



## **REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND**

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

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Annex 5 to OPG Amended in October 2017

# FULLY DEVELOPED PROPOSAL FOR RWANDA

## PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category: Regular project  
Country/ies: Rwanda  
Title of Project/Programme: Enhancing adaptation through sustainable green settlements and climate-resilient livelihoods in the Volcano Region of Rwanda  
Type of Implementing Entity: National Implementing Entity  
Implementing Entity: Ministry of Environment  
Executing Entity/ies: Rwanda Development Board  
Amount of Financing Requested: USD 9,977,585

**Letter of Endorsement (LOE) signed:** Yes   No

*NOTE: The LOE should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: <https://www.adaptation-fund.org/apply-funding/designated-authorities>*

### Stage of Submission:

This proposal has been submitted before including at a different stage (concept, fully-developed proposal)

This is the first submission ever of the proposal at any stage

In case of a resubmission, please indicate the last submission date: Click or tap to enter a date.

**Please note that fully-developed proposal documents should not exceed 100 pages for the main document, and 100 pages for the annexes.**

# 1 PROJECT BACKGROUND AND CONTEXT

## 1.1 National context

With a population of nearly 13 million and a land size of 26,338 km<sup>2</sup>, Rwanda has one of highest population densities in the world, at about 493 people/km<sup>2</sup>. Despite land scarcity, rain-fed subsistence agriculture was only recently eclipsed by the services sector as the predominant sector of the economy, contributing about 23% of gross domestic product (GDP). GDP reached USD837 per capita in 2019.<sup>1</sup>

The Volcano Region in Rwanda is home to over 1.4 million people spread across 4 districts in the north-west of the country: Burera, Nyabihu, Rubavu and Musanze. It is one of the most climate-sensitive regions in the country due to soil instability, construction in flood prone areas, high rainfall and the steep hills which are a source of heavy runoff. The natural drainage network is composed of a few permanent rivers and intermittent seasonal streams originating from the volcanoes, responsible for most of the floods observed in the area. A combination of the high rainfall and steep topography, as well as the predominance of a volcanic rock formation, leads to a situation whereby almost all rainfall is converted into direct run off due to very limited infiltration capacity of the soil. The high population density in the area implies that there is significant exposure of the local population to flooding events. The region has experienced major floods causing fatalities, infrastructure, and crop damage. The previous loss estimates vary from USD4 million to USD22 million per event in the Volcano Region; section 1.6 presents official statistics on disasters in a number of key categories over the past five years in the four districts and for Rwanda overall.

With no improvements in the drainage systems, future climate change is likely to lead to increased risks. The overall amount of precipitation is forecast to increase, and the number of heavy rainfall days, or intensity of rainfall, may increase, raising the potential risks of floods, landslides, and soil erosion. This could mean that current flooding and landslides that occur in the western areas will likely continue and could increase in future. The projected impacts of climate change are potentially undermining food security, health, and economic growth. Climate change scenarios foresee a significant increase in rainfall and the number of rainy days in the north-west highlands, particularly during the two wet seasons, which may make the seasonal streams a constant supply of water. Extreme rainfall events with a significant risk of flooding are expected to see a “robust increase” under the CMIP6 SSP2-4.5 scenario.

To mitigate the impacts of future flooding episodes, soil erosion and landslides leading to more destruction in the region, the project will reduce the exposure and vulnerability of the local population. The rural population in the Volcano Region is among the poorest in the country. The

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<sup>1</sup> National Institute of Statistics of Rwanda, retrieved online at <https://www.statistics.gov.rw> on 2022-01-13.

predominant economic activity is subsistence agriculture, and the local population is highly vulnerable to climate hazards given that a single loss of a crop can make a family destitute.

The project will limit the exposure of the local population to climate-induced disasters by relocating households from current precarious living conditions in zones prone to flooding or landslides to a smart green village. The vulnerability due to the narrow economic basis will be reduced through improvements in the agricultural practices and the development of small-scale businesses that align with the local economy. Small-scale businesses will be promoted to complement household income, for instance through the development of value chains for excess agricultural produce.

The project will be funded through a variety of sources. The Government of Rwanda will contribute resources in-kind, including the land on which the green villages are to be located. The Adaptation Fund is requested to fund the construction of 200 housing units (where 202 additional housing units will be co-financed by the Government of Rwanda) in a Smart Green Village to provide safe accommodation for households currently at risk of climate-induced disasters. The Green Climate Fund has been requested to fund infrastructural improvements in the region – specially to reduce the risk of flooding and landslides – as well as improvements in land management.

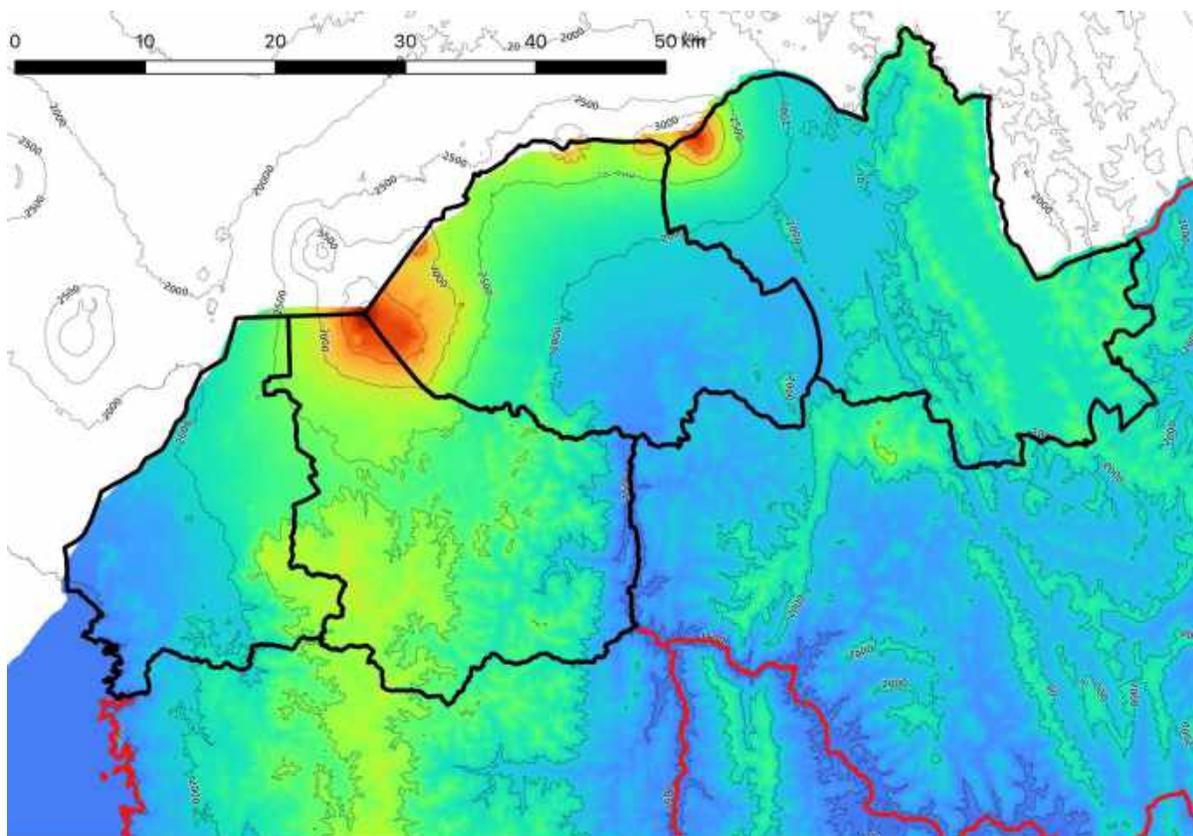
This project is in essence an upscaling of a previously approved project called “Reducing vulnerability to climate change in north-west Rwanda through community-based adaptation”, but now extended to cover all four districts of the Volcano Region. This proposal is informed by the terminal evaluation of the earlier project, and part of a larger effort to reduce risks to investments in the regional hydrology and land use improvements. Overall, the investments are expected to lead to a significant reduction in the exposure and vulnerability of the local communities to climate change.

This proposal – in contrast to the previously approved project – has benefitted from recent extensive studies in the region on geophysical and socio-economic conditions and trends, as well as from the availability of better quality and more detailed climate studies and climate change forecasts. The interventions of the project are based on climate change forecasts using a multi-model CMIP6 ensemble, the most current generation of climate change forecasts. A very detailed hydrological study of the region, producing detailed maps of flooding risk both under current climatological conditions and with incorporation of climate change forecasts, underpins the selection of households that will be relocated to the green villages that the project will construct.

## 1.2 The Volcano Region

The topography of the Volcano Region is dominated by tall volcanoes on the border and otherwise the terrain is mostly hilly (**Error! Reference source not found.**).

Figure 1: Topography in the Volcano Region, from SRTM30 data.



Rwanda is part of the western arm of the East African Rift System, the Western Rift, also called the Albertine Rift. The Western Rift is border by some of the highest mountains in Africa, including the Virunga Mountains in the Volcano Region. The geology of Rwanda consists of granite, migmatites, gneisses and micaschists of the Paleoproterozoic Ruzizian basement overlain by the Mesoproterozoic Kibaran Belt. The Kibaran, composed of folded and metamorphosed sediments, mainly schists and quartzites intruded by granites, covers most of Rwanda. Cenozoic to Recent volcanic rocks occur in the northwest and southwest. Some of these volcanoes are highly alkaline and are extensions from the Birunga volcanic area of southwestern Uganda (Rutagarama and Uhorakeye, 2010).

The hydrological network in the Volcano Region is not very dense, with only few permanent rivers. There is a denser network of intermittent streams that originate on the volcanoes, and which are responsible for most of the flooding in the lower reaches of the Volcano Region. The main rivers and gullies in the area include: Mutobo, Kinoni River, Rwebeya, Sebeya, Mukungwa. The Volcano Region also contains three lakes: Karago, Burera, and Ruhondo and their respective wetlands. A combination of the high rainfall and steep topography, as well as the predominance of a volcanic rock formation, leads to a situation whereby almost all rainfall is converted into direct runoff due to very limited infiltration capacity of the soil. Climate change scenarios foresee a substantial increase in rainfall and the number of rainy days in the north-west highlands, which may make the seasonal streams a constant supply of water.

Furthermore, because of the porous volcanic geology, the slopes of the volcanoes, as well as its surrounding areas, contain a good number of caves that play a key role in the hydrology of the area. There are several small streams that drain their water in caves and others that originate from the outlet of caves further downhill. One of the best-known examples is the Kinoni River that drains its water either in the Nyiragaju caves or in the Mugogo caves.

The world-renowned Volcanoes National Park (VNP) is located on the higher reaches of the volcanoes in the region. The VNP is home to many endangered and endemic species, the most iconic of which is the eastern mountain gorilla (*Gorilla beringei beringei*). About 50% of the global population of eastern mountain gorillas live in the VNP, with the species being listed as endangered by IUCN. The VNP is bordering on the Virunga National Park in the DRC and the Mgahinga National Park in Uganda. The Government of Rwanda is planning to extend the VNP with surrounding areas to create a more viable landscape for the survival of endangered species.

Land use outside of the VNP is dominated by small-scale agricultural operations on the fertile soils of the volcanoes (Figure 2). The main crops grown are potato, banana, beans, maize and vegetables (Table 1). Animal holdings are small, with dairy cattle being a significant source of income from sale of milk. The average size of land holding per household is approximately 0.7 ha and productivity levels are very low due to a predominance of shallow soils, especially on the slopes, resulting in limited soil moisture holding capacity, the limited use of inputs and mechanization, erosion on steep slopes, a lack of irrigation and post-harvest facilities as well as under-developed agricultural value chains and a lack of private investment. Smallholders often lack the knowledge, inputs, and technology to transition to more climate resilient farming systems that would help them to generate a marketable surplus for income security. They have neither the financial nor physical access to quality feed for livestock and have limited knowledge of improved feeding, fodder establishment and crop-livestock integration approaches. At the same time, extension services lack the technical capacity to effectively mainstream climate concerns into advice services. These two factors result in low crop and milk productivity, and inefficient use of resources.

Table 1: Area of crops grown (ha) in the four districts of the Volcano Region during season B of the year 2021<sup>2</sup>

Crop	Rubavu	Nyabihu	Musanze	Burera
Maize	1,753	3,652	2,833	2,525
Sorghum	439	0	1,076	6,103
Wheat	0	1,326	759	1,416
Cassava	422	293	80	74
Sweet potato	698	2,725	1,319	2,997
Irish potato	6,572	7,605	5,335	4,273
Taro & Yams	191	38	202	133
Banana	2,393	805	1,441	2,182
Cooking banana	835	158	432	982
Dessert banana	254	389	452	211

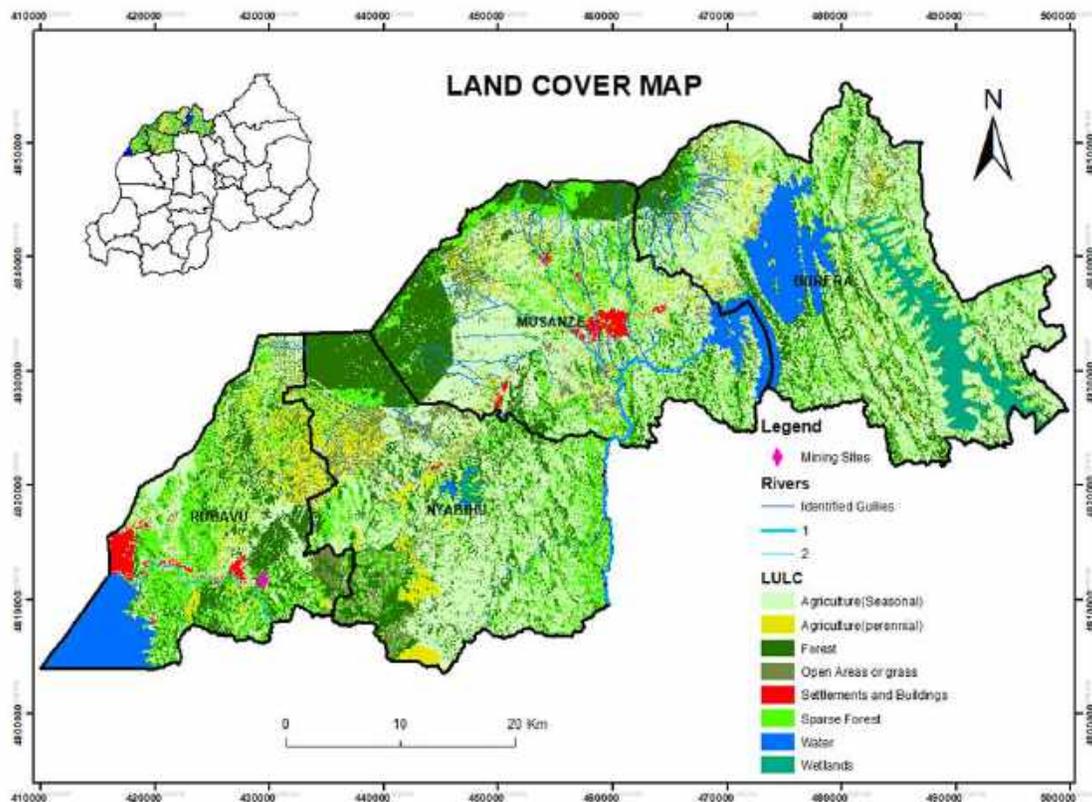
<sup>2</sup> Source: NISR, 2021.



Annex 5 to OPG Amended in October 2017

Banana for beer	1,304	258	557	989
Bean	3,891	2,038	4,470	11,768
Bush bean	447	0	305	692
Climbing bean	3,444	2,038	4,165	11,077
Pea	167	195	289	601
Soybean	150	40	7	0
Vegetables	2,260	862	1,129	333
Fruits	90	455	378	76
Fodder crops	458	526	264	192
Other crops	1,324	766	815	42
<b>Total</b>	<b>20,809</b>	<b>21,325</b>	<b>20,396</b>	<b>32,713</b>

Figure 2: Land use and land cover map of the Volcano Region<sup>3</sup>



### 1.3 Current climate

#### 1.3.1 Rwanda

Rwanda is located within the equatorial belt, but its climate is not strictly of the equatorial rainy type. It has a modified humid climate including rainy forest and savannah types. The central and eastern part of the country is generally of semi-arid type owing to its position in the rain shadow of the western highlands.

The rainfall characteristics exhibit large temporal and spatial variation due to varied topography and existence of large water bodies in and near the country. Two rainy seasons are distinguished, March – May and October – December. Temporal variability of the rainfall has resulted in extreme events, such as the floods resulting from the 1997 – 1998 El Niño episode, and frequent droughts that have far reaching socio-economic impacts to the country.

The warmest annual average temperatures are found in the eastern low-lying areas (20 – 21°C) and Bugarama Valley (23 – 24°C), and cooler temperatures in higher elevations of the central

<sup>3</sup> Source: FONERWA, 2019

plateau (17.5 – 19°C) and the highlands (less than 17°C). Temperatures vary little throughout the year.

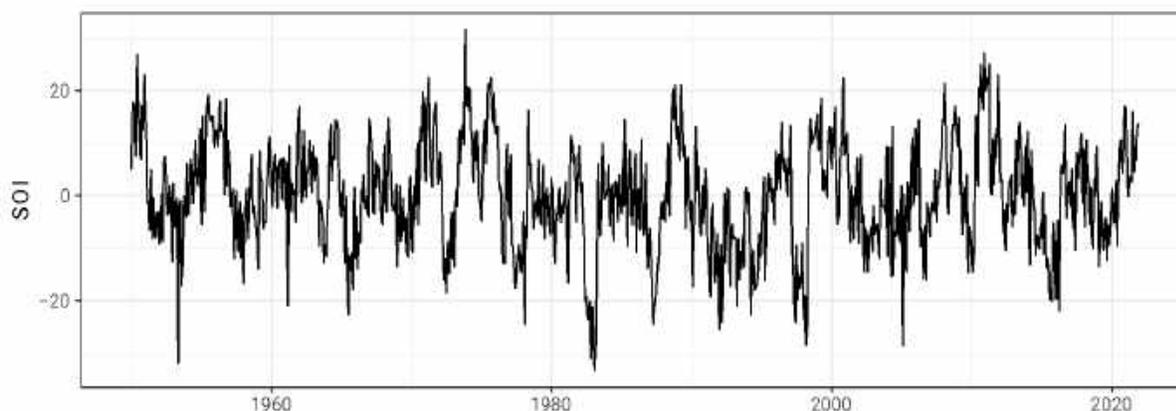
Rwanda experiences a bimodal pattern of rainfall, which is driven primarily by the progression of the inter-tropical convergence zone (ITCZ). The ITCZ follows the annual progression of the Sun as it crosses the equator into the northern hemisphere (March – May rainy season), and six months later into the southern hemisphere (October – December rainy season). The maximum rainfall occurs over the March – May and September – December periods.<sup>4</sup>

### 1.3.2 ENSO events

During an El Niño episode, the climate in Eastern Africa has a substantially increased probability of being unusually wet during the secondary and shorter rainy season of October – December, whereas the region’s primary and longer rainy season, March – May, is largely unaffected. El Niño events were associated with positive rainfall anomalies at the rate of 71.4%, while La Niña events were associated with negative rainfall anomalies at the rate of 72.7% over the period 1935 – 1992 (Muhire et al., 2014).

In the second half of 2021 La Niña conditions started to prevail. This suggests that early 2022 will be drier than usual. See Figure 1-3 for ENSO events over the period 1950 – 2021.

Figure 3: Southern Oscillation Index (SOI) for the period 1950 – 2021. Values above 7 indicate La Niña conditions (khaki coloured, drier than usual), while values below -7 indicate El Niño conditions (light blue, wetter than usual)



### 1.3.3 Volcano Region

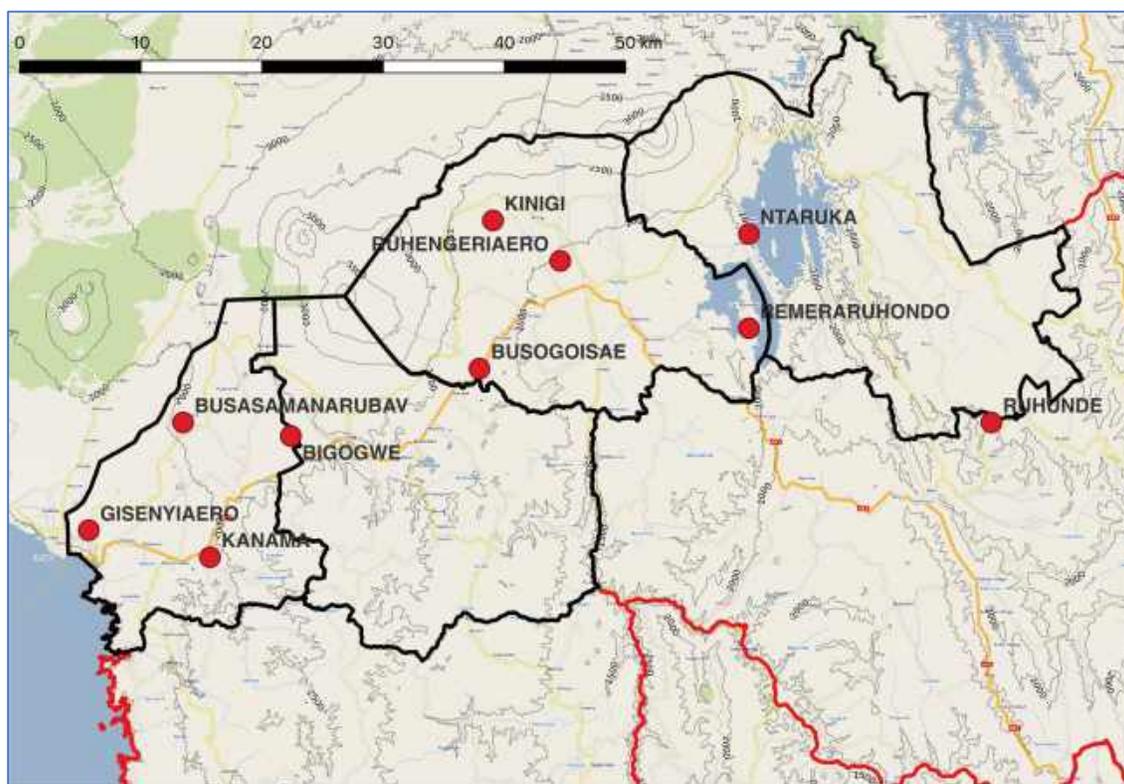
The climate of the Volcano Region is dominated by the high altitude and the presence of tall volcanoes on the north-western range, which forms the national boundary with the Democratic Republic of the Congo (Figure 4).

Data from 10 weather stations managed by MeteoRwanda have been identified for the climate description. The weather observation record for these stations is largely complete for the period

<sup>4</sup> Rwanda Meteorology Agency, 2021. *Climatology of Rwanda*.

1990 – 2021, comprising the current climatological normal period of 1991 – 2020 which is also the baseline for assessment of climate change. Climact analysis has been performed for key stations. Given the close proximity of the stations and the resulting large correlation between observations, results presented in this section will focus on three representative weather stations for purposes of this project: Bigogwe, Kinigi and Ntaruka.

Figure 4: The four districts of the Volcano Region in the north-west of Rwanda. The red dots indicate the locations for which weather observations are available<sup>5</sup>



### 1.3.4 Temperature

Temperatures have been steadily increasing throughout the Volcano Region since 1991, at a rate of 0.055, 0.056 and 0.045 °C/yr at Bigogwe, Kinigi and Ntaruka, respectively (Figure 5 and Table 2). The overall temperature increase is also apparent from the decrease in cold days and the increase in hot days (Figure 6 and Table 2).

<sup>5</sup> Sources: National and district boundaries by the National Institute of Statistics of Rwanda. Base layer by Open Street Map contributors. Map composition by the authors.

Figure 5: Monthly averaged minimum (blue) and maximum (red) temperatures at Bigogwe, Kinigi and Ntaruka over the period 1991 – 2021. The light-blue and pink ranges indicate the maximum range during the month.

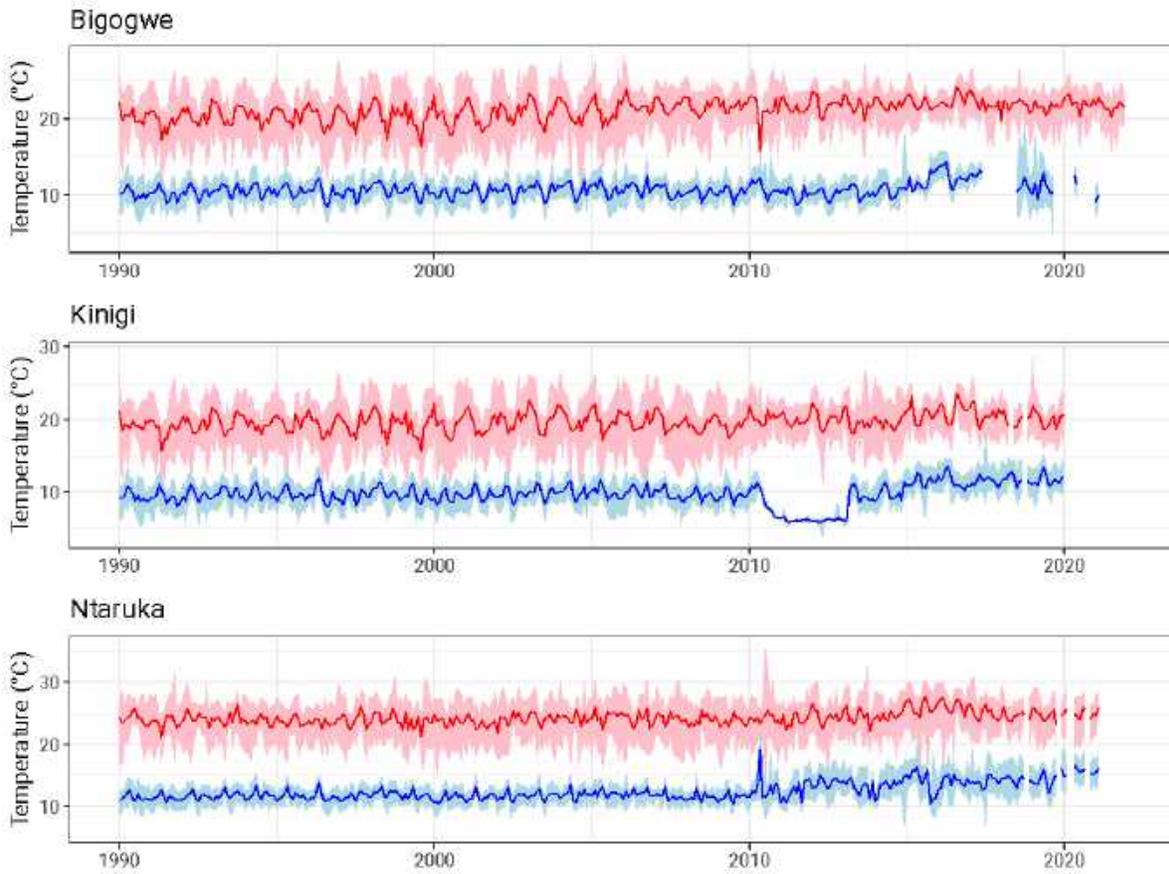


Figure 6: Increase in the number of hot days per year (red; CSDI1 indicator) and decrease in the number of cold days per year (blue; WSDI1 indicator) for Bigogwe (dashed), Kinigi (dotted) and Ntaruka (solid), over the period 1990 – 2021.

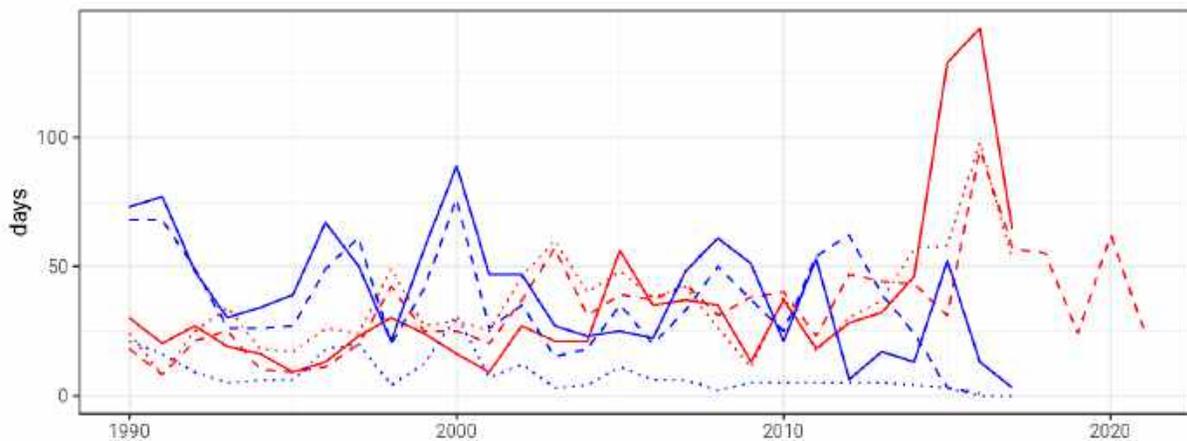
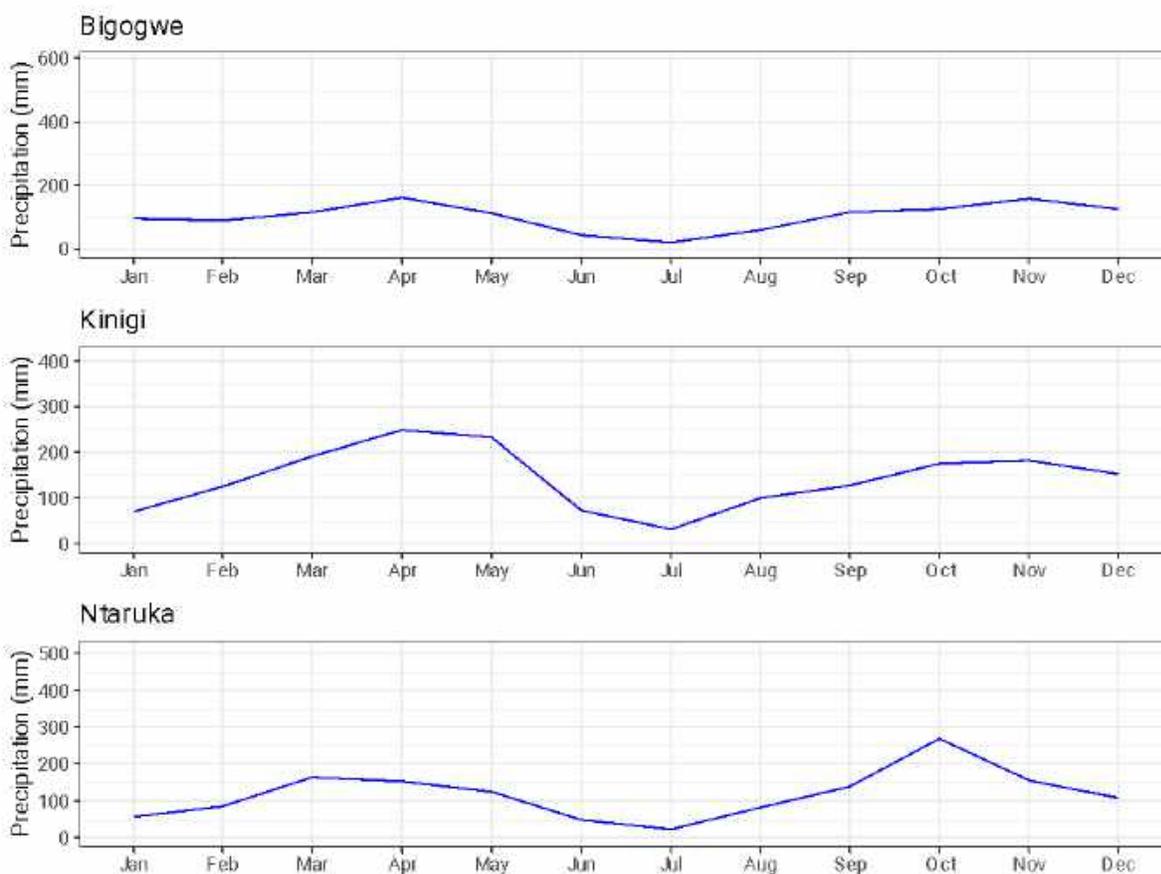


Table 2: Sen’s slope for key annual temperature indicators from Climpack analysis at Bigogwe, Kinigi and Ntaruka, over the period 1991 – 2021.

Indicator	Bigogwe	Kinigi	Ntaruka
TXx	-0.011	0.011	0.038
TXn	0.146	0.146	-0.023
TNx	0.038	0.029	0.152
TNn	0.050	0.040	0.011
WSDI1	1.333	1.000	1.137
CSDI1	-1.000	-0.245	-1.341

Figure 7: Monthly average precipitation and range over the period 1991 – 2020 at Bigogwe, Kinigi and Ntaruka.

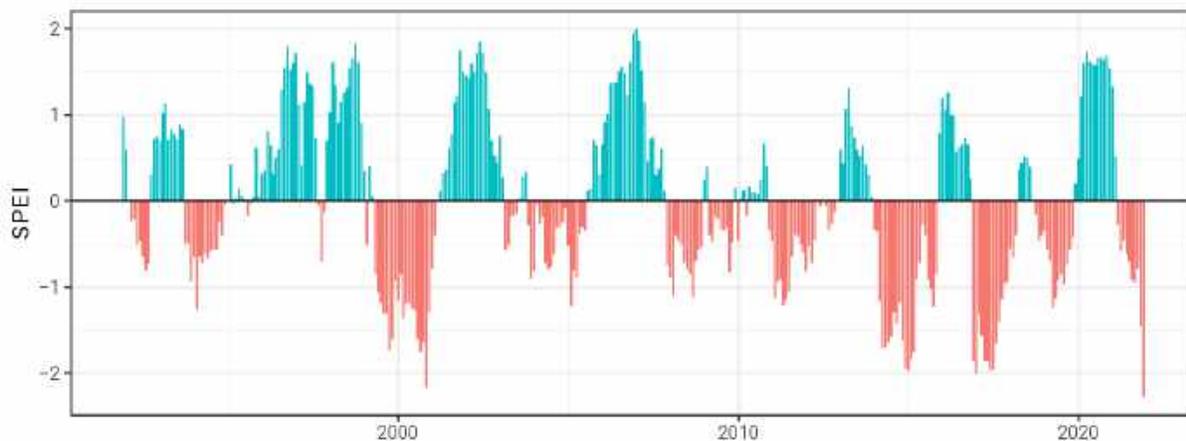


### 1.3.5 Precipitation

Average annual precipitation ranges from 1,232mm at Bigogwe, 1,714 mm at Kinigi and 1,406 mm at Ntaruka. The bi-modal pattern of precipitation that is predominant in the country is not very pronounced in the Volcano Region; the months of January and February still receive significant amounts of precipitation although less than the two adjoining “wet” seasons (Figure 7). Over the period 1991 – 2020 there has been very minimal change in the amounts of precipitation and its distribution throughout the year, showing no statistically significant trend. This is also obvious

from the standardized precipitation-evaporation index (SPEI) over the same period for Kinigi, which shows alternating wet and dry episodes but no significant trends (Figure 8).

Figure 8: Standardized precipitation-evaporation index (12 months) for Kinigi.



#### 1.4 Socio-economic profile of the Volcano Region

People living in the Volcano Region are less affluent and less literate compared to the national population. The Volcano Region has a bigger share of urban population since Musanze and Rubavu are secondary cities that are touristy and are near the DRC/Goma, respectively. Unlike other districts, Rubavu is more affluent compared to the whole country, due to cross-border trade with the DRC and income from tourism. Compared to the rest of the Volcano Region, Burera is less urban, less affluent, and less educated. The populations of Musanze and Rubavu are more prosperous since there are numerous economic activities influenced by the VNP, Lake Kivu, and the Goma border. There is a discrepancy between rural versus urban consumption (incomes), and the gap is wider for Rubavu and Musanze where there is more economic opportunity (Figure 9).

Most people in the Volcano Region are engaged in agriculture. A large proportion is working as independent farmers or as unpaid family workers, both at the national level and in the Volcano Region. A higher proportion of unpaid family farm workers is found in Burera. Nyabihu has more people getting paid for working on the farm. And this is primarily driven by the existence of agro-processing factories such as Mukamira Industry as well as pig production, which could be creating more jobs for the Nyabihu population. People getting paid for non-farm activities are more prevalent in Musanze and Rubavu as the participation of people in services is higher in these two districts. Rubavu has more non-farm entrepreneurs, and Burera has more farm entrepreneurs (Figure 10).

The data clearly shows a current dependency on agriculture in the area, and a planned park extension and infrastructure will affect livelihoods. It is therefore crucial to consider alternative sources of income as well as upgrading the agriculture market systems. These activities may include tourism, furniture, construction materials, agro-processing, agro-services, commercial high-yield agriculture, and others. We will consider opportunities for green transformation. For

example, exploring how modernized climate smart agriculture could be a sustainable and environmentally friendly way of improving livelihoods of the people residing in the Volcano Region.

Off-farm establishments in the Volcano Region are primarily micro enterprises with 1-3 employees, about 93% of all registered enterprises; this is very comparable to the national profile. Trade is the most dominant sector, followed by accommodation and food service activities. The share of trade is lower in Nyabihu and Burera as the two districts are more rural and agricultural. Overall, there are more enterprises in Musanze and Rubavu (Figure 11).

Figure 9: Brief socio-economic characterization of the four districts making up the Volcano Region

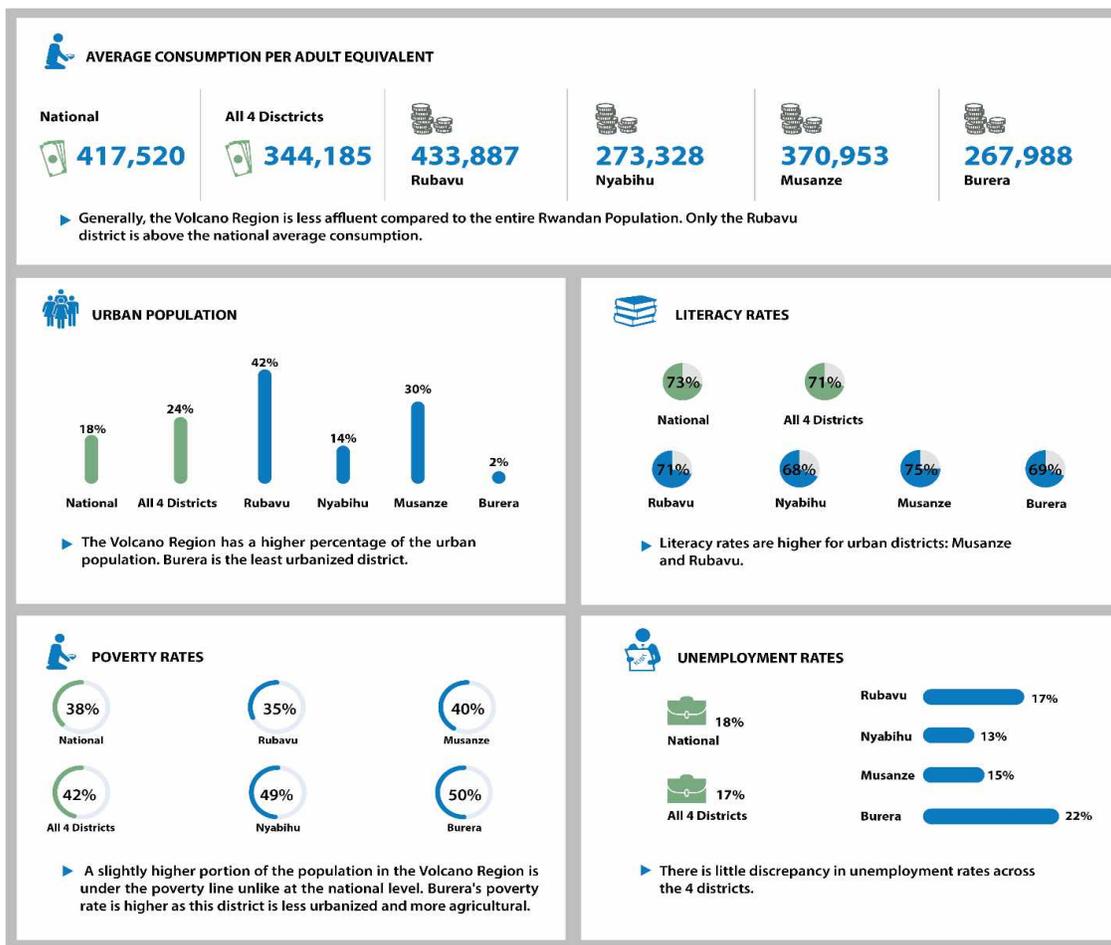


Figure 10: Distribution of labour by type in the Volcano Region.

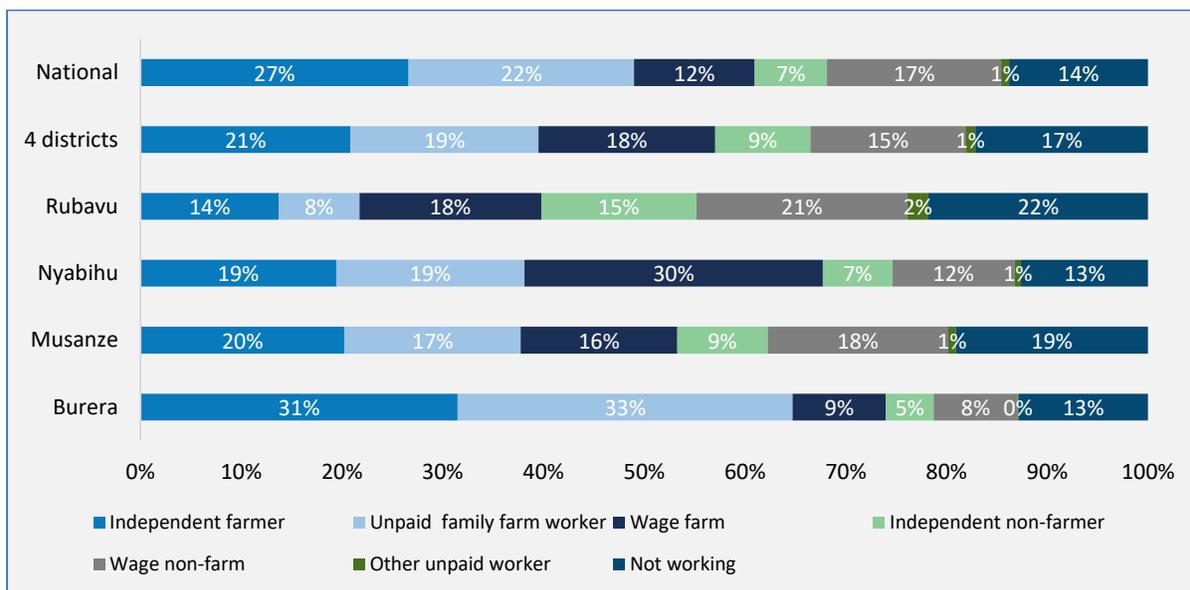
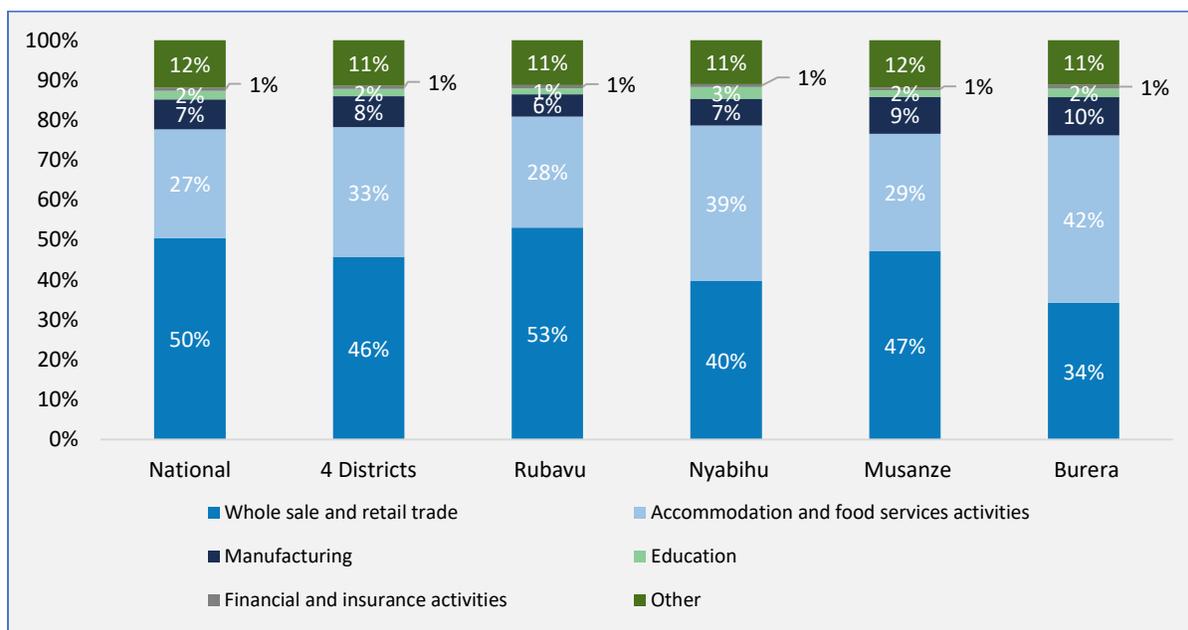


Figure 11: Off-farm business activities in the Volcano Region.



## 1.5 Demographic trends

The population of Rwanda has historically been growing fast, at approximately 2.6% per year in 2012 (NISR, 2012). In more recent years, however, the fertility rate has dropped by about 34%, from 6.1 births per woman in the period 2002 – 2005, to 4.1 births per woman in 2016 – 2019 (NISR, 2020). The projected increase in the total resident population for the year 2021 is 2.31%.

There has been significant unplanned settlement in fragile and sensitive areas, particularly following the 1994 genocide when nearly three million people returned from neighboring states to a war-ravaged countryside where they had to build up a new existence with little outside resources.

Rwanda's Vision 2020 intended that a proportion of at least 70% of households living in rural areas to settle in integrated viable settlements and that these planned settlements offer economic opportunities, favor rational land use and management, and accelerate servicing with basic social economic and physical infrastructures in rural areas. One of the challenges that the Government intends to overcome is to assist vulnerable communities living in high-risk zones from severe landslides and flooding.<sup>6</sup>

In 2011 the Integrated Development Program was set up as a multi-government institutions program headed by the Ministry of Local Government (MINALOC) Rural Settlements Task Force with a Steering Committee formed by MINALOC, Ministry of Defense, Rwanda Housing Authority, Rwanda Environment Management Authority (REMA), Ministry of Education, Ministry of Natural Resources, Ministry of Commerce and Industry, Ministry of Infrastructure, Ministry of Youth and ICT, and the Rwanda Agricultural Board. Annual action plans earmark funds for district

<sup>6</sup> Republic of Rwanda, 2012.

governments to support making available plots for rural housing as well as basic construction materials for the construction of model villages for vulnerable communities living in high-risk zones. Part of the strategy is to improve the efficiency of the use of land for construction by assisting the layout planning before settling, facilitating the fabrication and use of local construction materials, and constructing “4-in-1-house” and “2-in-1 house” types.

The intention of the Rural Settlements Task Force is the upgrading of rural settlements into integrated villages, providing opportunities for improved rural livelihood. Eventually, the locations will form types of mixed-use trading centers and be growth areas as part of the urban network.

## 1.6 Vulnerabilities and disasters

Due to the geophysical make-up of the Volcano Region, with steep slopes and friable soils in combination with intense seasonal rainfall, land use in the region is inherently susceptible to environmental disasters. The high population density and extreme poverty in the region imply that the land is intensively cultivated but without due regard for the geophysical risk of disasters, which are predominantly expressed through landslides and flooding. Geophysical disasters lead to economic losses at different levels: damage in infrastructure, crops and livestock; disruption of the economic system in communities where people were displaced; fiscal transfer to disaster response and crowding out of other functions as manpower is concentrated on disaster response rather than productive activities following a disaster.

The National Risk Atlas of Rwanda (MIDIMAR, 2015) identified problems as mainly due to the topography of the area, extension of agricultural activities on steep soil that were previously covered by natural vegetation, population growth, and lack of adequate soil erosion control measures. The landslide hazard assessment revealed that about 3.34% of the total population are exposed to a landslide at very high susceptibility with higher likelihood of hazard are mostly located in the Volcano Region. In 2018 in the four districts, 5,000 households (25,000 people) were affected by floods, of which 4,750 people from 950 households were directly affected. With the predicted increase in intense rainfall events as a result of climate change, the intensity of flooding may be expected to increase as well, with its concomitant impacts on the local population.

Rwanda sees a significant number of events rooted in environmental vulnerability that lead to losses and damages. The Ministry of Emergency Management (MINEMA) is the responsible government agency dealing with disaster preparedness and response and it regularly publishes statistics on disaster events by district (Table 3). While the losses and damages in the Volcano Region are not higher than in other areas of the country, they are still a significant burden on the development of the region into a resilient green economy. Project climate change is likely to exacerbate the situation unless mitigating measures are taken.

Table 3: Loss and damage in a number of key categories in recent years<sup>7</sup>

Year	Burera	Musanze	Nyabihu	Rubavu	Rwanda
<b>Deaths</b>					
2016	9	7	7	9	183

<sup>7</sup> Source: MINEMA, 2021.

Year	Burera	Musanze	Nyabihu	Rubavu	Rwanda
2017	6	2	6	2	82
2018	3	1	6	8	254
2019	2	8	2	1	134
2020	6	8	32	5	298
<b>Persons injured</b>					
2016	10	2	4	8	172
2017	3	8	2	16	151
2018	12	10	0	18	346
2019	5	5	3	4	271
2020	21	10	14	7	414
<b>Houses destroyed or damaged</b>					
2016	48	103	314	191	5,896
2017	44	231	81	301	5,802
2018	435	540	398	1,418	15,910
2019	61	46	42	185	5,691
2020	271	154	311	271	8,098
<b>Loss of crops (hectares)</b>					
2016	85	0	52	169	7,449
2017	4	266	44	22	5,277
2018	256	835	162	743	13,337
2019	32	24	39	32	10,610
2020	112	20	27	85	4,662
<b>Loss of livestock</b>					
2016	3	3	18	3	932
2017	1	11	9	4	590
2018	5	3	3	648	815
2019	4	2	3	2	113
2020	9	9	36	0	3,497
<b>Roads and bridges damaged</b>					
2016	0	0	0	1	42
2017	0	1	3	2	62
2018	19	1	3	11	96
2019	1	2	1	2	70
2020	9	2	8	5	257

## 1.7 Climate change projections

For the climate change projections, use has been made of a multi-model CMIP6 ensemble with the SSP2-4.5 scenario to determine anomalies over the epoch 2041 – 2060, relative to the current climatological normal period 1991 – 2020. The following CMIP6 models were used to construct the ensemble:<sup>8</sup>

ACCESS-CM2      CanESM5-CanOE      CNRM-ESM2-1      MIROC-ES2L

<sup>8</sup> The authors acknowledge the World Climate Research Programme, which, through its Working Group on Coupled Modelling, coordinated and promoted CMIP6. We thank the climate modelling groups for producing and making available their model output, the Earth System Grid Federation (ESGF) for archiving the data and providing access, and the multiple funding agencies who support CMIP6 and ESGF. The results contain modified Copernicus Climate Change Service information 2021. Neither the European Commission nor ECMWF is responsible for any use that may be made of the Copernicus information or data it contains.

BCC-CSM2-MR	CESM2	HadGEM3-GC31-LL	MIROC6
CAMS-CSM1-0 (precipitation only)	CMCC-ESM2 CNRM-CM6-1-HR	IPSL-CM6A-LR	MRI-ESM2-0

The graphs of multi-model CMIP6 ensemble data in this report indicate the 95% confidence interval of values from the separate models. The temporal horizon is the year 2050, coinciding with the expected lifetime of the investments in the green villages. To obtain more robust estimates, monthly data over the epoch 2041 – 2060 were averaged as representative for the year 2050, separately for each model. The ratio of these epochal averages to the corresponding average values over the current climatological normal period 1991 – 2020 was taken to cancel out model bias. This ratio therefore indicates the rates of change over the period considered, for each model. The individual models were then reassembled into a multi-model ensemble, and summary statistics generated, to arrive at the average of change over the periods considered.

### 1.7.1 Temperature

By the 2041 – 2060 epoch the daily maximum temperature is forecast to increase by approximately 1.2°C (+6%) relative to the 1991 – 2020 reference period. The nighttime temperature will increase faster (about +10%), with even larger increases in the June – August period (Figure 12 and Table 4). This implies that the diurnal temperature range will decrease by about 0.4°C.

### 1.7.2 Precipitation

The precipitation is expected to increase during the June – September period, although there is no agreement between the models for the months of June and September (Figure 12). The increase in June precipitation, while large at +24% to +112%, is not very concerning given that the current monthly precipitation is relatively low. The September precipitation increase (+110% to +127%), on the other hand, is of significant concern as it will effectively extend the wet October – December season by an additional month, increasing the likelihood of extreme precipitation events and flooding in the lowlands.

According to the WGI report of the Sixth Assessment Report (AR6) of the IPCC, extreme rainfall events with a significant risk of flooding are expected to see a “robust increase” in a +2°C world, consistent with the CMIP6 SSP2-4.5 scenario used in the analyses in this report.<sup>9</sup>

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<sup>9</sup> The 2021 Sixth Assessment Report of the IPCC, WG I, Technical Summary, states (TS.4.3.2.1) that “increases in heavy precipitation that can lead to pluvial floods (*high confidence*) are projected for most African regions”. For the South Eastern Africa (SEAF) region, table 11.5 of the main WG I report, “CMIP6 models project a robust increase in the intensity and frequency of heavy precipitation” for a +2°C world.

Figure 12: Relative minimum (blue) and maximum (max) temperature increases (left panel) and relative change in precipitation (right panel) at Gisenyi, Volcan Karisimbi and Lac Burera for the epoch 2041 – 2060 relative to the climate normal period 1991 – 2020 from

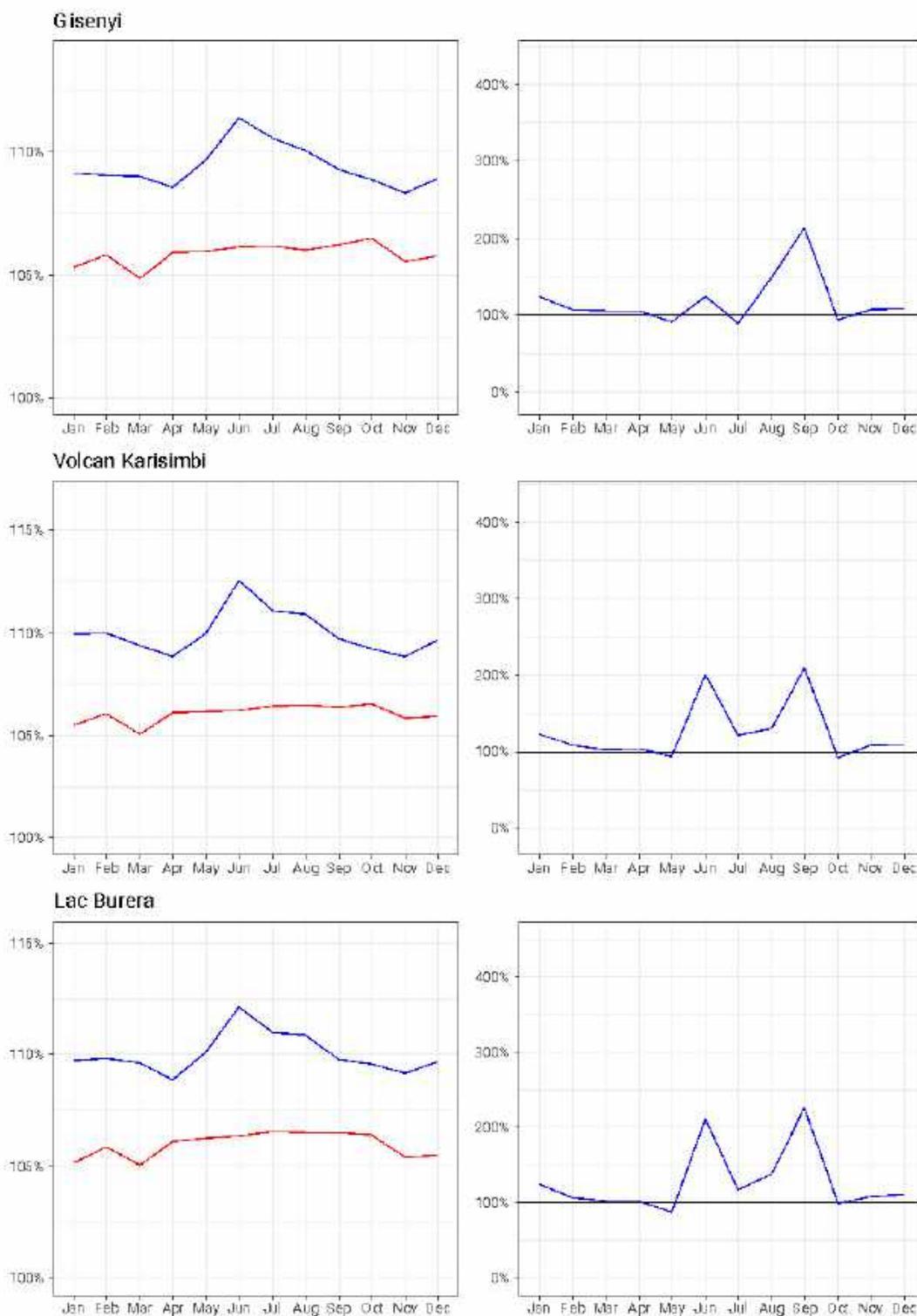


Table 4: Relative change in monthly temperature and precipitation over the epoch 2041 – 2060, relative to the climate normal period 1991 – 2020, using a multi-model CMIP6 ensemble with the SSP2-4.5 scenario.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Gisenyi</b>												
<b>Tmin</b>	1.09	1.09	1.09	1.09	1.10	1.11	1.11	1.10	1.09	1.09	1.08	1.09
<b>Tmax</b>	1.05	1.06	1.05	1.06	1.06	1.06	1.06	1.06	1.06	1.07	1.06	1.06
<b>Pr</b>	1.23	1.07	1.05	1.05	0.90	1.24	0.89	1.48	2.13	0.93	1.06	1.08
<b>Volcan Karisimbi</b>												
<b>Tmin</b>	1.10	1.10	1.09	1.09	1.10	1.13	1.11	1.11	1.10	1.09	1.09	1.10
<b>Tmax</b>	1.05	1.06	1.05	1.06	1.06	1.06	1.06	1.07	1.06	1.07	1.06	1.06
<b>Pr</b>	1.24	1.08	1.03	1.03	0.93	2.01	1.21	1.30	2.10	0.92	1.08	1.10
<b>Lac Burera</b>												
<b>Tmin</b>	1.10	1.10	1.10	1.09	1.11	1.13	1.11	1.11	1.10	1.10	1.09	1.10
<b>Tmax</b>	1.05	1.06	1.05	1.06	1.06	1.06	1.07	1.07	1.07	1.06	1.05	1.06
<b>Pr</b>	1.24	1.07	1.02	1.02	0.87	2.12	1.17	1.38	2.27	0.99	1.08	1.11

## 1.8 Climate change risk and impacts in the Volcano Region

The projected climate change in the Volcano Region, particularly the increase in precipitation, is expected to significantly increase the climate risk in the region. The climate hazard will increase due to increased runoff from the volcanoes to the lower areas, increasing the risk of flooding. The flooding is also expected to impact larger areas, leading to increased exposure of the households in the lower areas of the region.

The below sections elaborate on the increasing climate hazard and exposure, and implications for reducing the vulnerability to climate risks in the region, based on a detailed analysis of the Volcano Region using the HEC-RAS hydrological modeling software. Analyses have been conducted both for the current situation and the conditions predicted by the CMIP6 multi-model ensemble.

### 1.8.1 Climate hazard

The Kinigi and Rwankeri station rainfall intensity-duration-frequency (IDF) curves were adjusted for climate change per the relative change in monthly precipitation (Table 4). Due to the location of the stations, the Kinigi station rainfall observations were adjusted using the Volcano Karisimbi factors. For the Rwankeri gage, the observations were adjusted based on the averaged factors from the Volcano Karisimbi and Gisenyi factors. The observed monthly peak rainfall events were adjusted based on these factors and a Log-Pearson Type 3 (LPIII) extreme value analysis was performed to obtain the climate change adjusted rainfall depths for each recurrence interval.

The peak daily rainfall in each month was adjusted with the factors shown in Table 4 (Table 5). As Table 4 shows, some months can be expected to see a slight reduction in peak daily rainfall, where other months could see a significant increase in peak daily rainfall. By applying the monthly adjustments, the annual peak rainfall for a specific year could be the result of an event in a different month than the un-adjusted analysis. Years with had a large rainfall event in September would see a far larger adjustment to the peak rainfall event than for example a year with a small event in September, but the current peak rainfall event occurring in March of that year.

An LPIII analysis was performed on the climate change adjusted data for both the Kinigi and Rwankeri stations. The Kinigi station is representative for Region 1 and the Rwankeri station is representative for Region 2 in the Wagesho & Claire paper on which the IDF curves are based.

Figure 13: Annual peak daily rainfall events based on the current observations (light blue) and for the climate adjusted data (dark blue) for the Kinigi Station.

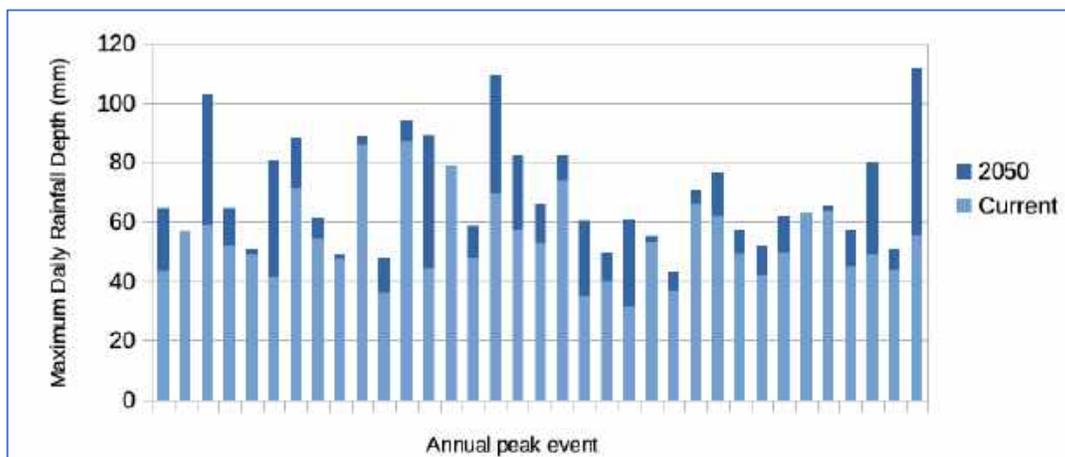


Figure 14: Annual peak daily rainfall events based on the current observations (light blue) and for the climate adjusted data (dark blue) for the Rwankeri Station.

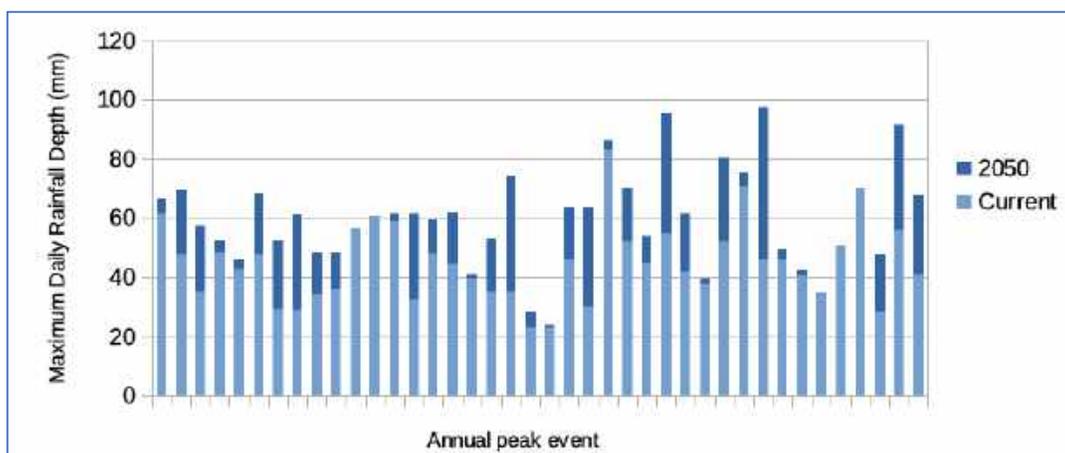


Table 5: Annual peak daily rainfall (mm) for the Kinigi and Rwankeri stations for different recurrence intervals for the observed data and the climate adjusted data

Recurrence interval	Kinigi		Rwankeri	
	Current	2050	Current	2050
2 years	52.1	65.9	43.2	59.0
5 years	64.7	82.2	55.2	73.7
10 years	72.7	93.1	62.6	81.4
25 years	82.5	107.1	71.4	89.3
50 years	89.8	117.7	77.7	94.2
100 years	96.9	128.5	83.7	98.4

In comparing the results presented in Table 5, the increase in peak rainfall intensity is over 30% for some recurrence intervals. Daily rainfall data can be useful in determining flood risk in large watershed, where the response of the river to a storm event is in the order of days. In much smaller basins, the sub-daily distribution of the rainfall will have an impact on the flooding. For example, if rain falls steadily at 2mm per hour, it is unlikely this will overwhelm the drainage systems (both natural and man-made). However, if this daily total of 48mm would have all fallen in a single hour, significant flooding is likely to occur. Observed rainfall patterns show that during large storms, over half of the daily total rainfall can occur in a single hour. To accurately capture the flooding potential, the available daily data needs to be disaggregated to sub-daily intervals. The interval should correspond to the size of the basin, with smaller basins requiring smaller intervals. Although small upstream areas of the watershed might respond quicker, the size of the watersheds in the Volcano Region warrant a time step of 1-hour to accurately capture flood risk due to rainfall.

SHER (2021) provided a review of the available methods in Rwanda to process daily data to obtain a higher resolution dataset. This review did not include the process used by FONERWA (2019), but from the provided description the method used was similar to the method used by Deltares for the Kigali area; this method was evaluated in the SHER report. The SHER report concludes that the Wagesho & Claire paper is the best method to use as it provides the proper spatial coverage for the project area and aligned with more detailed methods in areas outside the study area.

The Wagesho & Claire results were evaluated against the FONERWA (2019) results and showed to be within 10%, which can be considered very close given the uncertainty inherent to meteorology and data scarcity in the study region. As the SHER report pointed out regarding the Deltares study, even if the latest available sub-daily data would have been included, the sub-daily dataset would still be too small for a robust sub-daily distribution. The same will apply to the FONERWA study, making the Wagesho & Claire paper the preferred approach to determine the current rainfall intensities. The additional benefit of using the Wagesho & Claire paper is that this allows the application of the steps in this report to be easily applied to other regions within Rwanda.

The IDF curves in the Wagesho & Claire paper were updated with the adjustment factors, resulting in larger rainfall depth for each recurrence interval, as shown in Figure 15 and Table 6.

Figure 15: Existing (light green and light blue) and climate adjusted IDF (dark green and dark blue) for Region 1 (green) and Region 2 (blue).

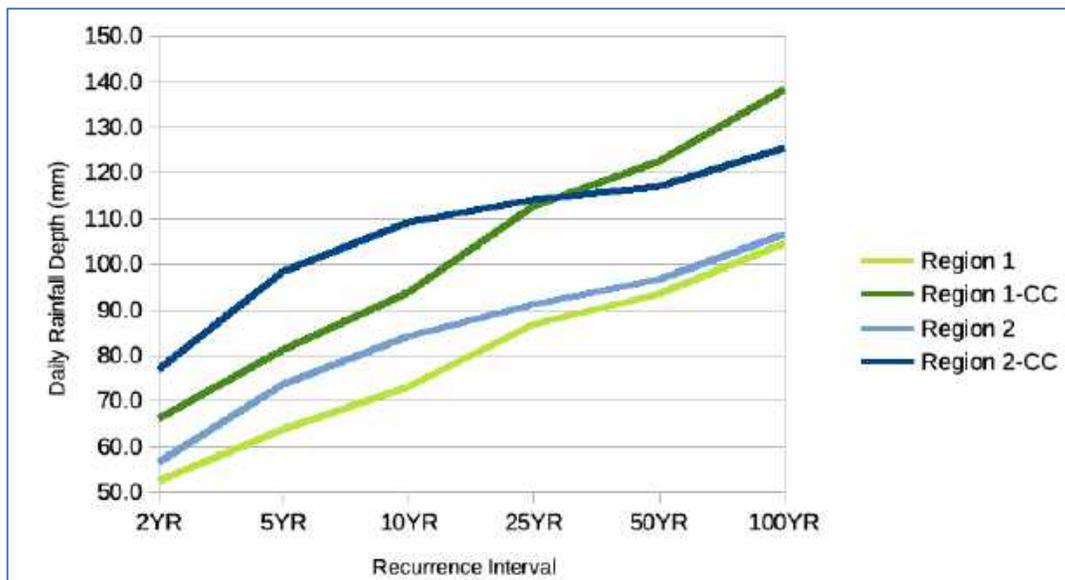


Table 6: Annual peak daily rainfall (mm) for Region 1 and Region 2 in the Wagesho & Claire paper for different recurrence intervals for the published IDF curves and the climate adjusted IDF curves.

Recurrence interval	Kinigi		Rwankeri	
	Current	2050	Current	2050
2 years	52.2	66.1	56.3	76.8
5 years	63.8	81.1	73.7	98.3
10 years	73.0	93.5	84.0	109.2
25 years	86.7	112.5	91.1	113.9
50 years	93.5	122.6	96.5	117.0
100 years	104.3	138.3	106.5	125.3

On the basis of this analysis, flood risk maps have been developed for the different recurrence intervals. Figure 16 shows areas that will be flooded in at different recurrence intervals, in some of the major catchment areas in the Volcano Region.



Considering the above analysis, future climate change is likely to lead to increased risks. The number of heavy rainfall days, or intensity of rainfall is projected to increase, raising the potential risks of floods, landslides, and soil erosion. This implies that current flooding and landslides that occur in the western areas will likely continue and could increase in future. The projected impacts of climate change are potentially undermining physical safety of households residing in precarious conditions, food security, health, and economic growth.

### **1.8.2 Exposure to the climate hazard**

Figure 17 indicates that built-up areas are concentrated in Cyuve and Rwebeya (holding Musanze Town in their downstream part) and smaller concentrations in Mwora, Muhe, Mutoba, Nganda, and Susa basins. Similarly, national roads exposed to floods are concentrated in Mutoba, Ngando, Cyuve, and Rwebeya (Figure 18). Additionally, Ngando has a long stretch of national

road which will be paved in the near future, increasing the asset value exposed to flooding value over time.

Figure 17: Exposure of physical assets from flooding in a 25-year event. White areas with a value of 0 are not at risk of flooding, with higher values and deeper colours indicating increased exposure to flooding (1 = forest; 2 = agriculture; 5 = built-up areas and infrastructure)

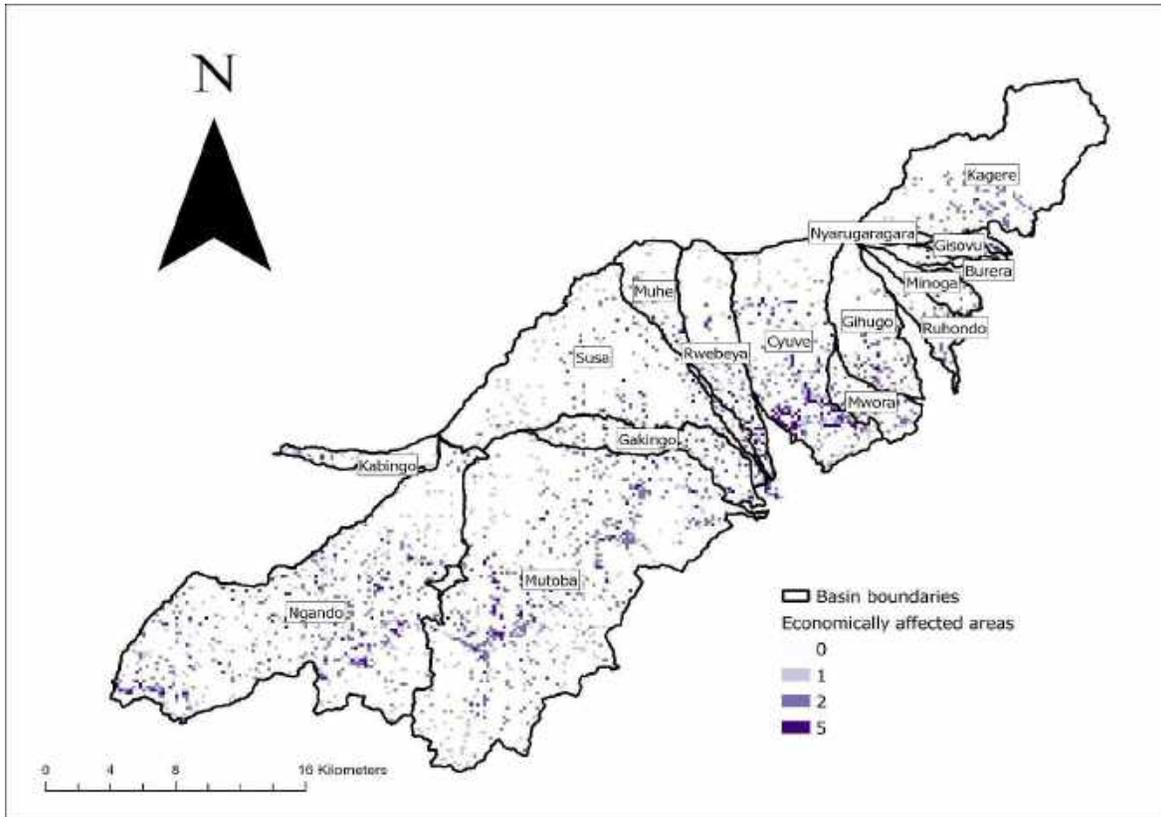
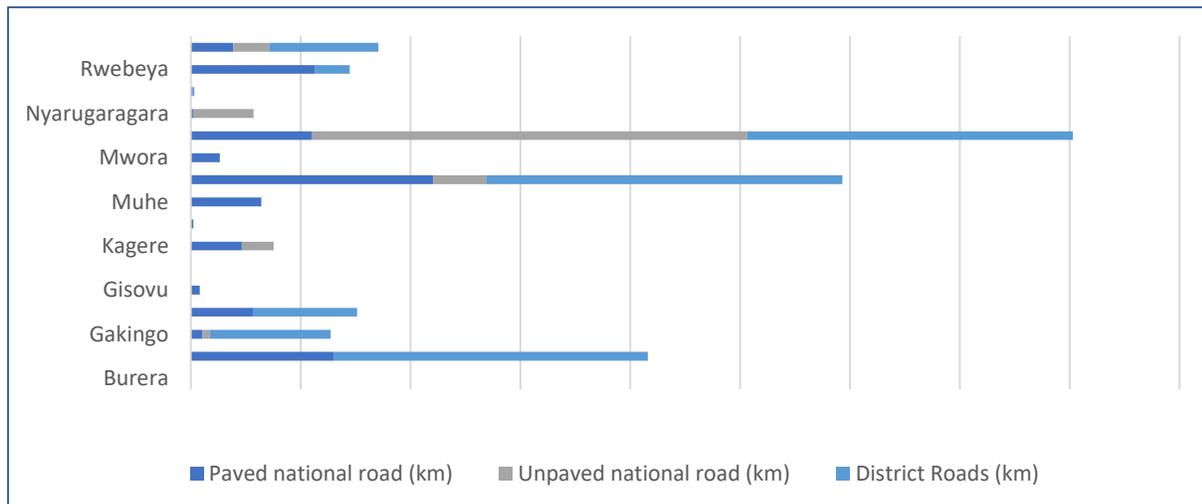


Figure 18: Roads exposed to flooding in a 25-year event across basins



### 1.8.3 Vulnerability to the climate hazard

Severe weather events, particularly droughts, have historically imposed heavy costs in Rwanda. The projected impacts of climate change may increase the frequency and compound the ramifications of these events, potentially undermining food security, health, and economic growth.

Although there is uncertainty associated with the future climate projections, climate change will have significant economic impacts in Rwanda. Given the high levels of uncertainty, it is difficult to accurately determine the economic cost of climate change. However, model estimations indicate that the additional net economic costs (on top of existing climate variability) could be equivalent to a loss of almost 1% of GDP each year by 2030, though this excludes the future effects of floods and other extremes. This estimate is therefore conservative.

There are indications that heavy precipitation – such as the number of heavy rainfall days, or intensity of rainfall – may increase, raising the potential risks of floods, landslides, and soil erosion. This could mean that current flooding and landslides that occur in the western areas will likely continue and could increase in future. Major flood events that occurred in 1997, 2006, 2007, 2008, and 2009 have caused fatalities, as well as infrastructure and crop damage. The impacts of these events are economically significant, with the 2007 flood causing an estimated direct economic cost of USD4 to USD22 million (equivalent to around 0.6% of GDP) for two districts alone. Future climate change could also significantly increase the health burden of malaria in Rwanda. Since malaria prevalence is influenced by temperature, rural populations living at higher altitudes have previously been at lower risk of contraction. Future projections, however, suggest warming of areas at higher altitudes, and the risk of contraction may thus increase by 150% by 2050. The increase in the disease burden is significant and could lead to full economic costs that are over USD50 million/year.

In recent years, higher temperatures, prolonged droughts, and elevated rates of evapotranspiration have led to disturbances in the hydrologic cycle and altered river flows. Climate change-induced temperature increase and precipitation variability may exacerbate negative impacts on lakes, rivers, and other important sources of water. This can have implications on the availability of water for hydropower and for distribution by utilities, such as those serving Kigali, which are already struggling to meet user needs. Other factors, such as the dearth of man-made storage, collection, and catchment systems, and changes in land use and cover associated with population and socio-economic growth, will also play an important role in shaping shifts in water resources.

Climate impacts of significance for agriculture and food security are likely to be temperature increases and more frequent droughts, with the nature and timing of impacts varying across regions. Climate impacts may alter the extent of areas suitable for agriculture and the length of growing seasons, affecting crop yields as well as hunger and nutrition. In addition, climate change may alter the occurrence and distribution of pests that may harm or ruin crops and livestock.

Climate change is poised to impact all sectors of Rwanda's economy, and to negate some of the country's remarkable development gains unless the country builds resilience and adaptivity to climate change. As Rwanda moves up the development ladder, it needs an investment strategy

that supports its economic growth and development aspirations – including those in Vision 2020, the Vision 2050 blueprint, and the National Strategy for Transformation (NST) while assuring the continuity and sustainability of such progress in the face of climate change.

### Households at risk per basin

Assessing the number of people affected and their adaptive capacity requires household level data at the basin level. The national household survey, EICV 5, produces data only at district level, so further assumptions are needed. We have used geospatial mapping of the basins to establish the rural and urban populations of each basin. Subsequently, we have used EICV 5 information on rural and urban populations in each of the districts, to estimate poverty rates, literacy rates, dependency of agriculture, and off-farm opportunities in each basin.

EICV 5 indicates the number of rural and urban households in each district and how much land each household owns. GIS data indicate the area of agricultural and built-up land in each basin. Combining this information can establish an estimated number of households on respectively a ha of agricultural and built-up land.

On agricultural land, EICV 5 indicates the average landholdings per rural household in each district. This is used to establish number of households per hectare (Table 7). From this, GIS data can establish the total number of rural households in each basin as well as the number of rural households at risk. Similarly, EICV 5 indicates the total number of urban households in each district. The number of urban households per hectare of built-up area can be established with total number of urban households by district and the ha on built up area from GIS.

Table 7: Assumptions used in calculating rural and urban households

Districts	Farmland per HH (ha)	Rural households (ha <sup>-1</sup> agricultural land)	Urban households (ha <sup>-1</sup> built-up area)
Burera	0.31	3.2	30
Musanze	0.28	3.6	190
Nyabihu	0.24	4.2	30
Rubavu	0.18	5.6	70

Table 8 shows the distribution of households in respectively rural and urban areas and district for each basin. This table is applied to convert EICV 5 data on vulnerability indicators into basin-level estimates on poverty, literacy, and dependency of agriculture and access to off-farm jobs. It is derived from GIS data on landcover combined with the estimated households per rural and urban hectares in Table 7.

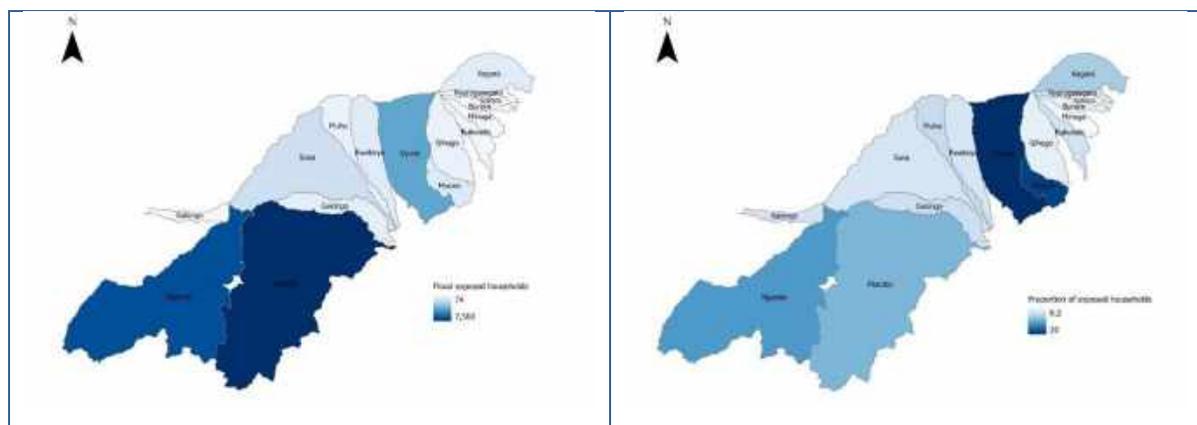
It is estimated that 25,000 households (100,000 people) are at risk of flooding disasters. Most of these households are found in rural areas. Mutoba, Ngando, and Cyuve have the highest households at risk, and they are the basins with the highest urban households at risk. The households at risk account for 13% of the total households in the region. Figure 19 clearly depicts how Cyuve has the highest share of exposed population compared to other basins.

Table 8: Rural and urban distribution of basins in districts

Basins	Burera		Musanze		Nyabihu		Rubavu	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban

Burera	99%	1%						
Cyuve	4%	0%	52%	44%				
Gakingo			99%	1%				
Gihugo	73%	1%	26%	0%				
Gisovu	100%	0%						
Kabingo					30%	0%	70%	0%
Kagere	97%	3%						
Minoga	92%	8%						
Muhe			64%	36%				
Mutoba			31%	4%	51%	13%		
Mwora			76%	24%				
Ngando			1%	0%	30%	3%	64%	2%
Nyarugaragara	95%	5%						
Ruhondo	98%	2%						
Rwebeya			52%	48%				
Susa			95%	5%				

Figure 19: Number of households at risk from flooding in a 25-year event (left pane) and proportion of households at risk (right pane)



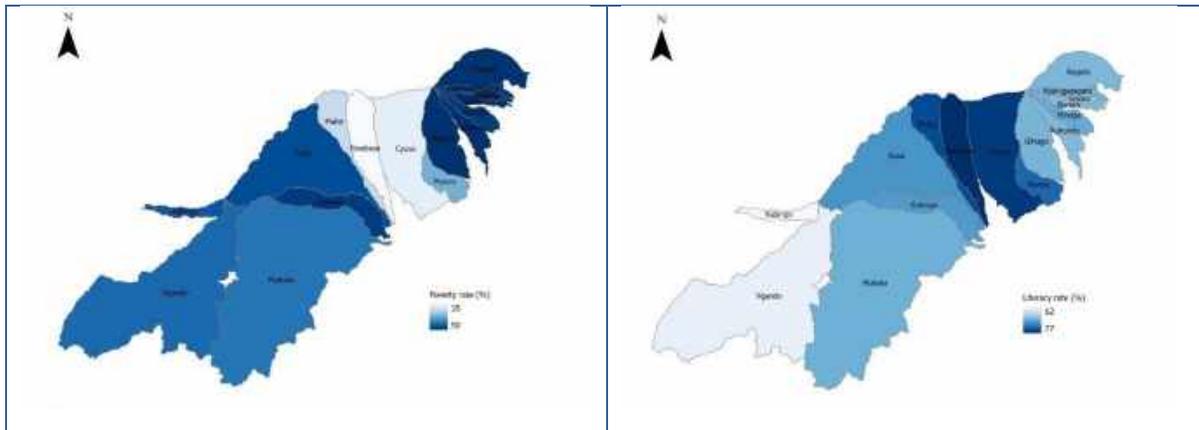
### Adaptive capacity

Overall, 45% of people residing in the selected basins for this study are below the poverty line. Muhe, Rwebeya, and Cyuve are more affluent as most of their parts are found in urban Musanze, which implies that people have higher incomes in these 3 basins. Households in Burera have higher poverty rates as the Burera district is predominantly rural. This sheds light on the existing low adaptive capacity in most basins, which seconds the importance of not only managing floods and mitigating their effects, but also coming up with interventions to lift people out of poverty and boost their adaptive capacity.

The literacy rate in the Volcano Region (16 basins) is 69%, versus 73% at the national level. Urban basins such as Rwebeya, Cyuve, and Muhe are the most literate basins, whereas Ngando and Kabingo are the least literate. The largest portion of Ngando and Kabingo are located in rural Rubavu, which has the lowest literacy rates.

The high incidence of poverty and low literacy rates can be used as proxy indicators for low adaptive capacity (Figure 20).

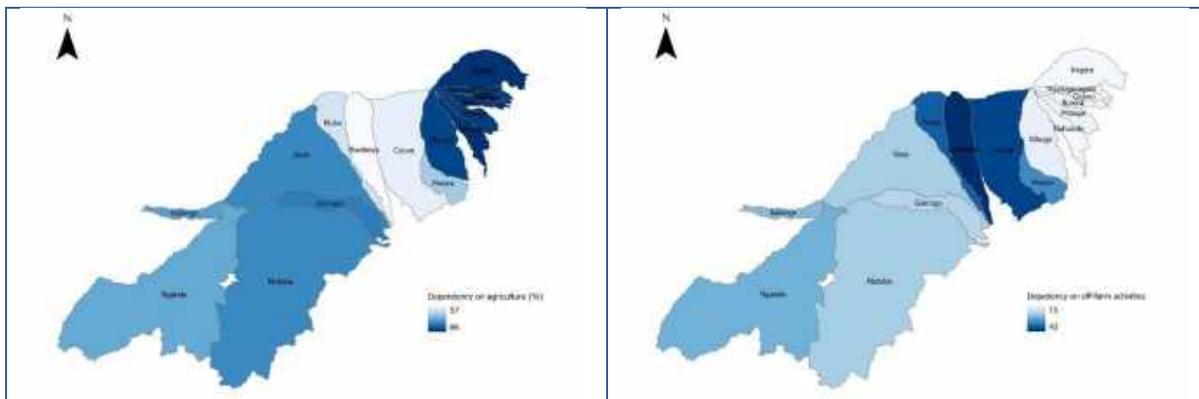
Figure 20: Poverty (left pane) and literacy (right pane) rates by basins



### Agriculture and off-farm activities

In the 16 basins, 73% of the working population is employed in agriculture, which is more than the national rate (70%), and the remainder (26%) participate in off-farm activities mainly driven by trade and construction sectors. Figure 21 shows that basins with high dependency on agriculture have fewer people working in off-farm economic activities. These two maps depict how the area is divided into three parts based on economic activities: 1) the northern-eastern part comprising basins that are in Burera district (Burera, Ruhondo, Nyarugagara, Minoga, Kagere) 2) the middle part with basins (Cyuve, Rwebeya, and Muhe) located, of most is in urban Musanze, and 3) the western-southern part with basins found in Nyabihu and Rubavu. The northern-eastern part has the highest share of people doing work in agriculture, of which is subsistence farming. The middle part has the highest dependency on off-farm activities such as tourism and hospitality and trade. And the western-southern region has high dependency on agriculture, but more involvement in off-farm economic activities compared to the northern-eastern part. This information sheds light on how the livelihood options being proposed should not only be implemented in Musanze, but also in other districts where people are still trapped in subsistence farming.

Figure 21: Percentage of working population in agriculture (left pane) and off-farm activities (right pane)



## **2. Project Objectives**

The overall objective of this project is to enhance climate resilience in the northern Rwanda through reducing vulnerability of local people to climate change impacts as well as improve households' adaptive capacity through sustainable climate-resilient livelihoods. The strategy of the project is to increase the ability of communities to cope with risks and effects from recurring floods, landslides and erosion by implementing a programme that blends sustainable settlements and alternative livelihoods in one of the most climate sensitive and vulnerable areas of Rwanda.



### 3. Project Components and Financing

Table 9: Project components

A6:B1A6:D14 Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount requested from Adaptation Fund (US\$)	GoR Co-financing (US\$)	Total Amount
1. Resettling households living in high-risk zones to a smart green village	1.1. Constructing climate resilient green village with 402 dwelling units	Reduced vulnerability to climate change impacts and increased access to economic and social infrastructure	6,757,585	9,222,115	15,979,700
	1.2. Provision of social amenities		640,000	660,000	1,300,000
	1.3 Capacity building of beneficiaries in construction and maintenance of the smart green village		200,000	331,000	531,000
2. Transitioning from low to high value agriculture	2.1. Promote the use of greenhouses at by communities to intensify the growing of high value horticulture destined for the Kinigi high-end tourism hotels	Increased household incomes through the adoption of climate smart agriculture	300,000	0	300,000
	2.2. Promote the diversification into the cultivation of horticulture (mushrooms, cherry tomatoes, herbs, garlic, ginger, etc) that destined for the high-end tourism market in Musanze and Kigali		200,000	0	200,000
	2.3. Develop a sustainable bamboo agro-forestry industry		120,000	0	120,000



Annex 5 to OPG Amended in October 2017

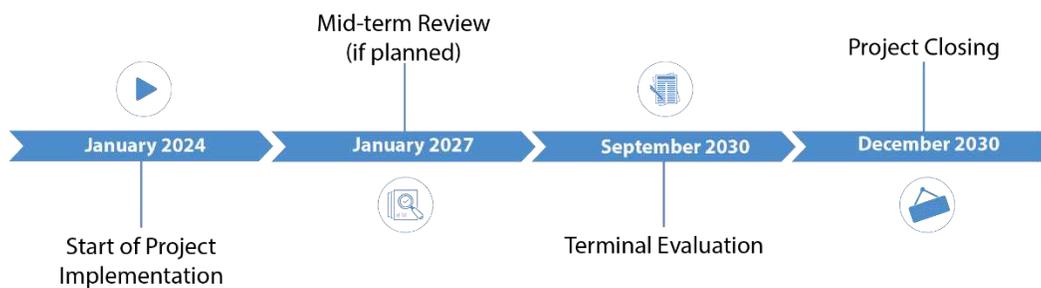
ADAPTATION FUND				
	that supplies – construction, food, and FMCG products			
	2.4. Develop community-based poultry industry that supplies meat and eggs to the high-end tourism market in Kinigi and Kigali		60,000	0
3. Diversification of income generating activities/livelihoods	3.1. Develop cottage industries making unique community handicrafts targeted at the tourism market	Diversified livelihoods, enhanced technical skills, and community tourism	50,000	0
	3.2. Create a cultural art village that generates awareness of and promotes the local culture in Kinigi		200,000	0
	3.3. Establishing a bamboo FMCG production unit		400,000	0
	3.4. Enhance technical and vocational skills for 1000 youth that would link the community into the services and construction sectors		100,000	200,000
	3.5. Establishing a cooking pellet processing unit		200,000	0
	4. Project/Programme Execution cost			750,000
5. Total Project/Programme Cost		9,227,585	10,413,115	
6. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)		0	982,035	
<b>Amount of Financing Requested from Adaptation Fund</b>			9,977,585	
<b>Amount Co-Financed by the Government of Rwanda</b>				12,145,150



<b>Total Budget</b>	ADAPTATION FUND			22,122,735
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## 4. Projected Calendar

Figure 22: Project timeline



## PART II: PROJECT /PROGRAMME JUSTIFICATION

### A. Project Components

#### 1. Component 1: Resettling households living in high-risk zones to a smart green village

Rwanda has a current program to resettle families in precarious housing situations to planned developments (*imidugudu*), providing the resettled households with facilities that are hitherto not available to them, including basic facilities such as potable water, sanitation, electricity, as well as local services such as schools, markets and churches. Under this output 402 families currently housed in precarious conditions on the steep slopes in the project area will be offered relocation to a local *imidugudu*.

This component is a scaling up of a previous project financed by the Adaptation Fund (AF): “Reducing vulnerability to climate change in northwest Rwanda through community based adaptation”. This project was implemented by MoE over the period 2014 – 2019. This component has the following concrete outputs:

- 1.1. Constructing climate resilient green village with 402 dwelling units
- 1.2. Provision of social amenities
- 1.3. Capacity building of beneficiaries in construction and maintenance of the smart green village

Beneficiary families will be trained and then provide manual labour build their new home under supervision of the building engineer to reduce cost and to create ownership, understanding and autonomous long-term maintenance. This component will be funded by the Adaptation Fund and the Government of Rwanda

The outcome of this component is **reduced vulnerability to climate change impacts and increased access to economic and social infrastructure**

##### 1.1. Constructing climate resilient green village with 402 dwelling units

Under this output, 402 households will be relocated from a high-risk zone to a smart green village. The Adaptation Fund will cover 170 housing units while government’s co-finance will fund the construction of 232 housing units. Households to be relocated currently reside in Kinigi sector in Nyabigoma cell in 9 villages. This cell has a population of 5,632 residents living in 1,353 households. Not all households are going to be relocated. The programme is aiming to relocate 402 households where the Adaptation Fund will fund the construction of 200 housing units and the Government of Rwanda will co-finance 202 houses. The recent socioeconomic baseline survey conducted for a 304-household sample highlighted the following about the community to be relocated.

- Poverty - 56% of these households were classified in Ubudehe category 3, 33% in category 2, and 11% in category 1<sup>10</sup>. Education – 94% have primary level education (the majority between 1-4 years); 1% of respondents have a diploma or university degree and 5% have only completed secondary school or received a vocational training education<sup>11</sup>. There are no gender differences in educational attainments across the surveyed

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<sup>10</sup> ibid

<sup>11</sup> ibid

population. The proportion of households with primary school graduates is higher compared to households with members that possess advanced degrees.

- Literacy - Most respondents are literate in Kinyarwanda and have not completed primary school. Women respondents have a higher percentage of the illiteracy compared to men.

The survey was also used to assess sources of income and the types of crops that households in the community were cultivating.

- Farming is the most common source of income to many households in Nyabigoma cell. Households primarily cultivate Irish potatoes and pyrethrum. Beans and maize are also cultivated but not substantially.
- In addition to their own farming, households also earn a living from providing labour on other farms. More than half of households earn income from livestock. On average, farming own crops has a 51% share in a household income<sup>12</sup>. Although a third of households indicated that they receive income from off-farm activities, this source only accounts for a small proportion of the household income on average.

The Smart Green Village will have the following attributes:

- 402 housing units (200 funded by the Adaptation Fund and 202 by the Government of Rwanda) with an average 75 square meters per family and plots of 300m<sup>2</sup> built in a 2-in-1 housing model by beneficiary families under the supervision of a building engineering firm;
- Green homes: structurally sound seismically safe homes, built with locally sourced materials, with passive ventilation, climate-smart responsive building siting/orientation, following latest Rwanda Building Code standards such as DRS 484 Adobe Block Specification, Technical Guidelines on Adobe Block Construction in Rwanda. See Chapter 4, Basis of design for the 2-in-1 house, for detailed engineering loadings and standards;
- Smart Green infrastructure: water collection and recycling/reuse in homes and farmland, access to affordable and sustainable electricity such as solar, all units provided with clean water supply, zero-energy waterless composting toilets with waste revalorization with outputs of solid fertilizer as well as Nitrogen-rich liquid fertilizer, promoting waste to resources and a circular economy approach.
- Solid Waste management: separation of organic waste from non-biodegradable waste providing appropriately designed compost stations at community level for organic waste and a central waste transfer facility at community level for plastic, metal, wood, waste and other recyclable materials also promotes a circular economy and waste to resources approach.
- Integrated Water Management: Water conservation and watershed management with Sustainable Drainage Systems, Bioswales, Rain-gardens, and Retention ponds. Stormwater design to naturally treat pollutants, provide erosion control and natural water filtration that prevents valuable soil runoff and provides more clean drinking water;
- Climate Smart Conservation agriculture: 0.1ha (1000 m<sup>2</sup>) of agricultural land per family with increase agricultural productivity practices, with organic and local climate-resilient

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<sup>12</sup> quantitative survey of sampled households in Nyabigoma cell, 2021

variety of seeds, and conservation best practices such as agroforestry that support increased biodiversity;

- Restorative landscape: Restore landscape and integration of edible landscapes in village fabric along streets and pedestrian paths to maximise food production, provide shade, and sequester carbon.
- Regenerating Ecosystems: use of native plants to support biodiversity and ecological health integrated within the village design with natural corridors connecting with wider ecosystems.

The architectural design of the housing units was developed with the following considerations in mind:

- Sustainability – reduce the environmental and carbon impact of the building through the selective use of materials
- Local Fabrication (Lo-fab) – encourage the use of local materials and crafts in the construction that promotes economic growth and education
- Innovation – use appropriate innovative materials and construction techniques that advances the local construction industry
- Cost efficiency – meet the projects aspirations with cost effective solutions
- Safety – provide structural robustness in the permanent case and ensure the building can be constructed safely
- Durability - design and detail the building to be long lasting with minimal maintenance - prolonging the value of the investment
- Comfort - provide sufficient ventilation and cooling to ensure occupants are both productive and healthy.

In addition, potential beneficiaries of the Smart Green Village have been consulted prior to the design phase to capture their preferences, which were also considered.

## 1.2. Constructing community buildings

In addition to housing units and infrastructure, the Smart Green Village shall also have a Village Hub, ICT Smart Plan, which is an integration of community public and civic buildings that will offer basic health, education services as well as opportunities for new off-farm jobs. These will include a health center, an early childhood center (nursery school), a mini market, a multipurpose hall with Office of local leaders, ICT community room, and Police station. The multipurpose hall will provide space to hold different meetings, events and ceremonies including for increasing community-awareness on climate-change, disaster risk mitigation, ICT Capacity Building and Skill Development, TVs, historical and cultural events. The ICT room will have Irembo services such as tax declaration and driving permit. School students and rural people shall be allowed to use the computer for consulting internet and use of Irembo services free of cost from the ICT community centre.

Table 10: Budget breakdown for social amenities

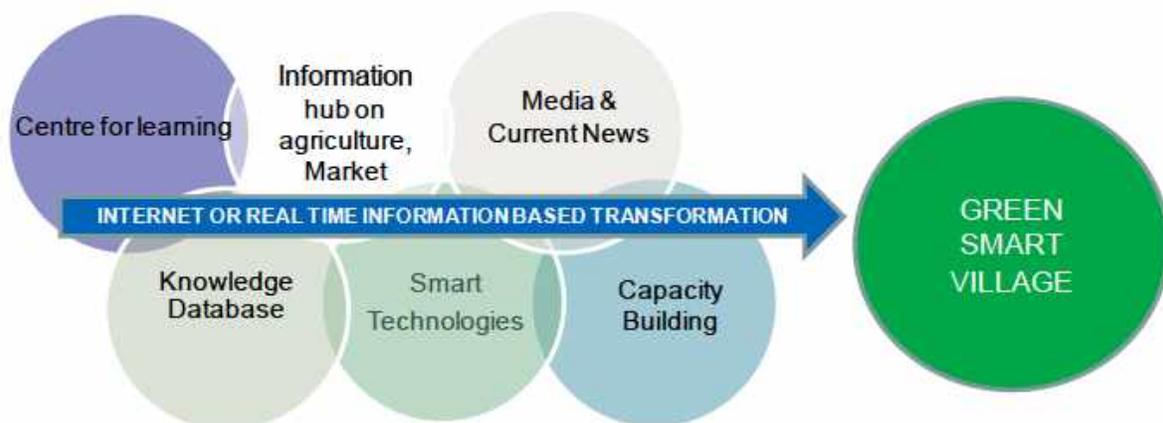
	Area	Unit	Rate	Amount
Health Post	200	m2	\$550.00	\$110,000

Early Childhood Center (Nursery)	500	m2	\$550.00	\$275,000
Mini Market + Post Harvest	1000	m2	\$550.00	\$550,000
Multipurpose Hall	400	m2	\$550.00	\$220,000
Office of local leaders	100	m2	\$550.00	\$55,000
ICT Community knowledge centre (Irembo)	50	m2	\$700.00	\$35,000
Police post	100	m2	\$550.00	\$55,000
<b>TOTAL</b>				<b>\$1,300,000.00</b>

The aim of the Village Knowledge hub with the provision of the ICT Community knowledge centre in the Multipurpose Hall is to have a SMART Green village which will be part of the following:

- Centre for learning and innovation. Training of farmers in modern farming techniques.
- Information hub will help transform agriculture into a viable market-oriented venture.
- ICT Community knowledge centre complete with computers and internet connection to help farmers get information on markets and integration of Irembo services.
- “Smart technologies” shall create more efficient systems and better-informed communities and village residents.
- Economic development and the creation of jobs.
- Promoting resource efficiency and mitigating climate change.
- Running Green villages more efficiently Supporting communities.

Figure 23: Internet or real time information- based transformation<sup>13</sup>



Villagers will be empowered by the presence of a hub delivering ICT and non-ICT products and services on many grounds:

<sup>13</sup> A toolkit for the development of Smart Green Villages in Rwanda, REMA, 2015

- Obtain valuable information through the internet on local or national political issues or on work-related issues, such as agricultural prices.
- Villagers can communicate through access to new communication technologies. They can share news with families and friends, network and share with business partners, develop information and broadcast it on the web, and make their opinion heard at different levels on various online platforms and forums;
- People from rural areas save money and time as products and services, such as administrative documents, are made available via their Village Knowledge Hub (ICT/ telecentre), thus eliminating the need to travel to large towns to access them;
- The Village knowledge hub services can also increase employment opportunities in rural areas:
  - ICT skills enable the local population to apply to more types of jobs as skilled workers. These skills can also support villagers to open new enterprises, or strengthen the management capacities of existing ones.
  - Village Knowledge Hub contributes to the reinforcement and creation of local micro, small and medium enterprises (MSMEs).

Finally, by providing an online and physical platform to buy and sell services and products, the Village Knowledge Hub increases the possibilities for businesses to sell and adapt themselves to local demands.<sup>14</sup>

### **1.3. Capacity building of beneficiaries in construction and maintenance of the smart green village**

Adaptive use of traditional local materials also allows for more of the labor associated with construction to be performed by residents. Constructing the community buildings can provide a skill building opportunity, helping train residents for construction of their own homes and giving them skills for future non-farm work.

During the construction phase of the model village, beneficiaries will first be trained on construction and site preparation. This will be an integral part of creating local ownership of the model village. The training will also empower beneficiaries, especially those who would like to enter the construction sector with skills, which can help them earn a living from construction works.

After the village has been set up, households will be trained on the use and maintenance of the houses including rainwater harvesting, waste management systems, how to use and maintain renewable energy infrastructure, cooking places, bathrooms, lights, and more. This training will ensure that beneficiaries feel responsible for houses, which will enhance the project's sustainability.

Table 11: Capacity building for green housing sustainability

No	Training topic	Potential beneficiaries	Expected duration per training session

<sup>14</sup> A toolkit for the development of Smart Green Villages in Rwanda, REMA, 2015

2.1.1	Construction skills (carpentry, electricity, plumbing, masonry)	Beneficiaries of the green model village	4 weeks for each skill
2.1.2	Use of houses and maintenance of different components of the houses	Beneficiaries of the green model village	1 week
2.1.3	Management of renewable energy systems such as biogas	Beneficiaries of the green model village	2 weeks
2.1.4	Management and monetization models of waste	Beneficiaries of the green model village	2 weeks

## 2. Component 2: Transitioning from low to high-value agriculture

Under this component, high-value crops and livestock that target high-end tourism market in the region will be introduced. Among households to be relocated, farming their crops is the most common source of income with a 51% share in a household income. Although a third of households indicated that they receive income from off-farm activities, this source only accounts for a small proportion of the household income on average. In addition, most households reported to have experienced a change in their income in the past 2 years, of which is negative change. The decrease in income can be attributed to a decrease in harvest as many farmers have highlighted in the focus group discussions that were conducted. This decrease in harvest is being caused by climate change impacts such as heavy rainfall, shift in the start date of rainy seasons, soil erosion, etc. Also, the majority of households to be relocated indicated that their preferred source of income is agriculture.

Table 12: Preferred sources of income

Preferred sources of income	Adults (respondents)	Male youth	Female youth
Agriculture	70%	68%	64%
Animal raising	15%	6%	
Crafting	3%	10%	2%
Carpentry		2%	1%
Tailoring	1%		27%
Other	11%	14%	7%

These households face challenges such as small plots of land, low access to markets, climate change events such as intense rainfall that leads to floods and soil erosion that impede productivity in this sector. This highlights the need of livelihoods enhancing the modernization of agriculture to help farmers shift from low to high-value agriculture.

The outputs for component 1 are: i) promote the use of greenhouses at by communities to intensify the growing of high value horticulture destined for the Kinigi high-end tourism hotel, ii) promote the diversification into the cultivation of mushrooms, cherry tomatoes, herbs, garlic,

ginger, and other vegetables that destined for the high-end tourism market in Kinigi and Kigali, iii) develop a sustainable bamboo agro-forestry industry that supplies – construction, food, and FMCG products, and iv) develop community-based poultry industry that supplies meat and eggs to the high-end tourism market in Kinigi and Kigali.

The outcome of this component is **increased household incomes and food security through the adoption of climate smart agriculture**

### **2.1. Promote the use of greenhouses at by communities to intensify the growing of high value horticulture destined for the Kinigi high-end tourism hotel**

Climate change poses a significant threat to farmers, which affects their yields and their ability to tap into local and regional markets and keeps them trapped in extreme poverty. More than 86% of interviewed households mentioned that it has been raining more compared to 10 years ago. About 40% expressed that the rainfall variability is much more intense. The majority of households to be relocated reported that have been negatively impacted by this rainfall variability.

To address this challenge, this project will enable relocated households and host communities to have access to the greenhouse technology to cultivate vegetables on a large scale and in good conditions, which will enable them to supply their produce to hotels in the Kinigi sector. With greenhouse farming, farmers will able to reduce the effects of unfavorable weather conditions such as high temperature, strong winds, heavy rainfall, hailstorms and as well as pests and diseases on crops, hence leading to increased yield. As a livelihood activity in the smart green village, 7 greenhouses will be provided to benefit the 402 relocated households and their surrounding communities.

### **2.2. Promote the diversification into the cultivation of horticulture (mushrooms, cherry tomatoes, herbs, garlic, ginger, etc) that destined for the high-end tourism market in Musanze and Kigali**

The introduction of greenhouses will enable farmers to shift from high to low land-intensive crops such as mushrooms, cherry tomatoes, herbs, garlic, ginger and other vegetables. These crops are high value compared to potatoes, beans, and other subsistence crops that households usually grow.

Under this output, farmers will be provided with trainings on the cultivation of these crops, and in addition, access to agricultural inputs such as seeds, fertilizers, and pesticides will be subsidized. In addition, farmers will be linked to markets such as hotels and restaurants in Musanze and Kigali.

### **2.3. Develop a sustainable bamboo agro-forestry industry that supplies – construction and FMCG products**

Given the restricted access that is linked to wood/timber through Rwanda's "sustainable forests and agroforestry" strategy, it is essential to find alternative materials in the construction sector that are climate resilient and sustainable. Houses in Rwanda currently use resources that are not produced by rural communities – steel roofing sheets, cement, trusses, doors, flooring, etc. The exception is bricks, but substantial energy mainly derived from firewood is used in their production. This exacerbates deforestation, soil erosion and loss of fertility. Eventually, their

production could lead to an increase in land degradation, to such a point that it would no longer be cultivable since all the clayey topsoil would have been removed. Reducing usage of conventional materials such as wood/timber considerably reduces the degradation of forests and land in the country.

This output entails bamboo forest farming with the goal to replace wood usage in construction and in the production of fast-moving consumer goods (FMCGs). Bamboo can be rapidly proliferated as a construction material as it is highly renewable and a good substitute for traditional wood/timber inputs. Under this output, 24,000 bamboo plants will be planted on a 50-hectare land - 5 ha will be in the smart green village and 45 ha in surrounding villages. Bamboo farming will create jobs from plantation to harvesting.

#### **2.4. Develop community-based poultry industry that supplies meat and eggs to the high-end tourism market in Kinigi and Kigali.**

Rwanda is one of the African countries with the lowest consumption of poultry meat per capita, only 0.2 kg of chicken meat consumed per capita per year in 2011. The Volcano Region households recorded 20% egg consumption and 3% live chicken consumption in 2017. In Rwanda, egg consumption counted for 0.63kg/person/year in 2014, against an African average of 2.5kg/person/year. The growth and extension of programmes such as OneEgg, School Feeding Programme, and the World Food Programme fosters demand for eggs.

The next 10-year projection shows a shift in meat production with 32% of total meat to come from chicken. Investment in poultry fits Rwanda's small size, even for farmers without big acres of land. Small scale farms have 1000 chicken capacity or less. Eggs from layer hens are a stable and affordable source of protein as well as potential source of income when commercialized.

This output aims to support relocated households in poultry farming. In the Smart Green Village, a 600 m<sup>2</sup> poultry farm will be constructed to house 6,000 chickens that can produce 1,200,000 eggs a year, which can generate revenue of USD 100,000 a year. This poultry farm will create full time jobs for relocated households and surrounding communities. In addition, the farm will help address malnutrition issues among children.

### **3. Component 3: Diversification of income generating activities/livelihoods**

In addition to modernizing the agriculture sector, there is a need to empower communities to have alternative sources of income. Since most people in the Volcano Region have no primary education let alone secondary education and have not received vocational training, the majority is doing work in subsistence agriculture, especially in rural areas. This information highlights the need to build people's capacity in off-farm skills by creating spaces that enable the population to acquire technical skills that can help them transition to an off-farm economy.

This component aims at creating new business opportunities for relocated households and surrounding communities all that is aimed at increasing resilience to economic, social, and climatic shocks. The component has the following outputs: i) develop cottage industries making unique community handicrafts targeted at the tourism market, ii) create a cultural art village that generates awareness of and promotes the local culture in Kinigi, iii) establishing a bamboo fast-moving consumer good production unit, iv) enhance TVET infrastructure and skills that would link

the community into the services and construction sectors, v) establishing a cooking pellet processing unit. The tourism and manufacturing sector will be strengthened as a result. The outcome of component 3 is **increased incomes through diversified livelihoods, enhanced technical skills, and community tourism.**

### **3.1. Develop cottage industries making unique community handicrafts targeted at the tourism market**

Among interviewed households, 10% of their male youth would like to have crafting as their source of income while 27% of female youth have tailoring as their source of income. Musanze district is one of the most important touristic sites in Rwanda due to Volcano National Park that hosts the rare mountain gorillas. Around 15,000 gorilla permits are sold every year. This growing tourism sector in the Region creates opportunities for local people to be part of visitor experience through unique and durable handicrafts.

Under this output, relocated households and surrounding communities will be trained in handicrafts and offered raw materials to start producing crafts. Extensive range of handicrafts that will be made include wooden products; ceramics and pottery; hand textiles and hand-loomed products; embroidery and woven products; basketry and mats. The Volcano Region offers vast access to raw materials needed for handcrafting: wood, bamboo, reeds, banana fiber, clay, stones, etc. Producers of these crafts will get a chance to exhibit their crafts in the cultural art village described in the next output.

### **3.2. Create a cultural art village that generates awareness of and promotes the local culture in Kinigi**

The government of Rwanda through the Tourism Board has positioned the country into one of the leading Tourist destinations in Africa – And this is despite her small size and fewer natural resources compared to her neighbors. Creative arts in which people in the community share their heritage treasures that show their ways of living to visitors have become an important aspect of tourism in Rwanda. Creative arts is a livelihood option that can reduce dependency on forest resources, which promotes conservation.

Under this output, a cultural art village will be set up where exhibiting the region's unique culture through arts will take place. The village provide space for artists to showcase their arts such as dances, poems, handicrafts, etc. to visitors who potentially come to visit the VNP. In addition, the cultural village shall have a coffee shop where visitors will be able to get coffee, tea, beverages, and light meals. The cultural art village shall also have rooms for accommodation where visitors of the Volcano region will come and stay while knowing that they are supporting local communities.

### **3.3. Establishing a bamboo fast-moving consumer good production unit**

Bamboo is an eco-friendly and sustainable material than the conventional wood. Bamboo grows faster with little need of fertilizer and pesticides and releases 35% more oxygen than a regular tree of the same size. Bamboo products are durable and moisture resistant.

This output aims to develop a new value-added bamboo industry to link bamboo plantations with a bamboo product market that will provide various kinds of products for daily use to meet higher

demands for livelihood in rural areas and to improve living in urban areas. The FMCG products that will be produced include chicken utensils, household items such as curtains, mats, toothbrushes, and more. This production unit will create job opportunities for local people.

### **3.4. Enhance technical and vocational skills that would link the community into the services and construction sectors**

In the Volcano Region, only 7% of the population above 16 years of age have a TVET education. Low TVET education implies that society has fewer technical skills which are essential for creating self-employment opportunities. Among beneficiaries of the Smart Green Village, 11% of households interviewed have members who received off-farm trainings such as culinary art and tailoring. Other training included health-related training for community health workers, conflict resolution, and more. This low penetration of off-farm training depicts the current skill gaps among beneficiaries and the surrounding communities. This justifies one of the aspects of livelihood improvement, which is to focus on skills development.

Table 13: Off-farm training

Off-farm trainings	Percentage
Tailoring	1.0%
Carpentry	0.7%
Welding	0.0%
Painting	0.3%
Food processing	0.7%
Culinary art	2.3%
Other	6.3%

This output entails empowering 1000 residents of Kinigi including those relocated to the smart green village to take short term TVET courses up to 6 months. This will provide participants with a range of technical skills such as carpentry, welding, tailoring, culinary art, and more. The funds will be used to finance course fees for 1000 people. This output will equip the community with practical skills to help them have diversified livelihoods that will better their standards of living. While output 1.3 will focus on beneficiaries of the smart green village and the trainings will be short, this output will also support people from surrounding communities.

### **3.5. Establishing a cooking pellet processing unit**

Cooking fuel such as firewood and charcoal present significant challenges in Rwanda such as carbon emissions, deforestation, and indoor air pollution. In fact, 80% of households use firewood and 17% use charcoal in the country. This affects women and children who spend time collecting firewood.

Under this output, a processing unit to produce green cooking pellets from human and animal waste will be established in the smart green village. These pellets are environmentally friendly solution because they do not emit much smoke and reduces the risk of contracting respiratory infections. These pellets will be an alternative source of energy for relocated households and surrounding communities.

## B. Environmental, Social, and Economic Benefits

The project's components will benefit 27,000 inhabitants of Kinigi sector (including the 402 households to be relocated). The Smart Green Village will decrease households' vulnerability to the effects of climate events such as landslides and floods. It will also enable them to have access to public infrastructure such as electricity and water. In addition, relocated households and the surrounding communities (Kinigi sector) will benefit from diversified and climate-resilient livelihoods that will empower them to rely less on unsustainable exploitation of natural resources.

### 1. Environmental Benefits

**Component 1** entails reducing household's vulnerability to the adverse effects of climate-related events such as flooding and landslides by relocating 402 households from a high-risk zone to a smart green village with improved housing units, infrastructure, and community buildings. This component brings significant environmental benefits outlined below:

- Water collection and recycling/reuse in residential homes through rainwater harvesting techniques
- Access to affordable and sustainable electricity such as solar, all units provided with clean water supply
- Reduction of the environmental and carbon impact of the building through the selective use of materials
- Waste separation at the smart green village will enable households to compost organic matter and to use plastic waste

For instance, to reduce the dependence on wood as source of cooking fuel, the project will provide HH with high-efficiency solid fuel cook stoves (Songa Green Stove - tier 3 cooking stove), that will be avoiding 0.6 t/GHG per year compared to the traditional solid wood cooking method. The Songa Green Stove can use any biomass with less than 20% water content, such as briquettes and dried agro-waste. The average cost benefit per household for the Songa Green Stove is 244,146 RWF over a 20-year period.

Considering the intermittency of power, the project provides roof mounted solar PV for basic lighting for the path from the units to the closest public toilet and street lighting. Units are connected to the national grid, which has a projected mix of renewables generation of 58% by 2024 (hydropower share is expected to grow from 39% in 2019 to 50% in 2024, and solar contribution to increase from 2% in 2019 to 8% in 2024<sup>15</sup>).

**Component 2** will enable community members to transition for low to high-end agriculture through the introduction of the greenhouses, high-value crops, bamboo farming, and poultry farms. Below are the environmental benefits that the component brings:

- Less use of land in agriculture
- Protecting crops from unfavorable weather conditions

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<sup>15</sup> REG - Generation capacity on the National Grid (December 2020)

- Increase in forest cover which reduces cuts down emissions
- Increased soil fertility using chicken manure

**Component 3** aims at creating new off-farm business opportunities for relocated households and surrounding communities all that is aimed at increasing resilience to economic, social, and climatic shocks. This component will benefit 27,000 population of Kinigi. This component will enable communities to shift from farming economic activities to off-farm activities that will prohibit the sustainable exploitation of natural resources such as wood for cooking energy, will reduce the carbon emissions from cutting down trees, etc. In addition, the bamboo FMCG will strengthen the bamboo agroforestry, which contributes to conservation

## 2. Social Benefits

Under **component 1**, households will be relocated to a smart green village with green attributes. Moving households from high-risk zones to a location that is less vulnerable to climate events will bring social benefits that particularly uplift women and children. Women and children won't be coping up with adverse effects of flooding and landslides anymore such as losing their food as the land is washed away or missing school.

For instance, the introduction of high-efficiency solid fuel cook stoves (Songa Green Stove - tier 3 cooking stove) to the village will have non-market health benefits from reduced indoor air pollution (with benefits from avoided health-related expenditures as well as productivity gains from avoided illness) and time savings from reduced time for collecting fuel. In addition to improving people's lives and contributing to climate change mitigation, distributed cook stoves will also contribute to gender equality, since due to its efficiency to save energy and time, women who are mostly involved in family responsibilities, will get the opportunity to do other income generating activities.

**Component 2** will empower women as they are the ones who rely on agriculture than their male counterparts. Moving into high-value crops will enable women to have sustainable sources of income, which will improve overall well-being of their households. In addition, the cultivation of mushrooms and the rearing of chickens will help in addressing malnutrition issues as communities will easily access these foods.

Under **component 3**, the cultural art village will help in preservation of the local culture as well as promote conservation. The cooking pellet production will ease the burden on women and children to collect firewood every day. In addition, respiratory problems that arise from smokes of conventional charcoal will be prevented as the pellets are a clean source of cooking energy.

## 3. Economic benefits

Relocating households under **component 1** will reduce the amount of loss that households were experiencing due to floods and landslides such as loss of property, hectares of crops, livestock, etc. Households will also have access to public and economic infrastructure that will enable them to do livelihood activities that are dependent on utilities.

In the Musanze District where affected households reside, 40% of the population are below the poverty line despite the fact that Musanze is a touristic region containing the largest part of the Volcanoes National Park. Five of the eight volcanoes of the Virunga chain (Karisimbi, Bisoke, Sabyinyo, Gahinga and Muhabura) are within the district boundaries. 66% of the working-age population are doing subsistence agriculture. Introducing the farming of high-value crops in **component 2** will allow households to increase their incomes, which will lift people out of poverty

In **component 3**, the introduction of off-farm livelihood activities such as handicrafts making, the production of bamboo FMCG, cooking briquets will be alternative sources of higher incomes compared to the conventional subsistence agriculture. Community-based tourism will promote macro-economic development and generates foreign exchange for the community. The skills development center shall foster technical skills especially among youth, which will accelerate self-employment in the community.

### C. Cost-effectiveness of the Proposed Project

The project enables communities to be resilient against climate shocks through resettlements of housing living in high-risk zones to a smart green village as well as through the introduction of climate-resilient livelihoods that enhance sustainable development. The project brings several environmental, social and economic benefits to beneficiaries ranging from reduced vulnerability to climate events such as flooding and landslides, access to public and economic infrastructure, increased incomes, reduced indoor air pollution, and more. The project activities are designed to obtain optimum results that will benefit direct and indirect beneficiaries in tangible ways.

Although component 1 has the highest cost per person (9,016 USD per person), the adaptation benefits that come with this component are worth the investment. If households continue to live in regions prone to flooding and landslides, more fatalities and loss of property and agricultural land may continue to rise exacerbated by future climate change. On components 2 and 3, the costs are almost negligible (44 USD per person) as more people are going to benefit. These two components will also likely result in further job creation that may impact people beyond the Kinigi sector.

Table 14: Project cost-effectiveness depicted

Component	Total cost (USD) without execution costs and IE fee	Number of beneficiaries	Concrete benefits	Avoided losses
Component 1: Resettling households living in high-risk zones to a smart green village	18,124,000	402 households Apprx. 2010 people	<ul style="list-style-type: none"> <li>• Sustainable planned green resettlements</li> <li>• Water collection and recycling/reuse in residential homes through rainwater harvesting techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerability to climate change issues such as floods and landslides</li> <li>• Fatalities</li> <li>• Loss of crop and livestock</li> </ul>

			<ul style="list-style-type: none"> <li>• Access to affordable and sustainable electricity such as solar, all units provided with clean water supply</li> <li>• Reduction of the environmental and carbon impact of the building through the selective use of materials</li> <li>• Waste separation at the smart green village will enable households to compost organic matter and to use plastic waste</li> </ul>	<ul style="list-style-type: none"> <li>• Malnutrition</li> </ul>
Component 2: Transitioning from low to high value agriculture	680,000	27,000 people (Kinigi's population)	<ul style="list-style-type: none"> <li>• Increased incomes for farmers</li> <li>• Food security</li> <li>• Afforestation, which sequesters carbon emissions</li> <li>• Access to manure from chicken farms</li> </ul>	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Dependency on natural forest resources</li> </ul>
Component 3: Diversification of income generating activities/livelihoods	1,200,000	27,000 people (Kinigi's population)	<ol style="list-style-type: none"> <li>1 Shifting from subsistence farming to off-farm activities</li> <li>2 Technical skills enhanced</li> <li>3 Increased incomes</li> <li>4 Local culture preserved</li> <li>5 Job creation</li> </ol>	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Dependency on natural forest resources</li> <li>• Reduced indoor air pollution to unclean energy sources</li> </ul>

## D. Consistency with National or Sub-National Development Strategies

The project is aligned with several national strategies that foster climate resilience and sustainable development. Below is a summary:

Table 15: Regulatory framework

Policy / Strategy	Alignment and relevance
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<b>National level</b>	
<b>National strategy for Transformation (NST1)</b>	<p><b>Economic Pillar</b> seeks to - Promote sustainable management of the environment and natural resources to transition Rwanda towards a Green Economy.</p> <p><b>Social Pillar</b> seeks to - Move Towards a Modern Rwandan Household through ensuring universal access to affordable and adequate infrastructure and services.</p> <p><b>Governance Pillar</b> seeks to - Increase Citizens' Participation and Engagement in Development.</p>
<b>Rwanda Green Growth and Climate Resilient Strategy (GGCRS)</b>	<p><b>Conservation and ecotourism</b> - To maintain Rwanda's protected areas as key economic assets supporting a climate-resilient services industry, a haven for biodiversity and a source of key ecosystem services, effective protection and sustainable management measures need to be undertaken</p> <p><b>Climate change</b> - Small-scale agriculture can bring wider benefits associated with climate compatible development including food security, improved environmental sanitation, and disaster risk reduction through slope stabilisation and flood mitigation.</p> <p><b>Low carbon housing</b> - Buildings should be designed to reduce the demand for energy and water and to support waste recycling.</p>
<b>NDC</b>	Rwanda's Nationally Determined Contribution serves as a blueprint for advancing targeted and measurable climate action in key sectors. It serves to guide coordinated responses for both government agencies as well as international organizations, NGOs, civil society, and community-based organizations.
<b>National Biodiversity Strategy and Action Plan (NBSAP)</b>	Provides a framework for conservation, sustainable use, and equitable sharing of benefits from biodiversity use and ecosystem services of the country. It also provides a framework for maintaining the necessary environmental conditions to reduce poverty, ensure sustainable development and food security in the country.
<b>Sector level</b>	
Private sector development and youth employment strategy (PSDYES)	<p><b>Commercialise agriculture</b> - Invest in production, value addition and agro-processing to create quality jobs through sectoral linkages as articulated in the crop intensification programme.</p> <p><b>Entrepreneurship</b> - Provide opportunities for greater involvement of youth in entrepreneurship and job creation, including optimization of the empowering role of information technology.</p> <p><b>Value addition</b> - Diversify the economy by reducing dependence on the agricultural sector and enhancing value-addition</p> <p><b>Infrastructure for growth</b> - Address the infrastructure limitations that hamper economic productivity and growth of the private sector</p>

EDP 2019	<p><b>Entrepreneurship</b>— provides the necessary environment for creation and growth of vibrant and competitive enterprises across all sectors of the economy</p> <p><b>Capacity building</b>- Improve access to skills and know-how for existing and potential entrepreneurs and workforce</p> <p><b>Markets and value chains</b>- expanding access to domestic and export market opportunities</p>
PSTA4	<p><b>Transition to high-value agriculture</b>- Raise profits per hectare by increasing agricultural yields and switching to higher-value agricultural commodities, such as horticulture, vegetable, poultry, pork, and fisheries.</p> <p><b>Agriculture transformation</b>- introducing new crop varieties, disease mitigation, etc. – as well as farmers' knowledge and skills to support specialization, intensification, diversification, and value addition</p> <p><b>Food security and nutrition</b>- Enhanced nutrition and household food security</p> <p><b>Markets and value chain</b>- Establishing stronger linkages between market-oriented production systems and efficient end markets.</p> <p><b>Climate change</b>- emphasises alternative land management practices with comprehensive climate-smart soil and integrated watershed management.</p>
<b>Sub sector level</b>	
National Tourism Policy	<p><b>Communities and MSMEs</b> – Provide support to MSMEs, ensuring that they have the capabilities and capacities to enter the tourism value chain, while also ensuring that communities contribute to and benefit from the tourism industry.</p> <p><b>Environmental sustainability</b> – Ensure that the tourism sector is planned and developed to the benefit of future generations of Rwandans, in terms of the sustainability of resource use, the protection of wildlife and the environment.</p>
Community based tourism enterprise (CBTEs) guidelines <sup>16</sup>	<p>By developing CBTEs, communities gain income-generating opportunities and better job prospects. At the same time, CBT helps communities to manage and preserve their knowledge and cultural resources. Essentially CBTEs should ensure that;</p> <ul style="list-style-type: none"> <li>- Adherence to responsible tourism practices such as environmental social, economic, and cultural sustainability are considered.</li> </ul>
<b>District level</b>	
Musanze district development strategy	<p><b>Agriculture</b> – Productivity increased, and resilience strengthened by use of improved inputs, effective and efficient irrigation, and soil conservation</p> <p><b>Tourism</b>- Improving touristic destinations and the service</p>

<sup>16</sup> CBTEs are primarily small businesses that have been developed around major Destination Management Areas (DMAs) like the Volcanoes National Park, Akagera National Park, Karongi, Rubavu, Nyungwe National Park, Muhazi, the Heritage Corridor and Kigali Central Hub.

	<p>sector</p> <p><b>Construction sectors-</b> development of industries for local construction materials to support the growth of the construction sector and the affordable and low-cost housing program</p> <p><b>Conservation-</b> Improved land use and management of water resources and switching to clean energy to reduce households depending on firewood.</p> <p><b>Nutrition-</b> Village-based ECDs used as entry points for education and provision of health services as well as raising awareness on nutrition</p> <p><b>Capacity building-</b> Employment promoted through skills development, entrepreneurship, and regulation</p> <p>Inclusive</p> <p><b>Housing-</b> upgrade current informal settlements</p>
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## 1. Environment and disaster reduction

The GoR has prioritized adaptation and mitigation to climate change impacts in its national policies and strategies. Below is a snapshot of national policies and strategies that show how this project aligns with government priorities:

1. **Green Growth & Climate Resilience Strategy (GGCRS):** The Strategy aims to guide national policy and planning in an integrated way and mainstream climate change into all sectors of the economy. GGCRS promotes green business and growth as cross-cutting issue for Rwanda's sustainable development.
2. **Strategic Programme for Climate Resilience (SPCR):** A detailed SPCR was undertaken and published in 2017. This was centred on four investment programmes, one of which was agriculture driven prosperity. This included costed actions for climate smart agriculture.
3. **National Land Policy:** Among the objectives of land policy, one is to promote good practices that are favourable to environmental protection and good land management, and to promote conservation and sustainable use of wetlands.
4. **Environmental and Climate Change Policy (2019)** seeks to provide strategic direction on environment and climate change in Rwanda, bearing in mind its linkages with socio-economic development.

In 2011, Rwanda adopted the Green Growth and Climate Resilience Strategy (GGCRS) setting out the country's actions and priorities on climate change relating to both mitigation and adaptation and to how these will be mainstreamed within economic planning. The GGCRS is also embedded in the NST1 in alignment with Rwanda's 7-year Government Program. The NST1 is a high-level planning policy that frames the country's subsequent local government and sector plans and includes specific projects or actions along three pillars for economic, social and governance transformation. The GGCRS provides a vision for how Rwanda can tackle climate change through

become a climate resilient and low carbon economy, and projects actions to be undertaken to inform Rwanda's vision for economic development, Vision 2050. The actions set out in the GGCRS provide the basis for the development of the NDC, as well as other key national guiding documents informing the country's low carbon development, culminating most recently in the National Environment and Climate Change Policy enacted in 2019 with the goal of achieving a climate resilient nation with a clean and healthy environment.

The management of floods affecting the Volcano Region, as is envisaged under this project, is explicitly mentioned as one of the strategic interventions under the 7<sup>th</sup> priority area of the NST1, entitled Sustainable Management of Natural Resources and Environment to Transition Rwanda towards a Green Economy. The strategic intervention aims at managing water flows from the Volcano Region and other rivers to mitigate related disasters and improve water resources management in the four districts that make up the Volcano Region.

## **2. Economic development**

Rwanda has embarked on a journey to transform the economy and the society by promoting economic transformation built on the private sector, knowledge, and natural resources. In 2000, the country adopted the Vision 2020 that has enabled the country to accelerate poverty reduction and to move into a knowledge-based economy. Vision 2020 was replaced by Vision 2050, which serves to promote economic growth and prosperity and improve quality of life for Rwandans. The implementation of Vision 2050 is driven by existing policies such as the NIST1.

The economic transformation pillar in the NIST1 focuses on job creation, urbanization, knowledge-based economy, industrialization, adoption of financial services, modernization of agriculture, and sustainable use of natural resources. The execution of the NIST1 is driven by other national economic development strategies such as the Strategic Plan for Agricultural Transformation (PSTA4), the Private Sector Development and Youth Employment, and the Entrepreneurship Development Policy.

Priorities in these national policies are aligned with pillars of the livelihood improvement component in this project. With this component, the project will enable communities to transition from low to high value agriculture, diversify income generating activities that are centered around cottage industries, tourism, and value addition, be linked to wider macro-economy such as high-end tourism, services, and construction sectors. All of these will be made possible by creating an enabling environment that relies less on non-renewable sources and that allows communities to access public economic and social infrastructure.

The Vision 2050 has overarching goals of promoting economic growth and prosperity and high quality of life for Rwandans and is anchored around five pillars:

### **1. Human development**

The Rwandan population is projected to increase by more than 50% to 17.6 million by 2035 and to double to about 22.1 million people by 2050. During this period, the share of the working age population is expected to grow from around 61% of the population in 2017

to 65.7% in 2050. Reaping the economic benefits from this “demographic dividend” will be realized only through an integrated approach that ensures that decline in fertility is backed up by essential investments in human capital development and economic reforms so that the country has a healthy, well educated, and highly skilled labour force that is gainfully employed.

## **2. Competitiveness and integration**

Rwanda’s ambition to become a developed country hinges on its ability to enhance competitiveness at various levels. Key aspects to consider include economic competitiveness underpinned by modern technology, innovation, research, quality infrastructure, favourable cost of doing business and micro factors such as increased firm and labour productivity.

## **3. Agriculture for wealth creation**

Agriculture has and will continue to play a prominent role in both economic growth and poverty reduction as it has important implications for food security, nutrition, exports, and has backward and forward linkages to both industry and services sectors. Going into 2050, the agriculture sector is expected to be totally transformed with professional farmers and commercialized value chains.

## **4. Urbanization and agglomeration**

Urbanization in Rwanda is rapidly evolving and presents many opportunities for increased access to markets, skills, and employment among others. The new focus will be on identifying and creating synergies between the critical elements of urbanization that create agglomeration and enhance the socioeconomic benefits of urbanization.

## **5. Accountable and capable State institutions**

Rwanda’s strong track record is underpinned by effective institutions which in turn facilitate economic growth and development over the long term. To fulfil the Vision 2050 aspirations, Rwanda’s institutions and governance will need to adapt to the changing environment, become modern, innovative, accountable to citizens, and rooted in the rule of law. Building on the achievements of Vision 2020 in citizen participation, good governance, rule of law, peace and stability, Rwanda will go into the next phase of long-term development aiming to consolidate gains made and continue citizen-centred reforms enshrined in local innovations and homegrown solutions.

Vision 2050 is currently entering its implementation phase. A mid-term review is envisaged in 2035 and regular reviews planned every 5 years to inform necessary policy improvements. The indicators and targets of Vision 2050 are presented in Table 4-1.

## **3. Rural settlements**

In the area of human settlements, the National Human Settlement Policy of 2004 lays out the basis for planning resettlement of populations for improved service provision, particularly for

people from the mountainous areas. The policy outlines the importance of orderly population settlement in Rwanda, spelling out the benefits of improvement of access to social services where people live closer to each. This eases planning for the provision of services including health care, education, water and sanitation, electricity, and other infrastructure thus enhancing the possibility of improved quality of life and meeting the Vision 2020 and EDPRS targets and MDGs.

The Population Resettlement Law of 2008 defines the settlement procedures and lays out the obligations of the central and local government for smooth resettlement of populations.

## **E. Compliance with National Technical Standards**

### **1. Integrated Development Program Model Villages**

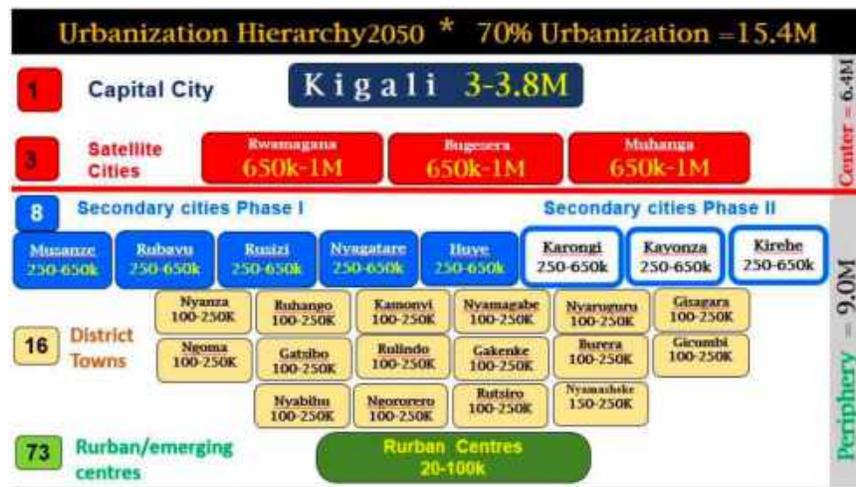
Rwanda's Vision 2020 intends that a proportion of at least 70 % of households living in rural areas to settle in integrated viable settlements and that these planned settlements offer economic opportunities, favor rational land use and management, and accelerate servicing with basic social economic and physical infrastructures in rural areas. One of the challenges that the Government intends to overcome is to assist vulnerable communities living in high-risk zones from severe landslides and flooding.

In 2011 the Integrated Development Program was set up as a multi-government institutions program headed by the Ministry of Local Government (MINALOC) Rural Settlements Task Force with a Steering Committee formed by MINALOC, Ministry of Defense, Rwanda Housing Authority, Rwanda Environment Management Authority, Ministry of Education, Ministry of Natural resources, Ministry of Commerce and Industry, Ministry of Infrastructure (REG, RTDA, WASAC), Ministry of Youth and ICT, Rwanda Agricultural Board. Annual action plans earmark funds for District governments to support making available plots for rural housing as well as basic construction materials for the construction of Model Villages for vulnerable communities living in high-risk zones. Part of the strategy is to improve the efficiency of the use of land for construction by assisting the layout planning before settling, facilitating the fabrication and use of local construction materials, and constructing "4-in-1-house" and "2-in-1 house" types.

The intention of the Rural Settlements Task Force is the upgrading of rural settlements into integrated villages, providing opportunities for improved rural livelihood. Eventually, the locations will form types of mixed-use trading centers and be growth areas as part of the urban network.

The Urbanisation and Rural Settlement Sector - Strategic plan 2012/13-17/18, sets the goals for the IDP Model Villages to incorporate green building principles such as the use of local materials, rainwater harvesting, and improved sanitation. Priority 3 of the strategic plan is to develop urban and rural settlements around economic activities and to have interlinking scales of spatial hierarchy at neighborhood, village, district, and city level.

Figure 24: National Land Use Master Plan Urbanization Hierarchy 2050



### 11 Pillars of IDP Villages:

1. Land Productivity – to increase agricultural and livestock productivity;
2. Post-Harvest Processing and Marketing - to assure food security and promote trade of agriculture products in internal and export sales;
3. Cooperative Development - to increase economic value and reinforce unity through joined capital and promotion of savings;
4. Off-Farm Employment - to diversify and modernize Rwandan economy through creation and enhancement of sustainable off-farm employment;
5. Promotion of Micro-finance and Insurance - to increase inputs for economic expansion and protect entrepreneurs against business risks;
6. Resettlement - to voluntarily settle citizens for efficient service delivery and land consolidation;
7. Rehabilitating Ecosystems – to ensure optimal utilization and sustainable management of natural resource base;
8. Social Protection - to provide effective and sustainable social protection and release productive capacities of the poorest and vulnerable;
9. Infrastructure development – to improve access to affordable electricity and transport infrastructure as support to economic transformation and access to other forms of energy (peat, biogas, solar) for improved welfare and environmental protection;
10. Promotion of ICT – to improve access to market information and technology innovations for production;
11. Leadership Development – to build a large cohort of community leaders who will catalyze social cohesion and an economic revolution.

Rwanda Housing Authority has set the following criteria for the selection of the settlement sites:

1. The site must be in a remote rural area;
2. The site should be not fertile soil where possible;
3. The site should be accessible (access to the existing road)
4. The site should be near existing infrastructure (School, market);

5. The site should not be in high-risk areas to disasters (Less than 20% of slope where possible).

## **2. The National Land Use and Development Master Plan for the period 2020-2050**

The NLUDMP 2020-2050 is a revision of the 2011 NLUDMP to ensure its alignment with the 7 Years Government Programme: National Strategy for Transformation (NST 1), 2017 – 2024 and Vision 2050, which aspires to take Rwanda to high living standards by the middle of the 21st century and high quality livelihoods. The main target of the NLUDMP is to find the best land-use balance sheet based on spatial and economic analysis and is the primary document regulating urban and rural development in Rwanda.

Summary NLUDMP measures and goals:

- Consolidate total number of Imidugudu from 14,000 to 3,000
- Increase the average size of Imidugudu from 172 Households to 550 HH
- The size target of new residence lots should be 300m<sup>2</sup> per HH for dwelling and kitchen garden, sites to be developed in a semi-detached typology or similar to promote density.
- The proportion between the housing lots and the entire area of a neighborhood should be 2.0-2.5, ensuring enough space for roads, public amenities and services such as schools, health, administration, cultural, market, infrastructure utilities, sports and recreational facilities, urban farming, urban forestry, landscaping, and open green spaces.
- The average size for one Umudugudu would be 0.414 km<sup>2</sup>, 41.4 Ha
- Water and sanitation: Household connections within premises will be increased from the current 9% (Estimate 2017) to 95 by 2035 and 100% by 2050. Access to sanitation will be scaled up to all from 86% (Est. 2016) to 100% and waste management systems. Efforts shall be directed towards increasing household onsite access to sanitation services from 2% to 80% by 2035 and 100 by 2050.
- Solid waste management: Have a robust Solid Waste management system for all development that is based on reuse hierarchy and promote zero waste generation.
- Support for the circular economy programs in all the planned activities of NLUMDP so that there is a minimum generation of waste (goal of zero waste).

Agricultural land in Rwanda plays a dual role in creating income and foreign currency through the export of agricultural products (mainly coffee and tea) and in producing food for the local population.

- The existing agricultural land would be protected against scattered housing and degradation due to soil erosion and improper management along the period of 2020-2050.
- The arable land per rural settlement will be around 420 Ha on average.
- Climate-resilient options should be implemented, such as improved bench terraces, agroforestry, improved seeds, drainage, irrigation on the hillside, and marshlands.
- The arable land per rural settlement will be around 420 Ha on average.

- Individual farming in small holdings of around 0.4Ha will have to stop, and different kinds of economic cooperations will be organized instead to reach 1.5Ha per HH in the future.
- Five production units of 110 HH and about 84 Ha will be established in each settlement.
- Yields improvements will be achieved dramatically due to the agglomeration of plots.

Health Facilities in rural settlements by 2050:

- Community health will be organized in clustered rural settlements sites.
- Health posts (0,06ha each): 3000 for future proposed Cell (496 in 2019)

Primary education in rural settlements by 2050:

- Average class size: 35 pupils/class (77 pupils/class in 2018)
- Average school size: 840 pupils (861 pupils in 2018)
- Classrooms: 90,150 (32,548 pupils in 2018)
- Schools: 3,756 schools (2,909 schools in 2018)
- Required size for a nursery school: 0.5Ha
- Required size for a primary school: 1Ha

Green development principles. To enhance environmental sustainability in urban and rural settlements development under the PUSH programs. The following key elements are recommended:

- All Population, Urbanization, Settlements, and Housing (Push) programs must be streamlined and have in place use of green planning, and technology approaches use in the urban development programs, i.e., enhance the green city and green neighbourhood concepts in the developments;
- Urbanization approach where city's development takes into account environmental aspects, especially through land-use and spatial development planning to achieve low carbon growth overall and build resilience to climate change, i.e., ensuring that all urban development processes incorporate climate risk and low-emission strategies into on all the proposed activities;
- All urban development should promote climate-resilient human settlements as this will lead to halting the proliferation of informal settlements in urban areas.
- All green infrastructure projects should be designed to complement gray infrastructure systems performing a combination of volume management, water quality improvement, and flood control;

**Summary of NLUDMP spatial guidelines for rural agriculture**

The arable land per rural settlement will be around 420 Ha on average.

Cooperative model for farming should be adopted to have a

### **Summary of NLU DMP spatial guidelines for rural settlements**

Average size of Umudugudu: 550 Households and 41.4 Ha.

Residence lots should be 300m<sup>2</sup> per HH for residence and kitchen garden

Housing to be developed in a “4-in-1” or “2-in-1” type to promote densification.

Proportion between the housing lots and the entire area of a neighborhood should be 2.0-2.5 to accommodate for infrastructure, facilities, urban farming and green spaces.

### **3. Rwanda One Health Strategic Plan II (2019-2024)**

The Government of Rwanda has increasingly become recognized as a global exemplar in economic growth, sustainability, and environmental policies. To realise its full potential and drive towards this goal, Rwanda continues to grow its commitment in creating a clean, healthy and climate resilient environment that supports a high quality of life for its citizens. This has generated considerable institutional transformations to address these needs and priorities, creating new governmental organizations and policies. Rwanda’s Vision 2050 is one such policy that targets these objectives by bringing high-quality livelihoods and living standards through environmental considerations. Building on that, the updated Rwanda One Health Strategic Plan II (2019-2024) was released, serving as a guiding document for a collaborative, holistic and multi-sectoral approach to address complex public health (human, animal and ecosystem interface) challenges in Rwanda.

### **4. Rwanda Building Code and Earth Construction**

In 2019 Rwanda released the second version of the Rwanda Building Code (RBC) with a particular emphasis on promotion of use of local construction materials, including the use of Adobe (rukarakara) blocks with the goal to reduce the embodied energy required in construction and to promote construction systems that are in balance with natural ecosystems. Point 2.6.5.1.3. of the RBC says: “Specifically, the use of adobe bricks is accepted for all buildings in category two as provided in the Ministerial Order categorizing the buildings.” This is for detached or attached dwellings of an area not bigger than 200m<sup>2</sup>.

Adobe block construction is very common in Rwanda, where 67% of households live in adobe block homes<sup>17</sup> (with a higher percentage in rural areas). Adobe block is not only affordable and low embodied carbon, but also does not require major infrastructure - the skills already exist and

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<sup>17</sup> Source: National Institute of Statistics of Rwanda (NISR), Rwanda Household Survey 2019/2020 report, March 20201

the materials required are locally available and plentiful. However, whilst adobe block construction can be structurally stable and durable, if not well designed or constructed they can require a lot of maintenance, or even be unsafe. For example, in a 2018 survey of 23 masons and 57 customers carried out by Earth Enable across each province, 70% of masons had no formal training, 85% of roofs leaked and 65% residents didn't feel safe<sup>18</sup>.

The effects of climate change are exacerbating the vulnerability of houses in Rwanda, with 23% of households affected by environmental issues including floods, landslides and heavy rains<sup>1</sup>. This is amplified by the fact that only 19% of households manage their rainwater<sup>1</sup>. These structures are generally not built with seismic design considerations, as we can see from the May 2021 Rubavu District seismic disaster following the eruption of the Nyiragongo Volcano in Goma, after which 2654 homes were in need of repair, reconstruction or relocation<sup>19</sup>.

For this reason the Rwanda Housing Authority (RHA) launched the Local Building Materials Think Tank to bring together parties with complementary expertise to contribute to the development of the following documents which can support RHA in regulating the construction of adobe block homes. Parties involved include RHA, Rwanda Standards Board, Rwanda Polytechnic, EarthEnable, MASS Design Group and Greenpact Africa. Both documents will be released in 2022.

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- DRS 484 Adobe Block Specification
- Technical Guidelines on Adobe Block Construction in Rwanda

DRS 484 Adobe blocks (rukarakara) - Specification details best practice for fabricating adobe blocks, including soil classification, addition of fibers, manufacturing process, curing process and performance criteria. It includes field tests which may be used to indicate soil classification and strength in the absence of access to a laboratory.

The Technical Guidelines for Adobe Block Construction in Rwanda also includes details on the block itself, aligning with DRS 484, but in addition provides guidance on the construction of the whole building. It includes site selection, retaining walls, drainage, block fabrication, construction of the foundations, walls and roof, doors, windows and finishes. Rwanda is considered a moderately seismic zone, and the earthquake hazard level varies across the country. In the regions of higher seismicity (for example the western province and the volcanic region) additional measures are advised.

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<sup>18</sup> Source: EarthEnable Rural Housing Construction Survey, 2018

<sup>19</sup> Post Disaster Needs Assessment and Recovery Plan for Rubavu District seismic disasters (2021), Government of Rwanda, July 2021.

These guidelines will inform policy and are intended to have a systemic impact on housing across Rwanda - influencing the construction of safer, durable, comfortable and more resilient buildings, with lower costs and lower carbon footprint than traditional brick homes.

Table 16: Cost and Embodied Carbon comparison of different walling systems

	Cost (200mm thick)	Embodied Carbon
Adobe block wall	\$11/m <sup>2</sup>	3 kgCO <sub>2</sub> e/m <sup>3</sup>
Concrete block wall	\$41/m <sup>2</sup>	69 kgCO <sub>2</sub> e/m <sup>3</sup>
Fired brick wall	\$33/m <sup>2</sup>	202 kgCO <sub>2</sub> e/m <sup>3</sup>
Volcanic stone wall	\$70/m <sup>2</sup>	109kgCO <sub>2</sub> e/m <sup>3</sup>

## F. Duplication of Project with other Funding Sources

The project aims at relocating households from a flood and landslide prone region to a smart green village and by improving their livelihoods through high-value agriculture and diversified climate resilient livelihoods. This project has aspects in common with the Adaption Fund funded project that was implemented in Northwest Rwanda in 2017.

Rwanda's Vision 2050 intends that a proportion of at least 70 % of households living in rural areas to settle in integrated viable settlements and that these planned settlements offer economic opportunities, favor rational land use and management, and accelerate servicing with basic social economic and physical infrastructures in rural areas. One of the challenges that the Government intends to overcome is to assist vulnerable communities living in high-risk zones from severe landslides and flooding. Several resettlement programmes have been implemented countrywide including the North-Western Rwanda.

Table 17: Key initiatives and programmes that are relevant for this project

Project	Description	Timing and Geographical coverage	Potential duplication and synergies
<b>Reducing vulnerability to climate change in Northwest Rwanda through community-based adaptation</b>	In 2014, the GoR received USD10 million funding from the Adaptation Fund to support the adaptive capacity of natural systems and rural communities exposed to climate change. Targeted communities resided in the Musanze and Nyabihu district. The project aimed at addressing factors intensified by heavy rainfalls that led to floods and landslides. The project introduced flood and erosion control measures such as de-silting the caves, rehabilitation of gullies in the watershed, rehabilitation of waterways, digging terraces and afforestation and helped people to be relocated to a model green village from high-risk zones	2013-2018 Musanze and Nyabihu	This completed project has elements such as resettlement and livelihood activities that have been utilized to this proposal. Lessons learned from this project will be applied to the current design and implementation arrangements, including project management

<p><b>Building resilience to climate change hazards in the Volcano Region of Rwanda</b></p>	<p>The Green Climate Fund has been requested to fund infrastructural improvements and watershed restoration measures in the region – specially to reduce the risk of flooding and landslides – as well as improvements in land management.</p>	<p>Pipeline Musanze, Rubavu, Burera, and Nyabihu</p>	<p>This GCF project will implement climate mitigation and adaptation measures in 12 basins in the four districts. While this proposal being developed is focused on Musanze and only considering resettlement and livelihood options, soil and water conservation measures will be implemented by GCF.</p>
<p><b>Strengthening climate resilience of rural communities in Northern Rwanda”</b></p>	<p>The proposed project area is adjacent to the “Strengthening climate resilience of rural communities in Northern Rwanda” project in the Gicumbi district, which is directly to the east of Burera district and was funded by the Green Climate Fund. FONERWA is the Executing Entity of that project as well. Some elements of that project are applied in the current proposal, such as relocating households from high-risk zones.</p>	<p>Ongoing in Gicumbi</p>	<p>At the time of writing of this proposal, this Gicumbi project is undergoing its mid-term evaluation, the results of which will inform the implementation of this project. Lessons learned from this project will be applied to the current design and implementation arrangements, including on project management</p>
<p><b>Integrated Development Program (IDP)</b></p>	<p>In 2011 the Integrated Development Program was set up as a multi-government institutions program headed by the Ministry of Local Government (MINALOC) Rural Settlements Task Force with a Steering Committee formed by MINALOC, Ministry of Defense, Rwanda Housing Authority, Rwanda Environment Management Authority, Ministry of Education, Ministry of Natural resources, Ministry of Commerce and Industry, Ministry of Infrastructure (REG, RTDA, WASAC), Ministry of Youth and ICT, Rwanda Agricultural Board. Annual action plans earmark funds for District governments to support making available plots for rural housing as well as basic construction materials for the construction of Model Villages for vulnerable communities living in high-risk zones. Part of the strategy is to improve the efficiency of the use of land for construction by assisting the layout planning before settling, facilitating the fabrication and use of local construction materials, and constructing “4-in-1-house” and “2-in-1 house” types</p>	<p>Ongoing</p>	<p>The 402 households resettled from high-risk areas will benefit from the alternative livelihood support provided under Component 2 and Component 2. The proposed project will also benefit from the on-going resettlement efforts (as it will contribute to reducing over-cultivation marginal lands) and will complement them by directly financing resettled communities with job creation, skills training, and provision of initial capital for alternative livelihoods.</p>

<p><b>National and district land use master plans</b></p>	<p>An ongoing national programme by MINIRENA to develop a national land use master plan and local land use plans.</p>	<p>Ongoing</p>	<p>District land use maps are now available for the project area and will guide the land zoning process in the improved land/water management interventions. These land use plans will also include an assessment of soil suitability for different crops to guide planting regimes and fertiliser application so will feed into the project's adaptation planning and promotion of climate resilient crop and livestock production systems.</p>
<p><b>Lake Victoria Environmental Management Project (LVEMP)</b></p>	<p>LVEMP II is a five year East African Community project under implementation in the five countries that share the Lake Victoria Basin: Burundi, Kenya, Rwanda, Tanzania and Uganda. It is funded through a US\$ 15 million IDA loan from the World bank. There are four components:</p> <ol style="list-style-type: none"> <li>1. Strengthening institutional capacity for managing shared water and fisheries resources;</li> <li>2. Point source pollution control and prevention;</li> <li>3. Watershed management with two sub- components: (i) Natural resource conservation and livelihoods improvement; and (ii) Community capacity building and participation; and</li> <li>4. Project coordination and management.</li> </ol> <p>In the Goma area, around 100 ha of radical terracing have been completed and 70ha of land planted with trees. The project also disburses small grants through SACCO branches to cooperatives through its Community Driven Development (CDD) sub- project initiative. This approach enables local communities to access project funds for sustainable enterprise development.</p>	<p>2012-2017</p> <p>So far the project has launched activities in two districts but is planning to roll out to a further 7 districts this year.</p>	<p>Under component 3 (watershed management), the project promotes similar interventions as those proposed in the new project design, hence there is good scope to learn from this project as it progresses. These include: rehabilitation of riparian buffer zones, sustainable land management, IPM, Farmer Field Schools and watershed management, training and awareness building on the Environmental Organic Law.</p>

<p><b>Landscape Approach to Forest Restoration and Conservation (LAFREC)</b></p>	<p>In 2014, the Global Environment Facility (GEF) approved funding for a project to implement forest-friendly and climate-resilient restoration practices in Gishwati-Mukura landscape located in western Rwanda.</p>	<p>2014-2019</p>	<p>One of the subcomponents in the programme supported demand-driven income-generating activities in order to increase the breadth of the economic options and security of the livelihoods base of the population within the Gishwati-Mukura landscape, thereby improving climate resilience. Lessons learned from this project will be applied to the current design and implementation arrangements, including project management.</p>
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The fact that many of the interventions summarized above are focused on the North West area of Rwanda sends a clear message in regard to the severity of the climate change related challenges in the area and therefore the need to ensure and enhance synergistic and complementary national efforts to addressing vulnerability of the communities in the area to climate change impacts. The Adaptation Fund therefore adds significant value and comes at the right moment to reinforce the national efforts towards addressing climate change issues in the vulnerable North-Western region of Rwanda.

## G. Learning and Knowledge Management

Lessons will be captured primarily through the Monitoring and Evaluation system which will provide regular monitoring of project indicators, as well as progress against the key milestones. The project will promote Participatory Monitoring and Evaluation System so that, as much as possible, the results of climate adaptation approaches will be measured, processed and evaluated by the communities involved. As well as enabling project participants to use the information to modify approaches as they go, this approach will also build the capacity of local communities to adapt to future climate trends and shocks. In addition to the routine monitoring of indicators, the project will also collect case studies under each component to drill down into specific innovations and practices that arise due to project interventions.

A lesson learning exercise will also be included at the mid-term of project implementation and at project completion. During this process significant new understandings will be catalogued and used to build the knowledge base of best practices as well as document where project implementation has resulted in unexpected impacts or investigate approaches that have not worked and why. Lessons learned will include detailed, specific information about behaviors, attitudes, approaches, that will inform project implementation and other interventions.

The project will also compile its lessons learned in a knowledge management database. This information will be used to prepare training materials, information brochures and other communication materials to disseminate experiences with other stakeholders, including women and members of socially disadvantaged groups. Upon closure of the project, the knowledge management database will be maintained by the Ministry of Environment and remain available

for use in other districts. Activities under learning and knowledge management will include the compilation of lessons learned in a knowledge management database, the preparation of communication materials for different stakeholder groups, with specific reference to women and disadvantaged groups, and holding workshops and other events to disseminate lessons learned from the project

## H. Consultative Process

Stakeholder engagements have been held with the district officials: Nyabihu, Rubavu, Musanze, and Burera to understand current climate issues, what the districts have done to mitigate the disasters, and the challenges they are currently facing. From these consultations, we have learned that the government have implemented a few flood management interventions in the region which have only solved 10% of the climate problem. Therefore, there is a need for more investments in hard infrastructure to increase adaptive capacity of these districts.

Moreover, local communities residing in Nyabigoma Cell to be relocated from precarious conditions to a Smart Green Village have been consulted. Research methods such as focus group discussions (FGDs) and a quantitative survey were utilized to assess beneficiaries' economic status, understand their fears and concerns about the project interventions, and their preferences for solutions. Four FGDs (2 mixed gender and 2 female) and a survey of 304 potential beneficiaries were conducted. These beneficiaries are located in Musanze District in Kinigi Sector in Nyabigoma Cell from 9 villages.

To assess the current income generating activities in the region, farm producers and processors were also consulted. Specifically, 8 FGDs with both on-farm and off-farm cooperatives were held in the four district to understand their challenges, opportunities, and available support systems as farm producers. In addition, 7 key informant interviews with private businesses in the region such as Holland Affairs (Winnaz) and Sopyrwa were conducted to understand challenges and opportunities on the side of processors.

The table below summarizes key consultations that took place, issues discussed and outcomes of the consultations.

Table 18: Summary of stakeholders consulted

Consultations (place and date)	Organization represented	Number of participants	Methodology of consultation	Issues discussed and outcomes of discussion
October 26 <sup>th</sup> , 2021	Musanze District	1	Key informant interview	<b>Issues discussed:</b> Description of the project, impacts of flooding in Musanze such as loss of agricultural crops, damaged houses, etc., what has been done to mitigate the impacts of flooding so far, when the project might be implemented

				<p><b>Outcomes:</b> The district agreed to shared data on ubudehe categories and cooperatives in the area, which would be contacted for primary data collection</p>
October 27 <sup>th</sup> , 2021	Burera District	2	Key informant interview	<p><b>Issues discussed:</b> Description of the project, rain-related disasters prevalent in the district, sectors at high risk, how men and women might be affected differently, what has been done to mitigate the impacts of flooding in the district</p> <p><b>Outcomes:</b> The district agreed to shared data on ubudehe categories and cooperatives in the area, which would be contacted for primary data collection</p>
Nov 1 <sup>st</sup> , 2021	Rubavu District	1	Key informant interview	<p><b>Issues discussed:</b> Description of the project, how frequent they have experienced rain related disasters, zones at high risk, how men and women might be affected differently, what has been done to mitigate the impacts of flooding in the district</p> <p><b>Outcomes:</b> The district agreed to shared data on ubudehe categories and cooperatives in the area, which would be contacted for primary data collection</p>
Nyabigoma cell, Musanze	Female community members	13	Two focus group discussions	<p><b>Issues discussed:</b> Their experience with climate-related disasters such as flooding and landslides, the frequency of these disasters, impacts of the disasters on their livelihoods such as loss of harvest (Irish potatoes and pyrethrum), their coping mechanisms, whether their experience is different from men's, and whether if they are aware of climate smart agriculture techniques,</p>
Nyabigoma cell, Musanze	Both female and male	13	Two focus group discussions	<p><b>Issues discussed:</b> Their experience with climate-related disasters such as flooding and landslides, the frequency</p>

	community members			of these disasters, impacts of the disasters on their livelihoods such as loss of harvest (Irish potatoes and pyrethrum), their coping mechanisms, and whether if they are aware of climate smart agriculture techniques,
Kinigi Sector, Musanze,	Representatives of 8 farmer and off-farm cooperatives	8	2 focus group discussions	Issues <b>discussed</b> : services provided to cooperative members, challenges they face, how flooding and landslides disrupt their activities, their strengths and weaknesses, kind of support they have received from which institutions, and climate smart practices they use in their cooperatives.
Burera District office	Representatives of 8 farmer and off-farm cooperatives	8	2 focus group discussions	Issues <b>discussed</b> : services provided to cooperative members, challenges they face, how flooding and landslides disrupt their activities, their strengths and weaknesses, kind of support they have received from which institutions, and climate smart practices they use in their cooperatives.
Nyabihu district office,	Representatives of 8 farmer and off-farm cooperatives	8	2 focus group discussions	Issues <b>discussed</b> : services provided to cooperative members, challenges they face, how flooding and landslides disrupt their activities, their strengths and weaknesses, kind of support they have received from which institutions, and climate smart practices they use in their cooperatives.
Rubavu district office	Representatives of 8 farmer and off-farm cooperatives	8	2 focus group discussions	Issues <b>discussed</b> : services provided to cooperative members, challenges they face, how flooding and landslides disrupt their activities, their strengths and weaknesses, kind of support they have received from which institutions, and climate smart practices they use in their cooperatives.
Nyabigoma cell, Musanze	Household heads	304	Quantitative survey	Issues <b>discussed</b> : their ubudehe categories, what they do for living, any shocks they have faced in the last years, their experience with climate related events such as rainfall variability, floods and landslides, and

				how these events affected their livelihoods.
Musanze, December 8 <sup>th</sup> , 2021	Hollanda Affairs (Winnaz)	1	Key informant Interview	<p><b>Issues discussed:</b> How Winnaz works with farmer cooperative in sourcing potatoes, challenges that exist in the Irish potato value chain, and opportunities to work with and support farmers.</p> <p><b>Outcomes/lessons:</b> Quality of potatoes that Winnaz uses to produce potato chips is hard to find in the area. Potatoes in the volcano region have excess carbohydrates, which makes it hard in processing. They require farmers to keep potatoes for long in the fields. This lack of consistent harvest affects the factory's utilisation capacity</p>
Musanze, December 13 <sup>th</sup> , 2021	Horizon Sopyrwa	1	Key informant Interview	<p><b>Issues discussed:</b> How Sopyrwa works with farmer cooperative in sourcing pyrethrum, challenges that exist in the pyrethrum value chain, and opportunities to work with and support farmers.</p> <p><b>Outcomes/lessons:</b> Maintenance of pyrethrum requires constant follow up. Unlike for potatoes that are harvested after three months, pyrethrum is harvested in 12 months. Intense rainfall can also impact the quality of pyrethrum. Pyrethrum grows well during warm weather</p>
Musanze January 13 <sup>th</sup> -14 <sup>th</sup> 2022	District level: Forest and natural resource management officer Sector level: Agronomists of sector Muhoza, Nyange, Musanze, Kinigi, Busogo, Gataraga.	7	A 40-minute discussion with each staff on the general understanding of the project as well as key areas need capacity-building and knowledge transfer to addresses current community and	<p><b>Issues discussed:</b></p> <ol style="list-style-type: none"> <li>1. Integrated watershed management: Flood control measures in gullies, streams and rivers, water management committees, soil and water conservation measures on hillsides.</li> <li>2. Increased resilience through improved livelihoods: Establishment of green housing in Rural Development Hubs, small business development supported in Rural Development Hubs</li> <li>3. Strengthened governance, early warning and knowledge management and learning</li> </ol> <p><b>Outcomes of discussion:</b></p>

<p>Burera January 17<sup>th</sup> 2022</p>	<p>District level: Division manager Sector level: Agronomists of sector Gahunga and Cyanika</p>	<p>3</p>	<p>institutional capacity needs.</p>	<ol style="list-style-type: none"> <li>1. Training needs for local community on sustainable agriculture practices, construction and management of rainwater harvesting systems, use of weather forecast and maintenance of hydraulic structures to mitigate flood impacts, Use of Geographic Information System (GIS) for the planning and monitoring of mitigation interventions, agroforestry skills, training WMC members on water management and training local administration officials on water management and how to manage these WMC</li> </ol>
<p>Nyabihu January 18<sup>th</sup> 2022</p>	<p>District level: District environmental management officer Sector level: Agronomists of sector Jenda and Kabatwa</p>	<p>3</p>		<ol style="list-style-type: none"> <li>2. Training needs for local community on maintenance of green houses, construction and site preparation, soil conservation, financial literacy, tourism skills.</li> <li>3. Capacity building needs in land use planning and disaster risk assessment including climate change,</li> </ol>

## I. Justification for Funding Requested

The Volcano Region in Rwanda is home to over 1.4 million people spread across 4 districts in the north-west of the country: Burera, Nyabihu, Rubavu and Musanze. It is one of the most climate-sensitive regions in the country due to soil instability, construction in flood prone areas, high rainfall and the steep hills which are a source of heavy runoff. The natural drainage network is composed of a few permanent rivers and intermittent seasonal streams originating from the volcanoes, responsible for most of the floods observed in the area. A combination of the high rainfall and steep topography, as well as the predominance of a volcanic rock formation, leads to a situation whereby almost all rainfall is converted into direct run off due to very limited infiltration capacity of the soil. The high population density in the area implies that there is significant exposure of the local population to flooding events. The region has experienced major floods causing fatalities, infrastructure, crop, and livestock damage. These climate-related events negatively affect community livelihoods: be it their housing, their harvest (source of income), etc.

The project's components seek to improve adaptive capacity of communities in Musanze by relocating 402 households to a smart green village and by introducing climate-resilient livelihoods to enable communities have livelihoods that are not prone to the impacts of climate change. Not addressing issues can exacerbate the effects of climate events such as flooding and landslides.

#### **A. Component 1: Resettling households living in high-risk zones to a smart green village**

**Baseline without AF funding:** Without the AF funding, it is likely that communities living in high-risk zones will continue to experience the adverse effects of climate change. Future climate change is likely to lead to increased risks. The overall amount of precipitation is forecast to increase, and the number of heavy rainfall days, or intensity of rainfall, may increase, raising the potential risks of floods, landslides, and soil erosion. This could mean that current flooding and landslides that occur in the western areas will likely continue and could increase in future. As climate events are exacerbated, so will fatalities, loss of property, crops, and livelihood be intensified leading to impoverished communities.

**Interventions with AF funding:** The proposed programme will reduce vulnerability of the relocated households to climate change impacts as they will be living in a smart green village located in a less prone area. The village will be constructed with durable materials that will resist future climatic changes, which is different for the less resistant houses that these families currently reside in. In addition, this component will enable relocated households to have access to economic and public infrastructure and utilities which will improve their standards of living. In addition, beneficiary families will be trained and then provide manual labour build their new home under supervision of the building engineer to reduce cost and to create ownership, understanding and autonomous long-term maintenance. This will ensure the sustainability of the village and provide construction skills that households may use in their daily livelihoods.

#### **B. Component 2: Transitioning from low to high value agriculture**

**Baseline without AF funding:** It is likely that people will continue to be trapped in poverty if the transition from low to high-value agriculture is not promoted in the region. 66% of the population in Musanze where project components will be implemented are involved in subsistence farming. Farmers face significant challenges including low productivity caused by the low levels of on farm mechanization and post-harvest value addition, cultivating climate-vulnerable crops, low access to finance, weak forward and backward linkages with other sectors, and more. These challenges are further exacerbated by climate change disasters caused by intense rainfall. If no interventions are implemented, communities will continue to use less climate-resilient agricultural practices using more land, which will not improve their livelihoods.

**Interventions with AF funding:** Component 2 will introduce high-value and eco-friendly value chains that target high-end tourism markets in the region. In this component, greenhouse farming will enable farmers to reduce the effects of unfavorable weather conditions such as high temperature, strong winds, heavy rainfall, hailstorms and as well as pests and diseases on crops, hence leading to increased yields. Increased yields will increase household income, which will

enable them to move out of poverty. The high-value crops such as mushrooms and other vegetables will empower communities to increase their incomes while using less land. The bamboo agroforestry will create job opportunities from nurseries, planting, maintenance, and harvesting. In addition, bamboo will contribute to the overall conservation in the area.

### **C. Component 3: Diversification of income generating activities/livelihoods**

**Baseline without AF funding:** Most people in the Volcano Region have no primary education let alone secondary education and have not received vocational training, the majority is doing work in subsistence agriculture, especially in rural areas. As farmers have small plots of land and face other challenges like climate change, high costs of inputs that limit their productivity, this makes 40% of the population in Musanze be below the poverty line. The poor penetration of alternative sources of income is justified by low technical and cognitive skills that communities have acquired. In addition, communities heavily depend on exploitation of natural resources especially when it comes cooking energy. Without any intervention, people will continue to depend on subsistence agriculture as a source of income as they won't have acquired skills to help them transition to off-farm economy. In addition, deforestation will continue to rise as people will continue to cut down trees for cooking energy.

**Interventions with AF funding:** This component aims at creating new business opportunities for relocated households and surrounding communities all that is aimed at increasing resilience to economic, social, and climatic shocks as well as at enhancing skills development that help people acquire technical skills to boost employment in the construction, manufacturing, tourism sector, etc. With AF funding, people will be equipped with tools and skills to make handicrafts and use their creative arts to attract more visitors in their communities. In addition, two producing units (one for bamboo FMCG and another for cooking pellets) will be established, which lead to more jobs created and a clean environment. In addition, the TVET center will boost skills level of community members in technical vocations such as welding, carpentry, tailoring, and more, which will indeed help in fighting against joblessness. When people have sustainable sources of income, they become more resilient to any shocks including climatic shocks.

### **J. Project Sustainability**

Rwanda's National Implementing Entity, the Ministry of Environment (formerly known as the Ministry of Natural Resources), and its partners have demonstrated through their participation in implementing various projects their full commitment to sustainable development through climate resilience in different sectors. With experience that the National Implementing Entity has from the execution of the AF funded project "*Reducing vulnerability to climate change in Northwest Rwanda through community-based adaptation*", the Ministry of Environment has capacity to design a sustainable project with the lessons learned from the previous project.

The proposed investment aligns with Government Priorities set out in key national policy documents including the Vision 2050, the National strategy for Transformation (NST1), the National Determined Contributions (NDCs), the Strategic Plan for Agriculture Transformation (PSTA4), Musanze's District Development Strategy. Alignment with national priorities ensures

Government commitment to project objectives during and beyond implementation. The operation of the project out of the Musanze District Headquarters will also ensure that District, Sector and Cell level governments play a central role in terms of project implementation and ensuring sustainability through the integration of adaptation plans into District Performance Contracts to institutionalize and sustain community interventions.

The establishment of a smart green village under component 1 will enhance planned urban settlements, which are more sustainable than informal settlements. The green attributes of the village such as waste and water management, renewable energy, etc. will contribute to village's sustainability. Architectural designs have been done with an aspect of sustainability in mind so that the environmental and carbon impact of the building be minimal using selective building materials such as volcanic stone, adobe blocks, and timber. In addition, beneficiaries of the green village will be trained on maintenance of aspects of their housing units, which will ensure ownership of the households. Also, the fact that relocated households will also be given agricultural land which they will use in high-value agriculture will ensure that these households adapt easily as they are mostly agricultural. Community buildings such as healthcare and education facilities will ensure ease integration of households in the new community as they will be able to access these services easier compared to their previous settlements. In addition, relocated households will be encouraged to form loan and savings groups to increase their access to finance.

To ensure sustainability for component 2 and 3, a market systems development (MSD) analytical tool was deployed to fully capture the constraint, opportunities, market failures etc. within the value chain for each livelihood option proposed. Market Systems Development (MSD) also known as Making Markets Work for the Poor (M4P) – 'seek to reduce poverty by making markets function more effectively, sustainably and beneficially for poor people'. The approach recognizes the poor as active market participants – as workers, producers and/or consumers – and seeks to address a variety of market failures that disadvantage them. For example, the poor often lack the inputs, services, skills, and information they need to be competitive and to adapt to the challenges and opportunities presented by markets. Unfavorable policy and regulatory environments and informal norms can also reduce their ability to benefit from market participation. In addition, engaging the financial sector to increase access to finance in communities, engaging the private sector, linking communities to markets will also contribute to the project's sustainability.

The strong emphasis on monitoring and evaluation (including the use of participatory systems) will provide for continuous feedback on impacts and results at the community level. Moreover, the knowledge management database will support the mainstreaming and replication of successful approaches through key national and regional agencies as well as lesson learning and sharing of best practices.

## **K. Environmental and Social Impacts and Risks**

- **Compliance with the Law:** There could risks related to non-compliance with the regulatory framework such as labor, land management, conservation laws, etc. However, the project will adhere to all national and international standards, policies, and regulations including AF's regulations from project design to implementation.

- **Access and Equity:** Risks that rise from the inability to ensure and monitor equitable access to everyone will be identified through further stakeholder assessments and extensive risk analyses. Out of this, the project will put in place measures to prevent any inequity during project implementation.
- **Marginalized and Vulnerable Groups:** The project targets poor rural agricultural households, women, children, youth, and illiterate people as vulnerable groups. There could be a risk of all vulnerable groups not being able to benefit from all project components. For instance, women who tend to be more illiterate may fall behind in capacity building and skills development that may require reading. Therefore, the project will ensure full participation of marginalized groups by using including methodology.
- **Human Rights:** The project shall not violate any human rights from design to implementation phase because the project will adhere to both national and international human rights. In further stakeholder engagements, human rights will be part of consultations.
- **Gender Equality and Women's Empowerment:** There is a risk of having less women involved in off-farm economic activities such as construction, carpentry skills due to the biases around women being more likely involved in agriculture than other sectors. However, the project will be designed in a way that both men and women will have equal participation in all project components.
- **Core Labour Rights:** As the project has components on job creation, there could be a risk of involving children under age. The project will ensure that national working standards are met such as working age, minimum wage, and occupational health are all respected.
- **Indigenous Peoples:** A full risk assessment will be conducted to know if there are indigenous people in the project area. If there are, they will have the same rights and access.
- **Involuntary Resettlement:** The relocation aspect could have a risk of involuntarily resettling people. However, prior stakeholder consultations have been conducted and the majority of households expressed that they would voluntarily move if they were given compensation equivalent to their possessions. Further assessments will be conducted to minimize the risks.
- **Protection of Natural Habitats:** The land spaces to be used in implementing activities are lands that are already used in agricultural productions. Therefore, there is no risk of destruction of natural habitats.
- **Conservation of Biological Diversity:** There is a risk that clearing land for either constructing the smart green village or for agricultural activities could lead to loss of biological diversity. The interventions will be implemented in open lands so that biological diversity will not be impaired.
- **Climate Change:** The transportation of project equipment and machinery and construction activities could lead to carbon emissions. Alternative measures that are carbon efficiency will be explored during the project implementation. The enhancement of bamboo agroforestry will offset these emissions.

- **Pollution Prevention and Resource Efficiency:** Construction activities could leave debris such as plastic waste behind. Cleaning measures will be applied after construction activities to ensure that the environment is not polluted.
- **Public Health:** COVID-19 is still a public health threat in Rwanda. Project implementation activities could increase COVID-19 contracts. Therefore, measures to halt the spread of COVID-19 such as vaccination, handwashing, and facemasks will be adhered to.
- **Physical and Cultural Heritage:** The project will be executed in one of the most touristic sites with a rich physical and cultural heritage. Local leaders will be consulted to understand more about these sites. Then, measures will be taken to ensure that the heritages are not destroyed or damaged.
- **Lands and Soil Conservation:** There is a risk of increasing run off during the construction activities under component 1. However, measures to increase water retention and conserve soil such as planting grass and trees near constructed units will be taken.

Table 19: List of environment and social principles

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
<i>Compliance with the Law</i>	X	
<i>Access and Equity</i>	X	
<i>Marginalized and Vulnerable Groups</i>		X
<i>Human Rights</i>	X	
<i>Gender Equality and Women's Empowerment</i>		X
<i>Core Labour Rights</i>	X	
<i>Indigenous Peoples</i>		X
<i>Involuntary Resettlement</i>		X
<i>Protection of Natural Habitats</i>	X	
<i>Conservation of Biological Diversity</i>	X	



<i>Climate Change</i>	X	
<i>Pollution Prevention and Resource Efficiency</i>		X
<i>Public Health</i>	X	
<i>Physical and Cultural Heritage</i>		X
<i>Lands and Soil Conservation</i>	X	

## **PART III: IMPLEMENTATION ARRANGEMENTS**

### **A. Project Implementation Arrangements**

**National Implementing Entity:** The Ministry of Environment (MoE) is the National Implementing Entity that will endorse the proposed Adaptation Fund Project. MoE is the Ministry responsible for ensuring sustainable development of the environment and management and rational use of natural resources. It is responsible for the development of policies, strategies, and programmes as well as the formulation of regulations and mobilizing resources for the development of the sector. The Ministry is also responsible for the monitoring and evaluation of the implementation of environment, climate change and natural resources management at the national level. MoE will be responsible for the overall management of the Project and financial, monitoring the achievement of the project outcomes/outputs, and reporting and supervision of the project with AF.

#### **Procurement of Goods, Works and Services**

All procurement of goods, works and services will be undertaken in accordance with National Implementing Entity's Rules of Procedure for the Procurement of Goods and Works (Law N°68/2018 of 25/08/2018 on public procurement, Ministerial order No 002/20/10TC of 19/05/2020 on the new procurement ceilings according to the level of the institution, Ministerial order No 002/20/10TC of 19/05/2020 establishing regulations on public procurement and standard bidding documents). MoE will submit to the secretariat, on an annual basis, a procurement audit report issued by the Auditor General's Office, or an independent auditor, on the Adaptation Fund project/s under implementation in relation to the effectiveness of its procurement systems and practice, as well as continuous availability of qualified resources in project cycle management. The report will correlate recommendations identified by the internal auditor of MoE and any relevant review by the Ministry of Economy and Finance (MINECOFIN), taking also into account any issues raised by stakeholders.

#### **Financial Management and Auditing Arrangements**

To effectively ensure project accounting and budget monitoring, the project will be equipped with suitable management tools (Procedures Manual, accounting software configured for this project, etc). Accounts will be kept in separate ledgers clearly showing all operations. The books and accounts will be incorporated into a computerized accounting management system suitable for producing financial statements that comply with international standards.

The annual financial statements, the special account and the functioning of the internal systems will be audited on an annual basis by the State finance General Auditor or a private auditing firm appointed by the General Auditor and fulfilling the Adaptation Fund's requirements. The auditor will be responsible for a posteriori evaluation and review of supporting documents. In addition, the Executing Entity, Rwanda Development Board (RDB), will prepare interim financial statements to be included in project quarterly progress reports. On the whole, this administrative and financial arrangement will reduce the fiduciary risk and ensure the efficient, effective and economic use of resources.

Disbursement arrangements: Adaptation Fund resources will be disbursed in accordance with National Implementing Entity's Rules of Procedure and Operational Procedures. The following two disbursement methods will be used: (i) the direct payment method for works, goods and services contracts; (ii) the special account or revolving fund (RF) method for goods and services contracts and for operating costs, project staff allowances and sundry management costs.

Adaptation Fund resources will be deposited into the special account opened by the project Executing Entity (RDB) in a local bank deemed acceptable to the Adaptation Fund. The provisions set forth in the Adaptation Fund's Disbursement Manual will apply. Disbursements from the special account will be made as an advance, based on an annual work programme and budget approved. Every request for an advance will be submitted to the NIE for approval and will cover a maximum period of six months of operations. The special account will be replenished on the basis of requests by RDB, backed by supporting documents for the use of at least 100% of the advance previously received.

MoE will also provide effective co-ordination with other climate change projects in Rwanda creating linkages where necessary. MoE will appoint a Programme Officer in Kigali to ensure the efficient disbursement and use of donor funds and timely delivery of project inputs and outputs. S(he) will also coordinate all other responsible parties for the purposes of forming the Steering Committee and Technical Advisory Group (see below) as well as support project implementation by assisting in recruiting and contracting of project personnel and consultant services, sub-contracting and procuring equipment in accordance with Government guidance and procedures (see above).

**Executing Entity:** The Rwanda Development Bank (RDB) will execute the Project. RDB was established in 2009 to promote economic development through managing, conserving, and improving the integrity of ecosystems so as to active environmental and tourism sustainability in the country. This includes wildlife protected areas – Volcanoes national park, Akagera national park and Nyungwe national park, reserves and sanctuaries lakes, rivers and swamps. RDB is also in charge of of overseeing protected areas and resources as well as develop Rwanda's tourism industry benefiting and boosting private companies to protect and benefit the people of Rwanda.

RDB will be responsible for implementing the project and will be ultimately responsible for the timely delivery of inputs and outputs and for coordination of all other responsible parties including other line ministries, relevant agencies, and local government authorities. RDB will appoint a Project Coordinator who will be based in Musanze and will manage a Project Implementation Unit.

RDB will also appoint a high-level official (Coordinator of the Single Project Implementation Unit) who will serve as the Project Director (PD). The PD will be a member of the Steering Committee and will provide oversight and guidance to an existing Single Project Implementation Unit (SPIU) within RDB.

**Steering Committee:** The SPIU will be overseen by a Steering Committee that will serve as the project's coordination and decision-making body and will ensure the project delivers its outputs

and achieves its outcomes. The Committee will periodically review project progress and evaluations, facilitate implementation (ensuring the necessary resources and support are provided in a timely manner) and provide guidance to the SPIU. The Steering Committee will also facilitate effective coordination between the key Governmental authorities at the national and district levels and ensure the project aligns with Government strategies and programs.

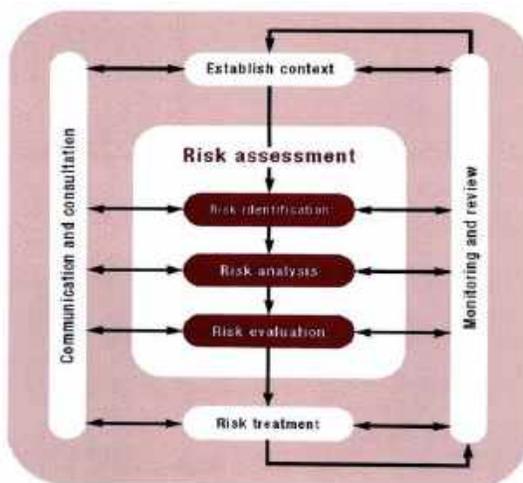
The Steering Committee will comprise a senior-level representative from Musanze (Vice Mayor Economic Affairs) and key ministries: Ministry of Finance and Economic Planning (MINECOFIN), FONERWA, Rwanda Development Board (RDB), Rwanda Housing Authority (RHA), Rwanda Land Management and Use Authority (RLMUA), Ministry of Agriculture and Animal Resources (MINAGRI), Rwanda Agriculture Board (RAB), Rwanda Environment Management Authority (REMA), Ministry of Infrastructure (MININFRA), Ministry of Trade and Industry (MINICOM), Ministry of Emergency Management (MINEMA), and Workforce Development Authority (WDA). The Steering Committee will be chaired by MoE and will meet every 6 months to review progress and approve work plans, budgets and any major changes in implementation. A local steering committee will also be established through the District Administration.

## **B. Financial and Project Risk Management**

### **GoR approach to risk management**

The project will be implemented by the Government of Rwanda through several its Ministries and agencies. Rwanda has a robust financial and project risk management framework that governs the activities of all government institutions. The Ministry of Finance and Economic Planning has published a set of Risk Management Guidelines to be followed by all government institutions and agencies. GoR recognizes that management of risk, is an important strategy for the achievement of NST 1, the Organic Law No. 12/2013/0L of 12/09/2013 on State Finances and Property requires every public institution to put in place risk management mechanisms to manage uncertainties that could impede achievement of institution's objectives. Figure 1 below provides visualization of the GoR risk management process that is applied to all projects under its implementation.

Figure 25: GoR risk management process



Source: Ministry of Finance and Economic Planning - Risk Management Guidelines, 2019

For this project, the following risk matrix has been drawn up based on an identification of the risk and how the risks will be managed and or mitigated- Table 20.

Table 20: Identified project risks and mitigation strategy

Type of risk	Description	Approach to mitigation
Strategic	GoRs ministries, agencies, and other stakeholders may not demonstrate the level of commitment needed to ensure the success of the project	Continuous communication and visibility, advocacy, and engagement with key stakeholders during the implementation of the project to secure and maintain political buy in.
		Consulting fully with the stakeholders so that the project remains relevant to their needs.
		Networking and establishing meaningful partnerships in support of delivery of the project
Financial	GoR implementing agencies lack the capacity to manage and track the project funds.	GoR through Minecofin has a system of annual assessments that ensure that projects are on track and that funds are spent on activities that had been agreed upon
		GoR internal audit function led by the Auditor general will ensure that all financial controls are in place and are being followed.
Economic	Some households and communities may benefit more than others from the implementation of the LIAP	Implementation of each intervention should include an inclusion assessment that guides the targeting of beneficiaries. Data should be collected on who in the targeted beneficiaries has or has not benefited from the project as designed.

Developmental	Some segments of the targeted population are left out of the beneficiation of the project – youth, women, and PWDs.  The project fails to deliver on its climate, environment, and conservation objectives	Continuous M&E of the project will help guide the implementation process and ensure that it is equitable.
		Implementation of the plan should mainstream youth, gender and PWDs across all interventions.  Each intervention should include an audit on the how climate, environment, and conservation objectives will be impacted, or negative effects will be mitigated and or eliminated.
Operational	GoR is unable to raise enough funding to implement the project  Poor visibility of the impacts and benefits of the project	GoR needs to draw up a funding strategy that will help raise financial support and commitment to support implementation at both the local and national government levels.
		Proactive, timely and planned communication and visibility actions throughout the duration of the project
Technical	Delayed progress in the implementation of the project that could impact on its usefulness to the affected communities.	Effective coordination at all levels – community, local and national government and with implementing partners (NGOs or private sector) to ensure the agreed interventions are delivered in a timely manner
Political	A poorly managed land acquisition and compensation programmes generates negative public opinions and distrust among the affected communities	GoRs agencies handling the relocation need to abide by the national and international guidelines on relocation and resettlement of communities.

## C. Environmental and Social Risk Management

### Context

The potential for economic growth in Rwanda is closely linked with development of its natural resources including land, water, biodiversity, and minerals. Exploitation of these natural resources may generate large economic benefits in the short to medium term. However, in the long-term unsustainable use of these natural resources increases not only environmental degradation, but decreases economic growth, increases social tensions, and decreases livelihood opportunities.

Climate change, land degradation, pollution to soils, water and air, lack of access to water, and reoccurring natural disasters pose significant risks to Rwanda and its possibility to attain sustainable development. In addition, driving forces such as extremely high urbanisation rates, the population's aspirations for higher living standards, and economic growth put additional pressures on the country's natural resources and environmental quality. However, rightly

managed, economic growth also constitutes an opportunity to reduce environmental pressures and social tensions, and a source of financing for environmental investments.

Rwanda has a Green Growth Strategy (2011) that aims to balance sustainable development that benefits all and delivers social improvement while limiting the impact on the climate and the environment. This Strategy aims to guide the process of mainstreaming climate resilience and low carbon development into key sectors of the economy. It provides a strategic framework which includes a vision for 2050, guiding principles, strategic objectives, programmes of action, enabling pillars and a roadmap for implementation.

### Environmental risks

The community to be relocated in this programme is currently in Nyabigoma cell, in Kinigi. This area has been prone to both flooding and landslides. A flood risk modelling assessment was undertaken as part of the development of the livelihood's implementation action plan. Based on this modelling assessment, Nyabigoma cell which has a total area of 2,892 km<sup>2</sup> and 6.1% of this area is predicted to be flooded under the T-25 scenario<sup>20</sup> - see figure 2. This flooded area is covered by 70% forests and 30% agriculture.

Similarly, several of relocation sites were identified. A set of criteria that was used to rank the suitability of each site with emphasis on how relocation of communities to each site would (i) reduce climate and environmental impacts; (ii) enhance community participation in conservation; (iii) support innovative and viable livelihood activities the increase the resilience at household and community level; (iv) improve the communities access to social infrastructure – roads, electricity, water, education, health etc.

A site at Kaguhu cell was identified as as the most suitable from an environmental and social economic perspective. A flood risk assessment was its suitability was assessed against the most recent flood models for the Kinigi area. Based on this modelling assessment, Kaguhu cell (which has a total area of 1,215 km<sup>2</sup>) is predicted that 4.9% of this area could be flooded under the T-25 scenario – see figure 13. This flooded area is covered by 55.1% forests, 44.7% agriculture, and 0.2% for settlements and buildings. In summary, the Kahugu site was chosen as it best delivered on the following:

- **Resilience to climate impacts** – the Kaguhu site is located on in an area that has limited flooding and landside risks.
- **Minimal environmental impact** – the site is relatively flat and even with heavy rainfall has good drainage which would minimise potential for soil erosion.
- **Conservation potential** – the site is outside the maximum area designated for the park expansion and hence will create a buffer and provide opportunities for the relocated and host communities to participate in VNP conservation activities.
- **Livelihood improvement** - the site is well located to the high-end tourism development and hence a key driver of economic activity and source of demand.

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<sup>20</sup> The probability of a catastrophic flood happening once every 25 years and the damage it would have on a specific area

Figure 26: Floods risk assessment in Nyabigoma cell

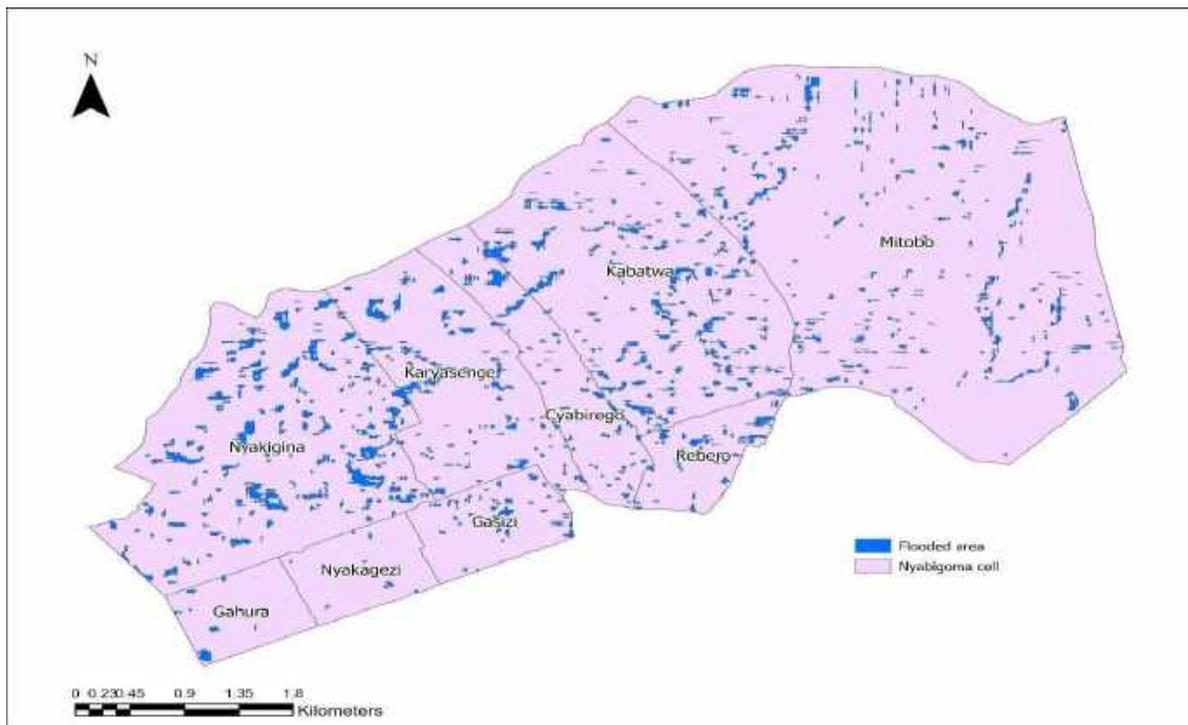
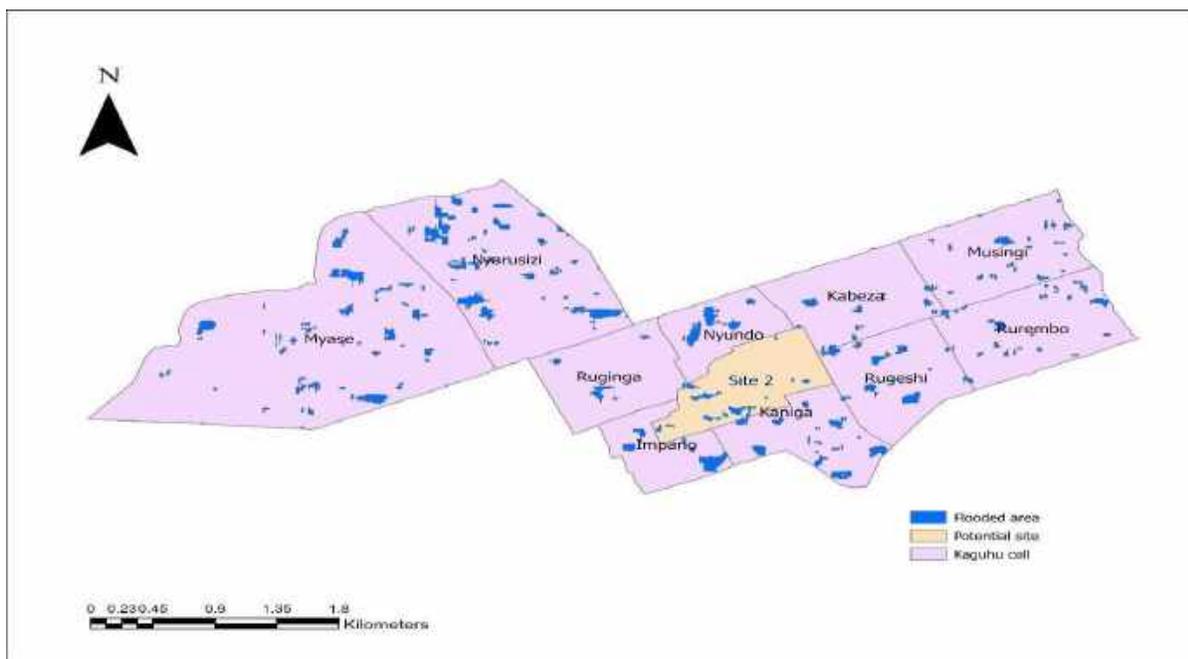


Figure 27: Flood risk assessment in Kaguhu cell



## Approach to managing environmental risks

In August 2018, Rwanda published a new Environment Law which regulates both Environmental Impact Assessments (EIA) and Social Economic Assessments (SEA). Since its adoption, EIAs and SEA's are mandatory parts of project design and implementation. The Rwanda Environment Management Authority (REMA) has outlined guidelines to be followed in the when undertaking environmental impact and social economic assessments<sup>21</sup>. The General Guidelines recognize several ways for public participation. They mention that it depends on circumstances of each EIA which of the following methods are considered appropriate:

- Public review of Environmental Impact Report,
- Informal group meetings with local community groups and leaders,
- Workshops,
- Public displays or bulletin boards posted in communities,
- Public notification and calls for written comments on proposed project/activities,
- Participation in scoping processes,
- Survey of a groups or individuals who are representative of the various interests being affected by a proposal,
- Consultation with focus groups to identify issues specific to certain stakeholders,
- Comment and review of the EIA,
- Distribution of relevant documents to the interested members of the public.

For this project, the following environmental risks have been identified – see Table 21 below;

Table 21: Identification and mitigation of environmental risks

Type of risk	Description	Approach to mitigation
<b>Environmental risks</b>		
Land degradation	Relocated communities use land use practices that reduce the quality of the land and its capacity to sustain livelihoods	Communities will be trained on sustainable land use that minimises the impact on climate and the environment
Pollution – land, water, and air	Relocated communities impose a significant environmental cost through land use practices that lead to increased pollution of land, water, and air	Capacity building and raising awareness of pollution impacts in the relocated communities
Lack of access to water	Relocated communities face competition for water due to lack of infrastructure and or high population density in the areas earmarked for relocation	Project has been developed to include water resource management and conservation at household and community levels
Flooding and landslides	Relocation sites are susceptible to flooding and landslides	The site selected for relocation has undergone extensive flood risk modelling to ensure the area has minimal exposure to floods and landslides

<sup>21</sup> The Rwanda Environmental Management Authority (REMA) is the central authority responsible for implementing EIA and SEA.

## Social risks

Communities to be relocated currently reside in Kinigi sector in Nyabigoma cell in 9 villages. This cell has a population of 5,632 residents living in 1,353 households. Not all households are going to be relocated. The programme is aiming to relocate 402 households. The recent socioeconomic baseline survey conducted for a 304-household sample highlighted the following about the community to be relocated.

- Poverty - 56% of these households were classified in Ubudehe category 3, 33% in category 2, and 11% in category 1<sup>22</sup>. Education – 94% have primary level education (the majority between 1-4 years); 1% of respondents have a diploma or university degree and 5% have only completed secondary school or received a vocational training education<sup>23</sup>. There are no gender differences in educational attainments across the surveyed population. The proportion of households with primary school graduates is higher compared to households with members that possess advanced degrees.
- Literacy - Most respondents are literate in Kinyarwanda and have not completed primary school. Women respondents have a higher percentage of the illiteracy compared to men.

The survey was also used to assess sources of income and the types of crops that households in the community were cultivating.

- Farming is the most common source of income to many households in Nyabigoma cell. Households primarily cultivate Irish potatoes and pyrethrum. Beans and maize are also cultivated but not substantially.
- In addition to their own farming, households also earn a living from providing labour on other farms. More than half of households earn income from livestock. On average, farming own crops has a 51% share in a household income<sup>24</sup>. Although a third of households indicated that they receive income from off-farm activities, this source only accounts for a small proportion of the household income on average.

Access to health care and social protection programmes is an important consideration for the communities to be relocated. From the survey the following are worth noting.

- Access to health services in Nyabigoma cell is more improved than the access in Musanze even at the national level. Ninety nine percent of households that we interviewed had insurance schemes, and the majority was mutual health insurance<sup>25</sup>. On average, households walk for 63 minutes to reach the nearest health center.
- Social protection programs in Nyabigoma cell include Vision 2020 Umurenge Programs (VUP) and one cow per family policy (Girinka). Eighteen percent of households are enrolled in the Girinka program and 6% are in the VUP<sup>26</sup>.

## Approach to managing social risks

The main social impacts in this project emanate from the relocation of communities that will be

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<sup>22</sup> ibid

<sup>23</sup> ibid

<sup>24</sup> Vanguard Economics, quantitative survey of sampled households in Nyabigoma cell, 2021

<sup>25</sup> ibid

<sup>26</sup> ibid

affected by the expansion of the VNP. The Government has developed various law, policies and strategies that related to humane and equitable relocation of communities affected either by natural disasters, development, urbanization etc. that are in line with international standards. The Government's Resettlement Policy Framework (RPF) of 2016 outlined guidelines and process to be followed in assessing the social impact of project like the VNP park expansion, and specifically how to manage the displacement and resettlement of the affected persons in lieu of the anticipated involuntary displacement.

RPF seeks to ensure that any possible adverse impacts of proposed project activities to people's livelihoods are addressed through appropriate mitigation measures against potential impoverishment risks. These risks will be minimized by:

- Avoiding displacement of people as much as possible;
- In the event that displacement is inevitable, having a well-designed compensation and relocation process in place;
- Minimizing the number of project affected persons (PAPs), to the extent possible;
- Compensating for losses incurred and displaced incomes and livelihoods; and
- Ensuring resettlement assistance or rehabilitation, as needed, to address impacts on PAPs and their well-being and restore livelihoods.

Table 22: Identification and mitigation of social risks

Type of risk	Description	Approach to mitigation
<b>Social risks</b>		
Increased poverty	Relocated communities are driven into higher levels of poverty due to a loss of livelihoods	GoR has developed a livelihoods improvement action plan that
Loss of economic assets	Relocated communities lose non-transferable assets such as housing and land	GoR implements a comprehensive resettlement action plan (RAP) that provides adequate and fair compensation for non-movable assets
Reduced access to social infrastructure	Relocated communities have reduced or face significant competition to access social services – health, education, social protection, and other government services	The LIAP has clearly outlined the need to enhance the provision of social infrastructure in the Kahugu cell to ensure sufficient provision of social services for the relocated and host communities
Reduced access to economic infrastructure	Relocated communities face challenges in accessing markets, jobs, and entrepreneurship opportunities due to poor access to infrastructure – roads, electricity, telecoms etc	The relocation site has undergone an extensive assessment of its suitability to enhance the livelihoods of the communities being relocated. the site was chosen given its proximity to economic infrastructure and the Kinigi tourist economy

## D. Monitoring and Evaluation Arrangements

Measuring the performance of the project is critical to helping assess its impact on beneficiaries in addition to understanding how it can be used to help shape future policy and approached to relocating sustainably communities. Consequently, the following is proposed

- **Monitoring the implementation progress** – this could be done on an annual basis using the results framework. For effective results, a baseline study will be required before implementation of the project commences.
- **Evaluation of the project** – depending on the agreed duration of the project, evaluation of the plan should be done at the midline and endline.
- **Lessons and impact stories** – this would be an important way of tangibly demonstrating the impact of the plan to stakeholders – communities, government, funding agencies, implementation partners etc

## E. Results Framework

### 1. The Theory of Change (ToC)

The dynamics of implementing this project requires an understanding of the challenges and opportunities that currently communities in the Kinigi sector face due to climate change impacts. As indicated previously, these challenges and opportunities have been identified through the collection and analysis of primary and secondary data, especially in-depth consultations with stakeholders at the local, regional, and national levels. The ToC presented in figure below attempts to explain how these challenges can be addressed and opportunities exploited to deliver the type of impact that was envisioned under this project /programme.

### 2. Project components

Based on the extensive consultations with stakeholders on the constraints and opportunities related to the relocation, the following areas of intervention have been proposed in this action plan.

- **Resettling households living in high-risk zones to a smart green village:** The village shall have climate-resilient settlements as well as improved public economic and social infrastructure.
- **Transitioning from low to high value agriculture** - By introducing high-value crops that target high-end tourism market in the region.
- **Diversification of income generating activities/livelihoods** – by increasing the level of agriculture value addition, creating new business opportunities in conservation all aimed at increasing resilience to economic, social, and climatic shocks.

### 3. Levels of intervention

Interventions in this project will be implemented at various levels based on type of activity and the targeted beneficiaries

- **Micro economy** – At this level the focus is on activities undertaken at the individual level that would enhance the incomes and resilience of the participating household. Examples include raising livestock or construction jobs in the green village etc

- **Meso economy** – At this level the focus is on activities that the community undertake as a group and or services delivered to them that would improve the economic and social standing of the community. Examples of these activities include a community-based poultry business, development of the tree nurseries, or the provision of a health facility.
- **Macro economy** – At this level the objective is to support both households and communities strengthen their linkages into the macro-economy - regional and national. Examples of this include provision of value-added services and goods to the tourism and construction industries.

#### 4. Cross cutting themes

In implementing the project, it's imperative that several cross-cutting issues are embedded and or considered in the design of the interventions. These include the following

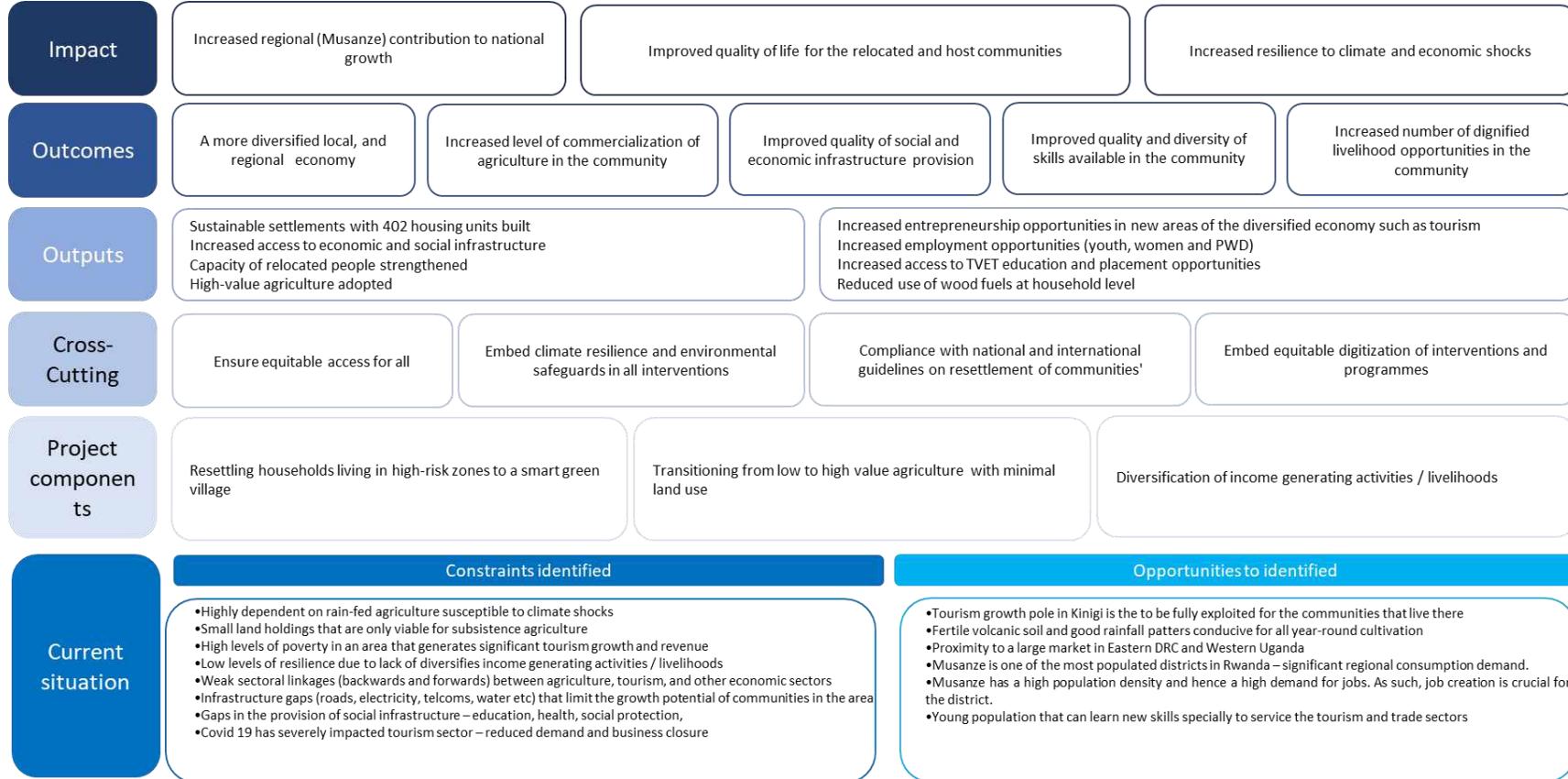
- **Maximize gender, youth and PWD participation** – At all levels an inclusion lens needs to be applied to ensure equitable access and participation by all. This means a careful understanding of the factors that may exclude the participation of some sections of society and how these would be addressed. Additionally, the M&E data collected on the impact of the project should be disaggregated to understand how different groups have benefited or been affected by the implementation of the plan.
- **Climate, environment, and conservation safeguards** – Imperative that all interventions are assessed on how they reduce and mitigate climate and environmental impacts while enhancing or complementing VNP conservation efforts.
- **Compliance with international standards** – It is critical that implementation of the plan and its interventions follows international and national standards on (i) resettlement of communities; (ii) conservation and biodiversity standards, principles, and practices.
- **Embedding digital solutions** – Where relevant digital solutions should be explored to simply process and to aid data collection and analysis. In doing so, it's important for these solutions to be tailored to be inclusive so as not to exclude some sections of the society that may not be digitally literate or have the infrastructure and tools to participate on these platforms.

#### 5. Assumptions underlying the ToC

There are several assumptions underlying the ToC. The assumptions are the conditions that need to be in place for this project to deliver on the outputs, outcomes and impacts outlined in the ToC. The assumptions explain the logic behind the project and the causal links attributed to the climate, conservation, economic and social impacts that the plan is expected to deliver to the targeted communities (relocated and host). The following assumptions are proposed;

- GoR's application to AdF is successful and is fully funded
- GoR raises sufficient funding to implement its compensation and relocation programme
- GoR raises additional funding for the non-AdF components of the project
- GoR and global efforts to contain the covid 19 pandemic are successful in limiting its impact on the international, regional, national, and local economies.

Figure 28: Theory of change



## F. Alignments with AF's Results Framework

### A. Outputs and indicators

Table 23 presents the output indicators and how they will be measured. The outputs and indicators outlined are not conclusive and can be further refined at the start and during the implementation of the project.

Table 23: Output indicators and their measurement

	Output indicator	How it will be measured	Source of data
Output 1	Sustainable settlements with 402 housing units built	No of households relocated	RDB
Output 2	Increased access to economic and social infrastructure	No of schools, ECD, health centres, recreational areas, roads, electricity connections etc built or upgraded	RDB
Output 3	Capacity of relocated people strengthened	No of relocated people who received construction training disaggregated by skills, age, and gender	Survey data
Output 4	High-value agriculture adopted	No of households that have transitioned to high-value agriculture	RDB
Output 5	Increased entrepreneurship opportunities in new areas of the diversified economy	No of new business operating in non-traditional sectors (gender and age disaggregation)	Musanze District, Kinigi sector  Or establishment census 2023
Output 6	Increased employment opportunities (youth, women and PWD)	No of jobs created disaggregated by gender age and disability	Labour Force Survey
Output 7	Increased access to TVET education and placement opportunities	No of people trained by TVET or other training centers – disaggregated by gender and age  No of people trained with placement opportunities	Labour Force Survey
Output 8	Reduced use of wood fuels at household level	No of households in Musanze using pellets as cooking energy	Integrated Household Living Conditions Survey

Source: Vanguard Economics, 2022

## B. Outcome statements and indicators

The following outcome statements are indicative and would be further refined in the validation of the project by various stakeholders – see Table 24. They are expected to provide an indication of the medium-term results achieved following the effective implementation of the project.

Table 24: Outcome indicators and their measurement

	Outcome indicator	How it will be measured	Source of data
Outcome 1	A more diversified and resilient regional economy	New sustainable income generating activities in the region	Survey data
Outcome 2	Increased level of commercialization of agriculture in the community	No of commercial operations recorded in the sector No of business linked to commercial off takers	Survey data
Outcome 3	Improved quality and provision of social and economic infrastructure	No of roads, schools, health centers, TVET etc that have been built or upgraded to support the project	Musanze district, Kinigi sector
Outcome 4	Improved quality and diversity of skills available in the community	No people trained in a range of TVET skills	Labour Force Survey
Outcome 5	Increased number of dignified livelihood opportunities in the community	No of people employed or business started in the Kahugu cell of Kinigi sector	Survey data of establishments in project area

## C. Impact statements and indicators

The vision and objectives of the project speak of the important role of the VNP expansion project will play in catalyzing green growth and contributing to improving the welfare and livelihoods of the communities impacted by the project. As such, the impact statements (Table 25) are designed to provide a framework from which the effective implementation of the project can be assessed.

Table 25: Measurement of the project impact indicators

	Impact indicator	How it will be measured	Source of data
Impact 1	Increased regional (Musanze) contribution to national growth	GDP growth in Agric, Tourism, Services and Construction	National Accounts
Impact 2	Improved quality of life for the relocated and host communities	Income, health, and education, measures for the district	Survey data
Impact 3	Increased resilience to climate and economic shocks	Income, climate events impacts	Survey data

## D. Alignment with Adaptation Fund result framework

Table 26: Alignment of result frameworks

Project Objective(s) <sup>1</sup>	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
<b>Impact 2</b> - Improved quality of life for the relocated and host communities	Income, health, and education, measures for the district	<b>Outcome 6:</b> Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.1 Percentage of households and communities having more secure access to livelihood assets	1,830,000
			6.2. Percentage of targeted population with sustained climate-resilient alternative livelihoods	
<b>Impact 3</b> - Increased resilience to climate and economic shocks	Income, climate events impacts	<b>Output 1.2:</b> Targeted population groups covered by adequate risk reduction systems	1.2.1. Percentage of target population covered by adequate risk-reduction systems	6,757,585
<b>Outcome 3</b> - Improved quality and provision of social and economic infrastructure	No of roads, schools, health centers, TVET etc that have been built or upgraded to support the project	Output 4: Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by sector and scale)	640,000

## G. Detailed Budget

The budget with a year-by-year breakdown is shown in the table below. The overall cost of the project is US\$ 22,122,735 over 5 years. The amount requested from AF for the project is US\$ 9,977,585 whereas the remaining US\$ 12,145,150 will be GoR Co-finance amount

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Table 27: Budget for implementation of proposed project

Project output/activity	Year 1	Year 2	Year 3	Year 4	Year 5	Total, USD	AdF	Co-finance	No.
<b>1. Resettling households living in high-risk zones to smart green villages.</b>									
<i>1.1 Constructing climate resilient green village with 402 dwelling units</i>									
Detailed design and engineering	925,000	0	0	0	0	925,000	391,169	533,831	1
Construction supervision of housing	172,000	258,000	0	0	0	430,000	181,841	248,159	2
Construction supervision of site servicing and infrastructure	153,600	230,400	0	0	0	384,000	162,388	221,612	3
Earth works / Landscaping	683,400	0	0	0	0	683,400	289,000	394,400	4
Roads servicing	482,400	723,600	0	0	0	1,206,000	510,000	696,000	5
Improved stormwater management and slopes stabilization	160,800	241,200	0	0	0	402,000	170,000	232,000	6
Power supply	0	442,200	0	0	0	442,200	187,000	255,200	7
Water supply	0	603,000	0	0	0	603,000	255,000	348,000	8
Rainwater harvesting	0	924,600	0	0	0	924,600	391,000	533,600	9
Composting toilet	0	723,600	0	0	0	723,600	306,000	417,600	10
Composting facility	0	40,200	0	0	0	40,200	17,000	23,200	11
Urban agriculture	144,720	217,080	0	0	0	361,800	153,000	208,800	12
Solar Street lighting and public facilities solar lighting	192,960	289,440	0	0	0	482,400	204,000	278,400	13
Kitchen gardens	0	241,200	0	0	0	241,200	102,000	139,200	14
Preliminaries	844,200	0	0	0	0	844,200	357,000	487,200	15
Substructure	1,407,000	0	0	0	0	1,407,000	595,000	812,000	16
Superstructure	530,640	795,960	0	0	0	1,326,600	561,000	765,600	17

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Wall finishes (plastering and paint)	0	603,000	0	0	0	603,000	255,000	348,000	18
Roof structure and covering	192,960	289,440	0	0	0	482,400	204,000	278,400	19
Doors & Windows	0	402,000	0	0	0	402,000	170,000	232,000	20
Ceiling and Insulation	0	1,608,000	0	0	0	1,608,000	680,000	928,000	21
Tiling	0	321,600	0	0	0	321,600	136,000	185,600	22
Plumbing and electrical	0	522,600	0	0	0	522,600	221,000	301,600	23
High-efficiency solid fuel cook stove	0	16,080	0	0	0	16,080	6,800	9,280	24
Sanitary and kitchen fixtures and equipment	0	596,820	0	0	0	596,820	252,387	344,433	25
<b>Subtotal</b>		<b>5,889,680</b>	<b>10,090,020</b>	<b>0</b>	<b>0</b>	<b>0 15,979,700</b>	<b>6,757,585</b>	<b>9,222,115</b>	
<i>Percent expenditure per year</i>		<i>37%</i>	<i>63%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>			
<i>1.2 Provision of social amenities</i>									
Health post	0	110,000	0	0	0	110,000	0	110,000	26
Early Childhood center (nursery)	0	275,000	0	0	0	275,000	275,000	-	27
Mini market and post harvest handling facility	0	550,000	0	0	0	550,000	0	550,000	28
Multipurpose hall	0	220,000	0	0	0	220,000	220,000	0	29
Office of local leaders	0	55,000	0	0	0	55,000	55,000	0	30
ICT community knowledge centre (Irembo)	0	35,000	0	0	0	35,000	35,000	0	31
Police post	0	55,000	0	0	0	55,000	55,000	0	32
<b>Subtotal</b>		<b>0 1,300,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0 1,300,000</b>	<b>640,000</b>	<b>660,000</b>	
<i>Percent expenditure per year</i>		<i>0%</i>	<i>100%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>			

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*1.3 Capacity building of beneficiaries on maintenance of the smart green village*

Preparation of training and awareness materials	7,500	7,500	0	0	0	15,000	0	15,000	33
Capacity assessment	58,700	0	0	0	0	58,700	0	58,700	34
Training workshops to raise awareness	27,600	37,750	37,750	0	0	103,100	0	103,100	35
Construction trades training	70,840	70,840	70,840	70,840	70,840	354,200	200,000	154,200	36
<b>Subtotal</b>	<b>164,640</b>	<b>116,090</b>	<b>108,590</b>	<b>70,840</b>	<b>70,840</b>	<b>531,000</b>	<b>200,000</b>	<b>331,000</b>	
<i>Percent expenditure per year</i>	<i>31%</i>	<i>22%</i>	<i>20%</i>	<i>13%</i>	<i>13%</i>				
<b>Cost for Component 1</b>	<b>6,054,320</b>	<b>11,506,110</b>	<b>108,590</b>	<b>70,840</b>	<b>70,840</b>	<b>17,810,700</b>	<b>7,597,585</b>	<b>10,213,115</b>	

**2. Transitioning from low to high value agriculture**

*2.1 Promote the use of greenhouses by communities to intensify the growing of high value horticulture destined for the Kinigi high-end tourism hotels*

Consultation with RAB and MINAGRI	2,700	0	0	0	0	2,700	2,700	0	37
Installation of greenhouses	40,000	80,000	0	0	0	120,000	120,000	0	38
Training in greenhouse use and facility maintenance training	9,800	14,700	8,820	8,820	8,820	50,960	50,960	0	39
Periodic maintenance	18,950	25,268	25,268	25,268	31,586	126,340	126,340	0	40
<b>Subtotal</b>	<b>71,450</b>	<b>119,968</b>	<b>34,088</b>	<b>34,088</b>	<b>40,406</b>	<b>300,000</b>	<b>300,000</b>	<b>0</b>	
<i>Percent expenditure per year</i>	<i>24%</i>	<i>40%</i>	<i>11%</i>	<i>11%</i>	<i>13%</i>				

*2.2 Promote the diversification into the cultivation of horticulture (mushrooms, cherry tomatoes, herbs, garlic, ginger, etc) that destined for the high-end tourism market in Musanze and Kigali*

Product assessment and development	9,600	0	0	0	0	9,600	9,600	0	41
Data collection and market research	19,500	0	0	0	0	19,500	19,500	0	42
Site identification and selection, establishment and cultivation	100,000	0	0	0	0	100,000	100,000	0	43

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Marketing and advertisement	3,150	4,250	4,250	4,250	4,250	20,150	20,150	0	44	
Operating costs/Transportation of products	9,135	10,404	10,404	10,404	10,404	50,750	50,750	0	45	
<b>Subtotal</b>	<b>141,385</b>	<b>14,654</b>	<b>14,654</b>	<b>14,654</b>	<b>14,654</b>	<b>200,000</b>	<b>200,000</b>	<b>0</b>		
<i>Percent expenditure per year</i>		<i>71%</i>	<i>7%</i>	<i>7%</i>	<i>7%</i>	<i>7%</i>				
<i>2.3 Develop a sustainable bamboo agro-forestry industry that supplies – construction, food, and FMCG products</i>										
Sites identification, products study, designs and selection	10,500		0	0	0	0	10,500	10,500	0	46
Establish and develop a sustainable bamboo agro-forestry industry	16,425	37,230	18,615	18,615	18,615	109,500	109,500	0	47	
<b>Subtotal</b>	<b>26,925</b>	<b>37,230</b>	<b>18,615</b>	<b>18,615</b>	<b>18,615</b>	<b>120,000</b>	<b>120,000</b>	<b>0</b>		
<i>Percent expenditure per year</i>		<i>22%</i>	<i>31%</i>	<i>16%</i>	<i>16%</i>	<i>16%</i>				
<i>2.4 Develop community-based poultry industry that supplies meat and eggs to the high-end tourism market in Kinigi and Kigali</i>										
2 rearing houses construction and equipment	40,000		0	0	0	0	40,000	40,000	0	48
First year feed costs and other production costs	12,000		0	0	0	0	12,000	12,000	0	49
Technician and labors	4,000	4,000		0	0	0	8,000	8,000	0	50
<b>Subtotal</b>	<b>56,000</b>	<b>4,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>60,000</b>	<b>60,000</b>	<b>0</b>	
<i>Percent expenditure per year</i>		<i>93%</i>	<i>7%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>				
<b>Cost for Component 2</b>	<b>295,760</b>	<b>175,852</b>	<b>67,357</b>	<b>67,357</b>	<b>73,675</b>	<b>680,000</b>	<b>680,000</b>	<b>0</b>		
<b>3. Diversification of income generating activities/livelihood</b>										
<i>3.1 Develop cottage industries making unique community handicrafts targeted at the tourism market</i>										
Needs assessment	3,325		0	0	0	0	3,325	3,325	0	51
Technical training on handcrafting skills	4,700		0	0	0	0	4,700	4,700	0	52

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Investments in cottage industries to make handicrafts	13,992	13,992	13,992	0	0	41,975	41,975	0	53	
<b>Subtotal</b>	<b>22,017</b>	<b>13,992</b>	<b>13,992</b>	<b>0</b>	<b>0</b>	<b>50,000</b>	<b>50,000</b>	<b>0</b>		
<i>Percent expenditure per year</i>	<i>44%</i>	<i>28%</i>	<i>28%</i>	<i>0%</i>	<i>0%</i>					
<i>3.2 Create a cultural art village that generates awareness of and promotes the local culture in Kinigi</i>										
Training of selected village members in hospitality and relevant tourism aspects	12,700		0	0	0	0	12,700	12,700	0	54
Cultural village venue establishment, preparation and construction	187,300		0	0	0	0	187,300	187,300	0	55
<b>Subtotal</b>	<b>200,000</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>200,000</b>	<b>200,000</b>	<b>0</b>	
<i>Percent expenditure per year</i>	<i>100%</i>		<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>				
<i>3.3 Establishing a bamboo FMCG production unit</i>										
Establishment of a bamboo FMCG production unit	125,000	200,000	25,000	25,000	25,000	400,000	400,000	0	56	
<b>Subtotal</b>	<b>125,000</b>	<b>200,000</b>	<b>25,000</b>	<b>25,000</b>	<b>25,000</b>	<b>400,000</b>	<b>400,000</b>	<b>0</b>		
<i>Percent expenditure per year</i>	<i>31%</i>	<i>50%</i>	<i>6%</i>	<i>6%</i>	<i>6%</i>					
<i>3.4 Enhance technical and vocational skills that would link the community into the services and construction sectors</i>										
Subside short-term TVET attendance for 1000 youth in Kinigi/Musanze	60,000	60,000	60,000	60,000	60,000	300,000	100,000	200,000	57	
<b>Subtotal</b>	<b>60,000</b>	<b>60,000</b>	<b>60,000</b>	<b>60,000</b>	<b>60,000</b>	<b>300,000</b>	<b>100,000</b>	<b>200,000</b>		
<i>Percent expenditure per year</i>	<i>20%</i>	<i>20%</i>	<i>20%</i>	<i>20%</i>	<i>20%</i>					
<i>3.5 Establishing a cooking pellet processing unit</i>										
Creation and capacity building of energy user groups	1,880	1,880	1,880	1,880	1,880	9,400	9,400	0	58	
Establishment of a cooking pellet unit	72,400	86,700	10,500	10,500	10,500	190,600	190,600	0	59	
<b>Subtotal</b>	<b>74,280</b>	<b>88,580</b>	<b>12,380</b>	<b>12,380</b>	<b>12,380</b>	<b>200,000</b>	<b>200,000</b>	<b>0</b>		
<i>Percent expenditure per year</i>	<i>37%</i>	<i>44%</i>	<i>6%</i>	<i>6%</i>	<i>6%</i>					

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<b>Cost for Component 3</b>	<b>481,297</b>	<b>362,572</b>	<b>111,372</b>	<b>97,380</b>	<b>97,380</b>	<b>1,150,000</b>	<b>950,000</b>	<b>200000</b>
<b>Project Execution costs (&lt; 9.5% of the total budget, before the NIE fees)</b>	<b>391,800</b>	<b>263,820</b>	<b>284,160</b>	<b>263,820</b>	<b>296,400</b>	<b>1,500,000</b>	<b>750,000</b>	<b>750,000</b>
<b>Total project cost (before the NIE fees)</b>	<b>6,831,377</b>	<b>12,044,533</b>	<b>287,318</b>	<b>235,577</b>	<b>241,895</b>	<b>19,640,700</b>	<b>9,227,585</b>	<b>10,413,115</b>
<b>Project cycle management fee (&lt;5% of the total budget)</b>	<b>196,407</b>	<b>196,407</b>	<b>196,407</b>	<b>196,407</b>	<b>196,407</b>	<b>982,035</b>	<b>0</b>	<b>982,035</b>
<b>Total amount of financing requested</b>	<b>7,419,584</b>	<b>12,504,760</b>	<b>767,885</b>	<b>695,804</b>	<b>734,702</b>	<b>22,122,735</b>	<b>9,977,585</b>	<b>12,145,150</b>

**Budget Notes:**

No.	Budget Notes
1	Detailed design and engineering
2	Construction supervision of housing
3	Construction supervision of site servicing and infrastructure
4	Earth works / Landscaping
5	Roads servicing
6	Improved stormwater management and slopes stabilization
7	Power supply
8	Water supply
9	Rainwater harvesting
10	Composting toilet
11	Composting facility
12	Urban agriculture
13	Solar Street lighting and public facilities solar lighting
14	Kitchen gardens
15	Preliminaries
16	Substructure
17	Superstructure
18	Wall finishes (plastering and paint)
19	Roof structure and covering

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- 20 Doors & Windows, total for the 402 houses
- 21 Ceiling and Insulation
- 22 Tiling
- 23 Plumbing and electrical
- 24 High-efficiency solid fuel cook stove
- 25 Sanitary and kitchen fixtures and equipment
- 26 Construction of health post on 200 m2 at \$550/m2
- 27 Construction of an early childhood center on 500 square meters at \$550/m2
- 28 Construction of Mini market and post harvest handling facility on 1000 sq. m at \$550/m2
- 29 Construction of a multipurpose hall on 400 m2 at \$550/m2
- 30 Construction of the office of local leaders 100 sq. m at \$550/m2
- 31 Construction of ICT community knowledge centre on 50 sq m at \$700/m2
- 32 Construction of a police post on 100 m2 at \$550/m2
- 33 International consultant for 9 days per year @ \$800 per day
- 34 230 days total to cover all regions by 3 local consultants @ US\$ 250 per day
- 35 30 days of training over 3 years includes training venues, refreshments, travel, preparation and delivery of training  
Hands on practical training to the beneficiaries occurring multiple times throughout the year. It includes venues, refreshments, training facilitation
- 36 tools and delivery.
- 37 10 days local consultant @ US\$ 250 per day to discuss plans with RAB and MINAGRI as well as hold relevant meetings and visits
- 38 3 greenhouses in 3 different sites, one in first year and 2 in second year. 800 sq. meter greenhouse to cost \$40,000 each.  
Training activities throughout the year each year to the selected farmers and personnels directly involved in greenhouse operations. Cost includes 20
- 39 days for local consultant @ US\$ 250 annually, training venues, travel and refreshments.
- 40 Purchase of equipment to use in maintenance, labors and relevant operational costs to maintain the facilities
- 41 International consultant for 12 days at \$800/day  
Data collection and market research in the selected districts on the performance of mushrooms, cherry tomatoes, herbs, etc. in Rwanda by a
- 42 consultancy firm over 20 days.
- 43 Growing space preparation, establishment and plantation cost
- 44 Radio broadcasts, posters, events and community meetings
- 45 Transport of products, farm inputs and other materials
- 46 2 local consultants for 20 days each @ US\$250 per day  
Establishment and development of bamboo forest through a professional and contractual services provider undertaking the activities of bamboo
- 47 trees plantation, value addition and transformation into finished products  
Construction of 2 rearing houses to use for chicks during brooding and another houses older hens in. Purchase of poultry equipment including
- 48 feeders, drinkers and litter. 10,000 hens flock target.

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- Year 1 costs of production to cover purchase of feeds, disinfectants and transportation of feed to the rearing houses. Revenues from sales will cover production costs of the following years
- 49 production costs of the following years
  - 50 Year 1 and year 2 staff cost for 1 poultry technician and 5 part time employees
  - 51 Local consultant for 15 days @ US\$ 235/day
  - 52 2 local consultants for 20 days total @ \$235 per day
  - 53 Annual investment within first 3 years in the skilled entrepreneurs within the community to make handicrafts
  - 54 Training events including venue, art expert fees, refreshments and travel allowances for participants
  - 55 Cultural village venue establishment, preparation and construction
  - Establishment of a bamboo FMCG production unit. Year 1 costings include site preparation, preliminaries and construction. Year 2 accounts for
  - 56 equipment, installations and early operational costs
  - 57 Subside short-term TVET attendance for 1000 youth in Kinigi/Musanze
  - 58 40 days at US\$ 235 by a service provider or NGO
  - 59 Establishment of a cooking pellet unit
  - 60 Hired at project inception
  - 61 Hired at project inception
  - 62 Hired 1 month after project inception to enable PM to participate in recruitment
  - 63 Hired 1 month after project inception to enable PM to participate in recruitment
  - 64 Hired 1 month after project inception to enable PM to participate in recruitment
  - 65 Hired 1 month after project inception to enable PM to participate in recruitment
  - 66 Hired 1 month after project inception to enable PM to participate in recruitment
  - 67 20 community animators - phone cards, per diems, and accomodation for training, refreshments
  - 68 Hired at project inception
  - 69 Toyota brand vehicle with up to 8 seats for mobility
  - 70 To ensure mobility to the fields by staff
  - 71 For faster mobility of community animators
  - 72 Mobile phones for 8 staff and 20 community animators
  - 73 Solar lamps with phone chargers for the community animators
  - 74 Personal protective equipment for community animators when on field
  - 75 Permanent staff hired at project inception

A breakdown of the project execution costs is shown in Table 28. The costs comprise of 9 staff within the project implementation unit. These costs amount to USD 1,500,000. Half of the financing will come from the AF and the rest from GoR co-finance option.

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Table 28: Project execution costs

Project output/activity	Year 1	Year 2	Year 3	Year 4	Year 5	Total, USD	AdF	Co-finance	No.
<i>Project execution costs (&lt; 9.5% of the total budget requested, before the implementing entity fees)</i>									
Project manager gross salary	41,400	41,400	41,400	41,400	41,400	207,000	103,500	103,500	60
Financial and administrative assistant	19,872	19,872	19,872	19,872	19,872	99,360	49,680	49,680	61
Monitoring and evaluation officer gross salary	18,492	19,872	19,872	19,872	19,872	97,980	48,990	48,990	62
Agronomist gross salary	11,000	13,248	13,248	13,248	13,248	63,992	31,996	31,996	63
Community development officer gross salary	11,000	13,248	13,248	13,248	13,248	63,992	31,996	31,996	64
Enterprise development officer gross salary	11,000	13,248	13,248	13,248	13,248	63,992	31,996	31,996	65
Communications officer gross salary	12,144	13,248	13,248	13,248	13,248	65,136	32,568	32,568	66
Community animators	19,000	19,000	19,000	19,000	19,000	95,000	47,500	47,500	67
Driver	6,072	6,624	6,624	6,624	6,624	32,568	16,284	16,284	68
Project vehicle	58,600	0	0	0	0	58,600	29,300	29,300	69
Motorcycles	28,700	0	0	0	0	28,700	14,350	14,350	70
Bicycles for community animators	5,755	0	0	0	0	5,755	2,878	2,878	71
Vehicle maintenance, insurance, tax, etc.	8,790	8,790	8,790	8,790	8,790	43,950	21,975	21,975	
Fuel for vehicle and generator	20,850	20,850	20,850	20,850	20,850	104,250	52,125	52,125	
Security	6,150	7,150	7,150	7,150	7,150	34,750	17,375	17,375	
Accommodation and perdiems	3,180	3,180	3,180	3,180	3,180	15,900	7,950	7,950	
Office rent	2,000	2,000	2,000	2,000	2,000	10,000	5,000	5,000	

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Office furniture	6,600	0	0	0	0	6,600	3,300	3,300	
Computers and IT equipment	11,665	0	0	0	0	11,665	5,833	5,833	
Internet connection	1,160	1,160	1,160	1,160	1,160	5,800	2,900	2,900	
Mobile phones (for 9 staff and 20 community animators)	1,000	0	0	0	0	1,000	500	500	72
Solar lamps with phone chargers	1,000	0	0	0	0	1,000	500	500	73
PPE for community animators	1,200	0	0	0	0	1,200	600	600	74
Project engineer for construction works	33,120	33,120	33,120	33,120	33,120	165,600	82,800	82,800	75
Stationery and supplies	3,650	3,650	3,650	3,650	3,650	18,250	9,125	9,125	
Management meetings	8,150	8,150	8,150	8,150	8,150	40,750	20,375	20,375	
Inception workshop and annual workshops	8,500	8,500	8,500	8,500	8,500	42,500	21,250	21,250	
Annual field visit for representatives of the Steering committee	3,250	3,250	3,250	3,250	3,250	16,250	8,125	8,125	
Baseline survey	28,500	0	0	0	0	28,500	14,250	14,250	
Mid term evaluation	0	0	24,600	0	0	24,600	12,300	12,300	
Final evaluation	0	0	0	0	33,490	33,490	16,745	16,745	
Audits	0	4,260	0	4,260	3,350	11,870	5,935	5,935	
<b>Subtotal</b>	<b>391,800</b>	<b>263,820</b>	<b>284,160</b>	<b>263,820</b>	<b>296,400</b>	<b>1,500,000</b>	<b>750,000</b>	<b>750,000</b>	
<i>Percent expenditure per year</i>		<i>26%</i>	<i>18%</i>	<i>19%</i>	<i>18%</i>	<i>20%</i>			

## H. Disbursement Schedule

Table 29: Disbursement schedule

	On signing agreement	Year 1	Year 2	Year 3	Year 4	Total
Date	2024	Dec 2025	Dec 2026	Dec 2027	Dec 2028	
Project Funds from AdF in USD	2,000,000	1,994,396	1,994,396	1,994,396	1,994,396	9,977,585

## PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

### A. Record of Endorsement on Behalf of the Government

*Provide the name and position of the government official and indicate date of endorsement. The endorsement letter should be attached as an annex to the project proposal. Please attach the endorsement letter with this template:*

<i>(Enter Name, Position, Ministry) Patrick KARERA, Permanent Secretary of MoE &amp; DA of Adaptation Fund in Rwanda</i>	<i>Date: (Month, day, year) April, 27<sup>th</sup>, 2023</i>
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**B. Implementing Entity Certification**

*Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans Updated NDC, Revised Green Growth & Climate Resilience Strategy, NST1) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy and the Gender Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

<sup>6</sup> Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

<i>Name &amp; Signature</i>	
Patrick KARERA Permanent Secretary Implementing Entity Coordinator	
Date: <i>(Month, Day, Year)</i> April, 28, 2023	Tel. and email: +250789414092 pkarera@environment.gov.rw
Project Contact Person: Diane BUCYANA	
Tel. And Email: +250788887939 & <a href="mailto:diannabucyana@environment.gov.rw">diannabucyana@environment.gov.rw</a>	



**ADAPTATION FUND**

**Letter of Endorsement by Government**

Government of Rwanda

28<sup>th</sup> April 2023

**To: The Adaptation Fund Board  
c/o Adaptation Fund Board Secretariat  
Email: [Secretariat@Adaptation-Fund.org](mailto:Secretariat@Adaptation-Fund.org)  
Fax: 202 522 3240/5**

**Subject: Endorsement for Enhancing adaptation through sustainable green settlements and climate-resilient livelihoods in the Volcano Region of Rwanda**

In my capacity as designated authority for the Adaptation Fund in Rwanda, I confirm that the above national grant proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the country.

Accordingly, I am pleased to endorse the above grant proposal with support from the Adaptation Fund. If approved, the project will be implemented by the Ministry of Environment (MoE) and executed by Rwanda Development Board (RDB).

Sincerely,

**Patrick KARERA**  
Permanent Secretary of MoE &  
DA of Adaptation Fund in Rwanda

