Sustainable Development Plan for the CMCC Region

12 August 2019

INTERIM REPORT on Data Collection and Ecosystem Services Mapping

This report (Deliverable 2) details the initial data collection efforts undertaken under the Sustainable Development Planning Consultancy, to understand the baseline of ecosystem services provided by the region, key ecosystem services to include in the SDP as identified through stakeholder engagements, proposed methodologies to quantify and map key services, important data gaps and next steps for the analysis.

Sustainable Development Plan for the CMCC Region

INTERIM REPORT ON DATA COLLECTION AND ECOSYSTEM SERVICES MAPPING

INTRODUCTION

The Chiquibul-Mountain Pine Ridge-Caracol Complex (CMCC; Figure 1) is an area of unique biological and cultural value, incorporating the largest block of contiguous tropical broadleaf forest in Central America with areas of socio-cultural significance like the Caracol Archaeological Reserve. Currently, the only access from the main George Price Highway for economic activity and tourism is by the Caracol Road, but pending plans to improve access have raised concerns about unplanned development leading to degradation of both natural and cultural assets.

Today, the primary economic activities within the CMCC include tourism, timber extraction, mining, and power generation at three sites along the Macal River. Historically, timber extraction served as the primary economic driver for creation and maintenance of the Forest Reserves, but there is a growing industry around adventure tourism. Currently an average of around 10,000 visitors/year visit the Caracol Archeological Reserve – about 1/8 of the total visitations to neighboring San Ignacio Town. Improvements to the Caracol road are expected to increase visitors to the region, which in turn can impact water supplies, waste disposal, and security, while potentially bringing jobs and economic growth to the area.

If the road is improved without attention to proactive planning, there is a danger that the primary potential values of the area – namely its Mayan cultural heritage, energy production potential, water supply for downstream communities, eco-tourism, and other regulating and provisioning ecosystem services – will be threatened or compromised before their full value can be realized.

Within this context, The Natural Capital Project at Stanford University (NatCap) has partnered with the Inter-American Development Bank (IDB), the University of Belize Environmental Research Institute (UB-ERI) and the Government of Belize Economic Development Council (EDC) to develop a Sustainable Development Plan (SDP) for the CMCC region. The goal is to integrate state-of-the-art ecosystem services mapping and analysis with stakeholder interests, values, and knowledge into an ecosystem-based SDP that maintains the long-term economic prosperity of the region and balances resource use with environmental protection and local livelihoods.

This report (Deliverable 2) details the initial data collection efforts to understand the baseline of ecosystem services provided by the region, key ecosystem services to include in the SDP as identified through stakeholder engagements, proposed methodologies to quantify and map key services, important data gaps and next steps for the analysis.

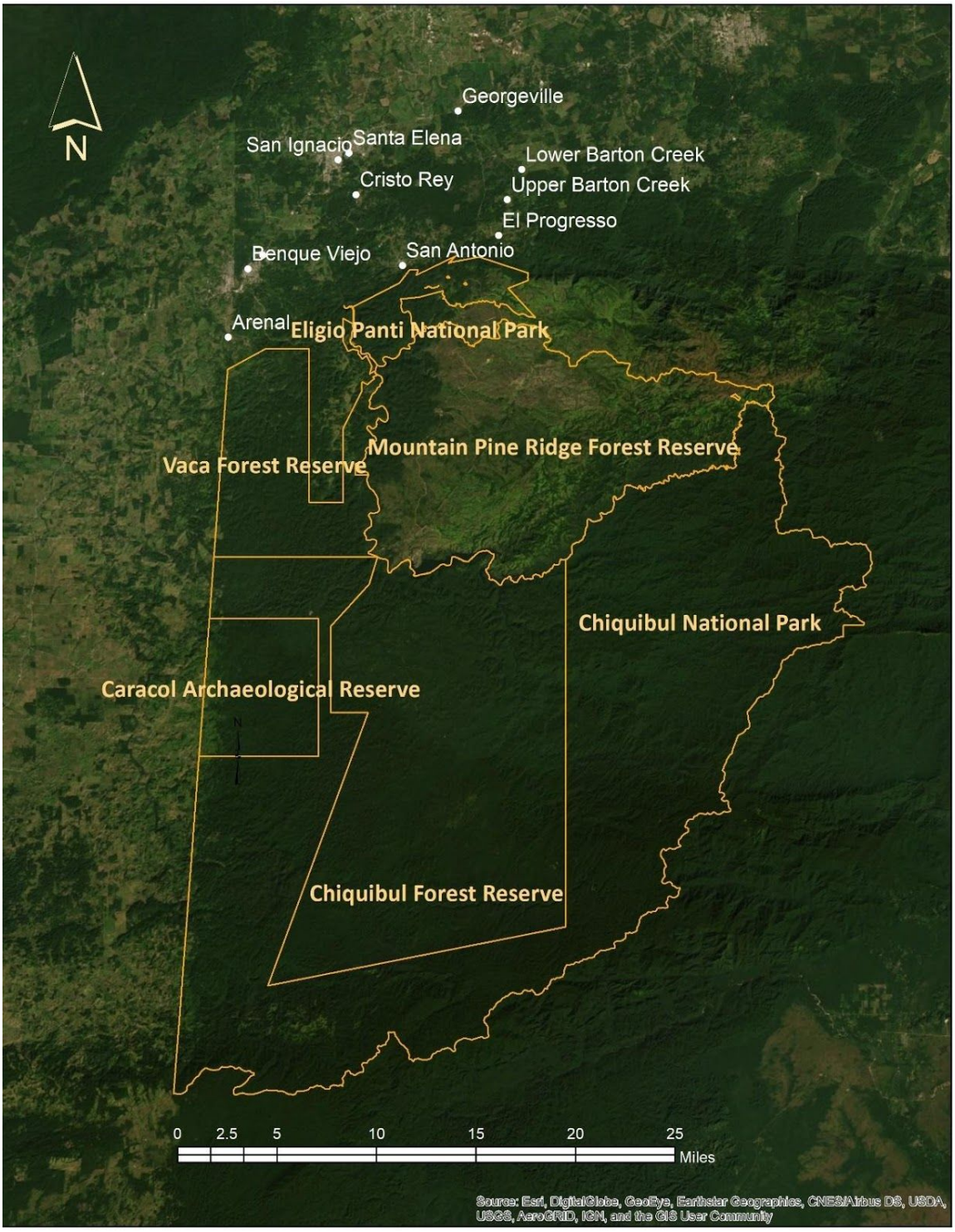


Figure 1. Map of CMCC region and surrounding communities. The Chiquibul-Mountain Pine Ridge-Caracol Complex includes four protected areas under different designations and management regimes (Chiquibul Forest Reserve, Chiquibul National Park, Mountain Pine Ridge Forest Reserve (MPR), and Caracol Archaeological Reserve); there are several other protected areas and communities buffering this area. Land management and

drivers in these buffer areas will have important consequences for the delivery of ecosystem services from the CMCC region.

Ecosystem Services Modelling

In consultation with IDB, UB-ERI, the EDC, and a broad representation of stakeholders (as identified in the project's Stakeholder Engagement Strategy), we gathered information through community surveys, stakeholder consultation workshops, and interviews on the ecosystem services most relevant to the stakeholders in and around the CMCC region. Our approach is first to compile a list of ecosystem services based on the values from the CMCC that are of greatest importance to stakeholders; second, to review literature on Belize and the study region to add potentially important services to this list; and third, to compare this list with the priority issues identified through the stakeholder engagement process, data availability, and potential analysis methods to identify four to five focal services for inclusion in the SDP. Our experience with similar planning processes has shown that this number tends to be manageable and accessible within real policy processes, while the added value of considering many more services is offset by the added burden to stakeholders of visualizing and evaluating trade-offs between across so many different dimensions.

Further, not all ecosystem services can be reliably valued in monetary terms, nor is it always desirable or politically feasible to do so. The prioritization of services will therefore entail two components: (1) identifying priority services for trade-off analysis, and (2) identifying services for which robust monetary values may be developed. From the full suite of ecosystem services recorded and mapped in the baseline analysis, we aim to select 3-4 services that can have a robust monetary valuation applied.

Identifying ecosystem services from the CMCC

In consultation with the EDC, UB-ERI, and a broad representation of stakeholders (engaged through a series of in-person workshops, unstructured interviews, and community surveys as outlined in the Stakeholder Engagement Strategy developed by UB-ERI), we scoped the ecosystem services most relevant to the policy issues and development alternatives under consideration. We began our data collection efforts by identifying relevant agencies, researchers, NGOs and other local leaders and institutions with expertise and data relevant to the issues and activities. We performed an initial review of literature and publicly available data and worked with the relevant government agencies (through the EDC), research community, NGOs and other institutions to obtain additional data.

Results from an initial community survey administered by UB-ERI showed that the most-recognized ecosystem services from the CMCC – across all communities questioned – were recreation (swimming, hiking, camping, etc.), water (availability, flow, quality), tourism (for jobs and economic growth), timber, and maintaining healthy soils for crop production. Medicine, game meat, and crop pollination were mentioned less frequently as well.

Stakeholder consultation workshop

We facilitated an initial stakeholder workshop in July 2019 to elicit the policy and development issues under consideration for the CMCC Region as well as for the area of influence of the proposed road improvement, villages and local communities living adjacent to the CMCC and ecologically sensitive regions. In this workshop (held over two days, one in Belmopan and one in Cristo Rey), there was representation from 15 government

Ministries/departments, six buffer communities, four private sector groups and six NGO/Civil Society/International Agency groups. Detailed notes and participant lists from the workshop are included as Appendix A. Following the workshop, a follow-up electronic survey was sent to participants who did not attend in order to obtain their views on priority ES and key policy and development issues (results pending).

The results from the workshop aligned well with results from the community survey: the ecosystem services identified by participants included (see Appendix A for full listing):

- Water flow & availability
- Water quality protection
- Economic benefits
  - Tourism that is nature-based, cultural, inclusive and sustainable (e.g., within carrying capacity)
  - Sustainable timber
  - Mining (sustainable and with a minimal impact on water sources)
  - Biodiversity as an asset that improves marketability
  - Apiculture (with native species)
- Energy security
- Healthy ecosystems
- Cultural/archaeological sites
- Carbon
- Research & education
- Meet Belize's international commitments (e.g. Convention on Biological Diversity)

Current and potential future threats to the continuing provision of these ecosystem services from the CMCC that were mentioned by participants included (see Appandix A for full listing):

- Population growth
- Increased garbage and human waste with increased access
- Expansion of agriculture (both illegal and through de-reservation and land sales)
- Illegal incursions (e.g. gold panning, logging, poaching, wildlife trafficking, burning), particularly along the border with Guatemala
- Deforestation (through both illegal and legal activities)
- Poor planning & inability to balance competing or incompatible uses
- Unregulated tourism development without regard to carrying capacity of sites

Cross-cutting issues that need to be addressed as mentioned by participants – regardless of the details of how and where the region is developed – included (see Appendix A for full listing):

- Sustainable livelihoods
- Zoning & enforcement
- Security
- Fire management
- Access issues
- Waste management

- Planning that is inclusive, equitable, and sustainable
- Governance that is inclusive, transparent, and accountable
- Funding mechanisms that share costs and responsibilities equitably
- Capacity-building for communities to prepare them to share in the benefits and responsibilities of development in the CMCC region.

In addition to the above issues, the workshop included a mapping exercise in which participants were asked to identify specific locations in the CMCC region that provide different benefits, in order to capture any remaining benefits that we may have missed, and to associate them with particular geographic regions. We also asked participants to identify any geographic areas of concern that need to be taken into account in the SDP. Results from this stakeholder mapping will help to identify areas where benefits or threats intersect with human demands, and will be crucial for producing metrics to evaluate the outcomes of scenarios in the next stages of analysis. For example, we know from the community surveys that water supply from the CMCC is important for the community of El Progresso, and from the mapping exercise we identified the specific sub-watershed that provides water to that community.

Data collection

Based on the feedback received from the project team, the stakeholder consultation workshops, community surveys, and our literature review of available data on the environment and ecosystem services in the region, we have requested and compiled data that would enable us to (1) perform a baseline assessment of the state of the CMCC landscape and (2) scope potential approaches for modeling ecosystem services mentioned above. Results from the initial data collection are given below.

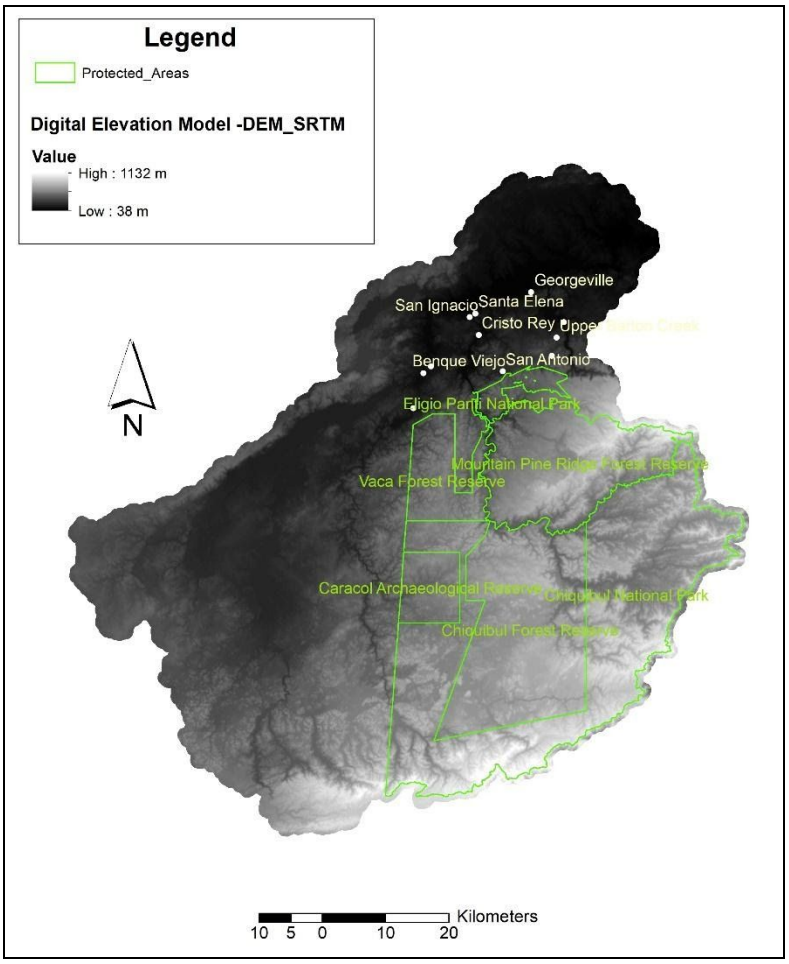
Baseline landscape assessment

Data compiled to date include information drawn from readily available online data sources (e.g. Biodiversity and Environmental Resource Data System of Belize (BERDS)), global geospatial datasets (e.g. NASA Shuttle Radar Topography Mission (SRTM), WorldClim, Open Street Map), satellite images, and prior ecosystem service analyses conducted by NatCap teams in Belize (Arkema et al. 2014, 2015). Basic environmental data include protected areas (Figure 1), topography (Figure 2), land cover and land use (Figure 3), forest loss from 2000-2017 (Figure 4), the location of streams and rivers (Figure 5), soils, historical precipitation, and infrastructure (roads and hydropower facilities).

Deforestation has caused massive changes in the CMCC region in recent decades (Figure 4) – both from natural (bark beetle infestation) and human drivers (e.g., expansion of agriculture and pasture and illegal logging along the international border). Hansen et al. (2013) mapped forest loss using satellite imagery from 2001 to 2017, and their dataset is updated regularly. These data show a pattern of forest loss consistent with local experience, and were vetted with participants as part of the stakeholder engagement workshop and through conversations with Forestry officers during a site visit to MPR. Given the high quality and spatial resolution (30m) of these data, we consider these the best data available on the patterns of deforestation in the area.

Using the DEM and location of downstream communities that depend on water supplies from the CMCC, we delineated the area for which ecosystem service flows must be modeled, to capture the hydrologic connectivity of the area (Figure 6). Because the CMCC is connected through hydrologic flows with the surrounding landscape,

the scale and extent for which services are mapped and modeled must be larger than the scale of the SDP and the policy scenarios considered therein. In this case, the headwaters of the Mopan River originate in Belize in the CMCC before flowing into Guatemala. The river travels north and then flows back into Belize before being joined by the Macal River (also originating in the CMCC). Besides the local communities of San Ignacio, Santa Elena, Cristo Rey, San Antonio, Georgeville, Upper and Lower Barton Creek, and El Progresso, the streams originating in the CMCC and the Belize River provide much of the surface water supplies to the downstream cities of Belmopan and Belize City. Therefore, the area for modeling water-based ecosystem services includes portions of eastern Guatemala, the CMCC, and the buffer areas to the north along the Mopan, Macal, and Belize Rivers.


Legend
Protected_Areas
Digital Elevation Model -DEM_SRTM
Value
High : 1132 m
Low : 38 m
Georgeville
San Ignacio
Santa Elena
Cristo Rey
Benque Viejo
San Antonio
Eligio Panti National Park
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Vaca Forest Reserve
Caracol Archaeological Reserve
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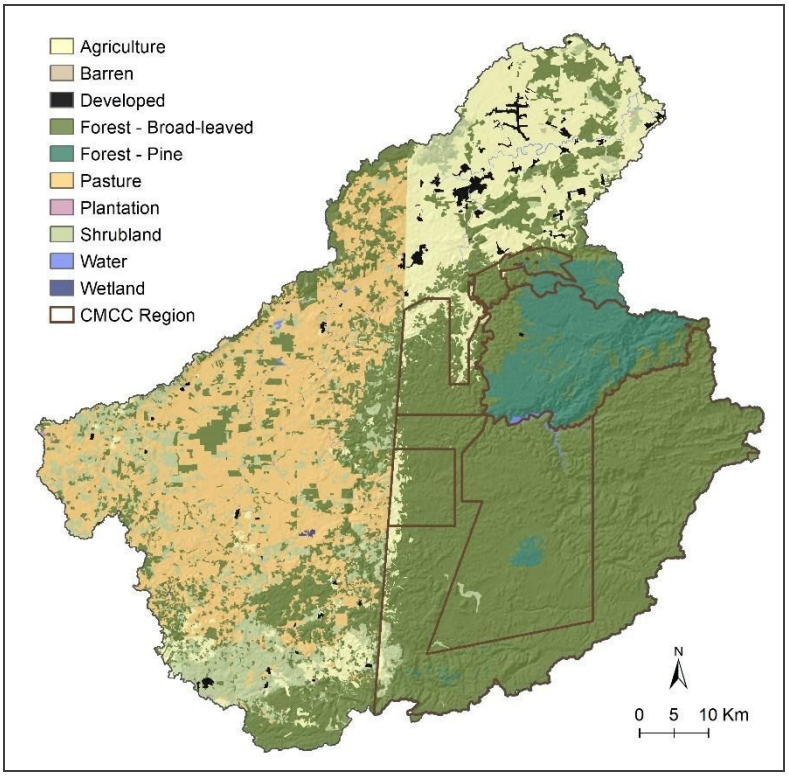
Agriculture
Barren
Developed
Forest - Broad-leaved
Forest - Pine
Pasture
Plantation
Shrubland
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CMCC Region
N
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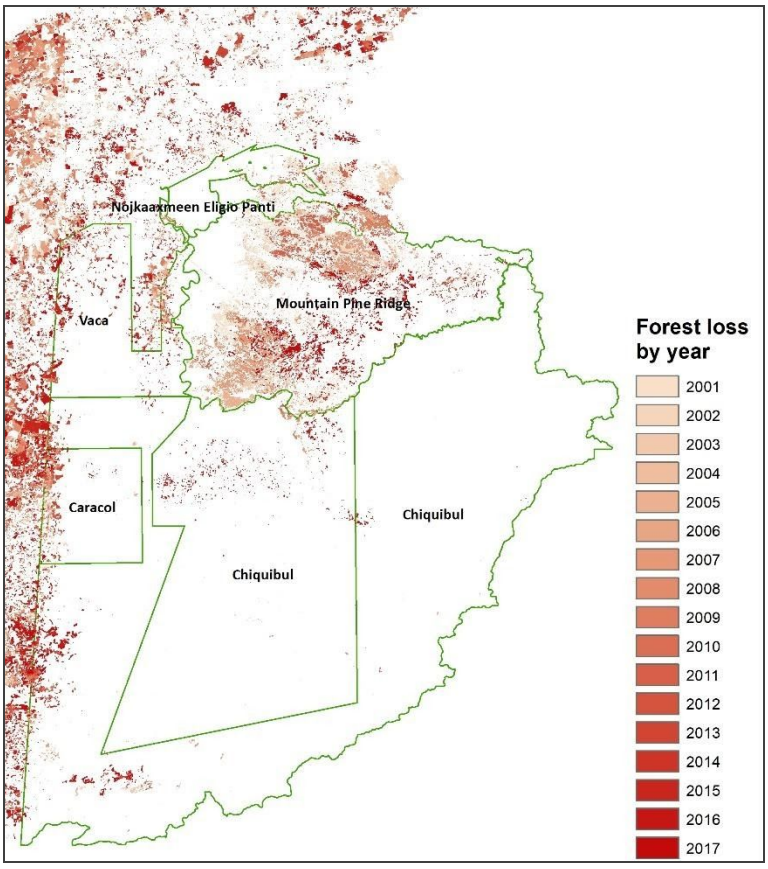
Nojkaaxmeen Eligio Panti
Mountain Pine Ridge
Vaca
Caracol
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Chiquibul
Forest loss by year
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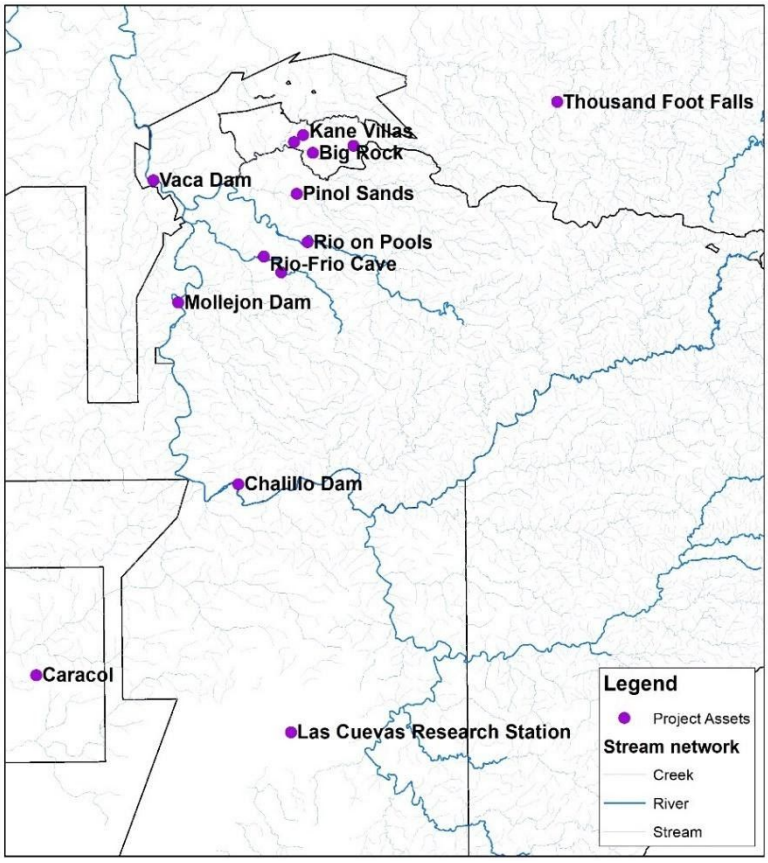
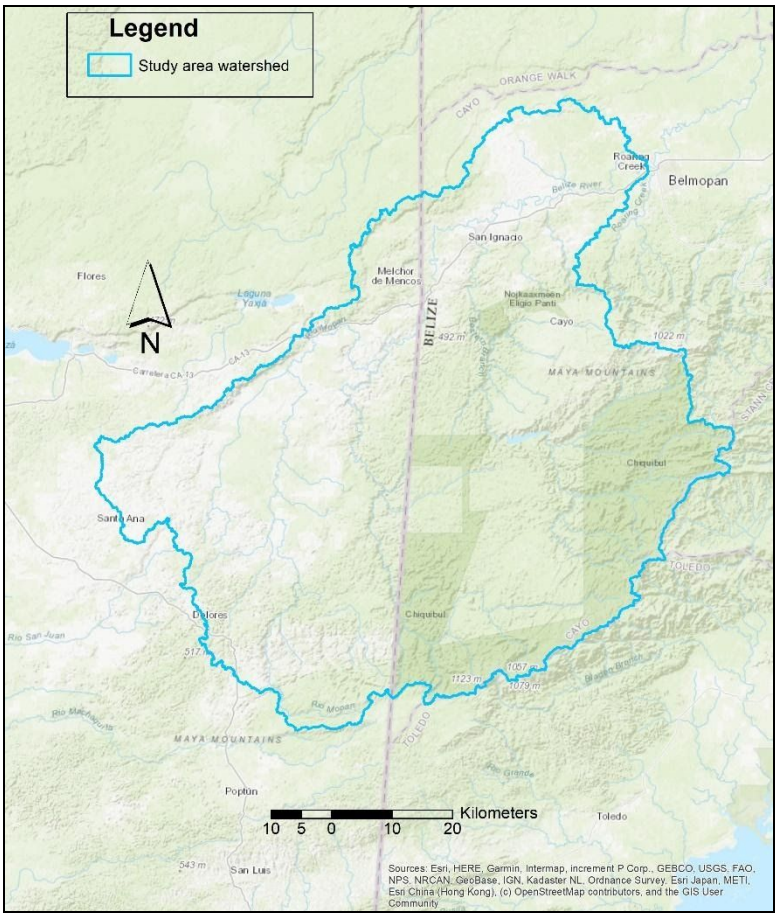

Thousand Foot Falls
Kane Villas
Big Rock
Vaca Dam
Pinol Sands
Rio on Pools
Rio-Frio Cave
Mollejon Dam
Chalillo Dam
Caracol
Las Cuevas Research Station
Legend
Project Assets
Stream network
Creek
River
Stream



Modeling approaches for ecosystem services

Typically, an assessment of ecosystem services includes developing biophysical models to simulate each service under current conditions, validating the models against observed data (where possible), simulating the change in each service that could be expected under different development scenarios, linking these changes to impacts on the beneficiaries of these services in specific locations, and then valuing (where feasible) the changes in each service considering the social preferences of the beneficiaries.

A useful exercise at this stage is to gather data and generate maps of areas where people are likely to benefit or suffer from changes in ES from potential land management changes. These are the “beneficiaries” of ES, and their location and distribution may be different depending on the services considered. This was one of the purposes of the mapping exercise conducted during the first stakeholder workshop. For example, the proportion of people relying directly on surface water supplies from a particular stream originating in the CMCC are the beneficiaries of water purification services in that area, while the locations and population of villages with high dependence on local forests for fuelwood may be mapped as the beneficiaries of fuelwood production services from forests. In ES analyses, these areas are sometimes referred to as “servicesheds”. Servicesheds are the areas

that provide specific ES to a group of beneficiaries, and these maps are important for later steps, when comparing costs and benefits of different implementation scenarios to different beneficiary groups.

With the information collected during the initial phases of stakeholder engagement, we have identified a potential list of ecosystem services to consider in the SDP, the type of benefits received, and by whom (Table 1). These services can be thought of as the objectives for which the landscape might be managed – that is, the quantitative attributes that stakeholders want to maintain into the future. The next phase of stakeholder engagement will be to define the specific development scenarios which will be acting upon the landscape and which will form the basis of an assessment of trade-offs. For example, one scenario might show a positive impact on one or two objectives – such as income from tourism and timber extraction – while causing a negative impact on other objectives – such as water availability for communities or water quality. Finally, we must also consider constraints, which are the boundaries around any activities that are considered in the scenarios. Potential scenarios of change could include identifying different areas of the CMCC region where tourism could be zoned or developed, assuming different visitation rates, or different zones where agriculture, mining, or timber extraction might be allowed to expand. Each of these scenarios would also be subject to constraints – for example, under current law there is no agriculture allowed in the Chiquibul National Forest, but tourism sites could be developed in certain areas that are allowed by law. Other constraints could be defined by stakeholders as part of the scenario development exercises to be undertaken in the coming months.

Mapping the ecosystem services delivered to different beneficiaries requires physical, ecological, and socioeconomic data, and quantifying the impacts on these services and the trade-offs of various development options typically requires simulation modeling using physically-based models. Table 1 lists potentially feasible analysis options for each service and benefit stream as identified by the NatCap team, and Table 2 lists the data requested and compiled to date for each service type.

The project team is still working to fill many outstanding data gaps that limit our ability to (1) validate biophysical models to simulate each ecosystem service under current conditions (major gaps are data on crop types, fertilizer and irrigation practices, as well as observed data to compare to model outputs); (2) model each ecosystem service under different development scenarios to produce the biophysical metrics of interest (gap is more detailed information on development options and their impacts on model parameters); (3) link the changes in each service to beneficiaries in specific locations (gaps in our knowledge of exactly where benefits are received and in what quantities); and (4) value the changes in each service (gap is economic information on the market and non-market values of services). While several options are presented here, selection of the appropriate analysis methods and final ecosystem services to be analyzed will be guided by our final assessment of data availability, technical capacity and resources available, in consultation with the full project team, the EDC and the SDP Project Steering Committee.

Table 1. Summary of ecosystem services from the CMCC, the type of benefit received, and potential methods to quantify the impacts of different development scenarios on these services, in terms of the quantitative (biophysical) metrics and modeling approaches.

Ecosystem service	Benefit stream (value)	Biophysical metric	Potential approach to quantify impacts
Water flow and availability	Hydroelectric energy generation	Baseflow at Vaca, Mollejon and Chalillo dams	InVEST Seasonal Water Yield model
	Drinking water supplies for communities, resorts, archaeological sites, etc.	Baseflow in streams providing drinking water to communities (e.g. Privassion Creek, others)	
	Irrigated agriculture and water for livestock	Dry season baseflow in streams near irrigated croplands	
	Tourism/swimming, tubing, rafting sites	Baseflow in streams where tourist sites are located (Figure 6, others to be defined)	
	Environmental flows for aquatic ecosystems/fishing	Baseflow in streams	
Water purification	Clean drinking water supplies for communities, resorts, archaeological sites, etc.	Avoided nutrient loads in streams providing drinking water to communities (e.g. Privassion Creek, others)	InVEST NDR (nitrogen retention) model
	Clean water for tourist, swimming, and recreation sites	Avoided nutrient loads in streams where tourist sites are located (Figure 6, others to be defined)	
Tourism & recreation	Income to private investors, resorts, tourism operators; Job creation and economic growth for communities; Revenues for the GoB	Visitation rates by zone (or by site) Footprint of developments Annual water demand	Consider scenarios of tourism development at different sites or zones, and calculate impacts on water demand, ecosystems, and/or conflicts with other services.
Ecosystem health and habitat quality	Maintenance of healthy ecosystems for biodiversity, tourism value, and general ecosystem services	Index of habitat quality relative to threats and stressors	InVEST Habitat Quality model
Timber	Timber concessionaires	Timber harvested annually	InVEST Timber model (or basic spreadsheet calculation)
Carbon	Carbon sequestration for climate change mitigation	Change in total carbon stocks	IPCC Guidelines for National Greenhouse Gas Inventories
Pollination	Improved crop production in farmlands adjacent to natural areas	Total (relative) yield attributable to wild pollinators	InVEST pollination model
Soils	Maintaining soil fertility for crop production	Avoided erosion	InVEST SDR (sediment retention) model

Status of data collection efforts

Table 2. Summary of data requested and compiled by ecosystem service type.

Ecosystem service model	Data type and format	Source(s)	Notes
Various (general data)	Land use and land cover	Map of the Ecosystems of Belize (Meerman 2017; BERDS)	Guatemala LULC data needs verification
	Forest loss		
	Digital elevation model (DEM)	NASA Shuttle Radar Topography Mission (SRTM)	
	Roads (existing and planned)	Open Street Map; Cayo District Roads from GoB EDC	
	Soil types and properties	ISRIC Soil and Terrain database for Latin America (SOTERLAC)	
InVEST Seasonal Water Yield	Monthly mean precipitation (raster)	WorldClim v2	
	Reference evapotranspiration	WorldClim v2	
	Rainfall events per year	BNSDI weather station data	Data requested
	Evapotranspiration coefficient by vegetation & land use type	Literature review	Ongoing
	Curve number by soil type, vegetation & land use type	Literature review	Ongoing
	Location of irrigated croplands, extraction points and average water demands	Ministry of Agriculture & Fisheries	Data requested
	Location of extraction points for community water supplies	Stakeholder mapping exercise (Workshop #1)	Needs verification
	Historical data on stream flows	Department of Environment	Data requested
InVEST NDR (nitrogen retention)	Monthly mean precipitation (raster)	WorldClim v2	
	Nitrogen loading and retention efficiency by vegetation & land use type	Literature review	Ongoing
	Data crops, irrigated areas, etc.	Ministry of Agriculture & Fisheries	Data requested
	Historical data on water quality, nutrient concentrations	Department of Environment	Data requested

Table 2 (continued). Summary of data requested and compiled by ecosystem service type.

Ecosystem service model	Data type and format	Source(s)	Notes
	Data on timber harvest procedures: amount harvested	GoB, EDC	Data requested

	each year, cost and value of timber operations		
Carbon	Carbon stocks by ecosystem type	IPCC Guidelines	
Pollination	Data on native pollinators, their habitats, and feeding behavior	University of Belize; Literature review	Information requested; literature review ongoing
Soils	Soil erodibility	ISRIC Soil Grids	
	Rainfall erosivity	Rainfall data: WorldClim v2; Erosivity calculation from FAO Soils Bulletin 70, Roose (1996)	
	USLE C and P factors by land use type	Literature review	

Path forward: next steps

We continue to look for the best sources of available data that will enable us to select priority ecosystem services for mapping and quantification, including 3-4 services that can have a robust monetary valuation applied. Specific next steps include:

1) Continue pursuing data that allow for baseline model development and validation, prioritizing the services most often mentioned by stakeholders: water supplies, water quality, recreation/tourism, and timber.
2) Compile data needs for market and non-market valuation of services and determine data availability.
3) Once data on crop types, irrigated areas and fertilizer use are made available, harmonize and finalize the Land Use Land Cover map include data from Belize, Guatemala, and data on Forest Loss from Hansen et al. (2013).
4) Complete literature review for remaining model parameters for which data are not available.
5) In consultation with project team and the SDP Steering Committee, make final recommendation for priority ecosystem services to map and to value, based on the final assessment of data availability, technical capacity and resources available.

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Appendix A: Summary of Feedback Received in Workshop 1

ACTIVITY 1: VISIONING EXERCISE: A Sustainable Future for the CMCC Region

Participants were split into small groups to discuss the following questions: (1) What does a sustainable future for the CMCC area look like? In other words, what would it be like if people were still benefitting from the area far into the future? What are you hoping to accomplish with development in this region? (2) What are barriers or challenges that might make it difficult to reach this sustainable future? What problems should we avoid? (3) What are some opportunities that you see for getting to the future that you want for the area?

Following the small group discussions, each group assigned one or more rapporteurs to summarize the main points from the group. NatCap/Stanford then led a facilitated discussion to summarize and systematize the responses and develop the following:

- A consensus list of objectives (based on desired outcomes) that need to be considered in the SDP. Note which of these are *ecosystem service goals*, and which are *other development goals*
- A list of barriers/concerns that need to be addressed
- A list of development opportunities

Responses to these questions and the discussion of objectives, concerns, and development opportunities are listed below.

VISION for a sustainable future for the CMCC area:

OBJECTIVES that need to be considered in the SDP (BENEFITS from the CMCC):

Responses from FRIDAY workshop July 19	*Responses from SATURDAY workshop July 20*

- Water
- Oxygen
- Economic benefits
  o Tourism that is nature-based, cultural, and sustainable
  o Sustainable timber
  o No agriculture in the CMCC; develop agriculture elsewhere and promote agro-ecological practices
  o No "Disney World" mass tourism
  o Fewer cruise visitors
  o Possibly apiculture, with native species
  o Energy security
	- Water flow & availability
	- Water quality
	- Healthy ecosystems
	- Tourism that is
	  o Sustainable
	  o Inclusive
	  o Based on art & nature
	  o Respects carrying capacity
	- Energy security
	- Mining (need to better understand impacts)
	- Limit extraction from mining

o Biodiversity as an asset that improves marketability o Reforestation Mining (participants were mixed on this: some were for and some against). All agreed that we should decrease mining impacts on water, and some thought we should promote sustainable mining. - Carbon - Meet Belize's international commitments (e.g. Convention on Biological Diversity) - Research & education	- Sustainable timber & logging (for example, cut 1 plant 2) - Cultural/archaeological sites

CONCERNS that need to be addressed in the plan

Responses from FRIDAY workshop July 19	*Responses from SATURDAY workshop July 20*
Enforcement	Garbage disposal, potential for increasing garbage
Governance: Transparency, accountability, inclusion, define clear roles & responsibilities	Deforestation
Lack of capacity	Participation of communities
Security	Local enforcement
Population growth	Government doesn't respect the plans
ICJ proceedings and pressure from Guatemala	Local government commitments
Funding	Funding
Poor planning & inability to balance competing or incompatible uses	Security
Infrastructure development putting pressure on sensitive areas	Benefits are not shared equitably
Carrying capacity	Unsustainable development (especially tourism, agriculture)
Land tenure, use rights, access, and legal framework	Illegal activities (e.g. hunting, gold panning)
Cooperation	Lack of consensus
Impact studies integrated in plans and funding mechanisms	Lack of responsibility
	Lack of education
	Lack of policies
	Contamination & pollution
	Human resources
	Ministries have too much discretion in application of policies
	Limits imposed on management by NGOs
	Governance
	Risk to habitats and wildlife
	Climate change
	Lack of political will
	Monitoring of tourism capacity
	Possibility of more destruction from timber harvesting
	Water contamination
	Environmental education
	Inefficiency and lack of transparency

	Road maintenance Security Ineffective and limited coordination Monitoring incursions Cooperation between communities and population

OPPORTUNITIES for development

Responses from FRIDAY workshop July 19	***Responses from SATURDAY workshop July 20***
Sustainable development plan that lays out a shared vision as well as roles and responsibilities Innovative development models (e.g., public-private partnerships for tourism development and resource management) Legislative reform There is a broad interest in the region that presents an opportunity for cooperation from local, national, and international actors Carbon value Inclusive governance Funding models, such as Debt for Nature or a CMCC fund Development based on multiple benefits Research & education Institutional capacity building for managers Promote sustainable practices	Capacity-building and training for communities to prepare them for the changes that development will bring. Use media to involve young people, give them hope CMCC should be designated as a World Heritage Site List CMCC on IUCN Green List Name CMCC as a Key Biodiversity Area Community development: jobs, include women, creative approaches Workshop for people who usually do not have a platform Diversifying energy sources Balancing tourism, watershed protection and protected areas National Park status for key areas, resulting in increased protection for the watersheds Better security & emergency response

ACTIVITY 2: MAPPING EXERCISE: Ecosystem Services in the CMCC Region

Participants were split into small groups and asked to identify specific places in the CMCC region that provide different benefits, and specific geographic areas of concern that need to be taken into account in the SDP. Participants drew on maps and made notes on the areas, their benefits, and concerns.

The results from this exercise are currently being digitized and will be incorporated into the scenario planning exercise used during the Second Stakeholder Consultation Workshop in September 2019.

ACTIVITY 3: Summarize ecosystem service OBJECTIVES, other development GOALS, and CROSS-CUTTING ISSUES to include in the SDP

A discussion was facilitated by NatCap/Stanford for all participants to build consensus on the primary objectives for the SDP – including both ecosystem services objectives and other development goals – and other issues that should be addressed in planning for a sustainable future. The results of this discussion are summarized below.

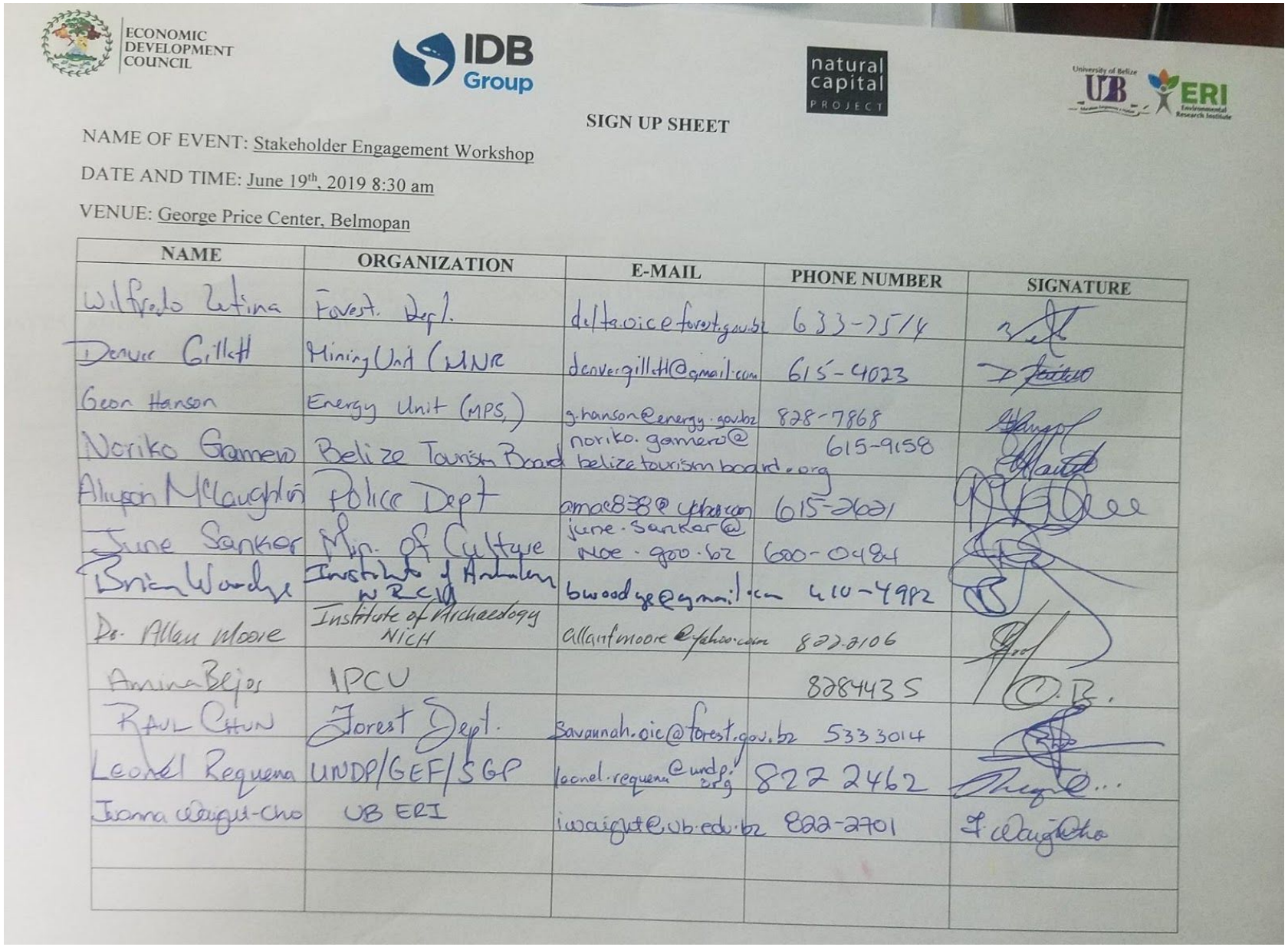
Responses from FRIDAY workshop July 19	*Responses from SATURDAY workshop July 20*
ECOSYSTEM-BASED OBJECTIVES ***1) Water flow & availability*** **1a) Securing water sources that are critical for:** • **drinking water, household & commercial use, resorts & tourist destinations** • **energy (hydropower)** • **agriculture, irrigation** • **recreation** **1b) Retain a minimum of X forested area along priority areas of the Macal River and other bodies of water.** ***2) Water quality*** **2a) minimize nutrient contamination** **2b) minimize sediment contamination** **2c) manage human waste and garbage at tourist sites** **2d) monitoring, enforcement and management of mercury contamination from hydropower dams** ***3) Nature-based tourism*** **3a) standards for density of accommodations based on proximity/remoteness** **3b) feasibility studies to determine carrying capacity, market potential, security, etc.** **3c) upgrades for existing sites** **3d) zoning, agreements and restrictions (and enforcement) put on tourism**	**ECOSYSTEM-BASED OBJECTIVES** ***1) Water flow & availability*** 1a) Protect watersheds that are critical for: • drinking water, household & commercial use, resorts & tourist destinations • energy (hydropower) • agriculture, irrigation • recreation 1b) No reduction in water flowing in creeks and rivers from CMCC ***2) Water quality*** 2a) minimize contamination from agriculture and road development 2b) manage human waste and garbage at destination sites (staff to man sites, incentives) 2c) no increase in pollution from sewage; wastewater 2d) education for communities on water quality issues and monitoring data 2e) enforcement by DoE

concessions within the CMCC; only allowed a certain distance within the protected areas **4) *Energy self-sufficiency*** **4a) Diversification towards new clean energy sources (wind, solar)** **5) *Sustainable timber*** **5a) timber revenue that is sustained** **5b) sustainable timber practices to maintain forest health, reduce impacts on water & biodiversity** **6) *Mining revenue*** **[some stakeholders for, some against]**	***3) Healthy ecosystem and biodiversity*** 3a) reforest degraded areas 3b) monitoring and management plans to keep it healthy 3c) more patrols in key areas (group 3 map shows one example of these areas) 3d) Fire management and bark beetle control and other practices to keep forest healthy ***4) Tourism development*** that… 4a) is sustainable (standards for development regarding water, sustainable energy, waste management) 4b) is inclusive (benefits are shared with communities) 4c) incorporates art and nature 4d) stays within the carrying capacity of sites ***5) Energy security*** 5a) Diversification towards new clean energy sources (solar) ***6) Other*** 6a) Mining: we need studies to determine true impacts before we know if it should be allowed. 6b) Either limit or implement sustainable extraction (for mining: zoning, restabilizing soils; for timber: cut 1 tree, plant 2) 6c) Logging only allowed within existing areas, transparent, monitored, and sustainable [but this is controversial] 6d) Cultural sites, increase security (funding for security) at archaeological sites

CROSS-CUTTING GOALS	CROSS-CUTTING GOALS
Security ● establish more conservation posts along the border ● grant more licenses for sustainable uses in the border area ● build on existing cooperative programs ● utilize technologies (e.g. Global Forest Watch, citizen science, drones) for monitoring **Fire management plan** ● bi-national fire management with Guatemala **Legislation** ● zoning for different uses within the CMCC	Responsible Development Zoning & enforcement to balance different uses ● no new de-reservations; all development restricted to existing private lands ● no agriculture in CMCC ● phase-out of logging in Chiquibul ● all new developments should follow standards for sustainability regarding water, energy, waste management, etc. ● incentives (low-cost loans, green financing, training, etc.) for development to happen in communities, not in CMCC ● border control: more budget and human resources allocated to this (to control incursions and their impacts like illegal gold panning, poaching, logging, etc.); make use of new technologies (e.g. drones) Access and security ● improve/increase trails ● more rangers with the right equipment, right training, potentially use existing manpower from elsewhere in the country ● Co-managers provide their own security ● More communication among different entities providing security within the CMCC Clean communities and ecosystems ● waste management that is harmonized for the region (within CMCC and buffer communities) Management plan that is inclusive, that is implemented and that people agree with. Education and awareness for communities

OTHER IMPORTANT CONSIDERATIONS	**OTHER IMPORTANT CONSIDERATIONS**
Quality of life **Maximize benefits for Belizeans** **Security – increase enforcement along the border** **Funding – resource mobilization** **Ensure adequate infrastructure to support growth & development** Compliance plans applied to existing housing developments within protected areas Bi-national cooperation (fire, watershed management) Consultative and transparent process for de-reservation (within and outside CMCC) Empower buffer communities to be the stewards of their land Social inclusion	Participation from all stakeholders Full-time research center that monitors natural resources, watersheds, advises on sustainable management Political will Develop leaders and role models in multiple sectors who can be champions of the plan and carry it forward across generations. National Park designation for some areas (TBD, possible expansion of Chiquibul National Park boundaries to encompass all of Chiquibul Forest) and/or World Heritage Site status and/or IUCN Green List Amending legislation acts to decrease ministerial influence, protect wildlife and habitat, develop fire management plans. Funding: ● charge a fee to companies and private landowners operating within the CMCC to help protect the area. ● Entrance fee at MPR gate, use the fee for waste management Many different legislative jurisdictions cover this area Mountain Pine Ridge area should be co-managed by Friends for Conservation and Development. [note it was unclear whether this suggestion referred to all of the MPR or only parts]

Workshop Participants: 19 July



ECONOMIC DEVELOPMENT COUNCIL

IDB Group

natural capital PROJECT

University of Belize UB ERI Environmental Research Institute

SIGN UP SHEET

NAME OF EVENT: Stakeholder Engagement Workshop

DATE AND TIME: June 19th, 2019 8:30 am

VENUE: George Price Center, Belmopan

NAME	ORGANIZATION	E-MAIL	PHONE NUMBER	SIGNATURE
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Noriko Gamero	Belize Tourism Board	noriko.gamero@belizetourismboard.org	615-9158	
Allyson McLaughlin	Police Dept	amac838@yahoo.com	615-2691	
June Sankar	Min. of Culture	june.sankar@moe.gov.bz	600-0484	
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Dr. Allan Moore	Institute of Archaeology NICH	allanfmoore@yahoo.com	822-3106	
Amina Bejos	IPCU		8284435	
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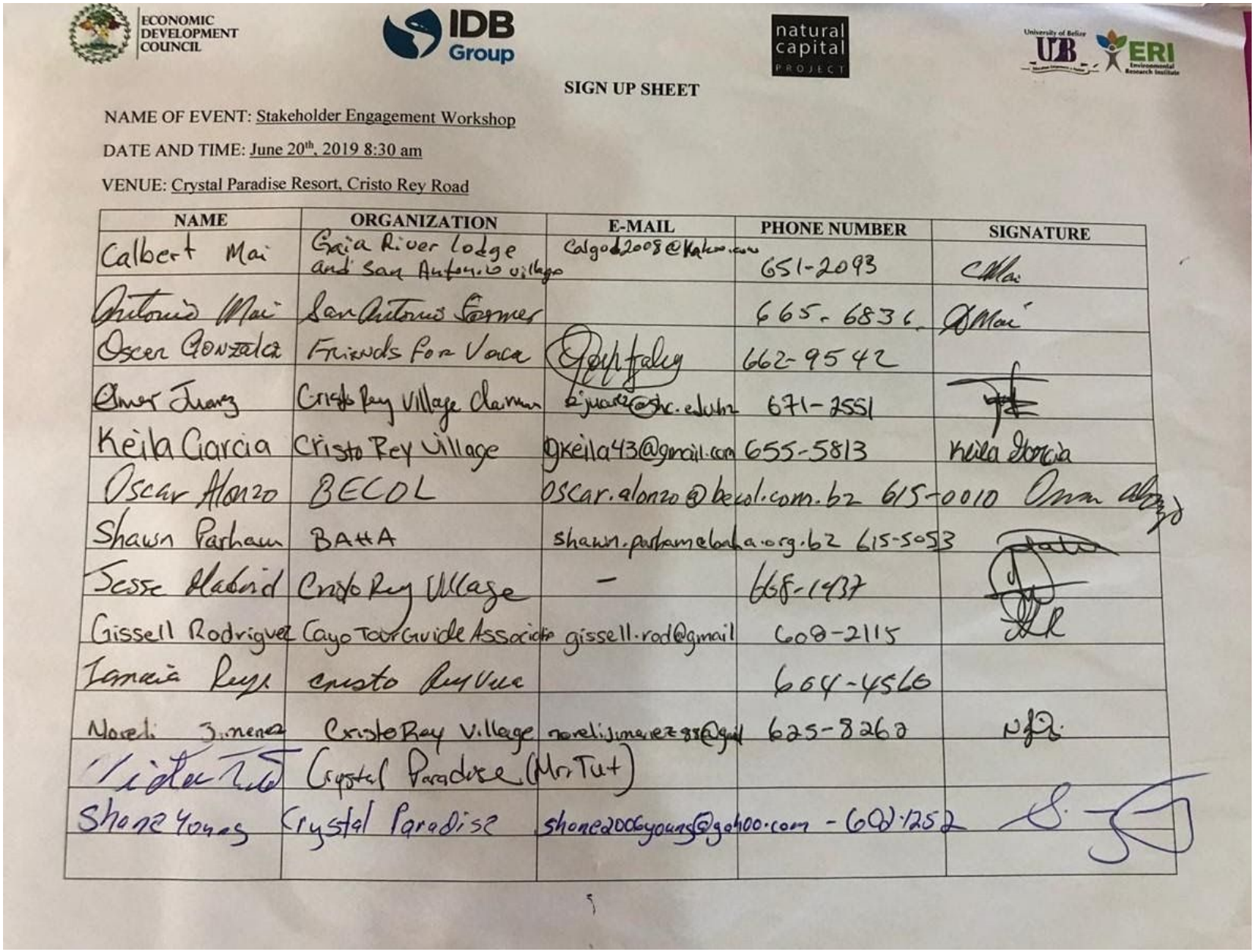
Leonel Requena	UNDP/GEF/SGP	leonel.requena@undp.org	822 2462	
Joanna Waight-Cho	UB ERI	jwaight@ub.edu.bz	822-2701	

Workshop Participants: 20 July



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University of Belize UB ERI Environmental Research Institute

SIGN UP SHEET

NAME OF EVENT: Stakeholder Engagement Workshop

DATE AND TIME: June 20th, 2019 8:30 am

VENUE: Crystal Paradise Resort, Cristo Rey Road

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Calbert Mai	Gaia River lodge and San Antonio village	Calgo82008@Yahoo.com	651-2093	
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Tamara Reyes	Cristo Rey Vill		664-4560	
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Victor Tut	Crystal Paradise (Mr. Tut)			
Shone Young	Crystal Paradise	shone2006young@yahoo.com	608-1252	

ECONOMIC DEVELOPMENT COUNCIL

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SIGN UP SHEET

NAME OF EVENT: Stakeholder Engagement Workshop

DATE AND TIME: June 20th, 2019 8:30 am

VENUE: Crystal Paradise Resort, Cristo Rey Road

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Jim Bevis	Bull Run	jbevis@Robarts.com	614-0844	