Sustainable livelihood approach towards enhanced management of rural resources

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Abstract: This research utilises the sustainable livelihood approach to evaluate the livelihood assets and resources and identify key challenges and development opportunities in a village in Southern Lebanon. Primary data using quantitative (structured questionnaire) and qualitative (semi-structured interview) methods were collected. The findings highlight the weak resource management and monitoring of various aspects. The factors influencing the village's livelihoods include constraints in water quantity and water quality monitoring, communication and micro-macro links, as well as the allocation of financial resources. The utilisation of the sustainable livelihood approach resulted in developing a practical action plan and a set of management strategies for the enhancement of the village's livelihood based on detailed local knowledge and community input. The significance of this research lies in defining and prioritising factors influencing rural livelihoods and typical relationships among them in real life situations. It focuses on quantitative and qualitative variables and provides evidence-based interventions.

Keywords: rural resources; management; sustainable livelihood approach; SLA.

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1 Introduction

It is estimated that 3.1 billion people or 55% of the developing world total population lives in rural areas (IFAD, 2011). Moreover, about three quarters of the people living in absolute poverty live in rural areas. Such areas are associated with limited economic opportunities, lack of assets, social and political inequities, and poor education and services. Worldwide, rural areas have been characterised with the decline in the agricultural sector and small business economies. This is accompanied by socio-economic marginalisation exacerbated with diminished local support such as education and healthcare services. As such, rural development has received attention over the last two decades for the purpose of enhancing and maintaining the quality of life in rural communities (Carney, 1999; Van Berkel et al., 2011). In order to alleviate poverty, it is imperative to strengthen and build people's capabilities and assets while ensuring good healthcare services, ownership of physical assets and education. Beyond the household level, poverty alleviation should enhance economic growth, develop infrastructure and ensure good governance (Chambers, 1981; Bebbington, 2002; IFAD, 2011).

Rural development has been the concern of many local, national and international organisations. Consequently, a number of approaches (integrated rural development, right-based approach, and sector wide approach) and themes have been developed and

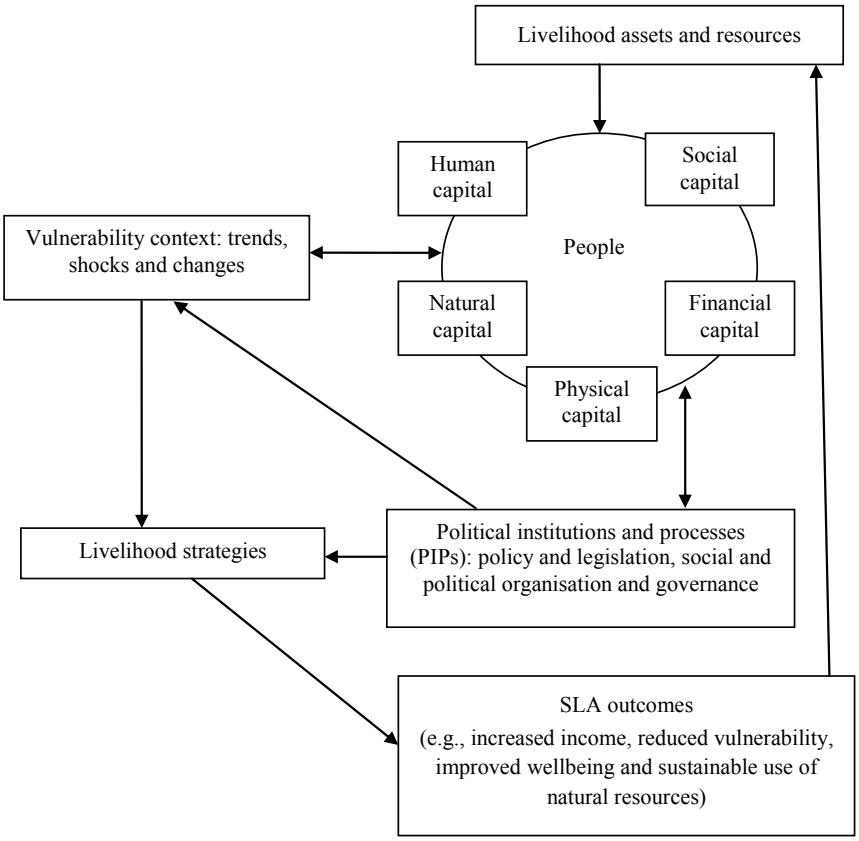
different phases in rural development thinking have evolved. In the 1960s, small farm agricultural activities were considered to be the engine of growth and development since they provide food, labour and a market of goods in the industrial sector of low-income countries. In the 1980s and 1990s, there was a transformation from top-down approaches (administered by political institutions) to bottom-up approaches (including participatory processes designed by rural inhabitants). Since the 1990s and 2000s, the sustainable livelihood approach (SLA) was introduced while being compatible with the bottom-up development progress. Many of the used approaches share common methodologies, tools, and goals (Ellis, 2000; Bryceson and Bank, 2001; Ellis and Biggs, 2001).

The SLA is an analytical tool that deals with the dynamic dimensions of well-being and poverty. The distinguishing feature of the SLA is a comprehensive framework that aims at identifying challenges and management strategies to overcome these challenges (Gilling et al., 2001; Norton and Foster, 2001). The framework places rural (underprivileged) people at the centre being surrounded by livelihood assets and resources including human capital (health, education, knowledge and skills and work status), financial capital (income from employment, savings and credit or financial funds), physical capital (infrastructure: roads, water supply and sanitation, schools, and electricity), social capital (social support networks) and natural capital (natural resources such as land and forests) (Norton and Foster, 2001; Allison, 2002; Morse and McNamara, 2013). The access to these assets is influenced by the vulnerability context, which includes shocks such as conflict, natural disasters and political instability as well as trends and changes such as population or demographic changes, environmental change, technology transfer, and trade.

Access to the assets is also influenced by political institutions and processes (PIPs) that cover the complex social, economic and political context within which people pursue their livelihoods strategies. The PIPs include policy and legislation, social and political organisation, and governance. Both, the PIPs and the vulnerability context, influence the livelihood strategies that are correlated with the ways rural communities use their assets to reach their goals. The outcomes of following certain livelihood strategies in a community may include increased income, reduced vulnerability, improved well-being, and more sustainable use of natural resources (Singh and Gilman, 1999; Arce, 2003; Toner and Franks, 2006). Figure 1 presents a schematic illustration of the SLA framework.

The guiding principles of the SLA are people centred (place people at the centre of development), holistic (recognise multiple influences on people and identify relations between factors affecting the people's livelihoods), dynamic (understand and learn from changes) and sustainable (ensure resilience in the face of shocks and stresses, not dependable on external support, and have the ability to maintain long-term productivity of resources). Moreover, they build on strength by analysing the strength of people (poverty-reducing potential) rather than their needs and tend to bridge the gap of communication between the policy level institutions and the community (Norton and Foster, 2001; Hinshelwood, 2003; Butler and Mazur, 2007; Carney, 2011).

Figure 1 Schematic representation of the SLA framework



Source: Singh and Gilman (1999), Arce (2003), Toner and Franks (2006)

The implementation of the SLA revealed that it could contribute to poverty reduction when applied effectively generally through provision of basic skills to increase productivity and achieve higher standards of living and through the provision of basic social, economic and infrastructure services in addition to poverty-oriented investments. Yet, various case studies failed to address the poorest. Development interventions have excluded poor people that lack income or assets to invest in development. Experiences with the SLA showed that increasing the representation of community groups in governments has played a greater role in raising awareness, enhancing responsiveness, and affecting policies (Nyerere, 2007). Empowerment has been strongly related to social inclusivity and the quality and nature of participation. Empowerment is also concerned with enhancing women's capabilities and participation of both genders throughout the project cycle. A number of development agencies applied the SLA to poverty reduction and social empowerment through enhancing people's confidence and skills to overcome constraints, addressing gender relations within both the household and community and establishment or strengthening of community-based organisations to build up the capacity for community members to plan and implement priority development activities. Successful cases showed the importance of having a mix of public and private partners

and links to local, national and international level as a way to advance work (Neely et al., 2004; Toner and Franks, 2006).

For example, in Pakistan and Zambia, the SLA was used to design new programs in relation to anti-poverty and setting up a platform for policy linkages. The main weaknesses of using the SLA approach were primarily related to political commitment and discrimination against the poor. Moreover, two main challenges of the SLA are:

1 that livelihood impacts are unquantifiable

2 attempts to quantify impacts are dependent on subjective assessment which was the case of a project in relation to wildlife in Kenya.

In Namibia, SLA has been used to assess the tourism sector using participatory techniques to assess how different project options influence people's livelihood choices (Farrington et al., 1999).

This study aims to evaluate livelihood assets and resources and identify challenges for development in a rural village in Southern Lebanon. An earthquake in 1956 significantly damaged property in the area, resulting in population migration and land abandonment. The situation resulted in a decline in the agricultural sector, which was a main source of income for many families. Moreover, the 17 years of civil unrest that ended in 1990 affected the village's livelihood and accordingly an assessment was conducted of the vulnerability context and political institutions' role as well as existing management strategies. The study concludes with a management action plan to overcome challenges and improve livelihood in the village. Given the goals of the research, a multi-disciplinary research methodology combining the questionnaire and focus groups, field sampling, documentary analysis, and secondary research provides the most appropriate methodology. The combination of several research methods can provide significant insights into the issue and compensate for each other's weakness. All this contributes to increase the validity and reliability of the study. The SLA utilises several existing tools and modes of analysis and helps in understanding how policies and institutions shape people livelihoods. The community-based participatory approach is a critical strategy to address rural development and sustainable management of rural resources.

2 Methodology

2.1 Study design and instruments

While primary data constitute the main source of information, secondary sources were also relied upon for information related to the need for and the importance of the SLA as a tool for developing sustainable livelihoods in rural areas. We acquired primary data using quantitative and qualitative methods. A bilingual (Arabic and English) structured questionnaire and semi-structured interview guide were developed. The questionnaire and the semi-structured interview included a written consent form to explain the purpose of the study and to assure that the participation is voluntary and participants are free to withdraw at any time. A summary of the issues addressed in the questionnaire are summarised in Table 1. Participants were also asked to rate the most important area of concern in the village that necessitates improvement.

Table 1 A summary of the issues addressed in the questionnaire

Capital	*Issues addressed*
Human	Age,
	Level of education
	Work status
Financial	Satisfaction with income
	Ability to cover basic needs
	Availability of financial support
Physical	Roads
	Shelters
	Medical centres
	Water and wastewater networks and treatment
	Solid waste management
Social	Internal conflicts
	Trusting the municipality
Natural	Illegal environmental practices (cutting trees, burning waste around houses, uncertified queries, etc.…)
	Accidents

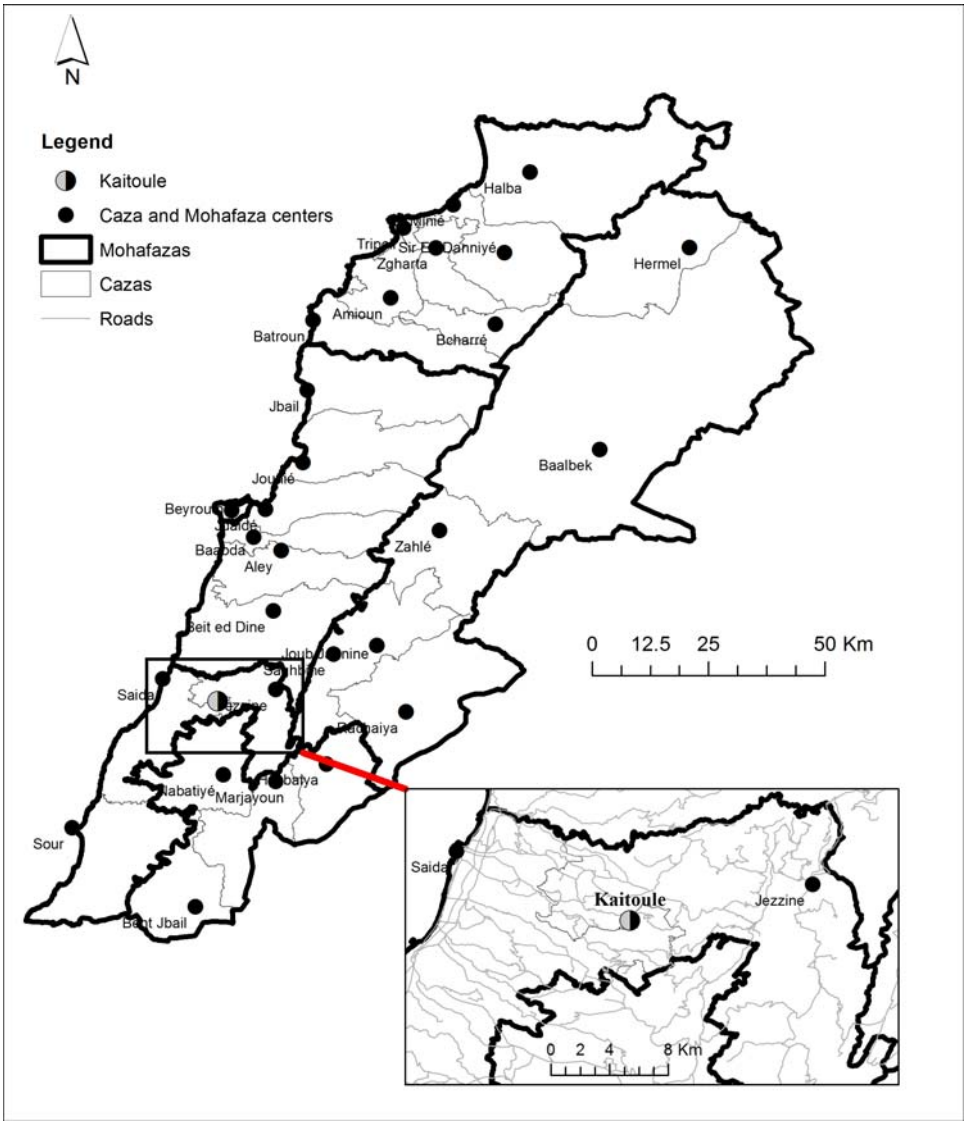
Semi-structured interviews were planned to complement the questionnaire. Initially, these interviews were restricted to individual municipality members (being elected directly by the village inhabitants) and were then altered by participants to result in a focus group discussion with four municipality members, who voluntarily agreed to participate in the study, that targeted the collection of data related to the vulnerability context and the role of the municipality as a political institution in the village.

In addition, water sampling was conducted to assess the quality of the spring water in the village and nearby areas. Based on a preliminary survey that was requested by the municipality in 2008 for the springs in the area, 12 out of 17 springs were tested for discharge, pH, conductivity, and total dissolved solids (TDS). Seven springs were recommended for usage with an estimated water supply of 500 m^3/day. Accordingly, a total of seven samples from the recommended springs were collected during the summer (dry season) and analysed for selected physico-chemical (temperature, pH, colour, turbidity, TDS, residual chlorine and nitrate) and microbiological parameters (faecal coliform and total coliform). These parameters are commonly used as indicators for drinking water quality in terms of aesthetics (colour, turbidity, and TDS), effectiveness of disinfection (residual chlorine) and pollution from agricultural sources (nitrates) (Merrington et al., 2002; OECD and WHO, 2003; WHO, 2008). Coliforms are also universally used as microbiological indicators for drinking water quality (Bordalo and Savva-Bordalo, 2007; WHO, 2008).

Sampling was done once representing a snapshot of conditions at that time, to give an initial indication of the quality of water. All sampling equipment and containers were thoroughly cleaned. Except during processing, all samples were kept chilled (4°C) from the time of collection until analysis. Water temperature, pH, electrical conductivity (EC), and TDS were measured on site using a Hach Model 44600 Conductivity/TDS Metre. Samples were transported to the Environmental Engineering Research Center (EERC) of

the American University of Beirut (AUB) for laboratory analysis in accordance to Standard Methods for the Examination of Water and Wastewater (APHA et al., 2012).

Figure 2 A map of the study area showing the Kaitoule village in Southern Lebanon (see online version for colours)



2.2 Study area

The study area is a village (Kaitoule) located 70 km southeast of Beirut and 30 Km east of Saida in south Lebanon and covers an area of 4 Km^2 (Figure 2). The altitude of the village ranges between 700 and 1,200 m above sea level. Development in the village is of definite concern as it shapes the well-being of the livelihood and defines its sustainability.

2.3 Population and sampling

The number of people residing in the village is about 200 individuals in winter and about 700 individuals in summer considering that many people return for holiday and summer break. The average family size in South Lebanon is 4.5 (UNFPA, 2012). As such, the number of households is estimated at 155 households. Equation (1) was used to estimate the total number of questionnaires to be administered to ensure a statistically representative sample size (Chacko, 2002; Turner, 2003). Accordingly, the estimated sample size was 82 randomly selected households, which constitute more than 50% of the total number of households.

$$S = \left[Z^2 * (p) * (1 - p) \right] / C^2 \tag{1}$$

where Z (critical value) = 1.64 at 90% confidence level, p = 50% probability of selecting an option, C = margin of error ± 6.3.

The unit of analysis (study subject) of the study at hand is the household member (interviewee). The sampling units that made up the study sample are the residential households. Household units, within each randomly chosen residential building, were then randomly selected. In the event of a non-response or rejection, an adjacent household unit was selected. Face-to-face surveying was conducted over a period of one month, taking approximately 15 minutes each to complete.

2.4 Data management and analysis

The data collected were numerically coded to be analysed using the Statistical Package for Social Science (SPSS) software version 16.0. We assessed statistical independence between variables using the Chi-squared test for independence (Agresti, 2007). The association between the variables was assessed with Cramer's V and Kendall tau (τ) correlation coefficient (Kendall, 1938). The tau statistic is a non-parametric test for statistical independence between two variables (Agresti, 2007). A τ statistic of +1 indicates a perfect positive relationship, whereas a τ statistic of –1 is indicative of a perfect negative association between two variables. A tau statistic of zero indicates the absence of a relationship between two nominal variables. While the tau statistic lies between –1 and +1, the second measure of association between nominal variables employed in this study, namely Cramer's V statistic, takes values that range between 0 and 1. A Cramer V statistic of zero indicates the absence of association between two variables, while a value of one is indicative of a perfect association between two variables. A statistical significance level of 5% was used in the analysis. Residual analysis, drawn from cross-tabulation or contingency tables, was also employed in this study to assess the independence of the variables. The residual is defined as the difference in the observed and expected frequencies.

A qualitative content analysis was employed to analyse transcripts. Interviews were based on a systematic procedure of taking notes and verifying data at the end. The text was broken down into important sentences or phrases using the coding process. Categories were then recognised and used to identify the important ideas and concepts that resulted from the data. An action plan was developed in light of the findings and conclusions drawn from the analysis of both the questionnaire and the group semi-structured interview results.

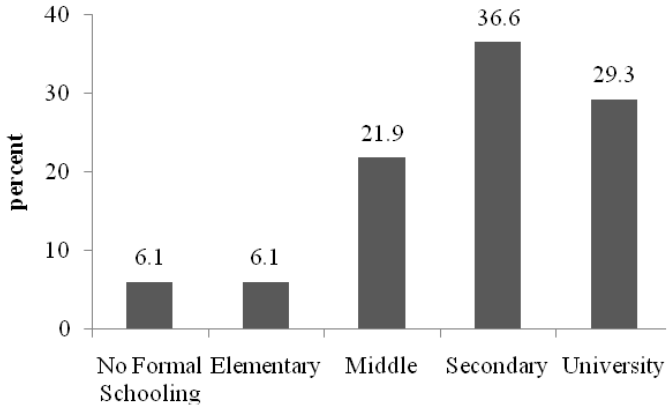
3 Results and discussion

3.1 Livelihood assets and resources

3.1.1 Human capital

The age of participants varied between 26 and 91. The survey ensured the participation of people from different age groups and from both genders. Out of 82 households, 52 (63%) participants were males and 30 were females (37%). The majority of participants are literate (Figure 3) with 29% holding a university degree and more than 50% reached secondary or middle level of education. The low percentage of people with 'No formal schooling' reflects the desire for an attainment of education, which appears to be rewarding at the individual, family and village level with an absence of social discrimination or inequalities on gender basis. The high level of education adds to the strength of people which is in turn is associated with better financial abilities and social environment. As such, educational level is considered an important poverty-reducing factor on which development activities should be built upon (Butler and Mazur, 2007).

Figure 3 Distribution of participants by educational level



3.1.2 Financial capital

While the greatest portion of respondents (n = 57) has jobs, a relatively high percentage (29%) has no jobs. Out of the 25 participants without jobs, nearly half (11 participants) are unemployed due to health-related issues, one quarter (seven participants) due to the absence of work opportunities, and one quarter (seven participants) because they are financially independent (i.e., inheritance or retired). The majority of participants who have jobs work outside the village with more than half (63%) working in the services sector. Similarly, more than half of participants (52%) can easily cover their daily life needs including medication, education and food supplies. Still, 48% find it difficult to cover daily life needs that are increasing with the people's urge to improve living standards. Concerning businesses in the village, the study reveals that the small-scale producers do not suffer from products' competition because their production is small and is easily sold to neighbouring villages.

A total of 25 participants out of the 43 that are satisfied with quality of network water (public water supply provided by the government) supplied have difficulties in covering daily needs while the rest (18 participants) do not. Table 2 shows a significant ($P < 0.05$) and moderate ($V < 0.3$) correlation between the two variables. Moreover, Kendall tau-b (τb) revealed a negative association between using the network water for drinking or food preparation and the ability to easily cover living needs (–0.22). Therefore, people having difficulties in covering living needs are more likely to use network water for all domestic purposes including drinking or cooking.

Table 2 Cross-tabulation of using water for drinking and food preparation vs. ability to cover living needs

Variable		*Can easily cover living needs*		*Total*	*Significance and strength chi-square (P)/Cramer's V*
		Yes	*No*		
Satisfaction with quality of water supplied	Yes	18	25	43	0.044/0.222
	No	25	14	39	
Total		43	39	82	

Table 3 Cross-tabulation of having an adequate shelter vs. ability to easily cover living needs

Variable		*Can easily cover living needs*		*Total*	*Significance and strength Chi-square (P)/Cramer's V*
		Yes	*No*		
Have an adequate shelter	Yes	38	22	60	0.003/0.443
	No	5	17	22	
Total		43	39	82	

Table 4 Cross-tabulation of the ability to cover living needs vs. working inside the village

Variable		*Work inside the village*		*Total*	*Significance and strength Chi-square (P)/Cramer's V*
		Yes	*No*		
Can easily cover living needs	Yes	1	26	27	0.003/0.4
	No	11	20	31	
Total		12	46		

According to Table 3, participants (38 out of 43) are more likely to have an adequate shelter (quality housing) when their financial status is good and can easily cover living needs. Table 4 summarises the results of the Chi-squared and the Cramer's V tests performed to assess the correlation between the ability to cover living needs and working inside the village. A total of 11 out of the 12 participants that work inside the village cannot cover living needs.

The correlation between educational attainment and financial capability was significant ($P < 0.05$) and strong ($V > 0.3$) (Table 5). Analysis of the residuals revealed a positive relationship between the university level education and the ability to cover living needs.

Consistent with worldwide observations (Nyerere, 2007; IFAD, 2011), the financial capital in the village was affected by the decline in the agricultural sector that used to be an important source of income for many families. Migration from the village is evident

by the low number of inhabitants. As expected, income gains shifted to non-agricultural wages and self-employment income (Nyerere, 2007; IFAD, 2011). As such, the majority of participants are working in the service sector with the highest percentage working outside the village due to limited economic opportunities in rural areas (Chambers, 1981; Bebbington, 2002). The limited economic opportunities are strongly associated with less financial capability as evident from the statistical analysis showing that participants working inside the village have low ability to cover financial needs and reflecting the importance of economic improvements in the village. Yet, most participants do not choose the financial capital as the most important capital that needs improvement. This may be attributed to the fact that many people are not willing to leave their work and their homes in the city and prefer improvement in other ways.

Table 5 Cross-tabulation of educational level vs. ability to cover living needs

Variable		*Educational level*[1]					*Total*	*Significance and strength Chi-square (P)/Cramer's V*
		I	*E*	*M*	*S*	*U*		
Can easily cover living needs	Yes	2	1	5	15	20	43	0.003/0.443
		(–0.6)	(–1.6)	(–4.4)	(–0.7)	(7.4)		
	No	3	4	13	15	4	39	
		(0.6)	(1.6)	(4.4)	(0.7)	(–7.4)		
Total		5	5	18	30	24	82	

Notes: Numbers in parentheses refer to residuals computed as the difference between observed and expected frequencies.
[1]I = illiterate; E = elementary; M = middle; S = secondary; U = iniversity.

3.1.3 Physical capital

The physical capital was reported by participants as the most capital that necessitates improvement (Figure 4). Out of 82 participants, a small percentage (12%) attends the dispensary in the village, while the majority (88%) prefers to go to hospitals in nearby cities. Moreover, about 66 participants (80%) reported that the dispensary is not well equipped reflecting poor healthcare services which are common in rural areas (Carney, 1999; Van Berkel et al., 2011). Road infrastructure is generally good as confirmed by the majority of participants (90%). Regarding shelters' conditions, the highest percentage of participants (74%) has adequate shelters and the rest expressed worries about humidity and cracks in building walls reflecting a need to examine and assess shelters' conditions to decrease health risks such as respiratory illnesses and lung function diseases.

All participants reported having backup access to electricity during governmental blackouts as they rely on private generators. With regards to solid waste, it is collected 2–3 times per week and almost all participants reported no incidents of solid waste accumulation, which is invariably related to the low generation rate and low population in rural areas when compared to urban areas. All participants are connected to the village water and wastewater networks reflecting adequate facilities regarding sanitation at the household level, which may not be the case in rural areas where access to sanitation facilities is relatively limited. However, the discharge of raw wastewater in the open

environment prior to treatment creates a concern considering its negative impacts on the receiving environment.

Figure 4 Ranking the capitals according to the need of improvement

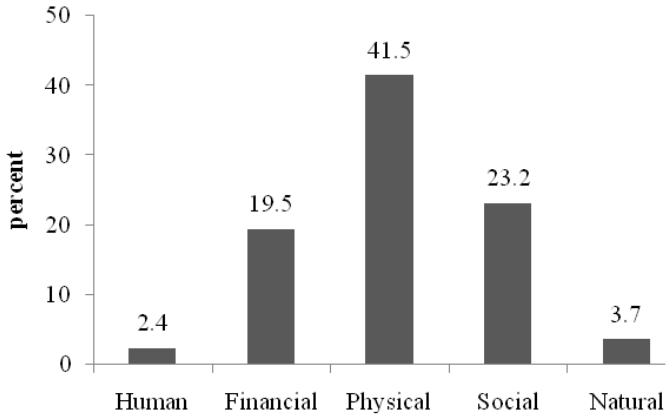


Table 6 The results of the spring water quality assessment

Springs / *Parameters*	*S1*	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*
pH	7.57	7.26	6.08	7.56	7.00	7.60	6.35
Conductivity (µs/cm) at 25°	439	364	797	622	584	489	420
TDS (mg/l) at 25°	219	182	398	310	292	245	210
Sulphates (mg/l)	4	54	360	215	63	74	51
Nitrates (mg/l)	4.1	1.1	0	3.5	4.6	4.9	10.4
Faecal/total coliform (CFU)/100 ml	0/0	22/35	0/15	96/145	2/37	15/39	0/19

While two-thirds of the participants (67%) reported that the water in the village is of a good quality, 33% perceived it as turbid or polluted. About 10% of those who use the water for drinking or food preparation reported gastrointestinal disorders on a regular basis. Half of the participants (48%) rely on bottled water for drinking and cooking. Laboratory analyses revealed the presence of faecal and total coliform bacteria in certain spring samples. A summary of the quality of the water samples collected from various springs in the village and nearby areas is presented in Table 6. The results showed that the TDS recorded for the majority of the samples is lower than the WHO guideline of 600 mg/l. None of the samples have exceeded the WHO Standard Value and the Lebanese Maximum Allowable value of 50 mg/l for nitrates. Likewise for sulphates, the majority of the samples were within acceptable values. With regards to microbiological contamination, the poor water quality may be attributed to poor operation and maintenance of the treatment processes by unqualified personnel.

A total of 40 participants out of the 55 that replied they are satisfied with the water quality, use the water for drinking and cooking purposes (Table 7). Moreover, most of the 27 participants that replied dissatisfaction with the supplied water quality do not use the

water for drinking and cooking. Noticeably, a strong correlation ($P < 0.05$, $V > 0.3$) exists between satisfaction with the network water and usage for drinking or food preparation.

Table 7 Cross-tabulation of satisfaction with the quality of water supplied vs. using water for drinking and food preparation

Variable		*Using water for drinking and food preparation*		*Total*	*Significance and strength Chi-square (P)/Cramer's V*
		Yes	*No*		
Satisfaction with quality of water supplied	Yes	40	15	55	0.003/0.58
	No	3	24	27	
Total		43	39	82	

Nearly 61% of the participants reported a problem with the quantity of water received at the household level as it is not always sufficient for daily usage especially in the summer. The quantity of water needed per day in the village based on the 100 litres/capita/day that is recommended by the WHO is 20,000 l/day (20 m^3/day) in winter based on a 200 inhabitants estimation and 70,000 l/day (70 m^3/day) in summer based on a 700 inhabitants estimation. The village receives an overall of 170 m^3/day, which is equivalent to about 850 litres/capita/day in winter with a population of 200, and 242 litres/capita/day in summer with a population of 700. Thus, water quantities are considered sufficient to meet consumption and hygiene demands when compared to the 100 litres/capita/day set by the WHO.

In the case of a seasonal water shortage of 50% in summer, the amount of water received will be about 50,000 l/day from the springs, in addition to 35,000 l/day from the Government Water Establishment. Therefore, the village would receive a total of 85,000 l/day (85 m^3/day) from both sources. This is equivalent to about 122 litres/capita/day in summer, which is also considered acceptable when compared to the WHO values. However, the problem arises when the village receives just 50,000 l/day (50 m^3/day), which is equivalent to 71 litres/capita/day in summer from the springs and nothing from the Government Water Establishment.

3.1.4 Social capital

The social capital was chosen by participants as the second aspect that needs improvement in the village. This may be explained by the social marginalisation and inequities in rural areas (Chambers, 1981; Bebbington, 2002). The results revealed that a minority of participants (14%) suffer from internal conflicts due to the presence of two political parties in the village. This may be attributed to the fact that most people have similar religious background and share common traditions and social norms which can boost social capital and positively affect the abilities of people to solve their own problems (Falk and Kilpatrick, 2000). The survey showed that a considerable number of participants (29) do not trust the municipality. The largest percentage of participants (73%) responded that the municipality does not arrange beneficial awareness and gathering events. This situation can affect the commitment of the municipality to the community and therefore can affect the trust between the two sides (Falk and Kilpatrick, 2000).

3.1.5 Natural capital

A small number of participants (9%) answered that there are unacceptable environmental practices like burning waste, cutting trees, or dumping garbage in surface water bodies in the village. The natural capital received the least rating with regards to the need for improvement. Although the municipality is trying to be vigilant about illegal environmental practices, a visit to the village revealed the existence of burning of tree branches and waste. Such activities may lead to fire accidents that can affect the area. Therefore, proactive activities are needed to control or decrease potential fire accidents that are often the outcome of human activities and negligence.

3.2 Vulnerability context

3.2.1 Natural shock

As mentioned earlier, as a result of the 1956 earthquake and the migration of people and the abandonment of lands, at present, productive areas in the village are < 5% (~0.2 km^2). These lands are mostly planted with olive trees and are governed and maintained by the municipality. A couple of fire accidents have been witnessed in the village leading to a loss of biodiversity and green areas that were known as important attractive aspects of the village.

3.2.2 Political shock

Nearly 17 years of civil unrest that ended in 1990 affected the village's livelihood. Inhabitants were forced to join armed militias or migrate to work in other areas for livelihood improvement and enhancement of family conditions.

3.2.3 Economic shock

Members of the municipality reported that the village has experienced an economic shock due to the loss of agricultural labourers and the increase in competitiveness. Farmers were unable to sell their crops as there were other crops from other countries in the market. The effect of products competition along with the effect of the political situation forced many people to get involved in non-agricultural activities outside the village. Currently, agricultural activities are concentrated on producing family needs. Moreover, there are two small shops, one butcher shop, one carpenter, three small chicken and cows' farms and two families that raise bee for honey production on a small scale.

3.2.4 Technological advancement

The village did benefit from technological advances in different ways. With the support of public and private institutions, the municipality implemented several projects including a water network, changing and upgrading street infrastructure and lighting, expansion of the sewer network, a telephone network and better rainwater drainage.

3.3 Existing management strategies

Due to the weak local economy that is characterised with the presence of a limited number of small-scale businesses, the municipality has been planning to implement various activities with the help of national and international institutions. Recently, the World Bank funded a project consisting of a tourist resort, which is in line with an overall view for the development of the village. In addition, the municipality is in the process of preparing for a wide publicity campaign targeting newly established ecotourism operators to increase the number of visitors to the village. The goal is to develop the local economy and create new employment opportunities.

With the support of public and private institutions, the municipality has been able to build a water network that covers the whole village. Regarding the quantity of water, visits to the village revealed that people at the household level use the water inefficiently. In addition, a considerable quantity of water is lost due to leaky pipes in the village. The municipality has built a large container of a capacity of 900 m^3 to store water when it is available from the Water Establishment. Two other plastic containers each of 20 m^3 are also being used for irrigation purposes. With respect to the water received from springs, treatment is conducted including screening, aeration, filtration using sand and adsorption units with activated carbon. However, the person responsible for the monitoring of the treatment plant lacks the expertise and qualifications. Likewise, with the support of public and private institutions, the municipality has been able to expand the sewer network and is planning to construct a wastewater treatment plant.

Concerning the organisation of meetings, workshops or events, the municipality had organised several summer camps for children. In addition, the ecotourism project will increase the number of visitors and thus increase the interaction among people in the village. As a response to the loss of green areas in the village due to reported fire accidents, the municipality has planted over 12,000 trees in the forest with an area of over 2 km^2.

4 Conclusions and management action plan

The utilisation of the SLA allowed the identification of possible entry points for development and support, by highlighting gaps in existing management strategies. The physical, social, and financial capitals were given higher priority for development. Least importance was given to the human capital and medical services in the village. Water quantity and water quality monitoring, communication, and allocation of financial resources are aspects that need effective management. Resources in the village were related to the existence of high financial and human capitals (people with high educational levels) both correlated with good living conditions.

Table 8 Management action plan addressing environmental challenges in the village

Aspect	*Action/measure*	*Coordinating authority*	*Frequency*
Physical capital			
Shelters	• Asses the conditions of shelters of unfortunate people in the village	M/E[1]	Annual
Water quality	• Assess the effectiveness of the water treatment plant • Monitor the quality of water to ensure a safe level of residual chlorine • Employ experienced personnel to operate the water treatment plant • Conduct town meetings with the community to inform people about water quality in the village and increase their awareness about the proper usage of water to protect public health	M MoEW[2]	Regular
Water quantity	• Initiate awareness campaigns on ways to save water and minimise losses at the household level • Detect and fix leaky pipes throughout the village	M	Biannual
Wastewater	• Consider decentralised wastewater treatment as it reduces the capital as well as the operation and maintenance costs	M/P[3]	-
Solid waste	• Carry out awareness programs to promote the reduction and recycling possibilities of solid waste • Assess the possibility of solid waste composting	M/P[3]	Biannual
Medical services	• Coordinate with the Ministry of Public Health to supply medical services specifically directed to the needs of the village	M	Regular
Social capital			
Communication and micro-macro links	• Initiate meetings and workshops to build micro-macro links and bridge the gap of communication between policy level institutions and the community • Involve the youth in the municipal and the development work as this instills a sense of belonging to the village	M	Regular

Notes: [1]M/E = municipality/local engineers; [2]MOEW = Ministry of Energy and Water;
[3]M/P = municipality/private sector; [4]MOA = Ministry of Agriculture;
[5]MOE = Ministry of Environment; [6]MOT = Ministry of Tourism.

Table 8 Management action plan addressing environmental challenges in the village (continued)

Aspect	*Action/measure*	*Coordinating authority*	*Frequency*
Financial capital			
Businesses	• Capitalise on present businesses • Support the livestock sector by assisting breeders and farmers in their production	M/P	Regular
Agriculture	• Construct and rehabilitate existing agricultural roads in order to provide access to arable lands	M MoA[4]	Regular
	• Protect green spaces and capitalise on them in developing ecotourism projects		
Marketability	• Improve advertisement and the linkages with local markets	M	Quarterly
	• Develop a weekly market for agricultural and commercial products	MoA	
Ecotourism	• Preserve cultural and natural heritage and valorise it to visitors	M MoE[5]	Regular
	• Rehabilitate hiking trails	MoT[6]	
	• Train touristic guides		
	• Prepare a comprehensive touristic map		
Natural capital			
Fires	• Involve the public in cleaning green areas from wood and fallen leaves	M	Annual
	• Assure the existence of forest roads to access fire locations		
Human capital			
Environmental behaviours	• Introduce pollution taxes and penalties	M MoE	Regular
Education	• Capitalise on existing knowledge and skills of local people through initiating meetings and workshops, which will help in training and sharing knowledge between people from different educational levels	M	Regular

Notes: [1]M/E = municipality/local engineers; [2]MOEW = Ministry of Energy and Water; [3]M/P = municipality/private sector; [4]MOA = Ministry of Agriculture; [5]MOE = Ministry of Environment; [6]MOT = Ministry of Tourism.

The proposed action plan (Table 8) aims at addressing environmental challenges in the village to ensure sustainable development and poverty alleviation. It defines roles and responsibilities of those involved in the development process. Mitigation measures should be executed, in a bottom-up participatory process, with the involvement and participation of the municipality and people from different age groups and both genders to encourage partnership between government and civil society. Concurrently, communication and cooperation of various ministries with the municipality and the

community are critical together with a commitment from the municipality to develop effective channels of communication for a successful implementation of the proposed plan. Typically, environmental management plans are developed by the government or experts. In our study, the utilisation of the SLA facilitated the development of a management action plan that is based on detailed local knowledge and community input whereby municipality members as well as members of the local community participated in the process. The analysis of the study area livelihood through a comprehensive framework enabled the identification of community challenges and the setting of the strategies to overcome these challenges. This comprehensive and practical approach can be replicated in other villages in developing countries. While several approaches could be adopted, utilising the SLA can additionally improve the accountability of the public institutions.

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