

# Participatory mapping in poverty reduction.

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**Abstract.** *The "Participatory Method" has recently found many applications in social development. Participatory Mapping is one of the components of this method. Some of the research results in this area have been published (See [2][3]). However, these results were achieved in the field of "Natural resources management" or "Environmental management". The project "Localized Poverty Reduction In Vietnam", which has been carried out by two Canadian universities and five Vietnamese universities as well the NCSH is intended to strengthen the Participatory Method and increase its effectiveness. During the past three years of research and practice in some communes in Vietnam, all members of the project have noticed the importance of drafting a community map for project planning and to increase community capacity. This paper aims to introduce some activities and to explain how they must be carried out in practice.*

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## **1. Introduction**

Vietnam is a developing country, and one of the poorest countries in the World. Therefore, poverty reduction is a major national objective. Over just a few years, Vietnam has achieved a lot in this area: according to official figures, in 1992 the poverty rate was 58% and by 1998 it had fallen to 37%)[See 1]. However, despite these achievements the percentage of poor people remains relatively high (In 2001 the total number of poverty households was 2.8 million) (see [1]). In practice, a lot of projects have already been implemented, but many of them have been unsuccessful.

There are many reasons for failures, and one of them is unsuitability. On paper, a project seems adequate, but in practice, it is not suitable for the beneficiaries and they do not support its implementation. Even if a project has been implemented, it does not bring as much benefit to the poor people as has been planned.

In this situation the so-called **Participatory Method** (PM) of project planning appears appropriate. This method is based on a new approach. According to PM, all the people in relation with the project must have a voice in planning and implementing the said project. In practice poor people usually have a low level of education, many of them even are illiterate. It is clear that if you want people to be more active in the discussion and their voices to be more effective you must raise their knowledge about themselves and society. This is the base to increase their capacities in planning and building projects. There are many methods to increase poor people's capacity: amid them, Participatory Mapping is a good one.

## **2. Participatory Mapping as part of Participatory Action in building and planning capacities.**

It is difficult to give a strict definition of Participatory Action, because this concept is relatively new and belongs to the social sciences. However, we can generally understand it as an involvement of members of the local community in all the steps of a project. In order to effectively participate, the community members must know a lot of things about themselves. For example, they must know where they live, what are the natural conditions etc. Only in that case, the opinions of community members are really suitable, effective and correct. A good way to increase knowledge of community members is Participatory Mapping. This means that the community members themselves, with help from outsider experts, make a map of their commune. The result is called Participatory Map or Community Map.

This type of map has more advantages than official government maps because the local people make it. The advantages of Participatory map are:

- It reflects correctly the current situation of the commune.
- It contains more details than official maps.

These sites are usually markets, the community's official buildings, the place in the river where villagers usually take water or the place where they usually hold meetings, etc.

- When a suitable map is available, the village community can use it for analysis and to decisions making. For example, using a map, community members can:
  - a) Present* the natural geographical location and social conditions of the commune.
  - b) Help analyse* the relations between poverty, geographical location and natural conditions

Following a) and b), community members can tentatively identify some causes for poverty and draft some plans for poverty reduction. For example:

- The weakness of an irrigation infra-structure may be due to adverse geographical location.
- The houses of some members of the community may not be suitably located for the development of the commune.

We must make sure that the mapping process and its use are worked out with the participation of the local people across the planning and implementation of the project so that the combination of Participatory maps and technique of GIS becomes a comprehensive process (See [3]). Even the digitization of a map has to be done with the help of members of the community. Before the appearance of Participatory method, the usual way of making maps was to use government's maps and digitized them, then impose the result on the commune to use it. We used to see that digitization was the job of some experts and we made GIS become one of the goals of a project. Consequently, very few communities understand what GIS is and what application GIS can produce, and the map become meaningless.

Through this paper, we want everybody to have a correct understanding of GIS. More specifically: the process of mapping must not be seen as solely a technological one; it must be based on Participatory Action, as the map is part of the commune profile but not the goal. Until now, we often made the mistake of considering the map as the final goal in the project. Most often, the mapping process

was done without the inputs of the local community, and the map did not contain important and essential information on the commune. Therefore, its use had little effectiveness. We only used the map to locate some objects that we had found. Now we must change our method of thinking and our method of work on mapping. We have to make mapping become a activity that will improve the learning process and increase the knowledge of everyone in the commune. The map must contain the materials from which we can get the information necessary for all phases of the project. This information cannot (or can hardly) be obtained or efficiently analysed without a GIS. In that situation the GIS is essential. In the LPRV project's 4<sup>th</sup> National Workshop held in Hoi An in December 2001, Mr. Marc Miller already talked about the concepts of 'Low tech' and 'High Tech' to indicate the two types of tools that can be used in the mapping process. Here, by 'High Tech', we mean the use of computers and software for digitization and integration of two maps as it is done at the 'University level'. But although it is at the 'University level' it also has to be done with the communities. The mission of the GIS experts is not only to introduce the advantages of GIS on collection and analysis of data but also to show how to use it to enrich Participatory Mapping. That way, the capabilities of local communities are also increased (see 4).

From experiences over the past three years and the knowledge that I have gathered from various documents, I think one of the first Participatory Actions in community profiling must be a Participatory Mapping operation, and that GIS should be used across the whole process of planning the project. By making a map the local Participants will not only increase their knowledge, but also put down some of their desires or demands onto the map.

While drawing a map, the communities must think about what they must draw and, of course, they will draw the things that seem important to them. During the mapping process, there might be some disagreements and controversy. However, these are not harmful. The people have to tackle them before they draw some conclusions. Through disagreements, the communities can understand many things: those may sometimes be seen as difficulties but may also be interpreted as

opportunities. Those should be the main parts of the future project. Over a 3-year period, not a single CPR (as far I know) produced a sustainable and global commune project aimed at poverty reduction (Hoi an workshop, 12/2001). We only made subprojects on one or two aspects of commune problems. In that context, a map did not seem very important for the planning of a subproject. But if we want to make a real commune project, a map should be used. It must be a part of commune profile. It is difficult to make any general decision without a good map. Furthermore, a map is a good visual tool for the communities. When people have a low level of education, the visual tool has more advantages than other tool.

We usually think that a map only contains quantitative information, that it cannot include qualitative ones. Of course, to put qualitative information into a map is difficult. However, it does not mean that a map cannot contain any qualitative information. We can tackle this problem by attaching the attributes to the object in the map or we can attach a sound file (.wav) containing the qualitative information about the object. It is, somehow, more complex but it can be done.

In essence, we must make mapping become Participatory Mapping and GIS become Participatory GIS. Only in this case can we reach our goals.

### **3. Main steps of Participatory Mapping**

As we already said, Participatory Mapping should be present during the whole process. In order to understand and implement PM more easily, we divided it into three phases. These are the **preparatory phase**, the **diagnosis phase** and the **implementation phase**. Every phase will produce various outputs. We will now discuss them in detail.

#### **A) Preparatory phase.**

This first phase will consist of the following topics: an introduction to GIS, the creation of a steering committee and the establishment of the relationship between the people (beneficiaries) and the representatives from the organizations involved in the project. These usually are the CPR (Centre for Poverty Reduction), the district government and some provincial offices. The main activities at this phase are:

- *Introducing the different characteristics of GIS to all involved in the PM process -*  
This is an important activity so it must be accomplished first. It is clear that if the participants do not know about the advantages of such an endeavour, they will only reluctantly take part. In Vietnam, not only do most communities do not know about GIS, but some official departments working in land use and management are also unaware of the specifics of GIS. One or more CPR members will have the task of clarifying this. As this is an introduction to the basics of GIS, every person interested is encouraged to take part. Of course, the leader and some important persons in the commune must attend, as they will be members of the steering team and afterward the members of the working team.
- *Creating the steering committee.* This step must follow the introduction to GIS. The Steering committee consists mainly of some commune leaders and community members who are familiar with the commune's geographical features and the cultural customs. Members will also include representatives of the CPR and some government officials. This is only the initial group; the number of members might reach 10 to 15. This number may change in the diagnosis phase.
- Determine whether there is any existing map in the commune or in an office at the district level which of may be suitable for the work at hand. If there is such a map or some draft land use plan available in the commune then this will greatly facilitate the implementation part of the process because this map (or draft) can be used as an initial map.
- The official government map must be used if it exists and is of better quality. It will be particularly advantageous if there is a map available at a large enough scale. This is important because, during the mapping process, the participants have to make some adjustments on the map so it can be integrated with the government's map afterward. We are referring here to the government's map available at the provincial scale.

**B) Diagnosis phase.**

When all the activities of the first phase are completed, the participants can move on to the **Diagnosis** phase. This is a very important one, because during this phase the participants must identify the objects and information needed for drawing the map. The main activities during this phase are as follows.

- *Determining the objects and information needed for the Map*

This step is natural. It is clear that if the participants want to prepare a map they must determine what has to be drawn or, put differently, what information has to be entered onto the map. The necessary information can be divided into two groups. The first is made of all the pertinent geographical objects. These are the roads, rivers, hospitals, important and official buildings, administrative boundaries, etc... The second consists of thematic attributes usually associated with the first: population of the area, length of a bridge or height of a mountain... This information is essential for the analysis and the decision-making so the facilitators must be aware of the importance of gathering reliable data at this stage. The participants must try their best to reduce the redundant information and increase the essential ones. The good collection of information not only facilitates the implementation phase but also reduces the time needed for drawing the map. Here some thematic objects might be not foreseen, but they can be added afterwards because there will be a field survey activity.

A field survey of the commune is helpful to gain familiarity with the culture of the commune and the features of its environment. Such a survey will be the opportunity to introduce and explain community mapping and the activities that will be undertaken and to establish rapport and trust between the members of the steering committee. During the visit, the following activities are important (see [3]):

- Visit cultural landmarks like burial grounds, ritual areas, and traditional meeting place.
- Identify selected geographical locations such as mountain peaks, ridges, river and stream junctions that structure or delimit the commune and its surroundings.
- Visit areas of different land use practices and vegetation types, and important resource sites such as water source and crop drying area.

- Identify boundaries and related features.
- Identify possible area of conflict with neighbouring communities.
- If a geographical object is important and seems likely to be difficult to draw then a photograph must be taken. For example: a river section, a section of track or road.

At this phase, the participants must start to think about the colour and the symbols to be used for representing the different features on the map. Of course, it is impossible to enumerate all types of objects immediately, but the participants can initially make a draft list of the main groups, afterward they can gradually add other types, symbols and colours as needed.

- ***Putting together a working team***

After preparing the information, the participants must organize a working team. Usually the core members of the working team are the members of the steering committee. They must decide how many additional members are needed. The number of members will depend on the quantity of information being used. If it is large, the steering committee ought to recruit a larger team. In any case, the steering committee must carefully consider each member of the working team and if he (or she) is qualified for certain purposes. It must also make sure that the working team is strong enough to deal with the amount of information available. The steering committee might have to decide whether or not more than one team of members is enough? Anyway, the essential matter is the map and the amount of work needed to complete it.

- ***Determining the working place and the map production method.***

At this phase, the steering committee must determine a suitable site for the work to take place. This is usually the commune office. It is good choice if the office is open and everyone in the commune can go and see the work in progress. In such a place, not only the members of the teams are drawing the map but also other people in the commune can see the work being done and make their suggestions. Some arguing is likely to take place and solving it will bring a lot of knowledge to the community

members. The drafting method must be chosen. There are several possible methods: the use of a blackboard and chalk, a marker and transparent plastic sheets, a pen and paper or a combination of these methods. For example: if a suitable map of the commune is already available, the participants can use a transparent sheet to over the original map and copy the necessary information on this plastic overlay. After this, the steering committee must decide when to complete the mapping with the help of the new information collected

### **C) The implementation phase.**

This is a most important phase. The result of mapping activities seriously depends on the accomplishment of this phase, during which the role of leaders is very decisive. At this point, the members of the working team are already identified but only on paper. This is the first time all the members of the team are assembled. Some of them may not know each other so, upon arrival in the commune, the experts from the CPR must go directly to the commune leader for a courtesy call. They can then proceed to the chosen site for the Community Mapping activities. All commune participants may not have gathered before the arrival of CPR members, therefore, while waiting, the opportunity must be taken to make those already present feel at ease by initiating conversation. When everyone is gathered, the mapping activity can start. At this phase there are three main activities: **drawing the boundaries and the main features; making adjustments and drawing additional features.**

#### **Drawing boundaries and the main features.**

If there is a suitable map or draft land use plan in the commune (this question was already discussed above) then participants can use this map as an initial one. If there is not, the participants must use the official government's map (provincial level) to draw the commune boundary. Then, the team must draw the main features such as main roads, rivers etc... Because the locations of these objects are of crucial importance, some disputes will appear here and the resolution of them is an important part of the participation process. If some problems cannot be resolved by the whole team then a compromise must be reached; if not, the leader of the team will have the decisive voice, otherwise the participants will waste a lot of time.

## **Adjustments.**

Once the important objects have been drawn, the participants must compare their map with the government's map to make some final adjustments. If the borders of the two maps are different, then the CPR's experts cannot integrate them, and consequently the Participatory Map cannot be inserted into the government's map. Usually the government's map has a correct border because this border is in relation with neighbouring communes. These adjustments are delicate matter. For example, if the participants do not accept the border as represented on the government's map, they must explain their reasons. Here the opinion of participants has a priority. If the participants can give a good explanation then the Participatory Map is accepted. The participants also have to make adjustments for the main features in the map in that same way. After this they will have a completed product.

### **Drawing additional features.**

After the adjustments, the participants can divide the map into two or three sections, one for each working team. When all the sections are completed, they must be integrated into a single map. There may be some difficulties, but the participants can use plastic overlays to complete the work, not unlike the copy and paste operation on a computer. Some other operations must also be undertaken (See [1]):

- Let the community members step back and look at the map in its entirety.
- Ask them to carefully look at the map and try to see if there are any corrections that need to be done.
- Allow them to ask each other questions and clarify points.
- Facilitate a discussion on the meanings and important features of the map.
- Answer questions they may have regarding future activities.
- Before leaving, express your gratitude for their cooperation and hospitality.

**Note:** As this is a participatory exercise, there are having various options to choose from. So three additional things must be pointed out here:

The first is that participants have to choose (or draw) the border in compliance with the chosen scale. In this case, at the beginning of the activity, we have scaled

and oriented the map. But sometimes this option is not suitable for Participatory Mapping. The fact is that when the scaled map is chosen everything must be put down at a strict and exact position. This complicates the drawing and may not reflect the people's perception and therefore the map may contain less qualitative information.

The second is that participants can independently draw the features, as they perceive them. In this case the participants usually draw the more important objects first and then spread to four directions. People usually allow more space to features they are more familiar with or to places where they spend most of their time. In such a case, boundaries may be drawn at the end of the operation; of course, the result is then a non-scaled map but this map may inform more on the perception the people have of their community. This option is very useful for increasing the community's capacities but it takes more time to accomplish because the participants have to transfer this un-scaled map to the scaled map, and there are two maps thus for data analysis and planning.

The third is that all activities must be flexible, particularly during the implementation phase. For example: on the matter of information being drafted onto the map and the number of participants, it should be possible to divide the working team into two smaller ones so that each of these two teams covers every part of the commune. Each group will draw the features, as it understands them. Afterwards, the two groups will compare their results. While comparing results they can discuss and resolve the differences that might exist in order to produce the final map.

There may be a situation where the activities may not go on as planned; the facilitator does not have the right to force the participants to follow a different direction: he can only give them clues or suggestions. So the result greatly depends on the capability and the inventiveness of the participants as well as good steering from the CPR expert(s).

#### **4. Technical integration of Participatory Maps and Topographical Maps.**

The community mapping activity provides crucial information on the community's perception of the area. Because the local people make the community maps, the information included can be very detailed, and this is the value of such an exercise carried out by the people who know the area best. The people can use the maps they have made to make plans and draw up strategies for further development. These maps have to be reproduced in a size and format that can be easily used by the community.

But the use of these maps has some limitations. First, it is not possible to use GIS technology to extract additional information from the map, for example the length of a river, the surface area of a range. Second, the objects on the map may be represented following a wrong scale; this may mislead the planners about the real situation of the commune. That is why we must digitize the community map and integrate it with the government's one.

There are two ways to do this. The first is to use a digitizer. In this case, one must be available along with the right software. However, such a device is expensive and it is hardly affordable by many government offices, let alone by community offices. So we will not consider this alternative. The second way is using a bitmap technique known by many at our CPR. Nevertheless, it seems appropriate to elaborate on this here as this will help reduce the time spent on digitization and increase the quality of the final map. This includes the following activities:

**A) Preparing a bitmap picture.**

There are two methods of generating a bitmap picture. You can photograph the map or scan it. If you take a photograph, you will have one unique picture that you can then digitize. In this case the picture is usually not clear, many details may be lost and this makes it difficult for you and thus you have to return to the original map and draw the details that do not exist on the picture. However, if you make the bitmap picture by scanning, you will not have just one picture but several. In this case, it is a little difficult to determine the co-ordinates of the pictures, but if the coordinates are correctly determined, a clear picture is obtained and the digitization will not be a problem (of course it will require a lot of time). In such a picture, most of the details are present.

**B) Studying the community map.** When the bitmap pictures have been made you have to be familiar with the Participatory Map to understand not only the features represented on the Map but also the picture you have prepared.

- Before beginning the digitizing process, it is important to be familiar with the areas on the map and the symbols used. Determine the necessary symbols, the colours and the number of layers to be used. It is very important to determine these characteristics because the number of layers and the contents in every layer have a big influence on the final display of the map.
- Consider each layer and the objects belonging to it, i.e. determine the contents of every layer.
- Besides the layers, the style and width of the lines have to be chosen carefully because it will take a lot of time to change the characteristics of the objects once they have been drawn, particularly when there is a large number of them.
- Community members may not share some technical concepts regarding the objects size, shape, or direction. It is therefore necessary to understand how they perceive these and how they are depicted on the community map.
- Feature symbols should also be carefully studied as these may sometime relate to size, shape, or direction.

**C) Digitizing the bitmap pictures.** This activity is mainly the responsibility of the GIS expert in each CPR as he should already be familiar with this procedure. In this manner, we usefully apply knowledge gathered during past three years. Anyone can use these notes as references for his work. It is better to use scanned bitmap pictures for the reasons given earlier.

Using a bitmap pictures poses some difficulty in determining the coordinates because in every picture three points with correct coordinates must be selected. For example, if you have six pictures then you have to choose 18 points with 36 numbers representing the coordinates of those points. Of course, nobody can select the coordinates without some margin of error, but the smaller error will, of course, give the best results. If the errors are too important, the pictures will overlap each other,

the objects will not be at their correct locations, and eventually you might not be able to draw the objects or might draw them in invalid locations.

In order to solve this problem you should make a unique bitmap picture that represents the whole map by gathering all the parts together. You can do this by using some software that is usually used for image processing as Paint or Imaging in Windows. With that kind of software, you can use operations such as *cut*, *rotate*, *drag* or *drop*, etc. to create the picture needed. Once you have it, you only have to choose three points for the whole map. **(About projection )**

Once you have a bitmap picture of the whole map, you start digitizing it. When you open the bitmap picture the first time, Mapinfo requires you to register the picture. In order to register the picture you have to choose the right projection and at least three points in the picture. The projection cannot be chosen freely the choice depending on the projection of the government's map, into which you intend to integrate the Participatory Map. After choosing the projection, you continue to choose your control points. It is better if you choose points that are easily located in the picture. These points are usually situated along the border or correspond to other important features on the map such as official community buildings, major streams or a main road. When the points are chosen, you have to assign the right coordinates to each point. In this operation, you have to know the exact geographical coordinates of the points: this is done by using a government map or an official document (if there is no government map). Be careful with the coordinates because they will ultimately help to determine the surface areas of regions, the distance between two arbitrary objects or the length of some feature t. It is advisable to examine the distances between some objects after the bitmap picture is digitized. If these distances are not acceptable to the steering group, then you have to re-examine the chosen coordinates for any mistakes. When you are confident in your choice of the right points with the right coordinates, you can then proceed to draw the rest of the map. When you finish this activity, you will have a digital Participatory Map. From now on, when we say Participatory Map we will be referring to the digital version.

**D) Integration of the Participatory Map and the government's map.** We suppose here that you have a digital government map. If you do not, you can digitize one using the same technique used for the Participatory Map. This being done, you will have two options to integrate both maps into one final one. The first is to transfer all objects from Participatory Map on the government's map; this operation will change the contents of the government's map in the community area. The second is to compare the two maps and change those objects in Participatory Map (of course if it could be changed) so that you can perceive almost two identical maps. We prefer the second option because it is (Participatory Map) more suitable for commune use and, at the same time, it can refer to government's map whenever necessary. You can finish this process by carrying out the following instructions:

Print the government's map and the Participatory Map (same size).

Discuss with the steering groups the differences in the two maps and how to rectify them. There are many kinds of differences. For example: the same object (river or range ...) may have a different shape on each map or it (community office, medical point ..) may have different geographical coordinates. We are sure that there will be many differences, so you must resolve them gradually. At first, you must make sure that the reference points on the two maps have the same coordinates. Afterward you can discuss and change other objects by overlapping every layer of the Participatory Map over the government's map. You can do this using a computer.

After finishing the changes, you have to print the resulting map and present it to the commune. At this time, everybody can look at it and give its opinions and suggestions about the map. You must record all of the suggestions hereafter you can use them to edit the map during field verification.

Carry out the field verification to rectify the mistakes in the map. This is the last activity in this phase. You can complete it with the help of some people from the commune. Because the mistakes you want to rectify may be controversial, you have to be very confident in correcting them. Be aware that this is not the last activity of the Participatory Mapping Process. The map will be improved and updated during its use.

## **5. Participatory maps and decision making.**

After digitization and integration of the two maps, communities have their own map and they can use it for planning development strategy or project. However, the map usefulness depends on the user's capability. In itself, the Map is nothing, it is not a plan or project, it only gives communities an overview of the commune situation. The planners have to view, analyse and collect the necessary information. There is no general method for using Participatory Map for decision making. Each person, each CPR, each commune has to use map by its own method. As you know, the information conveyed by the map is only part of several components of the project and its role in each project is different. If you have a project on land use or natural resource management then the map will give you more essential information than when you have other type of projects. In short, using a map is very flexible. However, in order to facilitate its use, we will introduce some examples as well as some of our opinion.

**A) General overview.** At first you have to look all over the map, analyse it and try to determine the main reasons leading a commune to poverty. Of course, you can determine the reasons of poverty, difficulties and advantages communities may have, by analysing the data collected by field survey. However, you can overview the commune situation more completely and wholly if you use the Digital Participatory Map because beside numeric data, here you have also geographic ones. A combination of two types of data will help you determine the commune current situation more exactly. Geographic data not only give many clues about the difficulties brought by nature those are: adverse topography, rigorous weather and etc, but also give you some ideas, which are very beneficial for you in your following works. Here you can take two directions in researching and developing a project.

The first direction is when you already have a draft of a certain project. In this case, you have to determine the new ideas or clues the map can bring so that you can use them to improve your project. You have to determine if the map interprets all the data you need for the project if it does not you must update it.

The second is when you do not have any project yet. In this case, you have to combine numeric data (collected by field survey) with geographical data in the map and make possible derivative data. These data, combined with the initial, could offer you some characteristics of a project. In both direction you have to determine concrete requirements and then give these requirements to the persons, who have responsibility to work with map, they will update the map, analyse it and will give the results back to you. Further updating and analysing are the content of the following activity

**B) Updating Participatory Map.** After taking a general overview on the economical and social situation of the commune and finishing the draft of a certain project. It is sure that you will need some data not available on the map. Now you have to update the map's data . This data is usually numerical and the attributes of some geographical objects. As we already mentioned in chapter 2, participants could not put all the data when making the map, some data can be updated later because it is collected by field survey in the commune. It is the time for the participants to update the data. Moreover, the data is not various in types as before but have a relationship with the recommended project, therefore it is more suitable for the project and the amount is smaller. That data can easily added to the map. After updating you can get the data you need for further analysis of the project.

**C) Verifying the project.** You can make a draft project with or without using Participatory Map. However, after finishing the draft project you should use the Participatory Map to verify the correctness and effectiveness of your project. Determine once more the subjective and objective conditions that needed to be accomplish for the project, is there any unclear problem? How the picture of economy and social will be changed after finishing project? In addition, how these changes will be visible on the map. It is very useful to answer all these questions and it would be better if many participants take part in this activity. We strongly suggest you make two maps for the project, one showing the current situation of commune and the other the future situation after accomplishment of the project. It is clear that your project will be more persuasive if it has the two above said maps. Visual data are always

perceive more easily by everybody. A project, that has the maps along, will have not only consensus and supports of communities but also attention of investigators - the integral feature of a project.

## 6. **Participatory mapping in development's sustainability.**

In the evolution of society, the term '**development's sustainability**' had various meanings. For example, a government had a project of building a bridge, and this project finish people have a bridge and it bring many benefits to people. In this case, nobody talks about 'development's sustainability' because this project already accomplished. However, we also can say that this project has '**development's sustainability**' because the result of it continues to play an important role in the development of society. Therefore, at first, I want to clarify the meaning of the term '**development's sustainability**' in our paper. Here, the term 'development's sustainability' of a project means this project not only continues bring benefits to the people but is also self developing i.e. the Participatory Map continuously receives new objects, new data and finds its application in another project. This is an important characteristic of a Participatory Map. For this to take place, we suggest the following activities that have to be done after the project's completion.

- **Purchasing a computer:** It is clear that it is impossible to add the objects to the Participatory Map infinitely. However, if you want to develop the map you have to add new objects. Therefore, the commune has to buy a computer and printer. This problem was hard to solve some years ago but is not difficult now because the price of computer is going steadily down (you can now buy a computer and printer for 13 million VN dong). A computer is used not only for maintaining the Participatory Map but also for many other purposes in the commune. It will bring to the commune a new perspective on a job and stimulate the people in increasing their knowledge.
- **Training course:** As you know, our project is almost over (only one year remains) so GIS's experts from the CPRs may not able to come to the commune every time they needed. Therefore, someone in the commune must know how to use and develop the Participatory Map. This computer's officer can be trained

simultaneously with the process of Participatory Mapping or can be trained later in some colleges. However, I prefer simultaneous training. In this case, this officer will have to begin his training when the digitalizing process begins. He can look or even work with the GIS's experts from the CPR. This process, we usually call 'learning by doing'. Moreover, afterward he can continue training by himself under the GIS's expert's help to master a GIS technology.

- **Establishing relations with other departments:** Communities can develop their map and use it in for various purposes without any relation with other government's departments. However, there will be more benefits if the commune establishes good relations with other departments in the province or district. In Vietnam a cadastral department or MOLISA usually use maps in their work so the CPR should help the commune to establish relationship with those departments. This is a mutually beneficial situation. Many people can share their data and by that way improve the content of it. This is not an easy problem now and it requires a lot efforts from the CPRs and the communities.
- **Maintaining close linkage with CPR:** At the beginning, this linkage is very important because other relations have not yet been established. During this time, the requirements of the commune have to be answered as soon as possible. The quick answer not only accelerates the work but also stimulates the communities. Gradually this linkage weakens and the CPR will not have as big a role as it has before.

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