AMERICAN UNIVERSITY OF BEIRUT

DEFINING ENVIRONMENTAL AND CULTURAL LANDMARKS IN LEBANESE VILLAGES THROUGH AN INTEGRATED PUBLIC PARTICIPATION GIS METHOD

by
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AN ABSTRACT OF THE THESIS OF

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The complexity and changeability of both the landscape concept and the human valuation process make people's designation of various landscapes values not well understood. Previous landscape research has tended to concentrate on one physical landscape component, such as water, built areas or flora; and on one value such as landscape aesthetics. To date, no study has empirically surveyed and studied, at a regional or national scale, the relationship between the diverse landscape components with the perceived landscape values of people (Brown, 2006). We spatially overlapped aerial photographs and valued landscape components (represented by the icons and stories selected by the people) through a nationwide public participation GIS (PPGIS) process and by using the Open Green Map (OGM) system's set of international icons. We discuss the benefits and limitations of the method for stock taking of baseline information for landscape planning. We used matrix grading evaluations to identify significant sustainable management systems of communal lands and their spatial associations in relation to the mapped landscape components. This study validates the effectiveness of public participatory GIS (PPGIS) in relation to efficiency of data basing in a data poor context, community involvement in an ethnically diverse nation, and the related planning outcomes at the level of local municipalities and national ministries.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Many theories of place perception and place attachment highlight the influence of local communities on the mechanisms that shape landscape features. Humans attribute value to places based uniquely on experience (Tuan, 1977). The combination of spatially referenced mapped data with their respective recorded non-spatial indicators, in relation to place usage and landscape values, provides a measure of place and people connection (Brown and Raymond, 2007). Recognizing the impact of social dynamics on the physical landscape of a place, Brown (2005) stated that mapped landscape values link the social sense of place with geographical locations thus shaping land management and aiding in decision making. It is very important to know the values of landscapes for developing and implementing land management policy and for mitigating land resource conflicts. Community based mapping empowers individuals and groups of people by providing them with the knowledge and skills and frameworks they need to affect change in their own communities. Increasing the role of local people in managing their natural resources is often the most appropriate solution to increase economic and environmental benefits. Livelihood of marginalized communities is directly dependent on healthy ecosystems as there is a recognized link between poverty alleviation and the benefits that people derive from ecosystem services especially the delivery of water and food. Values, as defined by Brown as "preference-related concept" (Brown 1984), consist of a concept (wilderness), an object (timber), or an activity (recreation). The Millennium Development Goals (MDGs), define effective

development through the disaggregation of tangible and perceived spatial relationships, shaped by several characteristics including age, gender and income (CBD, 2010). The main objective of the study is to promote community based landscape planning by building a geo-referenced database that defines key environmental and cultural landmarks in Lebanese villages through participatory mapping**.** A participatory mapping protocol was developed based on various participatory mapping methodologies and principles and by incorporating the universal icons produced by Green Map System. Introduced in 1994, the Green Map System was launched as an open source mapping system providing a universal set of icons. Since then, 54 countries have used the Green Map icons to generate public maps at various scales (Green Map, 2008).

CHAPTER 2

LITERATURE REVIEW

2.1- Community based conservation of natural resources

Environmental sustainability is a condition of balance, resilience, and interconnectedness that allows human society to meet the resource and service needs of current and future generations by making decisions and taking action to preserve the capability of the natural world to sustain human life. Human well-being depends on an integrated strategy for managing land, water and living resources that ensures that these essential services, and the systems that support them, are correctly valued, protected and managed. Livelihood of marginalized communities is directly dependent on healthy ecosystems as there is a recognized link between poverty alleviation and the benefits that people derive from ecosystem services especially the delivery of water and food. Increasing the role of local people in managing their natural resources is often the most appropriate solution to increase economic and environmental benefits (CDB, 2010). Furthermore, with water becoming a limiting factor in the MENA region, an integrated approach is necessary to remedy the impact of drivers such as demographic and climatic changes that limit water and lead to conflicting demands and conflicts. To address these issues, initiatives in the public, private and civil society spheres have increased in search for innovative approaches towards global natural resource management that are crucial to humanity and the environment (Axelord et al., 2011 and M. Klare, 2008). Local policy making initiatives contribute significantly to the bottom-up dynamics of policy making as they help shape the complex

multilevel coordination to address global issues such as climate change and loss of natural resources. The importance of local action in the conservation of natural resources through participatory planning, knowledge management and capacity building is globally recognized and clearly stated as a goal of the Aichi Biodiversity Targets for the 2011-2020 outlined by the Convention on Biological Diversity including the sustainable management and utilization of natural resources and the process of economic and social progress for all (CDB, 2010).

2.2- Participatory mapping

To promote community engagement in decision-making processes concerning natural resource management, participatory mapping has emerged as a powerful tool that allows remote and marginalized communities to represent themselves spatially, bringing their local knowledge and perspectives to the attention of governmental authorities and decision-makers (Chapin et al., 2005; McCall, 2012; and Rambaldi, 2005). For this reason, participatory mapping has been shown to be an effective tool that is commonly used to create maps that represent land and resource use patterns, hazards, community values and perceptions, to gather information on traditional knowledge and practices, to collect data for assessments or monitoring, to present alternative scenarios, and to empower and educate stakeholders (Chapin et al., 2005). Although local communities have been creating diverse spatial representations and mapping for centuries (Chambers, 2006), historically, maps were produced and employed by those in power to control territories (McCall, 2012). Participatory mapping denotes a change in the application and usage of cartography which enables local communities to develop and utilize their own maps for various purposes including the protection of ancestral assets. Participatory mapping was initially facilitated by outsiders in the 1970's. Later, in the 1990's participatory mapping spread

independently with tribal and ethnic groups in Australia, New Zealand, Africa (Cameroon, Ghana, Kenya, South Africa, Tanzania and the Congo basin), Latin America (Belize, Bolivia, Brazil, Colombia, Ecuador, Guyana, Honduras, Nicaragua, Panama, Peru, Suriname and Venezuela) and Southeast Asia (Cambodia, China, India, Nepal, Thailand, and Vietnam) with the primary objective of documenting land claims (Chapin et al, 2005). Communities have also used the visual power of maps to plan a path towards a green and sustainable future (Wortman, 2002). The term "participatory" has been attached to a diversity of fields such as natural resource management, development conservation, social psychology, nutrition, monitoring and evaluation, agricultural extension and research, business management and others. Of all the visual methods including participatory modeling, seasonal diagramming, Venn diagramming, matrix scoring and others, sometimes referred to as Participatory Rural Appraisal (PRA) methods, participatory mapping has spread the most globally. The spread of participatory mapping more than other methods is due to its flexibility, adaptability and the relative ease of facilitation, the fun, fulfillment and pride which people derive from it, and its multiple uses by a diversity of stakeholders (Chambers, 2006). Participatory mapping has also greatly benefited from technological advancements, spread and accessibility of Geographic Information Systems (GIS) and Global Positioning systems (GPS). The two streams of GIS and Participatory Mapping (PM) have intermixed and evolved rapidly in theory and in practice, and led to the emergence of a new field of participatory GIS (Chambers, 2006).

2.3 – Participatory GIS

Public participation geographic information systems (PPGIS) was coined in 1996 at the meeting of the National Center for Geographic Information and Analysis (NCGIA) to reflect the integrated practice of GIS and mapping at local levels for the purpose of producing knowledge of place. Other terms referring to this integration of disciplines includes participatory GIS or "PGIS" used to describe participatory planning approaches in rural areas of developing countries, and Participatory Learning and Action (PLA) the result of a spontaneous merger of methods with geographic information technologies (Rambaldi et al., 2006; Webler et al., 2001). A key strength of the PPGIS methodology is that it can build and strengthen trust by increasing opportunities for collaboration in public lands management (Brown & Weber, 2011). Although GIS maps are important, the upgrade of the process of data collection, integration, and mapmaking using GIS and public participation GIS is essential to ensure integrity of the information and respect for the local sources of the knowledge content (Brown, 2005). For instance internet-based PPGIS methodology is complementary to workshop or public meeting-based mapping. The first internet-based participatory mapping application was designed by Researchers at the Canadian Forest Service and developed to collect data on the locations of forest landscape values across a 2.4 million hectare study area in the province of Alberta, Canada. Later in the United States, additional internet-based studies for national forest management were developed. With respect to data collection, however, studies show that despite technological advances, traditional mail-based PPGIS methods still need to be used in conjunction with internet based data collection to compensate for the low responses using the latter method (Brown and Reed, 2000)

2.4 - Green Map System

Green Map System was conceived by a New York based NGO established in 1995. Green Map System produced the first Green map using its own unique set of icons for spatially pinpointing sites in New York City and capturing the locations of a widespread range of environmental sites throughout the city including natural areas, green vendors, and environmental problems (Webler et al., 2001). The set of icons produced are simple and inclusive, providing holistic information for local communities and visitors alike. The globally designed icons provide means to pinpoint landmarks with respect to sustainable living, nature, culture and society (Green Map, 2008). Since 2009, OGM became an interactive social mapping and social networking website, which hosts an online community venue where actions, ideas, photographs and impacts about green sites worldwide are shared. The Open Green Maps are freely viewed by the public, while only registered Green Mapmaker are able to create an interactive Open Green Map. Green Map System is currently active globally in over 400 cities, towns and neighborhoods in 51 countries. Over 325 Open Green Maps have been published online. Each green map is a unique product reflecting an existing or a future site. "Green Maps give us a fresh perspective of our cities and towns. They simplify the pin pointing of eco-resources such as bike lanes, farmers markets and wildlife habitats, along with cultural sites that make our hometowns special" (Green Map, 2008).

2.5- The Nature Conservation Center at the American University of Beirut

The Nature Conservation Center at the American University of Beirut (AUB-NCC), includes faculty students and staff from various disciplines who work together with the common objective of conserving and sustainably using biodiversity. Three years into a nationwide forest tree planting project in public lands, AUB-NCC realized that most Lebanese villages did not follow an ecological planning strategy in which tree planting, biodiversity conservation and sustainable eco-tourism are contextualized within town plans, To address this shortcoming the center launched a participatory mapping project to promote decentralization of ecological planning by engaging village communities in an adaptive approach of participatory mapping which encourages local communities to document, assess, and sustainably manage their natural resources. This study is the first outcome of NCC participatory planning program.

CHAPTER 3

METHODOLOGY

3.1 – Strategy for methodology development:

Methodology development integrated several participatory approaches (Brown et al., 2002; Chambers, 2006; Reed, 2008; and Meffe et al., 2002) and focused on the village recruitment process, trust building through skilled facilitation, formation of village multi-stakeholder committees composed of members from the public and private sector, and on the production of community based maps highlighting the role of local landscape planning initiatives while taking into consideration the natural, sustainable and social dimensions of the village. The process included eight months of fieldwork in each of the years 2011 and 2012, which involved participatory mapping workshops and were followed by four month of in-house deskwork at AUB-NCC. The data was collected through several field activities in collaboration with local community members. These activities included informal meetings, local mapping sessions and site exploration trips. The process resulted in a collective expression of ecological assets, activities, and threats illustrated by various map icons on the village's aerial photograph. The mapping process was fine-tuned following an adaptive learning loop inferring a structured and iterative process which aims at improving the application of effective PPGIS prototypes (IFAD, 2010). The adaptive loop is a "learning by doing" approach consisting of three defined stages: First, the call for participation and the formation of village committees; second, capacity building for landscape planning through participatory mapping; and third, online database building. The methodology consisted of identifying and mobilizing local community members willing to

participate in the project, conducting mapping sessions and data base building. While recording all strengths and weakness of the overall process and outcome, methodology adjustments were made through a constant field response mechanism (Chambers, 1983).

3.2 – Village selection:

3.2.1- Call for participation

In the first year (2011) the project objectives, activities, and call for participation were described in a letter that was sent by fax to municipality unions through Lebanese Ministry of Interior and Municipalities. The same letter was sent to villages who had been collaborating with the Center on low cost reforestation and with whom trust had been established since 2007. During the second year (2012) the same letter was sent by the Lebanese Ministry of Interior and Municipalities. In addition, the letter was sent to municipalities who heard about the project by word of mouth. AUB-NCC was contacted by interested municipalities who had heard about the project through the Ministry and through word of mouth among municipalities and the AUB community.

3.2.2 - Recruitment: Initial municipal meeting

The recruitment process was started as soon as the AUB-NCC team was contacted by a municipality representative who expressed interest in participating in the project. Following the phone call, an initial visit is made to meet with the mayor and municipal board representatives to explain the project in detail and elaborate on the participation conditions and steps. The meeting was concluded with a verbal agreement that by the next meeting a village committee (composed

of 5 to 10 members) which observes gender balance and includes members from the municipality and from the civil society will be formed to discuss the project further and start the participatory mapping process. The formation of a village committee is important to ensure a broader participation and inclusion of marginalized groups such as women and lower income individuals. Women do not always have the chance to participate in decision making at the public level where their representation is minimal. They need opportunities to contribute to local decision making through public forums and planning committees. As per Meffe et al. (2002), suggestions for membership were proposed to include members from the educational sector (teachers & principals), the private sector (business owners and entrepreneurs), the civic community (scouts and social groups) and individuals interested in the process. Follow up was done with the mayor by phone regarding the formation of the committee and the date of the second meeting. Once the formation of the committee was confirmed the second visit was scheduled to meet with the newly formed village committee and present the project. Throughout the process mayors and municipal board representatives who are not necessarily part of the village committee are consulted and feedback is solicited regarding the clarity and perceived relevance of the project objectives, level of project buy in in the village, suitability of project material (aerial maps, icons, participatory mapping forms) distributed. In addition, inquiries were always made to determine whether participation in the project is aligned or in support of projects existing or planned by the municipality or the village community. This consultation was performed to ensure the transparency of the project and clarity of the process (Rambaldi et al., 2006 ; Meffe et al., 2002). Feedback contributed to constant revisions of the methodology to accommodate stated expectations and needs to better engage in the process.

3.3 – Multi-stakeholder committee

3.3.1 - Identifying Stakeholders and Committee formation

Multi-stakeholder participation improves the effectiveness of environmental decision-making by utilizing community generated holistic information. When adopting "participation as a process", the quality of the generated input is strongly dependent on the nature of the process (Reed, 2008). The methodology adopted to identify stakeholders was based on published literature which highlights the importance of identifying relevant stakeholder as the crucial preliminary phase in all stakeholder engagement processes (Brown et al., 2002; Chambers, 2002; Reed, 2008; Meffe, 2002). Keeping in mind that a community is not a homogenous entity, a non-bias familiarization with the local social and political structure was performed according to Webler (2001) and aided in securing a holistic representation of the community. As per Meffe et al. (2002), the familiarization was done through direct communication with the stakeholders. Different types of knowledge and input is generated by one community, therefore a lot of care was placed while identifying the stakeholders in pre-mapping phases and all along the mapping process (Rambaldi, 2006). The mayor of each interested village was first approached and asked to identify a main contact involved in environmental projects, the main contact was often the person who had called AUB-NCC and asked to participate in the BVA project. In all cases, it was mandatory that the mayor or the mayor representative was present in the first village committee meeting where a briefing of the project and its requirements were presented. The process of identifying stakeholders was amended by secondary sources of information such as photographs, maps, publications available at the municipality such as historic documents, documents recording communal consensus among families, external funding documents allocated to development projects, newspapers and others (IFAD, 2009). Moreover, desk

research to review secondary sources of information available on websites such as the Ministry of Environment's website, online newspaper archives, Lebanon Mountain Trail website, and other local development organizations active in rural Lebanon such as Mada. Gaps in the stakeholder representation were identified and discussed at later phases of the participatory process, once the facilitators have gained community trust and support (NOAA,2009). As recommended by Chambers (2006) and others, expanding the stakeholder committee by introducing up to three new members at any stage was of added value whether the views of the additional members are in line or are not with those of the preliminary committee.

3.3.2 - Committee representative

Maintaining a strong relationship with a main local host (Mayor or main contact who applied for participation) who was willing to introduce the project and the project team, and willing to follow up on the project alongside the non-local facilitators from AUB-NCC, offered several benefits such as providing important information on stakeholders dynamics, gaining community trust and contributed largely to ensuring the successful completion of the project (NOAA, 2009). In agreement with the mayor, the committee representatives (CR) took charge of follow up and ensured a broad participation of stakeholders, and initiating contact with often forgotten members of the community. All the meetings were scheduled to accommodate the members and they were always held in the municipality.

3.4 - Participatory mapping process

3.4.1 - Materials and tools

AUB-NCC chose to use basic and simple materials and tools during all village visits and workshops. The mapping techniques were designed to make the mapping process comfortable and efficient in order to ensure high quality of the generated information recorded on the green map using familiar tools. It was of high importance that the adopted methodology was catered for technical capacity and comfort level of local participants (NOA, 2009). The field work package included the following:

a. Stationary toolbox: Masking tape,10 color pencils, 4 led pencils, 6 Color markers, 4 blue pens,
b. Printed material included a selection of Green Map icons adapted to Lebanon and translated to Arabic (appendix), a participatory mapping manual which includes a data recording form, icons definitions, entry for committee members, and entry for demographic data. The participatory mapping manual was kept in the possession of the participating committees until the process is completed and ready for digitization.
c. Aerial photograph of the village printed on A. Satellite imagery for its availability, its understandable language and ease of interpretation by people from all backgrounds (NOA, 2009).
d. Butter paper sheets to overlay map
e. Printed examples of Green Maps (initially these consisted of international sample and then of examples produced by the project.)
f. Digital Cameras: Sony alpha I 14.0® and Canon PowerShot SX280 HS® for field visit to document major landmarks and to document the mapping sessions.

g. Cellular phone with GPS: iPhone 4S® mobile application purchased on Apple AppStore "MotionX™ GPS" to record GPS locations of main landmarks

The universal set of Green Map Icons was reviewed and 79 icons relevant to Lebanon were selected and translated into Arabic. Decision regarding the exclusion of icons included icons referring to technologies that are not yet utilized in Lebanon, icons that are not yet relevant to Lebanese culture such as responsible company and alternative vehicles, nuclear facilities and others that are non-existent in Lebanon. The GMI consists of 170 icons and 12 categories, arranged in the 3 genres of nature, sustainable living, and culture and society. Several participatory mapping sessions were organized in each village. The first mapping sessions were always the most challenging to facilitate, as they entailed further discussion of the project objectives and the elaboration of a group dynamic between committee members which is initially unclear. In cases where there were tensions within groups these would fade away when the energies around the mapping round table would converge towards the common interest of enhancing the village. Sometimes the mapping sessions would stimulate the generation of simple low cost projects which would benefit their village in the near future. The mapping process was based on easy cartography using aerial photographs and a step-by-step manual developed for this purpose and which was readily completed by committees. The "game" like process resulted in technical maps which consisted of spatially overlapped aerial photographs with icons and stories selected by the people. The resulting methodology is a combination of a public participation GIS (PPGIS) process and the Open Green Map (OGM) system's set of international icons. The combined methodology enabled the recording of demographical information, natural and cultural landmarks, green space per capita, land tenure

ratios, and forest cover percentages. First 20 minutes were informal and agenda free discussions, followed by a minimum of 60 minutes of agreed upon mapping session. Informal discussions and flexible scheduling were key elements of successfully build trust between non-local project facilitators and the local community. The mapping sessions were not time restricted, the sessions duration was planned by the committees depending on their availabilities. Allocating sufficient time to clarify the objectives of the project and to undertake all the required steps Sessions were divided and spread out through up to 5 workshops held at the municipality of each participating village. This measure was taken to reinforce the importance of shared governance between the civil society and local authority (Granberg & Elander, 2007). The numbers of sessions depended on each committee's work progress rate during the allocated workshop time set beforehand by the committees. The focus of each mapping sessions depended on the flow of the discussion at the beginning of the workshop whereby the different themes were discussed. Upon completion of the mapping process, participating villages received digital and hard copies of their Green Maps which consisted of aerial maps featuring ecological assets, activities, and threats crucial in sustainable land management.

- *Introduction of the project*

Transparency is a main constituent of working with stakeholders and participatory mapping (NOAA, 2009). The project team clearly explained and answered questions about the structure of the mapping process, generated data usability, the impact of local participants influence on the project outcomes, the nature of the outcome and the capabilities of the adopted materials and tools (NOAA, 2009). The first 10 minutes of all mapping workshops and follow up meetings were dedicated for a brief reminder of each point stated below:

1- Introducing clearly each facilitator, including their village of origin and their non-political academic affiliation with the American University of Beirut. This step is a very important step, which will break political and social barriers.

2- Introducing clearly AUB-NCC's mission and scope of work. Reminding the hosts that no direct financial incentive will come out of the process.

3-Overview of the BVA project's mission, objectives, steps, timeline and outcomes, in the first year sample maps produced by other countries and in the second year using the BVA 2011 map booklet which included project mission, project methodology and 18 green maps.

4-Encourage hosts to ask questions; provide feedback about the previous visit and propositions for the way forward.

Each village visit started with 10 minutes of informal and agenda free discussion, followed by a minimum of 60 minutes of the agreed upon mapping sessions. The adopted language of all project materials and all sessions was the local native language Arabic, chosen for its ease of use among participants and its potential of making the green maps available to the general public (IFAD, 2010). The project team used the green map Arabic icons set translated by AUB-NCC in all mapping sessions according to the respective themes listed here below:

- *Mapping session #1: Introduction, brainstorming and Village overview:*

Introduce the mapping methodology and the universal set of green icons, brainstorm for ideas that will be put on the green map during the following months, explore the village's aerial photograph used as the base map throughout the mapping sessions, revise basic cartography

basics, pinpoint main built landmarks and draw main roads, and record demographic and cadastral information.

- *Mapping session #2: Ecological opportunities & threats:*

Locate natural resources, pollution sources, and discuss local natural resource management systems.

- *Mapping session #3: Outdoor activities and eco-tourism opportunities:*

Map outdoor activities such as hiking trails, camping, and biking. Also, discuss potential of eco-tourism routes.

- *Mapping session #4: Traditional sustainable practices, Sustainable living and future priority projects:*

Record the traditional sustainable practices maintained by the local communities. Sustainable practices include rainfed agriculture, wild edible plant collection, rain water collection ponds and others.

- *Map making step #5: In-house digital map making*

AUB-NCC provided technical support to digitize collected information which included hand drawn village boundaries, main roads, definition of public lands, trails and icon locations. The purchased digital 2007 image maps were rendered in a usable format using computer AutoCAD®, Adobe® Photoshop®, and Adobe® Illustrator® computer applications. This included the overlaying of villages cadastral boundaries, which were further defined using GPS reference points recorded on site.

- *Map making step #6: Green map revision*

Upon completion of the digital green map, AUB-NCC visits the village committees and conducts a final mapping session using the printed Green Map. The village committees have the opportunities to relocate icons, add icons and edit the text legends.

3.5- Database building: PPGIS database

Our membership at the Green Map System grants access to the online platform Open Green Map system where village maps are uploaded individually. Using the Open Green Map System (www.opengreemap.org). We chose the online name of "Lebanon Green Maps" for all the uploaded village green maps which are titled in Arabic and English using the respective village names. The online mapping tool offered by the Open Green Map System was used online at AUB with computer literate committee members to increase the technical capacity of local communities and increase the likelihood of future editing efforts done by the committees independently (NOAA, 2009). The online uploading of the green maps on OGM enabled the extraction of the longitude and latitude coordinates of each site. The Green Map System assures mapmakers the security and the online availability of the data stored on the OGM. Following the steps found in the "Tutorial: Exporting Open Green Map Data as CSV and KML files to use in Spreadsheet and GIS Software", AUB-NCC exported the Green Map data from OGM in comma-separated values (CSV) file format (Refer to appendices 3 & 4 for spreadsheet samples), which serve as the main import files of data where each row contains site information for Geographical Information Systems (GIS) such as ArcGIS and other database management systems (Reese & Samoila, 2009).

CHAPTER 4

RESULTS

In 2011 and 2012, a total of 302 individuals from 35 municipalities formed local village committees and participated actively in the project (Refer to appendix 1 and 2 for list of 2011 and 2012 villages). The formed local committees rallied their respective constituencies to define and map village green assets and sustainable practices, identify three priority environmentally sound future objectives, and collaborate with the project team to complete their village Green Maps. The 79 icons were organized under three categories namely landscape and nature, eco-culture, eco-threat and opportunities. At total of 1183 sites was recorded. Landscape and nature landmarks featuring in the different villages are recorded in the table below:

Landscape and Nature	% villages indicating presence of landmark (n=35 villages)
Wildlife habitat	97
Scenic vista	94
Sunrise / sunset site	94
Star gazing site	94
Water feature	91
Special tree	91
Migration zone	89
Public forest / natural area	80
Drinking water source	77
Streetscaping	57
Water front / riverside park	43
Garden	43
geological feature	40

Table 4: Landscape and nature icons percentages per total villages

Waterfront and Riverside Park Include free beaches (6% of the villages) and accessible riverbanks (37% of the villages). Damour and Bebnine the only two coastal villages among the 35 participating villages identified their public beaches as safe swimming sites. Swimming pools are privately owned and managed, access to the pools is not free of charge. All participating villages have mapped their village's water springs. However, descriptive indicators should be used to categorize the state of water springs whether they have been dry for the past few years and whether they are healthy drinking sources. The committees selected mostly cliffs and caves as geological features (40% of the villages) of value to the communities, where historic events

and local myths often characterize the mapped features. 28 Forests and Woodlands were mapped in 80% of the villages. The Forest cover of each village was estimated from aerial photo interpretations and surface area approximations provided by the committees. The forest covers were categorized into less than 10%, 10-30%, 30-50% and more than 50% of the village's total surface area. 8% of villages have a forest cover less than 10%, 20% of villages have a forest cover of 10-30%, 52% of villages have a forest cover of 30-50%, and 20% of villages have a forest cover of more than 50%. 97% of the villages identified a native special tree that is of cultural or ecologically significance to the community. Oak tree species were predominant among the 34 mapped special trees. All participating villages have located the center of food gathering zones, where the locals traditionally and seasonally gather edible plants. The most recorded animal species are the squirrel, the wild boar, and hyenas; 91% of the villages have located wildlife habitats where animals are most likely to be viewed. Protected areas host the largest animal habitats; such as the Shouf Biosphere reserve which links the highlands of the villages of Barouk, Maaser El Shouf, Mrousty, and Niha. All participating villages have identified bird migration zones, and listed the known predominant species. 57% of the villages publically maintain a basic outdoor sport site designed for playing sports such as basketball, mini-soccer and volley ball and 43% of the villages maintain public gardens. There are 2 villages who have equipped their public garden with a kids playground structure. All participating villages have located pit stops along vehicular roads where one can enjoy scenic views and sunset views. The chosen views are mainly directed towards valleys, the village's skyline, the surrounding mountain chains, or to the sea. While star gazing sites found in all participating villages as well, were mapped in areas away from the built areas, where light pollution is absent and where unobstructed views of the night sky are possible.

Eco-threats/opportunities landmarks featuring in the different villages are recorded in the table below:

Eco-threats/opportunities	
Waste dumps	17%
Water pollution sources	86%
Recycling sites	17%
Waste water treatment plants	29%
Green roofs	30%
Solar Energy sites	1%

Table 5: Eco-threats/opportunities icons percentages per total villages

17% of villages have landfills and waste dumps. The people of Shanai and the municipality of Kousba, turned their village's landfill area into a public garden which they are currently planting with various forest trees, mainly Cedar trees. The Municipality of Miniara has transformed what used to be the largest garbage dump in the Aakar region into a public garden that is now the pride of the village, where the children meet and annually participated in tree planting. Water pollution sources are a major concern to communities knowing that there is a lack of sewage networks. 86% of the villages have mapped water pollutions sources of high concern to the local community. Municipal waste water treatment plants for sewage are found in 29% of the villages. Recycling sites for waste reprocessing or refilling were not recorded by the participating villages. On the other hand, it is more common to find reuse sites (17% of the villages) where metal, furniture, cars and appliances are collected for second-hand sale. All participating villages have traditional green roofs on at least 30% of their built areas. The traditional green roof system consists of a metallic trellis on which vines (*Vitis vinifera*) are grown for grape production and

shading. In the specific case of the village of Ourhaniyeh, a family of sculptures has built their own home and museum, where they have installed an extensive green roof system with a 20cm deep planted soil layer covering the entire roof. Also, composting is wide spread among farm animal owners and is not formalized in large scale operations such as factories. Solar Energy sites for water heating, cover less than 1% of the combined built areas of all participating villages. Solar panels are mostly found on the roof of public institutions such as NGOs or schools and are less commonly found on the roofs of private residencies (26% of the villages). Other sources of renewable energy, such as wind energy sites and water energy sites, were not reported by the participating villages. Also, there is no significant trend of water recycling within households nor in geothermal heating.

Eco-Cultural landmarks featuring in the different villages are recorded in the table below:

Eco-Cultural landmarks	
Birds and wildlife watching	83%
Hiking trails	14%
Kayaking sites	0%
Camping sites	80%
Snowshoeing	23%
Local Market	100%
Eco-Agriculture	83%
Bicycle sites	63%
Ecotourism Resources	31%
Archeological Sites	83%
Museums	6%
Green schools	3%
Pollution monitors	3%
Public WiFi Spots	3%
Public libraries	26%

Table 6: Eco-cultural landmarks icons percentages per 35 villages

All participating villages have identified bird watching sites, and listed the known predominant species. The beginning of hiking trails was pinpointed by all participating villages. Furthermore, 14% of the villages indicated the presence of managed hiking trailed with maps, signage and information. Hiking trails consist of agricultural dirt roads, footpaths in green spaces and along riverbanks. Kayaking sites are part of the future plans of the village of Hammana and are not available in any of the participating villages. 80% of the villages designated private or public areas set aside for sleeping outdoors, using tents that campers set up. All mapped camping sites lacked landscape planning, basic camping facilities and tent rental facilities. Winter activities and related equipment rental shops are widespread among the only 8 high elevation villages that receive significant snow cover (Barouk, Maaser El Shouf, Mrousty, Niha, Aakoura, Barka,

Bsharreh, Ehmej and Hrajel). The villages of Bsharreh and Ehmej have ski resorts on public lands (6% of the villages). Snowshoeing is facilitated by 23% of the villages, along natural reserve trails or at the proximity of ski resorts. All participating villages have local markets where a diversity of permanent or temporary shops which sell locally grown produce, craft items, "Mouneh" (jams, pickles, Arak,…) and directly support small scale farming and local livelihoods. For example, the village of Hrajel remains a reliable source of meat and milk products produced following traditional animal herding and production. The goats graze on natural plants in the high altitudes of the village. Eco-Agriculture defines small-scale farming and rural farms that use sustainable methods such as agro-forestry, rain water collection or rain fed agriculture. In the village of Mishmish, local families utilize their communal lands to practice forest farming where rain fed cereals (lentils, chickpeas, wheat and barley). Through trial and error the people of Aarsal have successfully found a way to benefit from semi-arid highlands surrounding their village by planting more than a million cherry trees and the cherry harvest season has become an occasion for all generations of to come together. Currently the fragile agro-ecological assets are highly threatened and disrupted by the flux of Syrian refugees that have exceeded the number of local residents. Bike friendly streets with low vehicular circulation, agricultural dirt roads and hiking trails are often used as bicycle sites, 63% of the villages have mapped their bicycle sites. While designated bicycle paths along main vehicular roads and bicycle parking spaces do not exist. Significant examples of bicycle sites and bicycle path planning are found in the village of Niha El Shouf and in the village of Damour. The village of Niha is promoting mountain biking as an outdoor sport in the woodlands of the village where mountain paths and old village roads are being rehabilitated to accommodate for bikers. While at the planning level, the village of Damour, famous for its banana production along the coast is

planning to encourage biking between agricultural fields to allow tourists to enjoy the charming cool and shaded environment that banana plants create. 31% of the participating villages have Ecotourism Resources while all participating villages have a local tour guide, informally designated scenic view and star gazing sites. Archeological sites are locally recognized in 83% of the villages and are unprotected and underutilized. Very few villages have museums, 6% of the villages: Bsharreh's Gibran Khalil Gibran museum and Ourhaniyeh's Assaf sculpting museum. Green schools, schools with an environmental curriculum (3% of the villages: Ras El Maten), pollution monitors for the levels of pollutants present in the air (3% of the villages: Aarsal), Public WiFi Spots are very rare (3% of the villages) and public libraries (26% of the villages). Eco Club/Organization are wide spread and present in all villages. Also, volunteer sites are found in 83% of the villages and consist mainly of Red Cross and the civil defense organizations. Each participating villages identified an eco-expert who is willing to be part of the online database. The geo-referenced data was inputted in a simple and user friendly computer program, which enabled the translation of numeric data into simple spread sheets using Microsoft Excel. The entry fields included: village name, icon category, icon code number, latitude, longitude, activity name, activity description, contact person and contact person phone number (Refer to Table 5 for sample of data sheet used).

CHAPTER 5

DISCUSSION

Involving the key individuals and organizations in the mapping process contributed largely to the success of the process and the continuity of the project. The thorough understanding of stakeholders involved in development projects, community projects, landscape planning, and outdoor activities dictated the success of the process and the recorded data. Local governance mechanisms are centralized in the municipalities, who have significant resources at the financial, political, legal and constitutional level. Municipal and inter-municipal networks are venues of experience exchanges. Decentralization, ensures the participation of municipalities in planning processes and places them at the core of development projects (Granberg & Elander, 2007). Effectively contributing to the enhancement of the cooperation among municipalities, civil societies and the project team was emphasized throughout the project; and contributed to local capacity-building and ensuring the long-term sustainability of local agendas (NOAA, 2009). The years 2011 and 2012 constituted an important first phase whereby a methodology that enables communities to complete a mapping process that is conducive to large local participation and one that observes gender balance was successfully achieved. The developed methodology which consisted of participatory mapping coupled with the systematic ‘shopping list’ approach of the Green Map icons enabled the recording of a total of 1183 landmarks in 35 villages. The combined methodology increased significantly the efficiency of the local committees which no longer had to concentrate on thinking about ‘what are environmental and cultural assets’ but instead the focus of the committees was on ‘where are the environmental and cultural assets’.

The mapping sessions aimed at strengthening the capacity of municipalities to work together with their civil society constituency in landscape planning and data basing. At the end of every mapping session the understanding and appreciation of participants to their asset was expanded as they expanded their consultations for information collection, especially from the elderly, to complete the documentation, the process led to the generation of substantive information. The use of Green Map icons and the production of village Green Maps reconnected people with local natural and cultural attractions (Wortman, 2002). AUB-NCC is the only member of greenmaps.org in Lebanon and was the first in the Middle East region to engage in a process of selecting icons that are most suitable to Lebanon, amending others, and translating all the set into Arabic. The Arabic translation of icons was shared with greenmap.org and regional map makers in Egypt, UAE and Morocco. Communities around the world are stimulating ecotourism by using green maps. In Pinellas County, on Florida's Gulf Coast, the county's St. Petersburg-Clearwater Area Convention and Visitors Bureau developed a Web-based green map to draw tourists to its 37 miles of beach, parks, bird-watching sites and other natural attractions. According to Bureau director Carole Ketterhagen, green mapping was a natural fit for a county that has received many national awards for its environmental stewardship. Locals recognized the potential of green mapping to promote not only the county's beaches and natural areas, but also its vibrant museums and arts scene. Now the county is updating its green map to include natural food stores and restaurants and other environmentally friendly services. Similarly, Rhode island's green map, the first map prepared for a state, has become a vital part of its tourism program. Published by the state's multi-agency Greenways Council, the map guides visitors to trails, historic places and nature-oriented activities. Similar efforts to transform the data into an asset

for eco-tourism is being developed through the generation of eco-tourism maps (Wortman, 2002).

The building of a geo-referenced database by transforming traditional information into geo-referenced locations by relying on visual landmarks that local communities recognized in aerial maps. Maximum number of landmarks was ensured at the expense of accurate geo-referencing using GPS recordings in accessible sites. However, the strategy is very similar to PPGIS projects who provided participants with online digital maps where locations were already pinpointed and geo-referenced, except that in our case the digitization took place after locations were penciled in on printed maps. During the mapping process we did not restrict the methodology to a strict set of communication techniques as reported by Chambers (2006). Instead, our communication strategy relied on mixed techniques, that catered to communities preference including: hand delivered letters, handouts distribution, regular mail, they came to office, social media broadcasting chat group, internet OGM updating, fax, mobile phone messages, all the traditional methods of individual and focus group consultation, and field verification. The methodology took into consideration differences in access to technologies such as phone and internet, and customized the approach based on community preferences. This dynamic and community centered approach proved to be successful as it generated a 100% response rate.

The importance of adopting a methodology that is flexible and willing to adjust the project implementation process to ensure that the interactions with participating committees are positive and productive has been reported by NOAA (2009). Sustainable development projects including participatory mapping projects span over a considerably long period of time and can necessitate an untimely input from local participants (IFAD, 2010). The participants often

voluntarily participate in such projects on the account of their working hours, without any financial return. In agricultural communities busy times of the year are the sowing and harvesting seasons. The adopted approach was in line with PPGIS studies who advocate sensitive accommodation of the community's need (Chambers, 2006 & Meffe et al., 2002). The study established a participatory mapping protocol as a successful tool for collecting data for landscape planning and mobilizing local communities. The approach was very challenging for the facilitators, as it required conflict resolution skills, strong interpersonal skills and patience. Conforming to a variety of local habits and lifestyles made the process almost agenda free, but yet very focused. The facilitator has to believe that "They can do it" while allowing people time to work out for themselves how to do it (Chambers, 2006). From a survey perspective, the number of respondents was 100% as evidenced by regular attendances. Furthermore, the participatory mapping methodology defined the composition of the village committee, and set the frequency and nature of the workshops, in a way that enabled communities to complete a mapping process conducive to local participation, and by observant of gender balance within village committees (Chapin et al., 2005; Chambers, 2006; IFAD, 2010; and NOAA, 2009). All knowledge generated was immediately shared with the participating villages who were asked for feedback to contribute to improving compiled knowledge. The mapping process helped establish 35 village green maps that are the result of 204 participatory workshops with committees consisting of state and non-state actors. Village green maps have contributed to enhanced competence and expertise of municipalities in territorial planning and land use with regard to forestation, environmental protection, and risk prevention. The study strengthened the capacity of municipalities to work together with their civil society constituency in community-based landscape planning. While the level of withdrawal of administration from the project remained

minimal. During its first year, the initial expectation of the project was that out of 24 villages, 10 to 12 at most would express interest in carrying on until the results are declared. In fact, 18 villages showed enthusiasm with regards to completing the first mapping year and have cooperated soundly with the project team. The project was regarded with high importance and the municipalities took extreme care not to jeopardize their chances of remaining part of the project. Following the initial round of visits, 17 municipalities decided to participate in 2012 and they announced the formation of the village committees. None of the villages withdrew from the project, only one failed to complete the green map (Appendix 1 and 2 for the map and list of participating villages). Committee members came from the public sector (municipal committee member), the educational sector (teachers & principals), the private sector (business owners), the civic community (scouts and social groups) and individuals interested in the process. They all volunteered to serve in the village committee with whom we conducted the mapping sessions. A total of 35 committees were formed, consisting of 302 members, and respectively led by a local committee representative. Some communities were in conflict with non-local organizations, and chose to omit recording data on their green maps such as trails or protected areas. The committees were encouraged but not required to invite stakeholders involved in local projects, which seemed to be embraced with little enthusiasm by the committee, the latter was encouraged to avoid unrecorded data later which will create a non-holistic image of the village. The process was successful at engaging and empowering committees. The capacity of the village committees to complete the mapping process with enthusiasm in a period of seven months, with coordination and guidance from the project team proved the effectiveness of the methodology. The methodology was highly successful in communicating the importance of committees' collaboration as it was crucial that towards the end of the first year all the maps are regarded as

the work of the committees and not that of the project team, thus ensuring local ownership of the generated data. The informal round table discussions prevailing during the mapping sessions themselves encouraged the collaboration of all involved authorities to work together towards nature conservation (McCall, 2012). All participating municipalities collaborated largely with constituencies from their respective civil societies expect for the case of one village (Mrousty) where the local NGO did not overcome their past conflicts and did not collaborate in the creation of the village's green map, the municipality ended up withdrawing from the BVA project and the local NGO completed the mapping sessions. Cross-study comparisons in the participatory mapping field is complicated due to the wide variety of procedures associated with data collection and interpretation. The BVA green mapping method enabled the digital recording of GPS point data accompanied by text, on the locations of multiple landscape value types. A little help starting the mapping session and pin pointing the first 3 icons was always needed and fulfilled. The facilitator would start by pinpointing on the aerial photograph together with the committee the location of the municipality where the mapping session was taking place. The flow would quickly to "handing over the pen" and letting the process of dialoguing and mapping take off. The literature indicates that it is questionable whether the integration of GIS and GPS disempowers people knowing that required trainings might put the outsider/facilitator in a dominant role (Chambers, 2006). In our case, technical assistance was at the stage of digitization which neither the facilitator nor the local people were able to replace – the latter made both the facilitator and the local people equal. Also, the knowhow in GIS data basing through the online uploading on the green map system was shared with the local committees through a training workshop held at AUB. Conventional GIS data bases often lack spatial inventories of many of these value types, such as aesthetic or subsistence values, are commonly unavailable at large

spatial scales from. Because the project data is available in a spatially referenced format, it can be easily combined with ecological data to establish land and forest management planning mechanisms. By introducing technological modernizations to the paper version method of mapping of landscape values, established by Brown and Reed (2000), we can integrate landscape values data and community involvement into landscape planning processes. The simple cartographic component of the adopted participatory mapping sessions and the map reading tips shared by the project team to the committee or to committee members individually ensured a non-bias representation, because the success of participatory mapping builds on a widespread community involvement including the marginal and less-powerful members (Rambaldi et al., 2006). Differences in geographical literacy did not influence the representation and participation of committee members. In contrast to PPGIS projects who utilized sophisticated computer based or mail based techniques who reported having lower representation of participants with low education levels and women (McCall & Dumn, 2005). The project team introduced new icons to the green map international set of icons that are relevant to Lebanon and contextualize local sustainable practices: apiaries, reforestation patches, rainwater collection ponds, private forests and rain fed agriculture. 79 icons were translated to Arabic and shared them with green map system and regional partners in Egypt, UAE and Morocco. An Arabic icons manual was developed and used in mapping sessions applied in 174 participatory mapping sessions. The recorded demographic data were in line with those of publications of PPGIS methodology applications from around the world, which have also described a process involving less females then males and participants had high academic education levels in relation to the general population in question (Brown, 2005). A large number of participants felt limited and challenged by the large number of map elements. Upon completion of the first year and the first 18 green

maps, we felt that it was important to categorize and limit the number of mapped elements and the associated mapping workshop workload and duration in an effort to ensure the consistency, practicality and fun like aspects of the process (Chambers, 2006). The open ended list had an average of 30 map elements and took an average of 10 workshop hours per village to complete, while the icons list found in the step-by-step manual which included the 79 map elements and was completed in an average of 6 workshop hours. The amount and duration of workshops per village was reduced in the year 2012 by using the step-by-step manual. In contrast to the polygon drawing technique, very few participants highlighted the difficulty of mapping with point locations represented by the Green Map icons. Completed green maps helped municipalities promote their community's cultural, sustainable, natural and eco-touristic sites. Being heavily dependent on local knowledge and action, mapmaking teams comprising of project team and village committee members developed together the network, skills and spirit necessary to complete this challenging project. The approach enabled the recording of demographical information, natural and cultural landmarks, green space per capita, land tenure ratios, and green cover percentages. The results pointed out that the public associate particular interest with specific landscape components at the local scale. Greater than expected landscape interest was associated with public lands, threatened woodlands, reforestation efforts, landfills, agricultural landscapes (including rain fed agriculture and rain water collection ponds), springs, footpaths and riverbanks. Fewer than expected landscape interest was associated with pollution sources, indigenous flora, public transportation and waste management. Findings can enhance regional social and environmental impact assessment methods. All village green maps are available online for free viewing and printing using the greenmap.org website. Feedback recorded through informal interviews from the project participants made remarkably few references to the

mapping process technicalities. The 70 project participants (30% of total participants) who entered comments, fewer than 10 referred to the functionality and ease of application of the BVA methodology. Phone interviews with participating mayors and village committee representatives were conducted after the completion of the Green Map.

- *Strengths based on phone interviews:*

Content of the workshops: Based on the participatory mapping approach, committee members were responsive to the workshops and were a suitable venue to deliver key concepts.

Coordination with Municipalities: Municipality members were very cooperative and responsive regarding the objectives of the project and they have facilitated the process of events by not only being present as members in the committee but also by providing space for the workshops.

Cooperation of public and private sectors: Both sectors have teamed to deliver key concepts regarding the project.

Gender: Committees didn't consist of men or women only. Committees were groups of both genders in each village. The average ratio of women to men was 1 to 5.

Diversity regions: All participatory villages throughout Lebanon were reached.

Committee performance, coordination and motivation: Committee members were experts in their fields, they had good communication skills when it came to conveying the information and ideas they have.

The members enjoyed their work and were willing to help in the project facilitation and collaborate with us. Participatory mapping methods generally require time and resource-intensive interaction between participants and researchers. From a conceptual perspective, design efforts must be made to accommodate for cost and time effective wide participation in the mapping initiative within relatively large communities. The methodology can include more spaces created to facilitate the participation of marginal and less powerful community members (IFAD, 2010). Nevertheless for two years, the methodology secured broad participation by involving a large number of villages annually; despite political instabilities strong relations with the communities allowed the completion of the work without affecting the project steps and interest of participants. To understand village dynamic and perceived planning priorities, indicators were developed to shed light on the degree of communal engagement in the conservation of open spaces and the promotion of green living. These indicators were developed based on a combination of information generated from the green maps, discussion sessions, and field visits. The indicators include an assessment of 1) the level of consensus over protection and sustainable use of public and common lands, 2) increasing green areas including local reforestation efforts, and 3) local eco-tourism initiatives. The indicators are categorized in the table below:

Conservation of Village Communal Lands	
	Protection
4	Assigning conservation status
3	Regulation of access
2	Fire or other hazard prevention management
1	Grazing management
	Sustainable Use
1	Rain water collection
1	Wild edible plants & medicinal plant collection
1	Beekeeping
1	Eco-agriculture
1	Ecotourism
	Communal Consensus
2	Law enforcement + Communal consensus
1	Communal consensus
Increasing green spaces on communal lands	
Tree planting	
3	> 1000 trees / year
2	500-1000 trees/ year
1	< 500 trees/ year

Table 4: Assessment Indicators Categories part 1

Eco-tourism	
Hiking	
3	Footpath + signage or maps
2	Footpath
1	Dirtpath + truck track
Eco-Information (EI)	
3	Local NGO
2	NGO
1	International Organization
Camping (CP)	
3	Managed Campsite (Location & signage or maps)
2	Informal camping
1	Built, energy consuming sites

Table 5: Assessment Indicators Categories part 2

With respect to the future prospects of green spaces on communal lands three dimensions were considered; the degree of protection, level of use, and the extent of communal consensus. Grazing was considered as a first level protection demanding the least input in terms of technical expertise and financial needs; instead it relies primarily on local willingness to devise and enforce a local grazing policy that limits over-grazing and degradation of habitats. The next level includes grazing management and incorporates more complex issues such as evidence of local efforts to remedy forest fires, and mitigate pollution hazards, and natural disasters. This level not only relies on local consensus or willingness to act, but it necessitates technical and financial resources which may or may not be available to the community. The third level, which includes the first two, increases in sophistication by including local regulation of access to site to prevent illegal trespassing and to limit destructive practices such as illegal logging, permanent construction, and vehicular access. This level necessitates a larger community consensus and willingness to abide to local access regulations and requires human resource to ensure compliance to regulations. The last level is inclusive of all measures discussed before and assumes a more advanced and comprehensive communal agreement to engage in a process of drafting of a legal memoranda with government authorities to officially assign a protection status to green spaces on communal lands.

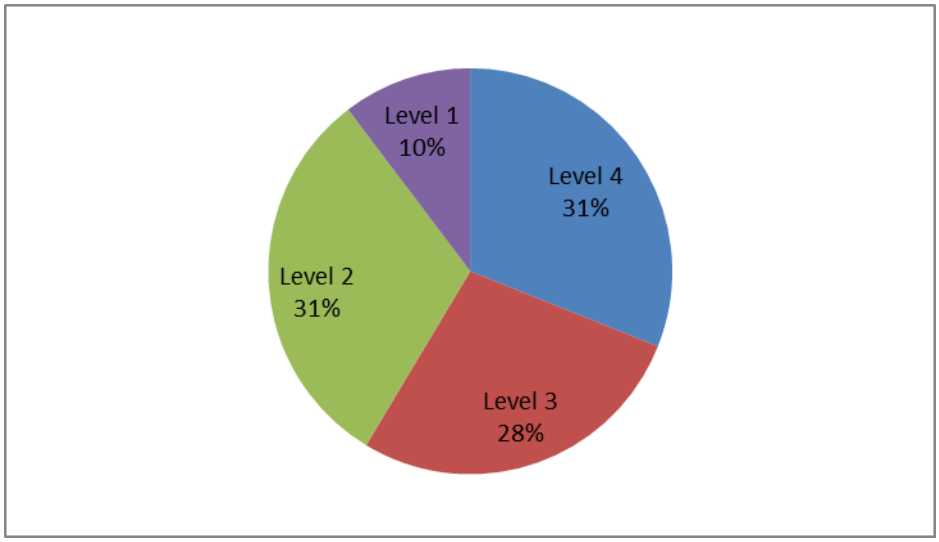


Figure 1 Protection levels

The study revealed that with respect to protection of green spaces on communal lands, all villages are aware of the destructive impact of grazing on the lands, and have devised local strategies to control or restrict grazing on these lands. The data also showed that the majority of villages are seeking to formalize the protection of green spaces on communal lands with a third of the villages trying to legalize the protection at the government level. Level of land use is the second dimension that was considered as influencing the future prospects of green spaces on communal lands. In this case five activities including rainwater collection, wild plant collection, beekeeping, eco-agriculture, and ecotourism were considered as categories under this indicator. These activities were assigned equal load and the information as directly derived from a set of icons. The level number in this case represents the number of activities performed on the land. The study revealed that in the majority of villages local communities still rely on communal lands for supplementing their livelihood. Interventions for the protection of these lands should

include all stakeholders that benefit from these natural resources and build on their willingness to contribute towards long term conservation of these lands to ensure their sustainable use.

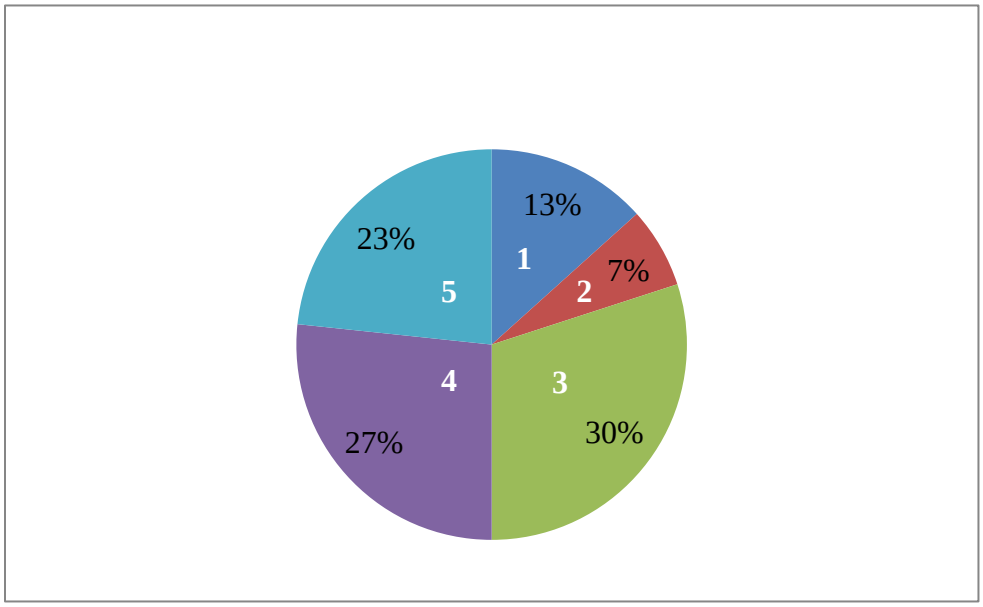


Figure 2 Sustainable use of village communal lands

Level of communal consensus is the third dimension considered in the indicator influencing the future prospects of green spaces on communal lands. This indicator was derived primarily from discussions and field observation and it includes two levels; an evident communal consensus and a higher level where this consensus is effectively translated into enforcement. Communal consensus is evident by the presence of signage, appointment and engagement of forest guards and municipal employees, traditional regulations of access and use between family clans. The study revealed that more than half the villages have reached consensus to conserve village communal land. Of these villages, 60 percent have devised local regulations that are enforced while the remaining rely on customary practice.

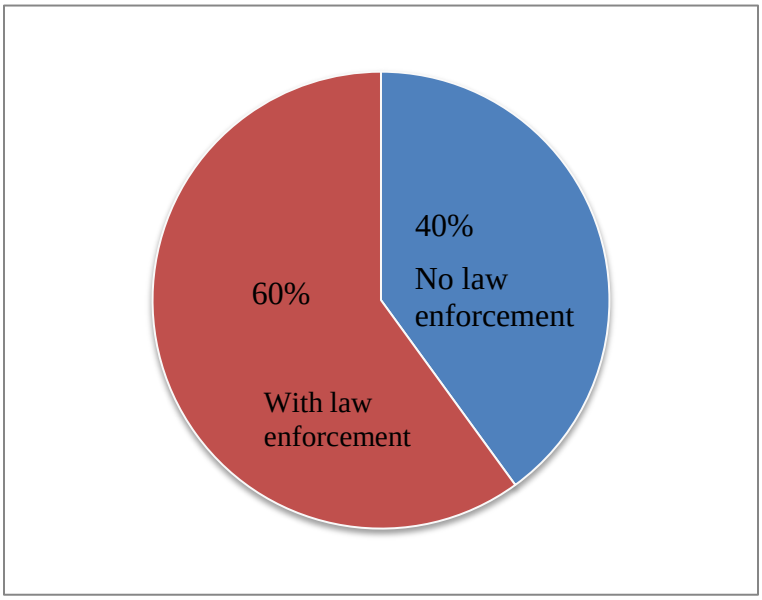


Figure 3 Law enforcement within communal consensus

Local efforts of increasing green areas including local reforestation efforts, were assessed through two indicators namely reforestation activities and the presence of local forest tree nurseries. The extent to which local communities engage in reforestation is reflected in the total number of trees planted in the communal spaces of the village. An estimate of 500 trees per year was selected as a minimum number of trees that can be planted by local authorities with or without support of the civil society. This number reflects a level of reforestation that can be achieved in a village through local efforts and without external support organizations (NGOs). The second level includes the planting of 500 to 1000 trees per year category and assumes some level of local organization to secure external support either in the form of funding, in kind donations or human resources. The last level where more than a 1000 trees are planted per year in a village reflects communities that have engaged through local authorities and civil society with external organizations and donors in a long term commitment to reforestation of degraded

communal lands. The study revealed that the majority of villages are engaged in tree planting activities (83% of villages).

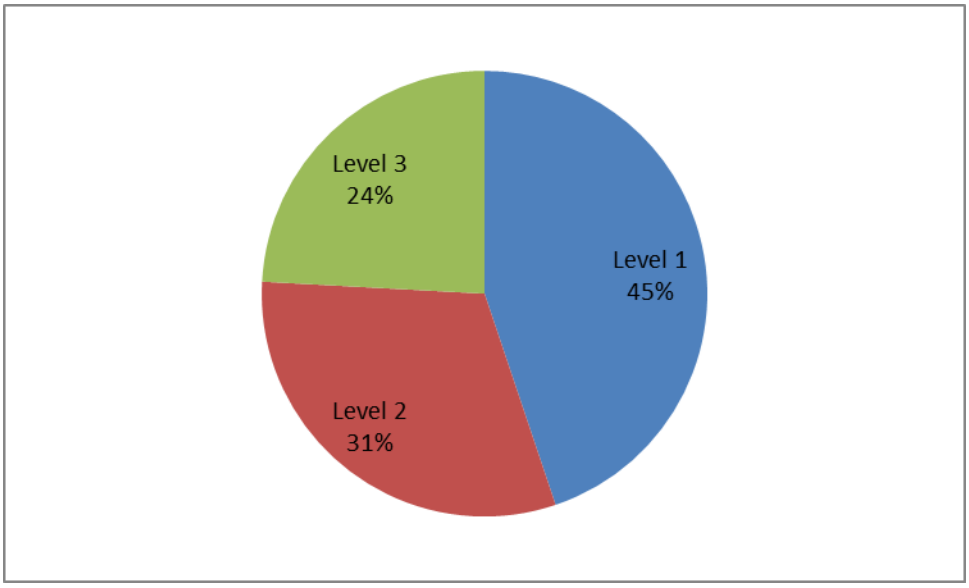


Figure 4 Tree planting levels

Almost half of the villages perform small scale local initiatives, while the other half are expanding their reforestation activities by partnering with external organizations. It is worth nothing that 24% of the villages have engaged in a long term strategy for reforestation of their communal lands. The recorded level of engagement in reforestation activities at different scales is a reflection of the interest of the local authorities and communities to retain the status of communal lands as natural habitats. Furthermore, the engagement of the local community and the leadership of the local authorities, may prevent future intentions for urbanizing these areas. Communal interest in promoting local eco-tourism was assessed through basic tourism related activities namely hiking, camping and the presence of eco-information sources. With respect to hiking the quality of the trails were used as an indicator of a local commitment to promoting this

activity. The first level was assigned to hiking trails that consisted of unpaved dirt path and truck tracks, indicating that although these were recognized by the local community as possible walkways into natural areas they were not developed intently for this purpose. The second level was assigned to footpaths which are a reflection of the frequent use of traditional trails by local communities and visitors familiar with the site. The traditional trails are maintained by frequent use which prevents their disappearance by overgrown vegetation, an indication of trail abandonment. The third level reflects intentional local efforts to promote eco-tourism by guiding visitors external to the village who are not familiar with the site. This third level assumes in addition to the presence of footpath some level of signage and trail maps.

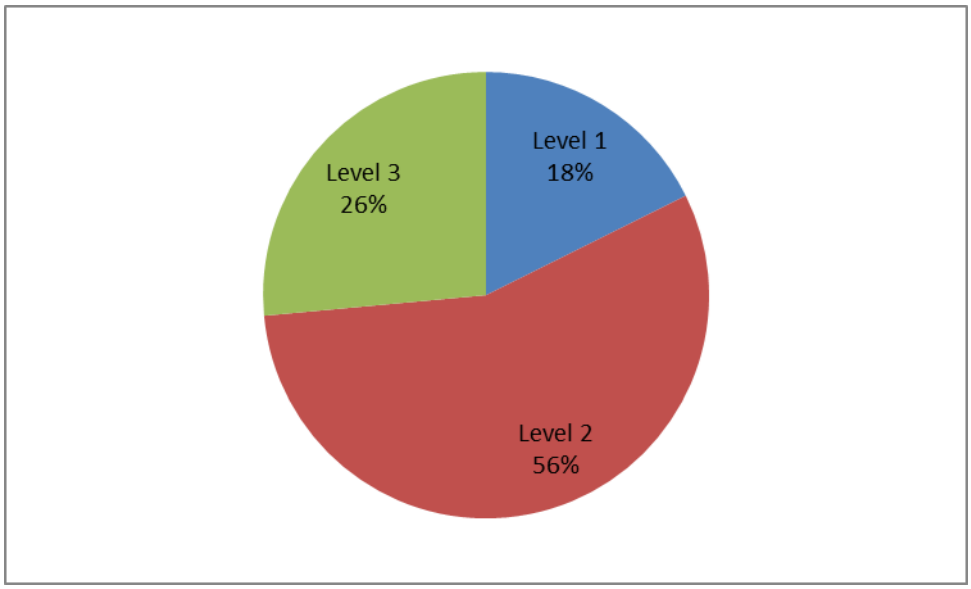


Figure 5 Hiking trail levels

The study revealed that majority of village (75%) still rely on traditional trails that constituted the basic transportation network between villages and which were travelled either by donkey or on foot. Although the economic value of these trails is lost, since they are no longer used for trade, today these trails have acquired a new potential value which is the hiking and exploration of semi-natural areas in the rural country side of Lebanon. The results reveal that this potential however has not been tapped by local communities as very few villages (18%) have effectively rehabilitated these trails for eco-tourism purposes by placing signage and producing trail maps. Furthermore, only one village adopted a recognized trail ranking system by assigning difficulty levels to the different trails in the village.

Another indication of communal support to eco-tourism is the designation of camping sites in communal lands. This indicator was assigned three levels with the first least desirable level consisting of sites that include interventions destructive to natural habitats, such as energy consuming constructed units and vehicular access to the site. The second level is an indication that the natural geomorphology of the site is conducive to camping and therefore the site has been traditionally used by the locals and different organizations (ex: scouts) however the local community has not capitalized on this asset to ensure its conservation or to boost its local economy.

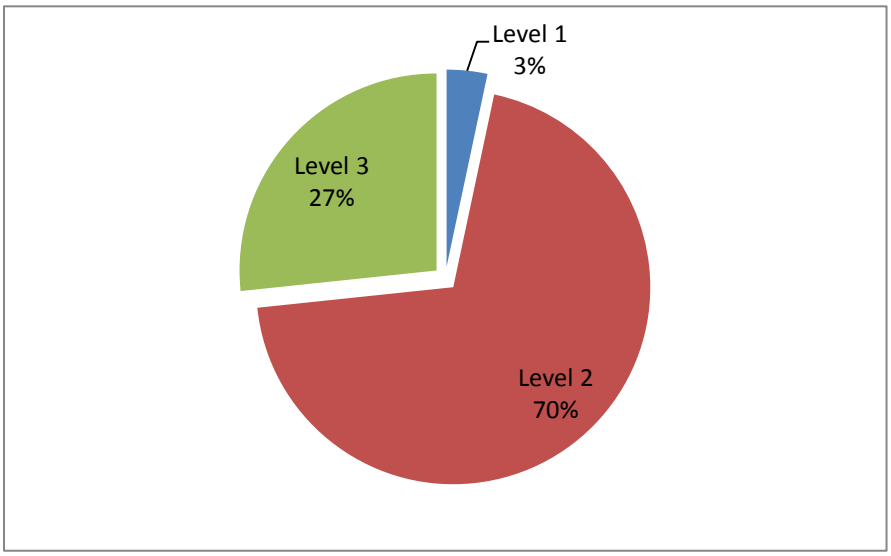


Figure 6 Camping site levels

The third level assumes that the local community has realized the economic potential of the communal land and is playing an active role by introducing environmentally friendly interventions to encourage visitors and to promote local economy. The study revealed that the morphology of the country and the degradation status of natural communal lands which includes open lands and woodlands is such that the majority of the green spaces on communal lands are suitable for use as camping areas. Accordingly, most villages (75%) have a traditionally designated camping area that have been underexploited for this purpose. Only a third of the villages manage these camping sites for the purpose of generating economic revenue from their use. Local efforts to publish information about the village natural and cultural assets through the production of flyers, publishing of websites, assigning of dedicated contact persons or through the establishment of information centers for tourism are indications of the interest of the village in promoting eco-tourism. The indicator for eco-information was developed to reflect communal commitment to eco-tourism rather than availability of information about the village.

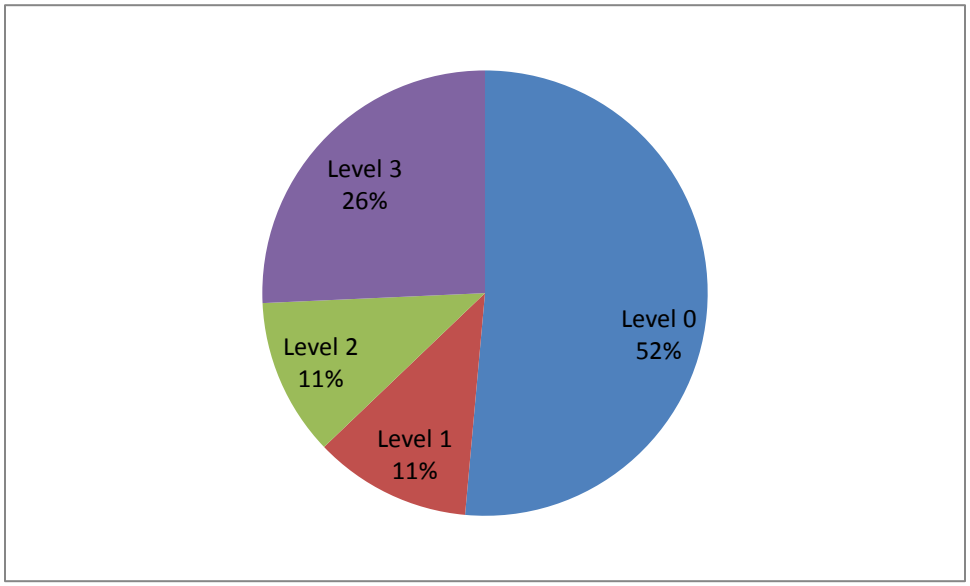


Figure 7 Eco-information levels

Accordingly, the third and highest level was assigned for eco-information produced as a result of local initiatives by local authority or local civil society. Regardless of the quality of the information material produced or the available infrastructure, local initiatives are a reflection of a broad communal consensus, over the need to leverage natural and cultural assets for the benefit of the local economy. The second level was assigned to eco-information produced by national NGO's and government institutions in support of the village. This is an indication some members of the village have engaged in a networking process with national NGO's and government authorities to benefit from initiatives that lead to the production of eco-information. The first and lowest level was assigned to eco-information produced as a result of the intervention of international organizations. Although, the final outcome of interventions at this level, is higher in terms of quality and standards, as it is benchmarked against international standards, it assumes the involvement of an applicant external to the village and a lesser number

of involved local individuals, since the process of securing international funds requires a certain level of expertise. The study revealed that half the villages do not have any form of eco-information. Of the remaining villages, 25% have taken the initiative to produce their own eco-information and 11% have relied each on national and international organizations for eco-information production.

Villages with a cumulative level 15 and above have communities is engaged in nature conservation and landscape planning, where natural resources are contributing to local economies and where efforts are needed to reinforce positive initiatives. Villages with a cumulative level of up to 14 necessitate a lot of support needed to move towards sustainability and promotion of local economies. The cumulative levels were obtained using a scoring matrix detailed in Table 4 and found here below.

Indicator	Level	Recommended actions
Conservation of Village Communal Lands	7 to 11	Developing local economies based on the conservation efforts
	6 to 0	Formalizing communal consensus, better definition of the regulation of access, and defining additional natural resource assets.
Increasing green spaces on communal lands	1 to 2	Enhance chances of future conservation of recently reforested areas by landscape design and planning that defines environment friendly functions with economic return.
	0 to 1	Mobilize communities to engage in increasing green areas
Eco-tourism: Hiking	2 to 3	Formalize the trail in terms of rehabilitation, and produce information about access, length and standardized level of difficulty.
	0 to 1	Promote local consensus that will prevent the paving and excessive use of the dirt paths, to keep them hiker friendly.
Eco-tourism: Camping	2 to 3	Develop and promote responsible camping guidelines that contribute to the conservation of the site.
	0 to 1	Conduct awareness workshops on eco-friendly camping management alternatives.
Eco-tourism: Eco-information	2 to 3	Increase the number of locals engaged in the eco-information production and dissemination.
	0 to 1	Develop and promote the local production of eco-information by engaging local communities.

Table 6 Cumulative indicators scoring matrix for landscape planning

Future research would involve extending the results of the adopted PPGIS method into prototypic landscape analysis models, for rural areas threatened by rapid urbanization (Kuchelmeister, 1998). The analysis would involve defining psychophysical components observed through relationships between physical landscape characters and various landscape values. Also, land use maps can be extrapolated while including local policies and communal consensus. The future research would be amending previous studies from around the world, which have applied and proven the effectiveness and need of similar methods of associating participatory mapping, physical landscape characters and landscape valuation (Brown, 2006). Outcomes can improve local and regional landscape assessment methods, leading to a sustainability augmentation in urban design and nature conservation processes. Spatial statistical methods can be applied to investigate the pattern of landscape values in relation to natural and human landscape features in the study area, Lebanon. By analyzing and discovering which landscape features serve as focal points or attractors for values, we hope to understand why some locations are valued more than others. In the other hand we can make it clear how the distribution of these values can be expected to change when landscape features are altered. We can identify landscape zones with high densities of values ("hotspots") if we apply the data to reforestation land allocation and forest fire management planning. In this way we can inform fire management planning about where to focus limited resources in an effort to minimize fire impacts. The survey application (BVA icons manual) content could be amended and improved to generalize the effectiveness of the prototypic database in relation to landscape planning. Technical amendments could include modifications in previously recorded site locations and text. The recorded data can serve in prospective applications of the database in the fields of

natural resource management, landscape architecture, urban design, regional planning, and protected area planning (Brown ,2005). An understanding of the relationship between mapped sites, physical landscape characteristics and urban planning is important for the provision of insight into development and land-use planning decisions that will shape landscape planning in a village. Future research should involve the use of logistic regression models for predicting the presence or absence of green map sites as a function of natural landscape features, ecosystem management mechanisms and landscape planning. Results of our participatory mapping exercise would be enhanced by comparing them with other methods or approaches of internet based Public Participation GIS. In the future, repeating the amended project in the same locations could enable the identification of changes in the spatial pattern of landscape features over time and the respective factors of change. Through an extended PPGIS activity, mapping further the forest cover and its landscape valuation implications could enable the assessment of the effectiveness of the mapped community fire protection zones defined at different scales.

CHAPTER 6

CONCLUSION

People are the basis of nature conservation and landscape planning (Yi Fu Tuan, 1977). A geographical information system (GIS) platform is required to integrate information about landscape values with spatially referenced ecological data and biophysical modeling results used in land and forest management planning processes. For example, spatial forest planning requires spatial data relevant to commodity and non-commodity management goals. The attributes of forest landscape values in the spatial information present important inputs for land-use planning exercises (Maness and Farrell, 2004), for the design of parks or reserve systems (Howard et al., 2000), and for assessing values at risk from natural disturbances, such as forest fires. The integrated PPGIS methodology caters to Arab culture and context, is efficient in decentralized database collection, in rallying constituency interested in local development, and in generating trust and creating a network of individuals that form the basis for a partnership between local communities, local authorities and government. We have demonstrated how an academic institution can play a role by providing an academic platform that uses resourceful methodologies that can lead to local and national consensus and influence policy over landscape planning and related economic activities. This PPGIS methodology has proven not only to build trust between academic institutions and communities, which has decentralized the process of map making and village perception, information generation and made it more relevant to local communities, of it also constituted a basis for strengthening trust by increasing opportunities for

collaboration in public lands management (Brown & Weber, 2011). The participatory mapping process has helped in building a constituency of people working together and with the government; a memorandum of understanding has been signed between the Ministry of Tourism and the American University of Beirut in support of landscape planning and eco-cultural activities. Policy formulation should be country specific and city specific, taking into account the available resources and the social context. Moreover, the methodology contributes to a shift from conventional centralized policy to a more community-based landscape planning strategy, to the decrease in data basing costs, and to empower locals to adopt meaningful conservation practices by their own initiati

BIBLIOGRAPHY

Axelord R.S., Vandeveer S.D. and Downie, D.L. "The global environment: institutions, law, and policy." 3rd edition. Washington, DC: CQ Press, 2011. Print.

Barbosa Olga, "Who benefits from access to green space? A case study from Sheffield, UK," Landscape and Urban Planning 83 (2007): 187-195

Brown Greg, "Mapping spatial attributes in survey research for natural resource management: methods and applications", Social Natural Resource 18 (2005): 17-39.

Brown Greg, "Mapping landscape values and development preferences: a method for tourism and residential development planning", International Journal of Tourism 8 (2006): 101-113.

Brown Greg, and Reed Pat, "Validation of a forest values typology for use in national forest planning," Forestry Science 46 (2000): 240-247.

Brown Greg and Weber Delne, "Public Participation GIS: A new method for national park planning" Landscape and Urban Planning 102 (2011): 1-15

Bolund, P. and Hunhammar, S.. "Ecosystem services in urban areas", Ecological Economics 29 (1999): 293-301.

Brack, C. L. "Pollution mitigation and carbon sequestration by an urban forest," Environmental Pollution 116 (2002):195-200.

Chambers Robert "Participatory mapping and geographic information systems: whose map? Who is empowered and who disempowered? Who gains and who loses?" Electronic Journal of Information Systems in Developing Countries 25 (2006): 1–11.

Chapin Mac, Lamb Zachary, and Threlkeld Bill "Mapping Indigenous Lands", Annual Review of Anthropology Vol. 34 (2005): 619-638.

Convention on Biological Diversity. "Aichi Biodiversity Targets". Convention on Biological Diversity (CBD). 18 October 2010. Web. 10 April 2014

Craig, W., T. Harris, and D. Weiner, ed. "Community Participation and Geographic Information Systems." 2002 London: Taylor and Francis.

Granberg Mikael and Elander Ingemar, “Local Governance and Climate Change: Reflections on the Swedish Experience”, International Journal of Justice and Sustainability 12 (2007): 537-548.

Green Map.“Green Map Icons Version 3 Definition." Green Map System. 22 November 2008. Web. 20 Apr. 2014.

Howard, P.C., Davenport, R.B., Kigenyi, F.W., et al., “Protected area planning in the tropics: Uganda's national system of forest nature reserves”, Conservation Biology 14 (2000): 858-875.

International Fund for Agricultural Development (IFAD)."The IFAD adaptive approach to participatory mapping: Design and delivery of participatory mapping projects." IFAD. 2010. Web 24 January 2014.

Klare Michael, “Rising powers, shrinking planet: the new geopolitics of energy.” 1st edn. New York: Metropolitan Books. (2008).

Kuchelmeister Guido, “Urban forestry in the Asia-Pacific region: status and prospects” Forestry Policy and Planning Divison, Rome and Regional Office for Asia and the Pacific, Bangkok (1998): 5.1-5.1.7

Maness, T., and Farrell, R, “A multi-objective scenario evaluation model for sustainable forest managing using criteria and indicators”, Canadian Journal of Forest Research 34 (2004): 2004-2017.

McCall Michael and Dunn Christine, “Geo-information tools for participatory spatial planning: Fulfilling the criteria for ‘good’ governance?” Geoforum Vol. 43 (2002): 81-89

National Oceanic and Atmospheric Administration (NOAA), Coastal Services Center. “Stakeholder Engagement: Strategies for Participatory Mapping.” NOAA Coastal Services Center. 2009. Web 15 February 2014.

Meffe, Gary K., Larry A. Nielsen, Richard L. Knight, and Dennis A. Schenborn. “Ecosystem management: adaptive, community-based conservation,” Washington, D.C: Island Press, 2002. Print.

Ministry of Environment (MOE) and ECODIT Liban, State and Trends of the Lebanese Environment: Chapter 5 Biodiversity and Forests (2010): 140-170. Available at: http://www.moe.gov.lb/getattachment/The-Ministry/Reports/State-Of-the-Environment-Report-2010/5-Biodiversity-and-Forests.pdf.aspx

Miskell Marvin, “The Deforestation of Mount Lebanon”, Geographic Review, Vol 59 No. 1 (1969): 1-28

Rambaldi, G., Chambers, M. McCall and J. Fox, “Practical ethics for PGIS practitioners, facilitators, technology intermediaries and researchers”, Participatory Learning and Action 54 (2006): 106-113

Reed Mark, “Stakeholder participation for environmental management: a literature review” Biological conservation 141 (2008): 2417-2431.

Reese Melissa and Samoila Ciprian, “Tutorial: Exporting Open Green Map Data as CSV and KML files to use in Spreadsheet and GIS Software.” Green Map System. 2009. Web 20 Januray 2014.

Tuan, Y.F. “Space and place: the perspective of experience.” Minneapolis: University of Minnesota Press, 1977. Print.

Webler, T., Tuler, S., Krueger, R. “What is a good public participation process?” Environmental Management 27 (2001),435–450.

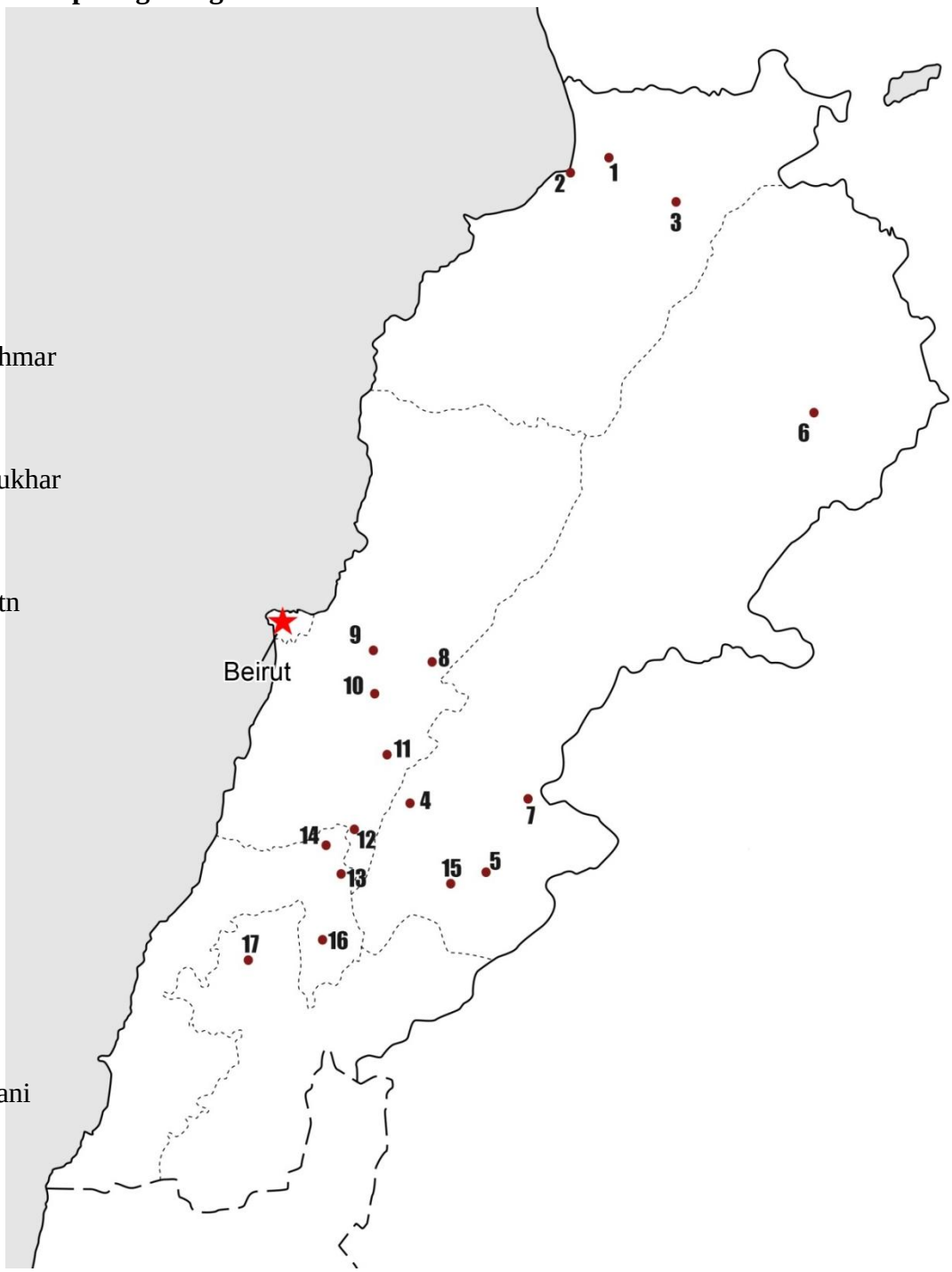
Wortman D., “Mapping a greener future”, Mother Earth News 83 (2002): 50-53.

World Bank Data (2011) data.worldbank.org

APPENDIX

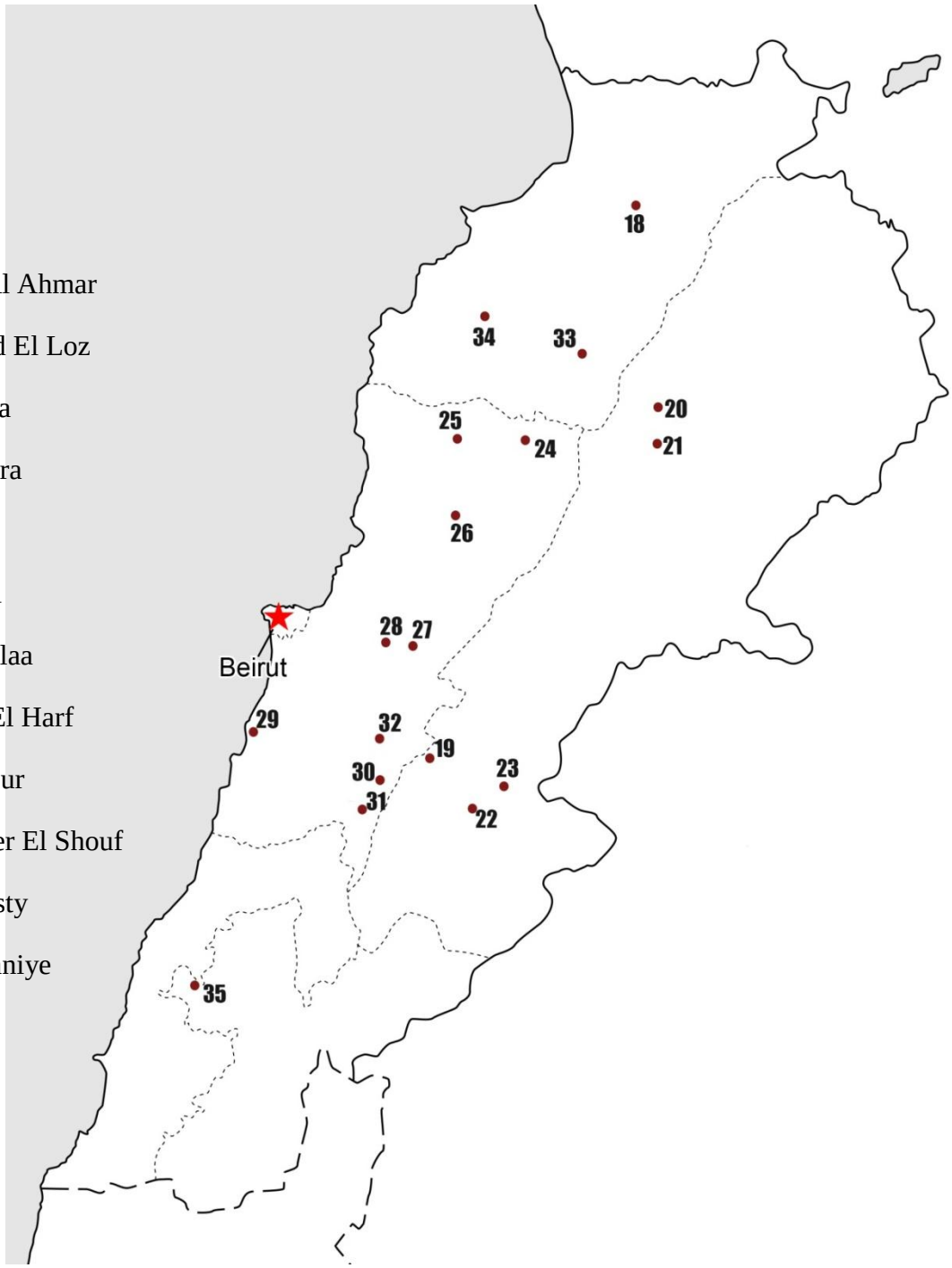
1. 2011 participating villages

1. Miniara
2. Bebnine
3. Michmech
4. Ain Zebde
5. Dahr Al Ahmar
6. Ersal
7. Aita El Foukhar
8. Hammana
9. Ras El Matn
10. Shinai
11. Barouk
12. Niha
13. Bkesine
14. Jezzine
15. Kawkaba
16. Rihan
17. Deir Zahrani



2. 2012 participating villages

1. Hrar
2. Aana
3. Bar'a
4. Deir Al Ahmar
5. Kamed El Loz
6. Manara
7. Aakoura
8. Ehmej
9. Hrajel
10. Al Qalaa
11. Deir El Harf
12. Damour
13. Maaser El Shouf
14. Mrousty
15. Ourhaniye



3. Icons database spreadsheet sample

Village	Category	Icon #	Latitude	Longitude	Activity Name	Activity Description	Contact Person	Phone number
Aarsal	Services	54	34.179927	36.440191	Municipality	Municipality of Aarsal	Municipality of Aarsal	08-240402
Aarsal	Outdoor activities	3	34.160291	36.399153	Special Tree	Cherry rainfed trees covering the outskirts of the town	Mr. Hassan Al-Flaiti	03-541517
Aarsal	Outdoor activities	11	34.179217	36.417028	Public garden	Public park is being rehabilitated to become valid and safe for children	Mr. Hassan Al-Flaiti	03-541518
Aarsal	Outdoor activities	1	34.178755	36.439054	Forest	Several lands have been rehabilitated and converted into reserves	Mr. Hassan Al-Flaiti	03-541520
Aarsal	Outdoor activities	12	34.166328	36.382127	Hiking	Aarsal is known for its inner roads in the outskirts of the town inside the vast cherries, apricots and apples fields	Mr. Hassan Al-Flaiti	03-541521
Aarsal	Outdoor activities	14	34.130386	36.359189	Camping site	The valley of Al-Marhaj , the Riaania area, and the Rahwa area	Mr. Hassan Al-Flaiti	03-541522

4. Village demographic database spreadsheet sample

year of participation	Region	Village Name (Latin)	Village Name (arabic)	Upper right corner lat	Upper right corner long	Lower left lat	Lower left long	Surface Area (km2)	Altitude (m)	Population	Built area %	Contact Number	Contact Name	Open Area %
2012	Mount Lebano	Aakoura	العاقورة	34.165164	36.015176	34.039767	35.855048	120	1450-2100	14000	0.5828% built	03-302017/03-858686/03-830045	Boutros Massaad/Walid Abi Younes/MR Joseph el Hashem	99.417
2011	Aakar	Aana	عانا	33.705389	35.805343	33.656179	35.731314	15000	900	2000	2.5391% built	71-120388	Jawdat Nakhle	97.461
2011	Akkar	Aarsal	عرسال	34.23459	36.62439	34.046194	36.32793	436	1450-1600	35000	2.3933% built	03-541517	Mr. Hassan Al-Flaiti	97.606
2012	Akkar	Ain Zebde	عين زبده	33.639096	35.721354	33.616084	35.676594	5.46 km^2	980-1100 m	3650	1.98%	03 125144	Bachir Abou Mounsef	98.02
2011	Akkar	Aita el foukhar	عيتا الفخار	33.614818	35.948627	33.6854	35.845011	28.62	1000-1480	4000	1.0630% built	03-818440	Hana Nasser	98.937
2012	Mount Lebar	Al Qalaa	القلعة	33.846393	35.734407	33.830352	35.721318	2	1050	800	23.167% built	03/885510	Riad El Anwar	76.832
2012	Beqaa	Bar'a	برقة	34.213839	36.166719	34.156952	36.104804	40	1400-2300	3000	1.3210% built	71-483710	Pierre Jaajaa	98.679
2012	Beqaa	Barouk	الباروك	33.715354	35.759992	33.675063	35.665753	18	1250-2220	12000	2.6609% built	03-703840	Leila Abou Aalwan	97.339
2012	Beqaa	Bebnine	ببنين	34.527822	35.997999	34.488124	35.976242	6.85	0-120	24000	21.7258% built	70-523710	Dib El Kassar	78.275
2011	Beqaa	Bkesine	بكاسين	33.581852	35.593275	33.545614	35.55988	5	550-1100	2000	3.5135% built	03-421885	Maroun Aziz	96.486
2012	North	Bsharreh	بشري	34.311774	36.142746	34.2065	35.98808	60	1400-3080	7000	3.03424% built	03-832060	Joe Rahme	96.965
2012	Beqaa	Dahr Al Ahmar	ضهر الاحمر	33.558756	35.874686	33.516117	35.817523	9.95	950-1500	1500	4.5241% built	03-946772	Elie Saade	95.475
2012	South	Damour	الدامور	33.736864	35.480061	33.687101	35.416632	2000	150	20000	12.1209%built	9613310210	Chaker Abou Abdallah	87.879
2012	Mounth Leba	Deir El Harf	دير الحرف	33.857784	35.674564	33.841068	35.706246	2.4	1050	800	11.184% built	03-337366	Remond Abou Jaoude	88.815
2012	South	Deir Zahrani	دير الزهراني	33.410418	35.478238	33.446163	35.418929	11.6	400-425	8000	11.8183% built	03-280860	Hasan Zwawi	88.181
2011	Mount Lebar	Ehmej	إهمج	34.148061	35.864373	34.112178	35.763599	17	1000-1450	4500	1.7853% built	70/796950	Iman Khalife	98.215
2011	Mount Lebar	Hammana	حمانا	33.832225	35.768535	33.795142	35.718324	8.2	1050-1500	1500	13.0662% built	71-004399	Laura el Hatem	86.994
2012	Mount Lebar	Hrajel	حراجل	34.047556	35.829144	34.010387	35.781095	12	1450	10000	8.1746% built	03/530025	Gebran Zgheib	91.826
2012	Aakar	Hrar	حرار	34.470753	36.153205	34.446542	36.101109	8	750-1150	4700	7.5698% built	03/154666	Ahmad Aantar	92.43
2011	South	Jezzine	جزين	33.568431	35.616822	33.501108	35.556483	21.2	950	12000	3.8297% built	03-720774	Habib Helo	96.171
2012	Shouf	Kamed el Loz	كامد اللوز	33.649346	35.851878	33.598602	35.794779	14	900	10000	10.2005% built	03/465157	Fawzi Sateh	89.8