

Analysis of Drivers of Deforestation and Forest Degradation and Identification of Response Strategies

Report: Analysis of drivers of deforestation and forest degradation; barriers for forest conservation, sustainable management of forests, and enhanced carbon stock; and strategic response options

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Acronyms

AT	African tulip
CBD	UN Convention on Biological Diversity
CI	Conservation International
CO ₂	Carbon dioxide
DoDD	Drivers of deforestation and forest degradation
DoF	Department of Forestry
EIA	Environment Impact Assessment
EMA	Environment Management Act 2005
FHCL	Fiji Hardwood Corporation, Ltd
FFHCP	Forest Harvesting Code of Practice
FME	Forest management enterprise
FSC	Fiji Sugar Corporation
GDP	Gross Domestic Product
HDI	Human Development Index
ICMC	Integrated Coastal Management Committee
INLUP	Integrated National Land Use Plan
MMC	Mangrove Management Committee
MRD	Mineral Resource Department
MoA	Ministry of Agriculture
MoF	Ministry of Forest
NDMA	National Disaster Management Act
NEC	National Environment Council
NGO	Non-governmental organization
REDD	Reducing emissions from deforestation and forest degradation
REDD+	REDD “plus” forest conservation, sustainable management of forests, and the enhancement of forest carbon stocks
RLUP	Rural Land Use Policy
TLTB	iTaukei Land Trust Board
UN	United Nations
UNCED	UN Conference on Environment and Development
UNDRIP	UN Declaration on the Rights of Indigenous Peoples
UNFCCC	UN Framework Convention on Climate Change



1 EXECUTIVE SUMMARY

The analysis of drivers of deforestation and forest degradation; barriers of forest conservation, sustainable management of forests and enhance carbon stocks and strategic response options was undertaken in September 2017 to October 2018 and finally completed in October 2020. The assessment involved in-depth investigation of extensive literature review with public consultation workshops at divisional level as well as community level workshops. Open Standards for the Practice of Conservation and Participatory Action Research were the main tool used to better understand the drivers and underlying causes of forest degradation and loss. In alignment with earlier works (GoF 2014, GoF 2018, Haas 2015) the drivers of forest degradation include logging, traditional use of forest and introduced species while the drivers of deforestation include infrastructure development and mining. Agriculture expansion and natural disaster are mutually inclusive drivers for forest degradation and forest loss. Underlying causes include social, economic, technological, political, and institutional factors as well as cultural preferences and norms.

Barriers towards responsible forest management includes governance, institutional policies, and cultural considerations. With a complex system of natural resource management, rules, and regulations across several Government agencies; well-meaning policies remain unimplemented due to weak understanding of Government roles across related sectors, levels, and social groups. Moreover, there is a capacity gap for effective monitoring and enforcement of new policies and regulations related to commercial and sustainable management practices. Participation, coordination, land and resource use, management practices and commercialization as well as capacity and relevant knowledge also contribute to barriers for effective management of forest degradation and deforestation.

The data set collated from Ministry of Forestry for each year between 2007 and 2017 indicated trends of significant and widespread deforestation across Viti Levu, Vanua Levu, and Taveuni. Projected rate of deforestation rises from 0.8% in 2017 to over 2% per year in 2035 and back to 1.5% per year by the end of the scenario. The annual area of deforestation is projected to increase from 8000 hectares per year to nearly 16,000 hectares per year in 2035 under business as usual scenario where deforestation is driven by agricultural clearing associated with high market price for kava. The GIS model makes predictions in 5-year intervals with strong increase in deforestation rates through the mid-2030s following projections based on the historical increase in deforestation that occurred from 2007 to 2017. Distance to farms is noted to be the biggest factor in Viti Levu and distance to logging was the biggest factors driving deforestation and forest degradation in Vanua Levu. Protected areas were a large factor contributing to avoided deforestation.

Estimates of the costs and benefits of three alternative strategies to reduce deforestation and forest degradation in Fiji were examined. Three strategies that have clear cost structure were assessed in the economic model. The modelling analysis in this document covers the period 2020-2045. The baseline scenario focuses on modelling land use for forests and other uses in the future as projected by the GIS model. Three strategy options analyzed in the economic model include (1) Integrated Land Use Planning; (2) Sustainable Agriculture Production and (3) Sustainable Forest Management. The results of the analysis suggest that the effort to conduct national land use planning can provide low-cost carbon sequestration. The sustainable forest management strategy is the next lowest cost option while sustainable agricultural management strategy is the highest cost option due to the uncertainty of the effect of improved productivity on land use.



2 OBJECTIVE OF THIS ASSESSMENT

Conservation International (CI), in partnership with Indufor Asia-Pacific, has been awarded a consultancy to undertake an analysis of drivers of deforestation and forest degradation (DoDD) and identification of response strategies through Fiji's Reducing Emissions from Deforestation and Forest Degradation-Plus (REDD+) Readiness Program as supported by the Forest Carbon Partnership Facility / World Bank. The overall specific objectives of this consultancy are to:

- (1) Identify and analyze all drivers and agents – both direct and underlying – of deforestation and forest degradation (including mangroves) and how past and current policies, governance, economy, culture, and social demands play a role in influencing these drivers;
- (2) Identify and assess the barriers to and agents for forest conservation, sustainable management of forests and the enhancement of forest carbon stocks at the national, subnational, and local level, and how past and current policies, governance structures, economic statuses, local cultures, and social demands play a role in influencing these drivers;
- (3) Determine land use and forest cover change trends and assess associated drivers; and
- (4) Identify strategy options and key interventions to address the DoDD and barriers to forest conservation, sustainable management of forests and the enhancement of forest carbon stocks.

3 APPROACH & METHODOLOGY

The approach to undertake this study was designed to capitalize on both national and international expertise across the various tasks, while building local skills and capacity throughout the course of the project. The analytical studies were based on local knowledge and perceptions from community to national level stakeholders and complemented with a depth literature review, and econometric and spatial modeling of future projections.

The methodology for achieving the objectives of the consultancy builds on the initial findings of the Fiji REDD+ Steering Committee, and was grounded in the following principles:

- Application of an international standard methodology for the identification, analysis, and prioritization of direct and underlying causes or DoDD and agents for forest conservation, sustainable management of forests and the enhancement of forest carbon stocks;
- Provision of consultancy services consistent with international frameworks and best practices;
- Alignment of the consultancy work plan with currently ongoing and known planned projects related to REDD+ implementation;



- Adoption of a consultative, participatory, and collaborative approach for the integration of stakeholder input; and
- Application of a local, country-driven process.

Details of methods used in each phase is described below:

3.1 Stakeholder Engagement and Consultation

A detailed consultation plan was developed during the inception phase to coordinate the engagement with multiple stakeholder groups. This stakeholder consultation plan was presented to and approved by the National REDD+ Secretariat during the national-level inception workshop in October 2017.

The consultation plan describes the engagement process with key stakeholders, outlines a list of stakeholders that will be reached to provide information on the DoDD and describes consultation structure and study sites.

The engagement process respected traditional and cultural considerations and was aligned with guidelines in the REDD+ Fiji Consultation and Participation Plan.

The communication structure was targeted at three levels: field, divisional and focal group interviews. Field and divisional consultation were conducted through workshops that involved mapping changes over time and historical profiles to identify direct drivers or agents of change. The approach used relevant sections of the Open Standards for the Practice of Conservation (OS) to identify indirect causes and barriers as well as to identify and prioritize strategy options to mitigate deforestation and forest degradation (CMP, 2013). Focal group interviews were guided by a set of key questions, and Participatory Action Research Tools (see Annex 3: National Workshop Report) to facilitate the discussions. Principles of Free, Prior, and Informed Consent (FPIC) was adopted throughout the intervention.

The list of invitees for the local and divisional consultation workshops are presented in Deliverable 1, with a brief assessment of their potential interest, expectations towards REDD+ and the contribution to DoDD assessment.

While the focus of the study is on determining national level strategic responses, issues and considerations at the sub-national and local level will also need to be identified to consolidate the development of strategy options. The team agreed with the REDD+ Secretariat on three study sites: Greater Tomaniivi, Serua Inland and Serua Coastal. The selection of each site aimed to capture representative forest types across Fiji, including mangrove and a wide range of drivers, indirect causes, agents of deforestation, forest degradation and barrier to sustainable forest management, carbon enhancement and forest protection.

3.2 Literature Review

The literature review was built upon the initial documents referenced in the ToR, including the FCPF Carbon Fund Methodological Framework (2013) and various analytical work by the United Nations Food and Agriculture Organization, Government of Fiji and others, and complemented by



an in-depth review of relevant government plans and documents, and scientific peer-reviewed publication. Over 150 references was used to argument the assessment, which. incorporated the following considerations:

Deforestation and Forest Degradation

- Consideration of direct, underline causes and actors (including **marginalized** groups and other interest groups) contributing to deforestation and forest degradation of all forested ecosystems (including mangrove);
- Consideration of economic activities associated with drivers and underlying causes of deforestation;
- Analysis of policies that influence patterns of deforestation and forest degradation, including land tenure and rights, social, cultural, and traditional pressures;
- Analysis of government policies on land use (e.g. concessions, and economic zoning) and development (e.g. infrastructure expansion)
- Availability of data for opportunity cost analysis of different land uses to quantify economic returns in terms of CO2 equivalent;
- Consideration of agricultural productivity trends and price trends for key land using outputs;
- Consideration of trends in mining and international price trends.

Forest conservation, sustainable management of forests and the enhancement of forest carbon stocks

- Policy analysis to determine effectiveness in advocating and implementing forest conservation, sustainable forest management and forest carbon stock enhancement including land tenure, social, cultural traditional pressures, and marginalised groups and other interest groups;
- Identification of main barriers to afforestation and reforestation;
- Review of sustainable mangrove management practices.

3.3 Qualitative analysis

During the implementation of the local, regional and national-level consultation workshops the team used basically two main tools: (1) the Open Standards for the Practice of Conservation (OS) approach (CMP, 2013) and (2) Participatory Action Research (PAR) tools, for the qualitative assessment.

The outcomes from the OS are a comprehensive conceptual model depicting the drivers of deforestation associated with the responsible social groups, and the interaction with economic, social and political causes. Another outcome of the OS workshops is a set of maps showing the distribution and intensity of the main causes of deforestation and forest degradation considering the recent past scenario.

The information gathered during the workshop reflects the local knowledge and was an opportunity to understand the deforestation dynamic from the stakeholders' perspective.



The PAR tools assisted in conducting research in communities that emphasize participation and action, aiming to understand the socio-cultural and economic perspective at village and household level. Several topics were discussed in dynamic exercises that range from *major causes of deforestation to farming practices and gender inclusion in decision process*. (see Annexes)

This information complemented the literature review and served as input for the deforestation model, besides providing a good qualitative assessment of the drivers of deforestation and forest degradation, and barriers to forest conservation, sustainable management and carbon enhancement.

3.4 Quantitative analysis

The Land Change Modeler (LCM) tool in the TerrSet Geospatial Monitoring and Modelling software was used to model future deforestation across Fiji, as well as to provide a more thorough understanding of the drivers of deforestation and forest degradation. The business as usual model used in the analysis assumes deforestation rates in the future are the same as the observed deforestation trends.

The 2012 - 2017 forest cover data from Viti Levu and Vanua Levu/Taveuni were used to establish the base rate of historical deforestation over a five-year period for the model. Forest cover for three years from this period, 2007, 2012, and 2017, were extracted to study and establish historical and current rates of deforestation and reforestation. Based on this data, the deforestation rate for Viti Levu between 2007-2012 is estimated at 4.26% which increased to 6.67% between 2012-2017. To validate the model, the 2007 - 2012 forest cover data was used to predict the expected deforestation and forest degradation scenario in 2017, which was then compared to the actual 2017 forest cover product.

The second step of this process was to model the likelihood that a pixel would transition between the forest and non-forest classes. Drivers of deforestation and degradation variables were defined and added into the model to establish the relationship, or relative weight, between each variable and the forest and non-forest classes. Such relationships provide an understanding of the cause and spatial distribution of the class transitions that occurred between 2012 and 2017, which depicts the probable spatial distribution for future deforestation and reforestation. Eight static variables were incorporated into the model based known relationship to deforestation as per available datasets. Details of these driver variables is outlined in Table 1.

Table 1: Static variables and data sources used in the modelling

Variables	Data used	Associated Deforestation and Degradation	Driver and for Forest
Distance from agricultural lands	– Landused dataset	Agriculture encroachment	
Elevation	- Digital Elevation Model (DEM)	Fires and accessibility to cane fields	



Distance from logging areas	– Data source	Infrastructure (road network for agriculture expansion)
Mining concessions	– Data source	Forest loss
Protected Areas	– Data source	Avoided deforestation
Distance to roads	– Data source	Infrastructure (road network for agriculture expansion)
Distance to villages	– Data source	Infrastructure, agriculture expansion, social, economic drivers
Distance to settlements	– Data source	Infrastructure, agriculture expansion, social, economic drivers

Using the historical rates of change between classes and the pixel transition likelihood raster produced using the driver variables, maps of the predicted landcover were projected for every five-year period until 2047. Estimated rates of deforestation are listed in Table 2 as well as the total forest areas were projected using historical deforestation rates.

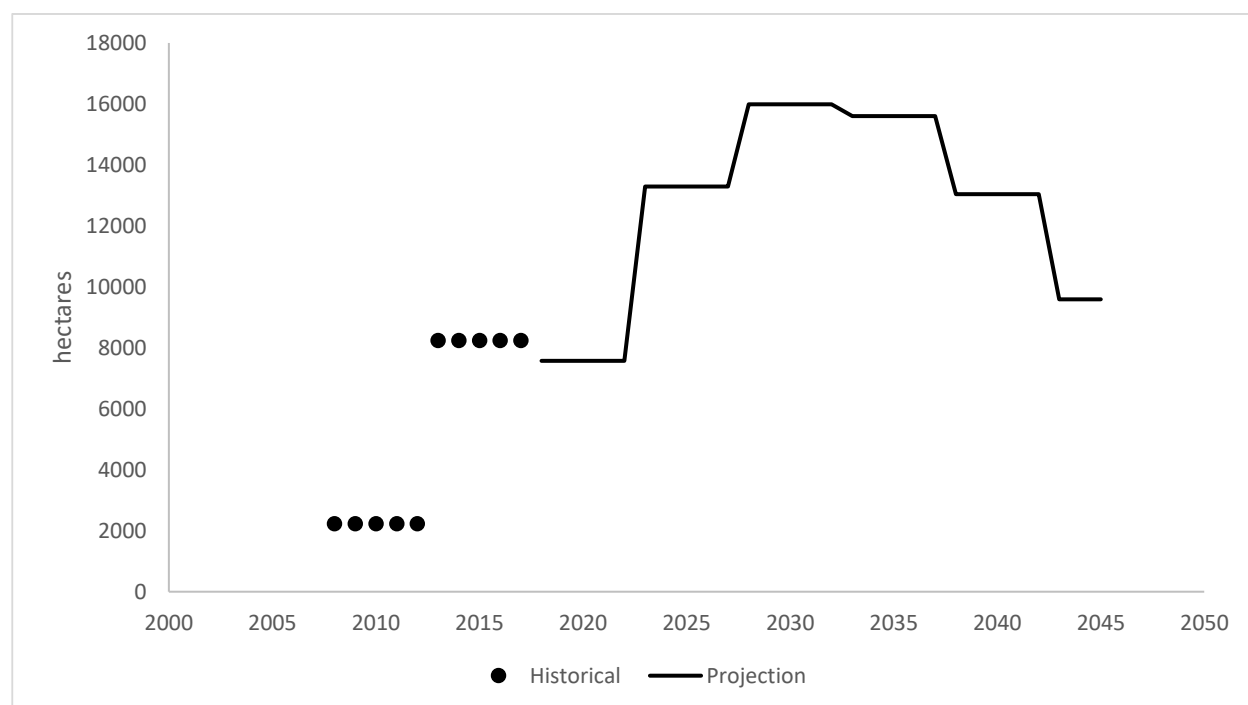
Table 2: Projection of deforestation rates based on deforestation rate between 2012-2017.

	Years	2017-2022	2017-2027	2017-2032	2017-2037	2017-2042	2017-2047
Rate of Deforestation	Viti Levu	6.67%	12.8%	18.4%	23.5%	28.2%	32.5%
	Vanua Levu/Taveuni	4.48%	8.53%	12.2%	15.5%	18.5%	21.2%
YEAR=>		2022	2027	2032	2037	2042	2047
Forest Area	Viti Levu	557,735	529,290	503,168	479,279	457,387	437,199
	Vanua Levu/Taveuni	401,292	395,317	389,967	385,126	380,740	376,775

The baseline was developed by using forest cover data set provided by Ministry of Forestry. Under the baseline land use model (Figure 2), the area of forestland in Fiji falls from 996,724 ha in 2017 to 640,371 in 2045, for a total reduction of deforestation 356,353. The rate of deforestation rises from 0.8% in 2017 to over 2% per year in 2035 and back to 1.5% per year by the end of the scenario. The annual area of deforestation is projected to increase from 8000 hectares per year to nearly 16,000 hectares per year in 2035 if kava production continues at the same level. The GIS model makes predictions in 5-year intervals, and those predictions are maintained in this report. The strong increase in deforestation rates through the mid-2030s follows the historical increase in deforestation that occurred from 2007 to 2017.



Figure 1: Predicted deforestation in Fiji, 2022-2047 (estimates based on Fiji GIS model).



The estimates for the benefits and costs of the strategy options are made for the time-period 2020-2045. The strategies are assumed to be implemented starting in 2020, and most strategy action, unless otherwise noted, are assumed to be implemented in each year from 2020 to 2045. The estimate of the cost per ton for each strategy is calculated as the average cost. It is not possible with this approach to estimate marginal costs, although marginal costs (the cost of the last ton sequestered) would be higher than the average cost. Average costs are calculated as the net present value of the costs divided by the net present value of the carbon. Mathematically this is represented as follows.

$$\text{Cost} = \frac{\sum_{t=1}^{25} (1+r)^{-t} \text{AnnualCost}_t}{\sum_{t=1}^{25} (1+r)^{-t} \text{CarbonGain}_t}$$

Estimates of carbon in forests and implementation costs of individual strategy options were obtained from Susana Waqainabete-Tuisese. These inputs were used to develop a spreadsheet model used to calculate benefits and costs over time. The estimates present value, a discount rate of 5% is used throughout the analysis. All prices in the model are US \$, and the assumed conversion rate with the Fiji \$ is \$2 Fiji = \$1 USD.

3.5 Assessment of REDD+ strategy options

The team identified and defined the strategy options for Fiji, based on the input from the consultation workshop and the qualitative and quantitative assessment. The team also assessed:



- Roles, strengths, weaknesses and gaps relating to governance structures and institutional capacities to address the identified drivers and agents;
- Forest sector governance and associated institutions including the cross-sectoral coordination mechanism;
- Supporting policies and legislation that can be enhanced or developed to address/mitigate the identified drivers/causes and agents.
- Factors that influence local communities and traditional structures to reduce deforestation and forest degradation and support forest conservation, sustainable management of forests and reforestation and afforestation.
- Gender issues and traditional and cultural values will play an important role in the assessment and identification of influential factors.

A large number of potential REDD+ strategy options, which include interventions, policies and actions, have been considered in the context of this study. Therefore, strategy options were prioritized based on the following criteria:

- Ability to generate non-carbon benefits such as income and food security, resilience to natural disasters and risk reduction;
- Climate change mitigation benefits in terms of carbon emission reductions and removals, and climate adaptation benefits;
- Alignment with existing government development plans;
- Political, social, cultural, and technical feasibility for implementation based on the perception from the national, divisional and community-level consultation.

The results will be presented in a consultation workshop to the stakeholders for final considerations and validation. Comments will be incorporated in the final document. Additionally, the final consolidated report will provide **several strategic options and directions which SESA will consider. SESA will therefore provide input into the final REDD+ strategy discussion** for national readiness and support the implementation framework for the Reducing Emissions and Enhancing Livelihoods Program.

4 FIJI CONTEXT

The Republic of the Fiji Islands consists of approximately 330 islands located in the South Pacific around the geographic coordinates 18°00'S 179°00'E. Fiji's total land mass amounts to 1.83 million hectares (ha), most of which is situated on the two main islands of Viti Levu (57%) and Vanua Levu (30%) (see **Error! Reference source not found.**). Sixty percent of Fiji's land mass is forested, of which 83% is natural rainforest and mountainous cloud forest, 5% is natural mangrove, and the remaining 12% is predominantly mahogany and pine plantations (see **Error! Reference source not found.**) (DoF, 2007b). Many species of plants and animals are unique to Fiji and cannot be found anywhere else (DoF, 2007a).



4.1 Physiology

Fiji is registered to have a tropical humid climate. Rainfall is highly variable and mainly influenced by the island topography and the prevailing south-east trade winds. The mountain ranges on Viti Levu and Vanua Levu create wet climatic zones on their windward sides and dry climatic zones on their leeward sides, resulting in the main islands having pronounced dry and wet zones. There is little climatic differentiation on the smaller islands. Rainfall is usually abundant during the wet season (November to April), especially over the larger islands, and it is often deficient during the rest of the year, particularly in the "dry zone" on the north-western sides of the main islands.

4.2 Population

Only about 100 of Fiji's islands are inhabited by a total of approximately 869,458 people, though the population is growing (see **Error! Reference source not found.**) (FBoS, 2017). Slightly less than half of Fiji's population (49.2%) resides in rural areas (FBoS, 2015). Given the nation's political history, Fiji today is a multi-racial society. According to the 2007 Census of Population and Housing, indigenous Fijian people (*iTaukei*) make up 56.8% of the population, Indo Fijians make up 37.5%, and the remaining 5.7% is comprised of other ethnic groups, including people of Chinese or European origins and minority Pacific Island races indigenous to Fiji (FBoS, 2008a).

As of 2016, Fiji ranks 91st among the 188 countries in the Human Development Index (HDI) with an HDI value calculated at 0.736, which falls into the category of 'high human development' (UNDP, 2016). Still, nearly one in every three Fijians remains below the poverty line (31%), which disproportionately impacts the rural population, 43% of whom remain below the poverty line. Many of these rural livelihoods depend significantly on terrestrial and marine resources; however, with lack of sustainable management, these subsistence or semi-commercial practices contribute directly to degradation and forest degradation (FBoS, 2016b).

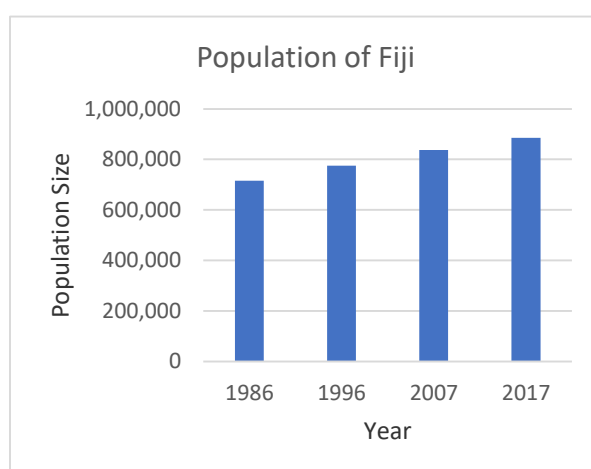


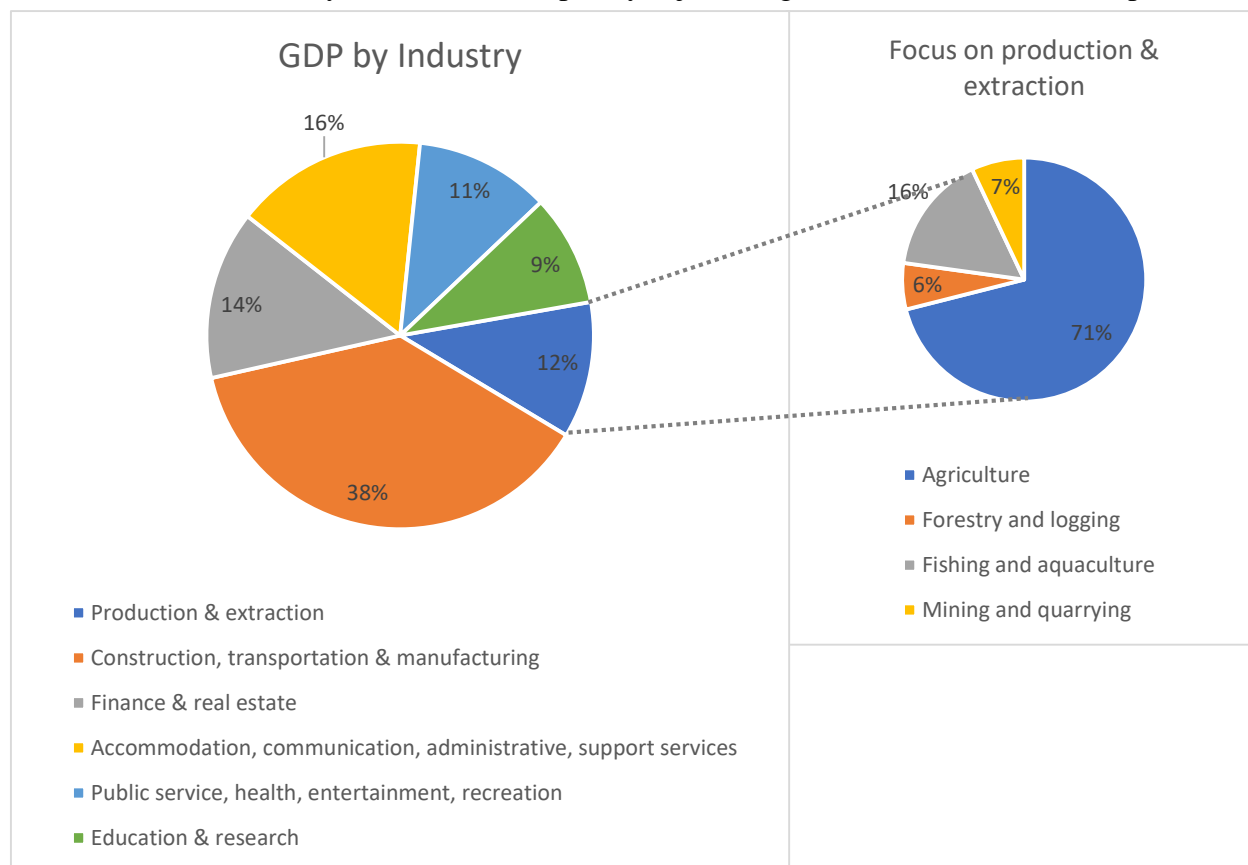
Figure 2: Population of Fiji (FBoS, 2017; FBoS, 2007b)

4.3 Culture & Governance

The Fiji Islands are divided into 14 provinces, comprised of 189 districts (*tikina*), comprised of 1169 villages. Approximately 88% of land in Fiji is communally owned by indigenous people under customary ownership through the iTaukei Land Trust Board (TLTB), 8% is private freehold land, and 4% is state land. The land that is communally owned by indigenous Fijians is administered by the TLTB in a statutory trust. At least 60% of registered living members of the clan (*mataqali*) under the official register of native landowners (*Vola ni Kawa Bula*) must come to consensus to approve any commercial development on their land; however, they have privilege of access and use for subsistence purposes.



Traditional administrative system of decision-making at the village and district level supports the government administrative structure. The traditional structure is based on understandings of and relationships within the “*vanua*”, which may also be understood as a set of cultural devices and structures which serve to maintain the integrity and harmony of the community. The authority of chiefs remains relatively intact in contemporary Fiji, with governance rooted in a deep historical



and empirical knowledge of the use of forests and land; however, in some cases, chiefs have assumed a more advisory or ritualistic role (Ravuvu, 1988; Cooke & Moce, 1995; Ruddle, 1988).

4.4 Economics

The economy is still dominated by agriculture, which employs about 60% of the population and accounted for roughly $\frac{3}{4}$ of the total collective agriculture, forestry, and fishing industry in 2014 (see Figure 3). There are more than 60 commodities listed in the 2009 National Agriculture Census, cultivated by more than 63,622 farmers operating 65,000 farms (Department of Agriculture, 2009).

More than 75% of all households in Fiji engage in agriculture, livestock production, forestry, or fishing (UNCCD National Focal Point, 2007; GoF, 2015b; Akram-Lodhi, 2016). The agriculture industry is primarily driven by sugarcane and kava (known locally as “*yaqona*”). Other major crops include rice, taro (known locally as “*dalo*”), cassava, sweet potato, ginger, banana, and other vegetables (Department of Agriculture, 2009). Tropical Cyclone (TC) Winston (category 5) hit Fiji in 2016, which impacted 62% of the population and resulted in an estimated total damage and loss across all sectors at FJ\$2.85 billion (Esler, 2016). The impact on agriculture, tourism, mining, commerce, and manufacturing will continue to persist for the next few years.



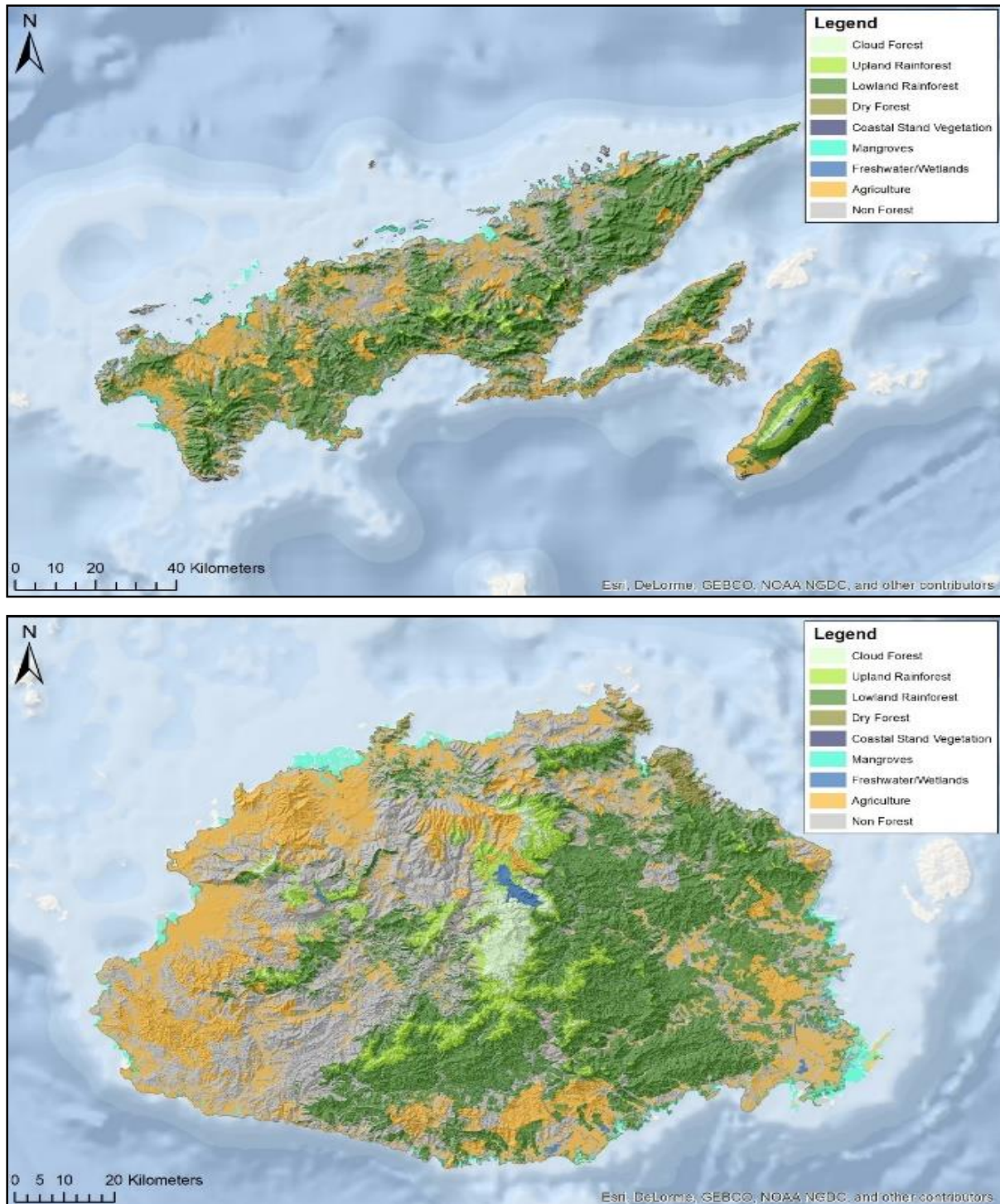
Figure 3: Gross Domestic Product (GDP) by industry (left) and specifically for production and extraction (right) at constant basic price for 2015 (provisional) (FBoS, 2016a)

4.5 Vegetation

Fiji is a country with many types of lush vegetation (see Figure 4). The principle types include:

- Cloud forest: This vegetation type is restricted to mountain tops and ridges above 850m and is almost always shrouded in clouds. Precipitation is high and temperature is generally much lower with trees generally stunted and heavily covered with bryophytes (Mueller-Dombois & Fosberg, 1998). This vegetation type can sometimes be found at lower elevations especially on mountain tops closer to the sea due to the Massenerberg effect.
- Upland rainforest: This forest system occurs between lowland rain forest and cloud forest usually around 650-850 m elevation (Mueller-Dombois & Fosberg, 1998). Usually found in rugged terrain and is often not logged and is classed as protection forest. On the southeast coast of the main island of Viti Levu this forest type can be observed at round 400m. Dominant timber trees found in the forest type includes two conifer species *Agathis macrophylla* and *Podocarpus vitiensis*.

Figure 4: Forest Cover on Viti Levu and Vanua Levu



- Lowland rainforest: A forest system that occurs mainly on flatland and gentle slopes in Fiji, ranging from near sea-level up to about 650 m elevation. Usually found on the windward side of the main islands and receives annual rainfall of around 2500 mm.



Majority of logged forest are from lowland tropical rainforest usually classed by foresters as production forest. Common timber tree species found in this forest type includes *Calophyllum vitiense*, *Gonystylus punctatus*, *Parinari insularum*, *Endospermum macophyllum*, *Agathis macrophylla* and *Syzygium spp* (Mueller-Dombois & Fosberg, 1998).

- Dry forest: This vegetation type is highly threatened once common throughout the coastal fringes of dry zone areas. Due to burning, grazing and conversion to agricultural land with only less than 10% of it remains. This vegetation type is also home to the critically endangered Fijian Crested Iguanas (*Brachylophus vitiensis*). Majority of tree species found in dry forest are deciduous *Garuga floribunda*, *Gyrocarpus americanus*, *Koelreuteria elegans*, and *Pongamia pinnata* (Keppel & Tuiwawa, 2007).
- Talasiga (sun burnt) grasslands: As the name suggests this vegetation type is dominated by the introduced grasses such as *Pennisetum polystachyon* (mission grass), *Sporobolus spp.* (wire grass) *Miscanthus floridulus*, (gasau or reed) and ferns *Dicranopteris spp.*, (qato or bracken ferns), *Pteridium esculentum*. This vegetation types covers one third of Viti Levu and Vanua Levu dry zone areas (Mueller-Dombois & Fosberg, 1998).
- Freshwater/wetlands vegetation: Found only in the wet zone of the two main islands restricted to poorly drained alluvial sites along coastal flatlands near major rivers. In Viti Levu these areas can be found along the two major Navua and Rewa Rivers. Freshwater vegetation ranges from lowland peats located away from active streams (Mueller-Dombois & Fosberg, 1998). These areas are dominated by native sedges such as *Elocharis ochrostachys*, *E. dulcis* and *Scleria polycarpa*. In some areas wetlands can be dominated by *Pandanus savanna*.
- Mangrove: Mangrove forest can be found at edge of the freshwater/wetland vegetation along coastal areas. They are found mostly along banks of major rivers and follows distinct zonation pattern. Towards the seaward edge is the *Rhizophora* zone comprised of *Rhizophora stylosa*, *R. samoense*. Following the *Rhizophora* zone is the *Brugiera* zone dominated by *Brugiera gymnorhiza* interspersed with *Xylocarpus granatum*, *Excoecaria agallocha* and *Lumnitzera littorea*. Mangrove forest is specifically highlighted in response to requirements outlined in the Terms of Reference. In the context of REDD+, avoiding emission from mangroves may contribute towards the Agriculture, Forest and other Land uses in Fiji's Nationally Determined Commitment. Mangroves are also an integral part of the Blue Carbon habitats where wide information gap exists. More information on Fiji's mangroves can be found in Box 1.
- Coastal strand vegetation: Restricted to the coastal areas this vegetation type occupies a narrow strip of land. On undisturbed areas exhibits clear herb-shrub-tree zonation greatly affected the natural disturbance of surf frequency and intensity. This vegetation type is also highly threatened by coastal development and is absent from the main islands and now restricted to uninhabited islands.
- Small islands vegetation: Restricted to small islands less than 100 m high which lack the orographic related precipitation experienced on high islands. Depending on the sizes of islands and the degree of disturbance vegetation tend to be dominated by either coastal



strand vegetation, some mangrove vegetation, talasiga grassland, some form of lowland land forest and plantations.

BOX 1: MANGROVES – the Nursery of the Sea

While still a relatively emerging topic in terms of climate change and carbon, mangroves play a large role in helping to mitigate and adapt to the impacts of climate change. Given Fiji's large expanse of mangroves, it is important to consider the threats to mangroves in addition to their role in both carbon sequestration and storage.

In addition to serving as a buffer against sea level rise and storm surges for vulnerable communities, mangroves are highly effective carbon sinks. With an average 1,023 metric tons of carbon per hectare, mangroves have about three times more carbon storage capacity per hectare than boreal, temperate, or tropical upland forests (Donato, et al., 2011; Watling, 2013). The global extent of mangroves is estimated at around 14.5 million hectares, with an annual loss around of 1.9% generating annual emissions estimated as high as 450 MtCO₂ (Pendleton, et al., 2012).

Fiji's Mangroves

Fiji is home to the third most abundant stands of mangroves in the Pacific Island region; however, while estimated at nearly 38,000 ha in 2010, this extent is decreasing (MESCAL, 2013). Mangroves are critical to sustaining coastal fisheries in Fiji, where mollusks, prawns, crabs, lobsters, and over 70 species of fin fish are caught and sold at local markets. Mangroves are also a valuable source of firewood, construction materials, tools, medicines, and dyes, in addition to supporting shoreline protection, sewage processing, and general aesthetics (MESCAL, 2013). Key challenges include the absence of a clear definition of mangroves and the lack of consistent, complementary legislation for the sustainable management of mangroves (MESCAL, 2013).

The Mangrove Management Plan for Fiji (Watling, 2013) records an estimated loss of mangrove over 16 years based on the work undertaken by the Secretariat of the Pacific Community–Pacific Islands Applied Geoscience Commission (SPC-SOPAC). Mangroves are among the most carbon-rich forests in the tropics, containing on average 1,023 tCO₂ /ha when soil carbon is accounted (Donato, et al., 2011). Loss of mangroves is generating an emission of approximately 222,000 tCO₂ annually. The estimate calculates resources in Viti Levu, Vanua Levu, Taveuni and Kadavu. The report also notes wide discrepancy in the estimates provided by the MoF and SPC-SOPAC, recommending that urgent attention is needed to reconcile the difference in order to provide solid basis for decision making.

The complex governance structure due to the dual systems of traditional tenure and westernized state ownership means that while the state technically owns foreshore lands – where most mangroves grow – iTaukei coastal communities retain unalienable customary rights to the use of living resources in these areas (MESCAL, 2013). This has historically been a beneficial arrangement for both parties, with the state's unofficial reliance on traditional communities as unpaid stewards resulting in their largely sustainable use for thousands of years (Watling, 2013). However, given the changing socio-economic system for and increasing pressure on many rural communities, new initiatives will need to recognize and reward communities as major stewards of mangroves, as opposed to depending upon communities to protect mangroves out of tradition and self-interest alone (Watling, 2013).

Multiple agencies deal with mangroves, including: the Department of Lands, which is responsible for foreshore land and reclamation, however inadequately equipped to facilitate on the ground



management activities; the Ministry of Forest (MoF), which is responsible for issuing and regulating commercial harvesting licenses for the use of mangrove but with reduced capacity to monitor activities; the Ministry of Fisheries, which is responsible for issuing and regulating licenses to fish; and the Department of Environment, which is responsible for protecting mangroves and associated biodiversity, providing considerable management responsibility but limited capacity for enforcement or implementation (MESCAL, 2013; Watling, 2013).

This complicated system whereby multiple actors are working with mangroves is further compounded by the absence of dedicated mangrove policy and legislation. Mangrove management is subjected to several interdisciplinary laws, regulations, and initiatives. Most notably, a Mangrove Management Plan for 1985 to 1993, is supported through the establishment of a Mangrove Management Committee (MMC) to advise the Department of Lands on inherited responsibility and best management practices (Watling, 2013). Under this plan, management zones are identified ranging from mangrove reserve to managed resource (e.g., traditional use, wood production, shoreline protection) to development (e.g., sewage treatment, urban development, tourism, agriculture). The plan was updated in 2013 to better serve as “a tool to administer, manage, facilitate, and control development and management of mangroves within Fiji”; however, it has yet to be endorsed by the cabinet (Watling, 2013, p. 2).

In addition to the Mangrove Management Plan, the National Biodiversity Strategies and Action Plan, Integrated Coastal Management Framework, Forest Policy, Climate Change Policy, and Tourism Development Plan support the sustainable management of mangrove resources (MESCAL, 2013). Worth noting that among these is the Fiji Forest Policy Statement which prioritizes the phasing out of commercial mangrove harvesting to manage mangroves for permanent conservation. Similar sentiments are outlined in the National Climate Change Policy, which calls for the conservation and sustainable management of mangroves (GoF, 2012).

Fiji is also a member of many multilateral environmental agreements, for which mangroves play a key role, including the CBD, UNFCCC and the Kyoto Protocol, United Nations (UN) Convention to Combat Desertification, Convention on International Trade in Endangered Species, the Ramsar Convention on Wetlands, the World Heritage Convention, UN Convention on the Law of the Sea, and International Convention for the Prevention of Pollution from Ships (MESCAL, 2013). Mangroves are also included in Fiji’s REDD+ policy as well as in the adaptation portion of Fiji’s Intended Nationally Determined Contribution (GoF, 2015b; Watling, 2013).

Deforestation and Degradation of Mangroves

The median rate of loss for mangroves in Fiji was about 0.5% per year from 1991 to 2007, or about 217 ha annually, with total losses to date estimated as high as 30% of the original extent (MESCAL, 2013; Watling, 2013). Deforestation and degradation of mangrove systems are underpinned by the unsustainable use, climate change, and lack of a dedicated policy framework. For example, when mangroves are converted to other uses, Traditional Fishing Rights Owners receive compensation for loss of fishing access and rights; however, this is generally a perverse incentive, as communities receive massive one-time payments when mangroves are destroyed, leading some to destroy mangroves themselves or allow others to do so (MESCAL, 2013).

Mangroves around urban areas are particularly at risk from unsustainable harvesting, overexploitation, pollution, waste disposal, dredging, and development such as housing and industry, infrastructure for tourism (MESCAL, 2013). Indeed, the primary threat to mangroves is urban development.

Opportunities for Sustainable Use



There is a need for an improved, coordinated, and consolidated plan and approach for mangrove management in Fiji, as well as to incorporate mangroves into all climate change adaptation and disaster risk reduction activities. Moreover, it is also acknowledged that some areas of mangroves need to be fully protected as national reserves or protected areas. As such Fiji's Locally Managed Marine Area network has established permanent protected mangrove areas covering 12.5% of Fiji's mangroves, though there is no legal recognition of these areas (Watling, 2013).

While there is some activity in terms of mangrove concessions for logging, the revenues from licenses do not cover the cost of management by the MoF. As a result, the MoF is unable to enforce and monitor mangrove utilization hence there is a lot of illegal logging (Watling, 2013). Ideally, fuelwood production and collection could be shifted to other species while adequate technical assistance is directed at communities and commercial growers on transition. Alternative local timber species may be advocated as alternative fuel wood.



5 DRIVERS OF DEFORESTATION & FOREST DEGRADATION

Generally, deforestation and forest degradation result from distinct drivers brought about by different agents, though some drivers affect deforestation in the immediate term and degradation in the long-term.

Drivers for deforestation cause conversion of forest to another land use or the long-term reduction of tree cover. Forest degradation considers long term reduction of potential supply of benefits from the forest and often results from poorly regulated or managed extractive activity carried out at a small-scale by many actors, which is further intensified by the general undervaluation of forest ecosystems and the non-tangible benefits they provide (Barquero-Morales, et al., 2014; Skutsch, Torres, Mwampamba, Ghilardi, & Herold, 2011).

Although Fiji's laws do not define forests, this study uses the Fiji REDD+ Policy definition of forests to guide the identification of DoDD:

“Land spanning more than 0.5 hectares with trees higher than five meters and a canopy cover of more than 10% or trees able to reach the thresholds in situ. It does not include land that is predominantly under agriculture or urban use. Forest is determined both by the presence of trees and the absence of other predominant land uses. Areas under reforestation that have not yet reached are expected to reach a canopy cover of 10 % and a tree height of 5 meters are includes as are temporarily stocked areas, resulting from human intervention or natural causes which are expected to regenerate. Includes areas with bamboo and palms, provided the height and canopy cover criteria are met, forest roads, fore breaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of scientific, historical cultural or spiritual interest, windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters; plantations primarily used for forestry or protected purposes. Excludes stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens (DoF, 2011, p. vi).

The conceptual framework for this study incorporates both direct drivers and underlying causes in addition to the agents that contribute to deforestation and forest degradation in Fiji (see Figure 5)

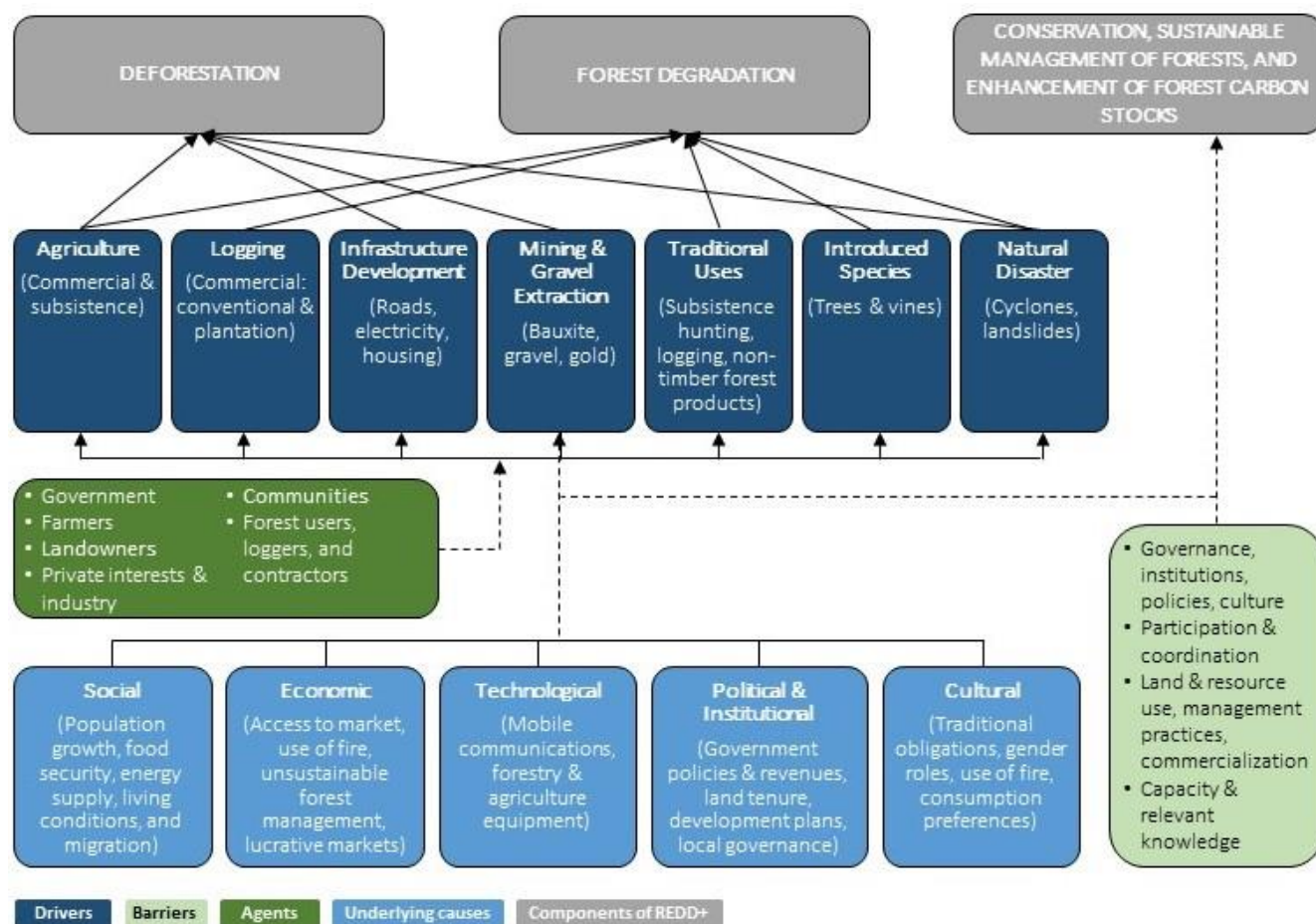


Figure 5: Conceptual Framework Depicting Proximate Drivers, Underlying Causes, Barriers, and Agents

5.1 Agriculture

This study includes both *commercial* agriculture, in which the objective is selling the majority of products, and *subsistence* agriculture, in which producers focus on growing enough food to feed their entire families with the surplus sold in the local market to complement household income.¹ Sugar cane production is the most important commercial agricultural product, while the most popular small-scale semi-commercial or subsistence crops include kava, taro, cassava, and rice.

5.1.1 Context

The Fiji National REDD+ Programme as established in 2009 identifies agricultural clearance as one of the three main drivers of deforestation in Fiji (GoF, 2017b), as confirmed by the participants of the community, divisional, and national consultation workshops (see Annexes). While there has been a significant change in agriculture over the last 20 years with a decrease in area under production, deforestation continues to be driven by conversion to agriculture as previously

¹ In Fiji, producers earning less than FJ\$8,000/year are categorized as subsistence, producers earning between FJ\$8,000 and FJ\$15,000/year are categorized as semi-commercial, and producers earning over FJ\$15,000/year are categorized as commercial (MoA, 2016).



harvested, now depleted areas are abandoned and new areas are cleared. It must be noted however that much of the available agriculture land were cultivated by the mid-1970s so development for new expansion of agricultural land will fall on rolling to steep terrain, often with some form of forest cover (Leslie & Ratukalou, 2002). Unsustainable practices are becoming increasingly common, including: intensive farming methods (e.g., hillside farming methods), land reclamation within wetlands (e.g., mangrove conversion for rice farming), and commercial husbandry with poor pasture management (e.g., slash and burn methods to clear areas for new pasture) (Ganpat & Isaac, 2016).

Twyford and Wright (1965) classified Fiji's land utilization capacity based on its suitability for cultivation and the effort needed to modify it for agricultural use. The results indicate that an estimated 29% of Fiji's land mass is suitable for agricultural production. An additional 32% need modification for drainage and soil conservation before they can be used for agriculture. Such lands are well suited for forest and (marginally) for grazing. The rest of the land – 39% is deemed unsuitable for both agriculture and forestry (although limited forestry use may be considered) with strong recommendation for protection for water catchment and biodiversity (UNCCD National Focal Point, 2007; Twyford & Wright, 1965; ADB, 2014a; Akram-Lodhi, 2016; MoA, 2016).

Between 1991 and 2009, the number of farms in Fiji reduced by one-third from 95,400 to 65,033, and the average size of each farm has decreased from 6.2 ha to 3.9 ha (Department of Agriculture, 2009). This represents an overall reduction in total farm area of nearly 60%, to the current total of 251,858 ha (Department of Agriculture, 2009) **which is equivalent to 14% of Fiji's landmass. Given that 29% of Fiji's land are suitable for agriculture production, an estimated 15% of prime agriculture land is either dormant or converted to other land uses such as infrastructure development.**

Although decreasing area of production, agriculture is still an important economic activity and remains the largest employer in Fiji. Estimates from 2015, value agriculture at 8.3% of GDP, which includes subsistence (2.8%); crops², livestock, and horticulture (4.2%); and sugarcane (1.3%) (FBoS, 2016b). Agricultural commodities have stabilized between 2014-2015 with strong increase in livestock beef and pig farms while cassava, taro and assorted vegetables have driven crop production. Inability to compete effectively in deregulated global markets coupled with political instability have had adverse effect on the sugar industry.

The demand for agricultural products is rapidly increasing, as a result of rural-urban drift along with change in diet and food preferences, the growth of the hospitality and tourism sector, and government pressure for more exports and import substitutions. In addition, non-renewal of agriculture leases has caused an influx in migration farmers, particularly those producing sugarcane, to move out of agricultural activities and into an urban lifestyle. As a result, about 51% of Fiji's population live in urban areas, and this is expected to increase to 60% by 2030 (see **Error! Reference source not found.**6) (UNICEF, 2011).

While urban population growth/migration is a major factor, Boucher, et al, (2011) points to changes in diet and food preferences as the more direct driver of deforestation and forest degradation. This demand results in a gradual replacement of traditional subsistence practices with

² Including taro.



commercial agriculture practices (see Figure 7) and the commercialization of traditional root crops and horticulture.

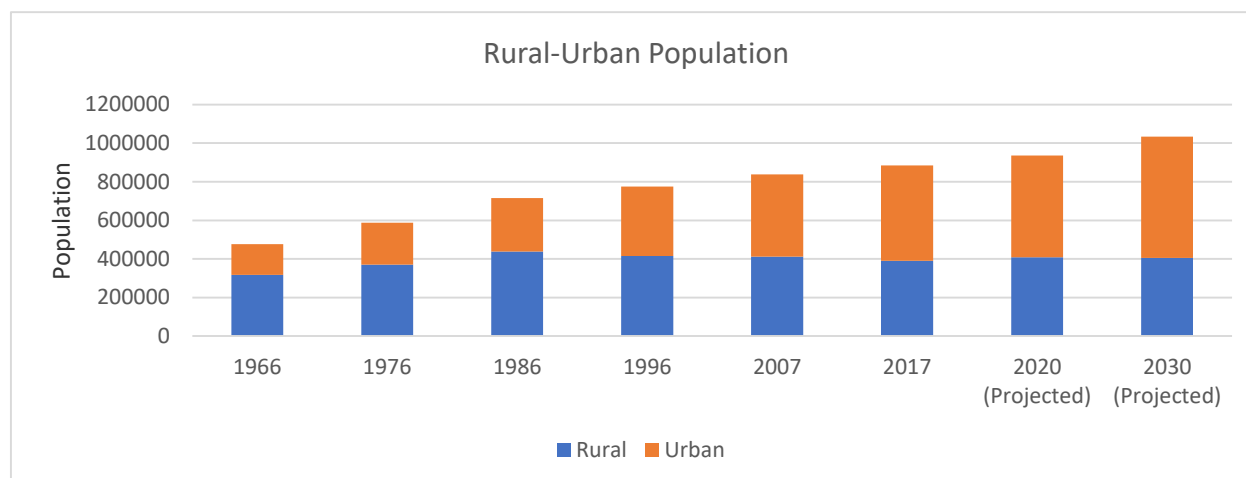


Figure 6: Trend in population of rural and urban areas in Fiji from 1966 to 2017 and projections for 2020 and 2030 (FBoS, 2008b)

Many of these tensions have been exacerbated by natural, climate-related events. For example, TC Winston, Category 5 cyclone hit Fiji in 2016 which impacted 62% of the population. This resulted in an estimated total damage and loss across all sectors at FJ\$2.85 billion (Esler, 2016), nearly one-third (29%) of which was sustained in the production sectors. The prices of certain crops like kava have significantly increased due to the cyclone and because of the high demand on both the domestic and export markets (Naleba, 2017).

5.1.1.1 Commercial Agriculture

Sugar is the only agricultural commodity that qualifies as a commercial crop, given the characteristics of: (1) being a leading commodity that drives production and (2) providing a consistent contribution to annual GDP. The government is a major shareholder of the Fiji Sugar Corporation (FSC) and recognizes the importance of the sugar industry with more than 20,000 independent farmers (cultivating an average 3 ha per farm) (Department of Agriculture, 2009).

Sugar was once the stronghold of the agriculture sector, reaching a maximum annual production of 3.2 million metric tons in 2006 (FSC, 2007); however, production has been declining since 2007 (FSC, 2015). Several factors contributed to this decline, including: the poor performance of the sugar industry, the slow adjustment to trade liberalization, the impact of natural disasters, incidences of pest and disease outbreaks, export trade restrictions, political instability and inconsistent public-sector support.

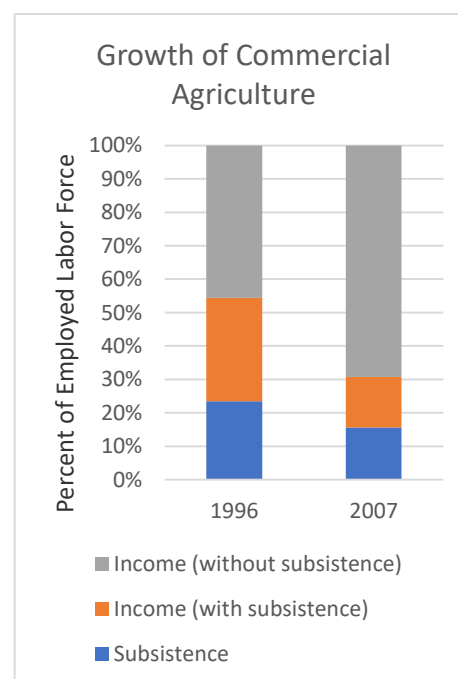


Figure 7: Shift in labor force category for economically active, employed population age 15+ (FBoS, 2016b)



The government began to reform and invest in the industry in 2006, to support mill upgrades for improved efficiency. The effort appeared to be successful for a short period, as efficiency of processing cane into sugar increased – but it then declined. Despite the improvement in sugar productivity, the stagnant growth of the sugar industry over the last decade reflects the failure of productive activities that spin off from a vibrant and growing export market. The lack of stimulus from the sugar sector and non-renewal of land lease has given rise to rapid rural-urban migration.

5.1.1.2 Subsistence Agriculture

Almost half of Fiji's population lives in rural areas and derives a portion of its livelihood from agriculture (ADB, 2012). The majority of farms produce a mix of crops and livestock (73%), with the remainder cultivating either crops (20%) or livestock (7%) (Department of Agriculture, 2009). Agricultural land uses are categorized as: temporary crops,³ permanent crops⁴ (including kava), coconut, pasture (including animal husbandry), planted forest, natural forest on farm, non-agriculture land, and fallow (see Figure 8).

There are over 30 species listed under temporary crops, the most popular of which are cassava, taro, and assorted vegetables which are most commonly cultivated by farmers with at least three hectares of land (see Figure 9). The most popular permanent crops are banana, coconut, and kava (Department of Agriculture, 2009).

In terms of DoDD, the production data from the Ministry of Agriculture (2017) indicates that the high levels of semi-commercial cultivation of kava, taro, and cassava cultivation are leading to encroachment into the native forests, as confirmed by the DoDD community consultation sites in Naitasiri and Ra provinces. Small patches of forest are cleared and planted with kava (as it requires shade in its first three years of growth), after which the kava is thinned and a greater patch of forest cleared to expose it to direct sunlight. Kava is followed by taro and cassava. By the time these crops are harvested, the soil is depleted of its fertility, causing farmers to continue to seek new farm lands in the native forests.

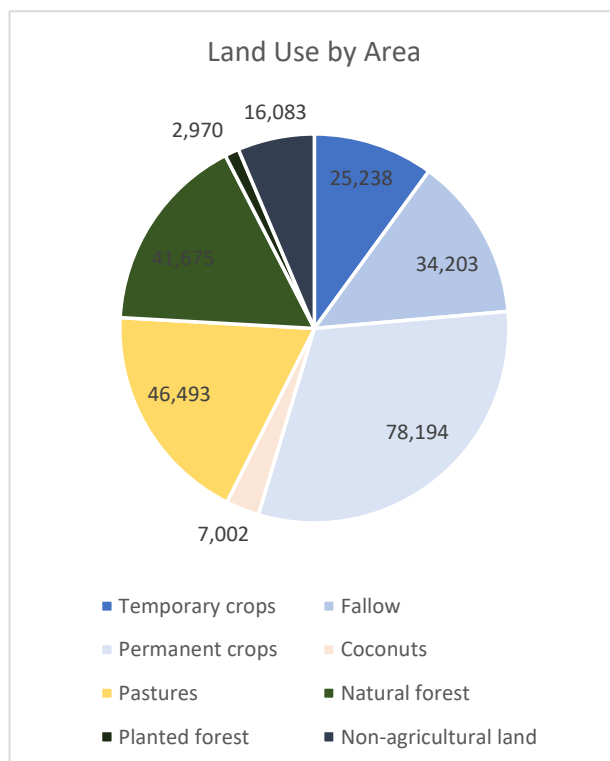


Figure 8: Area in hectares under each agricultural land use (Department of Agriculture, 2009)

³ Temporary crops include all crops that have a planting cycle of one year or less.

⁴ Permanent crops include all vegetables and woody plants or shrubs that take more than nine months to become productive, have a planting cycle of five years or more, and do not need to be replanted once it goes into production.

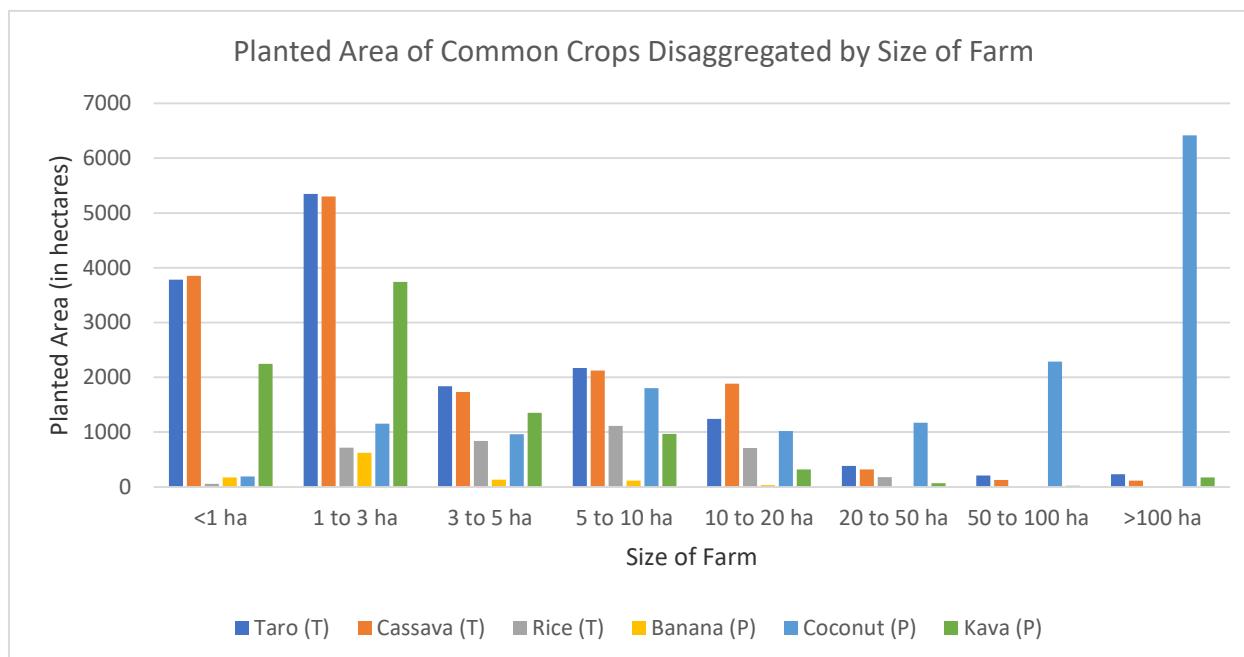


Figure 9: Common types of temporary (T) and permanent (P) farm production (Department of Agriculture, 2009)

The informants from Rewasau and Nabukelevu stressed that newly cleared forest is the best location for new kava crop. While kava has a production cycle of three to five years depending on the variety, high market demand is driving local farmers to plant the varieties with a shorter life cycle.

Many farmers in the study site prefer to plant taro and cassava for subsistence and sale of excess produce (CI, 2017). Vegetable farming in the study sites is limited to subsistence, other than the village of Navai in Naboubuco, Naitasiri (CI, 2017). Other subsistence agriculture includes rice farms although the area is very small (less than one ha); florist where ornamental plants are raised in a backyard nursery; and livestock. Livestock farms are often under one-half hectare in size with two to four animals. The cattle (raised for beef) are let loose in the forest with no restraint simply due to high cost of capital input needed for fencing material and maintenance of feedstock. Pigs and goats are also common amongst local farmers, often with a carrying capacity of four to six animals per farm.

Although ginger is a non-traditional commodity, it has proven to be a successful diversification crop in other areas which has generated interest among rural farmers. The caveat in such interests lies in the agronomical needs of the ginger plant which needs a lot of sunlight and good drainage hence is associated with forest clearing similar to kava. However, the production cycle

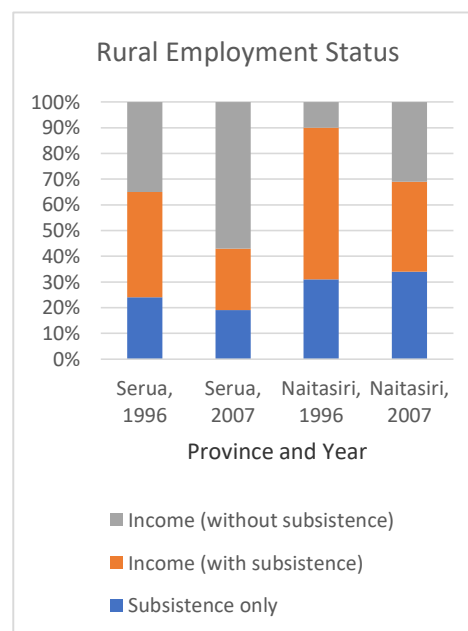


Figure 10: Change in rural employment status 1996-2007 by geographic sectors, Serua and Naitasiri (Bakker, 2013; Bakker,



of ginger is much shorter with greater impact on deforestation, forest and land degradation.

A complementary assessment of employment status by geographic sectors (see Figure 10) in both Serua and Naitasiri indicate that the level of dependence on subsistence declined in rural Serua but slightly increased in rural Naitasiri. However, the unemployment rate in 2007⁵ in both Provinces is high in comparison to Fiji bench-mark of 8.6%, at 11.3% and 13.4%, respectively (Bakker, 2013).

It has been observed that households where the head of the household works in agriculture are detected to be poorer than those whose heads worked in the services sector (ADB, 2012). Additional findings from the community consultations revealed that some households depend on remittances from relatives in urban areas. Coupled with easy availability of processed foods from village canteens, subsistence agriculture in some communities has declined.

5.1.1.3 Agriculture and Fire

Fire is widely used in Fiji by three main actors: (1) sugar cane farmers who burn their fields to facilitate hand harvesting;⁶ (2) village farmers who burn forest, fallow fields, and secondary vegetation to plant crops, and (3) hunters who use fire to flush out game and/or crop-thieving pigs (Kull, 2012).

Sugarcane burning is discouraged and penalized under certain conditions, but it is still practiced by farmers to quicken the task of harvesting, clearing weeds and undergrowth, and destroying insects; to minimize labor costs or mitigate labor shortages; increase crop weight; or to advance milling priority (Davies, 1998). This burning alone is responsible for 44% of greenhouse gas emissions from sugarcane production (de Figueiredo, Panosso, Romao, & La Scala, 2010). Sugarcane fires spread to grasslands, forest, and pine plantations, thus contributing to the forest degradation and deforestation.

In a rapid spatial assessment between the locations of the sugarcane plantations and fire occurrence between 2002 and 2016, it was observed that there is a high correlation between sugarcane plantations and fire occurrence (see Figure 11). This correlation is most evident in the northern lowlands of Viti Levu and Vanua Levu islands (see **Error! eference source not found.**).

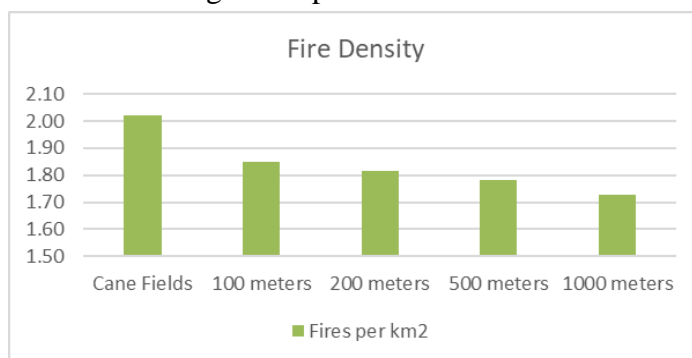


Figure 11: Correlation between proximity to sugarcane plantations and fire occurrence

⁵ Assessment criterion for unemployment strictly follows the International Classification of Labour Statisticians (ICLS) where subsistence workers are assumed to be “not actively looking for work” hence are employed by undertaking subsistence activities (Bakker, 2013).

⁶ Sugarcane fields are burned prior to harvest to remove the sharp leaves and other material on the stalk that slow down – and, in some cases, can injure – workers who manually harvest the cane.

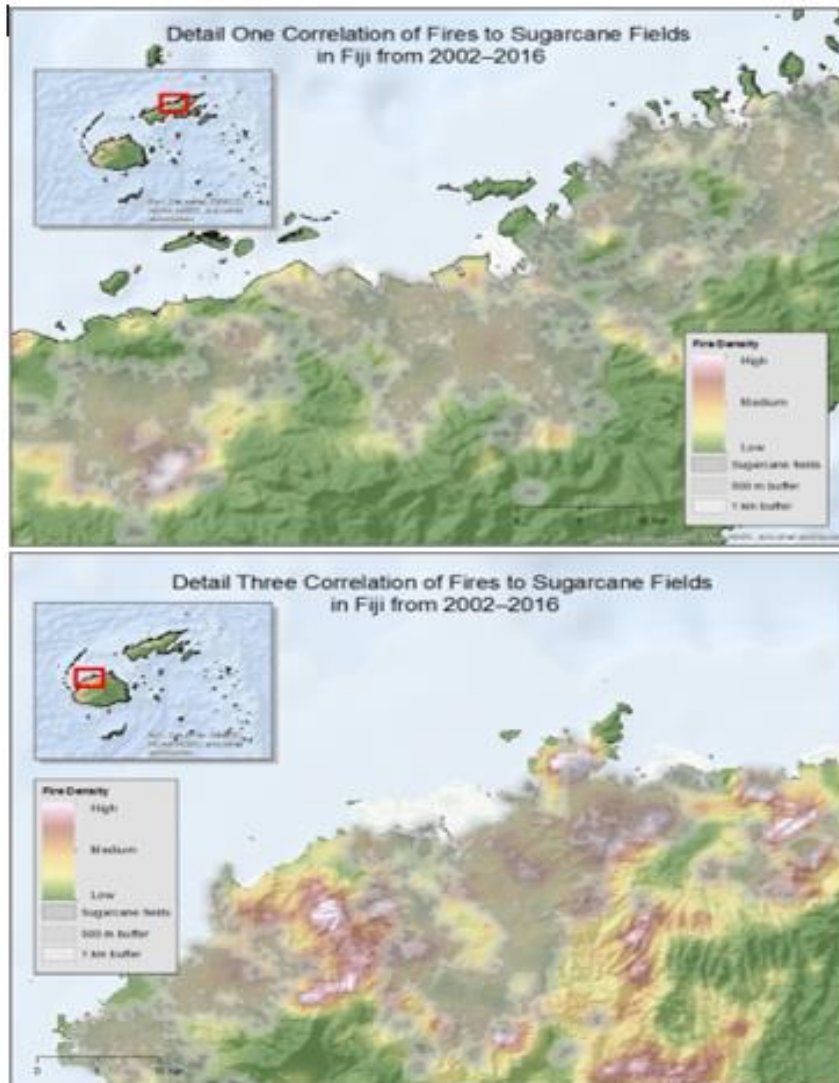


Figure 15: Correlation between sugarcane and fire

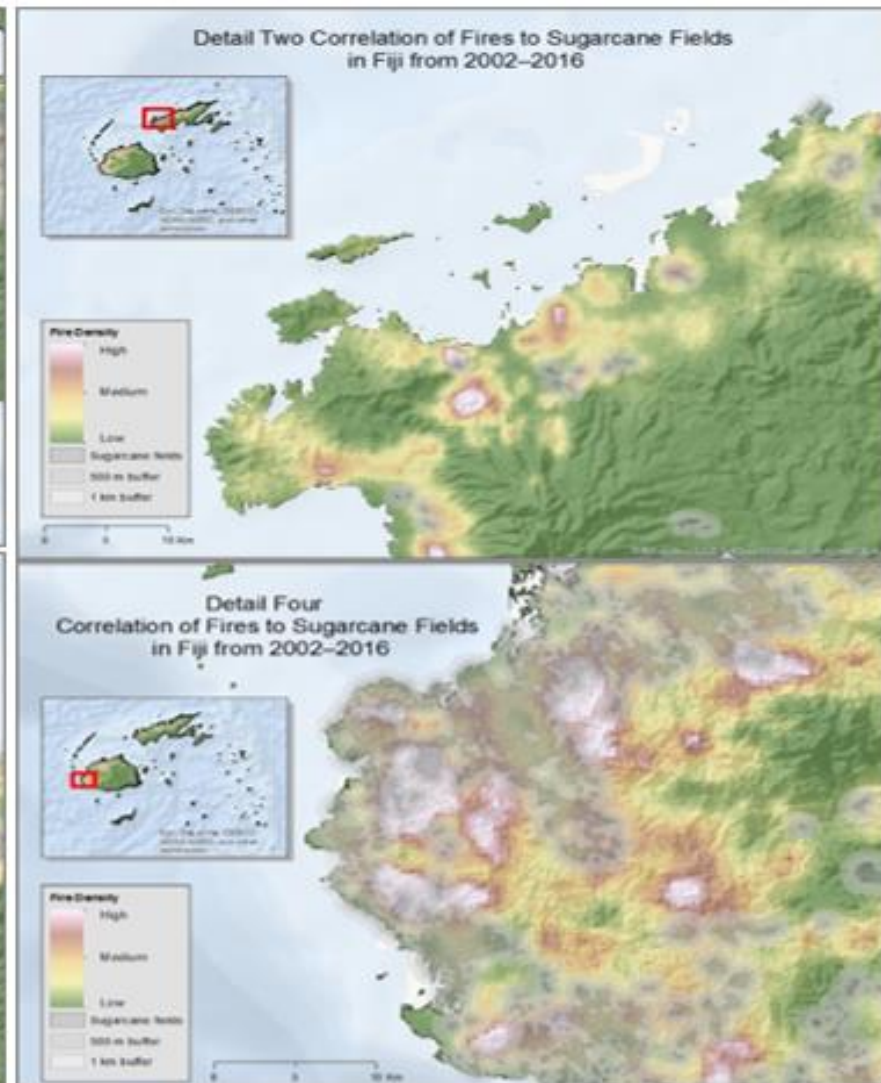


Figure 16: Correlation between sugarcane and fire



However, it was still observed that many fires occurred in the western lowlands of Viti Levu and Vanua Levu islands (see **Error! Reference source not found.**), where fewer sugar cane plantations are located. These regions are also predominantly occupied by pine plantation, and although fire clearance is strictly prohibited for FSC certification, unplanned fire is the main threat (Herold & Payton, 2009) and continues to occur in Pine plantations. Given the heavy ground fuel accumulated over time, many of these fires are very intense, exacerbating the effect on forest degradation and deforestation.

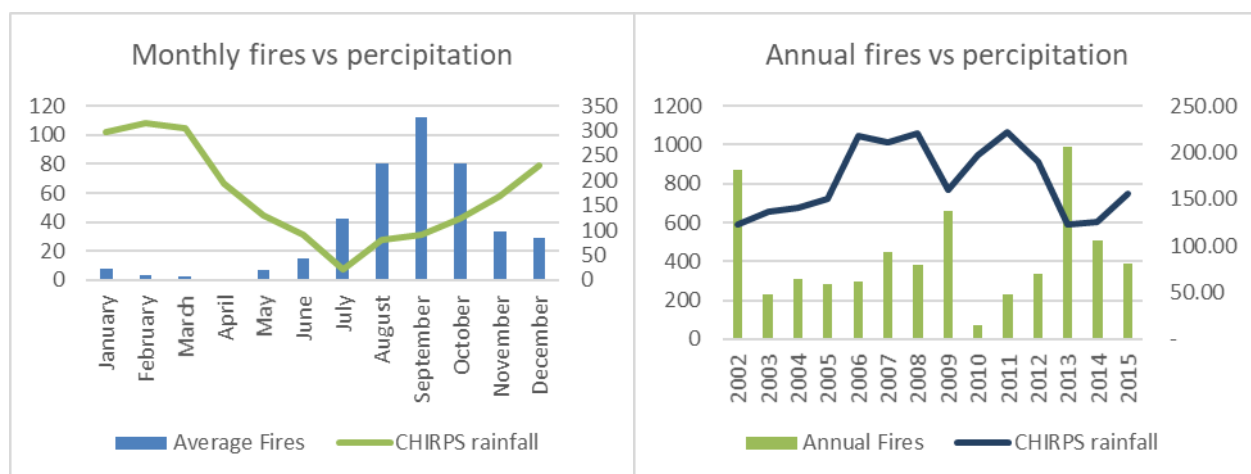


Figure 12: Correlation between precipitation and fire – monthly (left) and annually (right)

Fire takes place during the harvest season of sugarcane, lasting from July to November (dry season) with the peak of the burning season being in September (see Figure 12, left). Fire occurrence is also related to annual rainfall, showing an increase in fire when the annual rainfall was lower than the average (2003, 2010, 2014). The opposite is also true, wetter years (2007, 2009, and 2012) show a low number of fires (see Figure 12, right).

5.1.2 Actors & Agents

Agricultural expansion has generally been driven by national efforts towards food security (in terms of self-sufficiency and import substitutions) in addition to commercial production for export. Key actors include:

- Buyers of commodities, who place increased demand on agricultural production for international markets.
- The Ministry of Agriculture and Department of Environment, who are responsible for implementing and enforcing regulations relating to agricultural expansion and land conversion.
- Fiji Crop and Livestock Council, who is responsible for coordinating and aggregating large and small producers cultivating crops other than sugar.
- All private and business entities that are involved with agriculture inputs, pre-harvest, post processing and sale (domestic and export) of all agricultural produce.
- Local population, who is working to meet market demands for agricultural produce.
- Lease holders, whose goals are similar but may be driven by self-interest to maximize profit within the duration of lease tenure.



- The Ministry of Tourism, tourism industry and all related sectors whose growth has placed increasing demand on domestic products in addition to imports.

5.2 Logging

Commercial logging includes every activity where wood or timber products from forest resources are exchanged for economic gains, which includes plantation logging, conventional logging of native forest, and wood consumption for biomass plants and cremation.

The logging activities for subsistence uses are described in detail in the "Traditional Uses" section, which includes firewood and housing materials, among others.

5.2.1 Context

Fiji's forestry resources have long suffered unsustainable extraction through commercial logging and subsistence use of both timber and non-timber forest products. Underlying factors such as local and international demand as well as local infrastructure development have seen an insatiable demand for forest products required in building projects. Moreover, only 4.3% of Fiji's forests are legally protected.

The demand for construction materials over the past three years have been driven by investment in tourism projects such as the Grand Pacific Hotel, Denarau Casino Development, Wyndham Vacation Resort, and the recommencement of the Momi Bay Development (ADB, 2014a).

Rapid turn-around of logging activities in native forest after commercial logging exacerbates forest degradation in the absence of restocking or restoration, and these extremely degraded forests (see **Error! Reference source not found.**). Annual licenses for timber extraction in logged native forests are issued within five to ten years of coupe closure from the last logging activity. Other licenses include Forest Right Licenses to harvest mangroves for cremation and firewood licenses to collect waste logs for sale to businesses with industrial boilers.

5.2.1.1 Conventional Logging

Overall there has been decline in the harvesting of logs from native forest from around 130,000 m³ in 2003 to 46,000 in 2014, as most or all of the forest areas accessible by heavy machinery have already been logged, and extraction is moving into areas with higher costs (see **Error! Reference source not found.**) (Whiteman, 2005; FBoS, 2014; FBoS, 2008a). Under Sustainable Forest Management scenario, assuming an average log production at 62,500m³/year, the carbon emission is estimated at 252,000 tCO₂ however conventional logging is reported to emit 13% more carbon than Sustainable Forest Management (Haas, 2015).

Although conventional logging shows comparatively high growth rates in the remaining forest stand compared to lower intensity logging, this incremental growth was concentrated in the smaller trees, indicating a heavily degraded forest and decreasing proportion of commercial trees. Much of the remaining forest stands have only 40% of their initial biomass density due to severe degradation and high mortality from damage during felling and extraction (Kaitani & de Vletter,



2007). The communities that participated in the consultation process also highlighted that the damage caused by the heavy logging machinery (especially when misused) usually cause further degradation in the form of landslides, erosion, and sedimentation. In the absence of a national land use plan, this open and heavily degraded forests are vulnerable to conversion to other land uses such as plantation forest and agriculture.

Of the 914,868 ha of native forest on the main islands, 58% is Closed Native Forest (with over 40% canopy cover) and the other 42% is Open Native Forest (with 10-40% canopy cover); however, of these 388,415 ha of Open Native Forest, almost 96% of is classified as open multiple use forest while the remaining 4% is classified as open protected forest. Assuming that native species make up 91% of Fiji's forest cover, the mean carbon stock for Fiji's indigenous forest is estimated at 175 tCO₂e/ha or 157,325,000 tCO₂e (Payton and Weaver 2011).

The silvicultural prescriptions for native forests introduced in the Fiji Forest Harvesting Code of Practice (FFHCP) (MoFF, 2010; MoFF, 2013) set an allowable cut diameter so that only the biggest trees of target species are extracted while the smaller trees are retained to maintain the forest's natural composition and structure (Musson, 1992). However, although the application of the diameter limit is specified in the FFHCP, the logging industry has resisted its adoption and practice, citing insufficient profits (A. Tuisawau, personal communication, October 5, 2017).

In February of 2015, TC Winston devastated the Lau Group, Vanua Levu, Lomaiviti and the upper northern part of Viti Levu. To ensure speedy recovery, rural communities received logging equipment as part of the relief supplies, including chainsaws and portable saws, which enabled some communities to extract more timber.

High local and international demand for timber and high pressure for local development may collectively further pressure the process behind the formal steps of granting licenses, EIAs, and strict observance of the FFHCP in opening of new areas, which could potentially lead to increased deforestation and degradation.

5.2.1.2 Firewood

Mangroves were heavily exploited as a major source of fuelwood in the past, though are now more threatened by urban development than by collection for firewood. During the period 2008-2012, a total of 16 licensees produced between 256-956 m³/year (Watling, 2013), while in 2013 harvesting of mangroves for fuel accounted for only 39 m³ (DoF, 2015). A few mangrove wood concessions are currently licensed, and all are in the southern division, though illegal harvesting has been estimated to be around 50% of recorded production (Watling, 2013).

Wood from mangrove is also used for cremation, as it takes longer to burn and provides a good source of heat due to its density. However, the impact in terms of CO₂ emissions is negligible compared with conventional logging. For example, during the consultation process, in an interview



with local stakeholders it was observed that a cremation facility nearby Vatuwaqa cemetery uses 60 to 84 tons of firewood per year, representing less than 100 tCO₂/y.⁷

See Box 1 for more information on Fiji's mangroves.

5.2.1.3 Plantation Forests

By 1930, logging activities in native forest were prevalent, yet Fiji was importing large amounts of timber to meet local demand. The Fiji Forest Policy 1950 is based on a vision to make Fiji self-sufficient in timber products, thus trial plots for timber species were established in various locations around Fiji with native and exotic species of noted commercial value. These experimental trails only considered characteristics such as rate of growth, and native species were shown to be extremely slow growing in comparison to introduced species under plantation timber production. Potential environmental impacts – which are now known to be vitally important – were not critical criteria, if even considered.

The exotic species of *Swietenia macrophylla* (the Honduran or big-leaf mahogany) proved to be excellent in the wet regions of Fiji, while *Pinus caribaea* var. *hondurensis* (Caribbean pine) was identified to be best surviving species in the drier regions, and therefore, establishment of these two species commenced in earnest during the 1970s.

- Mahogany

The Fiji Hardwood Corporation Ltd (FHCL) – predominantly owned by the government and customary landowners – manages roughly 60,000 ha of mahogany plantations that have been established in logged-over native forest areas on the main islands of Viti Levu and Vanua Levu (DoF, 2015).

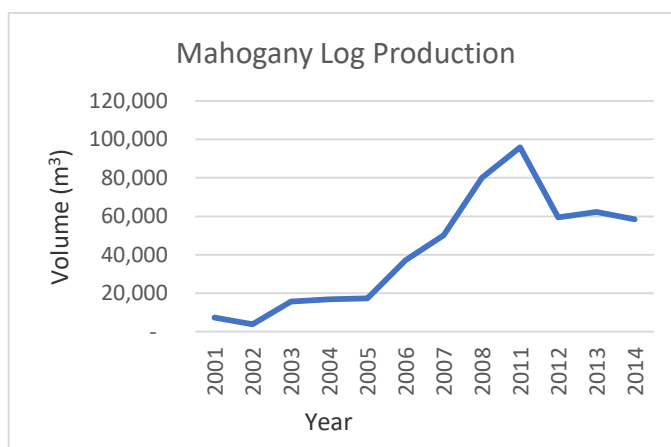


Figure 13: Annual plantation mahogany production (FBoS, 2014)

The anticipated steady growth of the sector was disrupted in 2009-2010 (see Figure 13) after heavy regulations were put in place that created a market monopoly for Sustainable Mahogany Industry, who secured exclusive extraction license from the government for the the most productive and dense mahogany stands (Class I & II) and shut out all operators in the market. License to the slightly less Class III was issued exclusively Pacific West Timber, a sister company of Sustainable Mahogany Industry.

No replanting has been recorded since mahogany harvest began, and both companies have recently closed operation while 13 licenses have been issued to local saw millers and resource owners (Boyle, 2017).

⁷ Considering a wood density of 0.703 grams per cm³ (Zanne, et al., 2009; Kauffman & Donato, 2012; Bosire, Bandeira, & Rafael, 2012), and a carbon fraction of biomass of 45%, that would represent 97 tCO₂/y.



Various communities living near mahogany forests have reported the loss of biodiversity in their forests and its waterways (Sue, 2003). An EIA found increased siltation and turbidity from logging; stagnant water due to obstruction from fallen logs; build-up of debris from logging causing water discoloration and possible reduction in dissolved oxygen; and possible death of aquatic life with low level of dissolved oxygen (Thaman B. , 2004).

- Pine

Fiji Pine Ltd – predominantly owned by the government and customary landowners – manages Fiji’s 76,171 ha of pine (DoF, 2015), which are established on the drier sloping *talasiga* grasslands (historically too poor in nutrients to support much else) as well as where native forests were converted for pine plantation establishment. Pine production increased in 2013 as plantation stock in Vanua Levu commenced harvesting in that year (see Figure 14).

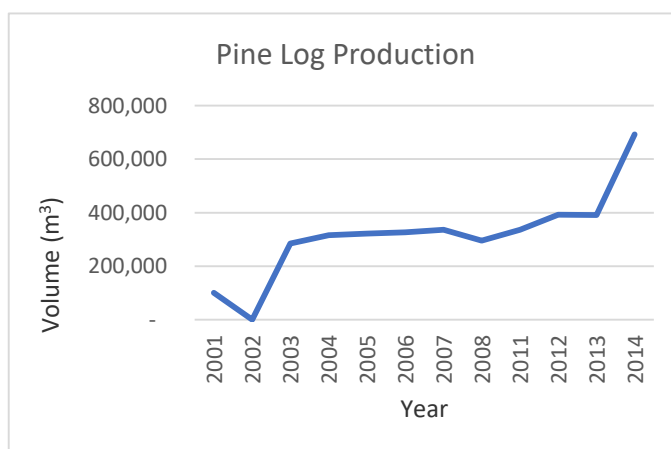


Figure 14: Annual plantation pine production (FBoS, 2014)

Resin production presents a potential opportunity to afforest degraded *talasiga* grassland landscapes with *Pinus caribaea* var. *hondurensis*, which is reported to have high resin content. Resin production is beneficial for carbon enhancement as resin tapping may begin at eight years and continue until 25 years, when the pine trees will be mature for sawn timber. Callison Pacific Pine Chemicals, a US-based company has been working in partnership with Fiji Pine Limited and Fiji Pine Trust since 2013 to extract pine resin, used as a base for making turpentine and rosin resins (Sovaraki, 2015). In 2013, the company employed over 600 people and exported over 800 metric tons of pine resin – worth FJ\$500,000 (Moceiwai, 2014).

5.2.1.4 Sandalwood (*Santalum spp*)

There two species of sandalwood present in Fiji: the native *Santalum yasi* and the introduced *Santalum album*. First harvested in the 1800s, the *S. yasi* has been exploited to a point near extinction due to its valuable essential oil (Thomson, 2006). The MoF has undertaken research and development of sandalwood to fully realize the potential to become a major forest commodity. Small woodlots planted by individuals and communities scatter the countryside and cover an insignificant area in Fiji. However, sandalwood presents an opportunity to enhance carbon stocks in degraded landscapes.

5.2.1.5 Sago Palm (*Metroxylon vitiense*)

Metroxylon vitiense, or sago palm, is a large endemic palm once widespread throughout the Navua and Rewa river deltas but today only found in 12 isolated populations, mainly in pockets on the coastal plains of Serua and Namosi. Sago is a monocarpic palm which produces flowers with fruiting structures after 15 to 20 years. Once the fruit matures, it drops to the ground and the tree dies. A study by Rounds (2007) found that, due to its distinct life cycle, there were serious threats



to the survival of the species, including large scale coastal drainage schemes that change water flow and direction; new residential and agricultural subdivisions; the growth of a ‘palm-heart’ trade as a local delicacy; and the introduction of unsustainable leaf harvesting for thatching (currently sold exclusively to the tourism industry).

Over the past 10 to 15 years, the demand for thatching has increased and villages have resorted to killing the trees or harvesting immature leaves to satisfy demand with no replanting. The heavy removal of leaves from immature trees stunts their growth and introduces a serious problem from weed invasion, which can smother young palms and even kill adults before they fruit.

Since 2010, Nature Fiji/Mareqeti Viti has been implementing a recovery plan endorsed by the NEC under the EMA (NF/MV, 2010). The recovery plan aims to restore and establish new sago populations in addition to working with landowners and importing peach palm (*Bactris gasipaes*) to be grown as an alternative to sago palm heart (Madigibuli, 2017). The impact of sago palm in terms of climate change emissions is negligible compared with other sources of deforestation and forest degradation in Fiji, however its unmanaged production can lead to local extension and jeopardize the integrity of the forest.

5.2.1.6 *Gliricidia* (*Gliricidia sepium*)

Gliricidia is a fast-growing, nitrogen-fixing tree, that is native to Central America but cultivated throughout the tropics for its many environmental services (e.g. shade for cacao and coffee) and products (e.g. green manure and fuelwood) (Elevitch & Francis, 2006). In Fiji, this species is used by the Nabou biomass power plant in Sigatoka as the main fuel source. The plant uses roughly 100,000 t/year, which is the equivalent of and generates 12MW of energy, and the biomass comes from plantations cultivated in degraded areas. The rotation cycle is about 15 years over a total area of 5,000 ha and will be sustainable long-term (Eltech Ltd, 2017). In terms of climate change mitigation, the plant is expected to have a positive impact, as it will eliminate 36,000 tCO₂ compared to diesel generation. The plant will also use African Tulip (more information below) and saw mill residues.

5.2.2 Actors & Agents

- Logging companies, who are responsible for the active felling of trees. This includes Fiji Pine Ltd. & Fiji Pine Trust both of which are predominantly owned by the government and traditional landowners. Also includes the Mahogany Industry Council, FHCL, Fiji Mahogany Trust; landowners and loggers who are involved in mahogany logging, post-harvest, processing, branding and marketing.
- MoF, whose role is to regulate, develop, and enforce restrictions within the logging industry.
- The Department of Environment, who is required to conduct an EIA for any commercial logging activity.
- The Department of Lands and Department of Fisheries, who together – along with the MoF and Department of Environment – manage Fiji’s mangrove resources; Department of Land for native logging in State Land as well as the establishment of Protected Area or Conservation Leases on all types of land tenure on behalf of the MoF.
- Landowners, who either fell trees themselves or consent to activity on their property by commercial logging operations.
- Local population, whose growth requires building materials and cleared land for expansion.



- TLTB, whose consent is required for licenses to harvest timber on iTaukei land.
- Buyers of wood and timber, who place increased demand on timber production for international markets.
- Tourists, who have placed increased demand on the Fiji Sago Palm production for thatch shingles.

5.3 Infrastructure Development

Several types of forest conversion to infrastructure were identified during the consultation process and literature review, which are grouped in this section. More specifically the infrastructure development includes: roads and transportation; hydro dams and electricity; urban development and resettlement; tourism development; and water systems.

In the context of this report, infrastructure expansion refers to basic support systems that are vital to a country's economic development and prosperity. Urban infrastructure includes the provision of clean water, sanitation and solid waste, electricity, road, education and health. Rural infrastructure comprises rural roads, rural housing, rural electrification, education and health. Rural road connectivity is an important aspect of rural development.

5.3.1 Context

Funding for infrastructure development in Fiji has increased substantially in the last few years to meet the government's target on fast tracking infrastructure development for economic development and the improvement of quality of life (FRA, 2013). In 2013, capital expenditure in the budget increased 30 percent from the previous year to reach FJ\$723 million (US\$410 million) thus level of capital expenditure is now over 3 times what it was four years ago in 2009 (Department of Energy, 2014). The Ministry of Infrastructure & Transport is directly responsible for policy formulation, planning, design, regulatory, coordination and implementation of programs, projects and services relating to engineering works, meteorology, transportation and public utilities which are part of the government infrastructure sector in Fiji. The Department of Town and Country Planning control and regulate the appropriate use of land in Fiji through the Town Planning Act (Cap.139) and Subdivision of Land Act (Cap.140). Fiji does not have a national land use plan, which is a major constraint to resource allocation and management in the rural sector and is of critical importance as it covers all land-based resources such as forest, agriculture, minerals, rivers and streams (GoF, 2015a).

5.3.1.1 *Roads and Transportation*

The transport sector contributes around 9% of GDP (FBoS, 2016b). Engineering infrastructure for both land and maritime transportation is a core function under the Ministry of Infrastructure, which is also responsible for rural electrification and renewable energy sources. Fiji Roads Authority is responsible for planning, developing, and maintaining Fiji's FJ\$11 billion road infrastructure, which consists of approximately 7,600km of road, 1200 bridges, 9000+ streetlights, and 47 jetties. Assuming 6m wide road network over area that were once covered with native forested; a rough estimate of the emission from Fiji's road may be estimates at 8,000 tCO₂. Although the direct impact is negligible it facilitates the access and urbanization.



In its first year of operation in 2013, the Fiji Roads Authority received FJ\$422 million (US\$236 million) in the budget (FJ\$395 million capital expenditure and FJ\$27 million operating expenditure) – a 75% increase on 2012 funding allocations to the roads sector (FRA, 2013). This included major projects which were externally funded such as the upgrading of the Buca Bay Road in Vanua Levu, the Sawani-Serea Road in Naitasiri, and the Sigatoka Valley Road in Viti Levu. The upgrading of these roads is expected to provide critical market links for farmers and buyers and substantially reduce their business costs (GoF, 2013b).

Access to markets and marketability of products increases with easy access to roads and other modes of transportation (GoF, 2013b). As such, the underlying catalyst for road construction is the need to meet the economic and social needs of rural populations to access markets, urban centers, health services, and education services.

In addition to the direct loss of habitat and ecosystems caused by the footprint of resource roads, another aspect is the subsequent impact whereby forests, land, and resources previously inaccessible become open for development and exploitation (J. Vakarewa, personal communication, September 3, 2017). For example, a recent study on the impact of roads on deforestation found that nearly 95% of all deforestation in the Amazon occurs within 5.5 km of roads or 1 km of rivers (Barber, Cochrane, Souza, & Laurance, 2014).

5.3.1.2 Hydro Dams & Electricity

The government's goal of bringing electricity to rural communities as a means of addressing poverty has driven the country towards hydroelectric development. Around 67% of the country's electricity requirements are met from renewable energy sources (62% hydroelectric, 4% biomass, 1% wind), with imported petroleum for thermal generation meeting the remaining 33% (Department of Energy, 2014).

In 1975, a 20-year development program for a long-term power system development was drawn up from detailed site investigations and studies. The Monasavu dam was established in 1982, based on these studies which indicated that the environmental effects of the project were projected to be minimal and within the capacity of the Fijian authorities to cope with (World Bank, 1978). While the initial logging for construction of energy infrastructure is detrimental for forests, the forested areas near dams are managed alongside the dam operations. The entire catchment area spans some 11,000 ha, including the 670-hectare lake, and is leased from 19 land owning units under the Native Lands Act. Assuming complete deforestation of the lake with forest loss equivalent to 670,000m³; the estimated emission to support the generation of 80 MW electricity (Tuiwawa, 2005) is estimated at 270,257 tCO₂. The Monasavu Dam is now supplemented by the Nadarivatu Hydro Electric Project at the head of the Sigatoka River, where up to 41 MW will be produced; however, this will be seasonal due to limited water storage.



Fiji's potential for additional hydroelectric power generation on the larger islands, especially micro-hydro schemes, is significant. In recent times, micro-hydroelectric has been developed in two of the priority catchments, Bukuya in Ba and Muana in Tunuloa (UNIDO, 2016; GoF, 2015b)(GoF, 2015). The construction of a dam on the Sovi River has also recently been proposed to address the Suva-Nausori corridor's needs for potable water; however, such a development would considerably lower the biodiversity conservation values of the Sovi Basin. A feasibility study to assess the impact of such infrastructure is under development by the Government of Fiji since 2013.

5.3.1.3 Urban development and Re-settlement

At the national level, 50.8% of the population is in urban centers and 49.2% in rural areas as depicted in Figure 15 (FBoS, 2008). An increase in population and the continuous influx from rural to urban areas have resulted in significant urban development resulting in encroachment onto first-class arable land, and the construction of homes on top grade agriculture soils with movement of agriculture to the marginalized rolling (unsuitable) hills. Outdated and unclear institutional arrangements as well as the prevalence of legal frameworks at different tiers of government have resulted in weak alignment between actors with limited response from relevant authorities to alleviate pressures of urban development challenges (Phillips & Meg, 2016). For example, unmanaged land development follows the main transportation corridors, and an inadequate stock of housing and land has resulted in 78,000 people living in 128 squatter settlements across Fiji (ADB, 2013).

Economic policy has shifted from a strong emphasis on import substitution, food self-sufficiency, and economic diversification, with the state playing a dominant role, to a strategy of export-led growth (Reddy, Prasad, Sharma, Vosikata, & Duncan, 2004). As such, first-class land is now being used for private developments in real estate, garment industries, tourism, and others. For example, in the corridor between Nadi Town and Nadi Airport, about 500 ha of top quality sugar cane land has been taken for nonagricultural purposes (UN Habitat, 2012). Increasing urbanization, particularly growth of industrialization and squatter settlements, has also resulted in greater utilization of mangroves. Mangroves around Suva are declining due to pressures from expanding land uses and from interior pressures due to increased resource use by locals, including the reclamation or destroying of mangroves for cultural use.

By 2028, approximately 13,141 leases issued since 1997 under the Agricultural Landlord and Tenant Act will expire, contributing to additional resettlement. Farmers displaced through expiring land leases also have to be relocated by the Ministry of Agriculture, Sugar and Land Resettlement's Land Development and Resettlement Unit to land where they can continue farming to gain their livelihoods (UNCCD National Focal Point, 2007).

5.3.1.4 Tourism Development

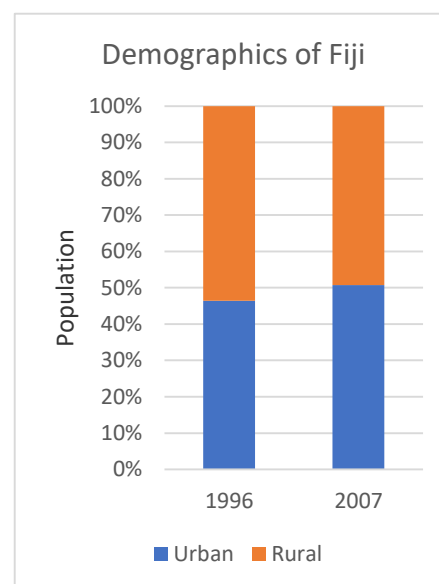


Figure 15: Demonstration of disproportionate growth in the urban sector from 46% of the population in 1996 to 51% of the population in 2007 (FBoS, 2008a)



Within the last two decades Fiji's tourism industry has grown dramatically, in the process overtaking the traditional export sector of sugar as the main foreign exchange earner and employment creator. Over 650,000 tourists visit Fiji annually (ADB, 2014a). In 1970, tourism contributed 32% of GDP while in 2009, tourism had increased to contribute 69% of GDP (Department of Energy, 2014).

Despite the social and economic benefits of tourism in terms of employment creation, foreign exchange earnings and linkages with the other sectors in the economy, tourism expansion is also engendering several detrimental changes. The increasing influx of tourists coming into the country pose increasing pressure on and competition for natural resources between agriculture, industry, housing and tourism (Narayan, 2015).

Since the first establishment of Denarau, a small private resort island, in 1969, major development works were undertaken around the islands of a scale never seen before in Fiji. The continuation of large-scale tourism development and urban expansion changes a landscape relatively quick over a short period, especially when mangroves are cleared for reclamation. Development of port facilities on delicate coastal ecosystems in Fiji is also increasing, with large areas of mangrove swamps being drained for this purpose (UNCCD National Focal Point, 2007).

5.3.2 Actors & Agents

Infrastructure development has generally been driven by national efforts in pursuit of economic development and improved livelihoods. Key actors include:

- The Ministry of Infrastructure & Transport, along with the Fiji Roads Authority and Water Authority of Fiji, who is responsible for policy formulation, planning, regulation, coordination, and implementation of services relating to transportation and public utilities.
- Local population, who requires infrastructure development to accommodate population growth.
- The Department of Town and Country Planning, whose role is to control and regulate the appropriate use of land in Fiji.
- Commercial agriculture producers, whose expansion necessitates improved infrastructure to deliver products to market and ports.
- The Ministry of Agriculture, Sugar, and Land Resettlement, who is responsible for relocating farmers when their leases expire.
- The Ministry of Tourism, along with hotels and tourism agencies, whose growth has placed increased demand on Fiji's energy production and transportation infrastructure.
- The Department of Environment, who is required to conduct an EIA for any development proposals, and also to enforce environmental codes and standards.
- Tourists, who increase temporally Fiji's population and increase demand for infrastructure, products and services.

5.4 Mining and Gravel Extraction

Although several prospects licenses were recently granted by the government to explore different types of minerals, the majority of mining activities were related to gold, bauxite and sand and gravel.



5.4.1 Context

Mining is considered an emerging economic sector with great potential to become a key sector of growth and a main source of government revenue in the future (Chen, 2015).

Mining and exploration in Fiji has historically been dominated by gold production from the Vatukoula mine, although significant other sector revenues come from industrial minerals such as coral sand, gravel, and quarried materials, such as bauxite, cement, gold, lime stone and silver. Along with the exploration license, a permit to remove merchantable timber is issued to the mining company to ensure maximum utilization of timber resources. The extraction of river sand and gravel deposits has increased significantly over the past two decades with the growing demand in the construction industry driven by domestic and commercial operators due to largely to its accessibility and easy extraction.

In early 2006, prospects for the sector looked bleak when global gold production declined and operations in Vatukoula were shut down to allow a reorganization aimed at bringing the mine back into profitability. It went back into action two years later, and the mining and quarrying sector on average accounts for 1% of GDP over the last five years. Over 1.2 million metric tons of hard rock, sand, and gravel have been removed since 2008, which is likely to have had a negative impact on the natural ecosystem of the rivers and coastal environment. Both open pit and underground mines exist in Vatukoula but very little information on the extent of these mines are available in the public domain.

History shows that mineral development poses special problems for communities adjacent to mineral deposits, so the government views the direct participation of residents as an integral part of a successful long-term relationship honoring the rights of landowners as well as immediate stakeholders in alignment with the Fiji Mining Act & Regulations (Cap 146). Overall, the lack of transparency and institutional capacity is a major barrier to understand and effectively police exploration, mining, and quarrying activities (MoSP, 2014).



Large industrial quarries for sand and gravel exist in the Nakavu deposit along the lower parts of the Navua river, the Naduri deposit to the west of the Sigatoka river mouth, the Semo Quarry located between Sigatoka and Nadi, and the Sigatoka Sand Dunes. XINFA Aurum Exploration Fiji Limited, a Canadian company; exports unprocessed bauxite with the soil yet to be chemically separated since Fiji has no local value added or processing facility. To date the Bauxite has generated FJ\$52.2 million (US\$26.1 million) – equivalent to 1.2 million dry metric tonnes of soil (Rawalai, 2017). The company expects to export at least 70,000 tonnes of bauxite a year. The EIA and the Environment Management Plan (which includes the impact mitigation plan) for the bauxite project is not in the public domain, and the full impact, in addition to the immediate loss of forest and soil erosion are now experienced by the stakeholders (see Figure 16). The exploration site is 30 hectares in size and the surface lease is 156 hectares. Assuming the total area of surface lease to be converted to mining; given that stocking conservative stocking intensity of $96 \text{ m}^3/\text{ha}$ (Musong 2014) and emission factor of 1.1 tCm^{-3} (Hass 2015) carbon emission from bauxite mining is estimated at 62,925 tCO_2 . The company is reported to be prospecting for additional sites as it competes with countries like Australia, Mongolia and Indonesia where the ore is of superior grade.



Figure 16: Aerial view of Bauxite Mine, Nawailevu, Bua (Vanua Levu) ©WWF SPPO/Ron Vave

Another threat from mining activities related to freshwater vertebrates and invertebrates is habitat destruction brought about by excessive gravel extraction, which leads to species decline and in turn affects food security for rural communities. Similarly, a constant supply of clean water has been an expectation of rural living and one of the important determinants in the location of villages. Rivers and streams have always provided drinking water but have also been important for washing and bathing, as well as for livestock needs.

Future government plans include several prospective mining licenses and special mining license for copper, silver, manganese, molybdenum, limestone/ marble, petroleum, gas and geothermal heat that have been granted to investors. Given the long gestation period from prospecting to mining, the government is looking at opportunities to support investors fast track the transition. Under the Environment Management Act (EMA), EIAs are an obligatory requirement to safeguard against potential activities that may have negative impacts.



Assuming that several mining projects may materialize at the same time the impact of mining on Fijian forest could be significant. In this rough estimation we considered all the active, and prospective mining concession areas (approximately 3,200 ha) being deforested and emitting 1.2 M tCO₂/ha (IGES, 2003).

5.4.2 Actors & Agents

Mining and other extractive activities have generally been driven by both domestic and international demand for minerals and construction materials.

- Buyers of extracted materials, who place demand on extractive activities for valuable minerals and other materials.
- Mining companies, who are responsible for prospecting works and activating mining and extraction of resources.
- The Department of Environment, who is required to initiate the EIA study as well as to inform stakeholders and assess the EIA in an open and transparent manner
- The Ministry of Lands and Mineral Resources, who is responsible for the administration, development and management all State Land initiatives including the facilitation of the country's mineral sector and ground water resources. The Ministry hosts two departments: the Department of Lands and the Mineral Resource Department (MRD).
 - Department of Lands, is responsible for negotiating surface access rights and benefit sharing on lands designated under the Land Bank.
 - The MRD who regulates the mineral sector which includes all minerals whether of high or low value.
- The Ministry of Forest for issuing Forest Right License to extract logs that are cleared during prospecting and mining operation however this will only become effective if the mining company wishes go sell the logs felled. Often, the logs are left to rot and the Ministry of Forest is not involved.
- TLTB, whose consent is required for licenses to mine on iTaukei land.
- Landowners, who may mine themselves or consent to activity on their property by commercial mining operations.

5.5 Traditional Uses

Fiji recognizes customary land ownership as enshrined in the Constitution. The rights flowing from customary land ownership, including traditional forest use, are regulated in the legislation. Traditional forest use rights for subsistence and customary purposes include harvesting of wood for firewood and other traditional uses, the collection of forest produce for food and medicinal purpose.

5.5.1 Context

Although the annual population growth in Fiji is low at 0.7% per year compared to the global average of 1.2% per year (World Bank, 2017), there has been a gradual increase in the rural iTaukei population overtime (see Figure 17).



The protection of traditional forest use is strengthened by its exclusivity, given no person other than the traditional landowners may exercise these rights where the land is un-alienated. Men and women have equal access to non-timber resources as sources of income and or food security.

The community consultation conducted in Tomaniivi and Serua revealed that communities still collect medicinal plants, wild crops, edible ferns, fruit, nuts, pandanus leaves (for weaving mats), sago palm leaves (for roof thatching), and wild pigs in the forest. Any non-timber forest products that are collected in excess are sold on the roadside or at local market. However, there is a lack of quantifiable information on the impact of such extraction to substantiate the impact of traditional practices.

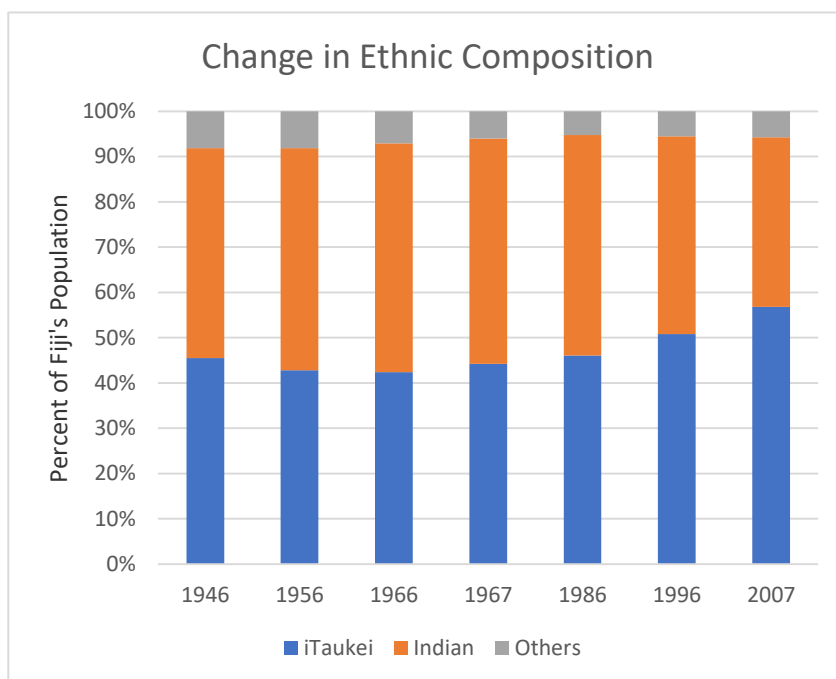


Figure 17: Changes in composition of population, 1946-2007 (FBoS, 2008a)

Various species are selectively logged for traditional use, and thus their unsustainable harvesting changes the natural forest species composition. The traditional demand for selected species has been exacerbated with the increasing iTaukei population. Traditional use of forest trees such as *Dakua makadre* (*Agathis macrophylla*, Pacific Kauri) include timber for the construction of village houses and community structures; tree trunks for canoes and gongs; dead branches for firewood; resins for glue and glazing pots; resin smoke as a dye for hair and tattoos; and – for several *mataqali*, villages and districts – also the totem tree.

Vesi (*Intsia bijuga*) is also highly valued for its durability, attractive dark red-brown coloring, and traditional use for central poles in chiefs' houses, gongs, and canoes. Its easy-to-work properties also make it suitable for woodcarving of valuable artifacts. The commercial production of kava bowls, weapons, and other artifacts to supply the growing tourist market has put additional pressure on the vesi population, particularly in the absence of replanting (Thaman, Thomson, DeMeo, Areki, & Elevitch, 2006).

Firewood collected from the forest has been a free and readily available domestic energy source. Firewood collection is considered a driver for forest degradation.

However, according to the senior men's group consulted through this study in the Naboubuco District in Naitasiri (representing the villages of Rewasau, Naelewai, Nasiriti, Nasoqo and Roma), the highly flammable species are scarce today due to frequent harvests, indicating a gradual depletion of such tree species (e.g. *yasiyasi*, *marasa*, *dawa*, *koka*, *vure*, *doi*, *davo*) (see Annexes). Nowadays, *molau*, *onolulu* and *gadoa* are the most commonly used firewood species, as they grow



like weeds along the roadsides and degraded areas. Mahogany debris after logging also makes excellent firewood.

During the consultation process, community members were asked to name 10 top firewood species, and rank flammability from one to ten with 10 being the most flammable. They were also asked to note the current level of use, the duration of firewood collection; the estimated distance walked and the frequency of harvest. The group were asked to consider what the future prospect for use are based on current level of access and identify those that have the highest, medium and lowest impact on forest degradation.

The group from Navai Village at the Tomaniivi workshop agreed to use the frequency of harvest as a critical indicator to forest degradation and to apply color code where red is “danger”; amber – medium and green depicting low impact (see Table 33). Results from all community discussion is summarized in Table 3 and it is evident that firewood species may have high flammability but small impact on degradation in comparison to one that may not have high flammability but is frequently harvested. The quantity of the firewood collected is a challenge to quantify as it ranges from a back-load (see Figure 18) to a hand-load or a few sticks that could be pulled over long distance.

A large portion of the most popular firewood in rural communities are native forest species. On



Figure 18: An elder of Nasoqo Village with a back-load of firewood © V.Masibalavu

average 21 kg of firewood is extracted every 13 days; equivalent to 590 kg of fresh weight per year. However, it was difficult to determine the area of forest impacted by firewood harvest hence carbon emission from firewood harvest is difficult to quantify without further studies.

The species harvested range from mangrove, mahogany, drou, vaivai, sorua and others.

The communities are aware of the potential restriction to mangrove harvesting and perceive that future use may decline. On the other hand, they are aware that mahogany plantations are currently coming into maturity and scheduled for harvest. Some communities are currently sourcing firewood from mahogany plantations where the duration for harvesting generally takes a day to collect 30kg of wood for fires every 3 days. Given its easy availability as waste wood after logging operations, communities perceive future use to continue to increase.

A summary of the 10 top firewood species is listed in Table 3 and details are outlined in the community workshop report (see Appendix).



Table 3: Trend and estimated quantity of Firewood Collection in Naitasiri and Serua

Species (Local name)	Scientific Name	Flamm- ability	Level of Current Use	Duration of Harvest (Time spent in hours)			Frequency of Harvest	Estimated Future Use	Weight (kg) per harvest
				1960	1990	2017			
Dogo	<i>Bruguiera gymnorrhiza</i>	10	High	0.5	1	4	10 days	↓	20
Drou	<i>Trema cannabina</i>	10	High	8	4	4	60 days	↓	60
Gadoa	<i>Macaranga spp.</i>	8	High	8	8	8	5 days	↑	50
Mahogany	<i>Swietenia macrophylla</i>	10	High	8	8	8	3 days	↑	30
Onolulu	<i>Piper aduncum</i>	6	High	8	8	8	2 days	↑	15
Sorua	<i>Alstonia spp.</i>	10	High	4	4	4	60 days	↓	50
Vaivai	<i>Samanea saman</i>	10	High	0.5	0.75	1	30 days	→	20
Vure	<i>Geiosis spp.</i>	10	High	4	4	4	14 days	→	40
Vuru	<i>Geiosis spp.</i>	10	High	8	8	4	3 days	↑	10
Yaqoyaqona	<i>Piper spp.</i>	10	High	0.5	0.75	1	10 days	↑	15
Davo	<i>Macaranga spp.</i>	10	Medium	8	4	4	1 day	↑	15
Dawa	<i>Pometia pinnata</i>	10	Medium	8	4	4	3 days	↑	8
Doi	<i>Alphitonia spp.</i>	10	Medium	4	4	4	10 days	↑	15
Gunugunu	<i>Gymnostoma vitiense</i>	10	Medium	0.5	1	4	14 days	→	20
Ivi	<i>Inocarpus fagifer</i>	10	Medium	0.5	0.5	4	30 days	→	15
Average (kg)									13

It may be noted that the recognition and exercise of traditional forest rights may have a positive influence on forest conservation and sustainable management provided it is exercised according to traditional natural resources management principles and practices. However, it may also constitute a risk to drive forest degradation when these privilege and rights are exercised unsustainably to meet the growing need for forest products associated with population growth, heavily reliance on natural resources for subsistence lifestyles and erosion of customary governance as well as the loss of traditional knowledge giving scope for the misuse of these rights

5.5.2 Actors & Agents

The primary activities are associated with Fiji's local communities who may use forest resources for traditional purposes. Key actors and agents are listed;

- iTaukei communities, who have inherent communal rights to use forest resources in traditional activities, such as the harvesting of firewood, collection of produce, and medicinal purposes.
- Lease holders who have rights to use forest resources in traditional activities, such as the harvesting of firewood, collection of produce, and medicinal purposes.
- TLTB, whose role is to manage and regulate the areas held under customary tenure arrangement in Fiji.
- Tourists, who have placed increased demand on the production of traditionally made kava related goods.

5.6 Introduced Species

Invasive plant species are plants introduced by humans to localities outside their natural range that become established in their new environment (Lowe, Browne, Boudjelas, & de Poorter, 2000).



The economic and ecological impacts of invasive alien plants worldwide have been widely documented (Rejmánek, Richardson, Higgins, Pitcairn, & Grotkopp, 2005; Pyšek & Richardson, 2006; Richardson, Daehler, Leishman, Pauchard, & Pyšek, 2010). The participants of the community consultations and divisional workshop identified introduced species as a drivers of forest degradation, and more specifically listed the following invasive plant species: African Tulip (*Spathodea campanulata*), Merremia vine (*Merremia peltata*), Broad-leaf mahogany (*Swietenia macrophylla*); and Caribbean pine (*Pinus caribaea* var. *hondurensis*), as the most notorious introduced species. Despite its invasive nature, such species enhance carbon stock through aggressive growth patterns.

5.6.1 Context

The invasive plant species take over any gaps in the forest created either through fallow, disturbance along roads or streams or clearing of logged areas. Once established in an area, they rapidly grow and out-compete their native counterparts, forming large monotypic stands.

Two invasive plant species identified in this study are timber species and are described in section on logging: the Caribbean pine (*Pinus caribaea* var. *hondurensis*) planted in the drier regions and the Honduran or big-leaf mahogany (*Swietenia macrophylla*) planted mostly in wet regions of Fiji. Both timber species were introduced as part of government policy to provide a forest-based industry and employment to rural based communities, generate foreign exchange income, and establish plantations on logged forest to meet local timber demand (Oliver, 1992).



5.6.1.1 African Tulip (*Spathodea campanulata*)

African Tulip (AT) is native to equatorial Africa and was introduced into Fiji as an ornamental tree in the 1930s (Smith, 1979). The species is listed as one of 100 of the World's Worst Invasive Alien Species by the Invasive Species Specialist Group (Lowe, Browne, Boudjelas, & de Poorter, 2000). In Fiji, AT is now the dominant tree species in secondary forest and abandoned plantations (see Figure 19), in some areas forming large monotypic stands, and has recently been recorded in primary forest (Keppel & Watling, 2011).

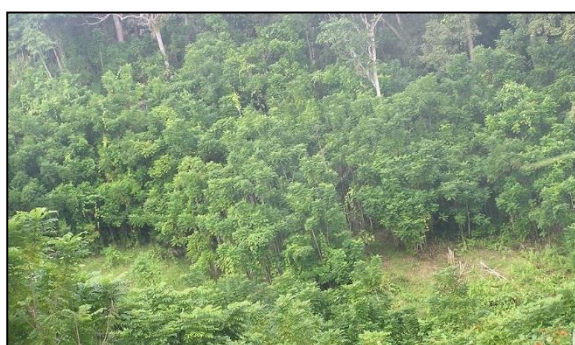


Figure 19: African tulip flowers (top) and encroaching on abandoned land (bottom) ©CI/Peg Arrington (top) and CI/Isaac Rounds (bottom)

The Fiji Department of Agriculture (Swamy & Singh, 2008) listed AT as a noxious weed, as it invades valuable farmland and is difficult to eradicate due to rapid re-sprouting from stems and high numbers of seeds and seedlings. In a survey of 360 households in 30 villages conducted in eastern Viti Levu in 2012, 76% of respondents stated that AT reduces agricultural output, 36 % stated that AT reduces land for grazing, and 48% stated that AT competes with other useful trees



(Daigneault & Brown, 2013). The same study also stated that farmers spend 10% of their 35 hours a week on managing AT whilst 95% of the villages stated that population of AT is increasing (Daigneault & Brown, 2013). The AT has an indirect contribution to deforestation, as agriculture frontier is being pushed into new land including forested areas, and AT invades when forests are cleared for agriculture and then left to fallow.

Trials by the MoF showed that despite growing much faster compared to their native counterparts, AT is not suitable for timber due to high moisture content, which causes warping, twisting, and cupping of the timber grains (Khan, 2004; Pene & Tuiwawa, 2016). There are very few studies in Fiji on the impact of AT on natural forest but studies from other countries have shown seedlings persist in low light conditions of closed natural forest (Larrue, Daehler, Vautier, & Bufford, 2014; Lugo, 2004). Recently data from long term monitoring plots in Sovi Basin Protected Area in Fiji indicated that within a ten-year period AT have greatly increased in size compared to their native counterparts (Pene & Tuiwawa, 2016).

There is an ongoing debate among the Fijian scientific community about the economic and ecological benefits and impacts of AT, in addition the potential for AT to assist in the restoration of agricultural and degraded land (Keppel & Watling, 2011); however further research is needed to quantify the negative and positive impact of AT.

5.6.1.2 *Merremia vine (Merremia peltata)*

Lianas and vines are part of a forest ecosystem that constitute less than 5% of woody plant biomass in tropical forests (DeWalt & Chave, 2004). When established they reduce tree recruitment, growth in increase gap recovery times leaving low-canopy, liana dominated areas which then extend outward over time (Schnitzer, Dalling, & Carson, 2000; Schnitzer, Mascaro, & Carson, 2008). They usually occupy tree fall gaps created through natural tree mortality, landslides or tropical cyclones. A recent long-term study in Panama found that lianas have a huge negative impact by reducing the net-above uptake by about 76% per year (van der Heijden, Powers, & Schnitzer, 2015).

Merremia peltata is a woody vine (see Figure 20), and although it is native to the pacific region, it is considered an invasive in this study by virtue of the nature of its growth, dispersal ability, phenotypic plasticity and wide tolerance range. Recorded from most high islands in Fiji; it is a serious invasive species due to its smothering effect on trees up to 20 meters high on forest edges (Daigneault & Brown, 2013; Taylor & Kumar, 2016).



Figure 20: *Merremia peltata* flower (top) and smothering endemic sago palms (bottom) ©CI/Isaac Rounds



It is found on lowland wet areas around abandoned or fallow lands, along rivers and old settlements. It has been classed by academic experts in the Pacific region as a serious threat to natural ecosystems with an urgency to develop bio-control (Meyer, 2000). It takes over logged areas thrives on disturbance where it smothers native plants. In recently logged mahogany forest in Nukurua, Tailevu it has formed a dense cover smothering the remaining native species that have survived the logging operation (Tuiwawa, 2004). Reforestation or rehabilitation of forests infested by *Merremia* vine are expensive and sometimes ineffective.

In a 2012 study conducted in 30 villages in eastern Viti Levu; 28 villages were assessed on whether *M. peltata* is found in their area. An estimated 42% of respondents reported that *M. peltata* reduces agricultural input while 34% reported that *M. peltata* competes with other traditional tree species (Daigneault & Brown, 2013).

5.6.2 Actors & Agents

The introduction of outside species can be particularly detrimental for islands like Fiji, and are generally driven by human actions, whether intentional or unintentional.

- The Ministry of Forestry, who introduced some of these species to replenish natural stocks.
- The Department of Agriculture, who studies and categorizes species by their level of impact, and contributes to the management of introduced species.
- The Biosecurity Authority of Fiji is mandated to protect Fiji's agricultural sector from the introduction and spread of animal and plant pests and diseases, facilitate access to viable agro-export markets and ensure compliance of Fiji's agro-exports to overseas market requirements.

5.7 Natural Disaster

Fiji is surrounded by the Pacific Ring of Fire which aligns to the boundaries of plate tectonic plates; associated with frequent deep seismic activities. Frequent tropical cyclones have hit Fiji almost on an annual basis as it is located in the tropical cyclone belt in the Pacific Region. Cyclones are characterized by damaging winds, torrential rain, storm surges which lead to flash floods and landslides.

5.7.1 Context

Fiji geographical position makes it vulnerable to natural disasters and external shocks. Over the last decade, cyclones have hit Fiji almost on a yearly basis with marked cyclone season from November to April. In the past decade, frequent and stronger impact of natural disasters has increased awareness and readiness as the general population realized the reality of associated risks. Disaster events in Fiji are reported to have an average annual economic damage estimated at FJ\$35 million impacting some 40,000 people each year (Esler, 2016).

The most destructive cyclone – TC Winston – made a landfall in Fiji on 20 February 2016 affecting 62% of Fiji's population where entire communities were devastated, resulting in an estimated total damage and loss across all sectors at FJ\$2.85 billion (Esler, 2016). Forest, crops, and infrastructure, such as houses, hospitals, and schools were damaged, with forty-four fatalities recorded. Landslides are associated with torrential rainfall during cyclones, which are the major contribution of severe storm events and triggers numerous landslides on catchment slopes.



Excess debris in drains/waterways generate large-magnitude overbank floods (Terry, Lal, & Garimella, 2008). More than 40 floods are experienced in Fiji since 1975 (ADB, 2014b). These floods are mostly associated with prolonged heavy rainfall during the passage of a tropical cyclone, tropical depression, and/or enhanced, slow moving convergence zone. Removal of vegetation cover through logging, wide spread expansion of subsistence and commercial agriculture, exacerbate water filtration into the soil substrate causing landslides under torrential rains. Fiji doesn't have a model to predict landslide occurrence that feeds the hazard maps (Greenbaum, et al., 1995).

Fiji has thus developed its Disaster Management Mechanism such as the National Emergency Operating Center in Suva and Divisional Emergency Operating Center in Lautoka, Nadi and Labasa. Each town and government station is expected to set up similar Emergency Center to organize, direct and assist community members find the safest shelter. A Regional Specialized Meteorological Center coordinates special media releases and instructions to areas of highest risk.

5.7.2 Actors & Agents

Very few agents, if any, can be listed responsible for deforestation or forest degradation, however the following agents are associated with disaster risk management and could potentially decrease the impact of natural disasters.

- Ministry of Rural & Maritime Development and National Disaster
- National Emergency Operating Center in Suva & Divisional Emergency Operating Center

6 UNDERLYING CAUSES

In the study of the DoDD discussed above, there are seven main strands of major causes and a myriad of inter-related underlying causes. The complexity of the ideas, inter-relationship of cause-and-effects of factors and issues gleaned through community and divisional consultation is challenging to depict. Appendix illustrates the results from the consultation process.

The underlying causes and indirect DoDD are simplified in a fishbone diagram (see Figure 21), as a visual representation to recall the underlying causes. The main bone corresponds to the agricultural expansion, logging, traditional use activities, introduced species, natural disaster, infrastructure development, and mining and gravel extraction that are driving deforestation and forest degradation. The secondary bones depict the underlying causes while the smaller lateral bones show specific causes

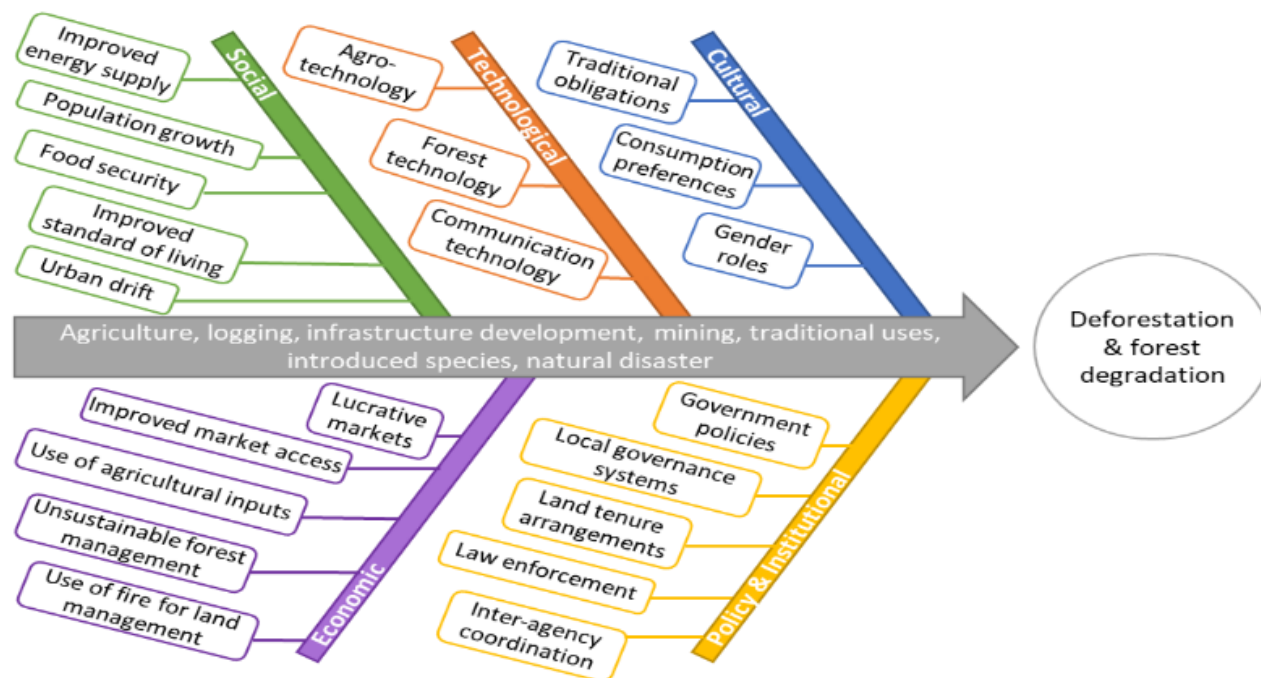


Figure 21: Schematic diagram of underlying causes

6.1 Social Factors

Social factors include: population growth, food security, improved housing conditions with better living standards, improved energy supply (including renewable), improved energy source for cooking, and urban drift. Social factors are directly related to poverty eradication.

Although the rate of population growth in Fiji is low compared to the global average, the Fiji Bureau of Statistics (2016c) projects one million people in Fiji by 2030. It was evident at the communities visited that there were a good proportion of the communities who were young and youthful. These youths would be requiring a piece of land to cultivate when they start their own family. They would be expected to build a separate dwelling for their own nuclear family and see to the education of their children. With limited alternative livelihoods, the youths will have no choice but to turn to farming. At the same time, non-iTaukei tenant farmers in the rural sector may be at risk from expiring land leases. Dislocated farmers are moving into the urban centers with low skill sets, contributing to poverty in urban areas.

Expired agricultural land leases are contributing to large influx of rural – urban drift as farmers are relocated upon expiry of lease. Associated social problems that may result from such a situation include increased demand for timber as a preferred building material, unemployment, deforestation and forest degradation associated with infrastructure development, agriculture and traditional wood extraction.



6.2 Economic Factors

Economic factors are driven by economic gains with mechanisms including improved market access, diversification of the product base, use of fire as an inexpensive land management technique and unsustainable forest management practices. These are all further driven by a lucrative market for non-timber forest products.

Attractive local and international market prices for agricultural products, wood products and minerals have provided much motivation for maximizing extraction and utilization of forest products. Given the long growth cycle of forest species, market driven diversification of core commodities and self-interest have often seen the conversion of forest land into agriculture for faster, short-term returns. Improved road access and construction of farm roads support supply chain for ease of market access.

More extensive prospecting for minerals with possible mining activities to follow is becoming a bigger concern in Fiji in recent times, particularly as the government is legislatively empowered with all mining decisions, pending positive outcomes of EIAs. While Fiji has the EMA (2005) to safeguard against potential activities that may have negative impacts, the country has limited the capacity to fully enforce the legislation.

6.3 Technological Factors

Technological factors include: the integration of agro-technology to increase productivity and improved communication technology as well as the use of forest technology for value adding end products.

Fiscal tax incentives directly support the modernization of agriculture and forest-based technologies. The construction of farm roads for improved access to technology is a game changer to many small farmers. Government assistance through the purchase of tractors and other mechanized farm implements enables a small holder subsistence farmer to increase productivity and efficiency of operation. It also fast tracks scheduling from land preparation to harvest with high possibilities of reducing fallow cycles. Outcome of such a trend is a move towards commercialization of small holder farmers which pushes resource utilization at a faster rate towards the tipping point or a collapse of ecosystem services and benefits.

Internet and mobile communication driven by innovative technology will impact all seven proximate drivers as well as indirect drivers. Ease of communication brings buyers to farm gate and reduces cost of production for the farmer, as a simple phone call to the buyer replaces needing to take produce to market. Communication and the need to stay connected with family, friends and business have a far-reaching impact. In the context of DoDD, it facilitates ease of access between market players along the value chain that may exacerbate over exploitation of limited resources.

In the context of the forest sector, chain saws and portable sawmills have been issued in response to rehabilitation efforts after TC Winston. While such initiative has good intentions, they run a high risk to be a major contributor to unplanned and illegal logging activities.



6.4 Political and Institutional Factors

Political and institutional factors include land tenure arrangements, local governance systems, and government policies, including import substitution and self-sufficiency. While a good set of strong policies has been adopted, there is a lack of full implementation and enforcement.

In the case of commercial agriculture, while there are a limited number of large commercial farmers due to Fiji's land tenure systems and the recent large exodus of sugarcane farmers, the government is advancing policy to modernize and increase production (MoA, 2014). Large commercial operations are dependent on an enabling environment conditioned by strong legal frameworks and policies, with current poorly coordinated and mismatched conditions between demand and supply conditions leading to market inefficiencies.

The Fiji Crop and Livestock Council is the national umbrella body to conglomerate large and small commercial farmers in a coordinated fashion for Fiji's non-sugar agricultural sector. Launched in 2010, it is comprised of 12 national commodity associations and seven sub-sector/regional associations that represent almost 60,000 farmers across the industry, including: pigs, honey, taro, kava, grazing livestock, ginger, cocoa, rice, fruits, and vegetables, in addition to agro-exporters, coconut millers, dairies, and organic producers.

Land in all the communities visited as part of the field survey are owned by the *mataqali*. *Mataqali* members have the right to decide land use however access to land and utilization of any resources must be used for subsistence only. Utilization of resources for economic gains would require the developer to secure land lease from TLTB upon consensus by at least 60% of the *mataqali* members.

Long term leases of large areas of land often result in large scale conversion and deforestation. For instance, communities of the Tikina Deuba, Serua claim that large tracks of their land have been leased out to developers for over 50 years. The leased lands have changed hands a number of times without the landowners' consent and as a result the lands have been deforested for rice cultivation and other development.

In contrast, subsistence wood extraction and agriculture are carried out at small scale and traditional communities do not require formal access rights to utilize natural resources. Customary decision-making processes are important but may have minimal impact as each member of the *mataqali* has equal rights of access to communal resources. With an increasing population, urban drift, the erosion of customary governance and traditional natural resource management knowledge and insufficient regulatory control, subsistence agriculture and wood extraction have the potential to have high negative impact on forests.

There is a limited coordination amongst government officials to ensure efforts and messages are consistent with policy objectives. In addition, during the consultation process it was evidenced that members of the community at the three study sites were not familiar with the National Forest Policy, logging regulations and other related policies. It reflects the restricted awareness regarding policies and laws.



6.5 Cultural Factors

Cultural factors include traditional obligations, consumption preferences, and gender roles.

Culture plays a crucial role in the use, management and development of land and forest areas. Communal living in Fiji dictates how people live their lives in traditional settings and there is redistribution and kinship obligations which necessitate the continuous use of forest resources. For example, kava is the traditional drink of indigenous Fijians, however, it is consumed by almost all ethnic groups as a social drink and this has placed high demand on planting. Kava is also a lucrative export commodity and is sold to Fijians and other Pacific Islands in overseas countries and this has pushed the planting of kava.

People in rural areas continue to plant and rely on root crops as a staple food. Taro, cassava, yams, bananas continue to be crops that are planted for consumption and commercial purposes. These crops also have high cultural significance and are used for traditional functions, for food exchange and for gifting. Culture dictate gender roles and men and women have different responsibilities and roles within the household, clan and village structure. Women are expected to do household chores and are also responsible for food gathering and this means planting, harvesting and foraging the forests. Men build houses, clear areas of land for planting and plant root crops, thus are involved in removal of forests. A lot of the work on forest management and sustainable land use are done with the participation of communities who use their cultural rights to land, cultural access to forest resources and unwritten kinship relationships and rules to develop, implement and enforce community-based management initiatives.

Given the land tenure system in Fiji, local decision-making and governance have a very strong impact on commercial agriculture. Assuming commercial farmers are driven by self-interest to maximize profits, they will be driven by land tenure arrangements, availability of land, consumer preferences, food security needs, market access, national policies, and tax incentives. For example, many farmers take advantage of fiscal tax incentives that support the importation of specialized vehicles for agriculture, forestry, tourism and mining.

Local governance through the *vanua* systems and the Ministry of iTaukei Affairs have structures that are cultural and customary which are known and understood by the people. These relationships may be opportunity to work across defined boundaries and part to challenging decisions. Nakorovou village in Serua for example and those villages along the coasts have traditional ties to those villages in the forested watershed, upstream along Navua River. Similarly, members of the Navaii village at the foot of Mt. Tomaniivi are originally from Nasoqo village, Tikina Nabobuco in Naitasiri. Past engagement has influenced land ownership and shaped how access to resources like forests, and other natural resource are safe guarded. Religion, churches and faith-based organizations form another layer of leadership and influence within these structures (Tuwere, 2002).

6.6 Causation of Underlying causes

The complexity of inter-relationships between proximate causes and underlying causes makes it difficult to discuss one without making reference to the other (see Appendix). Proximate causes consider the activities that lead to deforestation and forest degradation, while underlying causes refer to the reasons for and extent of these impacts on forests.



To identify systems dynamics that commonly lead to deforestation, Geist and Lambin (2002) recommends an analysis of the frequency of connection between proximate causes and underlying DoDD to determine the major relationships, interactions, and feedback process. Accordingly, three modes of causation are outlined and adopted in this analysis: (1) single factor causation, which relates to one underlying factor driving one or more proximate factors; (2) chain link causation, where several interlinked factors in combination would result in deforestation and forest degradation; and (3) concomitant occurring, where independent, separate interactions between factors are causing deforestation. For instance, an increase in population (even if it is a slow increase over time) will have a high impact on commercial agriculture as demand for food and land increases. Government policies such as modernizing the agriculture sector are aligned to support commercializing agriculture activities across the board hence policy and institutional factor will have a very high impact on commercial agriculture. The number of underlying causes that have high impacts are counted across each proximate driver to determine the level of causation (see Table 4), and each cell is color coded to depict high (red), medium (yellow), or low impact (green).

Table 4: Causation Analysis of Proximate Causes of Deforestation

			Underlying Causes									
			Social		Economic		Technological		Policy & Institutional		Cultural	
Proximate drivers		Causation Frequency	Demographic	Improve wellbeing	Market access & revenue	Commodity diversification	Technology to increase production	Communication technology	National development plan	Local governance	Consumption preferences	Traditional obligation
Agriculture	Commercial	Concomitant										
	Subsistence	Chain link										
Logging	Commercial	Concomitant										
	Subsistence	Chain link										
Infrastructure development		Concomitant										
Mining		Chain link										
Traditional use		Chain link										
Introduced species		Concomitant										
Natural disaster		Concomitant										

The result demonstrates the complexity that exists between proximate drivers and underlying causes as all proximate drivers are influenced by chain link or concomitant occurrences. This means that while several interlinked underlying causes combine to have an impact on DoDD situation also exists where independent and separate interactions between factors are causing deforestation such as the case of mining which is not directly linked or related to any other proximate cause yet is influenced by economic, technology, policy and institutional factors.

A comprehensive understanding of drivers and their underlying causes is imperative to address the basic requirements and building blocks for an effective policy response for DoDD. The underlying causes are further considered with agents/institutions listed against each proximate driver following Carodenuto's (2015) methods (see Table 5).



Assigning the value of “0” to “business as usual” and “1” to “increasing impacts of underlying causes in the future” - provides a rudimentary means of ranking the underlying causes outlined in Table 5. Social factor is the most important underlying cause followed by economic and technology which are of equal importance, then policy & institutional frameworks and culture. Comparison of aspects contributing to social factors indicate that improved wellbeing is of the highest important. Given that Fiji has an agro-based economy, improving wellbeing can be equated to increasing livelihood opportunities associated with agriculture activities. This is followed by National Develop Plans which determines priority policies and institutional support.

Table 5: Analysis of Underlying Causes and Agents, where red indicates high impact, yellow indicates medium impact, and green indicates low impact, and → indicates business as usual and ↗ indicates increasing impact of underlying causes in the future.

			Underlying Causes									
			Social		Economic		Technological		Policy & Institutional		Cultural	
Proximate drivers		Agents	Demographic	Improve wellbeing	Market access & revenue	Commodity diversification	Technology to increase production	Communication technology	National development plan	Local governance	Consumption preferences	Traditional obligation
Agriculture	Commercial	Agro-industry	↗	↗	↗	↗	↗	↗	↗		↗	→
	Subsistence	Urban & rural communities	→	↗	↗	→	→	→	→	→	↗	→
Logging	Commercial	Forest industry stakeholders	→	→	→	↗	↗	↗	↗	→	→	→
	Subsistence	iTaukei communities	↗	↗	→	→	→	→	↗	↗	→	↗
Infrastructure development		All sectors & population	→	↗	↗	↗	↗	↗	↗		↗	→
Mining		Mining industry & stakeholders	→	↗	↗	→	→	→	→	→	↗	→
Traditional use		Ethnic communities	→	→	→	↗	↗	↗	↗	→	→	→
Introduced species		Forest sector	↗	↗	→	→	→	→	↗	↗	→	↗
Natural disaster		All sectors & population	↗	↗	↗	↗	↗	↗	→	→		
Ranking of underlying causes			Social		Economic		Technological		Policy & Institutional		Cultural	
			61%		56%		56%		44%		33%	
Ranking of factors driving underlying causes			Demographic	Improve wellbeing	Market access & revenue	Commodity diversification	Technology to increase production	Communication technology	National development plan	Local governance	Consumption preferences	Traditional obligation
			44%	78%	56%	56%	56%	56%	67%	22%	44%	22%



In the discussion on forest degradation, communities in Naitasiri and Serua pointed to policy intervention such as the introduction of mahogany to logged over forest and the development of hydro dams through leasing their land to developers resulting in their alienating in the decision making process of such development initiative as they have no say after allowing their land to be leased – for national interest in support of National Development Plans. The assessment further indicates that efforts to improve technology to increase production is of equal importance to market access. Also, of equal importance are commodity diversification and communication technology which would further support market access and improving wellbeing.

7 AGENTS & INSTITUTIONS

Agents are the key actors who are actively participating in or enabling deforestation and forest degradation and can be loosely categorized into small and large scale.

- **Small scale agents**

Small scale agents include all stakeholders associated with subsistence farming and wood extractions. These stakeholders are assumed to seek and maintain sufficient resources with no interest for excessive commercial gains. Subsistence farmers are assumed to be motivated to meet food security before profits through selling excess produce once domestic needs are fulfilled.

Subsistence wood extractors on the other hand may sell non-timber forest produce such as ferns and freshwater fishes and will require licenses to sell firewood or any timber-based commodity such as fuel wood or post and poles.

Civil Society Organizations are also included in the small-scale category as assistance and intervention at community level tend to be site specific and donor driven.

- **Large scale agents**

Large scale agents include governance at national and local level. National level government includes central government agencies as well as statutory bodies such as TLTB and the National Trust of Fiji. Local governments refer to Provincial, district and village governance. Provincial governance is a quasi-government arrangement that bridges formal and traditional *vanua* based leadership.

Private sector interests include saw millers, forest contractors, and forest companies such as Fiji Pine Ltd. and FHCL.

Commercial farmers are also categorized under large-scale agents on account of the level of influence they have on proximate and underlying causes of deforestation and forest degradation.

From the perspective of agents, the social factors are considered to have a high impact on both commercial and subsistent agriculture however while the impact of the agro-industry on commercial agriculture is expected to increase over time, the impact of urban-rural population on subsistence agriculture is expected to remain the same as it will be limited by availability of land



and employment opportunity. Nevertheless, given the close association between fire and agriculture land clearing techniques, fire is expected to increase over time.

In contrast, local governance and cultural factors such as consumption preference and traditional obligation may have minimal impact on mining. The mining industry and stakeholders may have no future influence on traditional obligation or local governance but may have high impact on National Development Plan, technology and economic growth. Social factors may have medium impact as prerequisite for employment may not be available with the local population but the spin off from economic activities associated with mining is expected to increase over time.

Except for traditional obligations, all underlying causes will have a high impact on infrastructure development. Given the cross sectoral nature of infrastructure development, all sectors and population are listed as agents. The influence of all such agents on infrastructure development is expected to high. The exception are population growth and traditional obligations as the rate of population growth in Fiji is relatively low and traditional obligations have no influence whatsoever on infrastructure expansion as a proximate driver for DoDD.

8 BARRIERS

Most of the barriers to, and the agents for, forest conservation, sustainable management of forests and the enhancement of forest carbon stocks identified during the consultation phase and in the literature review were also listed as drivers and underlying causes of deforestation and forest degradation. This section highlights the major barriers that influence Fiji's path towards achieving improvements in conserving and sustainably managing forests and enhancing forest carbon stocks in the summary below. They are broadly related to: governance, institutions, policies, and cultural characteristics; participation and coordination; land and resource use, management practices, and commercialization; and capacity and relevant knowledge.

8.1 Governance, institutions, policies, and cultural characteristics

Fiji has a complex system of natural resource management rules and regulations across a number of government agencies, as discussed previously in this report. Applying those inter-agency rules and regulations in any given location towards sustainable conservation and forest management is challenging, as processes are not yet very clear or well-understood by the parties involved and there is no national reporting framework to synchronize knowledge and understanding across ministries and levels with respect to forest management (Scherl & Hahn, 2017).

For example, while the FFHCP is valid for the extraction of mahogany in community-owned land. Until recently this type of logging operation occurs without the involvement of the Ministry of Environment, and therefore has no EIA. Similarly, while the Ministry of Environment is responsible for representing and tracking the progress of implementation of Fiji's obligations towards international conventions (e.g., the CBD and UNFCCC Paris Agreement), it is the Ministry of Forests that is responsible for the on-the-ground implementation pertaining to terrestrial and mangrove environments. Moreover, the Ministry of Forests is often marginal in convention implementation meetings, resulting in deficient communications and reporting.



Government roles are not well understood across sectors, levels, and social groups. There is also a gap in capacity for effective monitoring and enforcement of existing policies and regulations related to any commercial and sustainable management practices. More specifically, there is a lack of clarity regarding the roles of forest guards and stakeholders, in addition to their relationships with investors. For example, the specific tools for the sustainable management of forests under FFHCP and Forest Certification Standard have only been partially implemented but are not yet fully compliant.

Adding another level of complication – and, at times, inefficiency – is the dual structure of both traditional and conventional administration systems, particularly considering 88% of Fiji’s land is held under customary ownership. Land leasing arrangements for individuals or groups that are outside the customary ownership system are very complex. The existing shared space between common and customary law considerations on land and resource use lacks a common approach to and understanding of issues such as tenure and user rights, restrictions and responsibilities, and duties and obligations.

8.2 Participation and coordination

Related to governance, Fiji has not fully instituted robust participatory mechanisms and coordination across and within sectors, organizations, and groups. The limited coordination amongst the agriculture, forestry, and fisheries sectors has resulted in mixed messages over the same land areas and resources. For example, while one institution focuses work on the sustainable management and conservation of forests and carbon stocks, the other may be working towards extracting the maximum yield for a lucrative market. The balance and tradeoffs between these decisions is not well understood and has not been adequately measured.

In most cases, the drive for economic opportunities far outweighs and can undermine the ecological and environmental benefits basically due to the lack of information that are readily available on the ecosystem service values and importance. The demand for proper ecosystem valuation is critically important in order to be able to make a well-informed decision on the most appropriate option to take and this will need to be articulated well in the Environmental Impact Assessment Terms of Reference.

At the community level, not all stakeholders understand the supporting traditional social structures, including the various hierarchies of customary leadership within landowning units and the complex social linkages amongst families and landowning units in different contexts. Given this lack of understanding, it is difficult to ensure comprehensive consultation, effective benefit sharing arrangements, and community support as pertains to forest tenure.

Inherent in such social structures are also unwritten cultural norms, such as deference to the older generation in decision-making processes, which ultimately do not preclude anyone’s right to speak and contribute positively. However, women are generally quiet in decision-making processes (especially those who have married into a village), but are asked individually for their consent when this is required to achieve a majority, for example, for TLTB lease approvals. This reduces the use of resourceful human capital, as many of these women are well-educated and provide support to elders in the community and could be good negotiators. Young people are also not fully engaged in natural resource management and development work, despite Fiji’s youthful population and the income generating opportunities that forests offer.



8.3 Land and resource use, management practices, and commercialization

Currently, there is considerable unplanned expansion of agriculture into forested and sloping lands with the perception that conventional unsustainable livelihood activities are more lucrative than sustainable forest management. This is exacerbated by the fact that the price of logs has not changed much in the last ten years and that the profits made by the companies are generally not passed on to the landowners. In other places, where communities have accrued the logging benefits, the promoting the long-term benefits of sustainable forest management and conservation is very challenging. Communities don't appreciate the long-term gain from conservation compared to the short-term gains from unsustainable logging (e.g. in Nabukelevu and Navaii). Combined with that is a prevalent lack of diversity in economic activities and food production in certain areas (e.g., Naitasiri is very heavily dependent on using their land for kava and taro). However, conservation can be adopted if the financial benefits are well-articulated from the start.

Attractive local and international market prices for agricultural products, wood products, and minerals have also motivated maximizing the extraction of forest products and land conversion to agriculture in pursuit of short-term returns. Along with these expansions, unsustainable agricultural and land management practices are applied, for example the use of fires to clear the land, or burn the sugar cane plantation for easier harvesting. The uncontrolled fires usually degrade the forest, but also commonly burn, or re-burn, the areas under natural or assisted regeneration, killing the new seedlings and impeding the enhancement of carbon stock. As consequence, areas of grassland are becoming common in the dry region of Fiji, near the sugar cane plantation, and the lack of vegetation is exposing the soil and increasing the risk of landslides and erosion.

A major barrier for forest conservation, sustainable management of forests and the enhancement of forest carbon stocks is the limited management of the remaining native forests in Fiji as they have been undervalued since Fiji's colonial era. It is still common practice that commercially valuable logs measuring at least 35 cm diameter at breast height (DBH) are extracted via licensing which is valid for only one year. The licensing process involves community owners, logging contractor, Department of Environment, Department of Forest and the TLTB with their different roles. Whilst the FFHCP is in place to safeguard against the extreme environmental impact of the logging operations, there is a widespread lack of compliance (especially with the application of the Diameter Limit Table for the selection of trees to be extracted). As a result, there is unnecessary degradation of forests, which become vulnerable to fires and conversion to other land uses.

There is also limited management of community-owned mahogany forests as in many cases forest owning community strikes an agreement with their logging contractor of choice, which then submits a Harvesting Plan to the Ministry of Forests for verification and the right to log occurs without proper EIA.

Couple to the issues related to the management of native and plantation forest, as such, is the limited transition from timber exploitation to sustainable forest resource management. Although Fiji Forest Policy has been developed, its adoption and implementation has been restricted due to limited government resources and concern for the transition of timber exploitation to sustainable forest resource management (DoF, 2007a).



8.4 Capacity and relevant knowledge

Capacity has not been fully developed for forest conservation and management, despite being critically important for effective conservation and sustainable management of Fiji's forest. Efforts toward capacity development have been insufficient and limited on three main groups: conservation and environmental management institutions and personnel; land and sea stewards; and a range of important partners, particularly leaders and younger career people (Scherl & O'Keeffe, 2016).

Because of the shortage of human and finance capacity, the Fiji Ministry of Forests experiences difficulties to implement the Fiji Forest Policy. While the Forestry Training Centre in Suva can train very good forest technicians, the Ministry has a limited number of staff members with the required management skills. The Ministry has lost significant human capacity these last fifteen years as the staff have left or migrated to other sectors. Furthermore, the civil service no longer supports its staff members with paid study leave to encourage continuing education and no longer maintain work placement in the Ministry for staffs after completing their studies. Limited capacity further reflects on the submission of fundraising proposals for new forest management projects. The Ministry of Forests recently started the development of a new vocational curriculum on biodiversity conservation and protected area management (FTC, 2017) with the aim of progressively promoting knowledge and understanding across sectors related to sustainable forest management and conservation as well as contributing towards climate change mitigation and adaptation.

Across a range of stakeholders there is also a general low level of awareness and understanding of rules and regulations governing land use, forest management and conservation. The consultation with communities and divisional stakeholders re-affirmed that almost all participants were not familiar with, for instance, the forest policy or logging regulations. Furthermore, limited of knowledge and capacity is widespread across sectors with respect specifically to forest conservation and sustainable management.

9 LAW & POLICY CONTEXT

This section summarizes the policies and laws that are relevant to REDD+ in Fiji and are applicable to the identified DoDD.

9.1 International Policy Context

Fiji embraced the global commitment to shift toward sustainable development at the 1992 UN Conference on Environment and Development (UNCED) in Rio. In relation to forests, the key outcomes of the UNCED were the Rio "Forest Principles".⁸ Fiji ratified two key multilateral environmental agreements that promote the conservation of forests and their ecosystems, and influence national policies on forests:

⁸ *Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests*



- The UN Convention on Biological Diversity (CBD), and its two subsequent protocols: the Cartagena Protocol on Biosafety in 2010 and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in 2010; and
- The UN Framework Convention on Climate Change (UNFCCC), that was followed by the Kyoto Protocol in 1997 and the Paris Agreement in 2015.

The most recent international policy instrument and that addresses key DoDD is the Agenda for Sustainable Development 2030 and the Sustainable Development Goals (SDGs). Many of the 17 SDGs have some relevance to addressing the DoDD. SDG-15 specifically addresses forests, aiming to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”. The nine targets (15.1 to 15.9, detailed in Box 2) with their respective indicators, and the three strategies (15.A, B and C) defined under SDG 15 constitute crucial enabling conditions for REDD+.

BOX 2: Sustainable Development Goal 15

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

15.4: By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

15.6: Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed

15.8: By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species

15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

9.2 Domestic Policy Framework

Fiji’s policies significantly evolved in recent years to support Fiji’s shift towards sustainable development, the conservation of biodiversity and sustainable management and use of forests and other natural resources, aligned with the articulation of a sustainable development framework for Fiji, that was materialized in the 2014 Green Growth Framework, and under the impetus of Fiji’s



international environmental commitments. However, the legal reform process has not kept pace and is yet to provide the required enabling tools and processes to implement these policies.

In 2005, the EMA was developed in response to Fiji's obligations under the CBD and based on the recommendations of the National Environment Strategy of 1993. It represents a significant milestone in the development of environmental law in Fiji and provides a strong framework as the overarching environment legislation for the conservation of the environment and the sustainable management of natural resources (GoF, 2005). With any legal discussion pertaining to the sustainable management of development activities and the control of waste and pollution, the EMA stands out as the most relevant and significant piece of legislation that Fiji has developed to address these two issues; however, lack of legal awareness along with weak compliance and enforcement of EMA and other existing laws is also an impediment to the effectiveness of the law to address and mitigate the DoDD.

A more comprehensive analysis of the policies and legal frameworks regarding REDD+ is described in the section below, as well as in each DoDD and barrier for forest conservation, where relevant.

9.3 Assessment Relative to Each Driver

9.3.1 Agriculture

USP (2017) reported that Fiji has gone through the transition of agriculture development strategies of the following approaches: a) commodity based and supply-driven approach; b) farmer-centred and participatory approach; and c) commodity based and demand-driven approach. These approaches were reflected in Fiji's agricultural development policies namely; a) import substitution in 1970s; b) export-led, deregulation encouraging private sector led development in late 1980s; and c) commodity development framework, farming assistance on agro-inputs in late 1990s; and modernising agriculture since 2014 (MoA, 2014).

The last three decades of such policies did not achieve the intended agriculture development and led to increased deforestation and land degradation. For example, the import substitution policies in 1970s were heavily implemented for two decades focused on increasing local food production to reduce its importation specifically rice, beef, dairy, and feed grains. Community consultations conducted with community members of Deuba District villages, Serua Province revealed that they had gone through infrastructure development in 1990s towards increasing the local production of rice, etc. (see Annex 1: Community Workshop Report). Native forests were cut down to give way to sugarcane farms, dairy and beef farms, mixed livestock and crop farms, irrigated rice schemes etc. Plantations of endemic sago palms felled to accommodate the drainage and irrigation wetland rice schemes. Most of the rice irrigated schemes have gone back to root crop farms or left idle, overgrown with grass and sedge species. Nature Fiji has been working with the Ministry of Forest to conserve the endangered endemic sago palms in the Deuba District (NF/MV, 2016).

Fiji Ministry of Agriculture recorded other contributing factors to the failure of the adopted policies as follows: land ownership, predominance of subsistence agriculture, inability to satisfy export markets due to inconsistent quantity and quality of commodities, over dependence on sugar industry, the hand-out or spoon-fed mentality due to government direct interventions, poor performance of established government corporations in agriculture processing and marketing



services, and the lack in capacity of leading government institutions in agriculture development (MoA, 2014).

The agriculture sector is governed by over 30 pieces of legislations which also include national policies, strategies and plans (USP, 2017). Four of these pieces are most significant in terms of their primary relevance to agriculture and rural land-use sectors.

9.3.1.1 Rural Land Use Policy 2006

According to Karim and Harrison (2016) the aim of the Rural Land Use Policy, is to guide management of resources with respect to agricultural practices. Its goal is to establish legislative frameworks that promote the sustainable use of land.

The policy's vision calls for Fiji's obligation to address the following broad strategies: a) protecting the integrity of ecological systems and biodiversity; b) reducing the rates and areas of land degradation; c) protecting natural resources; d) reducing damage to fragile ecosystems; e) maintaining and extending indigenous forest and plantation forest coverage; f) promoting sustainable farming systems; g) improving rural environmental conditions; h) encouraging the formation of land husbandry groups; i) preventing and controlling pollution; and j) implementing international environmental accords to which Fiji is a signatory (Leslie & Ratukalou, 2002; 2006).

The policy envisages the development and implementation of a national land use plan through a national and regional institutional structure with the process initiated and overseen by an independent National Land Use Council.

Fiji does not have a national land use policy and plan.

9.3.1.2 The 2020 Agriculture Sector Policy Agenda – “Modernizing Agriculture” 2014

The 2020 Agriculture Sector Policy Agenda focuses on a balanced approach to sustainable agriculture development (MoA, 2014). The national government sees its primary roles in: a) ensuring food security; and b) increasing income and employment opportunities in both urban and rural communities.

According to MoA the core objectives of the policy include: a) build modern agriculture in Fiji as an organized system of producing, processing, and marketing crops, livestock, and aquaculture products; b) develop an integrated production, processing, energy, and transport infrastructure support system for agriculture; c) improve delivery of agriculture support services; d) enhance capabilities to generate funds and secure investment through foreign investment, public private partnership, and other innovative business arrangements; and e) improve project implementation and policy formulation capability within the MoA and its partner institutions (MoA, 2014).

Fiji's National Green Growth Framework is complemented by the 2020 Agriculture Sector Policy Agenda's adopting innovations for 'climate-smart agriculture' that generate both adaptation and mitigation benefits (USP, 2017). Sustainable intensification is also addressed by the policy for intended increase in agricultural production.

The Ministry of Agriculture strengthens its emphasis on the continuation of implementing the principles of sustainable land use and forest management.



However, there is a lack of enforcement on its role in policing the Land Conservation and Improvement Act, 1953 (Cap.141).

9.3.1.3 Land Conservation and Improvement Act, 1953 (Cap.141)

According to USP (2017) the Act which was introduced in 1953 has had five amendments that include:

- The Land Conservation and Improvement (LCI) Act Order 21 (1959), which instructs all sugarcane to be grown along the contour;
- The 1970 amendments, which focus on drainage;
- The 1990s amendments, which focus on land degradation (soil erosion, decrease in productivity, unsustainable land-use practices);
- The 2002 amendments, which focus on the formulation and implementation of the National

9.4 Land Use Plan as one of its core functions; and

- The 2007 focus on the management, conservation and improvement of land and water resources in Fiji.

The Act's aim was to make provisions for the conservation and improvement of land and water resources. However, it lacked the necessary personnel and financial resources to be effectively enforced (UNCCD National Focal Point, 2007). The Land Use Section of the Ministry of Agriculture currently provides the secretariat functions from its own resources. USP (2017) listed the regulatory conservation orders under the act to include: bush clearance, cultivation of crops and methods of cultivation, grazing and watering livestock, lighting of fires and burning of vegetation (including cane trash), and the requirement for any landowners or tenant to carry out any necessary soil conservation measures on their land.

The Act authorizes the establishment of the Land Conservation Board assisted by Conservation Officers in supervising land and water resources. Conservation officers who have significant powers under the Act to enter land at any time are appointed by the Ministry of Agriculture.

A 2016 Land and Water Resources Management Bill will replace the LCI Act if endorsed by the Fiji Government.

9.4.1.1 The Agricultural Land and Tenant Act (ALTA), 1976 (Cap.270)

ALTA the amended 1960 Agricultural Landlord and Tenant Ordinance (ALTO) covers agricultural leases and outlines the rights and responsibilities of both landlord and tenants (USP, 2017). Land conservation provisions of ALTA apply to all native land and crown leases. In case of conflict, the provisions of ALTA prevail. ALTA includes provisions regarding the regulation and enforcement of appropriate land husbandry practices by tenant farmers.

USP (2017) stated that Section 9 of the Act it specifies the obligation of the tenant:



To farm, cultivate, manure and manage the entire holding in a good and husband-like manner according to the practice of good husbandry and also to keep the holding in good heart and condition and not to allow any part to become impoverished, injured or deteriorated by neglect or improper cultivation, and to keep the same clean and free from weeds.

Practice of good husbandry is defined in Section 13(2) as:

Having regard to character and location of an agricultural holding –

- a) The maintenance in good order of such terraces, drains, barriers, bunds and hedges and the carrying out of such measures of contour cultivation and cropping as the Permanent Secretary for Agriculture or his nominee shall consider to be the minimum standard necessary for the protection and conservation of the soil,
- b) The cultivation of the land in a husband-like manner and the maintenance of the fertility of the agricultural holding to the minimum standard considered necessary by the Permanent Secretary for Agriculture or his nominee,
- c) The avoidance of any practice commonly known to have an effect harmful to the soil or which may lead to a reduction in the fertility of the agricultural holding;

However, there is lack of enforcement by the relevant government ministries. **The Ministry of Agriculture is responsible for the provision of technical support for agricultural development in Fiji while the Ministry of Lands is responsible for issuing state land rent (ALTA) to interested farmers.** Ministry of Fisheries and Forestry, Ministry of Environment, Ministry of iTaukei Affairs provide advisory services to the Land Conservation Board under the Land Conservation and Improvement (LCI) Act (Cap.141) 1953. Fiji Sugar Corporation being the largest agricultural producer in the country is a key stakeholder in coordinating ALTA lease farmers with the powers to demand compliance to sustainable and international best practices. Although ALTA is primarily meant to support agriculture lease, it is cross sectoral requiring close collaboration among many line ministries, statutory bodies, private sector and civil society.

There are 33 pieces of legislation administered by the Ministry of Agriculture and directly influenced by ALTA. The Fiji Government needs to seriously consider the provisions in ALTA by providing a common platform vide an omnibus legislative act as well as improved resources (human, financial, technical capacity, etc.) to relevant institutions to protect and conserve Fiji's land and water resources sustainably (MoA 2014b).

9.4.2 Logging

9.4.2.1 Forest Decree 1992

The right to fell or extract timber other than mahogany is conveyed through a timber license issued by the MoF under the provisions of the Forest Decree. Although the Forest Decree makes reference to 2 types of timber licences, in practice, there are four types of license issued out to logging companies which include timber concessions (15 to 30 year period), long term license (10 years), annual licenses and other licenses usually for land clearing (Whiteman, 2005). Timber licenses are



required for logging in any forest reserve, native land, and State land and alienated land. The approval of a timber license is subject to landowner's consent, an approved logging and harvesting plan and since 2008, and an approved EIA under the provisions of the EMA 2005. Despite the emphasis on sustainable logging through the required approval process, unsustainable harvesting remains one of the largest threats to the sustainability of the resource.

- EMA subjects commercial logging to a mandatory EIA:

The EIA process has sufficient flexibility to assess logging plans against the standards defined in EMA. If approved development could be subject to conditions derived from the FFHCP as part of the conditions of approval. Effectively, the monitoring, compliance and enforcement of EIA conditions will be undertaken by the Department of Environment under the provisions of EMA and provides additional support towards ensuring sustainability of the project if well implemented and enforced. It is important to note that the EIA. Aside from considering whether logging practices meets sustainable standards, must also consider other aspects of logging that may impact on other resources including native species, protected and endangered species, water-sources, protected forests, sites of cultural and historical significance and controversial developments from an environmental standpoint, issues which if relevant should be part of the terms of reference for the EIA study.

- Fiji Forest Harvesting Code of Practice 2013:

Although the Forest Decree itself is less focused on sustainable harvesting, in October 2010; Cabinet endorsed the FFHCP for implementation in January 2011. The FFHCP is administered by the MoF together with the Forest Decree and its accompanying regulations and is applied to harvesting license applications as well as harvesting operations.⁹ The FFHCP calls for stakeholder consultation, field inspections and the development of a pre-harvest inventory and a Harvesting Plan as conditions precedent to the approval of a license. The FFHCP places emphasis on inclusive decision by recommending the communication and consultation with all relevant stakeholders including relevant state agencies responsible for national heritage and the environment to ensure that all environmental, social and commercial factors are fully considered before a license is issue. The FFHCP also requires the implementation of environmental and safety standards, as well as consent from landowners however the FFHCP is not reflected in legislation and therefore is not legally enforceable unless included as a condition of a timber license or the EIA. Currently, there is little evidence to suggest that the environmental sustainability standards are part of the conditions of an EIA but it would be a creative way to enable enforcement of the FFHCP until the provisions of the Code become law.

9.4.2.2 Fiji Forest Certification Standard

The development of the Fiji Forest Certification Standard adopted the Forest Stewardship Council Principles and Criteria for good forest management between 2006 and 2013. The Standard states the level of performance required and the type of evidence that should be provided by the Forest Management Enterprise (FME) for verification by the auditor, to show the compliance of forest

⁹ The FFHCP establishes a licencing procedure for harvest of indigenous forests and plantation forests. Although the Forest Decree makes reference to Timber Licences, the FFHCP refers to the same licence as a Harvesting Licence.



operations to the Standard during a Certification Audit. The Standard can be applied to all forests types managed for the production of wood and non-wood products.

The Standard covers all FME forest operations (e.g. nursery, planting, maintenance and harvesting) that may have an impact on the environment (forest management unit and landscape levels); the relationship that the FME has with local and indigenous communities in the vicinity of its Forest Management Unit(s) as well as its workforce and contractors/sub-contractors. The Standard also covers all relevant local and international laws and agreements/conventions that Fiji is a party to; in addition to areas of social or environmental significance.

9.4.2.3 Mahogany Industry Decree

The Fiji Mahogany Industry Decree (GoF, 2010) was promulgated in 2010 and repeals the Fiji Mahogany Act of 2003. The Decree regulates any mahogany plantation land in either iTaukei lands or State Lands intended for the use of planting mahogany trees. While the Decree falls under the responsibility of the Ministry of Public Enterprises, it establishes the Mahogany Industry Council, a separate and autonomous entity which is responsible for supervising and directing the maintenance and development of the national mahogany industry, and in particular supervises and directs the FHCL and Fiji Mahogany Trust in the performance of their functions under the Decree. The Decree empowers the Council to direct the TLTB when exercising its rights and obligations as lessor under a mahogany lease or under the iTaukei Lease in regard to (i) variations made to terms of the lease; (ii) the termination of lease; (iii) rights under the lease due to default; or (iv) failure of the lessee in complying with its obligations under the lease. The mahogany trees are also subject to the control of FHCL.

Mahogany licenses are issued by the Mahogany Industry Council who must have regard to the sustainable operation of the industry and the need for a comprehensive reforestation program. Mahogany logging does not adopt the FFCHP and does not comply with the EIA process under EMA. However, has its own harvesting code of practice. In an effort to control product labelling and marketing the Mahogany Industry (Licensing and Branding) Decree of 2011 outlines licensing conditions and labelling criterion (GoF, 2011). Two key licensing conditions include a reforestation and branding fee. It outlines what it terms as the brand certification principles and advocates the use of the Fiji Plantation Grown Mahogany Harvesting Code of Practice which will be monitored by the FHCL.

Logging of mahogany for commercial purposes must be subject to an EIA under the provisions of EMA however in practice, it is understood that there is an absence of compliance which places mahogany logging as a direct threat to the surrounding environment if logging practices do not meet sustainable standards. Further, without an EIA and standard sustainable operating procedures, mahogany logging can continue regardless of its impact to other matters of national importance identified in EMA. The Decree supersedes the iTaukei Lands Act, the Forest Decree and any other legislation that is inconsistent with the provisions of the Decree. However, EMA applies to everyone including government and is non-derogatory which means that it must be read together with other laws. Effectively this requires everyone that is subjected to EMA to include the requirements of EMA into their operations.



9.4.3 Infrastructure Development

Infrastructural development in Fiji is regulated by a number of laws dependent on the type of infrastructure and its location. Where sustainable resource management or the environment is concerned, the EMA is the overarching law applicable to the control and management of development activities. As EMA binds everyone including governance of any infrastructural developments, even government and other private entities must be subject to the EIA process if the development activity falls within the scope of EMA.

Schedule 2 of EMA requires mandatory EIA to be determined by the EIA Administrator for all proposal concerning construction of a dam, artificial lake, hydro-electric scheme or irrigation where "dam" means a barrier constructed to hold back water for the purpose of production of electricity, irrigation, controlling of flooding, catchments of piped water systems or waterways as well as the construction of a hotel or tourist resort. Schools, health centres and hospitals also require an EIA but are to be determined by the relevant approving authority.

Other laws that play an important role in infrastructural development include:

9.4.3.1 *Town Planning Act (Cap 139)*

The Town Planning Act regulates land use planning, establishes the processes for town planning schemes and the approval of development within the schemes. The Town Planning Act is administered by the Department of Town and Country Planning under the authority of the Ministry of Local Government and Urban Development.

The Act is development driven and has no environmental focus however; the Act is subject to the provisions of EMA therefore any activity that is likely to impact significantly on mangrove forests within Town Boundaries which are subject to an EIA. Town planning schemes however have the potential to provide the basis of protection for forest areas within Town boundaries, however, Town Planning Scheme are old and need to be revised to reflect national policies that promote sustainable use and development and the protection of areas of high conservation or heritage value from development.¹⁰

9.4.3.2 *Water Authority of Fiji Promulgation 2007*

The Water Authority of Fiji Promulgation 2007 repealed the Water Act of Fiji Cap 141 and the Sewerage Act Cap 128 when it came into effect on 1 January, 2010. The Promulgation establishes the Water Authority of Fiji as a commercial statutory authority with the responsibility of ensuring the effective management of water and sewerage activities. One of the key primary functions of the Authority is the protection, management and conservation of water resources. In the performance of all its duties, the Promulgation calls for environmental responsibility.

The Authority is empowered under the promulgation to:

¹⁰ MESCAL Legislative Review 2013



- to acquire the legal right to water sources and the right to obtain or draw water from the water sources for the purposes of its Water System,
- for the purposes of its Water and Sewerage System, to construct, use or access any road, area, premises, structure, machinery, State asset or other property of other person, for such purposes,
- to use any natural watercourse for the discharge of overflows from its activities under the Promulgation, subject to the requirements under other written laws;
- to acquire easements or other legal right of way or access to any private property or State assets.

One significant aspect of the Promulgation is that it requires the Authority to assist in the formulation and implementation of national policies or urban and rural land use planning, relating to the use and control of water bodies and resources. This is an important feature given the increasing need to ensure resources are managed effectively and that all key stakeholders work collaboratively to meet this objective.

The Water Board of Authority is the governing and executive body of the Authority and has the authority to perform the functions and powers of the Authority under the Promulgation or any other written law. The Board is responsible *inter alia* for advancing the interests of the Authority and its customers and ensuring that the implementation of any Government policy, consistent with the functions of the Authority, given to the Board by the Minister and comply with the directions of the Directors under the Public Enterprises Act.

Since the Decree came into effect, regulations have yet to be enacted. The Minister responsible however has powers to make regulations that may be relevant to conservation. This includes:

- regulating use, conservation and management of water resources;
- regulating pollution that may affect water resources or water systems.

Specific to Roads:

9.4.3.3 Fiji Roads Authority Decree 2012

The Fiji Roads Authority Decree establishes the Fiji Road Authority which is responsible for the construction, maintenance and development of roads in Fiji. The Decree empowers the Authority with all powers as may be reasonable necessary or convenient for the purpose of carrying out its functions under the Decree and regulating its own procedure.

The Authority is also responsible for:

- managing (land provision, network planning, designing, constructing, maintaining, renewing and generally managing the use of) all public roads, bridges and jetties;
- traffic management (including road design, traffic signs and markings);
- road safety (relating to provision and management of the road);



- the enforcement of vehicle load limits to avoid road damage (especially logging trucks and cane trucks);
- the issuing of over-width, height and lengths limits;
- Planning and management of Road Survey and Design;
- Provide advice, programme management services, design, supervision services for Capital Works Programme; and
- For such other matters, as the Minister may direct.

The provisions of the Decree prevail where there is any inconsistency with the provisions of the Decree and any other law. Effectively, this means that the Decree may override the provisions of the Forest Decree and any other law where there is no corresponding provision. The effect of this would mean that development of roads can lead to deforestation for the purposes of its construction. The provisions of EMA however must be read in addition to any other law and arguably it cannot conflict with the provisions of another law and therefore if development of a road is likely to result in significant impact to the environment or resource management, it should be subjected to an EIA.

Specific to Energy:

Infrastructural development for public electricity supply is governed by the provisions of the Fiji Electricity Act (FEA) of 2017. The purpose of the Act is to promote the development of the electricity industry through the appointment of an independent regulator to licence the generation, transmission and supply of electricity. Of particular interest to review is section 30 of the FEA Act which gives the State the right to acquire any land required for the purposes of public electricity supply and where an agreement cannot be met to acquire the land under the provisions of the State Acquisition of Lands Act 1940. Infrastructural development for energy supply may be subject to an EIA if the activity is likely to result in significant environmental or resource management impact.

9.4.4 Mining and Gravel Extraction

Specific to Mining:

There is no national policy on mining in Fiji. Mining is largely a State administered matter in conjunction with the relevant regulatory bodies such as the Department of Environment. Landowners in this event would grant the necessary consent through TLTB for surface access rights and are compensated for the loss of forest and garden that exist on the actual mining lease area. If the land is a designated land under the Land Bank, then the Land Bank Unit through the Department of Lands spearheads the negotiation on surface access rights and benefit sharing. The landowning unit is not involved if land is leased through the Land Bank leasing arrangement.

The EMA classifies mining operations as “significant waste dischargers”; therefore, an EIA is required for any new mining project proposal with an Environment Management Plan formulated to mitigate environmental issues highlighted in the EIA report. For current prospecting activities and mining operations, permits are required to ensure waste emissions are within the discharge-permit environmental release guidelines and comply with socio-environmental standards, benchmarked against international standards/best practices.



The Mining Act [Cap 146] reserves all minerals of all kinds including crude oil in or under all lands of all tenure as the property of the State. Minerals include precious metals, precious stones, earthy minerals, radioactive minerals, monazite sand, carnotite, coal, metalliferous minerals but do not include clay, gravel, sand, stone or other common inert substances.

The State also reserves the right to enter upon all lands in Fiji to search, dig and carry away all minerals. The Mining Act is only subject to the provisions of the EMA 2005 as all mining and extractive development activities must be subjected to the EIA process before a mining tenement can be approved.

The Mining Act is currently under legal review however in its present form, it can provide protection for water catchment areas, forest and nature reserves from mining as it is subject to the consensus of the Conservator of Forests or the Commissioner of Water Supply (or equivalent). This is a good example where infrastructural development for water supply which be a driver of deforestation or degradation can be used as a barrier for another driver, in this case mining which has potentially more serious implications to forest and land resources.

The Mining Act empowers the Director of MRD to declare any area up to 250 ha as a government protected area. A government protected area cannot be prospected or mined without the consent of the Director of Mines. Proper resource management and land use planning, together with coordination amongst agencies is required to minimize interference for mining activities.

In the Mining Act, certain lands are not allowed for prospecting, mining or entry, for example: any Fijian village; any land within 60m of any spring in use as a source of water supply (exceptions apply); or any reserved forest, declared as such under the provisions of the Forest Act (exceptions apply).

All prospecting licenses and mining leases are subject to established reporting requirements and regular on-site inspection which is undertaken by the MRD. Mines inspectorate officers ensure all activities undertaken are in adherence to statutory requirements as specified in the relevant Act(s). The Exploration and Mining Policy stipulates extensions to prospecting licenses on the condition of full compliance. Extensions are subject to the same conditions as apply to initial applications, however, in the case of an extension, it is expected that minimum exploration expenditure will significantly increase with each successive extension. Prospecting license holders have a right to progress from prospecting to mining if they have complied with the license conditions and they have proven that a minable resource exists. Permits to mine (for artisanal, small & middle-scale mining) can be issued for a maximum of two years, and are renewed annually. All leases are renewable, but the renewal period depends on the size of the proven resource. Thus, exploration and development are prerequisites of any Mining Lease holder.

The laws of Fiji are very broad in terms of mine closure. Project developers' obligations in terms of environment restoration, community rehabilitation, alternative livelihoods, care and maintenance are not clearly defined in the Mining Act & Regulation (Cap 146) and in the mining license/lease. The EIA through EMA provides a means through which mine closures can be addressed.

A second approach is the establishment of Mining Deeds that allows the transfer of ownership or interest in mining claims from one party to another. A feature of the Mining Deed is the



understanding that the incoming party inherits any outstanding issues of the previous owner and settles these issues (rehabilitation, relocation and promotion of alternative livelihood for redundant employees and other issues) as part of the Mining Lease transfer. The current MRD's vision is to have a proper Mine Closure guideline/policy formulated and implemented as a binding document to ensure current and future mine developers carry out effective restoration and rehabilitation works as per nature of their project upon mine closure. However, to date very little of such best practices can be cited or discussed.

Specific to Gravel Extraction:

Gravel is not considered a mineral under the provisions of the Mining Act and therefore the license to extract gravel depends on whether the gravel is extracted within the boundaries of State owned land or on iTaukei Land. Although not legally defined by law, it is generally accepted that the river up to the high-water mark belongs to the State and outside of that will depend on ownership of the land.

For this reason, there are two approving authorities responsible for the grant of leases and licenses for gravel extraction. The Department of Lands is the regulatory authority responsible for State Lands which includes foreshores, rivers and streams and therefore issues gravel extraction licenses for extraction of gravel on State Land. Most gravel is commonly extracted within the river boundaries however access to the gravel is through iTaukei Land at times causing confusion between licensing authority as to whom will issue the license.

The approval of gravel extraction licenses by Department of Lands and the TLTB however is subject to an approved EIA administered under the provisions of the EMA.

9.4.5 Traditional Uses

The Constitution of Fiji 2013 maintains and protects at the highest level the ownership of iTaukei, Rotuman and Banaban lands by customary owners and ensures that all land acquired by the State for public purposes must revert to the customary owners if the land is no longer required.

Consistent with the protection of indigenous land tenure, a law or administrative action to give effect to the communal ownership of iTaukei, Rotuman and Banaban land and access to marine resources is not inconsistent with the right not to be discriminated against as long as it does not infringe other rights and freedoms set out in the Bill of Rights Chapter.

This provision strengthens the recognition of customary user rights expressed in the Forest Decree 1992.

Part V of the *Forest Decree 1992* provides for the protection of customary rights relating to forests. The ownership of forest resources by the landowner limits the scope of authority of the State to



deal with forest resources without the approval of the owner. The Forest Decree clearly recognizes this principle and requires the approval of TLTB in all dealings with iTaukei land.¹¹

The recognition of traditional forest use rights of customary landowners expressly includes the right to hunt, fish and collect fruits and vegetables growing wild, as well as the cutting or removal of forest products for domestic local use, without requirement for payment of fees or royalties. There are some strict limitations to traditional forest use rights, as for example: do not apply to nature reserves and forest reserves on iTaukei land, or do not give the right to set fire to grass or undergrowth.

As a signatory to the CBD and Nagoya Protocol, the Fiji Government led by the Ministry of iTaukei Affairs and the Ministry of Environment through GEF funding is working with stakeholders towards the development of a National Access and Benefit Sharing Framework aligned to the Bonn Guidelines which is expected to provide for a transparent approach to access to genetics and ensure (i) prior informed consent; (ii) mutually agreed terms are established; (iii) monitoring and transparent process. The project also intends to develop a Free and Prior Informed Consent Framework (FPIC).

Traditional forest uses are captured under the environmental strategies e.g. National Biodiversity Strategy Action Plan. Traditional use of forest resources is stipulated under Focus 2 on Improving Knowledge however, there are no specific policies governing the traditional use of forest resources despite the fact that the Forest Bill 2016 seeks to address this. If passed, the Forest Bill retains the recognition of iTaukei customary rights on forests, and specifically of traditional forest use rights, but does so in much more succinct terms than the Forest Decree (in section (S.30) and six subsections of the Bill).

The Bill provides that “nothing in this Act shall be deemed to prohibit or restrict on—

- iTaukei reserve the exercise of any rights established by iTaukei the exercise of any rights established by iTaukei custom to hunt, fish, or collect fruits, vegetables, wood and other plants and animals; or
- alienated iTaukei land, with the consent of the lessee of such land, the cutting or removal in accordance with iTaukei custom of forest products which may be necessary for the purposes specified in paragraph.” (Forest Bill of 2016. S.30(1)(a)-(b).p.20)

The Bill does not contain the detailed provision on the purposes for which the cutting or removal of forest use are deemed to be customary (see Annex 1: Community Workshop Report), however there are some new provisions in the Bill relevant to traditional forest use.

¹¹ A license can only be approved if it receives prior consent from a relevant authority dependent on the nature of the land tenure that is reserved. On reserved State land prior consent is required from the Director of Lands. For forest reserves declared on native land, prior consent from the TLTB is required if there are no provision or royalties or royalties prescribed are envisaged at rate lower than prescribed. The requirement to obtain consent from TLTB is in recognition that the ownership of the trees and forest produce remains with landowner. It is an offence to conduct any of these activities without a license.



9.4.6 Introduced Species

Management or control of invasive plant species is addressed under Focus 5 and specifically objective 5.3 of the Fiji National Biodiversity Strategy and Action Plan of 2008 which states the need to control invasive and potential invasive species. The Fiji Forest Policy Statement does address the issue of invasive plants through environment and nature conservation. The 2008 Biosecurity Promulgation does address some aspects of invasive species management but focuses mainly on economic pests or interventions at national borders. Invasive plant species management can also be addressed through the EMA and provisions for EIA.

9.4.7 Natural Disaster

9.4.7.1 National Disaster Management Act (NDMA) of 1998

The NDMA establishes a National Disaster Management Council tasked to develop suitable strategies and policies for disaster mitigation and preparedness; training and capacity building for disaster response and management; recommend policies and strategies to the government as well as the ability to form sub-committees to execute specific tasks relevant for national disaster mitigation.

The NDMA also provides the mandate for a National Disaster Management Office which among other things is responsible for implementing National Disaster Strategy and other relevant policies; advise the National Disaster Controller and the Council on matters of interest relating to National Disaster preparedness, rehabilitation plans, coordinating disaster response, post disaster assessments and capacity building.

National Emergency Operating Centers are mandated under NDMA which shall co-ordinate activities of disaster monitoring, warning and post disaster response. The Center is to be activated when a threat for disaster develops and manned 24 hours with teams drawn from the public service and other voluntary agencies. Divisional offices are also mandated to be set up at divisional level to coordinate disaster response.

NDMA appoints the Permanent Secretary for the Ministry of Rural & Maritime Development and National Disaster to be the National Disaster Controller who is responsible for advising the Minister on operational matters relating to disaster management; coordinate planning and execution of disaster management measures; disseminate information and advice on matters relating to potential or actual emergency situations as well as to carry out or cause to carry out relevant training for disaster management activities. The Act allows the National Disaster Coordinator to control all government agencies and resources considered appropriate in response to national disasters.

The Act also provides penalty for obstruction or interference with the smooth delivery of the National Disaster Management Plan or Agency Support Plans.

9.4.7.2 National Disaster Management Plan

The National Disaster Management Plan replaces the EMSEC Precautionary Manual for Emergencies and is the policy piece of the NDMA above.

10 PROJECTION OF FUTURE DEFORESTATION AND FOREST DEGRADATION

10.1 Spatial distribution

The spatial allocations of future forest areas were created based on the transition potential soft prediction maps (Figure 22). The final prediction maps for 2022 and 2047 for both Viti Levu and Vanua Levu forest cover can be found in Figures 23 & 24.

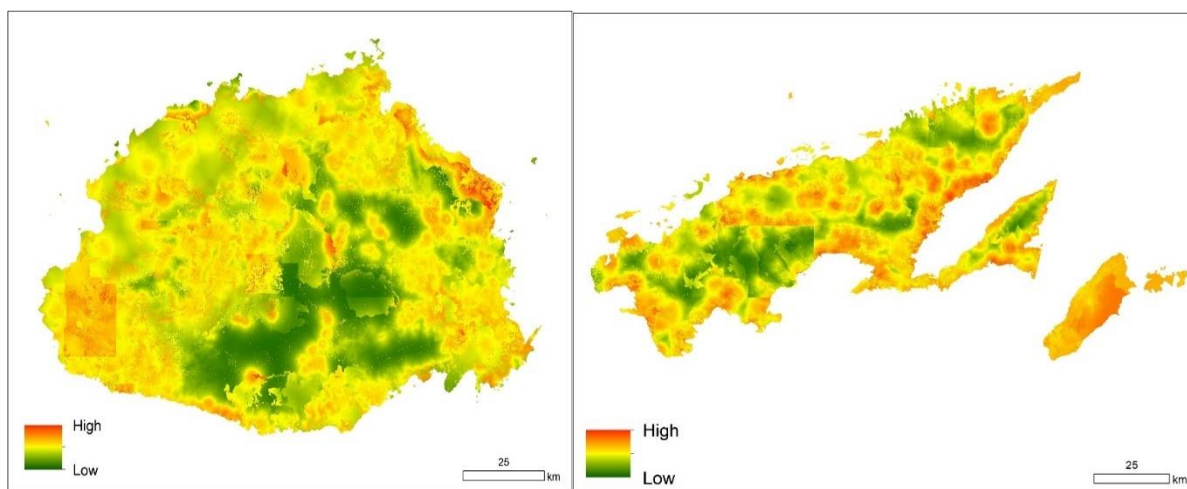


Figure 22: Soft prediction of Viti Levu (left), Vanua Levu/Taveuni (right) showing the likelihood of a given pixel to transition between the forest and non-forest classes

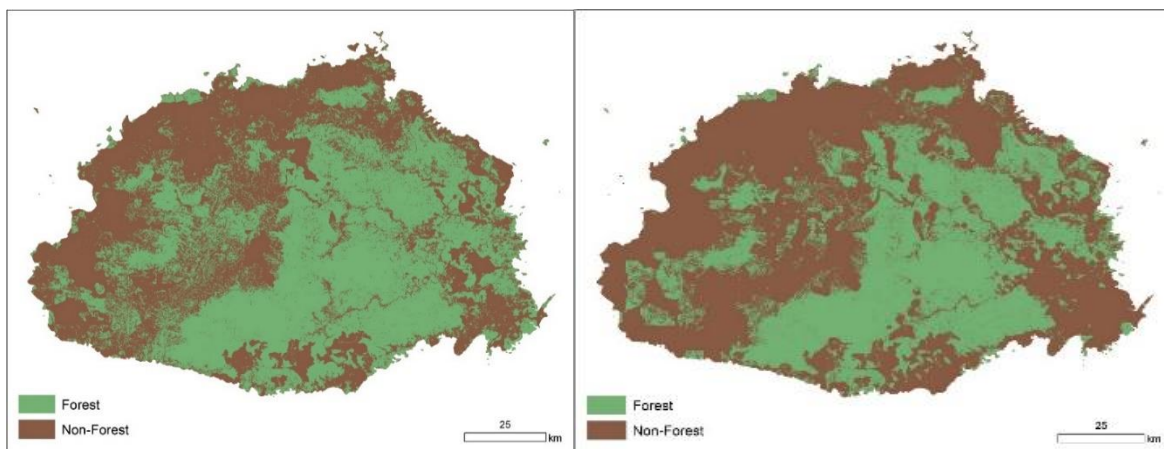
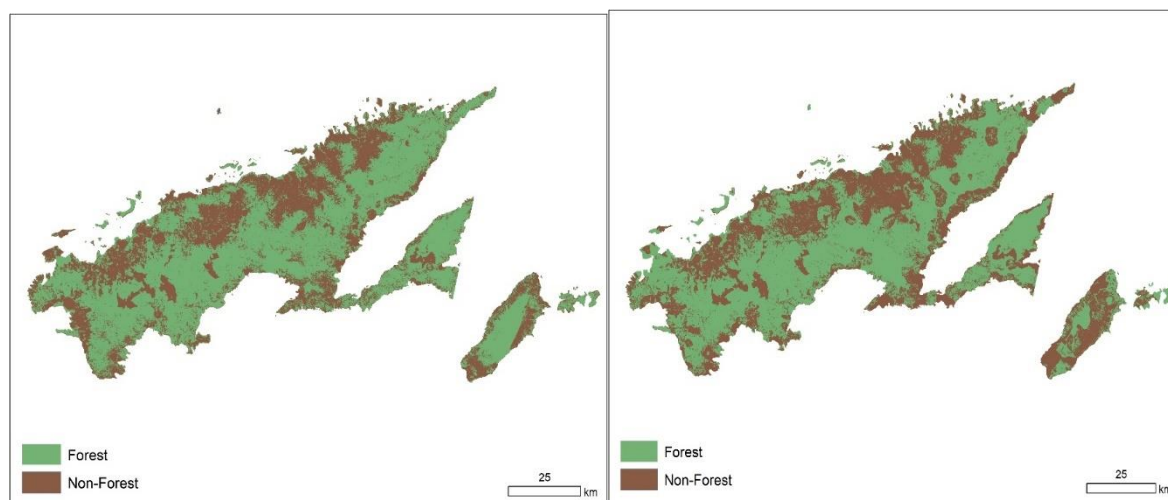


Figure 23: Hard prediction - Viti Levu Forest cover 2022 (left) and 2047(right) showing final prediction for the spatial distribution of forest and non-forest

Figure 24: Projection of Vanua Levu and Taveuni 2022 (left) and 2047 (right) showing final prediction for the spatial distribution of forest and non-forest.



10.2 Economic modeling

The results of the economic modelling indicate that the national integrated land use planning and forest management options present the lowest cost opportunities (Table 6). The national land use planning option, while low cost, has limited ability to be scaled up further since the implementation of land use plan will need institutional will and support for success. It is possible that the land use planning activities could lead to a larger long-term reduction in deforestation, however, there is not much evidence from the literature that planning alone can lower deforestation rates substantially.

The forest management option is relatively low cost due to the low cost associated with the efforts to reduce forest degradation associated with logging. While it is believed that the assumptions for the forest degradation analysis have been conservative, it would be useful to undertake more analysis of existing forest harvesting practices in Fiji in order to better understand the baseline for forest degradation. The results are based on the literature and estimates from tropical forests in Fiji and other regions (Whiteman 2005)

The costs for avoided deforestation are relatively low cost, and there is likely the potential to scale the avoided deforestation project. The annual costs of a scaled program that achieved a nearly 50% reduction in gross deforestation in Fiji would cost \$13 million per year if focused on the forestry actions alone. The other strategies appear to have more limited potential for scaling to reduce deforestation substantially.



Table 6: Summary benefit cost analysis results for the 3 strategies examined

Scenario	Net Change in Forest area in 20145 (Ha)	Net Change in native forest in 2045 (Ha)	Net reduction in C02 emissions 2020-2045	Cost (\$/tCO2)	Annual Cost of Program (\$/yr)
National integrated land use planning	4691	4691	647,308	\$11.41	\$238,218
Fire Management	-	-	-	-	-
Climate Smart Agriculture	32,174	4,094	4,421,272	\$43.64	\$6,014,483
Forest management	38,812	6,142	6,230,825	\$23.72	\$5,508,252

11 STRATEGIES

Given the objective of this study is to inform the development of Fiji REDD+ strategy, this chapter provides core contributions to the country's future strategy. The REDD+ strategy options proposed in this chapter are the result of an interactive process that synthesizes numerous stakeholder consultations and expert feedback (see Annexes) on the diagnostics of deforestation and forest degradation including the spatial and economic analyses.

A large number of potential REDD+ strategy options, which include interventions, policies and actions, have been considered in the context of this study. However, some are considered more viable than others and thus, only those options ranked with the highest chances of implementable success have been prioritised for more detailed consideration. The priority interventions have been selected based on the following criteria:

- ability to generate non-carbon benefits such as income and food security, resilience to natural disasters and risk reduction;
- climate change mitigation benefits in terms of carbon emission reductions and removals;
- economic benefits in terms of cost-benefits analysis;
- alignment with existing government development plans;
- political, social, cultural, and technical feasibility for implementation based on the perception from the national, divisional and community-level consultation.

The resultant policies and actions were identified during these processes and then organized into five major strategy options that are meant to complement each other in the process of REDD+: (1) Integrated National Land Use Plan, (2) Fire Management, (3) Sustainable Agriculture Production, (4) Sustainable Forest Management, and (5) Low-Impact Infrastructure Development.



The strategies are not stand-alone mitigation options, but are complementary to each other to effectively reduce deforestation and forest degradation. Furthermore, the National Land Use Plan is paramount for setting the *master plan* for land use, which will provide effective and efficient directions to support the sustainable development of forestry, agricultural and infrastructure development.

Each strategy is discussed via the following structure.

1. Strategy Description and Interventions.
2. Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis.
3. Feasibility Assessment.
4. Driver or underlying cause directly addressed by the strategy.
5. Driver or underlying cause indirectly addressed by the strategy.
6. Policy and regulatory frameworks, governance and institutional structures.
7. Assessment of the impact on traditional structures and local governance.
8. Assessment of opportunity cost.
9. Assessment of gender and vulnerable groups.

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the following aspects.

Socio-political feasibility – Assessment of how acceptable the strategy would be based in terms of socio- and political aspects on the perception of stakeholders consulted.

Technical feasibility – Assessment of how acceptable the strategy would be based in terms of technical aspects on the perception of stakeholders consulted.

Financial feasibility – Assessment of how acceptable the strategy would be based in terms of financial aspects on the perception of stakeholders consulted.

Climate change mitigation potential – Potential amount of tCO₂ avoided or removed to/from atmosphere if the strategy is implemented.

The incorporation of gender considerations into these strategies is important to ensure increased efficiency and sustainability as it contributes to women's involvement and commitment in forest management. It also ensures the integration of the wealth of unique knowledge, skills and experience of women which is vital to the implementation of proposed strategies. Gender inclusion in the strategies is aligned with one of the main strategies in the Fiji Government Gender Policy¹² which is establishing gender responsive implementation, monitoring and evaluation mechanisms for development within government and other agencies.

¹² Gender Policy, Fiji Government, 2014



11.1 Integrated National Land Use Plan

11.1.1 Strategy Description and Interventions

Fiji as yet, does not have an Integrated National Land Use Plan (INLUP) or a comprehensive national land use policy. This, despite the crucial need for a national land use plan elucidated at Legislative Council in 1960, through the Burns Report.¹³ Admittedly, there are current pieces of policies and institutional initiatives such as the Rural Land Use Policy (2005), the Land Use Section, within the Ministry of Agriculture and the Land Use Unit under purview of Prime Minister's Office, that are cognizant of matters pertaining to sustainable spatial planning during projects' consideration.

For clarity, given the close proximity and interchangeable use of terms in land administration towards land policy, land use policy and national land use plan, there is a need for a working definition in order to maintain the focus and specificity of the proposed strategies towards a INLUP. Land policy determines land use policy. It is a systematic framework for addressing the role of land in national development, land tenure and ownership issues, distribution, utilization, alienability, management and control. It has environment, spatial and tenure dimension. TLTB control and administration of customary land is a case in point.

National Land Use Policy on the other hand is an integral element of the National Land Policy with the aim to provide general guidance on optional and sustainable utilisation of land, based on analysis of land types, soil types, topographical features and ecological consideration as well as social and demographic features. An Integrated National Land Use Plan is about the decision-making process of examining different land use options, choosing between them and the development of a land use plan to realise the chosen priorities. Land use planning realises the outcome of land use policy and can also be understood as environmental planning. A national land use plan covers valuable discussions while setting concrete objectives and at the same time being operative in that it strategizes the implementation of particular actions to achieve stated objectives.

The INLUP should include the Rural Land Use Plan (as a major output in the implementation of the 2005 Rural Land Use Policy) to plan the boundaries for the management of forest and agricultural areas, according to the Land Use Capability Classification System – A Fiji Guideline for the Classification of Land for Agriculture, as well as plan urban development and infrastructure so that they do not encroach into areas meant for agriculture and forestry, including the mangrove forests which are immensely valuable for carbon sequestration, coastal protection and local livelihoods. Mining activities also threaten the aforementioned natural resources and have severe detrimental environmental impacts which are tremendously difficult to rehabilitate to their original states. As a result, mining activities need to be very carefully planned with serious consideration for the full valuation of all the tangible and intangible benefits of the natural resources that would be destroyed.

The National Development Plan, by way of example articulates the following emphasis:

¹³ See: Report of the Commission of Enquiry into the Natural Resources and Population Trends of the Colony of Fiji, 1959 (Legislative Paper No.1 of 1960)



- A goal of “*creating vibrant and environmentally sustainable urban centres*”, which includes: strengthen urban management and administration at municipal level; strengthen long-term planning for identification of growth centres; create an environment that fosters resource efficiency and effective management practices; and include vulnerability assessments (climate change, natural hazard impact projections) in infrastructure and urban planning.
- A goal of “*a sound regulatory environment for inclusive and sustainable private sector development*”, which include enhanced land use administration and build capacity to enhance development control efficiency.
- A goal of “*access to transportation through an efficient and sustainable transport network*”, which includes: expansion of rural road network, further development of full road network.
- A goal of “*accessible and adequate housing for all*”, which includes: (1) provide affordable/safe housing; (2) updated informal settlements; and (3) strengthen partnerships in the provision of housing/land for the poor.

The Integrated National Land Use Plan must be developed and managed utilising the principles of good governance, which include being accountable, effective and efficient, fair or equitable, and should operate in a transparent manner to include the participation of all the stakeholders. To improve transparency and facilitate informed decision-making, *access-to-information* legislation is recommended, as according to Villacís et. al. (2012) “Transparency supports the role of diverse actors in several ways:

- to hold others, especially government and/or key decision-makers, to account;
- to improve public policy and efficiency through complementary roles (“checks and balances”) and openness; and
- to combat corruption through a wider knowledge of the rule of law.”

Strategic Interventions:

1. Interventions required for a INLUP strategy intently seeks to harmonize existing plans, policies and regulations pertaining to land access, use and development such as the Rural Land Use Policy (2005), Mangrove Management Plan, Integrated Coastal Management Plan, Permanent Forest Estates (referred to in the Forest Policy post 2007) and the Land Use Capability Classification System – A Fiji Guideline for the Classification of Land for Agriculture to plan rural land use, Mineral Policy, Exploration and Mining Policy, among others. This eliminates duplicity and sectorial approach that delivers sustainable allocation of resource use that yields incoherent planning outcomes.
2. Additionally, the intended deliverable outcome of this strategy will deliver a national land use plan to guide and coordinate land utilisation with respect to forestry, biodiversity conservation, agriculture, infrastructure and development. The INLUP procedure should build on the vision outlined in the Rural Land Use Policy to maintain and extend forest cover and protect it from uncontrolled conversion. This is turn would require full commitment of the leading line Ministries pertaining to land and resource access and development such as Ministry of Lands and Mineral Resources, Ministry of Forest, Ministry of Agriculture and the Department of



Environment and Department of Town and Country Planning as well as the iTaukei Land Trust Board to collaborate in the development of the national land-use plan.

3. Development of *Access-to-information* legislation is recommended to improve transparency and facilitate informed decision-making.
4. Furthermore, existing bodies such as National Land Care Steering Committee (NLCSC) would also be required to expand the adoption of principles of Land Care concepts nationwide and to provide support and direction to the facilitation and extension of local Land Care Groups. These Land Care Groups may be closely related to the Rural Transformation Centres that are planned for by the Ministry of Agriculture, which may also be used to promote agroforestry integrated pest management and sustainable forest management in a similar manner to Forest and Farm Facilities of other countries, such as Vietnam and Myanmar.
5. As part of the INLUP process and general consultation mandate, community-based district and provincial level land use plans are to be incorporated into a national land use plan. This will ensure an inclusive procedural process as communities and all stakeholders effectively participate in decision-making regarding infrastructure development and resource management by developing communication materials to raise awareness. These community targeted consultations will include a gender mainstreaming approach, specifically through the inclusion of gender analysis and assessments.
6. Integrate and promote collaboration between all sectors responsible for infrastructure development to ensure long-term environmental sustainability along with social and environmental responsibility are built into development strategies. To avoid replication and to ensure robust data collation outlook and as part of the national data collection policy, national effort must be disposed towards data platforms to centralise and disseminate spatial planning information (e.g. a centralised GIS system) that can also be integrated into the REDD Monitoring Reporting and Verification system.
7. Develop a transparent and accountable system to record and incorporate stakeholder participation, with a clear procedure for addressing conflict resolution and grievances. Stakeholder participation and conflict resolution and grievances mechanisms are to include gender considerations. This demands the creation of an integrated national enforcement policy to avoid entrenched bureaucracy, duplication through sectorial implementation of redress mechanisms and ease of recording and processing efficiency.
8. Strengthen the Environmental Impact Assessment (EIA) process by including a consultation period, disclosing the reason for project approval or rejection, penalising entities that breach the EIA process, monitoring and evaluating before, during, and after project implementation. Implement a web-portal to share information and improve transparency of the approval process.
9. Develop and incorporate the ecological economic zoning (based on Key Biodiversity Areas, water catchments, waterways and suitable/arable land) as part of the spatial assessment of land use plans
10. Ensure government budget prioritisation.

11.1.2 SWOT Analysis



Internal aspects of the strategy are examined via their Strengths and Weaknesses, and the external aspects via their Opportunities and Threats.

Strengths <ul style="list-style-type: none">• Harmonises/strengthens existing plans/policies to avoid duplication• The actors already exist• Directly addresses many of the DoDD at the national scale (as opposed to project/site-specific)• Vertical integration of existing government structures to support implementation• Normative, strategic and operative alignment• Promotes more holistic and integrated planning	Opportunities <ul style="list-style-type: none">• Coordinating multiple actors• Support for a national land use policy; extends the rural land use plan to the national level; this will expand the discussion from agricultural to urbanisation and includes the other drivers under discussion, particularly as urbanisation is a major driver for the deforestation of mangroves.• Proper allocation of land uses ensures proper zoning of areas to support and incorporate conservation areas that should not be developed to continue providing ecosystem services• Utilises the existing framework for iTaukei affairs• Supports the 2020 National Development Plan• Non-government actors are already implementing land use plans at a local level• The process of developing a land use plan will directly support policy. It is problem-driven and information-dependent
Weaknesses <ul style="list-style-type: none">• Lack of capacity and resources, including financial, for implementation and harmonization• Lack of human resources among all actors	Threats <ul style="list-style-type: none">• The Mining Act (which supersedes all other acts) could conflict with the national land use plan• Semantics regarding land use plan versus policy• Potential lack of political will• Potential difficulty in enforcement and implementation• Uninformed and lack of consultation with communities• Long time line required to gain consensus and change attitudes• Potential for tension between communities and government departments and between sectors

11.1.3 Feasibility Assessment

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the aspects of the following criteria. The conclusion is that some technical assistance is particularly required to develop an *Integrated National Land Use Plan*, which is otherwise generally feasible.

Criterion	Score	Justification/Observation
Socio-political feasibility	++	Limitation in political will and community willingness to participate in community-based regulation and self-governance.



Technical feasibility	+	Low technical capacity to do EIA, monitoring and evaluation.
Financial feasibility	++	Funding identified as a barrier to developing local site-based resource-use regulations.
Climate change mitigation potential	+++	As a cross-cutting strategy, the land use plan will tackle several drivers and underlying causes of deforestation and forest degradation, therefore resulting in a great potential impact in reducing GHG emission.

Key: Strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus).¹⁴

11.1.4 Driver or underlying cause directly addressed by the strategy

This strategy directly addresses the following drivers: forest conversion to agriculture, infrastructure, mining, and logging.

11.1.5 Driver or underlying cause indirectly addressed by the strategy

With all the inclusive consideration of sustainable integrated land use purview of the proposed strategy, it is anticipated that positive direct and indirect effects will have cascading correlatives given the interconnected nature of cause and effect of land use planning, rather than specific targeted impacts. This strategy will have an indirect impact on local governance systems, food security, improved standard of living, forest and fire management as well as gender roles. It also addresses all the underlying causes directly pertaining to land use, which also extended to improving the coordination amongst government ministries. This strategy, once implemented, has the potential, with the harmonisation of existing policies to mitigate cascading impacts of improper land use. It will also impact underlying causes of deforestation and degradation by identifying and allocating more appropriately, land use types and suitability thus preventing likely future adverse impacts.

As many barriers for sustainable forest management, forest protection and enhancement of carbon stock are similar to the drivers of deforestation, this strategy will have a similar impact on forest conservation and reforestation.

11.1.6 Policy and regulatory frameworks, governance and institutional structures assessment

Assessment of the role and the strengths, weaknesses and	There are conflicting policies and laws regarding judicious use of land in Fiji in the absence of periodic review, laws, regulations and policies relating to land management and administration that can be weak and out dated. In addition, land is subjected to different uses, and thus its management falls under different
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¹⁴ The Key: “Plus” signs were used to record the scores to identify strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus). For example, when a given strategy has great political support and no social issues to restrict the strategy implementation, then three “plus” signs were assigned against the strategy. Conversely, if there are some potential political barriers to implementation, then they were assigned only one “plus” sign.



gaps relating to governance structures and institutional capacities to address the identified drivers and agents	<p>sectorial institutions that have limited human and financial resources. Introduction of new institutions aimed at improving service delivery at grass roots level can be saddled with weak implementation and lack of professional expertise as well as poor co-ordination. There is also a gap in capacity for effective monitoring and enforcement of existing policies and regulations related to any commercial and sustainable land management practices</p> <p>Amongst stakeholders, there is also a general low level of awareness and a mix of understanding of rules and regulations governing land use and forest management and conservation. Consultation involving communities and institutional stakeholders confirms this.</p>
Analysis of forest sector governance and its institutions including the cross-sectoral coordination mechanism	<p>This strategy calls for numerous actions, some already stated as being commonly implemented, and others that take on new or renewed enforcement mandates. There is a strong sentiment across communities that they can address ‘violations’ in terms of unacceptable behaviours, including those relating to how the land is used. Depending on how resources are provided for awareness, capacity-building and enforcement guidance at the community level, there may be some resentment of central and provincial authorities, leading to social/administrative conflicts</p>
Assessment of the willingness and institutional support of the various sectors to contribute to address the identified drivers	<p>Linking agriculture services from the ministry level to lower administrative bodies, both within the public sector and private sector, requires continued focus. The strengths of many NGOs that work at the community level can be better leveraged to ensure scaling up of these actions. Effective uptake of land suitability planning improvements for land use means designation of lands not suitable for agriculture that offer other land-use options (e.g. agroforestry) at the community level.</p> <p>Window of opportunity now exists through necessary exogenous policy direction of the NDP (2017-2036) for institutional rethink away from compartmentalisation, towards balancing the need for a certain degree of structure and comprehensiveness on the one hand the need for optimum level of diversity and autonomy on the other</p> <p>Amongst the raft of policy prompts of the NDP (2017-2036) there is a need for a clear shift from traditional more passive land use planning towards a more strategic planning base. This avoids disjointed incremental progress/ action without direction to a unified collaborative national planning where there is an ability to consider specific perspectives and interests in an integrated way.</p>
Identify supporting policies and legislation that can be enhanced or developed to address the	<p>The UN Millennium Declaration, the UN Millennium Development Goals and the World Summit for Sustainable Development (WSSD) Implementation Plan recognise the maintained integrity and restoration of land resources as a critical factor in achieving economic and ecological sustainability. To meet these challenges, new and innovative sustainable approaches are required that must consider the following:</p>



identified drivers	<p>Fiji current NDP (2017-36) taking into account the provisions of the: Rural Land Use Policy of Fiji 2005; Fiji Land Use Capability Classification System Guideline - A Fiji Guideline for the Classification of Land for Agriculture (2012) and, the 2020 Agriculture Sector Policy Agenda “Modernising Agriculture” (2014), Agricultural Landlord and Tenant Act (ALTA) 1967 and the Land Conservation and Improvement (LCI) Act (Cap.141) 1953. The latter is to be replaced when Land and Water Resources Management Bill 2016.</p> <p>As well, it must consider laws pertaining to environment and land and the various other laws, regulations, policies and guidelines in the different land sectors. It must also embed National Green Growth, Climate Resilience Strategies, Town and Country Planning Act (Cap 139) and the Land Subdivision Act (cap 140).</p>
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11.1.7 Assessment of the opportunity cost

Under the integrated national land use plan, the Fiji Government, statutory bodies and NGOs engage local communities and other partners in developing, implementing, and enforcing land use plans. The plan aims to zone land uses and establish a permanent forest estate, i.e., the area of land in Fiji that is officially designated as forest. The approach to establish these plans requires an inclusive process with all stakeholders such as government agencies, private citizens, NGOs and other important actors. The strategy thus includes capacity building measures, particularly on law enforcement and governance, improved information systems, improved monitoring, and enhanced reporting of forest management activities.

Development of a national land use plan is likely to be a necessary precursor for success in any of the other strategies (MoSP 2014, Leslie et.al. 2002, 2006). That is, for forest conservation activities to be successful, Fiji needs to have developed a land use plan that zones land uses and identify areas for the permanent forest estate that is widely agreed to by important constituencies, including NGOs and private citizens, who ultimately determine land use. The specific actions included in the land use plan are:

- Development of Integrated District Land use plans (IDLUP)
- Develop Community Management Plans based on Integrated District Land use Management Plan highlighting (IDLUMP) 4 key land uses (1) forest management (2) Climate Smart Agriculture (3) Forest Conservation (4) Carbon Enhancement
- Raise awareness on revised legal and regulatory frameworks and strengthening forest law enforcement and governance at national level for all stakeholders
- Capacity building on forest law enforcement and governance
- Forest sector patrolling and inspection - capacity building for interagency networking
- Upgrade forest information & data base system for improved monitoring and reporting
- Improved monitoring and reporting of forest management



The act of land use planning itself likely has little impact on deforestation. Nepstad et al. (2014) suggest that land use planning helped provide a foundation for future actions, but they do not provide estimates of the differential impact of planning itself. Given this, conservative assumptions are made about the effect of land use planning on land use change in Fiji. Specifically, it is assumed that the land use planning steps undertaken through REDD+ programs will reduce deforestation by 0.5% compared to the baseline starting in 2022 through 2030. After that, as more plans have been developed and implemented, they are assumed to reduce deforestation 1% from 2031-2045.

The costs of implementing this are estimated based on data provided by CI, who estimate that the costs of developing and implementing integrated land use plans for Ra Province in Fiji are \$2.56 per hectare. Under the proposed land use planning effort, 802,000 hectares are included in district land use plans by 2031. The present value of total cost developing and implementing these plans is \$3,357,435 using a discount rate of 5%. The national land use planning effort also includes a number of planning meetings and other efforts that are included in the costs of implementation.

Most of the costs of development of the plan, 72%, are the direct development costs. The remainder of the costs are capacity building efforts to engage various parties with the planning process and to encourage participation in implementation of the resulting plan.

Under the assumptions above, the area deforested is reduced in total to 4,691 ha by 2045. This increase in the area forested amounts to about 0.5% of the total area of forests on the two islands considered in the analysis. The total carbon savings associated with this reduction in deforestation is 647,308 t CO₂, and the cost of carbon sequestration is \$11.41 per ton. The costs are estimated as the present value of costs divided by the present value of carbon (\$3,357,436/279,497 million t CO₂).

It is important to recognize with land use planning that the total carbon potential is limited because the specific plans for land use are to be developed once the plan identifies appropriate zonation, and the costs of implementing a plan that reduces deforestation significantly could be substantially more costly than examined. For instance, the baseline suggests a loss of 375,444 hectares of forest in the next 30 years. Given the underlying economic and social forces that will drive that much land use change, a land use plan that substantially reduces this large amount of deforestation will require significantly greater investment, including enforcement actions, payments for ecosystem services, incentives for reforestation and afforestation.

11.1.8 Assessment of the impact on traditional structures and local governance

Factors that influence local communities and traditional structures to reduce deforestation and forest degradation and support forest	Land Use Planning must be orientated to local conditions in both method and content based on initial regional and local situational analysis. This includes the integration of sustainable alternative income streams and security of traditional food systems as well as the continuing exercise of rights and interests pertaining to it. This will require integrated planning process across the various sectors for trans-disciplinary consideration of local needs and traditional structures against ecological, economic, technical, financial, social and cultural dimensions of land use.
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conservation, sustainable management of forests and reforestation and afforestation	Gender mainstreaming of Land Use Planning will ensure the participation and inclusion of women and other marginalised groups at community level. Land Use Planning must also consider customary viewpoint building on local indigenous sustainable environmental expertise including taking into account traditional strategies in solving problems and conflicts. This must be understood and taken into account. Land Use planning is a procedure and requires transparency, therefore must enable free access to information for all stakeholders and to this end, new legislation to mandate <i>access to information</i> is recommended.
Assessment on how traditional laws and land use and access arrangements can be enhanced to support efforts in addressing the direct DoDD	<p>Conventional top down planning approach has had very little success due to lack of dialogue and co-ordination. Hence, appropriately acknowledged authorisation processes as well as traditional consultation and participation can be a key indicator in successful planning in addressing of direct DoDD. Use of “vanua” based local knowledge is crucial in this regard to provide support and import a sense of ownership this, however must be complementary and embedded into planning strategies.</p> <p>Whilst traditional laws and empirical practices are deeply entrenched into notions of sustainability and conservation, these are usually limited in scale of its application, usually within the bounds of the landowning units. These customary practices can be integrated with the scientific led evidence and packaged to assist in mitigation and remedial measures towards deforestation and forest degradation.</p>

11.1.9 Assessment of gender and vulnerable groups

Cultural norms and social practices highly influence gender dynamics and relations in Fiji. In rural communities, traditional gender roles are still the norm despite the progress in engagement in the formal work sector, education and decision-making processes at all levels of governance. Decision-making in traditional settings is still dominated by men, because of the patrilineal culture that dictates leadership, ownership of and access to resources. Even though men and women are all members of *mataqalis* or land-owning units, decision-making is still reserved for men. Gender inclusion in these strategies is extremely important, not only because of the active roles that women play in the use of forest resources, the land, rivers, streams and mangroves, but more importantly is the wealth of knowledge women have of the forest and its resources from generations of use.

The Fiji Government Gender Policy (2014) aims to integrate a gender perspective in all development planning and decision-making processes as the strategy for promoting gender while supporting gender mainstreaming which binds all sectors of government and guides community engagement. Strategy 5.4 in the same Policy looks specifically at the promotion of gender-aware and gender sensitive policies, plans and strategies in the rural development sectors and this includes REDD+ initiatives. This is mainly through the promotion of strategies to increase the participation of women in decision-making and utilisation of gender impact assessments, gender analysis and gender-aware approaches in assessing environmental issues. The Fiji National Gender Policy document therefore supports the gender mainstreaming of proposed strategies in this document.



11.2 Fire Management

11.2.1 Strategy Description and Interventions

The use of fire in Fiji is a common inexpensive agricultural technique used both (1) as a preparatory step to harvesting sugar cane and (2) to clear land for agricultural expansion. Such activities are not only harmful to the environment and to nearby populations whose air quality is negatively impacted as a result of burning, but also as a source of greenhouse gas emissions. There is a need for action and policy at the national level to restrict the use of fire, including the provision of adequate resources for enforcement.

As a more cost-effective, healthy alternative, sugarcane can be mechanically harvested in its “green” (i.e., unburned) state. For example, regional policies in Brazil have driven the transition from traditional burning techniques to mechanic harvesting to reduce impacts on the environment and human health, with some states having already transitioned almost fully to mechanised practices (Silva Capaz, Carvalho, Silveira, Nogueira, & Augusto, 2013).

Farmers are forced to expand into forested areas due to several reasons, including in response to a need to produce more, thus requiring additional land; or in response to having degraded and depleted the land upon which they are currently cultivating, thus requiring different land. One powerful strategy is to provide producers with adequate training and resources to improve efficiency and productivity on their existing lands to increase yields without expansion. For example, receiving agricultural inputs, access to credit, and technical training enabled an association of maize producers in Ghana to triple their annual yields without increasing their area under cultivation (King, et al., 2016).

Strategic Interventions:

1. Develop, adopt, and enforce a national fire management policy and legislation.
2. Enforce fire regulations by allocating sufficient resources by extending the scope of responsibility of the National Fire Authority (NF) into rural areas while improving coordination between the NFA, local police, community leaders and park rangers.
3. Train community members to serve in fire management groups, such involvement will empower the communities and has the potential to be further supported by being incorporated in the village bylaws through the iTaukei Affairs Board.
4. Demonstrate and incentivise alternative solutions to burning, such as mechanical harvesting of sugarcane, which can be implemented on flat land in addition to the introducing low impact hunting techniques such as hog traps.
5. Implement a system to disincentivise burning sugarcane by paying a premium for cane that has not been burnt.
6. Raise awareness among communities through a targeted campaign regarding climate change, the impacts of fire, alternative techniques, fire alerts, and misinformation (e.g., Fiji Sugar Corporation cane quality payment system). All awareness work will have a strong gender mainstreaming component.



11.2.2 SWOT Analysis

Internal aspects of the strategy are examined via their Strengths and Weaknesses, and the external aspects via their Opportunities and Threats.

Strengths <ul style="list-style-type: none"> • Incentivised fire prevention at the community level • The danger and negative impacts of fire are increasingly well-understood • Fire management would support and be aligned with other policies • There used to be a national planning office that addressed fire management (in the past) which worked to raise public awareness regarding fire management • Secretariat Pacific Community is supporting review of fire policy in Fiji • There is momentum around fire management 	Opportunities <ul style="list-style-type: none"> • Account for extra GHG emission reductions (the NO₂ emissions associated with burning) • Further supports the cane quality penalty and payment system (producers get a higher price if cane is not burned) • Decreased air pollution • Promotion of good soil management, preservation of soil fertility which leads to decrease soil erosion and siltation associated with burning • There is political will in implementing fire plans and policy
Weaknesses <ul style="list-style-type: none"> • Very difficult to implement and enforce • Demarcation of urban versus rural fire, so a historic gap in treatment of fire • No dedicated rural fire management policy • Lack of financial and human capacity for implementation • Although some policies cover fire management, their implementation and enforcement are limited 	Threats <ul style="list-style-type: none"> • Fiji Fire Authority only addresses / has authority over urban fires • Potentially could affect sugar cane production • Difficult to change cultural mindset and behaviour • Potential conflict with lease arrangements for sugarcane farmers • Fire damaged areas are more prone to establishment of invasive species (including, but not limited to weeds), and succession of invasive species

11.2.3 Feasibility Assessment

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the aspects of the following criteria. The conclusion is that the implementation of *Fire Management* is generally highly feasible.

Criterion	Score	Justification/Observation
Socio-political feasibility	+++	There are existing legislations that can be utilised for fire management. There is interest in implementing fire plans and policy



Technical feasibility	++	Willingness to adjust and adapt to new technology
Financial feasibility	++	Funds needed to invest in new technology
Climate change mitigation potential	+++	Account for extra GHG emission reductions (the NO ₂ emissions associated with burning)

Key: Strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus).

11.2.4 Driver or underlying cause directly addressed by the strategy

Improved fire management will directly address the drivers and underlying causes related to forest conversion to agriculture and traditional uses.

11.2.5 Driver or underlying cause indirectly addressed by the strategy

This strategy addresses a fundamental underlying cause – uncontrolled burning giving rise to deforestation, forest degradation, as well as a barrier for forest protection and carbon enhancement. Fire management is addressed across various legislative and policy frameworks, and this strategy should also indirectly improve the coordination among departments and lack of enforcement. The engagement of community members in the brigades would increase capacity and might provide livelihood opportunities.

11.2.6 Policy and regulatory frameworks, governance and institutional structures assessment

Assessment of the role and the strengths, weaknesses and gaps relating to governance structures and institutional capacities to address the identified drivers and agents	<p>Overall there is sufficient governance mechanism in place to manage fire or uncontrolled burning. The main weakness identified is the limited enforcement of the various legislation or the need for effective management or leadership to implement the strategy to manage uncontrolled fire. There is also a lack of coordinated approach across various organisations.</p> <p>Limited awareness on environmental stewardship amongst the rural communities on the negative impacts of uncontrolled burning. Awareness activities and discussions should be undertaken across generations and communities, both indigenous and non-indigenous. A bottom up approach is needed by utilising existing traditional structures in fire management.</p> <p>There is also a need to align various policies and strategic plans to ensure consistency and a complimentary approach is adopted with the Land Management, Agricultural and Forestry Sectors.</p>
Analysis of forest sector governance and its institutions including the cross-sectoral coordination mechanism	<p>Government through Ministry of Forest (MoF) should prioritise the protection of forest resources through trained personnel and resources available to them to fight uncontrolled fires. Review should be undertaken by the MoF on past management practices and gather information and research on fire management. This would set the foundation for appropriate legislative and policy direction towards fire management.</p>



	<p>The MoF should adopt a cross sectorial approach and coordinate local level prevention, preparedness and response together with other agencies such as NFA, police, Department of Agriculture and relevant local authorities.</p> <p>Although there are various legislations and associated policy framework that addresses fire management, there is a general restricted capacity in the enforcement of the various legislations. The Forest Decree of 1992 gives power to the Conservator of Forests and the Ministerial Advisory Board in appointing fire wardens/rangers or permit an area to burn, but limited effective leadership from the Conservator or the Board has largely prevented the Ministry of Forest from implementing their strategy.</p>
Assessment of the willingness and institutional support of the various sectors to contribute to address the identified drivers	<p>As President of the Convention of Parties for Bonn (COP23) under the United Nations Framework Convention on Climate Change (UNFCCC) the Fiji government made a commitment through its Nationally Determined Contributions to reducing emissions as part of its effort to mitigate the effects of climate change. This provides an opportunity to the MoF government to reduce emission from uncontrolled fire through the National REDD+ and Sustainable Forest Management program.</p> <p>In general, there is a pollical will to implement a fire management plan. In late 2017 following the COP 23, the Minister of Agriculture appointed the Permanent Secretary for Agriculture to lead the implementation of a National Forest and Rural Fire Management Strategy.</p>
Identify supporting policies and legislation that can be enhanced or developed to address the identified drivers	<p>Current legislations have adequate powers to reduce impact of uncontrolled fires, but staff need to be properly trained and funded. For example, the 1992 Forest Decree empowers the Conservator to declare and enforce fire hazard management around plantation areas. This should be complemented with community-based education awareness programs. Existing legislations that can be utilised for fire management includes:</p> <ol style="list-style-type: none"> 1. Fire Hazard Plan (National Disaster Management Act1997) 2. Fire Rangers (Forest Bill 2016) 3. National Fire Services Act (1994) 4. Village By-laws (iTaukei Affairs Act (Cap 120)) <p>At community or village level village by-laws can be used to assist in fire prevention and control. The government with the assistance of the Secretariat Pacific Community (SPC) is currently working to development a Forest and Rural Fire Management Strategy for Fiji.</p> <p>In Addition, the master award under Sugar Industry Act 1984 and subsequent Sugar Industry (Amendment Act) 2015 provides significant penalty for the delivery of burnt cane to the mill within the first 24-hour period. However, for each 24-hour period thereafter the fine is significantly small, and farmers are willing to take that risk since the fines is not high enough to deter the burning of cane.</p>



11.2.7 Assessment of the opportunity cost

The fire management options focused on reducing fires in sugar cane production and moving farmers towards green cane production rather than brown cane production. While this could have a collateral benefit for nearby forests, we were unable to determine the scale of the potential impact. There has not been an analysis of the impact of sugarcane fires on deforestation rates. Future studies should address this issue.

11.2.8 Assessment of the impact on traditional structures and local governance

Factors that influence local communities and traditional structures to reduce deforestation and forest degradation and support forest conservation, sustainable management of forests and reforestation and afforestation	Empowering communities to take ownership of their resources is crucial to reducing deforestation and forest degradation. Utilisation of current traditional structures such as enforcing traditional and customary laws through the iTaukei Affairs Act, with training and awareness of traditional communities on fire management. Churches should also be engaged as in most rural communities they have strong cultural and religious connection to land. Church pastors are well respected in communities. Actively engaging them as community champions will assist in driving fire management messages through.
Assessment on how traditional laws and land use and access arrangements can be enhanced to support efforts in addressing the direct DoDD	The existence of traditional and customary laws needs to be recognized as parallel to modern legal legislations. Free Prior and Informed Consent (FPIC) process is important to ensure community consent and participation.

11.2.9 Assessment of gender and vulnerable groups

It is expected that this strategy would have a positive impact on the gender and vulnerable groups. The strategy is beneficial for women in rural communities who often have to walk further inland after fires collecting wild yams and other resources. Vulnerable member of the community will directly benefit from reduce and no pollution from unintentional fires.

11.3 Sustainable Agriculture Production Strategy

11.3.1 Strategy Description and Interventions

As described in the previous chapters, agricultural expansion, driven by unsustainable production practices, is one of the top drivers of deforestation in Fiji. For farmers to implement more sustainable practices to meet yield goals without expanding area under cultivation, certain enabling conditions must be put in place through government programs and/or private sector incentives.

The success of this strategy depends on the presence of a national land use plan that renders spatial order through its ability to inform and correlate all matters relating to development involving land and any natural resources that may occur in or on it (e.g. minerals or forest) through its consideration of pertinent factors such as suitability, locality and future risks amongst others. Land



being the enabling utility in agriculture, it is crucial that work continue in earnest towards the fulfillment of a national land use plan given the rising competing interests to land suitable for sustainable agriculture production.

The validation of land tenure and land use rights is crucial in improving agricultural production, as it provides producers with the security they need to justify long-term investments in their land and the sustainability of their practices. Whereas the government leads in establishing enabling conditions, the private sector is key in driving improved agricultural practices to stimulate increased sustainability. Such activities should include aggregation of producers, provision of improved inputs and technical assistance, and adding value based on sustainability, all underscored by well-enforced conservation of forests.

Strategic Interventions:

1. Clarify, secure, and enforce land tenure for producers.
2. Incentivize the adoption of sustainable land management practices, including government subsidies for capital loans, machinery, provision of seedlings and general technical advice. Incentives should be directed linked to natural resources conservation and restauration, as well as to practices that maximize the adaptation to climate change affect.
3. Implement conservation agreements with local communities, by providing technical assistance and raise awareness among producers to encourage a transition to more sustainable agricultural practices, while protecting, conserving or restoring important forest areas
4. Establishment of a monitoring mechanism to measure the impact of sustainable practices, recognize and reward the champions, and improve adoption of such practices. **Strong political will coupled with policy implementation of climate smart agriculture; organising farmers into small clusters; supporting field demonstrations and field schools for local farmers provide the platform to monitor farm level performance as well as measure impacts of best practices adopted by farmers in the network.**
5. Promote (and explore) special markets for organic and fair-trade products outside Fiji.
6. **Provide training and support to producers so that they are able to increase productivity and efficiency within their current area under agricultural use, reducing the need to expand into surrounding forested areas. Training support may in the form of demonstration farms focusing on plot management and crop rotation within a one-acre land in addition to organising field schools to facilitate knowledge exchange and farmer-farmer learning.**

11.3.2 SWOT Analysis

Internal aspects of the strategy are examined via their Strengths and Weaknesses, and the external aspects via their Opportunities and Threats.

Strengths	Opportunities
<ul style="list-style-type: none">• There is a very good agricultural policy agenda (Fiji 2020	<ul style="list-style-type: none">• Increase production• Improvement of soil quality



<p>Agriculture Sector Policy Agenda, from 8/2014)</p> <ul style="list-style-type: none"> Aligns conservation with agricultural development (production/protection) Addresses both emissions reduction and economics/livelihood 	<ul style="list-style-type: none"> Opportunity to link to specialized markets (for organic/sustainable products); opportunity to focus on specialized market demand Opportunity for planned land management Opportunity for forestry and agroforestry maps and zoning to be included in the Fiji 2020 Agriculture Sector Policy Agenda, which includes rural farmer schools and information centres (Rural Transformation Centre approach, agricultural support services in rural communities) Opportunity to include both agriculture and forestry in the Forest Training Centre (FTC) training/curriculum Use of technology to increase awareness and improve access to market
<p>Weaknesses</p> <ul style="list-style-type: none"> Implementation will require substantial resources Lack of private capital assistance for agriculture, specifically farming (only the Fiji Development Bank) No long-term land use planning Land tenure system does not specify condition of use that supports sustainable agriculture production 	<p>Threats</p> <ul style="list-style-type: none"> Non-existent good/sustainable land use management Short-term leasing arrangements are not aligned with good/sustainable land use management TLTB lease conditions are not enforced Lack of knowledge awareness on sustainable agricultural production practices Focus on certain commercial crops (e.g., kava) Gov't subsidies for sugar production (government-based enterprise), which reduces incentive of farmers to do other/better Cultural/common practices, business-as-usual practices (conventional/unsustainable)

11.3.3 Feasibility Assessment

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the aspects of these criteria:

Criterion	Score	Justification/Observation
Socio-political feasibility	+++	Traditional laws and land use arrangements will be greatly enhanced under this strategy through the augmentation of traditional knowledge through scientific justification and proofs that justifies and strengthens traditional and customary practices of sustainable land management systems.
Technical feasibility	++	Need for technical expertise-Human Resources in Dept of Forests and Agriculture.



Financial feasibility	+	Market, private and government investment mechanism need to be enhanced.
Climate Change Mitigation potential	++	Addresses emissions reduction, climate change adaptation practices and economics/livelihood

Key: Strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus).

11.3.4 Driver or underlying cause directly addressed by the strategy

This strategy directly address agriculture as a primary driver of deforestation and forest and land degradation.

11.3.5 Driver or underlying cause indirectly addressed by the strategy

This strategy indirectly addresses Fiji's increased population growth and its exertion on agricultural systems to meet increased food demand. Based on current population figures of the 20yrs development plan, the current demographic structure is heavily inclined towards a young population majority with 62 percent below the age of 34 coupled. This is augmented by a decline in recent outward migration figures (see Fiji 2017-2036 DP, 2017). This strategy of improving farming capacity through sustainable land management practices would increase yield per capita thus decreasing the need for more spatial expansion. Better planning would mean retention of large natural forest and positively affect mangrove conservation saved from wanton destruction.

It is noted that any sustainable agricultural systems envisage that technologies employed to raise and uphold crop and livestock yields must not undermine the productivity of the natural resource system. In addition, sustainable land management practices through ecologically sound farming practices are of little value if farmers cannot afford the necessary inputs of crops and livestock, or of the variety proposed and are not meet the local needs. Hence this strategy demands a clear understanding of addressing agriculture as a driver in light of the mentioned underlying causes that warrants connection to the trans-disciplinary consideration of the underlying causes to meet demands of increased food needs and the sustainable use of resources that produce them. Given the fundamental importance of agriculture to society, sustainable production also indirectly addresses the policy and institution capacities in that sustainable agricultural production demands intensive consideration of limited spatial supply, hence warranting careful consideration of fit for the purpose land use that require wider participatory consultation.

11.3.6 Policy and regulatory frameworks, governance and institutional structures assessment

Assessment of the role and the strengths, weaknesses and gaps relating to governance structures and institutional capacities to	Current structure of the Land Use Unit under the Ministry of Agriculture reveals operational challenges in the harmonization of operational goals. This is inevitable given the administrative and operational design of the various units within the Ministry of Agriculture . Whilst the land Use Unit is about sustainable land use informed by land capability studies, this may be at odds with the goals of other sections within the same Ministry such as the Extension Unit, with emphasis on economic returns to farmers. Extension Unit advocates planting of crops with high cost -benefit ratio per area. Comparatively these approaches as is, are purposive and goal orientated with
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<p>address the identified drivers and agents</p>	<p>focused attention. They are not in alignment. As long as existing operational gaps and substantial coverage subsist, this impacts implementation and may mistakenly lead to wrong follow up emphasis during reviews at the opportunity cost of reduction and/or mitigation of deforestation and forest degradation.</p> <p>Role of Land Use Unit must therefore be expanded and its assessment mandatory in all agricultural ventures through careful assessment of current capacities and future manpower planning. Proper funding must be provided to enable this. So far implementation through sectorial approaches of the various government departments, ministries and statutory bodies are well defined. It therefore lacks the comprehensive nature that realistically reflect the practical competing interest of stakeholders of agriculture and the dire need for an uncompromised attitude towards sustainable land management practices for the sole purpose of achieving increased sustainable agricultural production.</p> <p>Environmental considerations during granting of leases are clearly defined but TLTB has the sole function of incorporating planning and environmental matters during lease negotiations for legal compliance. Monitoring and complaints in relation to breaches relating to the Ministry of Agriculture or Land Use Unit is usually triggered through the landowners' own volition to TLTB who in most cases have unclear pathways to settle disputes that pertain.</p>
<p>Analysis of forest sector governance and its institutions including the cross-sectoral coordination mechanism</p>	<p>Fiji has in place a Rural Land Use Policy (June 2005) under the Ministry of Agriculture. Among other issues, the policy emphasizes the need for sustainable forest management plans as part of an overall national land use plan. Also, Fiji has in place a forest policy that in turn mentions support for the development of a national land use plan. Fiji currently, does not have a national land use plan.</p> <p>Whilst isolated bits of policy progress towards a national land use plan can be gleaned from the varied approaches of government departments, statutory bodies and private institutions per sectorial resource allocation plans and spatial data; these are somewhat siloed and closely guarded within the host institutions. There is an urgent need to harmonize spatial data and plans at the national level to render substantive layers of interpretations towards a national land use plan.</p> <p>Government Land Use Section under the Ministry of Lands have in recent years, sought Parliamentary sanction towards the development of a national land use legislation. These have been unsuccessful. Despite the failed attempts, the goal towards national land use plan remains crucial and an ideal that is work in progress to date.</p> <p>Land and Water Resource Management Bill was one of the eight Bills pushed through Fijis' parliament in 2017. The Bill is proposed to replace the Land Conservation and Improvement Act (Cap 141) one of the 33 pieces of legislation under the Ministry of Agriculture. Once passed into law, this will</p>



	usher in clarity in responsibilities and regulations towards sustainable use of land and water resources in Fiji.
Assessment of the willingness and institutional support of the various sectors to contribute to address the identified drivers	<p>Willingness for collaboration and institutional support towards a sustainable agricultural production strategy must be priority, especially in all matters concerning the universal utility of land. This, however must not be confused from existence of policies, policy implementation, actions and the various measures within the different ministries and departments within the Ministry of Agriculture, Ministry of Economy, Ministry of Environment and iTaukei Lands Trust Board.</p> <p>The successful coordination of REDD+ preparedness phase by the Ministry of Forest is testament to the willingness of various actors in Fiji to contribute towards addressing identified drivers.</p> <p>Perhaps this willingness must be reflected into the operational procedures of the various stakeholders whereby there needs to be trans-disciplinary training of Officers to be aware of other Ministries/Departments emphasis, to address and mitigate the identified drivers/causes/agents of deforestation and forest degradation. One of the main advantages of operational and policy collaboration would be the availability and reliability of correlated data which in turn would inform processes such the current DoDD consultancy.</p> <p>The Land Use Unit of the Ministry of Agriculture recognises the importance of sectoral collaboration and have been instrumental in harnessing such network to develop District Land Use Plan. While institutional support was strong, funding limitation have only seen the completion of 3 District Land Use Plans (between 2010-2018) from a total of 195 districts spread over 15 Provinces.</p>
Identify supporting policies and legislation that can be enhanced or developed to address the identified drivers	<p>In addition to the mentioned legislation provided in the earlier Legal Framework synthesis pertaining to the main drivers, the following supporting policies may require further refinement.</p> <p>Ministry of Agriculture (MoA) to develop sustainable land management plans from 2 to 5 year land management plans moving on to long term management plans that needs periodic review according to country needs, farmers' needs, market demand, weather pattern, etc with dominant purpose of increasing sustainable production whilst minimizing resource base impact. This is to be developed by the MoA in conjunction with farmers, researchers, planners, foresters, economist land appraisers, fisheries expertise etc.</p> <p>Farmers being managers of the land on which they have tenure (lessees or traditional owners) need to be accommodated in the sustainable land management system process and to be monitored by Land Use Unit and/or Extension Unit of MoA to ensure strict compliance with sustainable land management plan.</p>



	Conservation and evaluation of plant and animal genetic resources, Integrated pest management, Conservation and enlightened management of soil and water resources, Crop and livestock diversification.
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11.3.7 Assessment of the opportunity cost

This strategy involves exploring several climate smart agricultural options including the following.

- Subsidies to encourage the establishment of 300 ha of riparian restoration per year in 6 districts.
- Subsidies to encourage the establishment of 300 ha of alley cropping in 6 districts per year.
- Interventions to reduce conversion of land from forest to Kava, and instead allow the use of these forest areas for vanilla production, which preserves the forest cover.

Assuming that the above activities will be undertaken for the period 2020-2045 under REDD+ ERP, the subsidy for riparian restoration is assumed to result in establishment of new native forest areas, with long-term sequestration potential of 175 t CO₂ per ha. A standard biological growth function is used to calculate the growth of CO₂ on the site over time as follows:

$$t \text{ CO}_2/\text{ha} = \exp(5.16 - 10/\text{age})$$

The subsidies for alley cropping are not assumed to change land use directly, but are assumed to raise agricultural productivity, and reduce deforestation. No published studies on climate smart agriculture in Fiji were found in the literature, however, studies from other parts of the world were available. One of the most recent published studies, Sain et al. (2018) found that climate smart agriculture increased productivity in agriculture in Latin America. They report increased yields of up to 40% with climate smart agricultural activities. Further it is assumed that these higher levels of productivity result in more agricultural output and less deforestation. It is important to note that there is a risk, however, that higher levels of productivity could lead to increased deforestation if livelihoods are improved and labor migrates into the agricultural sector.

The intervention to reduce land conversion by encouraging that farmers convert land to vanilla production rather than kava production is assumed to reduce deforestation by up to 200 ha per year. While this could reduce deforestation by 200 ha per year, there also may be some leakage associated with the activity. Leakage estimates in the literature, suggest leakage could be 40-50% (Sohngen and Brown, 2004; Murray et al., 2004; Murray et al., 2007). For this study, we assume that the leakage rate is 40%, such that for any hectare of increased forestland, 0.4 hectares are lost elsewhere.

To implement these approaches, it is assumed that 1,800 ha per year are established in riparian areas and these areas accumulate carbon following the yield function above. The costs to establish these lands are assumed to be \$750 (USD) per ha. There also are opportunity costs associated with the lost production from these lands, however many riparian areas are less productive than other areas on farms. Also, converting land to forests may provide some future benefits in terms of harvests. For the purposes of this study, we have assumed that the net opportunity cost of holding land in native forests versus agriculture averages \$200 per ha per year based on the 2014 Fiji Farm



Management Budget Manual (MoA 2014a). Net return estimates for many crops grown in Fiji are substantially higher than this, however, those estimates are assumed to be for higher quality land.

These interventions are assumed to lead 1800 ha of new forests each year, and 720 ha of additional deforestation due to leakage (net gain of 1080 ha). The interventions also maintain 200 ha of forest with vanilla production instead of kava. Finally, the deforestation rate is assumed to decline by 2% due to the improved productivity from climate smart agriculture. The leakage rate of 40% is also applied to the deforestation effect, so the net effect is a 1.2% reduction in deforestation.

By 2045, these changes lead to an additional 32,174 ha in forests compared to the baseline. There are e 45,000 new hectares of planted forests in riparian areas and elsewhere, but due to leakage, there are also 16,920 ha of additional deforestation elsewhere. The gross avoided deforestation is 6824 ha by 2045, and the net avoided deforestation is 4094 ha.

This scenario increases total carbon in forests by 4.4 million t CO₂ by 2045 and has a net present value cost of \$84 million. Of these total costs, \$38 million are lost opportunity costs associated with the increase in land in forests and consequent reduction of land in agriculture, and the remainder are direct implementation costs. Annually, the total costs are \$6.0 million per year, with annual opportunity costs of \$2.7 million per year. The cost per ton for this option is \$43.64/tCO₂.

A key assumption in the analysis is that the climate smart agricultural activities induce only a 2% reduction in deforestation rates, which reduces net deforestation by 4,094 ha by 2045. If the climate smart activities, however, are much more effective than anticipated at increasing agricultural productivity and reducing the demand for new land in agriculture, then the costs of the action would be lower. If we assume that deforestation rates decline by 10% instead of 2%, the reduction in deforestation (net) rises to 20,472 ha by 2045, and the costs of sequestration fall to \$32 per ton CO₂.

The other factor that has a strong influence on the costs of carbon sequestration is the opportunity cost of land. These are the costs associated with shifting land use from one set of practices to a less profitable set of practices. In the strategy, these costs often will be compensated by the program to provide an inducement to farmers to change their practices. Such compensation does not change the approach to calculating the cost per ton.

The base assumption assumes that converting from forest to agriculture provides net benefits of \$200 per ha per year. Thus, for the scenarios that reduce deforestation, the opportunity cost to landowners is a loss of \$200 per ha per year. If instead the opportunity costs are \$100 per ha per year, the costs of carbon sequestration fall to \$34 per ton CO₂, and if these costs are \$25 per ha per year, carbon sequestration costs fall to \$26 per ton CO₂. While the opportunity costs are an important component of the cost estimate for the strategy on sustainable agricultural practice, the costs remain fairly high even as this component of the cost falls.

11.3.8 Assessment of the impact on traditional structures and local governance

Factors that influence local communities and traditional	Traditional connection to land and ownership links are the foundation for consideration in traditional structures and communities in supporting any strategies that seeks their participatory partnership. Given the traditional ownership status of landowning units and communities, their contribution at
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structures to reduce deforestation and forest degradation and support forest conservation, sustainable management of forests and reforestation and afforestation	<p>the consultative stage of this strategy renders respect and recognition of subsisting social structure. Sustainable land management practices and goals as proposed are therefore reinvigoration of tradition old, farming practices that were less understood by those outside traditional social context and mostly operationalized at subsistence level. This is now publicized and augmented by science. Therefore, it is complementary to traditional farming techniques and bode well with the concept of taking care of ones surroundings as a lifelong responsibility. Point of difference in this instance is the scale of its application and its extension for application beyond the realms of traditional societies to all stakeholders. In all it is a positive influence in that it is an extension of traditional values and responsibilities in caring for the environment.</p> <p>Given that forest ecosystems support the many rights and interests of traditional owners at subsistence level, these can be negotiated to the level that such activities as gathering for and hunting can be allowed but monitored at certain levels such that they are not inconsistent with the very goals the strategy is aimed to achieve.</p> <p>The goal of sustainable management of forest as proposed mirrors traditional landowner aspirations is therefore an augmentation and not endangerment to local structures communities and traditional structures.</p>
Assessment on how traditional laws and land use and access arrangements can be enhanced to support efforts in addressing the direct DoDD	<p>Traditional laws and land use arrangements will be greatly enhanced under this strategy through the augmentation of traditional knowledge through scientific justification and proofs that justifies and strengthens traditional and customary practices of sustainable land management systems.</p>

11.3.9 Assessment of gender and vulnerable groups

Women and other marginalized groups were active participants at all consultations and training that address alternative livelihoods and smart strategies that capitalize on using existing resources to sustain livelihoods and ensure resilience in this exercise. For example, supply chain analysis of target commodities from different districts or village clusters that were identified and analysed recognized heavy engagement by women and these were to be maximized.

The role of women in all facets of development in Fiji is an unprecedented sign of tangible empowerment through all sectors, which is also markedly manifested in the agricultural sector. Dominant enabling contribution in this regard is due to the availability of accessible finance through small and medium enterprises (SMEs), government initiatives and initial start-up through NGOs assistance and aid programs. Government in this regard through the Land Bank initiative has provided feasible alternative for fast access to suitable agricultural land besides the iTaukei Land Trust Board (TLTB).



11.4 Strategy for Sustainable Forests Management

11.4.1 Strategy Description and Interventions

This strategy addresses first the conservation of forests and its biological resources so that they will be able to provide benefits in perpetuity, as well as integrated forest resources management by all its stakeholders, especially the forest owning communities, to create a forest-based economy (or bioeconomy). The concept of a *forest-based bioeconomy encompasses economic activities relating to all forest ecosystem services*, ranging from forest biomass to tourism, recreation and non-wood products (EFI, 2017). Given the already widespread forest degradation and deforestation in Fiji that has resulted from the undervaluation of its full ecosystem services, it is imperative to establish a Permanent Forest Estate(s), and to manage the estates through creating payment schemes for ecosystem services to realise its full economic potential of providing tangible and non-tangible benefits for Fiji's communities and societies. The tangible benefits include non-timber forest products, logs for timber production (from appropriate multiple use forests), clean water, prevention of soil and nutrients erosion, biodiversity conservation, etc. The non-tangible benefits include clean air, cultural values/recreation, protection of high conservation value forests for biodiversity values, watershed maintenance, ecotourism, and others.

It is of the utmost importance that plantation forests, especially those of introduced species, be also managed with environmental safeguards incorporated to enhance, their natural resources. These natural resources include soil erosion mitigation and control, nutrient leaching or loss through fires and runoff, biodiversity values, provision of clean water, maintenance of water tables, forest ambiance and aesthetics values, as well as any potential recreational and touristic values.

This strategy utilises Fiji's existing forest policies as the basis, namely the Fiji Forest Policy Statement 2007 and the Fiji REDD+ Policy 2011. The Fiji Forest Policy Statement 2007 was developed with widespread national consultation which involved expert group workshops and subsequent open presentation and discussion workshops in order to practice the values of good governance. These being accountable, transparent, participatory, effective, efficient and with fairness or equity.

Strategic Interventions:

1. Establishment of the Permanent Forest Estate (PEE), in conjunction with other land use planning. Establishment of the PFE will include the delimitation of management units for sustainable management within the categories of Multiple-Use Forests, Protection Forest, Plantations, and Mangroves. The PFE may be expanded upon via afforestation and reforestation of severely degraded old agricultural land and/or degraded forest. The use of agroforestry is recommended to engage the landowners and communities into bringing the forests back, especially on sloping/upland areas that are classified to be too steep for agriculture. It also includes, boosting the capacity of partner organisations such as the iTaukei Land Trust Board and the Lands Department to empower them to facilitate the establishment of the Permanent Forest Estate, including mapping.
2. Incorporate biodiversity conservation into the management regimes of natural and plantation forests, as stipulated in the Fiji Forest Certification Standard. This will require that The



Ministry of Forests lead the work with relevant stakeholders to establish a system of conservation areas within the PFE that take into account the provisions of the NBSAP.

3. Mangroves must be gazetted as Protected Areas to prioritise the conservation and sustainable management of all mangrove ecosystems to maintain their ecological values as well as their vital importance in the mitigation and protection against climate change impacts, especially their ability for very high-level carbon sequestration.
4. Watershed management and soil conservation to provide clean water, flood mitigation and protection against soil erosion, and other benefits inherent of forests, particularly healthy natural forest ecosystems. For that, the Ministry of Forests should partner with the TLTB and the Water Authority of Fiji to develop forest watershed lease arrangements to create a payment for ecosystem services scheme for watershed designated to provide water to urban areas. The relevant agencies in the lands, forestry and agriculture sectors will develop guidelines for waterway buffers and riparian strips, regardless if the streams or rivers run through forests, or not. All riparian strips will be of widths appropriate to the size of the waterway and will be rehabilitated with native species so as to protect the banks against erosion and reduce the runoff of chemicals and sediment. Watershed management and soil conservation will be included in forest management plans for all forest categories in the PFE. It must be made law for forestry operations to wholly compliant with the Fiji Forest Harvesting Code of Practice, which has specific guidelines to mitigate soil erosion and protect waterways.
5. Establishment of forest-based economy, which should encompass economic activities relating to all forest ecosystem services (including that of mangroves), ranging from forest biomass to tourism, recreation and non-wood products. Some intangible benefits may be realised outside the forest area. For example: clean air to breathe (and thus, indirectly, the reduction/avoidance of respiratory infections); cleaner waterways that support greater natural biodiversity and clean water supply to urban areas, reduced sedimentation and dredging costs of rivers, as well as healthy coral reef ecosystems which also vitally support local livelihoods and cultural values. Additionally, there is the creation of employment within the forest as well as in wood processing facilities, etc.

11.4.2 SWOT Analysis

Internal aspects of the strategy are examined via their Strengths and Weaknesses, and the external aspects via their Opportunities and Threats.

Strengths	Opportunities
<ul style="list-style-type: none">• Fiji has very good national policies on forest management• Addresses both climate and economy• Existing sustainable forest management pilot areas• Supported by international agencies (e.g., SPC, GIZ, international NGOs)	<ul style="list-style-type: none">• Opportunity to enhance forest carbon stock• Opportunity to align with national/international commitments (regarding carbon)• Opportunity to properly manage vulnerable areas (e.g. water catchments)• Opportunity for income generation (e.g., to create a sustainable forest-based economy)• Upcoming/planned government initiatives relating to SFM



	<ul style="list-style-type: none"> • Future Access Benefit Sharing for all stakeholders
Weaknesses <ul style="list-style-type: none"> • Current undervaluation of natural forest (tangible and intangible benefits) • Lack of capacity to implement and enforce strategy by all actors • Benefits are long-term, while many people pursue benefits that accrue in the short-term • Competing priorities between sectoral policies • Outdated fees schedules and lack of periodic review 	Threats <ul style="list-style-type: none"> • Lack of political will • The Mining Act (which supersedes all other acts) could conflict with the national land use plan • Resistance to new paradigm, technology and sacrifice short term benefits for long term gains – difficulty in changing cultural mindsets/behaviour • Limited market opportunities due to monopoly of plantation administration

11.4.3 Feasibility Assessment

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the aspects of the following criteria. The conclusion is that *Sustainable Forest Management* implementation is generally highly feasible.

Criterion	Score	Justification/Observation
Socio-political feasibility	++	Limitation in political will and willingness of stakeholders to participate in activities such as stakeholder dialogue, zoning of areas and multi-agency monitoring of license conditions.
Technical feasibility	+++	Technical expertise available locally
Financial feasibility	++	Uncertain funding opportunities
Climate change mitigation potential	++	Voluntary commitment from landowners to put critical habitats and biodiversity hotspots under Protected Area System aligned to NBSAP.

Key: Strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus).

11.4.4 Driver or underlying cause directly addressed by the strategy

The strategy addresses the following direct drivers of forest degradation in Fiji: logging, traditional use and introduced species (pine and mahogany). Unsustainable logging activities will be addressed through this strategy as sustainable forest management, forest conservation and carbon enhancement will ensure that the country has a sustainable logging industry and at the same time ensuring that biodiversity is protected and enhancing carbon stocks through reforestation activities.

11.4.5 Driver or underlying cause indirectly addressed by the strategy



This strategy addresses economic factors, policy and institutional factors and cultural factors, and outlines steps necessary to building a strong governance foundation for Fiji's forests, with the goal of reducing carbon emissions from deforestation and forest degradation, and promoting activities such as conservation, sustainable management of forests and the enhancement of forest carbon stocks (for example, through afforestation and reforestation). The strategy first aims to fully identify and quantify the forest ecosystem resource in its entirety and establish management protocols to achieve perpetual optimum resource utilisation. In other words, this strategy outlines steps to delineate and conserve the forest ecosystem for the provision of tangible and non-tangible benefits and establish responsible management of the forest resources (of native and introduced species) to optimise commercial and subsistence/traditional use of these benefits.

11.4.6 Policy and regulatory frameworks, governance and institutional structures assessment

Assessment of the role and the strengths, weaknesses and gaps relating to governance structures and institutional capacities to address the identified drivers and agents	<p>Particularly in a developing small country like Fiji, one of the major strengths for forest governance is the established the iTaukei Land Trust Board which has official custodianship of all indigenously owned land, accounting for about 90% of all Fiji's terrestrial territories. The TLTB maintains the register of all the landowning units and the land that each traditionally owns. Any land use that is proposed by non-owners needs to be negotiated via the TLTB to obtain a lease. Another strength is that the large government owned plantations have forest companies to manage their resources. These companies (Fiji Hardwood Corporation Ltd and Fiji Pine Ltd) have landowner relationships and benefits for the leased lands organised via their respective legislated Trust organisations, the Fiji Mahogany Trust and the Fiji Pine Trust. These models for landowner organisation and engagement are very good, in principle.</p> <p>Several weaknesses were identified that hinders sustainable forest management in Fiji. This includes the undervaluing of forest and mangrove resources which fails to realise the tangible and non-tangible benefits they provide and thus are not managed for their own sustainable use and are only regarded for exploitation.</p> <p>Another weakness identified is the lack of human resource capacity. Since 1999 the MoF lost half its workforce to the government-owned Fiji Hardwood Corporation Ltd. Other valuable staff members have also left for other organisations, or made to retire from civil service, or passed away. Although the Forestry Training Centre managed by the Ministry of Forests has evolved to now offer courses for technical level forestry and forest wardens, most of these graduates will never be able to make sound managerial decisions without having had undergraduate or postgraduate university studies. Therefore, the Ministry now has severely diminished capacity for management-level decisions by its reduced human resources and there is a limit to the work that can be achieved by international aid funded consultants.</p> <p>The TLTB leasing arrangements are modelled for land-uses such as agriculture which have a faster turnover in profits and are not suitable for the</p>
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	<p>sustainable management of forests and for the provision of payments for ecosystem services such as carbon sequestration. TLTB works in the best interest of landowners to ensure best returns for them but sometimes this may not be the in the best interest of SFM as their demands can be excessive. TLTB needs to review existing leasing and licensing procedures, including resource audit to forecast future land needs of landowning unit(s) and proper valuation methodology to render an equitable compensation package, amongst others.</p> <p>Forest governance structures are clearly demarcated; however, decision-making that relates to logging and forest use is left to landowners who have minimal capacity and knowledge to make informed decisions regarding logging contracts, sustainable logging practices, and long-term benefits and costs.</p>
Analysis of forest sector governance and its institutions including the cross-sectoral coordination mechanism	<p>With regards to Fiji's policies, legal, institutional and regulatory frameworks in the sub-section of forest related policies and laws, there are good, clear and coherent policies to support adaptive forest management and use of native and plantation forests, which also touches on mangroves. These policies were recently developed and are consistent with international commitments and obligations; however, Fiji's forest laws and regulations are still in the process of being aligned with its policies for native and plantation forests, while the policies, laws and regulations governing the use and management of mangroves is fragmented between at least three government ministries.</p> <p>As the area of forests accessible for logging diminishes, government through the MoF should prioritize SFM practices to ensure sustainable logging industry, protection of biodiversity and the adoption of forest certification schemes. The MoF has developed policies such as the 2007 Fiji Forest Policy and the Fiji REDD+ Policy which are consistent with international commitments and obligations. The MoF should work closely with the Department of Environment and the Ministry of Lands to ensure that mangrove clearing is minimised and controlled.</p>
Assessment of the willingness and institutional support of the various sectors to contribute to address the identified drivers	<p>Sustainable forest management, forest conservation and enhancement of carbon stocks is one of the main strategy currently being advocated by small island states as part of the REDD+ program to reduce carbon emissions. There are various policy documents and action plan that supports this strategy such as;</p> <ol style="list-style-type: none"> 1. Fiji REDD+ policy (2011) 2. Fiji Forest Policy Statement (2007) 3. A Green Growth Framework for Fiji (2014) 4. National Biodiversity Strategy and Action Plan for Fiji (2017-2024) <p>But to ensure that policies or actions plans and operationalised governments needs to allocate funding to carry out the activities identified in the plans.</p>



Identify supporting policies and legislation that can be enhanced or developed to address the identified drivers	<ol style="list-style-type: none">1. Update the 2013 Mangrove Management Plan to ensure mangrove resources are well managed.2. Mangroves must be gazetted as Protected Areas to prioritise the conservation and sustainable management of all mangrove ecosystems to maintain their ecological values as well as their vital importance in the mitigation and protection against climate change impacts, especially their ability for very high-level carbon sequestration. The Department of Lands should be empowered and resourced to be fully responsible for the holistic management and mandated to police any wrong doing that results in deforestation or degradation of mangrove areas.3. It must be made law for forestry operations to be wholly compliant with the Fiji Forest Harvesting Code of Practice, which has specific guidelines to mitigate soil erosion and protect waterways.4. The strict application of Fiji's Tree Diameter Limit Table must be used to guide tree selection in any harvesting operation in natural forests.5. It must be made law that sustainable management is required of all forested areas (including mangroves) and that management is compliant with the Fiji Forest Certification Standard. The Standard must be made applicable to all forest types and categories.6. The Fiji Forest Certification Standards should be adopted to ensure that Fiji's forestry sector is sustainable and compliant to international standard and good practices.7. The draft 2016 Forest Decree is still to be passed through Parliament and once gazetted, should address some issues that were not addressed in the current 1992 Forest Decree, such as carbon trading.
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11.4.7 Assessment of the opportunity cost

This strategy involves a wide range of afforestation/reforestation and forest conservation approaches. These include

- Capacity training to help with alignment to the forestry code of practice for Fiji (\$10 per ha for 10,982 ha per year, 2020-2045)
- Investments in monitoring of logging practices across the permanent forest estate (\$50 per ha for 1700 ha per year, 2020-2045).
- Establishment of 1219 ha of pine plantations over 5 years (\$1100 per ha)
- Establishment of 479 ha of mahogany plantations over 3 years (\$794 per ha).
- Establishment of 250 ha of pine woodlots over 5 years (\$750 per ha)
- Afforestation of 1900 ha per year in native forests from 2020-2045 \$(2484 per ha).
- Implement forest conservation agreements on 7000 ha per year from 2020-2045 (\$25 per ha)
- Formalize protection on these 7000 ha per year (\$10 per ha).



- Implement community-based forest protection in 3 communities per year and continue supporting these over the lifetime of the project (\$50,000 per agreement, 3 agreements per year, with continuing investment in existing and new agreements for entire 2020-2045 period).

These activities are undertaken for the period 2020-2045. As in Strategy 2 above, standard biological growth functions are used to determine the growth of carbon over time. For natural forests, the same yield function as above is used. For pine and mahogany plantations, the yield functions are as follows:

- Pine: $t \text{ CO}_2 \text{ per ha} = \exp(6.42 - 10/\text{age})$, where max $\text{CO}_2 \text{ per ha} = 613 \text{ t CO}_2 \text{ per ha}$
- Mahogany: $t \text{ CO}_2 \text{ per ha} = \exp(5.86 - 10/\text{age})$, where max $\text{CO}_2 \text{ per ha} = 350 \text{ t CO}_2 \text{ per ha}$

The capacity training and monitoring for implementation of the forestry code of practice is expected to reduce carbon emissions by encouraging the adoption of reduced impact logging techniques on natural forests. In 2017, Fiji is estimated to have harvested 240000 m³ of native forest assumed to be non-coniferous roundwood. Assuming this wood was harvested largely from native forests, the harvesting intensity in Fiji is 0.24 m³ per ha of forest. Ellis et al. (2019) estimate an emission factor of 5.7 t C emission per t C of harvest in tropical forests globally, suggesting that emissions from forest degradation could be 1,255,140 t CO₂ per year.

For the purposes of this study, it is assumed that implementation of the Fiji forest practices across an increasing number of hectares over time reduces the emission factor to 4.5 t C per t C harvested. Given this, we estimate that the emission reduction due to implementation of more widespread adherence to the forestry code of practice rises from 3,362 t CO₂ per year to 87,422 t CO₂ by 2045, for a cumulative emission reduction of 1, 180,192 t CO₂ over the 2020-2045 time period (see Table 7). The emission reductions from reductions in forest degradation are thus 21% of the total potential emission reduction in the forestry strategy.

The establishment of plantations and woodlots as well as afforestation of native forests occurs on 53,182 ha in total. As described in strategy 2, increasing the land in forests also causes leakage, so the net change in forests due to these increases is 31,909 ha, as some additional deforestation results from the establishment of new plantations. The combination of other approaches, including implementation of conservation agreements. Formalization of forest protection, community-based forest protection, is expected to decrease deforestation by 3% per year.

By 2045, afforestation and reductions in deforestation lead to an additional 36,004 ha in forests compared to the baseline. The net gain in carbon by 2045 is estimated to be 6.2 million t CO₂, with 4.2 million tons accumulated in newly afforested land (plantations and natural land) and 0.9 million t CO₂ due to avoided deforestation (Table 7). Reductions in forest degradation account for 1.2 million t CO₂. The total costs of the program are \$73.9 million in present value terms, for a cost of \$25.78/t CO₂.

Table 7: Predicted carbon reduction by 2045 for activities in the forest management strategy.

Activities	2020-2045
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	t CO₂
Afforestation/Reforestation	4,203,082
Avoided deforestation	847,551
Reduced forest degradation	1,180,192
Total	6,230,825

As noted in the climate smart agriculture scenario, one critical uncertainty in the analysis rests with the assumption about the reduction in deforestation due to the actions undertaken. If instead of a 3% reduction in deforestation the reduction is 10%, the amount of carbon sequestered increases substantially by 1,977,619 t CO₂ sequestered (or saved) by 2045. Costs fall to \$22 per ton. The fact that they do fall illustrates that avoided deforestation is lower cost relative to afforestation, and also that the fixed costs of the avoided deforestation program can be spread over more acres. Using the model, we determine the average cost of a ton of carbon sequestration through the avoided deforestation activities is \$18 per t CO₂. The afforestation activities cost \$27 per t CO₂, and the forest degradation efforts cost \$8 per ton CO₂. These low costs for the forest degradation activities arise because there are no land opportunity costs associated with implementing the practices.

As noted in the agricultural strategy above, opportunity costs are an important cost element, especially at \$200 per ha. Unlike the agricultural practices, however, these opportunity costs play a relatively more important role in the forest practices component. If the opportunity costs fall to \$100 per ha per year, the costs of carbon sequestration fall to \$16 per ton CO₂, and if the opportunity costs fall to \$25 per ha per year, the costs fall to \$11 per ton CO₂.

The sensitivity of the carbon sequestration costs to the opportunity cost of land suggests that it is important to better understand what the size of opportunity costs may actually be. The Fiji Farm Management Manual (MoA 2014a) indicates, and estimates of the value of important crops in Fiji suggests that opportunity costs are likely close to \$200 per ha per year, however it would be useful to generate more empirical data on these opportunity costs. Specifically, it would be good to test with actual farmers what the potential opportunity costs are.

One of the benefits of the forest program is that it can be scaled. Currently, the program achieves a modest 3% reduction in deforestation. This means that payments are made on only 21,000 ha per year on average over the 25-year planning horizon. Many of these hectares are lands associated with the afforestation program, and only 3,100 of them are associated with program to reduce deforestation. In contrast, if the program is scaled up to make payments on a larger area of native forest in order to reduce deforestation by 50% relative to the baseline, payments are made to 70,000 hectares on average over the 25 year period, with nearly 53,000 of these hectares arising from avoided deforestation. Under the larger program to avoid deforestation, 19 million t CO₂ are conserved by 2045, and average costs fall to \$18 per ton CO₂. The total costs of this program are substantially larger, however, at \$13 million per year, and \$188 million in present value terms.



11.4.8 Assessment of the impact on traditional structures and local governance

Factors that influence local communities and traditional structures to reduce deforestation and forest degradation and support forest conservation, sustainable management of forests and reforestation and afforestation	Communities view forest as a source of money through logging. Communities perceive carbon and non-carbon benefits from forest as insignificant. Urgent awareness activities are needed to ensure that communities are empowered and enlighten on the other benefits such as recreation, biodiversity and other environmental services that forest provide. Community leaders should be identified and trained to be local champions to conduct awareness activities using traditional community structures.
Assessment on how traditional laws and land use and access arrangements can be enhanced to support efforts in addressing the direct DoDD	Where possible traditional laws and norms should be observed and respected. Free Prior and Informed Consent is another crucial aspect to ensure that communities participate fully in the sustainable forest management. Currently, the grievance redress mechanism is being developed and will greatly complement these traditional structures to ensure open and transparent processes to sustainable forest management.

11.4.9 Assessment of gender and vulnerable groups

Women's participation in sustainable forest management and forest conservation is lacking and should be encouraged. Under Fiji laws, men and women are equal but in traditional settings, women's views are often superseded by men. Empowering women is key to ensure that their views are considered especially in forest conservation where their consent is needed to secure lease.

11.5 Low-Impact Infrastructure Development Expansion

11.5.1 Strategy Description and Interventions

To address forest degradation and deforestation caused by infrastructure development, there should be a shift toward low-impact infrastructure development expansion and the implementation of innovative approaches. These low-impact approaches to development expansion require feasibility studies through a sustainable development lens that ensures the detrimental environmental impacts of development are minimised. This strategy tackles climate change mitigation by reducing the footprint of infrastructure development, but also should incorporate elements of climate change adaptation (e.g. green-grey infrastructure).

Low-impact development expansion ensures that there is minimal impact of building transportation networks, increasing water and energy access, providing basic amenities to those in rural areas, and facilitating access to improved housing for all sectors of the population, amongst other things. The sustainable development principles and policy reforms that motivate these low-



impact development interventions should underlie all infrastructure development in the next five to twenty years.¹⁵

Low-impact development expansion should target building climate-resilient water and electricity infrastructure by ensuring that roads and other infrastructure development conforms to the National Land Use Plan and includes measures to minimise impacts on forests, mangroves, and agricultural areas. The National Development Plan (NDP) (2017-2036) emphasizes integrated development and the need for multi sector solutions (GoF, 2017), and already outlines infrastructure development focal areas. To this point, the NDP includes a goal of “access to transportation through an efficient and sustainable transport network with emphasis on the expansion of the rural road network and extending rural transportation services”. Under the NDP there is also a goal of providing affordable and safe housing, with the understanding that housing in both rural and urban areas needs to be accessible and requires improvement to reduce vulnerability to natural disasters and shocks.¹⁶

Low-impact development expansion also ensures a gradual adoption of sustainable development principles as highlighted under the Green Growth Framework for Fiji. These principles include, amongst other outcomes, the reduction of carbon footprints at all levels, increasing the adoption of comprehensive risk management strategies and an increased focus on greening strategies that will ensure low carbon emissions. This aligns to the NDP goal on the provision of an environmentally sustainable energy sector¹⁷ and commitment to achieving climate neutrality and a low-emission world.¹⁸ These interventions will also help develop a pathway to 2050 for decarbonisation of the Fijian economy.

These interventions also support the development and strengthening of a cross-cutting national enabling environment to address the current sector-based approach (MoSP, 2014). To assist the development of an integrated approach, and to ensure sustainable telecommunications, improvement in telecommunications infrastructure is needed.¹⁹

Strategic Interventions:

1. Mandate a full social cost-benefit analysis for all infrastructure development that includes assessing human vulnerabilities and ensuring low-cost and minimal environmental impact development expansion.
2. Ensure building climate-resilient water infrastructure is a key component of all new projects and adopt innovative technologies for industrial recycling and rainwater harvesting. This could be included in the ADB’s Country Operations Business Plan for Fiji which includes, as a primary strategy, ensuring urban water supply and wastewater management (ADB, 2017). This

¹⁵ Fiji has both a twenty-year (2017-2036) and a comprehensive five-year National Development Plan (2017-2021).

¹⁶ NDP goal of “promoting equal opportunities, access to basic services, and building resilient communities”, which include assisting rural communities to access basic necessities.

¹⁷ The National Development Plan includes a goal of “a resource-efficient, cost-effective and environmentally sustainable energy sector”, which includes: access to energy for all Fijians.

¹⁸ For example, the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change.

¹⁹ This is in line with the NDP focus on “universal access to information and competitive telecommunication services.



is aligned to the NDP goal of access to “clean and safe water” through ensuring long-term catchment security, by protection of catchment areas in Fiji.

3. Promote the adoption of a “green certification” system which could receive incentives or tax discounts from the government. This certification system should be inclusive of all planned low-impact infrastructure development.
4. Ensure future electricity infrastructure projects are climate-resilient and aligned with the Green Growth Framework’s three pillars: social, which includes inclusive social development; environmental, which focuses on building resilience and ensuring sustainable development; and economic, which addresses sustainable transportation and greening the tourism and manufacturing industries.
5. Pursue sustainable transportation by ensuring all transportation-related infrastructure development and repairs (roads, buildings, etc) are aligned with the Green Growth Framework. This is also to include land and maritime transportation policies and reforms under the ADB Country Operations Business Plan (2018-2020) (ADB, 2017).
6. In addition, the energy, transportation, and tourism sectors could commit to being greener through tax breaks and the introduction of environmental taxes to be borne, for example, by all airline travellers. A portion of the taxes collected from this initiative should be directed to communities that engage in community-based forest, watershed management, and/or mangrove or fisheries management.

11.5.2 SWOT Analysis

Internal aspects of the strategy are examined via their Strengths and Weaknesses, and the external aspects via their Opportunities and Threats.

Strengths <ul style="list-style-type: none"> • Alignment with Green Growth Framework • Alignment with the National Development Plan 2017-2036 • Adoption of green solutions cost effective and efficient to support human well-being 	Opportunities <ul style="list-style-type: none"> • Vertical and horizontal harmonisation and coordination across sectors to ensure efficient use of resource use • Harmonisation with the National Land Use Plan • Facilitate easy access for products and markets • Green infrastructure planning and development standards
Weaknesses <ul style="list-style-type: none"> • Not guided by National Land Use Plan • Land access and resource development are not determined by market forces – set up of land dealing encourage use of agency – initial dealing capped by law • Slow intake of new technology on water recycle, solar and wind energy etc. 	Threats <ul style="list-style-type: none"> • EIA processes not rigorously assessed and implemented • Facilitate expansion of resource utilisation and extraction • Facilitates rural-urban migration that potentially lead to greater urban problems • Infrastructure moving into arable land



<ul style="list-style-type: none"> Does not consider true valuation of tangible and intangible natural benefits of ecosystem services Non-implementation of free prior informed consent (FPIC) 	<ul style="list-style-type: none"> Availability for cheap loans for infrastructure development in Fiji Low unimproved capital on land rental rates
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11.5.3 Feasibility Assessment

Feasibility assessments were conducted for each REDD+ Strategy. The exercise was based on the consultation process and economic viability in the aspects of the following criteria. The conclusion is that implementation of *Low-Impact Infrastructure Development* requires significant community consultation and awareness and financial resources to be feasible.

Criterion	Score	Justification/Observation
Socio-political feasibility	+	There is little engagement of communities in these processes because of the lack of awareness and understanding of processes.
Technical feasibility	++	Limited capacity to monitor and effectively implement and enforce existing regulations.
Financial feasibility	+	Low impact infrastructure development usually is more expensive than regular infrastructure, however the long-term benefits might be save resources
Climate change mitigation potential	++	Aligns to the NDP goal on provision of an environmentally sustainable energy sector ²⁰ and commitment to achieving climate neutrality and a low-emission world. It has the potential to achieve climate change mitigation and adaptation goals

Key: Strong/very feasible (3 plus), medium (2 plus) or low/less feasible (1 plus).

11.5.4 Driver or underlying cause directly addressed by the strategy

The low-impact infrastructure development expansion strategy will directly address several drivers and underlying causes. Fiji does not have a National Land Use Plan, and this has implications on all aspects of land use which include infrastructure development, town and urban development and expansion into prime agricultural lands and ecologically fragile mangrove forests. Agricultural expansion and continued deforestation is addressed indirectly under this strategy because low-impact infrastructure development will support sustained export activities and a sustainable increase in domestic marketing, in addition to addressing accelerated movement into untapped lands, forest areas, and mangroves.

Forest logging is addressed indirectly through this strategy, over development of a sustainable transportation network and building of more sustainable and affordable housing. Mangrove



removal and conversion is addressed through sustainable and improved urban planning, which will ensure the retention of large tracts of mangroves around the country.

11.5.5 Driver or underlying cause indirectly addressed by the strategy

More specifically, the underlying causes are varied and most relate to: government policies, changes in government priorities, the obligation to meet the needs of the increasing population, the capacity at all levels to manage resources, the lack of stakeholder involvement, and lack of coordination between government departments and other stakeholders.

Integrated and coordinated development, increased collaborative strategies, and maximization of improved telecommunications will address sector-focused work which has larger, unplanned impacts on natural resources.

11.5.6 Policy and regulatory frameworks, governance and institutional structures assessment

Assessment of the role and the strengths, weaknesses and gaps relating to governance structures and institutional capacities to address the identified drivers and agents	<p>Forest governance structures are clearly demarcated; however, decision-making that relates to infrastructure is fragmented, politically motivated and engineer centric. Members of the land-owning units may have limited voice in engineering designs and standards of infrastructure development, but they play a key role through “first rights of refusal” to logging companies that open-up many rural areas originally under intact forest. However, integration of social aspects into the design of infrastructure development is difficult in view of many factors including budgetary constraints. Logging roads are monitored and evaluated by the Ministry of Forest and does not undergo stringent standards required for public access.</p> <p>Forest activities play an important role in opening-up rural road networks in collaboration with the Ministry of Rural Development & National Disaster Management, where ex-forest roads are upgraded for public vehicles. The Ministry of Rural Development & National Disaster Management assess, prioritize and coordinate all rural road works. It contracts the Fiji Road Authority to construct all rural roads. The Fiji Road Authority is a statutory commercial arm under the Ministry of Infrastructure and Transport.</p> <p>Other line agencies that are involved with rural roads include the Ministry of Lands and Mineral Resources, Ministry of Local Government, Housing and Environment, iTaukei Lands Trust Board and the Ministry of iTaukei Affairs. Each agency has a specific role for instance, Ministry of Lands provides access to state lands; Ministry of Local Government, Housing and Environment ensures compliance to environmental standards; iTaukei Lands Trust Board provides access rights to native lands while the Ministry of iTaukei Affairs supports traditional protocol for construction teams on site.</p> <p>The Environment Management Act 2005 specifically stipulates and attempts to address priorities, needs, gaps in legislation, and policies that govern resource use in Fiji. The EMA identifies and sets out to address the primary institutional gaps by the establishment of different units in the Environment Ministry. The</p>
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	<p>EMA sets out the establishment of the National Environmental Council and established units within the administration of the “environmental impact assessment unit”, the “resource management unit,” the “waste management and pollution control unit,” the “environmental management units,” and “environmental management committees.” To implement the laws and regulations, an “Environmental Register” for publication of rules is established, and “appointment of inspectors” and their powers are set forth.²¹ EIA is a basic requirement for the construction of all public roads in Fiji.</p> <p>The government has the responsibility to ensure sustainable infrastructure development; however, the biggest gap is identified as the inability of key government services such as the Ministry of Forest and the Ministry of Environment to effectively monitor and evaluate road construction standards due to the lack of human resources to cover all forest areas in Fiji, limited technological capacity to ensure improved and sustainable infrastructure, and insufficient funding to develop technologically secure and improved strategies.</p> <p>Ministry of Infrastructure and Transport is responsible for the Department of Water and Sewage as well as the Department of Energy. The governance structure of these natural resources delineates regulatory arm from the business interest. Legal instruments are passed to allow commercial statutory authorities that manage water and energy resources as business enterprise.</p> <p>Department of Water and Sewage provide policy support on water and sanitation, water supply management plan for rural water schemes and provide advisory services on policies regarding water and sanitation in the country. The commercial arm is a commercial statutory body known as the Water Authority of Fiji (WAF) which was established in 2010. WAF sources water from surface and ground sources. It services 98% of urban areas and 58% of rural area with an annual production of 114,461 million litres of water.</p> <p>Until recently, the energy sector has a single regular and business arm, This was change via parliamentary endorsement of the Electricity Act (EA) 2017 which is aligned to the National Energy Policy 2006. The EA clearly delineates the business and regulatory functions hence allowing Energy Fiji Ltd. full status of commercial statutory authority while delegating energy regulation to the Department of Energy.</p> <p>The above change allows autonomy to the Department of Water and Department of Energy regulatory functions. This change is envisaged to strengthen the two sectors and support adoption of best practices and international standards by the two commercial statutory authorities.</p>
Analysis of forest sector	There is a lack of cross-sectoral planning, implementation, and monitoring included in planned strategic interventions, which would enable a more

²¹ The Environment Department is now a Ministry and the government should look to build finance and human and technical capacity to meet the demand and requirements as stipulated under EMA.



governance and its institutions including the cross-sectoral coordination mechanism	<p>holistic approach to addressing deforestation and forest degradation, including mangrove removal and conversion.</p> <p>Legislation that mandate coordinated approaches and planning are not in place to ensure coordination with other sectors. This prevents the holistic appreciation of proposed strategies by communities which would ensure their buy-in and support.</p> <p>Many proposed strategies involve coordinated planning, which could threaten the on-going strategies that are already being implemented by the Fiji pine industry, mahogany industry, and Ministry of Forestry, in addition to the growth strategy by the Ministry of Agriculture and targeted export quotas of certain crops.</p> <p>Increase awareness among line agencies of what other Ministries are doing and why is imperative to encourage cross sectoral coordination and integrated approaches at the highest level. If connections are made at the highest level, it can be easily operationalised at all levels. A bottoms-up approach may not be as effective due to misalignment of policy priorities.</p>
Assessment of the willingness and institutional support of the various sectors to contribute to address the identified drivers	<p>Enabling mechanisms and platforms for policy review are not yet in place to ensure alignment with the Green Growth Framework, coupled with the outcomes of COP 23 and the launching of the 2017-2036 NDP.</p> <p>Given the cross sectoral nature of infrastructure development ranging from road works, energy, water, building, urban expansion and others; it is imperative for line ministries responsible for each component to understand stakeholders that have an impact or will be impacted by each infrastructure development option.</p> <p>Communities lack the consistent training and capacity building to participate in long-term sustainable development strategies that ensure the protection of resources for future generations.</p> <p>In the context of REDD+ the willingness of public, private and CSO participation in the Steering Committee is a positive indication of the support that various sectors are inclined and dispositioned to address identified drivers.</p>
Identify supporting policies and legislation that can be enhanced or developed to address the identified drivers	<p>Supporting policies for infrastructure development include the Rural Water and Sanitation Policy, National Energy Policy, Green Growth Policy, Rural Land Use Policy, Fiji 2020 Agriculture Sector Policy Agenda, Fiji Forest Policy and others.</p> <p>While legislative and institutional mechanisms exist to cover infrastructure development, the limited capacity to monitor and effectively implement and enforce these regulations results in poor management practices and conflicting outcomes.</p> <p>The EIA processes as outlined in the EMA 2005 provide guidelines and outline requirements for major infrastructure development, including</p>



	<p>consultation processes; however, EIAs are conducted with little consultation with landowners and communities. There is little engagement of communities in these processes because of the lack of awareness and understanding of processes.²² There is need for education and training in communities and with stakeholders so there is understanding of infrastructure developments, impacts, benefits and sustainability factors.</p> <p>A National Land Use Plan is critical to integrate and encompass all infrastructure development and address/mitigate drivers and underlying causes of deforestation and forest degradation.</p> <p>Through EMA, the EIA processes must improve, and accountability mechanisms put in place to ensure that EIA requirements are met and that there are wide consultations with communities and all stakeholders to take all concerns and interests into account.</p>
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11.5.7 Assessment of the opportunity cost

11.5.8 Assessment of the impact on traditional structures and local governance

Assessment of the role and the strengths, weaknesses and gaps relating to governance structures and institutional capacities to address the identified drivers and agents	<p>Interventions are to include empowerment of community leaders and other sectors of the community through selected trainings and capacity building programs. The strategy will include provision of alternative livelihoods through value adding activities, engaging men and women along the supply chains, and maximizing existing resources without moving into prime forest and mangrove areas.</p> <p>Planned low-impact development expansion will maximize the skill sets and resources that people already use. Involvement of communities will be through participatory approaches using tools and systems that are already in place to ensure respect for and maintenance of traditional uses of resources, values, and systems. Proposed development expansion will be holistic and take into account existing structures and governance systems at the community level.</p> <p>Communities in rural areas are located in off grid area hence heavily depend on alternative energy sources. Efforts by Ministry of iTaukei Affairs in collaboration with the Ministry of Infrastructure and Transport (Department of Energy) have sent women to India to attend the Barefoot International Solar Training Program. Women participation in such program promises</p>
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²² Several provisions in international instruments potentially impose obligations on Fiji under international law with respect to the rights of iTaukei owners regarding resources ownership such as land and forests. In particular, the following are relevant to considerations in the determination of compensation and benefit sharing emanating from the affectation of rights and interests pertaining to ownership.



	<p>positive dynamics in local governance structure while empowering women at community level to become skilled and proficient in a new trade/skill.</p> <p>EIA processes will include rigorous community participation and the identification and mitigation of benefits and impacts of proposed development expansion.</p> <p>Enforcement mechanisms will ensure that identified long-term impacts are avoided or addressed.</p>
Analysis of forest sector governance and its institutions including the cross-sectoral coordination mechanism	<p>Where they exist, traditional laws and norms need to be recognized as equal to modern legal mechanisms in terms of application and enforcement.</p> <p>Communities to work with NGOs and relevant government ministries to implement community-based management interventions to ensure minimal impacts of infrastructure development.</p> <p>The Sovi Basin Protected Area is an example of co-managed conservation area where traditional rights of landowners are respected and integrated into the management regime of the site. It also provides demonstration for local governance structures that oversights equitable benefit sharing mechanism for community members in the village who do not have land in the Sovi Basin Protected Area; fulfilling “equal benefit sharing” requirements of the Convention on Biological Diversity.</p> <p>Communities complaining and seeking redress after the implementation phase of projects is common upon realization of impacts on resources and livelihoods. There is an avenue for redress and if the project is deemed not suitable –this is referred to the EIA Administrator. The mechanism itself is not clear to ordinary community members and the general reference to the EIA Administrator highlight the lack of accountability in the process if the need arose for a reversal of development decision unless the Administrator and role and responsibilities of the role was transparent to all stakeholders.²³</p>

11.5.9 Assessment of gender and vulnerable groups

The Green Growth Framework ensures that resources are utilized with future use by communities in mind. The strategy will ensure an inclusive approach that incorporates all sectors of the community through participatory processes which consider different priorities and views.

Women and other marginalized groups are included through participatory approaches to consultations in communities. For example, implementation of Participatory Learning Approaches will allow for discussions at various levels and amongst the different village groups, and facilitate the meaningful engagement of women and other marginalized and vulnerable groups. These

²³ The EMA creates binding obligations for developers, as well as for government authorities. Under section 54(1) of EMA any person can institute court proceedings to compel any Ministry, department or statutory authority to perform any duty imposed on it by EMA or a Scheduled Act.



consultations will use tools and methods that are gender-inclusive and that target the priorities and needs of the marginalized groups and allow them to be part of decision-making processes.

Entry points for gender inclusion into cultural settings and structures need to be identified and maximized, including working with women who are chiefs, women from chiefly or decision-making clans, women with high education or business status, and through existing women groups and networks.

For interventions to be maintained and sustained, communities need to be a necessary part of all strategies planned. Their views, needs, and aspirations need to be included through transparent consultative processes, and their existing structures and norms relating to resource use and management at the community level need to be incorporated into planned strategies.

To ensure the meaningful participation of communities in proposed interventions, there is a need for rigorous and consistent training, awareness raising, and capacity building to all sectors of the community, especially to landowners, chiefs, and leaders who influence decision-making at the grassroots level..



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13 ANNEXES

Please see attached annexes (separate to this document)

- [Annex 1: Community Workshop Report](#)
- [Annex 2: Divisional Workshop Report](#)
- [Annex 3: National Workshop Report](#)