geonames, cycle maps, gpx trail maps etc. It also has application in the mapping of urban noise, pollution, traffic and congestion etc. (Antoniou.V, 2018). There are many technologies that make possible the application of VGI. Some of them are Web. 2, Geo referencing, GPS, GPS tracks .etc. Among these GPS is the first technology that enabled to measure the position on earth's surface. It has the potential to map the geographical area with the help of GPS coordinates while walking, travelling or driving.(Goodchild, M. F. (2007).

.The participatory mappingin Nandhikovil is basically a geospatial asset mapping by conducting a walk over with the help of GPS coordinates. A Functional literacy assessment is also conducted in the study to identify the sample as the android application configured to map the assets has no linguistic module to include the local language other than English.. Functional literacy means the ability of a person to get involved in those activities in which literacy is requisite in a group like setting or a community and which contributes for the overall development of the individual (UNESCO, 2008).

The main objective of the study is to attempt the usage of the tool supported by technology and assess whether it can be a substitute for both VGI as well as the conventional PRA Tools. The study is exploratory in a sense that it attempts to unveil the possibilities of the newly developed interface in mapping the assets of the community

3. Methodology

3.1Sampling Design

The sample size of the study is six, who passed the functional literacy assessment. The functional literacy assessment is meant to be only an evaluation

of the functional skills- ability to read English and operate the application. The functional literacy assessments with the self-prepared cards, detail the name of assets enlisted in the android application. The application provides a master list of about 53 assets, exclusively biophysical in nature and are commonly seen in a typical rural village in India. The cards represent the names of all assets in the master list, of which every 5th card was selected for conducting a standardized and uniform assessment among the population. The assessment involves reading and understanding of every fifth card (total-10 cards), solely prepared in English. The application had no language options other than English, affirming the importance and necessity of the functional literacy assessment in the study.

The study heavily relies on purposive sampling design as the participants were selected based on the performance in the literacy assessment and the ability the villagers had in operating basic tasks mentioned in the application. Although the initial intent was to construct a sample of both women and men, in the end only adult men were considered for the study and for the functional literacy assessment. This is because the women in the village expressed inconvenience to do a walkover, a time-consuming task based upon the size of a village, as part of asset mapping with the android application in the study area (seventh ward of Pichanur panchayath). Although five women in the village were interviewed for the study, they hesitated to participate due to the time demands of the study which would keep them from their obligation towards their family and children. However it should be understood that the study focuses only on testing the digital tool, and gave no room for any bias involved in the nature and size of the sample selected.

3.2 Research Design

. The research design involves a series of sequential steps as one step follows another. There are about seven series of such steps to consolidate the methodology of the research. The methodology of the study can be described in the following way.

3.2.1 Android Application

Identification of assets in a non-participatory manner was one of the first

preliminary stage as part of the study. This was done by conducting a walk over all along the study area to find out the assets to which people in the Nandhikovil are depended. The walk over continued for three days to map all assets that seems be useful and create a safe environment for the community. This non-participatory mapping was done with the digital tool, connected to Internet modem to ensure a reliable Internet connection throughout the digital mapping exercise. The application would mark the exact location of the assets with the help of GPS coordinates. So walking all over the defined area of the study would help to give a detailed information of the latitude and longitude.. The application also has other features to save the functional status as well as the ownership along with the prescribed GPS coordinates of that place. Thus, it gives a comprehensive overview of the location, status and ownership of the asset in the village. The application has already been coded with a master list of assets to select it for saving the corresponding information related to it. A separate option called 'View 'All My Assets' helps to give a pictorial representation of the marked assets, symbolized by a red mark on the satellite image, generated by the application. The application also ensures the delete and update option to ensure an error free mapping process.

3.2.2 Functional Literacy Assessment

The functional literacy assessment was conducted to ensure selection of the respondents who are proficient in reading English and have an understanding of basic smartphone operations. About 18 men in the village were interviewed and the required six respondents were selected based on their performance in the functional literacy assessment. They were shown names of the assets in English, programmed as a master list in the application. Every fifth card, representing the asset name in the master list was shown to all of them. Five of the men were hesitant to read out the words, and admitted that they did not know English. They were not able, therefore, to participate further in the functional literacy assessment. Four of them were failed in the literacy assessment as they were not able to say or read the words correctly for seven out of total 10 words. Only nine men passed the literacy test, of which four were able to say correctly nine out of the 10 words. The word they found it difficult to read and understand was the asset name 'Mosque.' They either misread the word as 'Music' or skipped it and found it difficult to say the meaning of it. During all the assessment there was a predetermination regarding the candidate's ability to pass the test so as to be selected as a sample for the research.

The selected nine members were further assessed to get an optimum sample size of six. They were given the tasks to operate the directions in the app to ensure that can perform the application without any external assistance or help during the participatory mapping. The men who correctly said the directions in the app

and performed it accordingly were considered as the qualifiers of the functional literacy assessment. In this task, a 27 year old man failed to click the option as mentioned in the directions in the app and was eliminated from the study. The rest of them passed this task and were selected for the study.

The availability of the selected participants at a particular time was also one of the major concerns as they were engaged in different occupations. The eight respondents, selected, were in the age group of 18-30 and were doing daily wage work in some temporary settings. Two of them didn't give any guarantee or assurance that they would be available on a particular time after coming from their place of work. So they were set as a reserve sample for the study to deal the situation in case of any shortages.

3.2.3 Sketch Mapping/ Conventional Mapping

As part of the methodology a sketch mapping or a resource mapping was done with the selected respondents to find out the assets in the community to which they are depended. No training or awareness was given on assets or resources prior to this conventional mapping as it may influence the mapping process and were only asked to draw the seventh ward in which their colony is situated. They drew the map of the seventh ward on a chart paper, colored and marked places located on the seventh ward of the Pichanur Panchayath. Places that villagers mostly use and visit were also marked and represented in the sketch map without any assistance or any compulsion, so as to generate a conventional map that relies on the memory of the respondents.

3.2.4 Participatory Digitized Asset Mapping

A training session was given to the respondents before the walk over in the seventh ward in the Pichanur panchayath with the android application as part of the study. The training session were conducted for 3 hours and the respondents were given basic instructions relating to the application as part of familiarizing them with the app, which was loaded onto a tablet computer. The availability of the respondents were also crucial as they usually were engaged in their own activities. Individual training was given to ensure that all of them understand all the features and the purpose of the application. Individual training also helped to address their queries personally, which might have otherwise been

suppressed in a group. This session was conducted to orient the respondents with the working of the android application in their village setting.

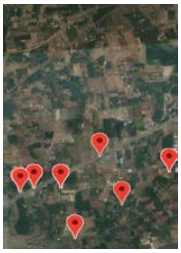
A mobile modem was set up to ensure a reliable Internet connection during the training and the digital mapping. The respondents walked all over the defined area with the android application and mapped the assets. The influence of any personal bias or interest were reduced by ensuring the active participation of all by the facilitator. All respondents were given an opportunity to discuss and tell their opinion about an asset while mapping at its location. Each of them were invited to express their point of view regarding that particular asset before saving an asset in the application. Their responses during the mapping were recorded for analysis with the help of a smartphone.

3.2.5 Semi structured Interview and Discussions

The study also relied on a semi-structured interview to collect the responses of the participants related to the asset mapping and the whole experience of using an app during walkover. The semi-structured questionnaire, consisting of seven questions, was prepared in advance to facilitate the interview with the respondents, so as to get a complete feedback of their experience they had with the digitalized asset mapping. The interview also accommodatedfor the respondents to share their experiences of the complete activities. The interviews were conducted individually with the respondents rather than on a group basis to collect the exact understanding of them regarding the asset mapping with the android application.

A discussion regarding the comparison of the asset maps (participatory and non- participatory) was also conducted among the respondents to cross-check the assets mapped in two different ways at different stages of the study. Two tablets connected to the internet were used for analyzing this comparison. This discussion was also spearheaded by the respondents, selected as sample for the study.

4. Data Analysis



This section mainly focuses on the data generated by the android application to

that of the conventional mapping exercise. The android application is configured with a satellite imaging system to easily identify the location of the assets.This image, formed on the basis of the data saved by the respondents during the walkover conducted after the sketch mapping or conventional exercise. The map generated in the satellite image contains the name of the assets and does not provide further information enlisted during the walk over

. The map generated during the non-participatory mapping exercise is shown in the fig 4.1. This non-participatory mapping exercise was done to identify those biophysical resources in the community on the assumption that it has a potential to become an asset and could contribute for its wellbeing of the community.The red markers in the satellite image represent the assets that have been saved as part of preliminary mapping exercise without the participation of the respondents from the village. In this satellite image only seven red marks are shown, representing seven assets and the remaining red marks of the assets are unseen due to the similarity in the geographical location and can be seen when the image is zoomed in. This map is based on the judgment or predetermination that the available biophysical resources in the community would be a source of life supporting assets. This exercise was done without any consultation or discussion with the respondents regarding the ownership and functional status. So the details in the application entered during this activity will be varying.

Table 4.1: Database of the assets mapped in a non-participatory manner

Sl.NO+A1:F24	Name of the asset	Functional Status	Ownership	Latitude	Longitude
1	Religious - Temple	Yes	Community	10.85911	76.88051
2	Tea Shop	Yes	Individual	10.86139	76.8714
3	Bridge	Yes	Government	10.85619	76.86091
4	Colleges	Yes	Individual	10.85636	76.86072
5	Forest area	No	Government	10.85679	76.86623
6	Community Hall	No	Community	10.85911	76.88051
7	Religious - Temple	Yes	Community	10.85678	76.86271
8	Water Storage Tanks	Yes	Government	10.85678	76.86271
9	Water Storage Tanks	No	Government	10.85678	76.86271
10	Cultivated Lands	Yes	Individual	10.84929	76.86806

11	Cultivated Lands	Yes	Individual	10.84929	76.86806
12	Cultivated Lands	Yes	Individual	10.8542	76.87429
13	Community Hall	Yes	Community	10.85911	76.88051
14	Public Taps	Yes	Government	10.85679	76.86623
15	Toilet	No	Community	10.85679	76.86623
16	Open Fields	Yes	Government	10.85679	76.86623
17	Shops	Yes	Individual	10.8892	76.90671
18	Cultivated Lands	Yes	Individual	10.8892	76.90671
19	Shops	Yes	Individual	10.8892	76.90671
20	Open Fields	No	Government	10.8892	76.90671
21	Other Retail Stores	Yes	Individual	10.8892	76.90671
22	Water Storage Tanks	No	Community	10.8892	76.90671

This satellite image and the table 4.2 shows the details of asset generated by the application during the walkover, conducted in a non-participatory manner, for the identification of the assets are done at the initial phase of research. This was done to have an understanding of the seventh ward and the biophysical resources used by the community in the study area. The application can also save additional information such as functional status and ownership category, related to a particular asset. Table 4.1 shows a detailed and overall view of the database of the assets generated by the application during the non-participatory asset mapping. This non-participatory mapping exercise was conducted to cross check the data generated in the participatory mapping exercise.

4.1 Participatory Asset Mapping

The participatory mapping with the digital tool was done among the villagers after ensuring the functional literacy. A conventional mapping exercise on a chart paper was done prior to the digital mapping with the villagers to compare

both them-two methods- from the respondent's point of view. They also marked assets similar to the one marked at the initial stage of the study. They were able to save the assets with the learning they imbibed during the training session, given to them. They walked all over the village and mapped the assets that they consider important to them. Some of the assets marked in the preliminary walkoverwere not depicted in the map of the respondents. When asked about the forest area, mapped in the preliminary walkover, they were of the opinion that the forest area doesn't offer much benefits to them and they rarely visit the place though situated close to them -both spatially and physically.

Table 4.2: Database of assets saved in the application by the respondents during the walkover seventh ward.

SL.NO	Asset Name	Functional status	Ownership	Latitude	Longitude
1	Street lights	Yes	Government	10.85909	76.88049
2	Tea Shop	Yes	Individual	10.85423	76.87428
3	Water Storage Tanks	No	Government	10.85423	76.87428
4	Anganwadi	Yes	Government	10.84938	76.86808
5	Street lights	Yes	Government	10.84938	76.86808
6	Water Storage Tanks	No	Government	10.85684	76.86625
7	Toilet	Yes	Government	10.85684	76.86625
8	Colleges	Yes	Individual	10.84944	76.86809
9	Cultivated Lands	No	Individual	10.84944	76.86809
10	Open Fields	Yes	Community	10.84944	76.86809
11	Open Fields	Yes	Community	10.84944	76.86809
12	Open Fields	Yes	Individual	10.84944	76.86809
13	Public Taps	No	Government	10.85909	76.88049
14	Community Hall	Yes	Community	10.85909	76.88049

15	Tea Shop	Yes	Individual	10.85909	76.88049
16	Tea Shop	Yes	Individual	10.8614	76.87143
17	Religious - Temple	Yes	Individual	10.8614	76.87143
18	Community Hall	Yes	Individual	10.86025	76.87596
19	Bus Waiting Spaces	Yes	Government	10.8588	76.86616
20	Religious - Temple	Yes	Community	10.84938	76.86808
21	Water Storage Tanks	Yes	Government	10.85909	76.88049
22	Other Retail Stores	Yes	Individual	10.84938	76.86808

5. Discussion and Findings

The assets marked in the village are the biophysical resources that the respondents and their families access in a regular basis. The assets in this study deals only with two types- natural resources and physical resource. The natural resources found in the study area (seventh ward of Pichanur Panchayath) include cultivated lands, open fields and waterbodies. The physical institutions and structures, mapped with digital tool, commonly found and support the life of people in the community include temple, water storage tanks, public taps, toilets and community hall. Etc.

All assets depicted on the chart paper were not mapped with the digital tool. The asset mapping in the conventional method relied heavily on the memory of the respondents during the activity as they discuss each other about their location before come to a consensus. Differenceof opinion was also seen among them during the conventional mapping, related to the boundary defined for the seventh ward and the location of the assets in it. It took few minutes along for them to memorize and understand all the things. They drew the map on the chart paper and took nearly one and half hours to complete it for mapping all important places and the most depended resources in the community. The time they have spent for the activity reflects the deliberation involved in the process of drawing the area.The chart paper drawn not only depicts the assets in the area, instead it concentrates and portrays the entire area of the seventh ward.

A 24 year old respondent temporarilyworking in the postoffice says,

'Iwas able to recognize the assets in the village after the asset mapping, especially the walk over activity. It was a reflective process as I understood the available and the absent assets in the village.I thought that there was only Community hall and temple in the street, but after the mapping Ibegan to think that the seventh ward has many number a public taps and lights. I was also able to learn the present status of the asset after this mapping activity.One thing that I would like to suggest is that the assets map should be done at the household level rather than at the community level so as to have a better understanding of what each household possess and lacks. This helps to reduce the dependency on usual household surveys.'

The walkover with the tool was a new experience andthey mapped and marked the assets without any delay or trouble. The walkover activity enabled a direct appraisal of assets and encourage discussion regarding that particular asset in the location of the asset itself. The assets that were unidentified in the sketch mapping or the conventional method were identified in the walkover activity. This was evident from the words of a 24 year old painter, educated only up to matriculation level.

'It was very easy to operate the applicationand the tablet and had an experience similar to that of using a smartphone. The assets unidentified on the chart paper were able to identify and map on the application as walking all over the village enabled an opportunity for a direct appraisal and promote the deliberation of the asset, its functional status and ownership. For example, the asset called 'bus waiting spaces' were unidentified on the chart paper. But during the walkover, we were *able to map it on the tool without any added assistance or guidance. Moreover there was no difficulty in using the application and mapping of the assets can be done by anyone who can operate a smartphone.*

The asset mapping in Nandhikovil was done for the first time in the village other than government surveys. A 25 year old electrician says

'The mapping was actually a first time experience for me as such activities are usually done at higher level. Mapping on a chart paper can be done at a particular place while using the tablet we need to walk all over the village to map the assets to give a different experience….The mapping activity provided a platform for me to appraise the shop of Mallika and I understood the concept of asset and got the ability to distinguish it on the basis of the functional status, ownership…..There was no difficulty in using the tablet as everything was easy for me because I have an android phone and this was familiar to me…..'

The respondents also had some viewpoints about the application in which it can be improved. They were of the opinion that local language in the *application* would make it a user friendly method than the conventional mapping. This was evident from the words of a 27 year old man, working as a physiotherapist in a nearby town

'The mapping on chart paper is nice as it can be done on a particular place itself instead of walking all over the village. It is easy and interesting for me to draw on a chart paper……'

These responses were collected during the semi structured interview conducted after the digitized mapping to understand the feedback of the respondents. Thus the second research question of the study is answered through the semi structured interviews.

Answering to the first research *question* of the study, the asset mapping in Nandhikovil through the conventional and digitized method can be can be distinguished based on these following factors. The table describes the observations that were drawn during the two mapping exercises.

Factors observed	Conventional Mapping	Digitized Mapping
Materials Required	Chart Paper Drawing materials	Android mobile phone or tablet Asset mapping Application Internet connectivity
Nature	Pictorial Representation	Digital Representation
Based On	Subjective knowledge and experience	Village walkover
Scope of Appraisal	No scope of direct appraisal in one activity Gives only a general picture of the area and its surroundings	Direct appraisal can be done along with mapping Scrutinization and categorization is possible through direct appraisal
Time Taken	One and half hours	Two Hours
Applicability	Literates and Illiterates	Only among functional literates
Traceability	Exact Location of the asset cannot be traceable	Exact location of the asset van be traceable through GPS coordinates
Frequency	Can be done in a single session	Requires multiple sessions if the area of mapping is very large
Flexibility	Can map anything on chart	Map those assets programmed in the master list of the interface.
Scope Of Discussion	Discussion on location of asset alone can only be conducted while during the sketch mapping	Discussion on the current status, ownership and its additional features of asset can be done

Procedure	Sketch Mapping of an entire area can be done within a particular place	Walkover is required to map the exact location of assets
Data	Static- The information can only be shared at a particular place and time	Dynamic- Foster the sharing of data irrespective of differences in physical space among respondents
Pre requisites	Memory of the respondents	Functional literacy
Area of study	Independent of the area of study	Heavily dependent on the area of the study as the walkover activity with the rural people can only be practical and convenient to do within a smaller area like a ward or a street
Challenges	Dependent on memory only Doubts may arise during mapping Distractions are there, but low in nature	Attitude of the respondent is very important Convenience is also a major problem Susceptible to lot of distractions while doing the walk over activity
Merits	Convenient Generates blue print of the area	Map exact location of the assets Enables direct appraisal Generates Birds eye view of the area

The digital tool can be an effective alternative to the conventional mapping if the challenges are addressed with due recognition. Moreover the area of the study is also one of the major concern as the walkover activity of a small region can only be done quite easily in a single session. If assets are distributed over larger areas then the area of the study have to be defined with at most importance and in such cases walkover activity can only be completed by doing it in multiple sessions. It may even take many days to complete the mapping when the convenience and the availability of the respondents are also taken into consideration as the study is purely participatory in nature. Another factor or problem that is very much essential and important for the study is attitude or the enthusiasm of the respondents. If the *respondents* are lethargic in nature and are unable to map all assets then the digital mapping tool is worthless, no matter how well it is programmed or configured in a user friendly way. In that perspective the respondents should be selected purposively after ensuring that they have the capability to do it and can spearhead the walkover activity. That is why the functional literacy becomes an essential and indispensable factor in this research. Distractions are also a major hurdle that needs to be overcome in the data collection as the respondents while doing the walkover will definitely have chances to interact with their near and dear ones, who are excluded in the study. In such cases, the entire group have to wait for them till they become convenient to rejoin and resume the walkover activity. This happened in Nandhikovil as two of the respondents in the meanwhile came across their friends and spent some time with them while doing the walkover and the entire

team waited for them for more than half an hour to resume the activity.If all these contingencies are addressed them the walkover activity during the digitized mapping can be done in an effective and meaningful way to become an alternative to the conventional mapping

The mapping with the digital tool enables to map the assets and its exact location with the GPS coordinates configured in it. It also renders the opportunity to simultaneously map and appraise the assets during the walkover unlike two separate activities required in the Participatory Rural Appraisal-Resource mapping and Transect Walk. With the help of digital tool, these two separate activities can be combined and integrated into one walkover exercise for mapping the assets in the community precisely and accurately. This tool may be used as an alternative to the conventional participatory mapping exercise without losing the spirit of participatory approach, an *essential* component required in all rural appraisal activities. Most of the features marked in the chart paper covered almost all important locations of the seventh ward along with the unimportant ones. The walkover activity with the help of android application, enabled scrutinisation of *assets* to create an asset list that is most crucial for the community to live in their habitat, unlike the overall geographical area provided by the conventional asset mapping method.

The third research objective was the comparison of the participatory asset mapping and non-participatory asset mapping. This was done at the last stage of the study to cross-check the assets generated in two maps. The respondents of the study were also a part of this discussion. The assets mapped were similar in nature except some differences in the ownership and functional status. The asset 'Temple' mapped at the initial stage, was described as a community owned entity, but marked it as the property of an individual by the respondents. Similarly,the forest in the area was mapped in the non-participatory mapping but was left unmapped in the villager's app mapping as they did not consider it as an asset. The cultivated lands are mapped at different locations in the non-participatory asset mapping, while in the respondents' asset mapping it was mapped only once. This cross checking of the assets were done only as part of clarification of the details regarding the assets and its attributes.

6. Conclusion

Participatory mapping enables to collect baseline information of a community, especially the resources or assets which people consider as important to their well-being. Participatory mapping whether digital or conventional emphasis the importance of the people's participation rather than the judgment of the researcher or the facilitator. It is this participation that needs to be nurtured to ensure an effective community development program for the people to address

their problems and issues. Thus to collect data without losing participation of the people is very crucial and the android application used in the studywas developed to accomplish this task in an easier and effective way. The tool though digital in nature hasn't been something new for the layman to understand their community and appraise the assets it possess. Moreover, the area of the study is limited only to a ward in a panchayath to scope down the intricacies associated with the walking all over a large area. The convenience of the respondents was a bottleneck as they were intercepted with some distractions like phone calls, interactions with relatives or friends during the asset mapping while walking along the area of study. However, this pilot study attempts only to substitute the conventional mapping methods with the digital tool, so as to explore new methods and tools for asset mapping and for PRA in general.

References

[1] Kretzmann, J., & McKnight, J. P. (1996). Assets-based community development. National Civic Review, 85(4), 23-29.

[2] Sharpe, P. A., Greaney, M. L., Lee, P. R., & Royce, S. W. (2000). Assets-oriented community assessment. Public Health Reports, 115(2-3), 205.

[3] Elwood, S., Goodchild, M. F., & Sui, D. Z. (2012). Researching volunteered geographic information: Spatial data, geographic research, and new social practice. Annals of the association of American geographers, 102(3), 571-590.

[4] Goodchild, M. F. (2007). in the World of Web 2.0. International Journal, 2(2), 27-29.

[5] Tulloch, D. L. (2008). Is VGI participation? From vernal pools to video games. GeoJournal, 72(3-4), 161-171.

[6] Kramer, S., Amos, T., Lazarus, S., & Seedat, M. (2012). The philosophical assumptions, utility and challenges of asset mapping approaches to community engagement. Journal of Psychology in Africa, 22(4), 537-544.

[7] Chambers, R. (1994). Participatory rural appraisal (PRA): Analysis of experience. World development, 22(9), 1253-1268.

[8] Woelk, G. B. (1992). Cultural and structural influences in the creation of and participation in community health programmes. Social Science & Medicine, 35(4), 419-424.

[9] Hung, K. C., Kalantari, M., & Rajabifard, A. (2016). Methods for assessing the credibility of volunteered geographic information in flood response: A case study in Brisbane, Australia. Applied Geography, 68, 37-47.

[10] Capineri, C. R. I. S. T. I. N. A., & Rondinone, A. (2011). Geografie (in) volontarie. Rivista geografica italiana, 118(3), 555-573.

[11] Cornwall, A. (1992). Body mapping in health RRA/PRA. RRA Notes, 16, 69-76.

[12] Biggs, S. D. (1989). Resource-poor farmer participation in research: A synthesis of experiences from nine national agricultural research systems (No. F/630.711 O3/3).

[13] Manderson, L., & Aaby, P. (1992). Can rapid anthropological procedures be applied to tropical diseases?.Health policy and planning, 7(1), 46-55.

[14] Gould, P., & White, R. (1974). Mental maps (Harmondsworth). England, and New York: Penguin.

[15] Macaulay, A. C., Commanda, L. E., Freeman, W. L., Gibson, N., McCabe, M. L., Robbins, C. M., & Twohig, P. L. (1999). Participatory research maximises community and lay involvement. Bmj, 319(7212), 774-778.

[16] Tumwine, J. K. (1989). Community participation as myth or reality: A personal experience from Zimbabwe. Health Policy and Planning, 4(2), 157-161.

[17] Antoniou, V. (2018). A Chimera of VGI, Citizen Science and Mobile Devices. In Mobile Information Systems Leveraging Volunteered Geographic Information for Earth Observation (pp. 133-149). Springer, Cham.

[18] Goldman, K. D., & Schmalz, K. J. (2005). “Accentuate the positive!” using an asset-mapping tool as part of a community-health needs assessment. Health promotion practice, 6(2), 125-128.

[19] Goodchild, M. F. (2007). Citizens as sensors: the world of volunteered geography. GeoJournal, 69(4), 211-221.

[20] Kongeseri, S., Sheshadri, S., Coley, C., Muir, A., & Bhavani, R. R. (2018). Games for Community Development and Problem

Solving: A Multi-Site Case Study. Advanced Science Letters, 24(4), 2358-2361.

Annexure

Name ofOpen source maps	Category	Software Type	SupportingPlatforms
Google Maps	Travel and location	Free	Android,web,I -phone
Google earth	Travel and location	Free Personal	MacOSX, Windows,Linux, Android, I phone
Waze	Social and Communications Travel and Locations	Free	Web, Android, I Phone Blackberry, Windows, Phone Kindle Fire
Here we GO	Travel and location	Free	Web, Android, iPhone, Android Tablet iPad, Firefox OS
2GIS	Travel and location	Free	Windows,, Web Android, iPhone, Blackberry, Android Tablet, iPad, Kindle Fire
Apple Maps	Travel and location	Free	Mac, iPhone, iPad, Apple
Bing Maps	Travel and location	Free	Web
Tranformap	Travel and location	Free OpenSource	
Rmap	Travel and location	Free OpenSource	Android
wikimapia	Education and Reference Travel and Location	Free	Web
Gmap.net	Travel and location	Free	Windows, Windows Mobile
Modestmaps	Development Travel and Location	Free OpenSource	Mac, Windows, Linux
Map quest	Online services Travel and location	Freemium	Web, Android, iPhone, Windows Phone, Kindle Fire
Uebermaps	Social and communications Travel and Locations	Free OpenSource	Mac, Windows, Linux, Web Android, iPhone, Android Tablet, Windows Phone iPad
Eye maps	Travel and location	Commercial	Android, iPhone, Android Tablet, iPad

KeplerJs	Travel and location Social and Communications	Free OpenSource	Web
Maverick	Travel and location Sport and Health	Freemium	Android
Pixel Map Generator	Travel and location	Free	Web
Wikiroutes	Travel and location Education and Reference	Free	Web, Android,I Phone
Mapline	Travel and location	Freemium	Mac, Windows, Web
Emerillon	Travel and location	Free OpenSource	Linux
Refuge restrooms	Travel and location Education and Reference	Free OpenSource	Web, Android, I Phone, Ipad
Tagzania	Travel and location	Free	Web
SAS.Planet	Travel and location	Free OpenSource	Windows
Gabbermap	Travel and location Social and Communications	Free	I phone
UMP-pcPL	Travel and location	Free	Web
Whattswhere	Travel and location Online Services	Free	Web
Earth view from Google earth	Education and Reference	Free	Windows,Chrome
Google Maps Go	Travel and location	Free	Android
Map pad	Travel and location	Free	I phone, I pad
Map Sphere	Travel and location	Free	Windows
Viamichelin	Travel and location	Free	Web
Where To Travel Next	Travel and location Online services	Free	Web