Participatory Watershed Management Planning Methodology

Funded by the World Bank's "Program on Forests" (PROFOR)

Deliverable 2

Section 1: Final Report
Section 2: Methodology for Participatory Watershed Planning
Section 3: Participatory Micro-Watershed Management Plans for Gwelan & Sault du Baril

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Preface

This report and related field studies would not have been possible without the efforts of many people, especially the team of specialists who carried out rapid expert assessments. This included agronomist Carl Monde, who served as key advisor and champion for this project at the Ministry of Agriculture, and was also a valuable key informant for site selection; agricultural economist Fresner Dorcin who facilitated workshops and edited the expert team's field report; engineer-hydrologist Jean Brunet Georges, ecologist-forester Joel Timyan, community organizer Vernande Joseph, and Glenn Smucker, the lead author of the report who is a cultural anthropologist. This team planned workshops and carried out Rapid Expert Assessments at two field sites, Sault du Baril and Gwelan (Anse à Veau).

The entire J/P HRO team benefitted greatly from the advice, comments and support provided by Katie Kennedy and Caroline Plante of the World Bank. Chris Ward, Executive Director of Haiti Takes Root for J/P HRO, fostered the entire process from beginning to end, including numerous exchanges over concepts, and overall facilitation of J/P HRO administrative support. Chris Ward also contributed greatly to the writing, editing and formatting of the report. Ecologist Joel Timyan made indispensable contributions for site analysis, thematic atlases for the two sites, biodiversity assessment, the proposed package of technical interventions, and the writing of two participatory micro-watershed management plans that are included in Deliverable 2.

Chris Ward served as a thoughtful reader and commentator, also Jerome Lebleu and Melinda Miles, who also provided unconditional support in other ways. Jason Riffe facilitated the design of high quality infographics. Liam Storrings contributed a series of high quality photographs. Numerous other photographs and visual illustrations were contributed by Joel Timyan and Glenn Smucker.

Fritz-Gerald Chery provided invaluable logistical assistance in the field. Above all, the farmers, fishers and market vendors of Gwelan and Sault du Baril contributed heart and soul to the participatory process and were indispensable contributors to the end product by virtue of their patience, enthusiasm and lively comments.

Acronyms

ArcGIS	*Arc Geographical Information Systems (ESRI software)*
ASEC	*Assemblée de la Section Communale,* Assembly of the Communal Section
AVANSE	*Appui à la Valorisation du potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale,*
BPDA	*Bureau pour le Développement de la Production Agricôle*
CASEC	*Conseil d'Administration de la Section Communale*
CIAT	*Comité Interministériel d'Aménagement du Territoire,* Inter-Ministerial
CNIGS	*Centre National de l'Information Géo-Spatiale*
DEED	*Economic Development for a Sustainable Environment*
DIA	*Direction d'Infrastructure Agricole (MARNDR)*
DINEPA	*Direction Nationale de l'Eau Potable et de l'Assainissement*
DPC	*Direction de la Protection Civile*
ESRI	*Environmental Systems Research Institute*
FAO	*United Nations Food and Agriculture Organization*
FEDA	*Ferme d'Experimentation et de Demonstration Apicole*
GE	*Google Earth*
GIS	*Geographic Information System*
GOH	*Government of Haiti*
Ha	*Hectare*
HTR	*Haiti Takes Root*
IHSI	*Institut Haïtien de Statistique et de l'Informatique*
J/P HRO	*J/P Haitian Relief Organization*
Km	*Kilometer*
Kml	*Keyhole Markup Language*
MARNDR	*Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural*
MDE	*Ministère de l'Environnement*
MPCE	*Ministère de la Planification et de la Coopération Externe*
NGO	*Non-governmental organization*
OAS	*Organization of American States*
OCHA	*United Nations Office for Coordination of Humanitarian Affairs*
PADF	*Pan-American Development Foundation*
PES	*Payment of ecosystem services*
PROFOR	*Program on Forests (World Bank)*
REA	*Rapid Expert Assessment*
RN21	*Route Nationale 21*
RPL	*Resilient Productive Landscapes*
SIG	*Système d'Information Géo-Spatiale*
TWMP	*Targeted Watershed Management Program*

UNDP	*United Nations Development Program*
UNEP	*United Nations Environment Program*
USAID	*United States Agency for International Development*
WB	*World Bank*
WINNER	*Watershed Initiative for National Natural Environmental Resources*

SECTION 1 - FINAL REPORT

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I. OVERVIEW

Purpose of Study

Objective. As part of World Bank's Program on Forests (PROFOR), the J/P Haitian Relief Organization (J/P HRO) designed and tested a highly participatory methodology for watershed management planning. The purpose of this work was to develop a replicable tool for generating community-led watershed management plans across the country as a defining feature of the Haiti Takes Root initiative (HTR).[1]

Deliverables under this PROFOR-supported study included the following:

- A draft methodology for participatory watershed diagnosis and planning, and a study plan for field testing this proposed approach (Deliverable 1);
- A final report, a detailed methodology and associated step-by-step guide for participatory watershed management planning, and participatory micro-watershed management plans for two test sites (Deliverable 2); and,
- A public presentation of study findings and methodology to key stakeholders (Deliverable 3).

Test sites. The proposed process for developing the participatory methodology included concrete application of the watershed planning tool in two targeted micro-watersheds:

- An upland portion of the larger Sault du Baril watershed, defined by mountain springs, waterfalls and highland agriculture; and,
- A micro-watershed defined by the Gwelan spring, including coastal wetlands, mangroves, fisheries, sand and gravel quarries, and adjoining dry slopes near the national road (Nippes).

Both micro-watersheds fall within the Rivière Froide watershed of the department of Nippes, an area affected by the destructive passage of Hurricane Matthew (October 4-5, 2016). Adjoining map shows site locations. Both sites are located within the Sault du Baril communal section of Anse à Veau commune.

Figure 1. Micro-watersheds targeted for testing participatory watershed planning methodology

[1] HTR is a unique public-private initiative led by the Government of Haiti, which seeks to promote sustainable reforestation and greater resilience to climate change in Haiti. Other members of the HTR Coalition include the Government of France, the World Bank, J/P HRO and the Parker Foundation.

Figure 2. Hydrological map of Gwelan micro-watershed

Figure 3. Wetland rice paddies of Gwelan, coastal mangroves in background

Figure 4. Hydrological map of Sault du Baril study site

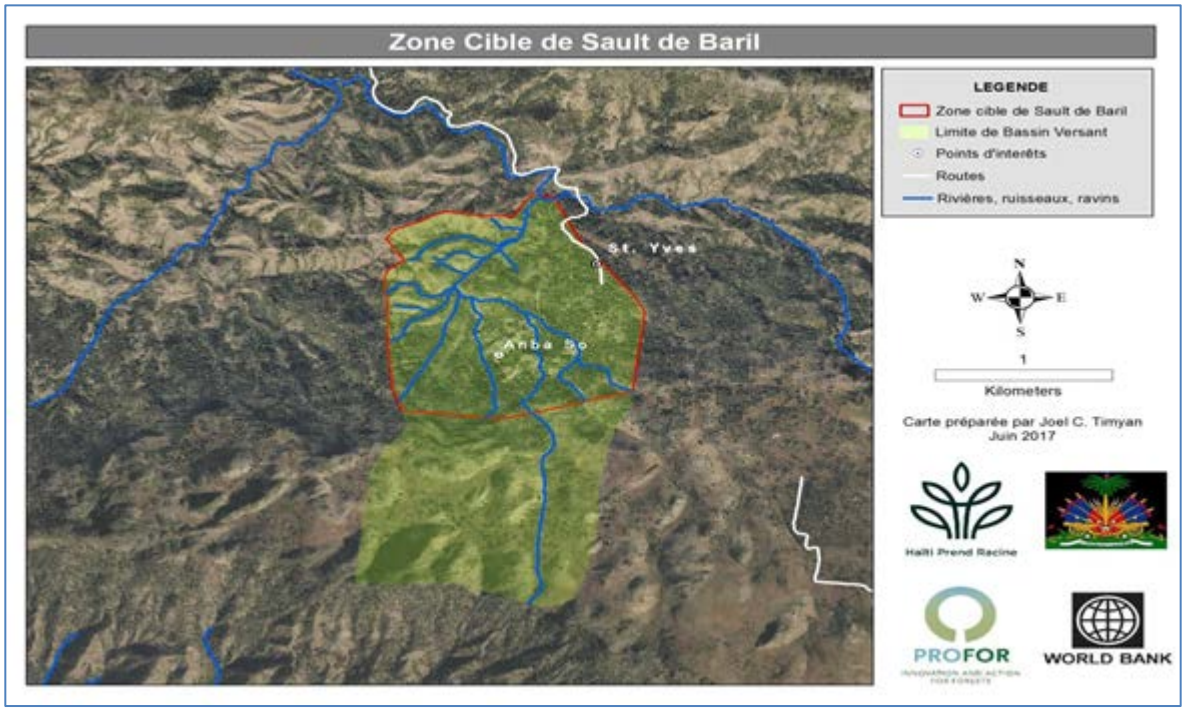

Figure 5. One of a series of waterfalls and riparian foliage characteristic of Sault du Baril pilgrimage site

Approach

The watershed orientation of this methodology includes a "ridge-to-reef" approach where applicable, and the targeting of *high priority* micro-watershed sites that show promise of a positive rate of return on land use planning and investments.[2] This approach prioritizes these critical sites for more intensive investment rather than equally distributed investments throughout all areas of the watershed.

Secondly, a guiding premise of the methodology is that successful programming of watershed interventions requires meaningful engagement of local populations in the implementation of more sustainable land use practices and more efficient management of water resources. In Haiti, this includes agricultural strategies that protect the resource base by, for example, emphasizing agroforestry and expanded tree cover on fragile slopes.

Accordingly, the critical incentive for more sustainable land use is the tangible economic interests of local people, linking livelihood pursuits with improved protection of the environment. The challenge is to identify sites that incentivize collaborative efforts focused on high-value natural assets such as springs, ravines, watercourses, wetlands, and irrigable land, as well as coastal resources such as mangroves, fisheries, and coconut groves.

[2] Haiti also has watersheds and sub-watersheds that do not include ridge to reef outlets to the sea.

Glossary of Terms

Watershed. Area of land that contributes runoff to a lake, river, stream, wetland, estuary, or bay[3].

Sub-Watershed. A water catchment area that falls within a larger watershed. It may also be a water course and catchment area within a hydrological zone.

Hydrological zone. Water resources within a geographic area. A hydrological zone may be composed of several watersheds.

Micro-watershed. A small watershed. It may be situated within a larger watershed. At the two sites targeted for study, it includes water courses and related catchment areas that are fed by nearby springs.

Agro-Ecological Zone. Zones based on the most sustainable agricultural use of the land given the soils and topography of the target area.[4]

Holdridge Life Zone. The Holdridge life zones system is a global bioclimatic scheme for the classification of land areas. It is a relatively simple system based on few empirical data, giving objective mapping criteria.[5]

Watershed approach. Spatial planning defined geographically by the flow of water including both surface water and groundwater. A watershed approach also includes biophysical and socioeconomic characteristics.[6] A watershed approach views local populations as the critical stakeholders in watershed management.

Watershed plan. A tool for managing natural resources of a watershed or micro-watershed which promotes sustainable economic development. [7] A watershed plan describes the character of the watershed, provides analysis, identifies priorities and defines actions to implement the plan. Watershed management actions should be supported by sound science, appropriate technology and a participatory approach to setting priorities for watershed management.

Watershed or micro-watershed stakeholders. Interested parties. People who have a stake in the target zone. People or institutions whose activities or interests are directly linked to a watershed or micro-watershed. It includes residents but may also include non-residents whose lives or work involve the targeted site, e.g., local elected officials or traders.

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[3] See Section 1.1 of the US EPA (United States Environmental Protection Agency) handbook on watershed planning (2008).
[4] This definition retains the notion of sustainable land use. See Annex for participatory micro-watershed management plans that include thematic atlases prepared by Joel Timyan for Gwelan and Sault du Baril study sites (Timyan, June 2017). See also FAO 1995 and FEWS-NET 2005, linking agro-ecological zones to varied livelihood strategies in rural Haiti.
[5] Holdridge, L. R. 1967. *Life Zone Ecology.* Tropical Science Center, San Jose.
[6] MDE (2012, 18), Guide Méthodologique pour l'Élaboration des Plans de Gestion des Bassins Versants d'Haïti, also Section 2.1 of EPA (2008) and CIAT (May 2011, pp 6-8).
[7] See MDE 2012.

Participatory Approach. Local empowerment. Engagement of local people in the process of watershed planning and management.[8]

Geographic Information System (GIS). A geographic information system is designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.

Cultigen. A cultigen is a plant that is the result of artificial selection by humans. It refers here to domesticated crops cultivated by Haitian farmers.

[8] The present study draws on the notion of subsidiarity, i.e., solving a problem at the level of the smallest or most local unit capable of handling the problem (Millon-Delson, 1992), and also on the notion of local empowerment, i.e., "empowerment of community members to define and solve their own problems" (Doolittle, 2016, 14).

II. STUDY FINDINGS

The study team developed a three phase methodology for participatory watershed management planning including the following: (i) a site selection phase, (ii) a rapid micro-watershed assessment strategy, combining a rapid science-based assessment by experts along with participatory assessment by local stakeholders, and (iii) a final phase to identify priorities for specific micro-watershed interventions, based on stakeholder review and consensus. These phases were developed and tested over a five-month period between April and August of 2017. [9]

The initial stage of methodology development included a literature review to draw upon lessons learned from earlier efforts at landscape level interventions in Haiti, including watershed management. The study team's reflections on lessons learned are summarized below. They are drawn from watershed management efforts in Haiti as well as other settings outside of Haiti. These lessons learned were taken into account in the development and testing of the Participatory Watershed Management Planning Methodology presented in Section 2 of Deliverable 2.

Reflections on Lessons Learned

Lessons Learned from Watershed Management Efforts in Haiti

Based on a detailed literature review along with stakeholder interviews, the HTR team has determined that lessons learned from other efforts at watershed management tend to revolve around several critical issues summarized below.[10]

- **Economic strategies for protecting the land**. Haiti's watersheds are actively used. They are not empty lands devoid of people. Consequently, reforestation efforts geared to protect land units without regard to livelihood concerns have not generally been successful. In contrast, revenue-generating farm forestry and agroforestry approaches have shown far more success at garnering participant support and the adoption of new land use strategies. Other successful efforts have included terracing linked to vegetable cropping (Murray 1979), or sugar cane in ravines and on slopes (Maïssade) and agroforestry cultigens such as coffee, cacao, shade cover and fruit and forest trees.[11]

- **Shortcomings of top-down strategies.** Scientific specialists have successfully studied watersheds from the top down in Haiti, utilizing GIS analysis and mapping to gain detailed understanding of

[9] See Annex A for implementation calendar, April-August 2017.

[10] For more detailed discussion see Tarter *et al*, 2016, A History of Landscape-level Land Management Efforts in Haiti: Lessons Learned from Case Studies Spanning Eight Decades. The discussion here also draws upon reports authored or edited by Glenn Smucker including the watershed management plan for the Chaîne des Matheux (2014), Environmental Vulnerability in Haiti (2007), Agriculture in a Fragile Environment (2005), Do Small Farmers in Haiti Invest in NRM without External Subsidy? (2003) and Social Capital and Development in Haiti (1999).

[11] See Smucker (2001) on PADF-Plus and conservation farming, Smucker *et al* (2005, 8) on sustainable landscape shifts related to revenue generation strategies, also Murray and Bannister (2004) on tree cropping, and White and Runge (1995) on micro-catchments including sugar cane in Maïssade ravines.

target zones. In effect, watershed planning requires scientific analysis to characterize watersheds and help set priorities for watershed interventions; however, outsider analysis alone, and the imposition of new land use practices by fiat from the top down, have shown little or no success in initiating landscape level shifts. To the contrary, top down interventions without local consultation have commonly been ignored or actively resisted by local inhabitants (see White and Jickling 1992). Maguire (1979, 5) noted that failed projects in Haiti commonly reflect "…the failure to involve local people in the effort."

- **The critical importance of participatory strategies**. Compared to top down strategies, participatory strategies have been far more successful; however, forms of participation have often been too narrowly defined by donors – for example, local contributions of land and labor, or evidence that farmers have adopted new practices. In sum, an important lesson learned is that local stakeholders should be integrated into the full cycle of project identification, implementation and ownership.[12]

- **The challenge of scaling up from scattered plots.** The agricultural landscape in Haiti is composed primarily of smallholders who farm a portfolio of four to five small, non-contiguous plots. The history of land use interventions in Haiti's watersheds tends to reflect this pattern, i.e., scattered interventions on fragmented plots. As a result, there has been far greater success with land use shifts on individual farm plots rather than contiguous parcels—let alone on whole slopes, micro-watersheds or larger watersheds. Therefore, a challenge in promoting watershed interventions has been how to scale up from a plot based approach to seamless coverage of contiguous plots and landscape level shifts in land use.[13]

- **Whole landscapes and whole watersheds**. A common feature of macro-level approaches has been a tendency towards overly ambitious goals and interventions.[14] Goals have not proven achievable within the limited time frames of three to five year funding cycles. As noted above, it has proved elusive in Haiti to instigate landscape level shifts. This is due in part to the overly ambitious land scale of whole watershed initiatives, too many actors, too much land, [15] too many parameters, and the sheer diversity of agro-ecological zones within a single watershed, including zones that show little promise for a rate of return that would justify the investment.[16]

- **Risk versus opportunity**. Watershed-level interventions defined primarily by needs, degraded land, risk and vulnerability have had difficulty achieving their goals—especially goals of sustainability. There has been more success with investing in assets and opportunities, such as springs, water courses, fertile soils, irrigable land or high value perennial crops including trees.

[12] See White and Jickling (1992), Smucker (2014) and Tarter et al (2016).
[13] See White and Runge (1995) on micro-catchment level interventions and collaboration across contiguous farm plots in productive ravines.
[14] See for example the USAID funded Targeted Watershed Management Project: Pwoje Sove Te (TWMP, 1987-1994); Développement Economique pour un Environnement Durable (DEED, 2008-2012); Watershed Initiatives for Natural Environmental Resources (WINNER, 2009-2011); or Appui à la Valorisation du Potential Agricole du Nord AVANSE-Feed the Future), in watersheds of the North and North-East (2011-2018), all cited in Tarter *et al* (2016); also, see DEED (2010), and Deslorges and Pierre (2013) regarding WINNER.
[15] The land area of each of Haiti's 54 major watersheds and hydrological zones is enormous (see OAS 1972).
[16] See Smucker et al (2005, 8).

For example, the success of the USAID funded Agroforestry Outreach Project and successor projects were rooted in farm forestry, i.e., planting trees as a harvestable crop.[17]

- **Watershed governance**. The watershed is not a legally prescribed unit of governance in Haiti. Furthermore, watersheds as geographic units do not generally coincide with administrative units. This complexity is a challenge for watershed governance, especially for enforcing zoning and related restrictions on land use. Nevertheless, a watershed approach is consistent with national policy guidelines.[18] Furthermore, the 1962 *Code Rural* includes erosion control measures and regulates tree cutting, land clearing and seasonal crops on slopes. The 2006 decree on local government provides for environmental action plans at the commune level.[19]

  In the end, governance issues are not so much constrained by the absence of a legal framework as by weak administrative capacity for enforcement, which may include the absence of political will for enforcement. At local levels, the issue of political will tends to vary from one site to another. Where watershed governance works best, it reflects active citizen support and active collaboration between local people and local elected officials, particularly around local issues affecting livelihoods, e.g., springs, irrigation user associations, grazing and fire control.

- **Grassroots as frontline for watershed interventions**. An important lesson learned is that the active engagement of local people and local elected officials is an essential ingredient of watershed governance. Consequently, watershed interventions should build on the most local feasible level of planning in keeping with tangible local interests, including economic incentives, using principles of subsidiarity. "Subsidiarity" is defined here as solving a problem at the level of the smallest or most local unit capable of handling the problem (see Millon-Delson, 1992). Planning may also require top down analysis, but direct watershed interventions work best in Haiti when building from the bottom up, including participatory planning.

- **Grassroots organizations in Haiti**. Social capital studies show that grassroots organizations operate best in rural Haiti when they emulate widely practiced, culturally indigenous groups whose functioning is firmly rooted in shared risk and shared gain, for example, rotating credit groups (*sang*) and rotating labor groups (*eskwad*).[20] These principles of shared risk and gain can also be applied to grassroots collaboration around natural resources such as water, including irrigation associations, or conservation works and protection of micro-watersheds via rotating labor groups and seamless, inter-parcel treatment of contiguous gardens (see White and Runge 1995).

Lessons Learned from Other Settings

The following section reflects lessons learned from settings outside of Haiti. This includes management plans from Kenya, recent case studies reported by the World Bank (EcoAgriculture Partners) and UNEP

[17] See Bellande (2009) on the economic potential of high calorie tree crops, Smucker (2001) on tree cropping and agroforestry, Smucker *et al* (2005, 8) on landscape shifts attributable to economic gain, also White and Runge (1995).
[18] See CIAT (March 2010, June 2011), the Haitian governmental Environmental Decree of 2005, and the 1999 watershed policy of the Ministry of Agriculture, also land use standards annunciated in the 1962 Code Rural.
[19] See Smucker (2014, 36-38) on issues in watershed governance.
[20] See Smucker (1999) on indigenous forms of social capital that work successfully.

(Landscapes for People, Food and Nature Initiative), also the complex challenge of Chesapeake Bay in the United States). [21]

- **Long-term investments.** An important lesson learned from South Africa points to the need for long term timeframes—at least ten years when organizing around landscape level investments. This reflects the importance of cultivating relationships with divergent stakeholders, and collaboration over time to incentivize changes in land use behavior (see G. Kissinger, 2014, Namaqualand, South Africa). A long-term strategy of at least ten years is also a prominent feature of HTR guidelines for watershed management and reforestation programming.

- **Manageable scale.** A report on regional lessons learned notes that stakeholders target landscapes that are small enough to manage, but large enough to serve a diversity of stakeholders with varied landscape related interests (see Buck 2017 on lessons learned in Mexico and Central America), i.e., "…a scale that is small enough to maintain a degree of manageability." This issue also sheds light on the challenge of scaling up from scattered plots, as noted earlier (see White and Runge, *op. cit*.), and working from the bottom up (Maguire 1995).

- **Diversity of stakeholders and interests**. Despite the issue of manageable scale, the above landscape definition (i.e., stakeholder views of a manageable scale) also recognizes the *diversity* of stakeholders and interests within even a small scale landscape (*ibid.*). This feature points to the complexity that flows from significant variability of agro-ecological zones in close proximity, a characteristic of Haitian watersheds at virtually all levels including micro-watersheds, and which must be considered and managed in any successful program.

- **Stakeholder mapping**. The above report (Buck et al 2017) also emphasizes the importance of identifying key stakeholders, and makes reference to the "Interest and Influence Matrix Tool" devised by Brouwer *et al* (2015). This tool seems consistent with rapid ethnographic approaches that rely on key informants who know the landscape and its actors (see Doolittle 2016). Use of key informants is a critical feature of the rapid HTR approach to identifying and engaging stakeholders.

- **Risks and opportunities**. The reference cited above also points to *stakeholder mapping* as a means to identify and classify groups according to the "risks and opportunities" that they perceive in the landscape, especially opportunities for near term gain related to improved land management. This reference is consistent with the HTR strategy for participatory identification of assets and opportunities in targeted watersheds and micro-watershed basins. The finding on stakeholder mapping also notes the importance of near term, medium term and long-term phases in watershed interventions and planning. The extended time frame is a critical parameter for watershed planning, particularly as meteorological events, market shifts, and the impact of watershed interventions generate new needs, risks and opportunities.

[21] These studies include the Lake Naivasha Management Plan (Government of Kenya, 2012-1022), Buck et al (2017) in Mexico and Central America, case studies authored by G. Kissinger in Brazil, Kenya and South Africa; management planning in the United States including the massive Chesapeake Bay watershed (see Chesapeake 2000), also the EPA handbook on watershed planning (March 2008).

- **Ecosystem services as a tool for land restoration**. Brazil has used payment of ecosystem services (PES) as a tool for land management.[22] The Atlantic forest experience in Brazil also pointed to the special links, not always fully leveraged, between forestry and ecosystem users dependent on public water supplies. This finding is in keeping with recent field observations of a nascent ecosystem approach to protecting a spring in the area of Anse à Veau (Rocher la Val). The latter experience is worth monitoring over time to observe evidence of impact and sustainability. The PES approach to protecting the Rocher Laval spring includes multi-year land rentals to facilitate natural regeneration and reforestation on contiguous plots between the lowland spring and the highland ridge above. Recent field interviews suggest that water volume has tended to increase over the 3-year period of land rentals devised to foster natural regeneration.[23]

- **Ecosystem services and smallholders on slopes**. Reporting on the Brazil experience also points to the utility of PES as suitable for smaller landholders in mosaic landscapes where the opportunity cost of land is low (see G. Kissinger, Atlantic forest case study, Brazil). This is consistent with the situation of the majority of smallholding hillside farmers in Haiti, including the Sault du Baril micro-watershed that is a focus of this study, where plots of private land are readily available for short and long term rentals, and the opportunity costs for doing so are very low.

Proposed Three Phase Methodology

In light of lessons learned, the study team proposed a methodology composed of three phases of participatory planning. As noted earlier, these interconnected phases were tested in two micro-watersheds within the larger Rivière Froide watershed. The following summary describes the methodology, which the team proposed for testing. Feedback on this draft methodology is then discussed below. This feedback was taken into account during the development of the final version of the Methodology, including guiding principles and their concrete application through the associated Step-by-Step Guide.[24] (See Section 2 of Deliverable 2 for the full methodology).

Phase I: Site Selection

The proposed Methodology for Participatory Watershed Planning included a criteria-based strategy for site selection. The prioritization of sites for watershed-oriented interventions took risk into account, but stressed assets and opportunities over vulnerability as guiding criteria for site selection. Given the orientation to micro-watershed sites as prospective targets, site selection also took manageable scale into account as a criterion.

An initial phase of top-down assessment relied on GIS data and maps already available from sources such as the Comité Interministériel d'Aménagement du Territoire (CIAT) and the Centre National de

[22] See Kissinger (2014) regarding the use of PES in Brazil.
[23] Smucker, April 2017, field interviews with local farmers, also Mme Mathurin and Agr. Carl Monde.
[24] As a final report, the present text includes the Step-by-Step guide along with reporting on the methodology; however, the Step-by-Step guide can also eventually be issued separately as a standalone document. Furthermore, the Step-by-Step guide may also be considered to some extent a working document, subject to further modification based on additional feedback and application to other sites.

l'Information Géo-Spatiale (CNIGS). Following GIS review, the site selection process called for field visits and transects, key informant interviews and discussions with other agencies, local elected officials and national level specialists and policy makers.[25]

Phase II: Rapid Integrated Micro-Watershed Assessment

Summary approach:

- Identify study area, jurisdictions, and biophysical milieu, including biodiversity;
- Identify water resources, uses, risks, irrigation, hydrology;
- Describe social and economic milieu, demography, land tenure, infrastructures and services;
- Identify land use patterns with a view to identifying environmentally sustainable value chains, perennials, multi-year crops, and non-farm employment opportunities;
- Identify vulnerabilities and needs for improved watershed management;
- Identify watershed assets and opportunities for investment;
- Describe institutional framework, critical actors, capacity for watershed governance;
- Define information gaps.

Information gathering for Phase II used both top-down and bottom-up approaches, pairing expert and scientific knowledge with stakeholder concerns and local knowledge.

Phase II.A: Rapid Expert Assessment

The first phase step in watershed characterization was achieved through a technically oriented Rapid Expert Assessment. For the PROFOR pilot sites, expertise for assessing pilot sites included support by well-qualified specialists of the Ministry of Agriculture (MARNDR). Ministry of Environment (MDE) personnel provided additional comments during methodology development. The Rapid Expert Assessment process included an assessment of social, agro-economic, hydrology and biodiversity issues. The scientific assessment also used GIS data from existing imagery, including layers readily available from CNIGS and CIAT. Using this GIS data, the team generated an atlas of thematic maps for each site. The process of site characterization included both individual and group interviews with local inhabitants and key informants (see Annex B for a listing of field interviews).[26]

Phase II.B: Stakeholder Micro-Watershed Assessment Workshop

The next step in characterizing the watershed included a needs assessment workshop with diverse stakeholders. Workshop participants were selected to ensure representation of all neighborhoods within the micro-watershed, the range of local livelihoods, and the different agro-ecological zones and related production strategies within the target watershed. Workshop participants also included local elected officials, grassroots organizations, and representatives of other local institutions. In sum, stakeholder consultation focused on the following elements:

- Characterization of the physical and socio-economic milieu;
- Identification of water resources and uses;

[25] Field interviews played an important role is adjusting the methodology as well as selecting micro-catchment sites for testing the methodology. See Annex B for the list of people interviewed.

[26] Key informants are people with a rich base of knowledge regarding the site stemming from their roles, personal history and training. For example, key informant interviews included local elected officials, a parish priest-agronomist, specialists from the agricultural ministry, a forester-beekeeper, a farmer who had served as mayor, leaders of grassroots organizations, women traders (*machann*) and traveling intermediaries (*madansara*).

- Needs assessment related to water and other local natural resources; and,
- Watershed dynamics, constraints and potential.

Phase III: Planning Priorities for Micro-Watershed Management

Stakeholder Micro-Watershed Assessment Workshop
As in Phase II, the concluding phase linked expert and scientific knowledge with stakeholder concerns and local knowledge. The expert team presented findings and proposed watershed management targets and interventions for stakeholder review and discussion in a second stakeholder workshop. The output of this process included:

- Identification of priorities for watershed planning and intervention;
- Proposed interventions adapted to agro-ecological zones within the target watershed; and,
- Guiding elements and priorities for watershed management planning.

Methodology Review Following Testing

Phase I Review Notes

Generating data for next phases. The first phase of site selection turned out to be a critical element of the overall methodology. The site selection process not only allowed the study team focus our efforts geographically, but also was useful in generating information characterizing the targeted watershed. For example, the site selection process precipitated the development of maps used in later phases including the Rapid Expert Assessment. It also served to identify valuable key informants, who continued to provide information and to serve as useful contacts during all phases of the study. This is important as knowledgeable key informants are a critical feature of rapid assessment strategies.

Testing selection criteria. Perhaps most importantly, the site selection phase served to test the selection criteria. The process of site selection for this study used two guiding criteria: sites with valuable assets and opportunities, especially water, and sites on a manageable scale, i.e., geographically well-defined sites whose relatively small local scale lends itself to local governance, and collaboration among neighboring households over access to the resource. Finding the right scale is important for successfully addressing challenges of project implementation and governance, as noted earlier.

Site analysis in terms of assets and a limited geographic scale provides useful data points for identifying opportunities to organize around concrete economic incentives, e.g., more efficient water management for increased revenues. Since water is a public resource, increased benefits from improved water management require cooperation among users. Therefore the site selection process seeks to identify sites with assets that lend themselves to leveraging economic incentives for collaboration.

Assessing neighboring sites. The site selection process focused on sites within a limited geographic area: Nippes coastal areas and uplands. Reviewing a number of prospective sites within the same region provided a comparative basis for identifying the micro-watersheds retained for study. In retrospect, it

was more efficient to compare neighboring micro-watersheds and watersheds within the same larger scale hydrological zone rather than going further afield for site prospection.

Other project activities. The site selection process also generated information regarding other watershed related projects in the region, including for example Agro-Action Allemande (PPI3-MARNDR). The presence of this organization doing watershed-related activities effectively ruled out Charlier as a study site.

Transects. Walking transects proved indispensable as a site assessment tool. Walking transects in neighboring watersheds generated a comparative sense of scale as researchers explored the notion of a manageable scale for participatory watershed planning and interventions. Transects include vantage points, perimeters, and a sense of the range and variation in ridge to reef landscapes (or at least ridge to mangroves), also walking the coastal littoral.

Detecting innovative approaches. First phase observations also generated information on practical strategies for testing an ecosystem services approach in the rural Haitian context, e.g., tree planting above the Rocher Laval spring on land under leasehold, held in fallow via multi-year rentals.

Researchers discovered innovative local strategies for managing *Prosopis juliflora* (*bayahonn* in Creole) on dry slopes adjoining lowland irrigation works. This included extended cycles of fallow on dry slopes, management of *bayahonn* for animal fodder, sustainable harvest of biomass (charcoal) in three to five year cycles, and planting *bayahonn* seeds together with food crops after a multi-year fallow cycle.

Phase II Review Notes

Rapid Integrated Approach. Pairing of scientific information with stakeholder knowledge proved to be a viable approach. The concept of watershed and water resources was discussed in the workshop format, but in the future this aspect should be given greater attention with more visual aids.

Operating as a team. Team meetings to orient rapid assessment and participatory stakeholder encounters proved critical to the methodology. The participatory methodology requires a special effort to develop a clearly defined team consensus on the central role of water, watersheds and the interface of science with a participatory strategy.

Relying on available data sets. The team's reliance on available data rather than generating new research proved effective. There is substantial information readily available, including GIS based maps. The rapid production of additional maps based on existing information proved useful for identifying stakeholder groups and discussions of land use, for example, maps on agro-ecological zones and Holdridge Life Zones. Testing this approach led to an innovation in the methodology: the creation of a Thematic Atlas for each pilot site (see Section 3 for participatory micro-watershed management plans, including thematic atlases).

Factors external to the micro-watershed. Watershed characterization of study sites also exposed the limits of information focused solely on the targeted micro-watershed. The micro-watershed must be evaluated in terms of parameters outside the immediate catchment area as well as those within.

For example, the water supply for Gwelan spring has relatively little to do with the immediate micro-catchment area; it has everything to do with underground hydrology originating on the highland plateau of Salagnac above Sault du Baril. Nearby rivers at flood stage constitute another factor external to the micro-watershed, which put Gwelan wetlands at risk. On the other hand, the Gwelan spring is also threatened by factors that fall within the micro-watershed basin including the national road, sand quarries, and human and animal pollution.

Workshop format. The workshop sessions included plenary sessions, which proved important for airing issues and sharing information among different interest groups and land use zones. It was useful to include stakeholders with range of contrasting vested interests within the same watershed as a geographic unit. It was also useful to explore these issues in separate livelihood-related groups. For example, separate sessions were held with fishers as opposed to farmers. Small group discussion and group interviews can also be undertaken independently of the workshop format. For example, the anthropologist and community organization specialist undertook group interviews with local stakeholders as part of rapid assessment, and also as preparation for plenary workshop sessions.

In retrospect, it was useful to meet with fishers separately from farmers; however, fisher sessions focused too much on the lucrative harvest of juvenile eels and not enough on other fish species and their relation to mangroves and paced harvest.

Local governance. Participating stakeholders were very pleased with the presence of local elected officials. In future sessions using the methodology, there should be greater attention to the issues of governance in local watershed management.

Phase III Review Notes

Gender balance and participation. Both sets of workshops were highly successful in terms of turnout, active discussion and stakeholder participation. Turnout was roughly double the number of people invited. Phase I and Phase II sessions included fairly balanced proportions of women and men. Women talked freely, though more so in Gwelan along the coast, which included fish buyers and vendors as well as fishers and farmers, though less so in Sault du Baril, composed primarily of farmers and some vendors (women). On future occasions, it could be useful to include small group discussions composed solely of women. Overall, stakeholders proved willing to participate in these discussion formats and the participatory planning methodology.

Watersheds versus local development plans. Phase III focused on participatory planning. What can we learn from the planning output? First of all, the focus of stakeholder interest was broader than watersheds. Water was nevertheless a subject of vital interest including water as risk as well as asset; however, the focus of stakeholder debate included health, education, and roadways, as well as livelihood issues.

In retrospect, stakeholder priorities and proposals for intervention more closely resembled a local development plan than a watershed management plan *per se*. This is a lesson learned and should be taken into account in future applications of the participatory methodology. The planning output should consistently target water management and watershed resources, including their livelihood related issues. This can readily be addressed by a more focused watershed orientation to workshop facilitation.

Setting priorities as a first step in watershed planning. Secondly, the output from participatory planning focused very much on priorities and their ranking, for example, waterfall and spring protection, mangroves as a buffer for rice production, or sedimentation affecting the eel harvest. Setting priorities is an essential feature of watershed planning, perhaps the most important aspect. On the other hand, it is not a detailed watershed action plan, which requires significant additional input by specialists including, for example, technical information on irrigation design, water flow and drainage. This would also take additional time. Nevertheless, prioritizing needs, goals and sites for investment is the critical feature of watershed planning. Field testing demonstrates the ability of a rapid participatory approach to do so. Priorities can be used to influence local government budgets or donor financed investments, and should serve as a basis for more detailed technical planning for watersheds and micro-watersheds.

Near term versus long-term goals and priorities. Thirdly, stakeholders showed a special interest in identifying near term priorities along with longer-term goals and targets. In response, workshop facilitation included stakeholder prioritization of first step activities such as tree crops (fruit trees), agriculture (disease resistant varieties, agroforestry crops), and a ranking of specific zones and ravines for ravine barriers and conservation works. These targets were deemed higher priority than, for example, installation of hydropower, which was also identified as a target of future investment in Sault du Baril.

Colleague Review of Participatory Methodology

The J/P HRO team organized a session to present the participatory methodology and findings from pilot testing of the approach at the two target sites. In response, colleagues from the Ministry of Environment (MDE) and the Ministry of Agriculture (MARNDR) raised the following points:

Agro-ecological zones. MDE and MARNDR technicians expressed agreement on the concept of agro-ecological zones as a guiding element of watershed planning.

Science and participatory watershed assessment. Specialists took note of the innovative character of the PROFOR participatory assessment method, which links science and scientists with participatory assessment. The emergent term for this is a Rapid Integrated Approach to watershed assessment and planning. These colleagues deemed this to be an innovative feature of the HTR approach relative to other participatory approaches in Haiti.

Local governance. The stakeholder workshop forced local elected officials to meet with constituents to meet and share notes on local resources including springs, riverbanks, sand mining, mangroves, and uncontrolled grazing. This was an unintended but positive effect of the workshops. Stakeholder comments visibly put pressure on newly elected local officials to enforce rules, an impact noted with

approval by the ministry specialists present in the meeting, who expressed concern over local resource governance as a constraint to implementing watershed plans. This also reinforces the idea that local resource governance should be an important feature of future participatory workshops and planning exercises.

Participatory planning process and raised expectations. In field testing, the presence of outsiders in the field, including MARNDR officials and NGO representatives, raised high expectations for next stage follow-up to implement plans. Ministry specialists also raised this issue as a limiting factor in participatory approaches, i.e., the absence of tangible follow through on participatory planning, therefore a source of failure for participatory approaches that were attempted in Jacmel.

Near term entry level projects (*porte d'entrée* activities). In response to the issue of implementing plans, stakeholders pushed workshop facilitators to assist with a ranking of near term priorities, i.e., initial quick response projects including those requiring outside funding. This innovation in the participatory methodology also responds to similar issues raised by the ministry colleagues, as noted earlier.

Land tenure conflict in improved watershed management. Stakeholder workshops in Gwelan brought landholders together with sharecroppers working wetland rice paddies of Gwelan. The divergent interests of these two groups would tend to put them at odds if the production base for the wetland rice paddies were improved; however, the presence of both groups at the workshop forced them to interact in advance, in anticipation of emergent conflicts, and to do so in the presence of local elected officials whose tasks include mediation of conflict. This aspect of the methodology responds positively to issues raised by ministry colleagues regarding the importance of identifying local groups with conflicting interests, which is a risk to local watershed management. This issue reinforces the central role of local elected officials as the key actors in local watershed planning.

Watershed plans versus local development plans. The session generated debate over the difference between watershed planning focused on water management as opposed to wider ranging local development plans including economics and livelihood, health, education and infrastructure. The group raised questions about the J/P HRO team's presentation of its fieldwork in this regard. Is the planning Gwelan and Sault du Baril a local development plan, or is it more specifically a watershed management plan focused on the flow of water?

This issue also reflects conflicting planning paradigms between the two ministries, i.e., the Ministry of Agriculture focuses on production and the Ministry of Environment focuses on resource protection. This concern therefore pushes the J/P HRO team to strengthen its focus on water management, which also includes livelihood issues, especially agriculture and agroforestry, and to de-emphasize broader planning objectives such as health and infrastructure.

Defining watersheds. The group raised questions regarding watersheds, including thirty major hydrographic zones defined in a major national study in 1972 (OAS) that is still the standard reference for the Haitian government. In a national context of large-scale hydrographic zones and watersheds such as the Artibonite, which drains a fourth of the nation's landmass, how does one go about defining watersheds and micro-watershed basins as spatial planning units? How can you show watershed-scale impact? This provided opportunity to situate the PROFOR methodology in a smaller-scale watershed

context, where it is possible to concentrate interventions on high-value production sites, i.e., smaller-scale planning units, where it is economically and socially feasible to make an impact.

Symposium on participatory watershed planning methodology. The environmental ministry representatives proposed a follow-up symposium using a workshop format to discuss the issues raised above, and to present the participatory planning methodology in greater detail, including how to define stakeholder participation, and how to approach the issue of manageable units of spatial intervention.

SECTION 2 - METHODOLOGY FOR PARTICIPATORY WATERSHED MANAGEMENT PLANNING

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List of Figures, Tables, Boxes and Appendices

D. Methodology for Rapid Biodiversity Assessment

I. Overview

The following narrative describes a field-tested methodology for participatory watershed planning. The approach is science-based and also actively integrates the local population and other stakeholders into the process of watershed assessment and planning. The participatory planning methodology is based on a series of guiding principles presented below. The intended purpose of this methodology is sustainable watershed management at the local level. See Figure 1 below for a graphic summary of the guiding elements of participatory planning. This establishes the theoretical base for practical step-by-step applications summarized in Figure 3.

The participatory methodology incorporates aspects of existing toolkits and approaches; however, it also has certain unique features:

- Unlike other tools, it is devised to address the specific character of Haiti's ecology, rural economy, socio-cultural features and local governance; and,
- It prioritizes micro-watersheds and ravines within larger watersheds, where water or other assets serve as a focus of investment and intensive community engagement.

The primary audiences for this methodology are:

- Field practitioners, local elected officials and implementing organizations working with local populations to develop local land use plans using a participatory approach; and,
- Donors, government agencies and decision makers targeting investments in natural resources and local watersheds in Haiti.

II. Guiding Elements of Participatory Watershed Management Planning

Hydrology and Anthropology. By definition, effective watershed intervention requires careful attention to context. Haitian watersheds are not empty landscapes; they are instead characterized by a wide range of human endeavors, including small farmers scattered across the landscape. In response, the Participatory Watershed Management Planning Methodology is firmly rooted in an anthropologically-informed approach to natural resource management. This includes careful attention to the social and cultural context of land use in Haiti's watersheds, especially the small farm system.[27]

Rapid. The method proposed here for prioritizing watershed interventions is rapid and cost effective. It relies heavily on existing data (reports, maps, GIS) rather than undertaking new research. It also relies on the knowledge and experience of respected key informants familiar with the natural and project history of the area, which saves time.[28] Expert input takes the form of rapid assessment rather than lengthy field studies and household surveys. Participatory workshops are focused and time limited.

[27] See Appendix A below for more detailed description of an anthropologically informed approach to watershed assessment and planning in Haiti.

[28] Knowledgeable key informants are a valuable resource and serve to accelerate knowledge acquisition related to target sites. This includes a sense of natural history including major meteorological events that resulted in land use and land cover changes,

Interactive. The field study process is marked overall by a highly interactive approach. Interdisciplinary site assessment team members conduct fieldwork jointly and discuss observations, including end-of-the-day review following field visits. The interactive approach applies equally to the process of site selection, expert assessment, key informant interviews, and workshop consultation with local stakeholders. The interactive approach stimulates reflection on land use planning and enriches the process of information gathering.

Participatory. As with other catchwords, the term *participation* is widely used but with a range of different meanings, or without a single clearly defined meaning. The participatory methodology described here relies on marrying the science of high-level experts with the local knowledge and experience of watershed users and stakeholders. These interactions are intended to be two-way rather than simply top-down. This integrates local knowledge and concerns together with scientific knowledge and best practices. Technical solutions build on stakeholder needs and priorities. As a result, watershed residents are full partners in the planning process even if the process includes specialists. It is their process, their watershed, and their priorities.

Concentration of efforts. A review of watershed interventions suggests that *successful* resource management of whole watersheds has rarely, if ever, happened in Haiti. One reason for this is that watershed interventions have historically been widely scattered, thereby diluting the impact of watershed interventions. On the other hand, small-scale geographic concentration of effort has been successful. Therefore, a realistic strategy is to target an intermediate scale of intervention based on critical zones within watersheds, and to concentrate efforts across garden borders, rather than treating scattered parcels. Accordingly, prioritize sites where seamless coverage is justified by a higher estimated return on investment, and focus on integrated land use planning at a manageable scale.

Adaptive. The Haitian landscape is highly diverse. Therefore, make a special effort to tailor watershed interventions to each site. This includes careful attention to species-site matching in relation to elevation, rainfall and soil types, as well as local patterns of land use and the flow of water. Build on positive features of the small farm system in Haiti, including agroforestry associations, tree crops, and a broad diversity of cultigens. A guiding concept is analysis of the landscape in terms of life zones or agro-ecological zones. These zones should be mapped and taken into account when prioritizing interventions.

Manageable units. Watershed assessment includes top down analysis; however, watershed interventions on the ground work best when working from the bottom up. This works best when local stakeholders live in close proximity and have economic reasons to collaborate across plot lines. Therefore, intervention sites should be of manageable size from a social organizational perspective. Try to solve local resource management issues at the smallest organizational unit capable of handling the problem or of leveraging a resource-based opportunity. Identify concrete economic incentives to collaborate around local resources such as water, springs, productive ravines, and irrigation perimeters.

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also an awareness of earlier projects that succeeded or failed. Sites assessed in Anse à Veau benefited greatly from the experience and historical knowledge of specialists from the agricultural ministry.

Livelihood imperatives in watershed planning. Haiti's watersheds are not only marked by the flow of water. Haitian watersheds are also marked by the flow of people, goods and services, i.e., "marketsheds", "humansheds" and the struggle to make a living. Under these circumstances, livelihood imperatives must be taken into account, particularly in a rural context deeply marked by poverty.

Target assets and opportunities. Interventions over entire hydrological zones are prohibitively expensive. Therefore, prioritize assets and opportunities over vulnerability as the defining criterion in targeting watershed intervention sites. Focus scarce project resources on zones where prospects for success are highest. In rural Haiti, this includes water-related assets such as springs, productive ravines, wetlands and irrigation perimeters. Link economic incentives to environmental sustainability, especially high value perennial crops and agroforestry value chains. Distinguish between sites meriting more intensive (for example, the Gwelan wetlands pictured in Figure 2 below) versus more extensive modes of intervention.

Figure 1. Guiding Elements Of Participatory Watershed Management Planning


HAITI TAKES ROOT
GUIDING ELEMENTS PARTICIPATORY WATERSHED MANAGEMENT PLANNING
7 KEYS TO SUCCESS
MANAGEABLE UNITS
Human scale & proximity
Priority sites & zones
Micro-Catchments
RAPID
GIS & available data
Rapid field assessment
Targeting critical sites priorities
ADAPTIVE
Tailored interventions
Species/site matching
Agro-Ecological zones
PARTICIPATORY AND SUSTAINABLE WATERSHED MANAGEMENT
INTERACTIVE
Expert team joint work
Field interviews
Stakeholder workshops
CONCENTRATION OF EFFORTS
Contiguous parcels
Local landscapes
Priority sites vs scattered interventions
PARTICIPATORY
Stakeholders full partners
Science plus local knowledge
Locally vetted priorities
TARGETED ASSETS & OPPORTUNITIES
Economic incentives
Water & sustainable resource use
Local livelihoods

Figure 2. Watershed assets as targets of opportunity for sustainable micro-watershed management
Artesian spring, wetlands, artisanal irrigation and mangrove buffer in Gwelan

III. Step-by-Step Guide to Participatory Watershed Management Planning

The methodology for participatory watershed management planning presented in this guide follows three successive phases (see Figure 3 below for a graphic presentation of the process):

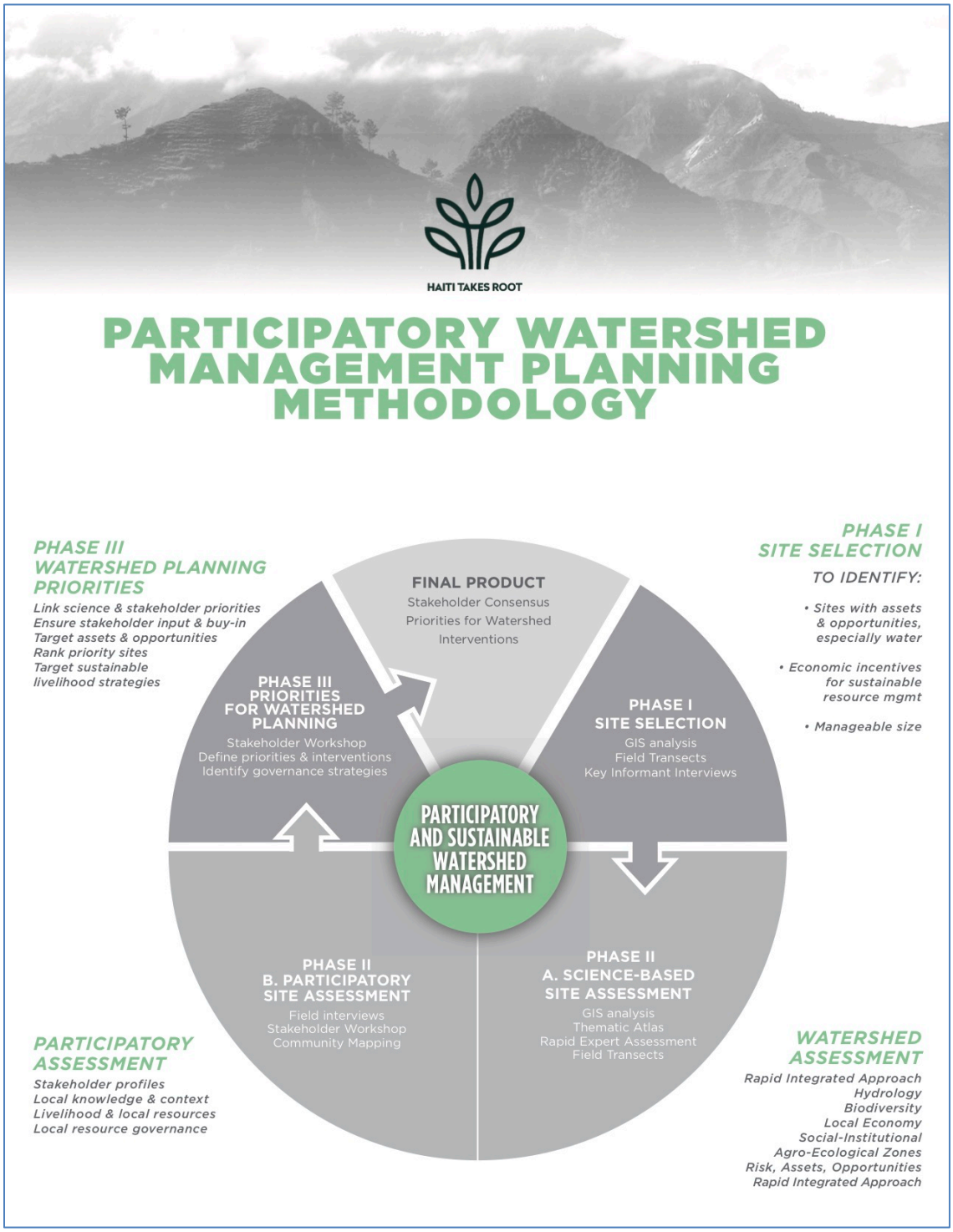
Phase I: Site Selection. Site selection for watershed interventions is an essential component of the participatory watershed planning process. Well-chosen sites significantly enhance prospects for project success and long-term sustainability. The process of site selection relies on a combination of expert analysis of maps and remote sensing data, key informant interviews and on-the-ground field site visits. The goal is to identify high-priority micro-watersheds within a larger target watershed where investment in participatory planning is justified by watershed resources, assets and opportunities.

Phase II: Rapid Integrated Micro-Watershed Assessment. Phase II characterizes the high-value micro-watersheds targeted for investment. A Rapid Integrated Approach links a rapid expert assessment with participatory assessment by local stakeholders. Phase II includes: an atlas of thematic maps prepared by a GIS specialist; field transects; interviews with watershed users and key informants; and a stakeholder workshop devoted to site analysis, participatory sketch mapping and needs assessment.

Phase III: Planning Priorities for Micro-Watershed Management. The third phase defines land use zones, priorities and prospective interventions within targeted micro-watersheds. The process for doing so relies heavily on a Participatory Planning Workshop. This workshop includes stakeholder review of findings from the rapid expert assessment, including a land use zoning strategy, and the development of stakeholder-vetted priorities by activity sector, agro-ecological zone, specific sites and concrete projects. Workshop findings and priorities serve as the basis for preparing a participatory management plan validated by stakeholders for each targeted micro-watershed.

The end result of this three-step methodology is a set of practical, sustainable management plans for targeted micro-watersheds in the intervention zone. ***By replicating this process in a series of micro-watersheds within the target watershed, project activities can contribute visibly to landscape-level change.***

Figure 3. Participatory Watershed Management Planning Methodology



Appendix A. An Anthropologically Informed Approach to Watershed Planning and Management

The participatory methodology for watershed planning is anthropologically informed. It pays close attention to the social and cultural context of watershed planning. In rural Haiti, this includes the peasant farm system as economic enterprise and social unit including the sexual division of labor. It includes farmer decision making, labor strategies, household consumption, market dynamics, the agricultural calendar and periods of peak demand for scarce cash, including spring planting and fall schooling.

A culturally informed approach takes into account the botany of the yard (*lakou*) and traditional agroforestry practices. This includes multilevel, polycultural production in field gardens, an agroforestry system known as a *jaden kreyol* ("Creole garden"). It also takes into account resource links to non-farm livelihoods including religious specialists, fishers, market traders, traditional crafts, wood markets, charcoal makers, sawyers, coffin and furniture makers, carpenters and house builders.

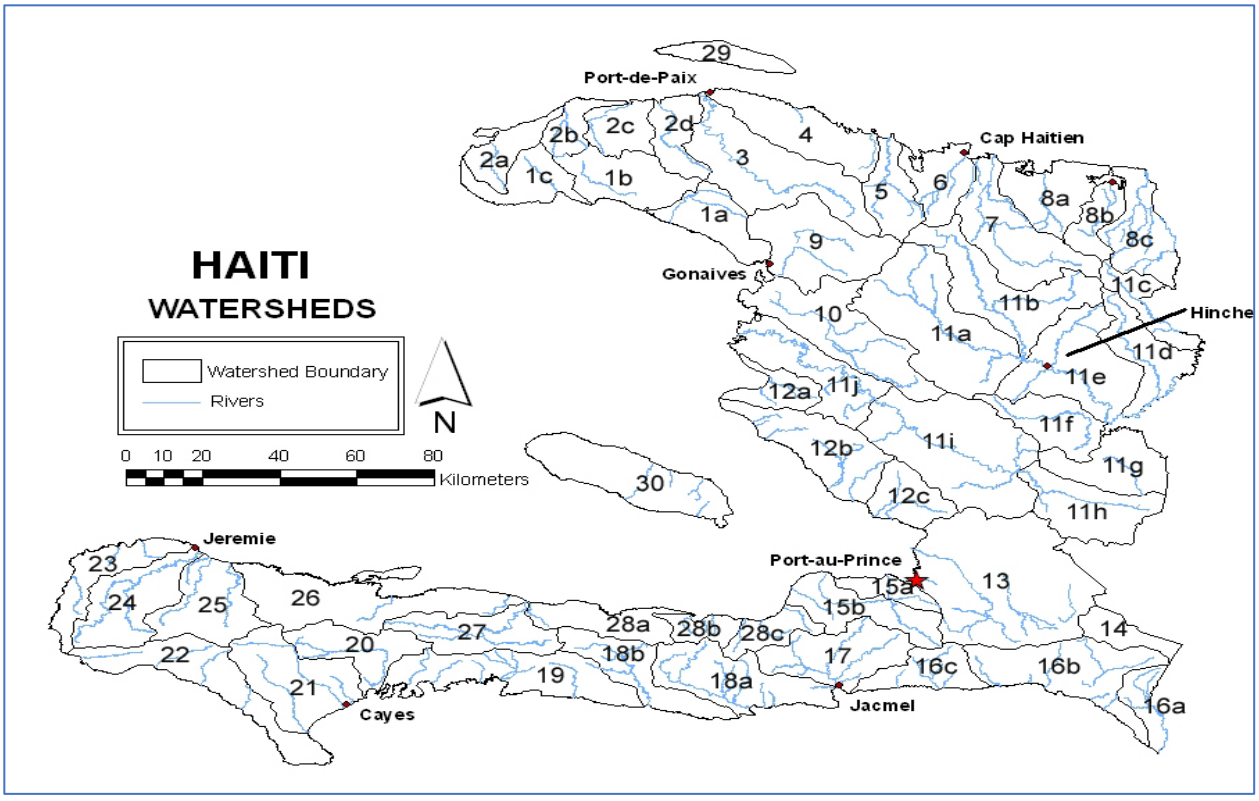
An anthropologically informed approach makes inquiry into local social arrangements outside the household including agricultural labor, rotating labor groups, rotating credit groups, and grassroots organizations, including women's groups. Local social dynamics include political issues, factions, special interest groups and patterns of resource governance. Accordingly, social inquiry pays special attention to sources of conflict and competition over land, water and other scarce resources, including potable water, irrigation perimeters, fisheries and coastal resources. A culturally sensitive approach also takes into account commons such as mangroves, sacred trees and pilgrimage sites linked to natural resources such as springs, waterfalls, caves and cliffs.

Anthropologically oriented data gathering relies on qualitative as well as quantitative information, including semi-structured interviews and group interviews in the field. This includes interviews at rural residences and garden sites, markets and other points of sale including street vendors, and serendipitous encounters with watershed dwellers during field transects.

Phase I: Site Selection

Site selection is an essential first step for participatory watershed planning. This pivotal decision has an enormous impact on prospects for success, given the sheer complexity of Haiti's hydrology. For example, the Haitian land mass is a largely mountainous agricultural landscape (80%) divided into major hydrological zones (see Figure 4 below).[29] These large-scale hydrological zones contain hundreds of watersheds and sub-watersheds, thousands of micro-catchment basins and millions of inhabitants. Furthermore, given current land use patterns, virtually all of Haiti's watersheds are vulnerable to soil erosion on upper slopes, and severe flooding downstream.[30] In this complex hydrological context, how do watershed investors and participatory planners decide where to work? What criteria should guide site selection?

Figure 4. Major rivers and hydrological zones of Haiti [31]



This methodology addresses these challenges by adopting a site selection process that prioritizes watersheds with natural assets that constitute opportunities for investment, for example, water and irrigable land as targets of investment in the face of climate change and seasonal shifts in rainfall. The final step of site selection targets small-scale watersheds of "manageable size" for more intensive, highly

[29] These hydrological zones are large in scale, varying from 169 square kilometers (Savanette) to 6,336 square kilometers (Artibonite). See also MDE (2012), which references CNIGS mapping drawn primarily from the earlier OAS analysis.
[30] Smucker et al (2007) on watershed vulnerability.
[31] From OAS 1972, a landmark definition of hydrological zones in Haiti

participatory modes of intervention. These small-scale watersheds are identified here as "micro-watersheds".

- **Focusing on "Assets and Opportunities"**. In light of the country's complex hydrology, interventions that would have a measureable impact on entire hydrological zones or large watersheds are prohibitively expensive, particularly in relation to available funding. As a result, the initial challenge is to choose sites that enhance prospects for success in watershed management. Site selection necessarily takes into account the factor of risk, but the methodology privileges assets and opportunities over vulnerability as the critical factors in selecting a watershed or micro-watershed site for investment. In this way, assets such as water, irrigation works and high-value agroforestry offer economic leverage for stakeholder collaboration across garden borders, thereby enhancing the protection of watershed assets.
- **Identifying "Manageable Units" of Intervention**. In the rural Haitian context, a highly participatory approach works best when stakeholders live or work in relatively close proximity — for example at the level of a micro-watershed and neighboring households—and where there is economic incentive for collaboration across garden borders. This could be an irrigation user association for collective water management, or adjoining garden owners in productive ravines with terraced plots producing high-value cash crops, such as vegetables. Accordingly, to facilitate participatory planning, sites should be manageable in size from a social organizational perspective (see Step 4 below for discussion of critical methodological issues related to determining manageable size).

The overall approach to site selection entails a 4-step process to identify high-priority micro-watersheds within larger target zones. Priority micro-watersheds are targeted for intensive investment and participatory land use planning.

The selection process begins with GIS review of larger geographic units prioritized by government such as regions, administrative *départements* or storm-affected areas. The next step is to review component hydrological zones of the larger region, each of which is composed of several watersheds, and to target specific watersheds with high value natural assets especially water. Within targeted watersheds, the final step is to identify critical micro-watersheds for intensive, asset oriented investments, beginning with participatory site assessment and planning with stakeholders.

See Table 1 below for a summary description of the site selection process, funneling down from larger to smaller geo-spatial units. Site selection relies in large part on GIS analysis, but also involves other available data, including qualitative information, expert knowledge of the zone, key informants and field observations including transects. For further discussion of criteria and available GIS layers, see Appendix B ("Use of Quantitative and Qualitative Criteria for Watershed and Micro-watershed Selection".)

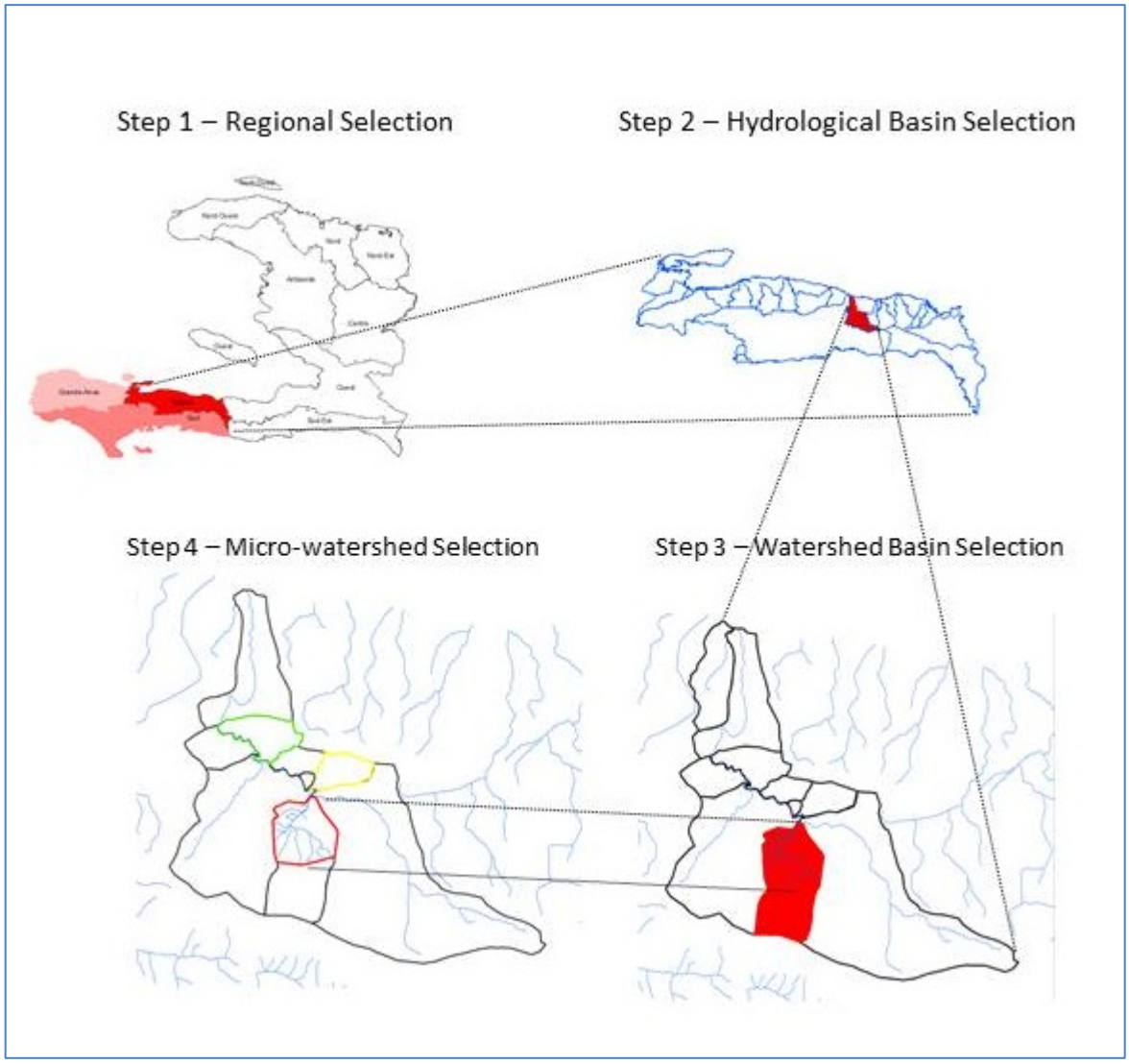
Table 1. Four steps of site selection, by guiding criteria

Steps	Guiding Criteria	Tools	Results
Step 1. Region or *département* priorities	Government or donor priorities	Government or donor strategic plans	Targeted region or *département*
Step 2. Selection of hydrological Zone	- Rainfall & water resources - Cultivated land per capita - Tree cover	GIS analysis	Targeted hydrological zone
Step 3. Selection of Target Watersheds	- Watershed limits - Roads and irrigation infrastructures - Erosion risk - Flood-prone populations	GIS layers and analysis	Targeted watersheds
	Economic and agricultural assets	Atlas Agricole d'Haiti	
	High-value biodiversity sites and protected areas	ANAP and other GOH maps and documents	
	Agroforestry & climate-smart value chains	Reports, maps, key informants interviews, preliminary site visits	
Step 4. Selection of Target Micro-watersheds	- Site assets with livelihood benefits, e.g., water, small-scale irrigation and high value agroforestry - Sites providing valuable ecosystem services - Economic incentives for stakeholder collaboration across garden lines - Manageable scale	- GIS analysis - Key informant interviews - Site visits and field transects	- Targeted micro-watersheds - Environmentally sustainable investment opportunities

The final product is a listing of critical micro-watersheds that are manageable in scale with productive assets or ecosystem services that justify investment in participatory planning, and where concentration of efforts can have a tangible environmental impact.

Figure 5 below illustrates the site selection process as it applies to targeting micro-watersheds. A sequence of four inset maps zoom in from larger regions and hydrological basins to watersheds and micro-watersheds. This example is drawn from PROFOR micro-watershed site selection in the Rivière Froide watershed of the Nippes Department. In this case, the final step identifies three micro-watersheds as prospective targets for participatory watershed planning and implementation.

Figure 5. Example of the 4-step process for targeting micro-watersheds in Nippes Department



The site selection and participatory planning processes presented below can be repeated for multiple micro-watersheds within larger watersheds. The result is a series of participatory, sustainable interventions at critical sites within a targeted watershed. The intended outcome is landscape-level shifts at micro-watershed levels, and a positive cumulative effect on the ecology and economy of the broader watershed.

See Figures 6 and 7 below for landscapes targeted for participatory planning at pilot sites, based on the criteria of assets and manageable size. These micro-watersheds are further described in Section 3 of Deliverable 2 ("Participatory Watershed Management Plans for the Gwelan and Sault du Baril Micro-watersheds").

As a corollary to micro-watershed site selection, the 4-step site selection process discussed above rules out less productive zones of the larger watershed as targets for intensive investments. As a complementary activity, these areas may lend themselves to less intensive programming, such as tree distribution and agroforestry extension services. High-priority sites for these less intensive land interventions are adjoining lands upstream from targeted micro-watersheds.

Figure 6. Ridge-to-reef view of micro-watershed assets in Gwelan

Sand quarry, irrigated wetlands, mangroves; Sault du Baril waterfall fed by artesian spring

Figure 7. Sault du Baril micro-watershed assets
mountain stream, waterfalls and agroforestry landscape

Phase I Actions

Preparation
Recruit a "site selection team" of at least two experts: an anthropologist, plus an agronomist or agricultural economist. Ensure that the team has access to GIS data from public agencies such as CIAT or CNIGS, or from a GIS consultant. A highly qualified interdisciplinary team is critical to the methodology presented here. Team members should have fluent knowledge of French and Creole, capacity for inter-disciplinary collaboration, and extensive experience in rural Haiti, including a watershed orientation to sustainable land use. Required skills include rapid rural assessment, community outreach, and familiarity with small farm systems, irrigation, agriculture and agroforestry.

In addition to site selection, this two- or three-person team will provide continuity with the next phases of participatory planning. This includes Rapid Expert Assessment of targeted micro-watersheds. It also includes facilitation along with other specialists of the next two phases of participatory watershed planning, including a close partnership with stakeholders.

Terms of reference for site selection team
Select target sites for investment in participatory watershed planning and implementation.

- Identify watersheds and micro-watersheds with underutilized or inadequately protected natural assets especially water.
- Undertake a rapid preliminary assessment of watershed and micro-watershed assets, and identify opportunities for improved resource management, such as water for irrigation.

Site Selection Criteria for Targeting Watersheds and Micro-watersheds

- A small watershed or micro-watershed with significant natural assets, especially water.
- Micro-watersheds with the potential to leverage inherent economic incentives to collaborate across garden lines around water or other shared local resources;
- Geographically well-defined sites of manageable scale where stakeholders live in close proximity and have economic incentives to collaborate.

See Box 1 below for site assessment tools and topics to guide interviews and observations related to site selection. This box can be photocopied from the Step-by-Step Guide as a resource for key informant interviews, and to orient field observations including transects. There is some duplication of questions in the tick lists, which contributes to triangulation of data sources when using semi-structured interviews to supplement GIS analysis.

Box 1. Tools to guide field interviews and observations related to site selection

Primary Topics of Team Inquiry

- Most significant natural assets of the watershed or micro-watershed
- Underutilized assets with the potential for sustainable livelihood benefits
- Water related assets as opportunities for investment, such as springs, water courses, freshwater surfaces and wetlands
- High risk sites (flood plains, ravines, landslide-prone areas, erosion-prone garden areas) that threaten resilient productive investments
- Trees and other perennial crops that generate income on slopes, suggestive of investment opportunities for expanded, sustainable production
- Primary sources of income among watershed residents and the extent to which they are sustainable or unsustainable

Topics of Inquiry for the Anthropologist

- Institutional presence, grassroots organizations and their functioning, also projects and NGOs
- Cultural practices, labor arrangements, sacred trees and pilgrimage sites.
- Land tenure arrangements, large and small holders, renters and sharecroppers
- Local resource governance, grazing violations, protected areas
- Conflict over resources, land, water, commons, state land
- Local leadership, elected officials, grassroots organizations, dynamic local entrepreneurs
- Informal social capital including indigenous groups for labor exchange (*eskwad*), rotating credit (*sang*) and mutual aid.

Topics of Inquiry for the Agricultural Economist

- Cash crops, livestock
- Food crops primarily for household consumption
- Perennial crops, tree crops, Creole gardens, agroforestry, fallow cycles
- Crops and trees (i) in humid ravines and (ii) on slopes
- Non-farm employment, commerce, market networks, fishing, wood fuel, value chains
- Agricultural calendar, planting and harvest cycle of major crops
- Agricultural concerns of local farmers, plant pathologies, changing agricultural strategies
- Historical shifts in production strategies
- Natural areas providing ecological services
- Economic opportunities

Tick list for Interviews with GOH Specialists*

- Geographic priorities for site selection
- Location of protected areas, existing and planned
- Current and past projects in target area
- Current and future public funding for area infrastructures, including roads and irrigation
- Referral to other resource persons and key informants
- Referral to pertinent maps, documents, reports, and technical studies

* Especially knowledgeable area specialists from MDE, MARNDR, CIAT and CNIGS.

Tick List for Local Key Informants Interviews

- Most significant natural assets of the watershed or micro-watershed
- Underutilized assets with the potential for sustainable livelihood benefits
- Local project history, successes and failures
- Current projects and NGO services
- Private sector investments and value chains
- Historic shifts in production strategies
- Resource governance related to grazing, fire, trees, water, protected areas, conflicts over resources
- Referral to other local resource persons and key informants

Tick List for Field Transect Observations

- Types of ground cover
- Crop patterns and land use by elevation
- Location and characteristics of water resources, springs, water courses
- Location of water resources for household use
- Crops and trees (i) in humid ravines and (ii) on slopes
- Wooded areas: tree and fruit harvest
- Downed trees from storm damage
- Vegetation around houses, Creole gardens, living fences, hedgerows on slopes

- Soil types, erosion, bare slopes, ravine risks
- Wood harvest: planks, poles, fuelwood
- Activities observed during transects: field gardens, house-and-yard compounds, footpaths, charcoal, sand quarries, fishing

Step 1: Regional or Departmental Prioritization

Step 1 Action

- This first step identifies the broad target region at the regional or departmental scale. This is a strategic imperative driven by policy and funding considerations.[32]

Step 1 Outputs

- A list of promising hydrological zones, as illustrated in Figure 5.

Step 2: Selection of Hydrological Zone

Step 2 Actions

- Conduct initial top-down assessment of hydrological zones, relying primarily on available GIS data from sources such as CNIGS, CIAT and Google Earth. The existence of productive assets and opportunities within the region should be the guiding focus of site selection, even at this higher order stage of analysis. Identify hydrological zones with water resources and downstream irrigation works that require upstream protection.
- When conducting GIS analysis, review data available for rainfall (higher is better), population density in relation to cultivated land (lower agricultural pressure is better) and tree cover (more is better). These conditions are propitious for increased investment in tree cropping, i.e., productive, sustainable assets as an investment opportunity.[33] See Appendix B ("Use of Quantitative and Qualitative Criteria for Watershed and Micro-Watershed Selection") for further detail on selection criteria.
- Interview national and regional key informants with knowledge of the region, including representatives of the Ministries of Agriculture and Environment, CIAT and CNIGS. These specialists can rapidly orient the team to opportunities and constraints in the target region, thereby saving valuable time in site selection. Such sources also supply information useful in all subsequent phases of participatory planning.

Step 2 Outputs

- A targeted hydrological zone
- A list of promising target watershed(s) within the hydrological basin
- An initial set of maps, documents and key informant information that inform subsequent phases of site selection.

[32] For a first cut on site selection, PROFOR researchers selected the Nippes hydrological zone (28a among the 30 major hydrological zones of Haiti according to the categorization of OAS 1972). This targeting of a hydrological zone reflected Government of Haiti prioritization of the Grand Sud in the wake of Hurricane Matthew.

[33] Alternatively, these same criteria could be used to identify higher risk sites for watershed investment.

Step 3: Selection of Target Watershed(s)

This step calls for more in-depth GIS analysis to develop a more detailed information base regarding watersheds within the target hydrological zone. This quantitative information is paired with qualitative data elicited from key informant interviews and preliminary field observations. See Appendix B for more detail on qualitative data.

Step 3 Actions

- Use available GIS data to short-list prospective watersheds. Identify natural assets, investment opportunities and risks within the watershed and its component micro-watersheds.
- Identify water resources and other natural assets, irrigable land, and high-value infrastructures including irrigation works, also protected areas and other natural areas that provide significant ecosystem services, such as mangroves.
- Identify economic and agricultural assets including agroforestry and climate-smart value chains.
- Conduct initial site visits and field observations in selected watersheds (see Box 1 above for guidelines).
- Conduct key informant interviews with area specialists and local residents (see Box 1 above for topics of inquiry).[34]

Figure 8. Local key informant interview with the parish priest in Gwelan

[34] Critical local key informants include local elected officials and leaders of grassroots organizations, also religious leaders such as the parish priest. High-value key informants may also include environmental and agricultural ministry specialists who have special knowledge of the area. Key informants are discussed further in the section on rapid expert assessment of the targeted watershed.

Step 3 Outputs

- Selection of a target watershed or watersheds, especially contiguous prospective watersheds within the larger hydrological basin
- A short list of promising micro-watersheds within the larger target watershed(s)

Step 4: Selection of Target Micro-watersheds

Step 4 examines high-priority micro-watersheds within the larger watersheds targeted in Step 3. This is the most intensive of the four-step Site Selection Process. The goal is to identify and document micro-watersheds that meet the following criteria, using a final filter that is more specific than criteria cited earlier:

- Underutilized or inadequately protected natural assets that can be leveraged for stakeholder collaboration, especially water, irrigation and high-value agroforestry,
- A geographically well-defined site of manageable scale where stakeholders live in close proximity.[35]

[35] This is defined as roughly an hour's walk or less from periphery to center, and a relatively small population of asset-related stakeholders. The number of such stakeholders is variable, but for local organizational purposes should not exceed roughly a thousand people per micro-watershed, and may be far less.

Step 4 Actions

- Prepare GIS-based maps of short-listed micro-watersheds to facilitate site selection
- Conduct qualitative interviews with local key informants and watershed stakeholders including local elected officials, representatives of grassroots organizations and other local leaders (see Box 1 above for topics of inquiry and sample questions).
- Conduct site visits and walking field transects in prospective micro-watersheds including upland and lowland areas; walk or drive micro-watershed perimeters, as feasible (see Box 1 above for guidelines on this process).
    - Identify assets, risks, and investment opportunities.
    - Note dominant features of the micro-watershed.
    - Ask questions when encountering residents or workers along the way, e.g., farmers, traders, fishers, quarry workers, charcoal makers, plank sawyers and house builders.

Step 4 Outputs

- Targeted micro-watersheds of manageable size that lend themselves to participatory approaches focused on productive natural assets, and are therefore candidate sites for Phases II and III of the participatory planning methodology.
- Identification of environmentally sustainable investment opportunities, e.g., springs, wetlands, water courses, artisanal irrigation, high-value agroforestry, other economically significant assets.
- A brief report on site selection including findings, recommendations and sources of information.

Illustrative natural assets identified at pilot test sites. In the case of Sault du Baril, local people and key informants pointed to the waterfalls as a valuable natural resource, with economic benefits as a destination for religious pilgrims and ecotourists, as well as potential for irrigation and hydropower. In the case of Gwelan, local people and key informants pointed to the economic value of Gwelan Spring for rice production, as well as coastal fisheries including juvenile eels.

Phase I Time and human resource requirements. Once the larger target region has been strategically defined, site selection can be undertaken within a two-week period by a team of two people.[36] Initial site visits including transects average a half day per site.

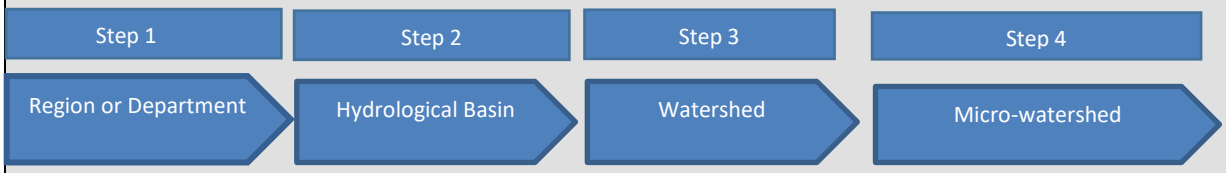
[36] Site selection may take longer than two weeks depending on the logistics of travel, including road conditions.

Figure 9. Field transect encounters with fishermen in the coastal area of Gwelan

Appendix B. Use of Quantitative & Qualitative Criteria for Watershed & Micro-watershed Selection

Prioritization of Watersheds. When targeting watersheds for improved management, geographic units at any scale should be prioritized and ranked based on selection criteria in light of the objectives for watershed management. Prioritization is required to optimize limited resources available at any given time for purposes of watershed management planning and implementation. As noted in the earlier narrative, the site selection methodology described here is based on four successive steps to prioritize geographic investments, as shown below.

Figure 1. Top Down Steps in Geographic Prioritization for Watershed Interventions



Steps 2 and 3 of site selection rely heavily on quantitative GIS analysis to rapidly and cost-effectively identify watersheds and micro-watersheds with natural assets that offer opportunity for investment. Steps 3 and 4 use GIS but also rely on qualitative sources of data including semi-structured interviews and on-the-ground field observations. The following text describes this process in more detail, especially GIS analysis, and lists the GIS data layers that are available to facilitate site selection.

Criteria. Site selection criteria include environmental, socioeconomic and vulnerability factors. Analysis of larger geographic units relies on GIS layers for broad categories of data divided by hydrological zones and watersheds, e.g., rainfall, tree cover, population density. More detailed site analysis uses higher-resolution data on tree cover, agricultural and economic activities, slope classes, demographic trends, and the mapping of springs and other water resources. See Table 2 below for a summary of GIS data presently available (November 2017). Date useful for site selection are grouped thematically as follows:

- *Environmental Criteria:* the presence of factors that foster sustainable land use such as agroforestry, especially on slopes, and sustainable agricultural intensification on terraces and flatland areas, also natural ecosystem services:
    - average annual rainfall,
    - water resources,
    - existing tree cover,
    - per capita cultivated land,
    - presence of high-value environmentally protected areas, or natural areas providing important ecosystem services
- *Socio-economic Criteria:* factors that indicate an enabling environment for reforestation and sustainable land use:
    - infrastructure, including downstream investments (roads, irrigation systems, markets),
    - social capital, both current and prospective,
    - sustainable agro-economic / climate-smart value chains and livelihood activities.
- *Vulnerability Criteria:* environmental risk due to the effects of deforestation,
    - soil erosion risk, including on steep slopes and ravines
    - populations residing in the floodplains.

Quantitative vs. Qualitative Criteria. Data useful to site selection are not all available in the form of GIS layers. Table 1 below summarizes the factors, data source, type and status for GIS layers available (as of August 2017); however, GIS analysis should be complemented by qualitative data, expert knowledge and field assessment, especially for Steps 3 and 4, once higher order hydrological zones have been selected. Useful qualitative criteria are listed in Table 2 below.

Indexing as a tool for comparing spatial units. A common method to select and prioritize watersheds is to build indices based on factors deemed essential to achieving a particular objective (e.g., risk reduction, conservation of natural areas, protection of infrastructure, promotion of tree crops and agroforestry, sustainable production

strategies). These indices can be based on a single factor, multiple factors or multiple indices. Multiple factors and indices are generally weighted according to the relative contribution of the component factors to the overall index, which is then ranked to prioritize the watersheds. Examples of watershed prioritization based on indexing have been conducted for the entire country (Smucker et al., 2006), across several hydrological basins (AECOM, 2015) and for a single basin (Briceño & Gonazalez, 2017).

Table 1. GIS Layers and Indices as Tools for Site Selection

Base Layers	GIS Layers Available (per November 2017	Data Source	Type	Year	Step
	Hydrological basins (54)	CNIGS	Polygon Vector	1987	1
	Watersheds (300+)	CNIGS	Polygon Vector	2012	2
	Administrative boundaries	CIAT	Polygon Vector	2013	1 and 2
Environmental Index	Avg. Annual Rainfall	CNIGS	Polygon Vector	2001	2 and 3
	Per capita cultivable land / Land Pressure index	MARNDR/ CNIGS	Polygon Vector by commune	2009	2 and 3
	Tree Cover Index	Churches et al. 2014; Yang et al. 2015	Polygon Vector, Raster	2011	2 and 3
	Water resources, based on River and Ravine Index	CNIGS	Polyline Vector	2006	2 and 3
Socio-economic Index	Roads & Irrigation Systems	CNIGS	Polyline Vector	2012	2 and 3
	Economic/Ag Production	Atlas Agricole d'Haiti (MARNDR)	Documents, reports, maps, publications	2015	2 and 3
Vulnerability Index	Soil Erosion Risk Index	CNIGS	Polygon Vector by class	1998	2 and 3
	Flood-prone Pop.	Guillande (2005), IHSI (2015)	Polygon Vector by commune	2005, 2015	2 and 3

Table 2. Qualitative Criteria:

Environmentally protected areas, other natural areas that provide high value ecosystem services
Socioeconomic Indicators
High value agroforestry or climate-smart value chains
Demographic profile conducive to success (population pressures and competition from agriculture)
Promising agro-climatic zones
Social and institutional capital
Governmental or donor investments
Potential GOH or Donor Partnerships
Current NGO investments and potential partnerships

Environmental index and site selection. Step 2 of the site selection process targets watersheds and relies primarily on GIS analysis from available data. This step is a triage or filtering phase of site selection, and relies heavily on GIS layers for simple, broad categories of data conducive to more sustainable land use on slopes, especially tree planting. Table 3 below demonstrates an environmental index based on rainfall, tree cover and agricultural pressure on the land.

Table 3. Factor weights for environmental index favoring agroforestry & tree investments

Layer	Factor Wt.	Sub-factor Weights	Notes
Average Annual Rainfall (mm/year)	30	> 2800 = 1.0; 1600-2800 = 0.75; 1000-1600 = 0.50; < 1000 = 0.0.	Higher is better for agroforestry and tree crops

Estimated Tree Cover (%)	40	% tree cover and/or natural wetlands. Tree cover is defined as 30 m x 30 m grid cell > 50% tree cover.	Higher is better for agroforestry and tree crops
Per capita cultivated land (persons/km^2)	30	< 310 = 1.0; 310-543 = 0.75; 543-775 = 0.50; 775-1318 = 0.25; > 1318 = 0.0.	Lower is better due to agricultural pressures on tree cover
Total Index Value	100		

Higher rainfall and tree cover are generally associated with greater reforestation success rate because increased ***rainfall*** improves tree survival and growth potential. Also ***existing mature trees*** create a more favorable environment for growing saplings (protection from drying/ damaging wind and sun; sources of seed and propagules) as well as sustainable agroforestry systems on mountainous slopes. Natural coastal wetlands are included in the tree cover classification as they are areas that are potentially important for protection or mangrove restoration.

Per capita cultivated land is indicative of the population pressure on the land and environmental degradation, i.e,, lower population densities are favored for reforestation. Trends in ***demographic*** pressures can be analyzed based on 2003, 2009, and 2015 densities.

Water availability and resources, such as springs and artisanal irrigation systems, have proven to serve as rallying points for social mobilization for the environmental protection and restoration. They are therefore of special interest as a potential success factor in assessing watersheds for investment. GIS layers are readily available for ravines and watercourses.

Environmental Vulnerability Index. The environmental vulnerability index shown in Table 4 below measures environmental vulnerability attributable to deforestation including soil erosion risk, and flood risk to populations living in floodplains. *Soil erosion risk* is a classification that combines four factors: slope, soil erodibility (soil type and composition), climate erosivity (forces of wind and water) and vegetative cover.

Higher levels of risk may undercut prospective investments in tree cropping and agroforestry. In this case, high risk would discourage watershed investments, whereas less risky sites would offer greater opportunity for success in promoting sustainable and resilient production systems. The *flood prone population* is the population living in flood zones. Large populations in floodplains are vulnerable to deforestation upstream and could greatly benefit from upstream reforestation and improved water management. On the other hand, upstream reforestation alone cannot ensure flood protection, especially in a large watershed where it would take years to cover a significant portion of upstream lands.

Table 4. Factor weights for environmental vulnerability index

Layer	Factor Wt.	Sub-factor Weights
Soil Erosion Risk	0.50	5 = 1.0; 4 = 0.8; 3 = 0.6; 2 = 0.4; 1 = 0.2; 0 = 0.0
Flood-prone Pop. (x1000)	0.50	> 100=1.0; 75-100=0.8; 50-75=0.6; 25– 50=0.4; 10-25=0.2; <10 = 0.0
Total Index Value	100	

Socio-economic Indicators. The ***road network*** is important in terms of field *access*, and also *visibility* for purposes of training and demonstrations of success. CNIGS mapping includes 4 different major categories of roads.

The presence of ***irrigation works*** is also a critical factor for sustainable agricultural production downstream, which requires upstream protection of water resources and mitigation of erosion risk.

Although ***social capital*** is a critical factor, there is no GIS database of social capital readily available. The more subtle indicators of current and prospective social capital are best addressed in field-based studies, especially for grassroots organizations and indigenous groups, including both formal and informal groups, and overall characterization of watershed stakeholders. Qualitative assessment and knowledgeable local informants can help identify NGOs or social enterprises or value chain investors that hold promise as prospective partners.

A ***climate smart agro-economic approach*** would target areas with value chains that support resilience in the face of climate change. This includes (i) tree crops and other perennials, also (ii) sites that would benefit from more efficient use of water resources, especially springs, water courses, irrigated land, and land deemed irrigable. For crop patterns and agroforestry (coffee, cacao), some maps are available from the MARNDR *Atlas Agricole d'Haiti*. For promising value chains, qualitative information is available from knowledgeable informants including farmers, traders and investors, also firms organized as social enterprises.

Phase II. Rapid Integrated Micro-Watershed Assessment

During Phase I, the planning team identifies micro-watersheds with sufficient assets and opportunities to justify targeted investment in participatory land use planning and implementation. As the next step, Phase II generates more detailed understanding of the physical and socio-economic attributes of targeted micro-watersheds, including risks, assets and opportunities for improved resource management. Phase II employs two complementary approaches:

- *Phase II.A*: a science-based "Rapid Expert Assessment (REA)" to gather detailed technical information about the target micro-watershed; and,
- *Phase II.B*: a highly participatory "Stakeholder Micro-Watershed Assessment Workshop."

In this way, Phase II integrates local knowledge and concerns together with expert analysis and best practices, with a view to characterizing the target zone. Site characterization includes agro-ecological and hydrological features, as well as a biodiversity assessment. The primary output of this process is a detailed understanding of each micro-watershed targeted for participatory planning.

Terms of reference for rapid assessment team
The team recruited for Rapid Expert Assessment also serves as the Workshop Facilitation Team for planning and facilitating participatory stakeholder workshops. Accordingly, the overall terms of reference for the team of experts include the following:

- Conduct rapid expert assessment of targeted micro-watersheds.
- Plan and facilitate two participatory stakeholder workshops at each targeted micro-watershed.[37]
- Serve as resource persons at micro-watershed stakeholder workshops.

Team composition and skill sets
Selection of the right mix of professionals is crucial to the success of rapid assessment and participatory planning. The required skill set includes anthropology, community outreach, workshop facilitation, agronomy, economics, rural engineering, hydrology, biodiversity, and GIS analysis and mapping, including land use zoning. Accordingly, the team should include four to five experts, depending on the skills mix of experts recruited. [38]

See terms of reference in Box 3 below for a forester-ecologist, anthropologist, agricultural economist, rural engineer-hydrologist, and community organization specialist. The individualized terms of reference focus specifically on topics of inquiry for Rapid Expert Assessment; however, all team members also serve as shareholder workshop resource persons, and assist with workshop facilitation.

[38] It is conceivable that a specialist could cover portions of more than one set of the topics listed in individualized TORs, depending on the skills mix. If so, TORs and levels of effort can be adjusted accordingly; however the REA team should include at least four individuals to facilitate rapid inquiry on a range of topics.

The team should be gender balanced, including at least two women. The Phase I site selection team of two specialists should be retained as members of the larger REA and Workshop Facilitation Team, hereby ensuring continuity between site selection, micro-watershed assessment and participatory stakeholder workshops. All team members should have fluent knowledge of French and Creole, capacity for inter-disciplinary collaboration and participatory approaches, and extensive experience in rural Haiti, including a watershed orientation to enhancing stakeholder resilience in the face of climate change.

Phase II Actions

Phase II.A: Rapid Expert Assessment

The primary objective of Rapid Expert Assessment (REA) is to characterize targeted micro-watersheds and make recommendations for watershed management, including the following:

- Describe the physical and socio-economic character of the micro-watershed;
- Classify the micro-watershed in terms of agro-ecological zones (defined below); and,
- Develop the following for stakeholder review and discussion during Phase II.B and Phase III:
  - Menu of interventions for resilient and productive land use, adapted to agro-ecological zones.
  - Land use and watershed intervention zones to guide the implementation of participatory watershed plans.

Expert Analysis

The primary value-added dimension in expert analysis is technical judgment regarding risks, opportunities, and the prioritization of sites and interventions for improved land use management. This includes priorities for improved water management, especially irrigation and potable water. It also includes recommendations for enhancing stakeholder reliance on sustainable value chains, multi-year crops, and improved management of watershed risk. Box 2 lists overall guiding topics for REA field inquiry.

Box 2. Primary Topics of inquiry for Rapid Expert Assessment

- What are the most significant natural assets of the micro-watershed?
- Are there underutilized assets with the potential for sustainable livelihood benefits?
- Are there water related assets as opportunities for investment such as springs, water courses, and wetlands?
- Are there high risk sites (flood plains, ravines, landslide-prone areas, erosion-prone garden areas) that would threaten resilient productive investments?
- Are there trees and other perennial crops that generate income on slopes, thereby pointing to investment opportunities for expanded, sustainable production?
- What are the primary sources of income among micro-watershed residents and to what extent are they sustainable or unsustainable?

NOTE: These topics were listed earlier in the narrative on Phase I site selection. They are also pertinent for Rapid Expert Assessment of micro-watersheds.

Describing the Micro-watershed

Expert-led assessment is based on GIS analysis, available data and documents, semi-structured qualitative interviews, and on-site observations and field transects. The REA gathers data on the following features of each micro-watershed targeted for study:

- Study area, jurisdictions, and biophysical milieu including biodiversity;
- Water resources including uses, risks, irrigation, hydrology and coastal resources;
- Social and economic milieu, demography, land tenure, economic activities;
- Current land use patterns, production systems, revenue generation strategies; and,
- Institutional framework, critical actors, local capacity for watershed governance.

The team relies heavily on information already available from existing sources, especially GIS data. The team assesses the micro-watershed and presents results in the form of a brief narrative and a "Thematic Atlas" (see description of atlas mapping below).

Box 3. TORs for Rapid Expert Assessment Team, by Disciplinary Specialty

Forester-Ecologist.

- Conduct GIS analysis of targeted micro-watersheds
- Prepare Thematic Atlas of targeted micro-watersheds (discussed further below)
- Conduct biodiversity assessment of target site including ground cover, ecosystems, mangroves, waterfalls (discussed further below)
- Classify and map the micro-watershed in terms of agro-ecological zones (defined below)
- Assess local production potential for tree crops, fruit and forest species, agroforestry value chains
- Assess impact of major meteorological events on local ecosystems and small farms
- Identify high-priority sites and zones for protection or restricted use
- Propose ecologically sustainable strategies and cultigens for resilience in the face of climate change

Anthropologist.

- Develop typology of watershed stakeholders (discussed further below)
- Inventory local grassroots organizations, including their goals and geographic coverage
- Describe sexual division of labor for agriculture, commerce, and non-agricultural livelihoods (fisheries).
- Describe local labor practices including work parties (*konbit*), rotating labor groups (*eskwad*), daily wage labor (*vann jounen*), contract labor (*djob*)
- Elicit evidence of conflict over local resources including land, water, irrigation, state land and commons, such as mangroves, pasture and pilgrimage sites
- Elicit current practices and issues regarding resource governance, including the following:
    - Stakeholder concerns related to rule enforcement, e.g., use of fire for land clearing, uncontrolled grazing, water rights, mangrove protection, and water for irrigation
    - Role of local elected officials and grassroots organizations in resource governance
    - Protection of springs and other water resources, including irrigation; charcoal, fuelwood and tree harvest rights and restrictions; protected areas, mangroves and coastal resources.

Agricultural Economist. Elicit information on the following topics:

- Local production systems, agriculture, animal husbandry, agroforestry, tree crops
- Non-farm livelihoods dependent on watershed resources, e.g., quarries, fisheries, religious pilgrims, ecotourism
- Local commerce, market networks, value chains
- Land tenure arrangements, public and private land, large and small holders, renters and sharecroppers.
- Agricultural calendar, rainy seasons, planting and harvest cycle of major crops
- Primary cash crops, ranked in order of importance
- Food crops produced primarily for household consumption
- Strategies for income generation during the slack season for agriculture

- Access to credit, including agricultural credit
- Agricultural concerns of local farmers, e.g., plant pathologies, access to markets, access to agricultural inputs, changing agricultural strategies
- Historical shifts in local crop patterns and agricultural strategies

Rural engineer-hydrologist.
- Conduct inventory of water resources including springs, wetlands, irrigation, waterfalls, pools and ravines.
- Identify water-related opportunities for investment including irrigation, water harvest and storage.
- Identify flood prone sites and sources of flood risk.
- Conduct risk analysis of infrastructures including roads, pedestrian pathways, sand and gravel mining, also ravines and ravine barriers, water courses, riverbanks and erosion risk.
- Assess impact of severe weather on local production and agricultural infrastructures.

Community Organization Specialist
- Assist with typology of watershed stakeholders based on site, livelihood and agro-ecological zone.
- Assist with inventory of grassroots organizations including women's groups.
- Ensure that a representative cross-section of stakeholders is invited to participatory stakeholder workshops.
- Coordinate team planning and facilitation of stakeholder workshops, which is further described in Phase II.B and Phase III narratives of the step-by-step manual on participatory planning.

Phase II.A Actions

- **Create A Thematic Atlas Of Each Targeted Micro-Watershed**. Conduct GIS analysis and prepare a "Thematic Atlas" of watershed characteristics and land use zones. An atlas of thematic maps is the first step in micro-watershed characterization and a critical tool for Rapid Expert Assessment and participatory watershed planning.

  The main objective in creating the Thematic Atlas is to rapidly generate maps that characterize the watershed and facilitate land use planning. The Thematic Atlas also informs other actions of Rapid Expert Assessment, including field interviews and transects. The Thematic Atlas includes maps listed in Table 2 below.

Table 2. Maps in Thematic Atlas, by theme

Category	Themes
Administrative boundaries	Regional location, Commune, Communal Section
Physical geography	Watershed boundaries, hydrological network, geology, hydrogeology, soil erosion risk, soil quality
Water Resources	Rainfall, springs, rivers, irrigation, wet and dry ravines
Socio-economic Profile	Settlement patterns, Infrastructure (roads, irrigation)
Land Categories & Zoning	Holdridge Life Zones, Land Use by vegetative cover, Agro-ecological zones, Protected areas, Watershed Intervention Zones

GIS analysis can tailor available data to a range of themes. A GIS approach also has the flexibility to add new data for specific projects in the future. Development of the Thematic Atlas relies on

existing geo-spatial files in various formats, and generates new maps as needed, including classification of target micro-watersheds in terms of "agro-ecological zones" as defined below. See Appendix C, "Methodology for Developing a Micro-Watershed Thematic Atlas," for a more detailed technical description of the Atlas methodology.

- **Map Agro-Ecological Zones Of The Targeted Micro-Watershed**. Agro-Ecological Zones are a culminating feature of the Thematic Atlas of maps. Agro-Ecological Zones are defined as *the most sustainable use of the land given the soils and topography of the target area*.[39] This classification is a critical element of the methodology for watershed planning. The defining features of agro-ecological zoning are climate, landform, soils, land cover and land use potential and constraints. At pilot sites studied, agro-ecological zones included mangroves, wetland rice paddies, irrigable land, agroforestry, silvo-pastoral areas and native forests to be restored.

- **Propose Watershed Intervention Zones**. The Agro-Ecological Zones serve in turn as the technical basis for proposing Watershed Intervention Zones as the guiding framework for implementing watershed management plans, including governance aspects. These Intervention Zones include: Protected Areas, such as mangroves or sacred waterfalls; Special Management Zones for high-risk sites such as ravines, sand quarries and degraded areas targeted for restoration; Controlled Use Zones for agroforestry and conservation structures on slopes, in lieu of erosive weeded crops on unprotected slopes; and Public Zones including roads, marketplaces and urban areas. See Section 3 of Deliverable 2 (" Participatory Watershed Management Plans for the Gwelan and Sault du Baril Micro-watersheds") for the use of Agro-Ecological Zones and Watershed Intervention Zones as tools proposed for resilient and productive land use of targeted micro-watersheds.

- **Interview Key Informants**. Identify and interview key informants with longstanding, special knowledge of the area. Some reside locally and others in the capital city, as discussed below. The front line of key informants is local elected officials and *notab* (opinion leaders), including leaders of grassroots organizations and religious leaders. Interview categories include:
    - *Local key informants*. Generate background information on the targeted micro-watershed and surrounding area. Make inquiry regarding water resources, project history in watersheds, production systems, landmark meteorological events that changed local production strategies (see textbox below for local key informant tick list).

[39] The notion of agro-ecological zoning used here follows FAO (1996). In the Haitian ecological context, the defining parameters are first of all climate, based on the Holdridge life zone system, then land form (slope and geology), soils and land cover (Personal communication, Joel Timyan, October 2017). Also, see FEWS NET (2005) for classification of agro-ecological zones in Haiti related to livelihood.

Box 4 - Tick list of topics for semi-structured interviews with local key informants

- Local project history, including successes and failures
- Current projects and NGO services in the zone
- Important private sector investments and value chains
- Historic shifts in production strategies
- Charcoal, fuelwood, and wood harvest dynamics
- Fruit value chains and other perennial crops
- Location of high risk sites, flood plains, ravines
- Water resources and location
- Listing of watershed assets and opportunities
- Names and leader contacts for grassroots organizations
- Names of other local resource persons and prospective key informants

- *Technical specialists of GOH ministries*. Contact governmental specialists at the Ministries of Environment and Agriculture, also CIAT and CNIGS for information on policy priorities, public funding in the target area including infrastructures, documents and databases available. Ministry-level key informants also include the *département* offices of MDE and MARNDR (see textbox below to guide interviews with technical specialists in GOH ministries).

Box 5 - Tick list of topics for semi-structured interviews with technical specialists in GOH ministries*

- Geographic priorities for site selection
- Location of protected areas present and planned
- Policy concerns on watershed intervention
- Current and past projects in target area
- Current and future public funding for area infrastructures, including water, roads, rivers and irrigation
- Availability of ministry resources for technical support and agricultural extension
- Referral to other resource persons and key informants
- Referral to pertinent maps, documents, reports, and technical studies

* For example, MDE and MARNDR, also CIAT and CNIGS.

- *Representatives of Grassroots organizations*. Use key informant interviews to generate names of grassroots organizations and their leaders or contact persons. Conduct a rapid inventory of local grassroots organizations present in the micro-watershed, including producer groups, women's and youth groups, and water user associations on irrigated sites. Identify area coverage and objectives of grassroots organizations inventoried.
- *Local officials*. Local elected officials are the front line of local resource governance, and are thus high-priority key informants. Their initial engagement as key informants anticipates longer-term engagement for stakeholder workshops and participatory watershed management planning and implementation. They include mayoral council members, communal sectional officials, CASECs and ASECs. Other local governance informants include: DINEPA committees for potable water, DPC committees on civil

protection and natural vulnerability; and judges, notary and land surveyors responsible for law enforcement and resource conflict. See adjoining Box 6 for tick list to guide interviews with elected officials and local governance informants.

Box 6. Tick list questions for semi-structured interviews with elected officials and other local governance actors

- What are the law enforcement issues related to local resource governance, e.g., grazing, protected areas, mangroves, tree cutting, charcoal, quarries & riverbed mining of sand and gravel, charcoal and wood harvest?
- Is there conflict over water, springs, irrigation?
- Are there blocks of state land in the area, private domain of the state? How is it being used? Is it a source of conflict? Are there water resources?
- Are there land tenure conflicts in the area or the targeted micro-watershed area? If so, where?
- What are the most common law enforcement problems that come to your attention?
- Are springs being protected from animals? Are springs protected by trees, restrictions on tree cutting?
- Are there efforts to plant trees above springs? If so, where?
- Has anyone been arrested for harvesting mangroves, for example, for charcoal or polewood?

- **Develop a Stakeholder Typology to Facilitate Workshop Planning**. Interview key informants to develop a typology of watershed stakeholders. The purpose in doing so is to ensure participant diversity, gender balance and the full range of micro-watershed stakeholders in upcoming workshops. The stakeholder typology is based on five filters to ensure workshop diversity and representation:
    - Geographic location (residence);
    - Livelihood;
    - Agro-ecological zone;
    - Local elected officials; and,
    - Leaders of grassroots organizations, including women's groups.

The Thematic Atlas described earlier is a useful tool for ensuring stakeholder representativeness, including settlement patterns and land use zones. Map based information should be cross referenced with information from local leaders and key informants who have direct knowledge of micro-watershed residents and grassroots organizations.[40]

The Thematic Atlas for the watershed includes a map that shows *Settlement Patterns* (housing). Therefore, use the map of housing clusters as a guide to different population agglomerations and neighborhoods (*abitasyon*). Secondly, for the livelihood criterion, consult the Thematic Atlas map entitled *Land Use Zones*, which has livelihood implications (dense agriculture, quarries, agroforestry, pasture). In addition, for adequate representation of livelihood interests and women's activities, consult with local leaders to ensure participation, for example, by dry land farmers, irrigation farmers, fishers, market vendors, traveling intermediaries (usually women) and

[40] The CASEC together with leaders of grassroots organizations also serve as channels for inviting stakeholder workshop participants.

other entrepreneurs, also gravel quarry workers, charcoal makers, and herders. Thirdly, use the Atlas map of *Agro-Ecological Zones* to ensure participation by people who reside or make a living in mapped ecological zones, an approach that anticipates zoning components of the participatory watershed planning process.

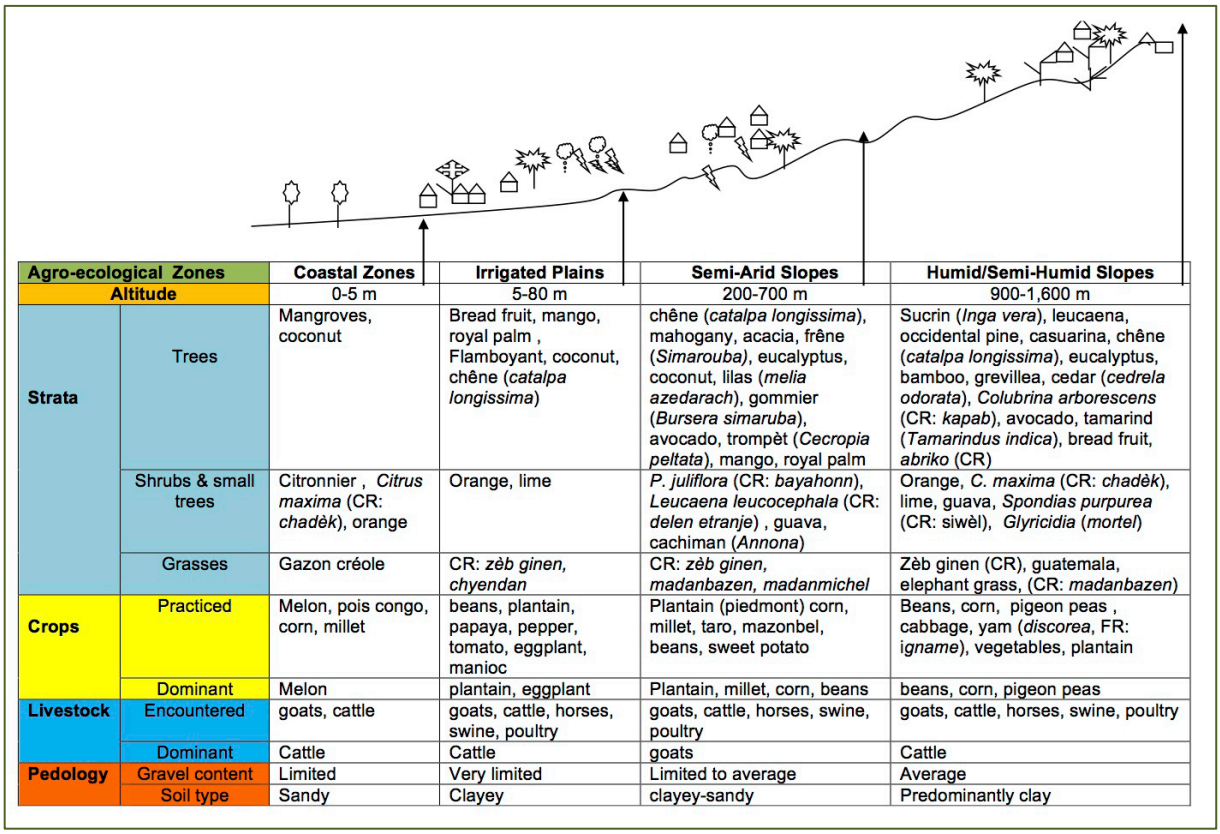
- **Conduct REA Field Observations**. All members of the inter-disciplinary team conduct direct field observations. This includes vehicle-based observations and walking transects across the targeted landscape. As feasible, the REA team conducts field observations jointly, including field transects. For example, an REA team of four specialists may split into two teams, go in different directions, and meet to share observations at the end of the day. This approach takes advantage of the team's disciplinary diversity, and facilitates thoughtful discussion in response to field observations.
    - *Field Transects*. Conduct walking transects across the micro-watershed. See Box 7 below for a tick list to guide field transect observations. Recruit a knowledgeable local resident to accompany team members as a guide and key informant. Review maps and choose a direction that avoids spatial bias, including upland and lowland areas, also the coastal littoral if applicable. Walk the perimeter of the micro-watershed, if feasible, or a portion thereof. Take pictures as a way of retaining visual information regarding land use and water resources. Take notes on field observations including a transect diagram that records shifts in ground cover and land use along the way. See Figure 15 below for two sample transect diagrams. One is a more elaborate diagram that summarizes a wide range of watershed information organized by agro-ecological zone and elevation in a mountainous region of Haiti. The other is a simple hand-sketched map used to record transect observations and changes in the landscape. [41]

Box 7 – Tick list for field transect observations

- Changes in land use by distance and elevation
- Ground cover including slopes and flatlands
- Crops/trees in humid ravines (*fond frais*) & on slopes
- Water resources, springs, water courses, irrigation
- Where people go for water
- Downed trees from storm damage
- Vegetation around houses, Creole gardens, living fence
- Hedgerows or conservation structures on slopes
- Signs of erosion, bare slopes, high risk ravines
- Evidence of wood harvest, planks, poles, fuelwood.
- Use of living fence and choice of species
- Activities observed during transect: field gardens, house-and-yard compounds, footpaths, springs

[41] See Doolittle (2016, 63) on conducting transects and compiling observations on ground cover and patterns of settlement in a transect diagram.

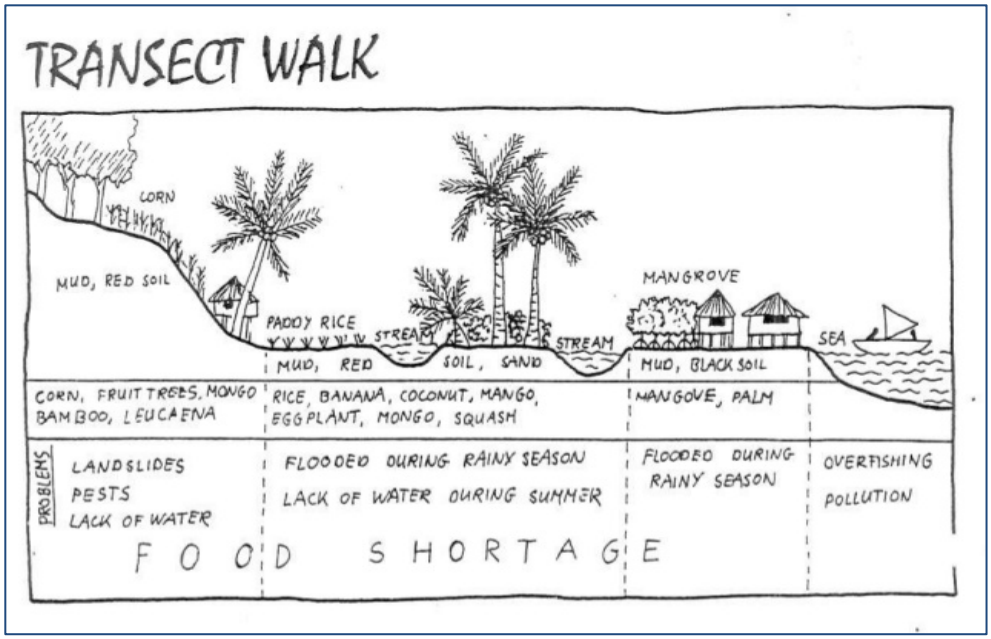
Figure 10. Detailed ridge-to-reef transect by agro-ecological zone, elevation & cultigen



Agro-ecological Zones		Coastal Zones	Irrigated Plains	Semi-Arid Slopes	Humid/Semi-Humid Slopes
Altitude		0-5 m	5-80 m	200-700 m	900-1,600 m
Strata	Trees	Mangroves, coconut	Bread fruit, mango, royal palm , Flamboyant, coconut, chêne (*catalpa longissima*)	chêne (*catalpa longissima*), mahogany, acacia, frêne (*Simarouba)*, eucalyptus, coconut, lilas (*melia azedarach*), gommier (*Bursera simaruba*), avocado, trompèt (*Cecropia peltata*), mango, royal palm	Sucrin (*Inga vera*), leucaena, occidental pine, casuarina, chêne (*catalpa longissima*), eucalyptus, bamboo, grevillea, cedar (*cedrela odorata*), *Colubrina arborescens* (CR: *kapab*), avocado, tamarind (*Tamarindus indica*), bread fruit, *abriko* (CR)
	Shrubs & small trees	Citronnier , *Citrus maxima* (CR: *chadèk*), orange	Orange, lime	*P. juliflora* (CR: *bayahonn*), *Leucaena leucocephala* (CR: *delen etranje*) , guava, cachiman (*Annona*)	Orange, *C. maxima* (CR: *chadèk*), lime, guava, *Spondias purpurea* (CR: siwèl), *Glyricidia* (*mortel*)
	Grasses	Gazon créole	CR: *zèb ginen, chyendan*	CR: *zèb ginen, madanbazen, madanmichel*	Zèb ginen (CR), guatemala, elephant grass, (CR: *madanbazen*)
Crops	Practiced	Melon, pois congo, corn, millet	beans, plantain, papaya, pepper, tomato, eggplant, manioc	Plantain (piedmont) corn, millet, taro, mazonbel, beans, sweet potato	Beans, corn, pigeon peas , cabbage, yam (*discorea*, FR: *igname*), vegetables, plantain
	Dominant	Melon	plantain, eggplant	Plantain, millet, corn, beans	beans, corn, pigeon peas
Livestock	Encountered	goats, cattle	goats, cattle, horses, swine, poultry	goats, cattle, horses, swine, poultry	goats, cattle, horses, swine, poultry
	Dominant	Cattle	Cattle	goats	Cattle
Pedology	Gravel content	Limited	Very limited	Limited to average	Average
	Soil type	Sandy	Clayey	clayey-sandy	Predominantly clay

Source: Smucker (2014), drawn from management plan for Chaine de Matheux (Cabaret-Arcahaie), Haiti

Figure 11. Example of simple hand-sketched map used to record transect observations



https://www.slideshare.net/sagar_104rao/hrvc-analysis-tools-and-techniques. Downloaded 12.3.17

- *Opportunistic interviews*. Conduct brief, serendipitous interviews during walking transects and other field site visits. Take the opportunity for brief exchanges to better understand the watershed, local access to water and other resources, livelihood issues, land use, and settlement. Take note of what people are doing, and tailor questions accordingly, in response to tasks that people are doing at the moment of encounter: for example, women doing laundry at the spring (where do they live, how long of a walk?), market traders encountered along the path on market days (what market, what produce?), charcoal makers (what wood, what markets, are they local residents or outsiders?), quarry workers (where are they from, do they see underground water when mining sand?), sawyers sawing a tree into planks on site (what kind of tree, was it cut down or did it fall due to severe weather?).[42] See Figure 12 images below of people encountered during field transects in Gwelan and Sault du Baril, generating opportunity for brief opportunistic interviews.

[42] This is an anthropologically sensitive approach consistent with rapid ethnographic inquiry. These are actual examples of people and questions encountered in a transect walk in Sault du Baril (G. Smucker, V. Joseph, June 2017). People in rural Haiti are quite responsive to questions about what they are visibly doing, and what they know about their natural and agricultural environment, especially if the questions fall into the category of public information, and if the questioner uses cultural norms for greetings and informal exchanges using idiomatic Creole.

Figure 12. Field transect including chance encounters with watershed stakeholders

Sault du Baril farmer transporting breadfruit, with a living fence in the background

Quarry workers in highland area of Gwelan

- **Conduct a Rapid Biodiversity Assessment**. The objective is to rapidly assess micro-watershed biodiversity, including native and non-native flora and fauna. The assessment establishes the presence or absence of ecosystems and indicator species, i.e., species endemic to Haiti. The presence of endemic species is an indicator of the health and status of local ecosystems.

  Steps in biodiversity assessment include the following (See Appendix D below for further detail on the methodology of the Rapid Biodiversity Assessment):
  - Identify a classification framework such as the Holdridge Life Zone system;
  - Conduct a literature review pertinent to the target site;
  - Assess habitat quality;
  - Document historical coverage; and,
  - Analyze Thematic Atlas maps.

  Expected results of Rapid Biodiversity Assessment:
  - Description of (i) flora and fauna, (ii) native vegetation, (iii) climate, and (iv) ecosystems;
  - Species recommendations for risk mitigation related to soil and genetic erosion, invasive species and water balances; and,
  - Species recommendations for restoration of natural ecosystem services (native biodiversity, clean water and air).

Phase II.A Outputs

The primary output of Phase II.A is a Rapid Expert Assessment report including the following elements:

- A multi-disciplinary narrative describing the physical and socio-economic character of the micro-watershed in keeping with REA terms of reference and specific topics by disciplinary specialization, including the following:

- Thematic Atlas of required maps including site classification by Agro-Ecological Zone;
- Typology of different categories of stakeholders;
- Biodiversity assessment;
- Inventories of:
    - Grassroots organizations including women's groups;
    - Water resources and location; and,
    - Local production systems, including tree crops and agroforestry.
- Menu of proposed interventions for resilient and productive land use, adapted to Agro-Ecological zones; and,
- Site classification by Intervention Zones, proposed as a framework for implementing participatory watershed plans.

Phase II.A time and human resource requirements

Fieldwork for the Rapid Expert Assessment requires 1-2 days per micro-watershed site. The entire REA process for a given micro-watershed, including planning, team meetings and write-up, can take place over a period of two to three weeks, once team members have been mobilized.

Appendix C. Methodology for Developing a Micro-Watershed Thematic Atlas

Introduction. An atlas of thematic maps is a critical feature of Rapid Expert Assessment and participatory watershed planning. The atlas methodology uses Geographic Information Systems (GIS) to manage spatial data and generate maps from existing data sets. GIS can tailor available data to a range of themes. A GIS approach has the flexibility to add new data for specific projects in the future.

Objective. The main objective of an atlas is to rapidly generate maps that characterize the watershed and facilitate watershed planning. Each map visualizes spatial relationships among important watershed features. The maps should be readily accessible while not overwhelming the reader with technical terminology. It may be necessary to include a glossary or definition of terms.

Collecting the Data. The first step is to access and compile existing geo-spatial files in various formats. These formats are generally vector or raster layers.[43] In Haiti, the Centre National d'Information Géo-Spatiale (CNIGS) is reputed to have the largest library of geo-spatial products in the country. Many of these products are free of charge.

Other government ministries provide map products upon request, such as the Comité Interminstériel d'Aménagement du Territoire (CIAT) or the Ministry of Agriculture (MARNDR). Larger donors in Haiti also have GIS teams and geo-spatial files including UNDP, World Bank, IDB, USAID and the EU. There are also open-access geospatial data available on online. This ranges from satellite imagery, aerial photography, vector- and raster-based maps and digitized versions of historical (for example, see www.haitidata.org). See Quinones *et al* (2007) for a useful compilation of private and public geospatial sources.

Map themes. The next step is to list specific thematic maps needed for watershed characterization and planning, identify what maps are already available, and identify any additional maps required. For rapid watershed assessment, the Atlas methodology follows map priorities proposed by CIAT[44] plus other maps including land use zones. The data for CIAT proposed maps are readily available from CNIGS, generally at a scale of 1:10,000 or 1:25,000. The Atlas Methodology includes the thematic maps grouped by category as shown earlier in Table 2.

Settlement patterns and habitation density. Settlement patterns are analyzed by locating points on a time series of Google Earth imagery and converting to a GIS vector map. Alternatively, a new vector map can be created directly in ArcGIS by digitizing points on a high resolution aerial photo that is free of cloud cover and shadows.

Land use by vegetative cover. This is created by using a longstanding Government of Haiti classification of land use on a national scale (MPCE, 1998). Major land use categories are as follows: Urban, Agricultural, Semi-natural, Natural, Bare and Water surfaces. These categories are sub-divided (e.g. Forest under Natural areas). Polygons are created representing each category on the most recent imagery available on Google Earth (2015-2017). These polygons are saved in a Keyhole Markup Language (kml) file and converted to a vector layer using geoprocessing tools in ArcGIS.

Aerial Photography. CNIGS has 2010 and 2014 photography available that is very useful to characterize a watershed and generate new thematic maps. The aerial photography is also used as background to the vector layers to provide texture to the colored polygons, lines and points. The resolution of the 2010 photography is 30 cm and the resolution of the 2014 photography is 15 cm. Both were acquired by unmanned aerial systems (UAS), also referred as drones. For rapid reconnaissance purposes, drones are increasingly used to survey and collect data economically and efficiently. Software is available to georeference the imagery so that maps are precise, accurate and scaleable.

Time requirements. The time required to create atlases for the two pilot micro-watersheds (Gwelan 183 ha vs. Sault du Barail 193 ha) was a total of 50 hours: 38 hours to create the maps and 12 hours to write the explanatory text in English and French. The data for preparing atlases was already available to the GIS specialist. Most of the time

[43] A vector layer is made up of points, lines and polygons that symbolize the points of interest on the map. A raster layer is made up of pixels. Each pixel represents an area and color; together the pixels make up the image. Satellite and aerial photos are raster files. The finer the resolution, the more information is available for analysis. For finer resolution, each pixel represents a smaller distance on the ground.

[44] CIAT. March 2011. Guide méthodologique pour les études de diagnostic des bassins versants.

required was devoted to GIS geoprocessing, and the use of data management and conversion tools standard to ArcGIS software.

Appendix D. Methodology for Rapid Biodiversity Assessment

Introduction. A rapid biodiversity assessment is an important component of the rapid environmental assessment phase of a watershed management plan. The assessment provides a reference to the natural history of the area as well as the basis for ecosystem services that provide species and habitat diversity, clean water and air and important hydrological and soil conservation services.

Objectives. The main objective is to rapidly assess the biodiversity, including native and non-native flora and fauna. In Haiti, this requires a biologist or ecologist that has the scientific knowledge and experience to recognize the natural vs. non-natural status of the ecosystems in the Caribbean and especially those ecosystems and species that are endemic to the island and Haiti in particular. It is most often the latter species that are "indicator species" of the health and status of the ecosystems found within the watershed.

Methodology.

Classification Systems. There are many classifications systems that determine what habitats and species are likely to be found in a watershed. A climate-based classification system like the Holdridge Life Zone is the simplest method to apply and offers the additional advantage of being available as a GIS layer so that a map can be generated for a specific area of Haiti. Other classification systems have not be digitized, but include plant community categories developed in the Dominican Republic (Hager & Zanoni, 1993) or for the entire Caribbean (Areces-Mallea et al., 1999).

Scientific Literature. There is an extensive scientific literature devoted to the ecology, botany and zoology of Hispaniola. Knowledge of this literature is very helpful to summarize the most important features of the natural history relevant to a given watershed in Haiti. An example of the literature used for the Gwelan and Sault du Baril watersheds included studies on bats (Klingener et al., 1978; Soto-Centeno et al., 2017), birds (Latta et al., 2006), reptiles and amphibians (www.caribherp.org), natural area inventories (Hilaire, 2008); Timyan et al. 2013; Zarillo et al., 2014) and key biodiversity areas of Haiti (Timyan, 2011).

Habitat Quality. A rapid environmental assessment will not be expected to confirm the presence of species endemic to the watershed unless these species are relatively common and easy to identify at the species level. Nevertheless, habitat quality as reflected in the amount of disturbance to the soil and vegetation is a good indicator of biodiversity. This can readily be determined by a seasoned ecologist. Indicators of habitat quality include the presence of non-native species, and the conversion of previously forested areas to a mixture of cultivated areas, grasslands, shrubs and barren rock.

The historical coverage of natural habitats can be determined by satellite imagery and aerial photography. For example, the original extent of mangroves along the coast of the Gwelan watershed is easily observed by analyzing the time series of satellite imagery available on Google Earth and verifying these images with high resolution aerial photos and collection of ground truth data.

Maps. Certain maps are very useful for the assessment since they provide the reader a visualization of the watershed in the context of features important to the biodiversity. These map themes include the Holdridge Life Zone, annual precipitation, geology and land use. Customized maps can be compiled to highlight certain features, such as the location of the map to a key biodiversity area, habitat quality or forest cover.

Results.

- Brief description of the vegetation type native to the watershed, its climate and certain features that characterize the structure and function of the watershed's ecosystems.
- Description of the flora and fauna.
- Recommendation of species designed to mitigate watershed risks (notably both soil and genetic erosion, invasive species, water balances).
- Recommendations for:
    - Restoration of ecosystem services (native biodiversity, clean water and air, mangroves, degraded slopes),
    - The biodiversity component of stream and ravine management,

- Conservation-oriented land management,
- Conservation of ethnobotanical resources.

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Phase II.B: Stakeholder Micro-Watershed Assessment Workshop

The next step in Rapid Integrated Assessment is a Stakeholder Assessment Workshop to characterize the micro-watershed in terms its dominant features, risks and assets, and to do so from the perspective of local residents whose lives and livelihoods are intertwined with watershed resources. The Stakeholder Assessment Workshop actively elicits stakeholder knowledge and user information as a complement to REA findings.

The highly interactive workshop integrates stakeholders as full partners in the site assessment and planning process. Workshop topics serve as a launching pad for stakeholder identification of micro-watershed characteristics, needs and assets, and the setting of priorities for micro-watershed management. The watershed-oriented planning process is discussed in more detail in the Phase III description that follows.

The adjoining text box lists workshop topics for stakeholder discussion and debate. Special attention is paid to the livelihood concerns of stakeholders, and their reliance on water and other local natural resources.

Box 8. Workshop topics for stakeholder discussion

- Concept of watershed and watershed planning including the notion of designated land use zones
- Features of the micro-watershed including land forms, streams, roads, place names and commons
- Agricultural land use, irrigation, rain fed agriculture, pasture, fallow, tree crops and agroforestry
- Local livelihoods related to water including springs, floodplains, slopes, ravines and seawater
- Benchmark weather events and historical shifts in ground cover and agricultural practice
- Local project history, including successes and failures
- Local governance issues in natural resource and water management, including mangroves
- Micro-watershed assets and opportunities, especially those related to water and other resources
- Watershed-related risks, needs and priorities, including prospective intervention sites

Workshop facilitation. REA team members serve as resource persons at the stakeholder workshop. The team's Community Organization Specialist assumes primary responsibility for facilitating the workshop. The REA team also presents its preliminary rapid assessment findings and recommendations for stakeholder review and comments.

Stakeholder participation. Workshop participants are selected to ensure representation of all neighborhoods, various livelihoods dependent on watershed resources, especially water, and the range of agro-ecological zones and production strategies within the micro-watershed. Workshop participation also includes local elected officials and representatives of grassroots organizations and other local institutions.

Local partners. The CASEC, ASEC and leaders of grassroots peasant organizations are lead partners in workshop planning. The CASEC is the primary channel for inviting participants to stakeholder workshops. The REA Community Organization Specialist works closely with the CASEC and other local leaders to ensure representative stakeholder participation in the workshops.

Figure 17. REA workshop facilitator using flip chart to record participant views in Sault du Baril

Figure 14. Stakeholder workshop participants in Sault du Baril

Phase II.B Actions

- **Conduct pre-workshop interviews with livelihood groups.** In keeping with the participatory methodology, the anthropologist and community organizer conduct pre-workshop field interviews with watershed users and local residents. Interview targets are drawn from the typology of local micro-watershed stakeholders prepared during the REA. Qualitative interviews include group interviews with livelihood related groups, such as paddy rice farmers, dry land farmers, fishers, quarry workers, charcoal makers and market vendors.

  Findings from individual and group interviews help to inform the workshop agenda for the Stakeholder Assessment Workshop, including local context-specific issues. Interview topics focus on livelihoods and revenue links to local resources, including water, grazing, charcoal and tree harvest, agroforestry, sand and gravel mining, and commons and resource governance. Livelihood concerns may vary from one target site to another, depending on locally specific patterns of livelihood and resource use. This round of interviews requires an estimated two days per targeted micro-watershed.

- **Issue workshop invitations**. Based on the Stakeholder Typology and in consultation with local leaders and grassroots organizations, prepare a list and invite workshop participants that reflect the range and variation of watershed stakeholders, including gender balance. To ensure balanced representation of stakeholders, invitations are personalized rather than open-ended invitations.

The primary conduit for invitations is the CASEC and local grassroots organizations. The invitation process should not be dominated by any single person at the local level. This process is coordinated by the Community Organization Specialist to ensure that workshop participants are representative of livelihood and place within the watershed. Workshop participants also include local elected officials and representatives of grassroots organizations and other local institutions.

To facilitate opportunity for debate, the number of attendees should be limited to 50-60 individuals, primarily residents of the micro-watershed.[45] This helps to avoid lengthy travel times and sets the stage for post-workshop, face-to-face collaboration around watershed projects and priorities. Workshop invitees may also include non-resident stakeholders such as absentee landlords and entrepreneurs, the *commune* agronomist (MARNDR), mayor's office and *département* offices of the Ministries of Environment and Agriculture.

Box. 9. Preparation Checklist for Stakeholder Assessment Workshop

- REA team members:
  - ✓ Complete summary report of Rapid Expert Assessment in the target micro-watershed, including the Thematic Atlas, Stakeholder Typology, and assessment findings and recommendations.
  - ✓ Prepare PPT assisted summary of REA for presentation to workshop stakeholders.
  - ✓ Prepare PPT assisted presentation of the concept of watershed.
  - ✓ Select and print large-scale maps to be used during the workshop.
  - ✓ Assign responsibility for workshop facilitation and reporting.
- The Community Organizer meets with CASEC and local leaders to:
  - ✓ Review workshop goals, agenda and facilitation.
  - ✓ Reserve an on-site meeting place for the workshop, such as a school or other local facility.
  - ✓ Finalize participant invitations in keeping with the representative stakeholder typology.
  - ✓ Organize logistical support including food, beverages and power source for PPT presentations, projector, screen, flip charts, markers and easels.
  - ✓ Assign responsibility for workshop process notes (rapporteur) including notes on stakeholder comments and questions raised, a list of participants, and transcription of flip chart notes.
  - ✓ Assign responsibility for opening the workshop, particularly the CASEC and local elected officials.

[45] In the rural Haitian context, there is a tendency for invited stakeholders to invite other people, thereby increasing the scale of participation. This factor should be kept in mind during the invitation process

- **Conduct Stakeholder Assessment Workshop**. The Community Organization Specialist from the REA serves as Workshop Facilitator. Other REA team members serve as resource people during the workshop. A rapporteur is designated to document participant debate, comments and questions. The rapporteur also transcribes flip chart notes from workshop sessions. These elements are the raw material for drafting a workshop report. They also serve as a reference for Phase III development of a participatory micro-watershed management plan.

  The key features of the workshop include:
  - Presentation and discussion of the concepts of watershed planning to frame workshop debate and planning;
  - Presentation of REA findings for stakeholder review and comments;
  - Participatory Sketch Mapping to facilitate participant discussion of the following:
    - Micro-watershed characteristics, risks and assets;
    - Prior project interventions in the micro-watershed, if applicable; and,
    - Historical shifts in land use and ground cover over time.

  Workshop planning tools include*:*
  - Illustrative stakeholder workshop agenda for micro-watershed assessment (See Box 10 below); and,
  - Information on participatory sketch mapping, including examples: a land use sketch map in Limbé, and a participatory historical sketch map showing land use shifts over time (Box 11 below).

Phase II.B Outputs

- A brief narrative report of Workshop proceedings including:
  - Transcription of flip chart notes;
  - Summary notes on comments and questions raised by participants; and,
  - Participatory sketch maps.
- REA team's presentations of assessment findings, including maps and visual aids (PPT)Share workshop report with CASEC, ASEC, mayor, grassroots organizations, and other interested workshop participants and watershed stakeholders

Phase II.B time and human resource requirements

Workshop sessions can be organized and carried out over a two-week period, including advance notice of one week to invite stakeholder participants. The workshop requires at least a half-day session of four hours. The revised REA report should be completed within one week of the workshop, and shared with workshop participants and stakeholders.

Box 10. Illustrative Agenda for Stakeholder Assessment Workshop

PLENARY SESSIONS

Getting Started. 30 minutes

Welcome and introductions, facilitator, CASEC, ASEC, office of Mayor, 10 minutes

Presentation of workshop objectives, facilitator, 10 minutes
Ground rules for participation, facilitator, 10 minutes

Opening Theme: Watershed Concept 20 minutes

What is a watershed? What is a watershed plan? REA team, 10 minutes
Questions and debate, 10 minutes

Refreshment break, 10 minutes

Participatory Watershed Sketch Mapping 80 minutes

Facilitator-led exercise in for stakeholder characterization of the watershed.

Watershed features: sketch map exercise and discussion. 45 minutes

History: landscape changes, project history. 15 minutes

Detail. Stakeholders develop spatial representations of micro-watershed characteristics by creating hand drawn maps on a flip chart (see Box 11 below for further description, and the Figure 18 illustration). Use the process of sketch mapping to incite discussion of watershed features, problems, assets and opportunities.

Watershed features. Sketch map topics, 45 minutes:

- Boundaries of the micro-watersheds
- Important landmarks including roads, housing clusters, markets, schools, churches
- Local neighborhoods or place names within the target area
- Water resources, springs, streams, wetlands, waterfalls, coastal waters
- Agricultural land use, irrigated and rain fed agriculture, pasture, fallow, woodlots
- Site links to tree crops, high value cash crops, food crops for household consumption
- Other land use categories including sand quarries, fisheries, fish ponds, pilgrimage sites
- Commons including springs, water courses, wetlands, waterfalls, mangroves, state land
- Topography including steep slopes, flatlands, ravines
- Sites subject to conflict over resources including land, water, mangroves, charcoal
- Governance issues in local resource management
- Risk analysis, flooding, sea surges, wind damage, erosion, high risk ravines, landslides
- Watershed resources and assets

History. Create a new sketch map focused on landscape changes over time (see Figure 19 below). Facilitate participant discussion and debate on the following topics, 15 minutes:

- Changes in the landscape over time
- Benchmark weather events
- Project history in the area

Break, 5 minutes

Characterizing the Watershed 85 minutes

Participatory Watershed Sketch Map Findings. Rapporteur. 10 minutes
Rapid Expert Assessment Findings, REA team. 30 minutes
Questions, comments, debate. 30 minutes
Synthesis: needs, assets, opportunities. Rapporteur. 10 minutes
Closing comments. CASEC and local elected officials. 5 minutes

Food Service – End of Workshop I

Box 11 - Participatory Micro-watershed Sketch Mapping

Participatory tool. Participatory sketch mapping is a tool for stakeholder characterization of watersheds and local land use. It facilitates stakeholder identification of watershed risks, needs, assets and opportunities. Sketch maps

represent the resource system in a visual form readily understood by villagers and watershed specialists. It facilitates stakeholder discussion of land use in cultural terms as local residents and resource users.

Land use categories. Participatory sketch mapping elicits local categories of land type, place names, commons and pilgrimage sites. The exercise identifies watershed features including streams and other water resources, roads, housing clusters, agricultural land, sand quarries and forests. Categories of land use may be rice paddies, rain fed agriculture, woodlots, fallow, pasture, fish ponds and fisheries. Sketch mapping facilitates stakeholder discussion of commons such as spring water, wetlands, state land, coastal resources and mangroves. It is a useful tool for identifying sites with current or potential conflict over resource use for example land tenure issues, access to water, outsiders versus insiders, irrigation front-enders versus tail-enders, herders versus farmers, wood charcoalers versus fishers (mangroves for fish habitat) or charcoalers versus farmers (mangroves as a wind and sea break). Sketch mapping is useful for inciting discussion of watershed resources and problems. It can also be used to visualize changes in the landscape over time as shown in the drawing below. [46]

Method. Workshop facilitator leads participatory process of identifying and sketching characteristics of the watershed. This begins with demarcation of watershed boundaries and prominent landmarks.
Recruit a knowledgeable participant (schoolteacher) to demarcate roads, settlements, rivers and landmarks.

The core group of participants for map sketching should be a small group of participants; however, the larger group observes, interacts and contributes verbally to the mapping process. The facilitator elicits participation by asking straightforward open-ended questions, beginning with prominent landmarks and boundaries. The process should take place with as little intervention as possible from the REA team.

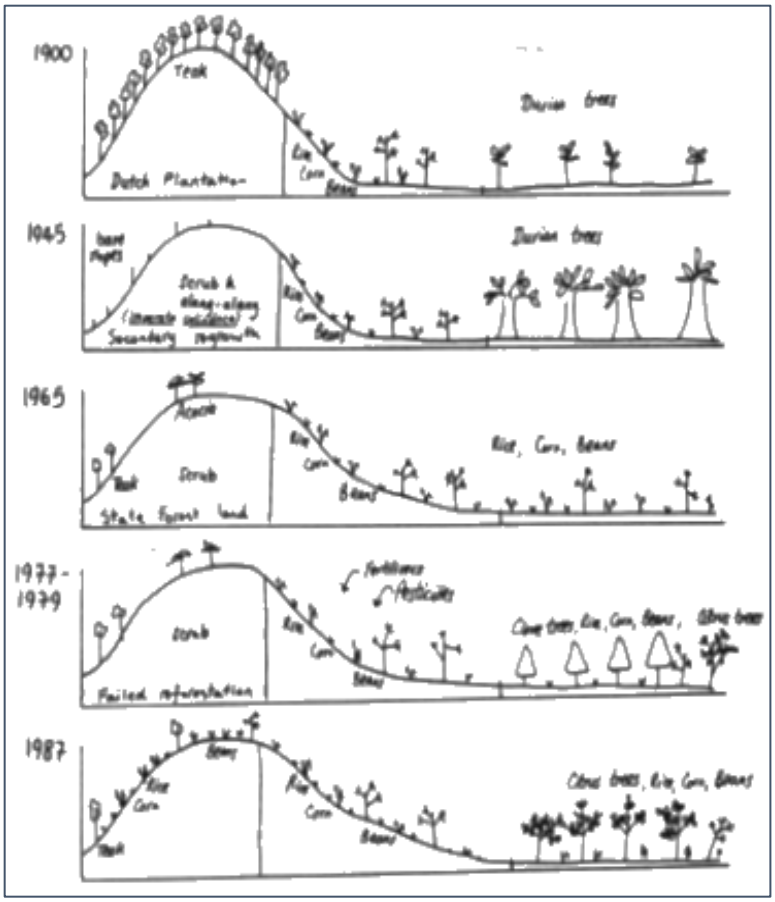
In the post-workshop period, the Participatory Watershed Sketch should be photographed and included in the proceedings of the workshop. The sketch map should be posted on the wall and used as a reference during the Phase III follow-up workshop devoted to watershed planning and priorities.

Sketch maps represent the resource system in a visual form readily understood by both villagers and watershed specialists. It facilitates stakeholder discussion of land use in cultural terms, reflecting stakeholder roles as local resource users, as illustrated in Figure 18.

[46] For the use of sketch mapping in Haiti see DAI (2008). For further reference see Doolittle (2015), Asia Forest Network (2002), and Jackson and Ingles (1998).

Figure 15. Participatory land use sketch produced by local farmers in Bassin, Limbé, Haiti (DAI 2008)

Figure 16. Sketch map of historical shifts in land use



SOURCE: http://www.fao.org/docrep/005/T7845E/AC689E05-3.gif

Phase III. Planning Priorities for Micro-Watershed Management

The culmination of the three-phase participatory methodology is a micro-watershed management plan. In support of this objective, the central feature of Phase III is a Participatory Planning Workshop to identify and rank stakeholder priorities for micro-watershed interventions by sector, site and project. The Planning Workshop also facilitates stakeholder consensus on special intervention zones as a framework for sustainable land use in the targeted micro-watershed. See Box 12 below for a pre-workshop II checklist.

Box 12 - Preparation checklist for Participatory Planning Workshop

- Prepare key workshop inputs:
  - ✓ Prepare easy to understand maps of the Agro-Ecological Zones in the targeted micro-watershed
  - ✓ Produce an overview of map proposed Watershed Intervention Zones
  - ✓ meet to finalize Workshop II agenda
- Community Organizer meets with CASEC and other local leaders to:
  - ✓ Review Workshop II goals, agenda and facilitation,
  - ✓ Invite representative stakeholders to Workshop II, ensuring continuity of participation from Workshop I,
  - ✓ Reserve a meeting place for the workshop,
  - ✓ Organize logistical support including food and beverages, power source for PPT presentations, projector, screen, flip charts, markers and easels,
  - ✓ Print maps of Agro-Ecological Zones and proposed Watershed Intervention Zones
  - ✓ Assign responsibility for workshop process note taking, including notes on comments and questions raised in open debate, list of participants, and transcription of flip chart notes,
  - ✓ Assign responsibility for opening the workshop, including CASEC and local elected officials.

As in earlier phases of the participatory methodology, the process for setting land use priorities links expert assessment with stakeholder concerns and local knowledge. The prioritization process is rooted in joint assessment of micro-watershed risks, assets and opportunities, as described earlier in Phase II.

The end goal for the Participatory Planning Workshop is broad stakeholder agreement on the guiding elements of a management plan for the micro-watershed. After the stakeholder planning workshop, workshop reports and the REA assessment serve as raw material for the REA team to prepare a watershed management plan for the targeted micro-watershed. See "Participatory Watershed Management Plans for the Gwelan and Sault du Baril Micro-Watersheds" (Section 3 of Deliverable 2) for plans resulting from the participatory planning process.

Plan implementation.
Consensus built during the planning workshop sets the stage for local government, grassroots organizations, and future projects to orient investments and watershed action plans that reflect stakeholder priorities.

The three phases of participatory planning also establish a precedent for participatory modes of project implementation. In effect, participatory planning serves as a model for the implementation

process, ensuring stakeholder consultation and participatory approaches in the process of local investment and resource governance.

Phase III Actions

- **Finalize And Print Maps Of Proposed Micro-Watershed Intervention Zones For Discussion And Validation By Workshop Participants.** The maps are based on *Agro-Ecological and Micro-Watershed Intervention Zones* developed by the REA team during Phase II. In the Phase III workshop, this zoning strategy is presented to stakeholders for review, refinement and consensus.

  Micro-Watershed Intervention Zones are derived from the Thematic Atlas prepared earlier, including agro-ecological classification of the micro-watershed with a view to sustainable land use and enhanced resilience. Accordingly, Intervention Zones delineate sites that justify more concentrated investments due to higher potential than other sites for a favorable return on investment. Examples of such sites include irrigation works, mangroves as a windbreak and sea buffer, springs and wetlands, and high-value humid ravines (*fond frais*) surrounded by contour hedgerows in contiguous gardens. The zoning process also rules out portions of the micro-watershed where limited productive potential does not justify concentrated investment but could benefit from agroforestry extension, including seedling distribution and construction of erosion barriers in high risk ravines.

- **Conduct the Participatory Planning Workshop**. To ensure continuity, the planning workshop follows the same format as the Site Assessment Workshop, including the same stakeholder participants, grassroots location and logistics, as well as the designation of a workshop rapporteur and documentation of participant discussion, questions and debate. Key features of the Participatory Planning Workshop include:
  - Review of watershed concept and site assessment findings from the first workshop;
  - REA team presentation and stakeholder discussion of land use zoning and proposed *Micro-Watershed Intervention Zones*; and,
  - Stakeholder prioritization of watershed interventions by sector, site and project.

  See the sample workshop agenda for micro-watershed planning in Box 14 below. Also, see Figure 17 for an example of the participatory stakeholder workshops held in Gwelan and Sault du Baril pilot sites. In both cases, stakeholders made neighborhood schools available as meeting places for participatory assessment and planning workshops.

- **Develop Micro-Watershed Management Plan**. In the period following the participatory planning workshop, the REA and Workshop Facilitation Team drafts a Micro-Watershed Management Plan. This narrative includes the following elements, based on workshop proceedings and REA assessment:
  - Characterization of the watershed;
  - Zoning plan for watershed interventions; and,
  - Stakeholder vetted projects and priorities ranked by site and sector.

As illustration, see "Participatory Watershed Management Plans for the Gwelan and Sault du Baril Micro-watersheds" (Section 3 of Deliverable 2).

Box 14. Sample Agenda for Participatory Planning Workshop

PLENARY SESSIONS

Getting Started.	25 minutes
Welcome and introductions, facilitator, CASEC, ASEC, office of Mayor.	10 minutes
Presentation of Workshop II objectives, facilitator.	10 minutes
Confirm ground rules for participation, facilitator.	5 minutes
Opening Theme: Review Watershed Concept and Features of the Target Micro-watershed	40 minutes
Elicit participant review of watershed concept & planning. Facilitator.	10 minutes
Review Worshop 1 participatory sketch map. Elicit participant summary of watershed features, risks and assets. Facilitator.	15 minutes
Summary of Rapid Expert Assessment findings. REA team.	5 minutes
Questions and debate.	10 minutes

Refreshment break, 10 minutes

Land use zoning and watershed oriented interventions	55 minutes
Use sketch map to introduce notion of land use zones. Facilitator. .	5 minutes
Questions and debate	10 minutes
Introduce map of *Agro-Ecological Zones* in target watershed. REA team.	10 minutes
Questions and debate	10 minutes
Propose map of *Watershed Intervention Zones* for stakeholder review. Facilitator.	10 minutes
Questions and debate.	10 minutes
Ranking of Priorities for watershed management in target watershed	90 minutes
Listing and ranking of priorities using a highly interactive approach. Risks, assets and Investment opportunities ranked by sector, site, zone and specific project. Facilitator.	75 minutes
Synthesis of ranked priorities. Rapporteur.	10 minutes
Closing comments. CASEC and local elected officials.	5 minutes

Food Service – End of Workshop II

Figure 17. Participatory Micro-Watershed Planning Workshops held in local school

Phase III Outputs and Outcomes

Outputs

- Stakeholder consensus on the zoning of interventions in the micro-watershed.
- Stakeholder ranking of priorities for micro-watershed interventions by sector, site and project.
- Workshop report including transcription of flip chart notes, summary notes on comments and questions raised in open debate, summary of ranked priorities for watershed intervention.
- A final micro-watershed management plan for the targeted zone that includes a zoning strategy, field interventions and specific projects that reflect stakeholder priorities and concerns.

Expected Outcomes

- Ongoing integration of stakeholders in watershed assessment and planning.
- Ongoing integration of science together with stakeholder inputs into watershed management
- Active stakeholder partnerships with donors.
- Active citizen partnership with local elected officials in watershed management and local resource governance, including special land use zones.
- Participatory approach to implementing watershed management plans and projects.

Planning targets for a local watershed may be funded from more than one source. A stakeholder-vetted micro-watershed plan may include priorities that specific projects, such as the upcoming Resilient Productive Landscapes (RPL) program, may not be able to fund. As a result, a micro-watershed management plan is not necessarily the equivalent of an RPL or other donor's business plan for the zone.

Phase III time and human resource requirements. The concluding workshop can be organized within a week, including invitations and logistical requirements. It requires at least one half-day

session, and includes the REA as resource persons. As before, the team's community organization specialist facilitates the workshop. Report preparation and a summary text on watershed priorities should be prepared the week following the workshop, and then circulated to local institutions and stakeholders.

Participatory Implementation of Micro-Watershed Plans

The final product of the three-phase process of participatory planning is a micro-watershed management plan. As discussed above, the plan proposes a strategy for managing watershed resources based on sustainable agro-ecological zones for land and water use, and stakeholder vetted priorities for different sectors, sites and prospective investments. The real challenge is to implement the plan. Accordingly, the micro-watershed management plan should guide upcoming local investments by donors, government, NGOs and local associations within the micro-watershed.

Implementation. Plan implementation takes two forms:

- Translating targeted projects into detailed business plans and concrete activities; and,
- Using the plan as a guiding framework for improved local governance of watershed resources, especially water and sustainable land use.

Both efforts should build on the momentum from participatory planning to ensure participatory approaches to implementing project activities and local resource governance. The participatory planning process sets a precedent. It creates high expectations among stakeholder participants and serves as a model for ongoing stakeholder consultation. Participatory stakeholder planning thus sets the stage for an ongoing participatory approach to all subsequent phases of plan implementation.

Partners In Micro-Watershed Governance. This sector includes governance roles in managing land use zones, grazing, fire control, tree cover, mangroves and the protection of springs and other water resources. Communal sectional assemblies (ASEC) and the CASEC may choose to take land use zones into account in their deliberations and planning; however, land use zones proposed by watershed plans are not legally binding unless protected by legal instruments, such as communal ordinances or a central governmental decree. In all cases, implementation of proposed zoning restrictions on land use also requires active citizen support, regardless of legal measures, including grassroots organizations and direct resource beneficiaries, such as water users in an irrigation perimeter.

The micro-watershed management plan is also directly pertinent to local government planning and annual budgets. This involves local elected officials at the level of communal section (CASEC and ASEC) and commune (mayoral council and assembly). Watershed planning related to springs is of direct interest to DINEPA, including local water management committees. DPC planning for disaster mitigation and risk management encompasses protective structures for erosion and flood control. This may implicate local DPC committees at the level of commune and communal section. Irrigation perimeters fall under MARNDR jurisdiction, including the departmental MARNDR engineer for agricultural infrastructures. The Ministry of Environment is responsible for protected areas (ANAP) and protection of natural resources including land, air and water.

Organizational Development. The front line for implementation of micro-watershed management plans is local elected officials and grassroots organizations, especially the CASEC in partnership with local associations. In reality, the organizational implications for implementing stakeholder-vetted priorities may surpass the capacity of existing institutions. Therefore, improved water management may require the creation of new social entities, such as a water user association. For example, Gwelan wetlands are presently farmed without canals or organized water management. These wetlands are also a high priority target for watershed investment; however, investment in canals will require a matching investment in the facilitation of social arrangements for water distribution, i.e., an organized water user association with a business plan.

Other examples from PROFOR study sites include the protection of Sault du Baril waterfalls and artesian springs. This requires a social organizational investment to accompany management plans and any legal provisions for improved protection and management. These cases point strongly to a need for social organizational specialists along with agronomic or other technical specialists to support improved watershed management, i.e., organizational skills that are culturally and socially sensitive to the local context.

Business Plans And Grassroots Organizations. Activities and specific projects identified by stakeholders should be transformed into business plans. Forthcoming investments such as the RPL program will require a feedback loop with local stakeholder communities. Project implementation should build on the planning process to strengthen local capacity and generate leadership for the next stages of implementation, including the development of business plans.

Local micro-watershed governance requires the CASEC to be front and center, backstopped by commune authorities, plus grassroots organizations as the active interested partners in local resource governance. In the case of a water user association for irrigation, governance of water distribution is the responsibility of the water user association. Such an association has to be created as a new entity. It will not self-create by virtue of its mention as a required feature of local watershed management. This requires organizational development, with technical assistance by a community organization specialist, most likely to be provided by a forthcoming project such as the RPL.

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ANNEX A. STUDY PLAN IMPLEMENTATION CALENDAR

Preparations Literature review, stakeholder and key informant interviews	April
Phase I. Site selection. Stakeholder and key informant interviews	April-May
Prepare study plan. Draft methodology for participatory watershed planning	May
Phase II.A. Expert site characterization Rapid Expert Assessment GIS Analysis	June
Phase II.B. Stakeholder site analysis and needs assessment Stakeholder Workshop 1	June
Phase III. Priorities for Watershed Planning & Intervention Stakeholder Workshop 2 Present expert recommendations Stakeholder review and discussion	July
Reporting: Expert and stakeholder findings Final Report and Methodology guide	August
Symposia Partner and colleague symposia to present methodology guide	August - October

ANNEX B. LIST OF FIELD INTERVIEWS AND CONTACTS

A broad range of qualitative interviews informed the site selection process and the development of the draft participatory watershed planning methodology. Field interviews included individual and group discussions with local farmers, fishers, buyers-vendors (*machann, madan sara*), and local religious leaders. These were complemented by opportunistic encounters with farmers during field transects in several areas including Javel-St. Yves, Gwelan-Kahouk, Sou Monn-Sou Sent, and the coastal littoral (Gwelan), pilgrims at Sault du Baril waterfalls (Anbaso) and men and women doing laundry in the small Anroso plateau, which is marked by artesian springs.

Field interviews also included central government employees with knowledge of the Nippes area, local elected officials and members of local bodies of government, including a DINEPA water committee, also other key informants including an Anse à Veau notary, a forester-beekeeper, moto-drivers and small traders.

Finally, the PROFOR team engaged with specialists on agricultural value chains, agroforestry, hydrology, mangroves and coastal resources, including those with knowledge of other projects and sites, particularly in the Grand Sud.

Central Government
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3 members of the Comité Source Laval, local DINEPA committee for Laval Spring

[47] CASEC, Conseil d'Administration de la Section Communale
[48] ASEC, Assemblée de la Section Communale

An ASEC and farmer of Charlier
Jérome, a CASEC and farmer of Diabley

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Hugues Abraham, technician, specialist in marine environmental management, UNEP
Joanas Gué, agronomist, agroforester, former Minister of Agriculture, former presidential advisor
Ronald Toussaint, agronomist, biodiversity specialist, former Minister of Environment
Jean-Vilmond Hilaire, botanist, former Minister of Environment, former director of Audubon Society
Fresner Dorcin, agricultural economist, former Minister of Agriculture
Jean Brunet Georges, engineer, hydrologist, MARNDR
Nelie Guillaume, former IICA coffee project technician, Pestel, 3740-7660

Group interviews at target sites
Farmers near arboretum site (Rivière Froide)
Farmers, fishers, wetland users, Sou Monn crossroads, Gwelan-St. Montfort
Rice farmers, roadway culvert, Plaine Montana wetland, Gwelan
Fishers (fin fishers, eel fishers), fish and eel buyers and sellers, cockfight arena, Anba Kadè – Gwelan
Planters, porch of Hernes Legerme, St. Yves/Sault du Baril

Other Field Interviews

<u>Salagnac</u>
René, agriculturalist, nursery technician
Lunès Louis, agriculturalist, vegetable grower
Estime Marcel, agriculturalist, former mayor, Anse à Veau, 4605-1051

<u>St. Yves – Sault du Baril</u>
Hernes Legerme, President, MODESBA (Mouvman Devlopman Sault du Baril), 3719-0627, 4357-6409.
Denis Vibert, parish priest, Chapelle St. Ives-St. Joachim, Sault du Baril, 3359-0876, 3059-0876

Yves-François Leger, Sahel le Paysan, Secretary, MODESBA
Behrman, agriculturalist, member of MODESBA, Sault du Baril
Sentivyo, 3249-9355

Gwelan-Kahouk
Yves Marie, moto-taxi, eel buyer, Gwelan, 3916-2822, 4434-9420
Boby Edouard, eel buyer, Gwelan, 4605-4836
Iraden Louis, priest, agronomist, St. Monfort Chapel (Gwelan-Kahouk), 4085-8930, 4704-6809.
Cinéus Placide, rice farmer, Gwelan wetlands, 3600-4201
Mme Pradel Francois, dry slope near Gwelan wetlands, 4455-3203
Louisima Longen, rice farmer, Gwelan wetlands
Cetoute Legene, rice farmer, Gwelan wetlands, Vice-President, APDR (Asosyasyon plante pou devlopman Rouk), 4605-9717
Joseph Bastien, sorghum farmer, dry slope, Gwelan

Anse à Veau
Sherley Saintil Ervilus, 3602-1046, President, MOFA, Mouvman Fanm Anse à Veau
Fritz-Gérald Chery, Treasurer, AJAD (Association Des Jeunes Ansavelais), 3689-6700

Neighboring areas
Volcy , planter, irrigation farmer, Chanterelle, 4607-6148
Compas Michel, agriculturalist, President, Association Usagers Planters Chanterelle
A farm couple harvesting beans, wood sellers, near distribution reservoir, Charlier (Koray-Bercy)
Excellent Jérome, agriculturalist, Diabley irrigation perimeter
Henry Ghana Alty, planter, President, Association des Irrigants du Périmetre Charlier (250 members)
Compas Samuel, planter, President, Association des Usagers Planteurs Chanterelle, 3635-8682

Grassroots Organizations Encountered

Acronym	Name	Type	Telephone	Locality
FAAA	Femmes actives pour avancement Anse à Veau	Women	31 22 97 61	Anse à Veau
AJPO	Association Jeunes Progressistes O'Rouk	Mixed	38 37 50 45 37 42 41 89	Kahouk
APDR	Association Plantè pou Devlopman Rouk	Mixed	47 64 21 47	Gwelan
APO	Association Pêcheurs O'Rouk	Mixed		Kahouk
MOFA	Mouvman Fanm Ansavo	Women	36 02 10 46	Anse à Veau
OMINIP	Organisation des Missionnaires Nippes	Mixed	38 72 92 94	Nip
FVSB	Fanm vanyan sault du Baril	Women		Sault du Baril
MODESBA	Mouvement pour le Développement de Sault du Baril	Mixed	37 19 06 27	Sault du Baril
AJAD	Association Jeunes Ansa vêlais pour le Développement	Mixed	36 89 67 00	Anse à Veau
OJAA	Organisation Jeunes pour l'avancement de l'Anse à Veau	Mixed	47 96 64 04	Anse à Veau
AAN	Association des Apiculteurs de Nippes	Mixed	37 70 96 53	Nippes

AJPSDP	Association des Jeunes Progressistes pour le Sault du Baril	Mixed		Sault du Baril (St. Yves)
AIPC	Association des Irrigants du Périmetre Charlier	Mixed		Charlier (Petite Riviere de Nippes)
AUPC	Association des Usagers Planteurs Chanterelle	Mixed		Chanterelle (Petite Riviere de Nippes)
APDR	Asosyasyon Plantè Devlopman Rouk	Mixed		Kahouk, Gwelan, Riviere Froide