STRATEGIC PLAN 2023-2028

NIRDA

National Industrial Research and Development Agency

Executive Summary

This NIRDA's second generation of strategic plan provides a new orientation for industrial research and development and innovation aimed to support the national goal of promoting diversified and competitive industries in Rwanda. This document plays two major roles. Firstly, it stands as an implementation document for the national industrial policy in line with the country's vision and national strategic orientation. Secondly, this strategy plays an important role as a reference planning document for subsequent annual planning execises by NIRDA and its stakeholders and partners for the 2023 – 2028 period.

The strategy builds on achievments and progress made during the implementation of the first strategy which guided activities and interventions in the area of industrial development in Rwanda during the 2018-2022 period. The previous strategy was implemented with a customized focus on a mission to enable a generation of industrial innovators to become competitive through technology monitoring, acquisition, development, transfer and applied research. Through this 5-year strategy, ten (10) value chains were supported, seven (7) research and development projects undertaken, and both life science and STEM for an industry hub have been operationalized to support private sector industries to become more competitivene. The implementation of the Strategic Plan 2018-2022 was expected to be a catalyst for an increase in export potential to undertake import substitution and innovations around selected value chains.

A situation analysis was conducted to identify key issues partianing to the development of the industrial sector in Rwanda so as to inform new strategic interventions. The issues identified were around core functions of NIRDA and its support systems. The areas of core functions comprise the technology development and quality testing, tehnology transfer and commercialization, and technology gap. With regard to the support systems that were assessed, these include the institutional capacity development, human resource development, the monitoring, evaluation and learning (M&EL) framework, public and private paternerships, and finance and procurement.

Based on key gaps and issues partianing to the prformane of NIRDA's core functions, the strategy has proposed a number of strategic actions clustered under three main pillars: (1) science, technology, and innovation for the industries, (2) private-led industries and partnerships, and (3) capacity development for industries. Under each pillar, there are around nine priority areas with a total of thirty two strategic actions/interventions and respective estimated budget and performance indicators as detailed in Annex 1- (Table 12).

For an effective implementation of this strategy, some critical considerations are important to document. These include, but are not limited to, mobilization of sufficient resources and adequate infrastructure, active engagement of the private sector and other partners, skilled human resources, and ownership of this strategic plan by the staff at all levels. Furthermore, being an implementing agency of the Ministry of Trade and Industry, NIRDA is supposed to have a sector strategic plan to more guidance on division of labor and joint planning with other aligned agencies. Overall, the current estimated budget to implement the proposed interventions in this strategic plan is 47 billion Rwandan Francs.

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List of Abreviations and Acronyms

BDS	Business Development Services
BRD	Rwanda Development Bank
CPCIC	Cleaner Production and Climate Innovation Centre
CST	College of Science and Technology
DMRS	Domestic Markets Recapturing Strategy
EAC	East African Community
EDP	Entrepreneurship Development Policy
GDP	Gross Development Product
IRST	Institute of Scientific and Technological Research
KPIs	Key performance indicators
LDCs	Low Developing Countries
M&EL	Monitoring, Evaluation, and Learning framework
MIFOTRA	Ministry of Public Services and Labour
MINECOFIN	Ministry of Finance and Economic Planning
MINEDUC	Ministry of Education
MININFRA	Ministry of Infrastructure
MiR	Made in Rwanda Policy
MSMEs	Micro, Small and Medium Enterprises
MVA	Manufacturing Value Added
NCCLCD	Climate Change and Low Carbon Development
NCST	National Council for Science and Technology
NES II	National export strategy
NIRDA	National Industrial Research and Development Agency
NISR	National Institute of Statistics of Rwanda
NRIA	National research and innovation agenda
NST-1	National Strategy for Transformation-1
PAST4	Strategic Plan for Agriculture Structural Transformation
R&D	Research and Development
RAB	Rwanda Agricultural Board
RAS	Rwanda Academy of Science
RDB	Rwanda Development Board

REMA	Rwanda Environmental Management Authority
RFDA	Rwanda Food and Drugs Agency
RHA	Rwanda Housing Authority
RP	Rwanda Polytechnic
RRECPC	Rwanda Resources Efficiency and Cleaner Production Centre
RSB	Rwanda Standards Board
RTB	Rwanda TVET Board
SDGs	Sustainable Development Goal
SEZ	Special Economic Zones
SMEs	Small and Medium Enterprises
STEM	Science, Technology, Engineering and Mathematics
STI	Technology and Innovation
SWOT	Strength, Weaknesses, Opportunities & Threats
TVET	Technical and Vocational Educational Training
UNIDO	United Nations Industrial Development Organization
UR	University of Rwanda
UR-HG	University of Rwanda-Holdings Group
USD	United States Dollar
VCs	Value Chains

1. Introduction and Background

1.1. INTRODUCTION

Over the last few years, the mid-term review of NST-1 has substantiated that the National Industrial Research and Development Agency (NIRDA) has contributed towards industrial research that generated scientific knowledge and new technologies to complement research done by other research-based institutions such as RAB and the academia. More industries have been developed through sector-specific support and incentives to enhance their competitiveness and expansion, through investing in capacity building for priority sectors and suppliers, and supporting technology acquisition and upgrading (MINECOFIN, 2022[1]). It is against this background that NIRDA has opted to establish a new strategic orientation to support the country's ambitions and strategies in the area of industrial development based on technology upgrading in priority sectors and value chains.

1.2. BACKGROUND

NIRDA was established in 2013 with a mission to support the diversification of the Rwandan economy, replacing the former Institute of Scientific and Technological Research (IRST). Its mandate is defined through national policies and strategies adopted a few years after its establishment. Such policies include the Domestic Markets Recapturing Strategy (DMRS) and the Made in Rwanda Policy (MiR) adopted in 2015 and the Science, Technology and Innovation Policy adopted in 2020.

Further, to locate NIRDA's contribution to Rwanda's industrial development, the reference is made to the Presidential Order no. 073/01 of the 09/12/2022 governing NIRDA. According to the Order, NIRDA's responsibilities are as follows:

a) to gather, analyze and monitor global and regional industrial technology knowledge;

b) to conduct technology audits and analysis in selected priority industrial value chains to guide its interventions;

c) to facilitate firms to acquire industrial technology and ensure technology transfer and its commercialisation;

d) to provide industrial business and technical advisory services to private enterprises;

e) to conduct applied research with private enterprises to enhance industrial development, sampling and prototyping of commercial products;

f) to support the development of new industrial property rights and their commercialization;

g) to establish modern laboratories and provide industrial laboratory testing services to the private sector;

h) to establish technology incubation and product development centres, especially those promoting resource efficient and green technologies;

i) to support the incubation of technology foresight;

j) to train industrial enterprises in areas which promote industrial competitiveness, access to markets and development of new competitive value chains;

k) to establish and develop industrial research and development partnership with international, regional and national institutions, both private and public;

l) to advise the Government on policy relating to industrial competitiveness and industrial research development;

m) to perform any other responsibility which is not contrary to its mission, as may be assigned to it by the law or competent organs.

To carry out its missions, NIRDA has prepared and implemented a strategic plan covering the period 2018-2022, which was aligned to the central development themes of national development framework as depicted in the country's Vision 2050 and the Rwanda Government seven (7) year programme, as enclosed in the National Transformation Programme (NST1). NIRDA's strategic plan 2018-2022 was implemented with a customized focus on a mission to enable a generation of industrial innovators to become competitive through technology monitoring, acquisition, development, transfer and applied research. Through this 5-year strategic plan (2018-2022), ten (10) value chains were supported, seven (7) research and development projects undertaken, and both life science and STEM for the industry hub have been operationalized to enable private sector industries to be more competitive. The implementation of the strategic plan was expected to be a catalyst for increased export potential to undertake import substitution and innovations around selected value chains.

However, despite positive developments made during last decades, the industry sector remains less competitive and the Rwandan economy is still a net importer, even if the trade deficit has decreased progressively. Thus, the current strategic plan 2023-2027 aims at building on the actions initiated in the implementation of the strategic plan 2018-2022 and undertaking new strategic interventions to improve the national industrial diversification, productivity and competitiveness.

1 NST-1 (Mid-Term) review.

1.3. THE NATIONAL CONTEXT OF INDUSTRIAL DEVELOPMENT

1.3.1. The manufacturing industry structure is dominated by young SMEs

In Rwanda, the industrial structure remains dominated by young, micro and small sized enterprises. According to the 2020 establishment census, among manufacturing firms, 69.43% are three or less years old, while those aged more than 10 years only constitute 7.58%. This structure of the manufacturing industry in terms of age is reflected in the whole industrial sector. However, situation is different for the agriculture sector, where enterprises aged 3 or less years or less represent only 37.16% of all enterprises operating in the agriculture sector, while those aged more than 10 years represent 48.37%.

Table 1: Percentages of the enterprise age distribution per economic sector

Age Groups	Manufacturing	Total Industry	Agriculture	Services
Between 0-3 Years	69,43	67,48	37,16	72,71
Between 4-5 Years	12,03	12,24	14,46	11,30
Between 6-10 Years	10,96	11,95	26,18	8,82
Between 11-25 Years	6,42	7,01	18,70	0,53
Between 26-50 Years	1,08	1,18	2,99	1,02
Between 51-100 Years	0,07	0,13	0,50	0,83
101 and plus	0,01	0,01	0	0,04
Total	100	100	100	100

Source: NISR 2020 Establishments Census

According to the 2020 establishment census, 97.8% of enterprises in the industrial sector are of micro and small sized, while only 0.6% are of large size in terms of number of workers[2]. Further, this industrial structure is reflected in that of the manufacturing industry where micro and small sized enterprises also predominate. Briefly, young SMEs are predominant in the Rwandan industrial structure, while older and large firms are very few. This can be interpreted as a consequence of the low performance in terms of production, diversification and competitiveness of the industrial sector both at the domestic and international scene.

Table 2: Size structure of the industry sector based on a total number of workers at the firm level

Size Category	Manufacturing	Mining and quarrying	Electricity and gas	Water and Sewerage	Construction	All Industry	All Sectors
Micro (1-3)	87,13	20,42	20,00	93,25	47,06	85,92	91,74
Small (4-30)	11,33	49,65	64,29	5,00	38,82	11,92	7,13
Medium (31-100)	1,17	16,90	14,29	1,52	11,18	1,58	0,93
Large (>100)	0,37	13,03	1,43	0,23	2,94	0,59	0,19
Total	100	100	100	100	100	100	100

Source: NISR 2020 Establishments Census

2 The Enterprise Size is defined according to the SMEs Development Policy (MINICOM, 2010).

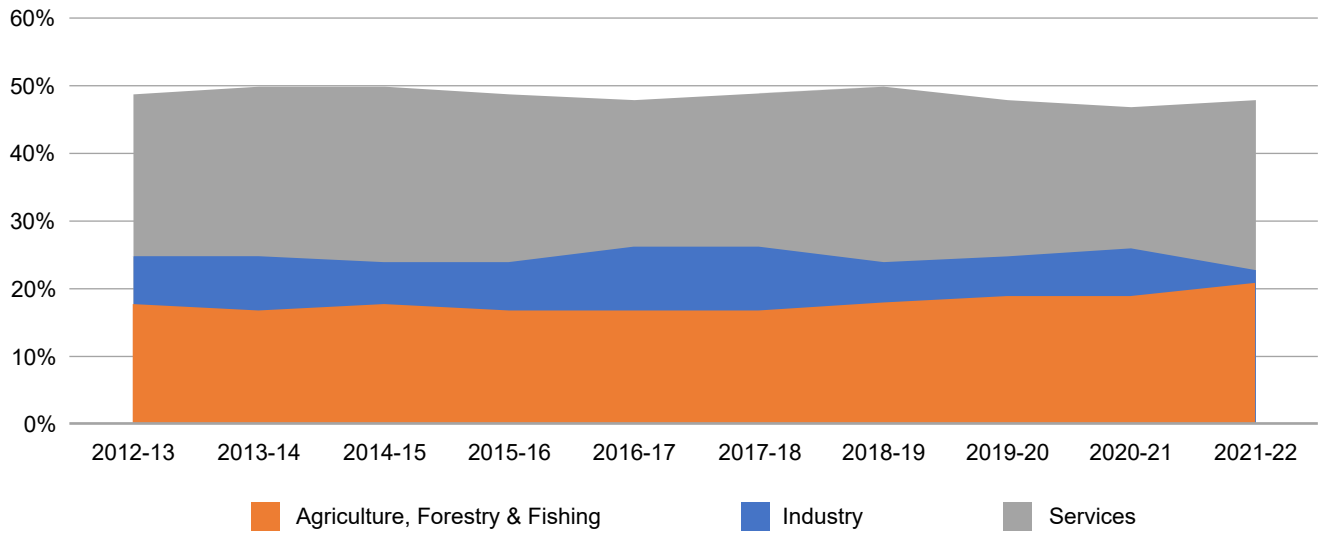
Further, this structure is probably the cause of limited investment in research and development (R&D) and innovation as raised by the World Bank enterprises survey conducted in Rwanda in 2019. Indeed, according to this survey, only 9 manufacturing enterprises out of 120 surveyed reported having invested in R&D, i.e., 7.5% of all manufacturing industries. Among firms which reported investing in R&D in 2018, only three were large sized, four were medium sized and two were small sized in terms of the number of permanent workers. Furthermore, only 14 manufacturing enterprises reported having introduced a new product during the previous 3 years, representing 11.7% of total manufacturing industries. Thus, these figures confirm that the research and innovation mindset among the owners and managers of manufacturing enterprises is still poor and needs a specific action from the Government.

1.3.2. The contribution of the manufacturing industry to GDP is relatively high and slightly increasing

The contribution of the industrial sector to the Rwandan economy is significant. During the last 10 years, its contribution to GDP averaged 18%, with the minimum being 17% and the maximum being 21% as recorded in the fiscal year 20212022. However, its contribution is lesser than that of services (49%) and that of agriculture (25%) (Figure 1).

Considering the detailed contribution of the industry to GDP by subsectors, the manufacturing industry dominates, with an average contribution of 9% during the last 3 years (see Figure 2). The construction sub-sector comes next with an average contribution of 7% during the last 3 years. Also, as can be sen in Figure 2, the contribution of the manufacturing industry has been growing since the fiscal year 2015-2016, and outpasses the construction subsector.

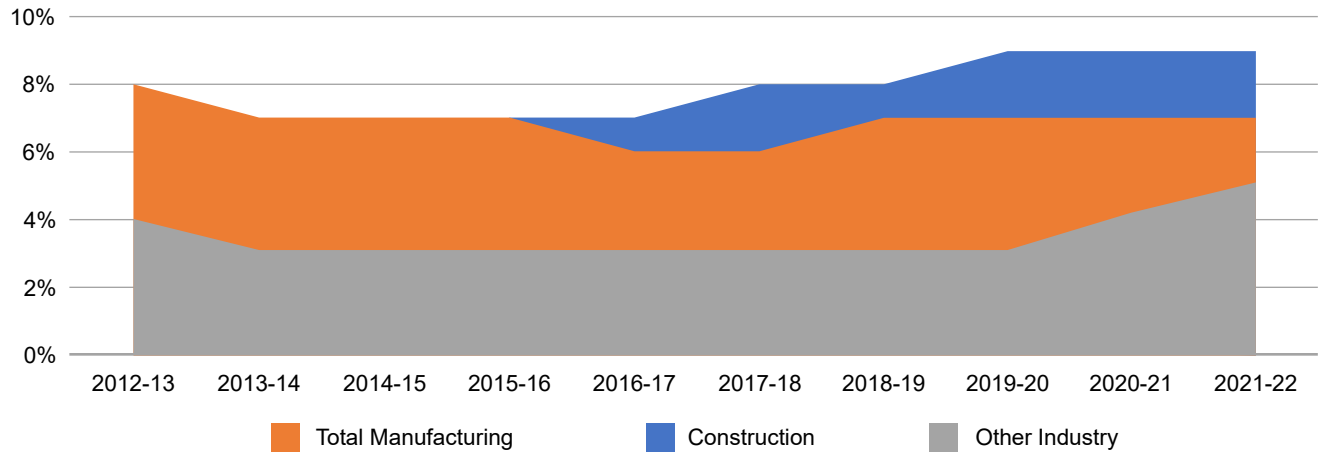
Figure 1: Rwanda's GDP distribution per economic sectors



Source: Computed from NISR (2022) Rwanda GDP National Accounts

With reference to the SDG target 9.2 related to inclusive and sustainable industrialisation, the industry's share of employment and of gross domestic product should at least double in least developed countries by 2030. In Rwanda, the share of the manufacturing industry's gross domestic product is expected be at least 14%while the share of the whole industry's gross domestic product should be 34% by 2030. This remains a big challenge for national industrial policy implementers, as the deadline of the target is only 6 years away.

Figure 2: Contributions of industry subsectors to Rwanda's GDP



Source: Computed from NISR (2022), Rwanda GDP National Accounts

1.3.3. The contribution of the industrial sector to employment

The number of manufacturing establishments is relatively limited because their proportion represents 7.15%, which is far below that of wholesale and retailing trade establishments that represent 57.4% while those in the accommodation and food susector represent 19.9%.

However, despite this relatively low number of manufacturing establishments, their contribution to employment is remarkable. The number of total employees working in the manufacturing subsector represents 10.4%, while this proportion is of 26.7% for the wholesale and retail trade and 11.9% for the accommodation and food services subsector. On average, an establishment operating in the manufacturing employs 4 workers in total, which is higher than the average of 3 workers per establishment in the whole economy. This average is 1 worker in wholesale and retail trade and 2 workers in the accommodation and food services sector. Only two subsectors employ more workers than the manufacturing subsector and these are agriculture and education (see table 3).

Table 3: Percentages of establishments and workers employed per economic activity

Economic Activity	% of Establishments	Percentage of workers			Average #workers
		Total	Male	Female	
Agriculture, forestry and fishing	0,17	2,38	1,89	3,15	42
Manufacturing	7,15	10,41	10,04	11,00	4
Other industries	0,79	3,79	4,98	1,93	-
Whole sale and retail trade	57,38	26,72	25,86	28,05	1
Accommodation and food services	19,85	11,86	12,45	10,94	2
Education	1,80	15,34	14,51	16,64	26
Other Services	12,85	29,49	30,27	28,29	-
Total	100	100	100	100	3

Source: NISR 2020 Establishments Census

1.3.4. The competitiveness of the industry and manufacturing industry sectors

Regarding the competitiveness at the international scene and considering the number of enterprises exporting or importing goods, the national manufacturing industry remains less competitive. Only 1.76% of manufacturing enterprises operate on export markets. In the agriculture sector, 5.92% of all existing enterprises have participated in export markets of goods. These figures confirm the limited competitiveness of the industry sector in general, and the manufacturing industry specifically.

Table 4: The percentage of industrial enterprises in international trade

Have done some transaction of goods with a foreign country during 2019								
Type of trade	Manufacturing	Mining	Electricity	Water	Construction	Total	Agriculture	Services
Export	0,69	8,45	4,35	0,30	0,59	0,80	4,44	0,18
Import	1,28	5,63	26,09	0,68	18,24	1,55	2,96	1,12
Export & Import	0,47	2,11	2,90	0,00	0,59	0,47	1,48	0,09
No intern. trade	97,56	83,80	66,67	99,01	80,59	97,18	91,11	98,61
Total	100	100	100	100	100	100	100	100

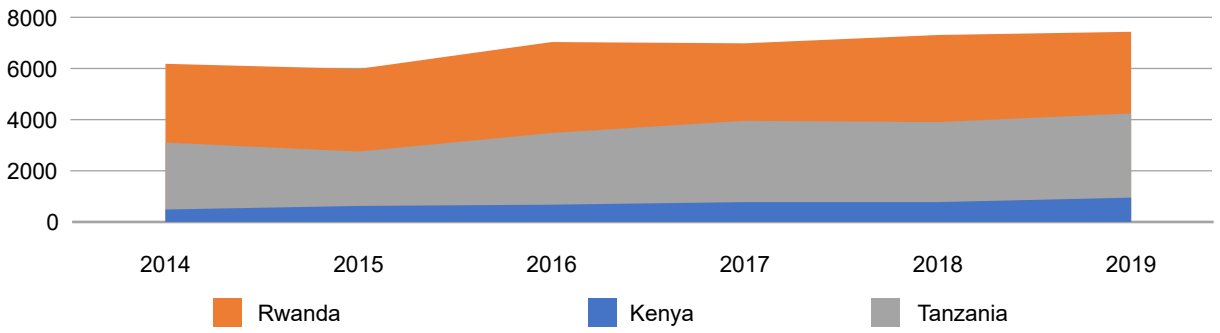
Source: World Bank's Rwanda Enterprise survey 2019

Thus, despite its potential in terms of employment and of productivity, the national industrial sector in general, and the national manufacturing industry in particular, still face challenges in terms of international competitiveness. This can be seen through the World Bank enterprises survey carried out in 2019 on the reasons preventing enterprises from exporting. Only 11.69% of the surveyed manufacturing enterprises reported insufficient production capacity, which almost double the national average of 5.9%. Inadequate technology is among main factors hindering the competitiveness of the Rwandan manufacturing industry.

1.4. THE REGIONAL AND GLOBAL CONTEXT OF INDUSTRIAL DEVELOPMENT

The regional industrial development context can be understood through a comparative analysis of the manufacturing industry's productivity. Using the UNIDO database about the industrial development, and comparing the Rwandan economy with other regional economies, the constatation is that the Rwandan industry is lagging behind compared to other regional industries. The comparison with Kenya and Tanzania illustrates that the manufacturing value added (MVA) of Rwanda is 5 times smaller than that of Tanzania and 9 times smaller than that of Kenya. Also, in terms of intertemporal progression, the two regional countries have an MVA which grows faster than that of Rwanda. Consequently, more effort is needed to upgrade the national manufacturing sector so as to be more competitive on the regional market.

Figure 3: The Manufacturing Value Added (MVA) in millions of USD of three EAC countries



Source: Computed from UNIDO industrial database

In its SDG-9 report, UNIDO (2021[3]) published a report report on the achievements made on SDG 9-2 target, which is about promoting inclusive and sustainable development, especially by increasing the contribution of the manufacturing industry in employment and productivity. In the report, UNIDO observed that the industrialisation of nations worldwide has been an engine of growth and of poverty reduction. The report shows that the productivity of the manufacturing industry is evaluated at around 3% of the annual growth since 2013, with a peak of 4.4% in 2017 and the lowest value of 2.8% in 2019, due to tensions between leading economies, among other factors. In addition, the COVID-19 pandemic impacted the manufacturing industry by restricting the movements of goods and people, resulting in a drop in manufacturing estimated at 6.8% in 2020 (UNIDO, 2021).

However, the negative impact of the pandemic was fiercer in developed economies than in developing countries. Even if globally industrialised economies continued to dominate the manufacturing industry, their share dropped from 60.3% in 2010 to 50.5% in 2020. The COVID-19 pandemic has accelerated the relatively increasing trend of the manufacturing production share of developing countries in comparison to developed countries, with the predominance of China in this gradual shift. In fact, the share of China is 31.7%, while the share of other emerging economies (excluding China) is 14.5% of global manufacturing production. The share of less developed economies in the global manufacturing production is negligible, around 1.1 percent only.

With regards to the employment share of industrialisation, UNIDO (2021) reports that the 4th industrial revolution and the emergence of advanced digital production technologies has had a negative impact on employment share of industrialisation, particularly in developed countries, in terms of job losses and reduction of hours worked. Worldwide, the share of manufacturing employment in total employment decreased from 15% in 2000 to 13.7% in 2019. However, in LDCs, the trend was different even if the acceleration was reduced: LDCs doubled their share of manufacturing employment in total employment since 2000, and this share increased slightly from 6.8% in 2009 to 7.3% in 2019. The growing trend was also observed in other developing countries (UNIDO, 2021).

1.5. STRATEGIC PLANNING PROCESS

The process of developing this strategic planning was made up of three main phases:

Phase 1- Desk review: The first phase was a desk review of all relevant documents to be informed about the status of, and progress made against, the various targets of the previous strategic plan (2018-2022). These include, but are not limited to, the strategic plan document itself, annual reports, value chains technology audit reports, various needs assessment and technical reports, annual plans, internal policies and procedures manuals.

Phase 2 – Key consultations: in this phase, a number of consultations were conducted first with NIRDA's senior managers and technical personnel at the inception stage and during the review process. This was done through a technical deliberative workshop and key informant interviews with stakeholders and partners. The insights received at this stage added significant value to the understanding of both internal and external environments of NIRDA as part of the SWOT analysis. This phase also served as an opportunity to understanding the impact that NIRDA had achieved in the previous five years.

Phase 3- Situation analysis: This third stage involved a situation analysis based on data and information gathered during the the above two phases to understand the current context of NIRDA in terms of its achievements and impact made during the implementation of the previous strategic plan. The core activities conducted in ths phase included the following:

a. Assessment of NIRDA's vision, mission and strategic objectives to investigate whether these needed to be updated;

b. Review of the progress made on key performance indicators (KPI) to establish whether the strategic objectives had been achieved. This also applies for KPIs related to the national strategies and policies to establish the extent to which NIRDA is achieving its mandate.

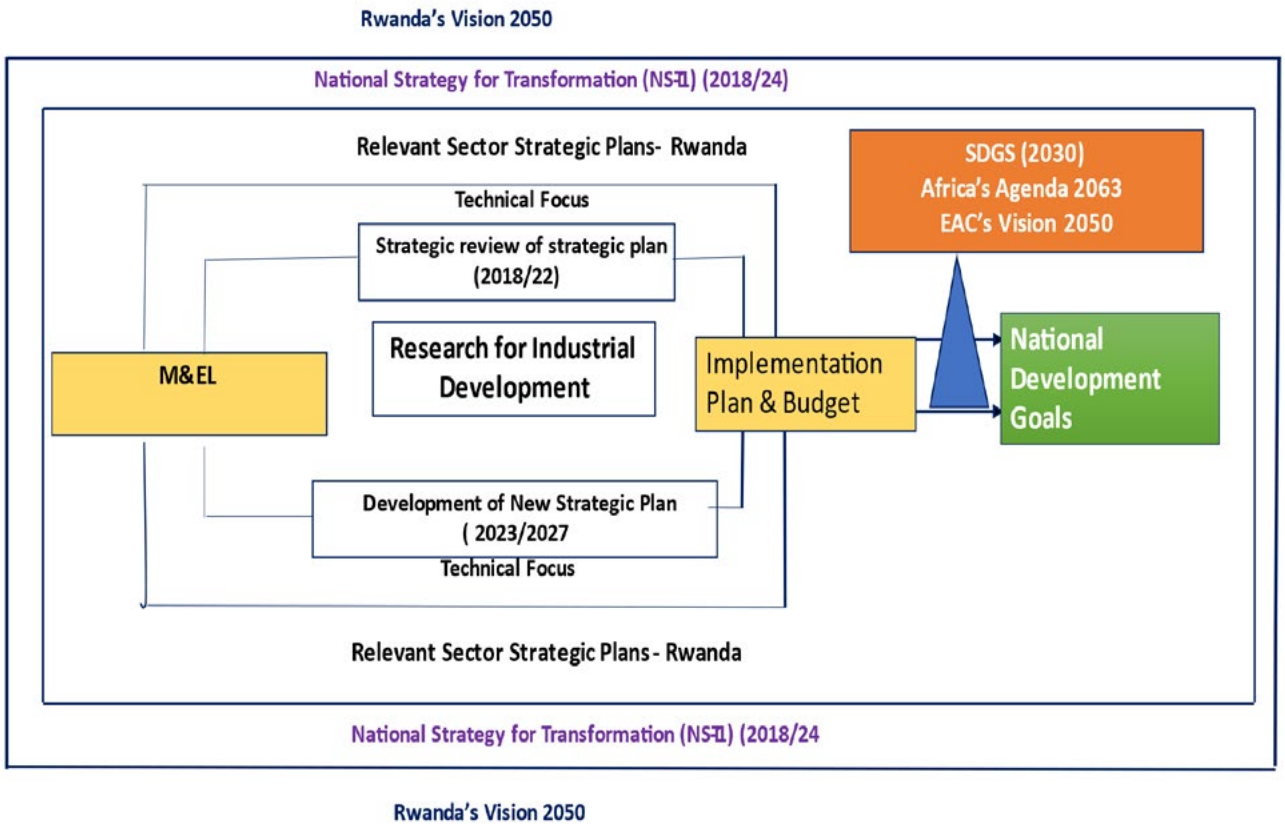
c. Identify key challenges and gaps encountered during the implementation of NIRDA's strategic plan 2018-2022.

d. Formulate recommendations on how to mitigate the challenges observed and highlight the lessons learnt so to inform this new strategic plan for the period 2023-2027.

The conceptual and analytical framework used in the desk review process is depicted in Figure 1 below. As has been stated, we started by reviewing the previous strategic plan (2018/22) in a context of relevant sector strategic plans, the National Strategy for Transformation and Vision 2050. The analysis built on the existing monitoring, evaluation and learning frameworks, the implementation plans, and of the budget allocated to NIRDA's interventions. Further, the analysis of NIRDA's achievements was linked to at the extent to which NIRDA contributed to national development goals as reflected in the National Strategy for Transformation and relevant sector strategic plans.

3 UNIDO (2021) Statistical Indicators of Inclusive and Sustainable Industrialization. Biennal Progress Report 2021.

Figure 4: The methodological process to develop NIRDA's Strategic Plan



2. National policy and strategic context of industrial research development in Rwanda

2.1. THE POLICY AND STRATEGIC FRAMEWORK

The industrial research and development in Rwanda are embedded in an arsenal of rich and coordinated national policies and strategies, from Vison 2050, through the "Made in Rwanda" policy, to the National Research and Innovation Agenda (NRIA).

☞ **From Vision 2050 to NST1: increase investment in R&D to upgrade industries and increase the workers' productivity**

Vision 2050 builds on the achievements of Vision 2020, and intends to challenge the issue of the recurrent deficit of trade, the limited contribution of the manufacturing industry to GDP and the marginal level of investment in research and innovation in comparison to regional and international contexts. The main target of Vision 2050 is of transforming Rwanda's economy from a low-income economy to an upper-middle-income country by 2030 and a high-income economy by 2050.

This will be possible thanks to a diversified economy built upon future industries, with an aim to increaseworkers' productivity. Basing on a potential to increase productivity and employment, three priority sectors were identified to be further developed: construction, manufacturing and agro-processing. Through the private sector led industrialisation, the development of these three sectors should be done through increased investment in R&D and in business innovation. To cope with the issue of limited competitiveness at the international scene and limited capacity for Rwandan firms to enter and survive on regional markets, there is a need to support SMEs to strengthen their innovation capabilities and their use of technological innovations.

About the manufacturing subsector, Vision 2050 envisages upgrading value chains with a potential to create jobs and improve value addition of local materials. Priority value chains to be developed are textile, apparel and leather. In addition, to leverage the industrialisation of Rwanda's economy, Vision 2050 orientations envisage popularizing the "Made in Rwanda" policy and, in partnership with the private sector, develop industrial parks across provinces.

The National Strategy for Transformation (NST1) strategy prolongs and details Vision 2050 in terms of midterm orientations for industrial research and development. Indeed, despite economic strides made during last decades, the agriculture sector remains predominant in terms of employment but the least productive of all the sectors. Further, the urbanisation rate of Rwanda remains low, while it is considered as the catalyst of inclusive economic growth and development. Thus, NST1 advocates for accelerated urbanisation from 18.4% in 2016/17 to 35% by 2024, and the promotion of the private sector led industrialisation to reach the structural shift of resource base exports to high-value goods and services base export. This will be possible by identifying and developing priority value chains with a big potential for markets linkage effects.

Thus, the Government of Rwanda (GoR) should promote locally produced materials and the "Made in Rwanda" brand. The value chains that are likely to boost the economic industrialisation were identified: the pharmaceutical plant, the mosquito nets manufacturing plant, the chemical fertiliser plant, the industries producing construction materials, essentially using local materials and packaging materials plant. Also, NST1 envisages to facilitate the agro-processing industries to access raw materials and considers research and development as key to fast-tracking this economic transformation, especially in the field of industrialisation for development.

☞ **Industrial policy, the domestic market recapturing strategy and the national export strategy: Enabling environment for industrialisation by upgrading technology and innovation at the firm level to enhance the competitiveness of Rwanda economy**

The industrial research for development is also a core subject in the industrial policy which is still a draft and is expected to be approved in few months. This upcoming policy builds on the fact that Rwanda's economy is still dominated by traditional agriculture and low-value services and investment in R&D represents only 0.76 percent of GDP and is mainly university R&D.

Consequently, there is a need for developing an enabling environment for industrialisation, including industrial spatial planning, to diversify Rwanda's economy and increase the capacity of its export-oriented industries. This implies capacity building for Rwandan firms to meet domestic and international quality standards and obtain certification, leveraging industrial parks, zones, and clusters to maximize the effectiveness of industrial infrastructure for priority sectors as well as taking advantage of positive externalities realised through the agglomeration of industrial activities. To achieve this, the

forthcoming industrial policy advocates the upgrading of technology, research and innovation capacity at the firm level, and increasing collaboration between research institutions and industry for technology commercialization.

The upcoming industrial policy posits that "the national productive ecosystems should be integrated in the global economy by fostering low-carbon industrial capabilities, circular economy principles and green certification, as well as identifying and leveraging new green growth opportunities". Thus, the promotion of industrial productivity should support the environmental sustainability and green growth initiatives, including the development of climate-resilient productive sectors and the protection of local environment.

The domestic markets recapturing strategy (DMRS) adopted in 2015 focuses on the support to local producers and services providers to enable them to compete with imported products. Priority sectors and subsectors were identified and priority projects were selected to boost the creation of value chains or clusters, and preference was given to projects with strong linkages with other sectors.

In the construction sector, the following sub sectors were selected: cement, steel and iron, aluminium products, paints and varnishes, plastic tubes, and ceramic/ granite tiles. In addition, traditional complementary or substitute raw materials were identified to attract new investment; these are clay, timber, sand, stone, agro-waste, compressed soil to replace bricks and tiles. In the light manufacturing sector, the following subsectors were selected: pharmaceuticals, textiles and garments, plastic products, packaging materials/paper and paper products, soaps and detergents, insecticides, wooden furniture and miscellaneous products such as hands tools used in agriculture. In agro-processing, the subsectors identified are sugar, fertiliser, edible oil, rice, dried fish/aquaculture and maize. The strategy also favours linkages between agro processing, animal feeds production and organic fertiliser usage to improve agricultural productivity.

The orientations of the DMRS were complemented by the revised National Export Strategy (NES II) adopted in 2015. Contrary to the DMRS, the NES II focus on the supply side of the Rwandan economy competitiveness. The targets of NES II include developing non-traditional exporters such as agro-processing, manufacturing, agriculture (fresh fruits and vegetables, flowers, essential oil, stevia), and services (tourism, transport, logistics and distribution, ICT, etc.).

Further, building on the argument that large firms succeed and survive better on export markets, even when the number of SMEs entering the export markets increases faster, the NES II targets to support SMEs and create large exporters to improve their survival and competitiveness on the export markets. To boost the innovation behavior of SMES, the Entrepreneurship Development Policy (EDP) aims at removing constraints of IP registration laws which hinder firm-level research, development and innovation.

☞ **The Made in Rwanda (MiR) Policy and Science, Technology and Innovation (STI) Policy: Promoting firm's access to modern technology through firm-level investment in R&D and innovation**

The Made in Rwanda policy adopted in 2017 lays its foundations on the achievements made by NES II and DMRS. Given the increasing industrial contribution to GDP above 15%, and DMRS putting more emphasis boosting the domestic demand of local products to replace competitive imports, the "Made in Rwanda" policy targets to address the supply-side bottlenecks and explicitly foster the partnership with the private sector to increase the competitiveness of the economy. The "Made in Rwanda" policy envisages building on specific sectors and value chains identified through previous strategies (particularly DMRS and NESII) and promoting firms' access to modern technology by continuously investing in R&D and innovation.

The MiR policy explicitly states the role to be played by NIRDA in the promotion of local production and value addition. This is specially about enhancing input efficiency of producers through the prospective Rwanda Resource Efficiency and Cleaner Production Centre (the current Cleaner Production and Climate Innovation Centre – CPCIC). CPCIC was created in 2008 by in partnership with UNEP and UNIDO, and under the NIRDA umbrella. Through CPCIC, NIRDA should enhance input efficiency of producers while theMiR policy targets to increase the number of firms supported. In addition, the MiR policy aims at creating a centre of excellence in packaging, housed in NIRDA, to support SMEs in packaging and branding requirements.

Other interventions made by NIRDA under the MiR policy include upgrading technologies of private firms in priority value chains, dissemination of technology across sectors, by sharing context-specific and locally applicable success stories, and carrying out technology gap assessments to inform the selection of strategic value chains to target for R&D support. In addition, the MiR policy assigns another role to NIRDA, though subsidiary: relocation of small and medium sized industries in SEZs, in collaboration with RDB.

The Science, Technology and Innovation (STI) Policy adopted in 2020 supports MiR strategic orientations, undertaking improvements in R&D and innovation through four policy directions and strategies: (1) STI governance, (2) resources mobilisation to finance R&D and innovation, (3) increasing R&D and innovation outputs and (4) strengthening STI professionals' capacity and expertise.

About the STI governance, the current STI performance is undermined by fragmented initiatives and their lack of cohesion. Thus, the STI policy advocates for the consolidation of the linkages between STI actors in six (6) priority sectors: sustainable energy, food security and modern agriculture, health and life sciences, local

production and value addition, digital services, products and lifestyles, environment, tourism, natural resources and climate change. The role of NIRDA is embedded in "local production and value addition", to contribute to reducing imports and to controling the balance of payment. In this line, the National Research and Innovation Agenda (NRIA) has identified five (5) STI priority areas which are aligned to national gaols, and assigned to NIRDA's mandate: (1) construction materials, (2) packaging products, (3) textiles and leather products (4) chemicals and fertilisers and (5) food processing.

To diversify and coordinate resource mobilisation, the STI policy orientations are putting in place an effective strategy to mobilize resources from the Government, the business sector, regional and international partners, research foundations and philanthropic organisations. Also, the STI policy aims at establishing and adopting incentives to attract private sector funding for R&D and innovation.

To improve R&D and innovation outputs and to cope with the relatively small number of patent applications and grants, the STI policy envisages strengthening innovation support mechanisms, including establishing technology transfer and innovation spaces and facilitating commercialization of innovation products. Furthermore, the STI intends to strengthen R&D units in priority sectors in both the private sector and higher learning institutions. In addition, to improve R&D and innovation outputs, the STI policy has planned the following interventions: technology import and adaptation; establishing a roadmap for promoting export and deployment of local knowledge abroad; promoting research and innovation in new and emerging technologies through venturing; strengthening cooperation with diaspora and international scientists and innovators; and promoting the advancement of indigenous knowledge, home grown solutions and local technologies.

To deal with the issue of lack of STI professionals in volume and quality, the STI policy recommends the following interventions: capacity building initiatives to develop a critical mass of STI professionals in line with the education sector policy; stimulating research and innovation culture and mindset change; and developing researchers' professions and careers.

Furthermore, the STI policy recommends that STI institutions, including public and private sectors and civil society organisations should make and implement their policies, strategies and programs in accordance with this national STI policy. Similarly, institutions in charge of standards (sector-specific regulatory authorities) should monitor locally developed and imported technologies to ensure that they meet technical and quality standards.

From the discussion offered in the previous sections, it is clear that the government of Rwanda has made tremendous progress in policy making and strategic planning. With specific reference to NIRDA's mandate of ensuring industrial development, specific policies and strategic plans have been reviewed to give a picture of provisions related to NIRDA's mandate and, at the same time, provide guiding assumptions for this strategic planning as summarized in the following matrix.

Table 5: A summary of key national policy and strategic provisions relevant to NIRDA's mandate

Vision 2050, NST1, Policies and SSPs	Key provisions: Assumptions for NIRDA's strategic plan
Vision 2050	**Vision 2050 provides for:** ▪ A diversified economy built upon future industries. Priority sectors are agro processing, manufacturing, and construction. ▪ Private led industrialization through increased spending in R&D and business innovation. Some interventions include helping SMEs to strengthen their innovation capabilities and create, adopt, adapt and use technological innovations. ▪ Promotion of competitive manufacturing through the development of various value chains with a high potential in terms of employment and value addition as well as the Made in Rwanda brand. ▪ Development of Rwanda's industrial parks through the PPP approach.

The National Strategy for Transformation (NST1)	**The NST1 (2018/24) provides for** private led economic growth and accelerated urbanization to boost economic growth. With specific reference to industrial development, the following are strategic provisions relevant to NIRDA's strategic plan: ▪ Promoting and developing local construction materials in collaboration with the private sector, in line with the "Made in Rwanda" policy to support the growth of the construction sector and an affordable and low-cost housing programme; ▪ Promoting industrial development and export and reducing import; ▪ Promoting the "Made in Rwanda" brand in collaboration with the private sector; ▪ Establishing and expanding industries in collaboration with the private sector to promote locally produced materials; ▪ Identifying and developing priority value chains to attract the right anchor firms with market linkages. ▪ Facilitating agro-processing industries to access raw materials; ▪ Constructing and developing industrial parks in provinces and expanding Kigali Special Economic Zone.
The National Industrial Policy (current draft)	**The national industrial policy provides for:** (1) Creation of enabling environment for industrialization, including industrial spatial planning. This entails the following areas of intervention: ▪ Industrial sector diversification and development of capabilities in export-oriented industries, ▪ Strengthening the "Made in Rwanda" brand; ▪ Improving the capabilities of Rwandan firms to meet domestic and international quality standards and obtain certification; ▪ Leveraging industrial parks, zones and clusters to maximise the efficiency of industrial infrastructure for priority sectors as well as the positive externalities realised through the agglomeration of industrial activities; ▪ Ensuring that effective spatial planning for industrial development is well integrated with other spatial planning activities. (2) Development of technology, science, and innovation capabilities. This involves: ▪ Promotion of technology upgrading, research and innovation at the firm level; ▪ Increased collaboration between research institutions and industry for technology commercialization. (3) Industrial productivity which supports environmental sustainability and green growth. The intervention areas relevant to NIRDA's mandate comprise: ▪ Supporting the development of climate-resilient productive sectors; ▪ Stimulating low-carbon economic growth to meet Rwanda's NDCs and prepare Rwanda's firms for green global market trends; ▪ Protect the local environment.
The Domestic Markets Recapturing Strategy (DMRS)	**The domestic markets recapturing strategy** aims at increasing local production for domestic market and export to reduce the trade deficit. It further provides for the need to diversify export commodities, which requires upgrading producers and service providers to enable them to compete with imported products. The priority sectors considered include construction, agro-processing, and light manufacturing.

The Made in Rwanda Policy (2017) - MiR	**The Made in Rwanda policy** highlights the opportunity to build on specific sectors and value chains in order to promote domestic production and the competitiveness of products and services in Rwanda. This policy objective encompasses a number of key aspects: ▪ The policy seeks to promote and develop Rwandan products that meet international standards in all aspects, including price, quality and safety; ▪ The second aspect embedded in this policy objective is to reduce the trade deficit by boosting domestic supply to compete with imports, as well as improving export capabilities; ▪ Thirdly, the policy aims to change the perception that Rwandan-made products are of lower quality than imports; ▪ The fourth aspect is to establish enabling conditions for small and medium sized industries along the economic zones across the country.
The Entrepreneurship Development Policy (2020) - EDP	**The entrepreneurship Development Policy** is articulated around seven pillars also interlinked with other policy priority areas and actions: ▪ Improving access to skills and know-how for existing and potential entrepreneurs to effectively start and manage a business; ▪ Improving business support system for entrepreneurs, including business consultants, mentors, incubators and accelerators; ▪ Improving entrepreneurs' ability to access the finance required for business growth from various sources, including equity, debt and grants from public, private, and peer-to-peer sources; ▪ Streamlining tax regimes that are supportive to entrepreneurship development; ▪ Expanding access to domestic and export market opportunities for entrepreneurs; ▪ Improving entrepreneurs' access to technologies and innovations for business growth and productivity; ▪ Promoting the culture of entrepreneurship and equitable access to business opportunities for all entrepreneurs.
The Science, Technology and Innovation Policy (2021) - STI	**The Science, Technology, and Innovation policy** provides for a number of actions that are directly linked to the mandate area of NIRDA as a research entity for industrial development. The policy identifies a number of cross-cutting structural interventions needed to strengthen sthe cience, technology and innovation (STI) system and improve the alignment of STI: ▪ Effective STI governance; ▪ Increased scientific and technology output; ▪ Increased R&D and innovation financing; ▪ Improved STI capacity and knowledge networks development; ▪ Enhanced international STI collaboration. The policy outlines the following national priority areas for science, technology and innovation: ▪ Sustainable energy ▪ Food security and modern agriculture ▪ Life and health sciences ▪ Local production and value addition ▪ Digital services, products and lifestyles ▪ Resilient environment and natural resources
Future Drivers of Growth (2018) - FDG	▪ Improving the effectiveness of the Government's tax incentives and other industrial policy interventions. ▪ The effectiveness of the government's extensive industrial policy interventions could be improved by shifting from general support to targeting successful enterprises. Crucially, a performance-based approach (focused on firm productivity and exports) should be mainstreamed in all interventions.

2.2. SECTORAL POLICIES AND PARTNERSHIPS

The policies and strategies related to research for industrial development are linked to other sectoral policies, and the success of NIRDA's interventions is influenced by the interventions by other actors directly or indirectly related to its mandate. Thus, partnership and collaboration with other actors are indispensable for NIRDA to fulfil its mandate successfully. In the next paragraphs, an analysis of sectoral linkages and possible collaborations with respect to NIRDA's priority sectors of intervention is provided.

2.2.1. The agro-processing sector

In the agro-processing sector, the National Agriculture Policy is the main instrument to scrutinize in order for NIRDA's operations to be successful. Other complementary documents also exist, including the strategic plan for agriculture transformation 2018-2024 and the industrial master plan for agro-processing.

The 2028 National Agriculture Policy aims at shifting Rwanda's agriculture from a subsistence and low productive agriculture to a highly productive and commercial agriculture. In this context, all agriculture operations have to be upgraded from seeds production to agro-processing for the value addition in agri-products.

About crops and livestock upgrading, the agriculture policy advocates for the production of seeds and the improvement of breed performance and animal feeds through local private-led seeds industries. In addition, incentives should be provided to achieve more value addition in agriculture products. Further, the policy envisages to promote fisheries and aquaculture by establishing and operationalizing research centers to produce high quality fish seeds.

Furthermore, the promotion of high value addition in agriculture produce will be possible by: improving soil fertility for more agriculture productivity and reduction of fertilisers import, generating revenues from sales and processing of agriculture products, and supporting productive and nutritional diversity through R&D. To sustainably the support to R&D and innovation in agriculture, the policy encourages the elaboration of a legal framework, especially for property rights applicable to seeds.

The improvement of agriculture productivity should also be extended to the post-harvet management. Thus, better post-harvet management and support to agri-food processing must be envisaged, by promoting the use of food preservation techniques and agri-food processing to absorb agriculture products and create better paying jobs.

In addition, because a productive agriculture should be based on R&D, the National Agriculture Policy advocates for an increased investment in R&D and innovative and locally adapted agriculture technologies. For this intervention to be successful, the policy envisages more coordination of R&D and innovation in agriculture and an upgrade of RAB's research capacity. In this regards, NIRDA's interventions are linked to those of RAB and, therefore, partnership, collaboration and coordination should be reinforced. The areas of collaboration must be identified from the details provided by the Strategic Plan for Agriculture Structural Transformation 2018-2024 (PAST4). The PAST4's interventions are classified into two axes: productivity and resilience and inclusive market and value addition.

About the productivity and resilience, PAST4 intends to prioritise high-value commodities such as horticulture, poultry and piggery, increased the productivity of animal resources, aquaculture and fisheries, and increased availability and accessibility of animal products. In addition, PAST4 envisages the promotion of sustainable animal nutrition, feeding and husbandry practices, the improvement of animal genetic resources, availing equipment and technology for fisheries and aquaculture, among others.

For inclusive market and value addition, the following interventions are planned:

- Strengthening market-oriented production, productivity, and processing of agricultural commodities, including quality assurance and certification;
- Post harvest handling and aggregation, including value addition increase through pre-processing and processing prioritised value chains, especially in subsectors of tea, coffee, horticulture and dairy through the MiR branding;
- Agriculture investment promotion, supporting the MiR brand in line with DMRS with a focus on sectors with a high potential, particularly the agro processing. Here, the collaboration of RDB is solicited.

The areas of collaboration described above are also outlined in the Industrial Master Plan for the Agro-Processing sub sector 2014- 2020 as follows: (i) boosting the agriculture productivity, (ii) enhancing local entrepreneurs' capacity to undertake the transformation of agriculture raw materials into industrial products, and (iii) strengthening technological efforts and innovation capabilities, linking research to the agro-processing sub-sector through investment in production technology and innovation.

To achieve the targets outlined in the abovementioned areas of intervention, there is a for access to energy, institutional capacity development for agro-processing, target science, technology and training policies, especially on-the-jobs and in-house skills development to have skilled labour, with a focus on local community. In this context, NIRDA relies on partnership with other stakeholders, particularly the institutions in charge of power energy such as MINIFRA and REG, institutions in charge of capacity building such as RTB, RP and UR and the private sector federation (PSF).

2.2.2. The construction raw materials subsector

In the subsector of construction raw materials, NIRDA's potential collaborators and partners can be identified through in documents: the National Housing Policy, the National Roadmap for Green Secondary City Development and the Industrial Subsector Master Plan for Construction Materials.

The National Housing Policy provides a framework for the construction sector in general. With regards to the construction raw materials and for the sustainable and affordable housing, the policy advocates for the use of appropriate construction technology and materials. With reference to appropriate technology and materials, three conditions are set: (i) promoting the use of local construction materials, with an emphasis on increased quantity of the materials produced in Rwanda, their quality and their competitive costs; (ii) the production of green construction materials, especially those that do not lead to reduction in food production; and (iii) investment in R&D and innovation to access an appropriate technology to handle waste water, the water supply system, and secured electricity supply.

The National Roadmap for Green Secondary City Development provides and details the guidelines of The National Housing Policy. It advocates for the promotion of green buildings in accordance with the National Strategy for Climate Change and Low Carbon Development (NCCLCD). In this regard, it envisages the development of energy efficient building standards, regulations for grey and rainwater recovery, water treatment, and waste water management. Also, it favours the use of local materials for construction and identifies the following priorities: timber, clay, sand, soil, concrete among others. To ensure the use of quality and green construction materials, the National Roadmap for Green Secondary City Development promotes local green building certification.

Among the local construction materials listed above, the Industrial Subsector Master Plan for Construction Materials identifies those which should be priviledged because they are sufficiently available and have a potential to create a niche in domestic and export markets: clay, wood, sand and stone. It also recommends that they should be branded and produced with a green industry that meets internationally accepted standards, and capacity building for local human resource.

The following partners for the development of local skills and capacity building of local engineers' body for the implementation of these construction guidelines emerge from these three documents: RHA in charge of housing and urbanisation, RTB, RP and UR.

2.2.3. The light manufacturing sector

In the light manufacturing subsector, the following documents serve as guidelines: the SEZ Policy, the National Quality Policy, the TVET Policy, the Green Growth and Climate Resilience Strategy, and the National Environment and Climate Change Policy.

The SEZ policy aims at addressing the infrastructure constraints that hamper industrialisation. With the SEZ policy, the priority sectors defined by Industrial and MIR Policies should be privileged. Also, the SEZ policy aims at promoting the Made in Rwanda brand through SMI parks. In this context, SMIs with a high potential to grow and proven business record receive an emphasis, with agro-processing being targeted in first place. Inside SEZ and industrial parks, NIRDA oversees programs of technical assistance and BDS to SMIs. In addition, NIRDA focuses on industrial technology improvement, including resource efficiency while REMA monitors the environmental impact. Other institutions partnering in SEZ and industrial parks are RDB, MINEDUC, MIFOTRA and affiliated agencies in charge of skills development and trainings, and MININFRA and affiliated agencies responsible for the availability and reliability of energy, water and other utilities.

The National Environment and Climate Change Policy aims at raising awareness of the use of green technologies and practices, and provides guidelines to promote and support industries and local SMEs to adopt clean technologies with appropriate incentives and disincentives. Thus, it targets the promotion of resource efficiency and clean production technologies development and transfer. The Green Growth and Climate Resilience Strategy shares the same target, as it promotes a green industry and private sector development, especially in SEZ and industrial parks, where there is need for scale up resource efficiency, and efficient and zero waste technologies. Again, the partnership with REMA, as an implementation agency, is required for NIRDA to be successful in its mandate.

The National Quality Policy provides a framework to ensure that industrial productivity meetshealth and environment quality standards. In this regard, it facilitates export markets access and international competitiveness by Rwandan enterprises. RSB, which is in charge of the implementation of this policy, provides technical assistance and training to SMEs for them to contribute to trade promotion and competitiveness and support DMRS. Therefore, NIRDA should partner with RSB to promote and upgrade industrial technology.

The TVET policy aims at improving the understanding of skills needs in key priority sectors and matching industry demand of skills and supply of skilled graduates. The TVET policy framework is guided by strategies of SMEs development, skills development and entrepreneurship in order to support dynamic change in the Rwandan economy. Thus, NIRDA's role in industrial development cannot be achieved without collaboration and partnership with RTB, RP and UR and other institutions in charge of TVET policy implementation.

2.2.4. ICT and tourism

In Rwanda, the tourism industry is guided by the Rwanda Tourism Policy which regulates its standards requirements. RDB, the implementation agency, develops guidelines and tools for responsible tourism, including waste disposal, energy use, and infrastructure development, including internet. About internet infrastructure, the National digital Talent Policy provides a framework to address the mismatch between demand and supply of digital skills and literacy, including in the tourism industry. Thus, NIRDA's interventions in upgrading digital skills and expertise require a specific partnership with RDB, which is in charge of investment orientation in the tourism industry.

2.3. CHALLENGES AND PROSPECTS OF INDUSTRIAL RESEARCH DEVELOPMENT IN RWANDA

With reference to national policies explored in the previous sections, NIRDA's mandate is about supporting industries in technology to contribute to national industrial development and trade competitiveness of the economy. According to the MiR policy, NIRDA's interventions can be categorised in three axes: (i) firm-level technology upgrading in priority value chains, (ii) technology dissemination across sectors by sharing context-specific knowledges and locally replicable stories, and (iii) technology gap assessment to inform the selection of strategic value chains for R&D support.

2.3.1. Firm-level technology upgrading

As has been explained earlier, Rwanda's industrial environment is characterised by limited investment in R&D and innovation. This is crucial at the firm-level, where R&D is still limited or even non-existent. Therefore, the STI policy advocates for the establishment of R&D and innovation unit in priority sectors in both private and public institutions. The current practices of NIRDA in technology support to firms consists of transferring imported technologies in priority areas identified after a technology gap assessment. Such practices are very demanding in terms of finance and less effective in terms of technology dissemination. In fact, transferring imported technologies to enterprises is very expensive and this necessitates the amiability of international development partners, who are not always available.

NIRDA needs to meet STI policy requirements in supporting the private sector. In addition, its interventions should happen at the firm-level. Consequently, upgrading firms' technology should happen in the priority sector specified in the STI policy through:

- Increasing the number of firms supported in input efficiency through its center, the Cleaner Production and Climate Innovation Centre (CPCIC), formerly known as the Rwanda Resources Efficiency and Cleaner Production Centre (RRECPC).
- Supporting SMEs to access packaging materials by creating a Centre of Excellence, housed in NIRDA.
- Helping the enterprises to create R&D units to upgrade their prototype products through the usual practices of incubation and acceleration.
- Awareness campaigns to increase the number of R&D units in the firms operating in priority sectors, as defined in the National Research and Innovation Agenda (NRIA) with reference to the following: (1) construction materials, (2) packaging products, (3) textiles and leather products, (4) chemicals and fertilisers, and (5) Food processing. Also, NIRDA should initiate awareness campaigns to stimulate a research and innovation culture and a positive mind-set at the firm-level.
- Upgrading NIRDA's building and equipment to operationalise its STEM and Life laboratories.
- In priority areas, strengthening capacity building for NIRDA's staff and that of private enterprises in charge of R&D and innovation to upgrade their skills. There is also a need to develop strategies to develop researchers' profession and careers in NIRDA and in private firms.
- Promoting the R&D collaboration with the diaspora and international scientists at both NIRDA and firm levels.

2.3.2. Technology gap assessment and technology transfer

As emphasized in the STI policy, the R&D outputs in Rwanda are marginal and patent applications and registration are still very limited and, therefore, NIRDA cannot rely on domestic R&D products to support private enterprises. Moreover, with limited R&D equipment and professionals countrywide, it is very hard to hope for an upgrade and an increase in the number of R&D outputs in a few years. Thus, during this strategic implementation period, NIRDA will continue to import and adapt technologies to support private enterprises.

However, some interventions should be initiated to create embryonal mass of R&D products at the firm level. These include:

- Conducting technology gap assessment in priority sectors to inform the selection of firms to be supported in R&D;

- Adapting imported technologies and providing technical assistance to private enterprises in priority areas to help them adopt modern technologies;
- Creating spaces for technology transfer and commercialisation within local firms and between local and regionl/international;
- Developing an appropriate strategy for resources mobilisation to support R&D and innovation in NIRDA and at the firm level to increase the number of R&D outputs. Resources should be mobilised from the government, the private sector and development partners, including philanthropic organisations.

2.3.3. Technology dissemination across priority sectors

The Rwanda industrial structure is dominated by MSMEs, which replicate technologies developed and used by large enterprises. Nevertheless, the demand for industrial products from domestic, regional and international markets calls for the contribution of these MSMEs. Consequently, NIRDA should promote technology dissemination, especially through sharing locally replicable successful stories.

3. Situation analysis of NIRDA

3.1. KEY RESULTS FROM THE PREVIOUS STRATEGIC PLAN (2018/2022)

NIRDA's interventions for the 2018/2022 period revolved around five strategic areas: (1) institutional capacity development, (2) technology and operational monitoring, (3) technology acquisition, commercialization and transfer, (4) applied research and technology foresight and (5) business and technical development and advisory services to support industries. Overall, these strategic areas and respective targets were designed to develop the industry in order to increase and diversify export products while reducing the country's reliance on imports of industrial products. Box 1 below provides a brief description of the key targets while Table 7 gives a snapshot of key achievements.

Box 1: Strategic priority areas in NIRDA's previous strategic plan (2018/22)

- Under the first pillar, *institutional capacity development*, key targets included strengthening NIRDA's institutional capacity by adopting a new organizational structure, filling the gaps in terms of human resources with adequate skills and competencies, setting up operational services and manuals, and building the capacity of the personnel.
- With respect to *technology and operational monitoring*, the key targets are related to technology audits, project piloting through a competitive process for each selected value chain, helping in intellectual property rights acquisition in selected value chains, monitoring supported projects, and improving NIRDA's operational knowledge management system.
- Under Strategic Pillar Three, *technology acquisition, commercialization and transfer*, the targets were to increase awareness on new project that calls for implementation, support in project piloting for technology development, transfer and replicating by selected the companies that would partner with NIRDA during the project development process.
- On the pillar about *applied research and technology foresight,* NIRDA had targeted to support the adaptation of existing technologies to improve the development of appropriate new technologies or the competitiveness of partner enterprises in selected value chains through applied research. It also amied at applying technology foresight to identify possible future growth scenarios for Rwanda's industrial sector and identify how best to establish the necessary fundamentals for the growth of future sub-sectors, value chains, products or services.
- With reference to the pillar on *business and technical development and advisory services to support industries*, the key targets included establishing a department in charge of technology acquisition, commercialization, and transfer plus the conduct of customer surveys.

Table 6: Key results under strategic areas for the strategic plan 2018-2022

Strategic Area (2018/2022)	Key achievements
Institutional capacity development	NIRDA has been able to: ▪ Review and get the new organizational structure approved; ▪ NIRDA has developed job description for all staff; ▪ The staff recruitment at NIRDA to fill the agreed job positions is at 80.8%. There is a 20% gap in recruitment; ▪ NIRDA has conducted training on needs assessment and supported its staff to undertake their new roles more competently; ▪ NIRDA has organized and conducted some training with partners in the implementation of a comprehensive training programme for 69 of its staff; ▪ NIRDA has established necessary internal systems and procedures based on an an approved workflow process; ▪ NIRDA has procured essential operating infrastructure / equipment for its operations and those of partner organizations.
Technology and operational monitoring	▪ NIRDA has conducted 14 technology audits in all selected value chains; ▪ NIRDA has planned and implemented an awareness raising programme of technology acquisition opportunities in each selected value chain; ▪ There is evidence of only ten (10) enterprises that have acquired Intellectual Property Rights (IPR) for the supported value chains; ▪ NIRDA has supported 49 enterprises out of one hundred eighty-one (21.5%) enterprises which applied for technology support during the period 2018-2022. ▪ NIRDA has conducted monitoring for pilot projects to determine effectiveness of acquired IPR
Technology acquisition, commercialization, and transfer	▪ NIRDA has undertaken several activities to increase awareness among identified value chain actors; ▪ NIRDA has established a private led technology development culture through the open call for project concepts/ full application for technology development and transfer for each value chain; ▪ NIRDA has selected and supported 10 Value chains and only 9.7% of pilot projects have been selected under the various open calls in the course of this Strategic Plan; ▪ NIRDA has been able to mobilize funds and support the acquisition of technology by different enterprises. But this fund is still insufficient looking at the demand and the level of expectations from the compagnies supported.

Applied research and technology foresight	▪ NIRDA undertook or commissioned pre-commercial exploratory applied research and development to develop an area of capability or a technology platform that is likely to lead to increased competitiveness or the opening of a new market opportunity; ▪ NIRDA has provided laboratory testing and development services to the private sector; ▪ NIRDA has provided technology incubation facilities to test the viability of pre-commercial concepts. ▪ NIRDA has supported companies in the adaptation of technologies and prototyping.
Business, technical development, and advisory services to support industries	▪ Business and technical development advisory services were provided to potential applicants for support from NIRDA. Several compagnies received training on marketing and communication, business management, packaging and labelling, and taxation. ▪ 165 companies acquired business advisory services ▪ NIRDA has not achieved the planed customer satisfaction survey.

Source: Constructed from the assessment of the strategic plan 2018-2022 achievements

3.2. NIRDA'S INTERNAL AND EXTERNAL ENVIRONMENT: A SWOT ANALYSIS

NIRDA's strategic planning process requires a deep understanding of its current internal and external environment. This is done through the analysis of the current strengths, weaknesses, opportunities, and threats (SWOT). The SWOT analysis offered in following paragraphs was conducted in a participatory approach, involving NIRDA staff, its stakeholders, partners and beneficiaries. The assessment has addressed various thematic areas pertaining to the mandate of NIRDA, including NIRDA's core operations and supporting system and collaborations with external partners. Some of these partners include development partners, public institutions intervening directly or indirectly in the areas of industrial development, organisations and institutions in charge of national, regional and international industrial policies and strategies, among others.

3.2.1. NIRDA's core operations

The day-to-day operations by NIRDA's staff as depicted in the assessment of ist strategic plan 2018-2022 can be classified in three categories: (i) technology development, including industrial products quality testing; (ii) technology transfer and commercialisation, including knowledge sharing among industries; and (iii) technology gap assessment to inform the selection of industries in need of technology support.

A. ***Technology development and quality testing***

According to the assessment of the strategic plan 2018-2022, this operation is conducted at two levels: the firm level and in NIRDA premisses by NIRDA staff. The main output of this operation consists in IP applications and registrations.

According to the information provided by NIRDA's staff and industry managers or owners, NIRDA's intervention R&D and innovation at the firm level is still limited to trainings in compliance with standards and to assistance in filing IP applications.NIRDA also supports technology prototype development through incubation and acceleration. However, most of support was directed to students' projects rather than projects from industries. According to the information collected during field visits, some industries are in needs of R&D services at the firm level and call for NIRDA's intervention, for example by placing R&D staff in industries, even under cost sharing conditions.

Moreover, R&D activities are still marginal at NIRDA as illustrated by few IP and patents applications and registrations: since its establishment, registration is ongoing only for three (3) R&D products. The good news is that R&D working space and equipment are now available in NIRDA premisses owned by itself or jointly with other institutions such as the University of Rwanda. Also, staff appointed to R&D services are not enough in number and they need training to upgrade their skills. According to information collected, the R&D service is not among priority areas because the focus is put on supporting the industries using existing technologies while R&D and innovation activities take long to produce final usable technology and are costly.

The strengths identified in "technology development" include the existence of lab facilities (building & equipment), and the fact that it is the only national

institution mandated to conduct industrial research for development. The areas for improvement include limited resources in terms of funds and staff number and skills, a long process for procuring theneeded lab consumables and materials, lack of incentive and mechanisms to attract and maintain high calibre researchers, and long time and complex protocols needed to validate an industrial R&D and innovation product.

Nevertheless, a number of opportunities have been identified, including a high demand of technology development at the firm level and good partnership with various stakeholders involved in R&D and innovation such as RSB, RAB, UR, RP and RTB. However, the following threats are likely to have a negative impact on NIRDA's operations related to technology development: strong competition of imported products with improved technology, which can discourage technology development at the local level, and an inhibitor R&D and innovation mindset and culture inducing low level of R&D and innovation at the firm level.

B. *Technology transfer and commercialisation*

Since its establishment, NIRDA has supported industries through importing existing technology. This is done through an "open calls" mechanism, where industrial firms compete and the winner is supported with a modern technology identified by NIRDA in selected Value chains in priority sectors identified by DMRS, the MiR policy and the STI policy. However, this NIRDA's technology transfer approach is limited because it is conditioned by the availability of funds. Until now, all the funds used were from international development partners such as UNIDO, Enabel, etc., who set conditions for their financing based on their own choices of value chains to support. While NIRDA's mandate includes the creation of spaces for technology transfer and commercialisation among industrial firms themselves, this has not been done so far. NIRDA is also expected to facilitate knowledge sharing of locally replicable successful stories among firms.

According to the information collected during consultations with NIRDA's stakeholders and the beneficiaries of its services, the main causes of inexistence of firms' initiatives about the technology transfer are the limited R&D and innovation in industries, and the industrial structure that is still dominated by SMEs which, by nature, are less innovative. However, some firm owners and managers who were consulted reported the existence of opportunities for possible new products to be developed and introduced on the markets if more skills and funds are available. This can also be done through transfer to other firms by the mechanism of technology licensing.

Under this rubric of "technology transfer and commercialisation", the strengths identified are: the existence of foreign improved technologies which can be imported and used immediately or with minor adaptation, and the existence of incumbent industries which are able to adopt imported modern technology easily. The weaknesses are the high amount of funds needed to finance import, adaptation, installation and use of imported technology, and the lack of skills to adapt and maintain modern imported technologies.

The opportunities identified include the fact that some firms have new ideas to develop through an incubation and acceleration mechanism which can be licensed to other firms operating in the same value chain. At the same time, NIRDA is facing the following threats: high acquisition and maintenance costs of imported equipment, the lack of skilled manpower to adapt and maintain imported technology, and the dependency of technology transfer on international development partners' conditions and choices.

C. *Technology gap assessment*

Technology audits are conducted in priority areas and value chains by hired consultants and are supervised by NIRDA's staff. Technology audits are always conducted when at least the funds to conduct them are available and, in a better case scenario, when sufficient resources to finance identified technologies are available to support selected industries. As has been pointed out earlier, these funds are provided by international development partners and are not included in NIRDA's ordinary budget from GoR. Normally, each technology audit is followed by an "open call" to identify and select the industries to be supported. So far, fourteen (14) technology audits have been conducted, while only 10 open calls were launched. The proportion of the industries selected in comparison to the number of applicants remains low, only 21.5%. However, winner and non-winner industries are supported in technical advisory and business development services.

The strength of the "technology assessment" operation is the existence of national priority sectors and value chains to assess the technology gap these were set by national policies and strategies. The weaknesses identified include the fact that the resources used to fund technology audits are not from normal channels of NIRDA budget funding, and technology audits are only conducted when funds are available. However, this operation also has an opportunity: the existence of local technologies which can be upgraded to be adopted by firms operating in the audited VCs. The treat is that NIRDA has no control on the partners who fund technology audits in terms of amount of funds and of choices of VCs.

Table 7:SWOT Analysis of NIRDA's core services

Core Services	Strengths	Weakness	Opportunities	Threats
(1). **Technology development and quality testing**	Availability of lab facilities (buildings & equipment)	Limited funds and staff in number and skills	High demand for technology development at the firm level	Competition of imported products with improved technology
	NIRDA is the only national institution mandated to conduct industrial research for development	Procurement procedures to purchase needed lab consumables and materials are long.	Good partnership with various stakeholders involved in R&D and innovation such as RSB, RAB, UR, RP and RTB	Poor mindset and culture about R&D and innovation at the firm level
		Lack of incentives to attract and maintain high caliber researchers		
		Long time and complex protocols to validate a R&D product		
(2). **Technology transfer and commercialisation**	Possible to import improved technologies that can be used immediately or after minor adaptation	High amount of funds to finance import, adaptation, installation and use of technologies	Some firms have new ideas to develop through incubation and acceleration	High maintenance cost of imported technologies for supported firms.
	Incumbent industries are able to adopt easily imported technologies	Lack of enough skills in NIRDA to adapt and maintain imported technologies		Lack of skilled manpower in the country to adapt and maintain imported technology
				Technologies to import are conditioned by preferences and choices of funders.
(3). **Technology gap assessment**	National policies and strategies have set priority sectors and value chains to assess	Resources to fund technology audits are not from NIRDA's budget	Existence of local technologies which can be upgraded	Selection of VCs to audit is influenced by external funders
		Technology audits are only conducted if funds from outside NIRDA's budget are available		

3.2.2. NIRDA's support systems

Following the assessment of the strategic plan 2018-2022, six (6) NIRDA's support systems were identified to be sustained: (1) institutional capacity development, (2) Human resource development, (3) Monitoring, Evaluation and Learning Framework, (4) Public and Private Partnerships, (5) Finance and Procurement, and (6) Industrial research and foresight. They all constitute the unique mechanism to allow NIRDA to successfully undertake the actions related to its mandate. In next paragraphs an analysis of the current status of support systems is offered.

A. ***Institutional capacity development***

NIRDA's institutional capacity includes its organisational structure, its administrative and financial procedures, and its administrative buildings and equipment. NIRDA's organisational structure was revised twice during the 2018-2022 period. The 2018 revision focused on the staructure that was in place during the transition from IRST to NIRDA in 2014. It resulted in the reduction of staff number from 189 to 97. The second revision took place in 2020 and reduced the number of staff to 78. The target of the two successive revisions was to guide NIRDA in the new direction of supporting industrial firms to upgrade their technology level. However, they resulted in the reduction of the value R&D and innovation while it is the centre of NIRDA mandate, as stated in many national policy and strategies. In addition, some functions such as human resource, IT unit and planning and monitoring are missing.

With regards to procedures, NIRDA established required internal systems and procedures. However, its SOP needs to be revised to conform to new orientations in the new strategic plan. Also, while NIRDA has procured essential operating infrastructure and equipment for its daily operations, it staff raised the issue of long bureaucratic procedures which restrict or lessen the purchase of reagents and consumables for its labs.

The main strength in the "institutional capacity" of NIRDA is that financial and administrative procedures have approved. The weaknesses are limited consideration to R&D units in terms of staffing, consumables and equipment, and some positions that are missing in the organisational structure. However, NIRDA has an important opportunity which is the existence of national policies and strategies which clearly define its mandate and, therefore, constitute the main reference to guide improvements required in its structure. The threat resides in its inability to undertake the reforms of its organisational structure without the approval of the line Ministry, MINOCOM.

B. ***Human Resources Development***

The recruitment of needed staff is not yet complete, as only 81% of planned positions are occupied, and the vacant positions are mainly at the senior level. In addition, most of the senior positions occupants are acting, pending the recruitment of permanent staff by the Government. Staff are not conducted on a regular basis because staff development funds are managed by RDB, while international partnerships are still at an embryonic stage to allow staff regular and advanced training. During consultations with NIRDA staff, the dependency on the line Ministry for human resource management was raised as a challenge impeding timely correction ofpossible errors in tasks sharing and accountability.

Here, the strength is that 81% of staff are available in all departments, while the weaknesses identified is the missing human resource unit required in the management of NIRDA's staff. The opportunity is the existence of staff development funds in spite of them being managed outside NIRDA. Also, the existence of international partners can help NIRDA build on and upgrade the skills of its staff, while the treat is that the mechanism for reorganising the staff management is controlled by MINICOM, which is outside NIRDA's system.

C. ***The monitoring, evaluation and learning framework***

As described in NIRDA's Monitoring and Evaluation Manual, the M&E framework is structured around value chains and NIRDA's projects in the value chains. The M&E system helps keep track of NIRDA's achievements in its project management and changes happening within the supported value chains. The M&E is not designed to monitor achievements within NIRDA's administrative units. Thus, the system of communication and reporting does not allow for the management of NIRDA as one organization, while this is needed to undertake annual planning and monitoring of NIRDA's activities, besides the projects undertaken in value chains. This is consequence result of the missing unit in charge of planning and monitoring on the organisational structure.

The strength of NIRDA's Planning and M&E system is the existence of overall projects' M&E manual which guarantees the monitoring and evaluation of projects undertaken even when their individual M&E system is not well designed. The weakness is the absence of an administrative M&E system, which can weaken NIRDA's reporting system and negatively affect the quality of its achievements. However, the fcat that NIRDA has its own organisational structure as an autonomous government agency is an opportunity. This guarantees the possibility of reforms to incorporate the units that are needed to improve its functioning. The threat is the dependence to the line Ministry, which implies that NIRDA does not control the timing of needed reforms.

D. ***Public and private partnerships***

NIRDA's partnerships can be divided into two categories: policy partnerships and operational partnerships. Policy partnerships are directly or indirectly defined by national policies and strategies for each of NIRDA's interventions. For example, in agro-processing, NIRDA works in partnership with the institutions involved in agriculture including MINAGRI and RAB, while in technology

development, it collaborates with academia and NCST. Operational partnerships are about indispensable collaborations during NIRDA's day-to-day operations. The include, for example, collaboration with value chains (VCs)' actors for selected projects, the funders who financially contribute to supporting winners and non-winners among value chains' actors, and all agencies intervening in the open call process, just to mention but a few.

According to information collected during the consultations, there is lack of a clear coordination mechanism for partners, both private and public. Collaboration of NIRDA with a specific partner is guided by an individual MoU or remains fully informal. This is especially the case for partners of NIRDA in technology development, technology transfer and acquisition, which are not well defined. For example, to import technologies, different steps and individual procedures are used and partners are selected on the spot. There is no clear strategy to link VC actors' needs to technologies supported through incubation and acceleration mechanisms. This coordination does not exist even between NIRDA and similar agencies under the supervision of MINICOM, and the misallocation of roles was reported between NIRDA and MINICOM itself.

The strength of this support system is the existence of legal and policy instruments within NIRDA to support the coordination of partners, especially about MoUs and contracts. The weakness is that there is no clear coordination of partners, especially public ones (Government and its agencies). The opportunity is the existence of committed partners while the threat is that existing coordination mechanisms are outside NIRDA's control. For example, the collective working groups gathering together development partners and Government institutions and agencies are managed outside NIRDA.

E. *Finance and procurement*

NIRDA has Finance and procurement units to support ordering and payment of its purchases. The two units are on its organisational structure and are hosted inside its premisses. However, some payments and procurement procedures are guided by rules that are not controlled by NIRDA. For example, when paying for foreign technology to import, international trade procedures involve BRD. BRD also introduces its financial regulations in funding a selected VC actor who is a winner of a technology to be imported. It was reported that some winners were removed only because they had fiscal arrears to pay and this problem is limited to NIRDA's projects.

About sources of finance, NIRDA's ordinary budget is funded by the Government, while its projects are funded by development partners. The ordinary budget is guided by the procedures regulating public finance management, while its projects finance management is guided by MoUs and financial procedures of BRD, the banker of NIRDA's projects.

The strength is the existence of procedures regulating NIRDA procurement and purchases, while the weakness is this existence of procedures external to NIRDA's normal channels which have a direct impact on NIRDA's decisions and operations. The opportunity resides in the existence of external source of funds to finance NIRDA's projects, while the threat is the existence of external financial procedures (banking procedures in BRD), which hinder NIRDA's decision making, especially about open call process.

F. *Industrial research and foresight*

NIRDA has upgraded its R&D infrastructures and equipped its labs, especially its life sciences lab in Huye and STEM labs in Kigali (UR-CST premisses). Some of R&D buildings (in Huye) are owned in partnership with UR. However, all NIDRA's R&D buildings and equipment are not fully used and laboratory and other infrastructure do not have a regular maintenance and cleaning protocol. Further, NIRDA labs should have calibrated equipment and regular provision of consumables and/or reagents. The information collected during consultations shows that the lessening of lab consumables and materials is due to procurement procedures, but also to the higher financial resources needed.

In this area, the strength is the existence of R&D infrastructure and equipment, the weakness is that they are not operational at 100%, the opportunity is the possible partnership with academia and other government agencies involved in R&D to share infrastructure and equipment, while the threat is the dependence on external expertise for calibrating R&D labs.

Table 8: A SWOT Analysis of NIRDA's support systems

Support Services	Strengths	Weakness	Opportunities	Treats
(1) Institutional Capacity Development	Approved financial and administrative procedures	Limited consideration to R&D units in terms of staffing, consumables and equipment	Existence of national policies and strategies which clearly define NIRDA's mandate.	Inability to undertake the reforms on the organisational structure without the approval of MINOCOM.
		Some functions missing in the organisational structure.		
(2) Human resources development	Staff recruitment at 81% overall	Missing human resource unit in NIRDA	Existence of funds for staff development hosted in RDB	Mechanism for reorganising the staff management is controlled by MINICOM
(3) Monitoring, Evaluation, and Learning Framework	Existence of overall projects' M&E manual which guarantees the monitoring and evaluation of projects undertaken	Absence of an administrative M&E system, which weakens the communication and reporting framework	A legal framework that defines NIRDA as an autonomous Government agency, allowing it to undertake (propose) the reforms needed.	Dependence on the line Ministry: NIRDA does not control the timing of reforms needed
(4) Public and Private Partnerships	Existence of legal and policy instruments within NIRDA to support the coordination of partners, especially through MoUs and contracts.	There is no clear coordination of partners, especially public ones.	Existence of committed partners	Existing coordination mechanisms are outside NIRDA's control.
(5) Finance and Procurement	Existence of procedures regulating NIRDA's procurement and purchases	Existence of procedures external to NIRDA's normal channel, which has direct impact on its decisions and operations (see BRD)	Existence of external sources of funds to finance NIRDA's projects	External financial procedures (see BRD) hinder its NIRDA's decision making, especially concerning open call processes.
(6) Industrial research and foresight	Existence of R&D infrastructure and equipment	R&D infrastructure and equipment are not operational at 100%.	Possible partnership with academia and other government agencies involved in R&D to share infrastructures and equipment	Dependence to external expertise for calibrating R&D labs

3.3. NIRDA'S STRATEGIC ORIENTATION (2023-2028)

3.3.1. Mission, Vision, and Strategic Goal

Mission: to "lay a solid foundation for a structural shift in industrial development by producing competitive goods and services through technology and innovation while encouraging and preserving environmental standards".

Vision: "to become a centre of excellence in the provision of green and private led solutions for the development of competitive industries towards a diversified economy in Rwanda".

Strategic Goal: to "strategically position NIRDA in empowering private compagnies and SMIs to acquire innovation and technologies needed to increase their competitiveness, diversify, and expand competitive industries in Rwanda".

3.3.2. The new strategic orientation

NIRDA aspires to be well positioned as a key player in industrial development in Rwanda. This is a critical step which has to be reflected in its new strategic orientation. This positioning sppels out expected core functions in promoting research and development to support the development and competitiveness of industries.

Therefore, in the next five years of this strategic plan (2023-2028), NIRDA will continue to operate and pursue research, development, and innovation in industrial and allied technologies. The focus will be on areas corresponding to the National Research and Innovation Agenda (NRIA) and the specific priority sector of "local production and value addition". These areas include (i) construction materials, (ii) packaging products, (iii) textiles and leather products, (iv) chemicals and fertilisers and (v) food processing. NIRDA's interventions will be guided by the spirit of the new Industrial Policy to be soon approved. More specifically, NIRDA will contribute to the improvement of industrial capacity to diversify production, meet domestic and international quality standards, protect natural environment and promote resource efficient technologies, and access competitively domestic and international markets.

The proposed priority areas and interventions of this strategy will leverage the achievements made in the previous and first generation of NIRDA, after the transition from the former IRST. The strategy represents a shift towards competitive industries and a significant contribution to diversified economy in Rwanda in the following ways:

(1) **Undertaking more research, development, and innovation in industrial and allied technologies in the area of construction materials, packaging products, textiles and leather products, chemicals and fertilisers and food processing in Rwanda**. This strategic plan emphasizes the need to undertake more research and development which, in turn, leads to technology development and innovation in response to gaps and challenges facing industries. Technology development is expected to be done in the tone of the "Made in Rwanda brand". This calls for further investment in laboratories and facilities at both NIRDA and firm levels to support technology development, innovation and incubation.

(2) **Conducting technology mapping and foresight to inform R&D and investment in developing competitive industries in Rwanda.** There will be a shift from technology audit and monitoring to a broader context of technology mapping and foresight. In this case, technology mapping entails the identification of development gaps in the industrial sector, informing actions for future product and technology development, and promoting competitive industries and domestic market recapturing strategy.

(3) **A stronger role of the private sector with NIRDA shifting from an actor to an enabler of the industrial sector.** A new area of focus for NIRDA is to empower private compagnies, SMIs, and large industries to play an active role in the generation and use of technologies in expanding industries. Further, this will require a shift from general support to targeted support or demand driven technology development of successful industries. This will help pull more investment through public private partnerships towards competitive and diversified industries. In addition, NIRDA will continue to ensure support in areas of capacity building, quality assurance, technology design and engineering, and industrial incubation.

(4) **Strengthening collaboration between NIRDA and the government agencies involved in R&D, higher learning and vocational training institutions, professional and industrial organizations, and the private sector.** This calls for joint and collaborative efforts to advance technology and innovation in the industry sector, enable more resource mobilization through research and development grants to support research, development, and innovation needed by industries, and share R&D infrastructure and equipment.

(5) **Improving coordination and stakeholder engagement.** Three wings of collaboration (government agencies, the private sector, and development partners) need to be strongly connected in order to support the development of industries through effective institutional and organizational arrangement in a consistent manner. Subsequently, specific interventions and enabling conditions will need to be availed to support emerging small and medium sized industries along the various industrial zones/parks across the country.

3.3.3. NIRDA in Rwanda's ecosystem of science, technology, and innovation

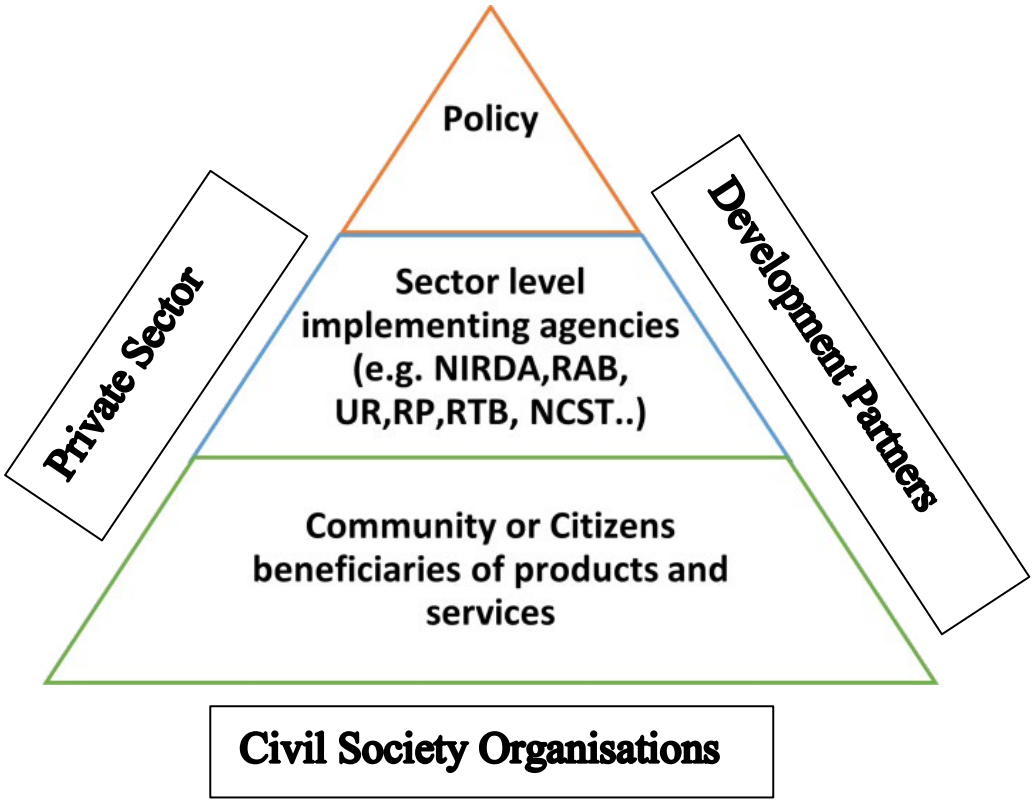
NIRDA is one of the key players in the entire ecosystem of science, technology and innovation in Rwanda. Other key players include the Ministry of Education (MINEDUC) and affiliated agencies such as the National Council for Science and Technology (NCST), University of Rwanda (UR), Rwanda Polytechnique (RP) and Rwanda TVET board (RTB); the Ministry of Agriculture (MINAGRI) and its R&D affiliated agency, Rwanda Agriculture Board (RAB); the Ministry of Industry and Trade (MINICOM) and its affiliated agencies, Rwanda Standards Board (RSB), the Food and Drugs Agency (FDA); the NGO Rwanda Academy of Science (RAS); among others. in a nutshell, the functions of science, innovation and technology development are shared among the above institutions.

Strategically, NIRDA needs to define its specific contribution as per its mandate as well as possible links with other agencies involved in R&D as well sector links and complementarity. The situation analysis done in the context of this strategic planning highlights that NIRDA focuses on technology development, foresight, monitoring, acquisition and commercialization, capacity building, and investors orientation and advocacy in resource use efficiency and natural environment protection. These roles are played in collaboration with other players in the different priority sectors such as government ministries and agencies, communities of practice including young scholars in technology incubation, the private sector, civil society organizations, and development partners as depicted in Figure 4.

Box 2: NIRDA's intervention areas

- Technology Development.
- Technology Foresight
- Technology monitoring and knowledge sharing
- Technology acquisition and commercialization
- Cleaner Production and Climate Innovation
- Private Industry Capacity Building
- Technological Guide for Investor Mobilization
- Resource Mobilization for Industry Development

Figure 5: NIRDA's position in the STI ecosystem



3.4. PILLARS, PRIORITY AREAS, AND ACTIONS

This strategic plan is articulated around three pillars, nine priority areas, and a set of proposed strategic interventions (activities or actions) under each priority area depicted in Table 9. To ensure that all planned interventions are successfully implemented, the current functioning of NIRDA needs to be improved in terms of both its core functions of research and development and of its support systems.

Pillar 1: Science, technology, and innovation for the growth of industries

The first pillar aims at improving the current status of technology mapping, foresight, and investment in technology development and proposing solutions to support the government's overarching goal of diversified and competitive industries in Rwanda. The interventions under this pillar are expected to improve NIRDA's position as a key player in the entire ecosystem of science, technology and innovation in Rwanda.

The main result expected from this pillar is the improvement in technology mapping and foresight, and in technology development investment at the firm level for improved and diversified production of goods and services.

Priority area 1.1: Technology mapping and foresight

NIRDA should shift from ad hoc technology audits that are conducted to inform the identification of technology gaps in a specified value chain with a purpose to inititate open calls processes to a wider technology mapping. The latter aims at identifying industrial production gaps in priority sectors in order to set an R&DI agenda based on emerging and potential industrial needs and establishing guidelines for technology development and acquisition.

Under this priority area, the following actions will be undertaken:

1- Mapping of innovation and technology needs across priority sectors;

2- Establishing credible performance guidelines for technology development and acquisition;

3- Establishing a data repository of technology needs and solutions for industries and young entrepreneurs;

4- Developing NIRDA's industrial research and innovation agenda based on emerging and potential industrial sector needs.

Priority area 1.2: Technology and product development in the tone of strengthening the "Made in Rwanda" Brand

NIRDA will contribute to the development of new industrial products based on industries' needs, via the mechanisms of technical advisory and coaching, technology incubation and acceleration, and technology acquisition and commercialisation. Thus, more emphasis will be put on the demand-based support rather than on NIRDA's initiatives as has been the case so far. However, this support will follow a comprehensive study on industrial products that have the ability to respond to domestic market recapturing and inform the actions to develop targeted value chains with enough potential to contribute to industrial growth and competitiveness. Consequently, the following actions will be taken:

1- Conducting a comprehensive assessment on the ability of industrial products to respond to domestic market recapturing to inform the actions on industrial products development;

2- Targeting value chains across mapped priority sectors with enough potential to develop and contribute to horizontal and vertical growth of industries.

3- In collaboration with the private sector, developing new products to address industrial gaps identified, via technology advisory and coaching, technology acquisition and commercialisation, and technology incubation and acceleration.

4- Initiate and facilitate collaboration and partnerships in technology development between domestic industries, academia, foreign industries and international scientists, including Rwanda diaspora.

Priority area 1.3: Investment in technology development labs and facilities

NIRDA will promote the creation and development of R&D and innovation units within private industries. At the same time, it will strengthen its R&DI capabilities in terms of infrastructure and equipment. The following actions will be undertaken:

1- Promoting industries' technology upgrading through different incentives provided to create and develop R&D and innovation units at the firm level;

2- Promoting collaboration between research institutions, private entities and industries in joint investment in R&D infrastructure and equipment, resource efficiency and technology development;

3- Initiating collaborations and partnerships between NIRDA, academia and other R&D institutions for efficient use of, and investment in, R&D infrastructure and equipement;

4- Creating and operationalise incubation centres for innovation and technology development to support new and modern industrial products development, responding to existing and future market needs;

5- Developing an appropriate strategy for resource mobilization to support R&D and technology development at both NIRDA and firm levels.

Pillar 2: Private-led technology development, innovation and partnerships for industrial development

NIRDA current business model is mainly based on supporting technology acquisition by the private sector or operating industries through open calls and other related support services. It features a supply driven approach that nourishes a paternalistic behaviour of industries rather than a demand-driven approach that encourages creation of technologies in response to the market's demand. Thus, the shift embraced by this new strategic plan is to empower private companies and industries by responding to their needs and requests to develop prototypes. This will be done through technology incubation and acceleration in order to establish and expand competitive industries in the tone of the "Made in Rwanda" Brand. In addition, the new approach will promote the private sector's active engagement in R&DI as well as the development of products needed on domestic and international markets.

The main expected result is to increase locally made industrial products and services, translating into increased and diversified industrial production to serve domestic and export markets.

Priority area 2.1: Private-led development support to industries

In partnership with the private sector, NIRDA will contribute to the capacity building of private industries in priority sectors and targeted value chains. However, more effort should be put in business interactions between industries themselves rather than on direct support from NIRDA. More specifically, NIRDA's role in CPC creation and support, and development of industries in Special Economic Zones (SEZ) and industrial parks should be clearly defined. In this context, the following actions will be undertaken:

1- Building the needed and customized capacity of companies operating in priority industrial sectors;

2- Defining the partnerships model between NIRDA and the private sector, academia, government institutions and other actors in industrial capacity development;

3- Establishing a platform for technology transfer and commercialisation, and knowledge sharing and management among industries;

4- Liaising with key Government institutions to identify and establish the areas and modalities of NIRDA's support.

Priority area 2.2: Demand-driven technology development

NIRDA will help private industries to develop industrial technologies based on firms' demand in order to respond to domestic and export markets needs, with more emphasis on successful SMIs with a bogger potential to influence markets. More specifically, NIRDA's technical support will shift from general support to targeted support to successful enterprises and SMIs. In this regards, NIRDA will perfom the following actions:

1- Conducting an activity to cluster and rank industries across priority industrial sectors to inform NIRDA's foreseen technical support;

2- Developing a clear strategy for raising seed grants to support industry technology development through the private-public partnership model.

3- Conducting advocacy on identified challenges facing industries, and liaise with other Government institutions and the private sector for awareness campaigns on the industrial related issues.

Priority area 2.3: Technology acquisition and commercialization

While NIRDA will continue to support private industries to acquire new and modern technologies, more effort will be put in the promotion of technology acquisition by firms themselves. Further, NIRDA will expand its interventions to the promotion of the adaptation of imported technologies and to technical support for modern technologies adoption. In addition, NIRDA will create a Centre of Excellence to facilitate industries' access to packaging materials. In this regard, the following actions will be undertaken:

1- Creating spaces for the private sector's active engagement in technology commercialization and transfer and knowledge sharing among local industries, and between domestic and foreign industries;

2- Promoting the adaptation of imported technologies and providing technical advisory and coaching support to private enterprises in priority sectors to help them adopting modern technologies;

3- Assisting and facilitating SMIs in acquiring and transferring IPs for technologies and new industrial products developed or upgraded;

4- Liaise with other concerned Government institutions to facilitate industries' access to raw materials and packaging materials.

Pillar 3: Governance and institutional arrangements for industrial developmemnt

One of the key issues identified during the review of NIRDA strategic plan 2018-2022 is the existence of deficiencies in the coordination of Government institutions in the governance of the industrial sector. The evaluation of this strategic plan revealed a misallocation of roles in the implementation of the mandates assigned to Government agencies affiliated to MINICOM and, more specifically, conflict of interests between NIRDA, NCST, RDB and MINICOM. This weakens the governance and organisation of industrial enterprises, especially SMIs, because of the numerous requirements

in terrms of compliance with standards and quality assurance, testing and certification. Consequently, with this new strategic plan, NIRDA should clarify its role in industrial governance vis-à-vis other public institutions, starting with its own organisational enhancement as an autonomus Government agency. In this regard, *the aim is the improvement in service delivery by NIRDA to enhance industrial governance and green growth*.

Priority area 3.1: NIRDA's institutional capacity development to strengthen industries' capabilities

NIRDA will conduct a comprehensive legal and policy assessment with a purpose propose possible institutional reforms to improve its own capacity to organise the industrial sector. The following actions are planned:

1- Conducting a comprehensive skills and competencies audit to inform a specific long-term capacity development programme for NIRDA's staff;

2- Assessing and identifying relevant law and regulations reforms needed to create a conducive environment for service delivery by NIRDA in order to enhance research, innovation and technology development of industries;

3- Defining and proposing improvement in NIRDA's support system to achieve its mandate, and fully operationalise CPCIC;

4- Enhancing and equiping NIRDA's administrative and R&D infrastructure, and other facilities to operationalise its STEM and life science laboratories.

Priority area 3.2: Industries' resource efficiency and natural environment protection

NIRDA will incorporate resource efficiency and natural environment protection in industrial development interventions. Moreover, issues of youth and gender mainstreaming in industrial development progams and actions will be highlighted. Under this priority area, the following actions will be undertaken:

1- Conducting an economic and environmental impact assessment to determine the profile of industries in terms of raw materials needs, resource efficiency and natural environment protection;

2- Through the Cleaner Production and Climate Innovation Centre (CPCIC), providing assistance to, and advocacy for, industries in terms of resource efficiency and environment protection;

3- Liaising with stakeholders to establish joint and complementary services for quality testing and compliance with standards;

4- Initiating and developing a Youth and Women Mainstreaming strategy in industrial technologies development.

Priority area 3.4: Promotion of start-up micro and small industries

The current industrial policy and legal framework does not favour the emergence of micro-industries, which are essentially rural and household held, and thus not able to comply with standards and quality assurance requirements. Consequently, NIRDA will devise and initiate specific programs to promote and encourage micro and small industries to emerge and to grow in an industrial competitive environment. In addition, there is a plan to conduct assements and an identification of law and regulations reforms required to create a conducive environment for industrial development.The following actions are specifically planned:

1- Identifying and promoting enabling conditions for small and medium sized industries along special economic zones and industrial parks across the country;

2- Providing special technical advice and support to start-up micro and small industries to help them emerge, survive and grow;

3- Establishing a specific program to promote Micro and Small industries in their growth and graduation and address specific challenges they are facing.

4- Identifying and promoting various technological incentives in support to other Government's initiatives to attract Foreign Direct Investment.

Table 9: Matrix of pillars, priority areas and actions

Pillar	Priority Areas	Key activities/ Actions
Strategic Objective #1: To improve technology mapping and foresight and the investment in technology development at the firm- evel for improved production of goods and services.		
1.SCIENCE, TECHNOLOGY, AND INNOVATION FOR THE GROWTH OF INDUSTRIES	1.1. Technology, mapping, and foresight	1.1.1. Mapping of innovation and technology needs across priority sectors. 1.1.2. Establishing credible performance guidelines for technology development and acquisition. 1.1.3. Establishing a data repository of technology needs and solutions for existing Industries and young entrepreneurs. 1.1.4. Developing NIRDA's industrial research and innovation agenda based on emerging and potential industrial sector needs.
	1.2. Technology and product development to strengthen the "Made in Rwanda Brand"	1.1.1. Conducting a comprehensive assessment on industrial products with the ability to respond to Domestic Market Recapturing to inform the actions on industrial products development. 1.1.2. Targeting value chains across mapped priority sectors with enough potential to develop and contribute to horizontal and vertical growth of industries. 1.1.3. In collaboration with the private sector, developing new products to address the industrial gaps identified through technology incubation and acceleration. 1.1.4. Initiating and facilitating collaboration and partnership in technology development between domestic industries, academia, foreign industries and international scientists, including Rwanda diaspora.
	1.3. Investment in Technology Develop-ment, Labs and Facilities	1.3.1. Promoting industries' technology upgrading through different incentives provided to create and develop R&D and innovation units at the firm level. 1.1.2. Promoting collaboration between research institutions, private entities and industries for joint investment in R&D infrastructure and equipment, resource efficiency and technology development. 1.1.3. Initiating collaboration and partnership between NIRDA, academia and other R&D institutions for efficient use of, and investment in, R&D infrastructure and equipment. 1.1.4. Creating and operationalising incubation centres for innovation and technology development to support new and modern industrial products development, responding to existing and future market needs 1.1.5. Developing an appropriate strategy for resource mobilization to support R&D and technology development at both NIRDA and firm levels.
Strategic Objective#2: To increase locally made industrial products and services translating into increased and diversified industrial production to serve domestic and export markets		

2. PRIVATE-LED TECHNOLOGY DEVELOPMENT, INNOVATION AND PARTNERSHIPS FOR INDUSTRIAL DEVELOPMENT	1.1. Support private-led development of industries	1.1.1. Building needed and customized capacity of the companies operating in the industrial sector. 1.1.2. Establishing a platform for technology transfer and commercialisation, and knowledge sharing and management. 1.1.3. Defining the partnership model between NIRDA and the private sector, academia, government institutions and other actors in industrial capacity development. 1.1.4. Liaising with key Government institutions to identify and establish the areas and modalities of NIRDA's support
	1.2. Demand driven technology development support	1.1.1. Conducting a proper activity to cluster and rank industries across priority industrial sectors to inform NIRDA's foreseen technical support. 1.1.2. Developing a clear strategy for raising seed grants to support technology development of industries through a private-public partnership model. 1.1.3. Conducting advocacy on identified challenges facing industries, and liaising with other Government institutions and private sector for awareness campaigns on the industrial related issues.
	1.2. Technology acquisition and commer-cialization	1.1.1. Createing spaces for the private sector's active engagement in technology commercialization, transfer and knowledge sharing among local industries, and between domestic and foreign industries. 1.1.2. Promoting the adaptation of imported technologies and providing technical advisory and coaching support to private enterprises in priority sectors to help them adopting modern technologies. 1.1.3. Assisting and facilitating SMIs in acquiring and transferring IPs for technologies and new industrial products development or upgrade. 1.1.4. Liaising with other relevant Government institutions to facilitate industries' access to raw materials and packaging materials.
Strategic Objective # 3: To improve service delivery by NIRDA to permit it enhancing SMIs governance and green growth		
3. GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS FOR INDUSTRIAL DEVELOPMENT	3.1. NIRDA's Institutional capacity development.	3.1.1. Conducting a comprehensive skills and competencies audit to inform a specific long-term capacity development programme for NIRDA's staff. 3.1.2. Assessing and identifying relevant law and regulation reforms that are needed to create a conducive environment for service delivery by NIRDA in order to enhance research, innovation and technology development of industries. 3.1.3. Defining and proposing improvement in NIRDA's support system to achieve its mandate and fully operationalise CPCIC. 3.1.4. Enhancing and equiping NIRDA's administrative and R&D infrastructure and other facilities to operationalise its STEM and life science laboratories.
	1.2. Industries' resource efficien-cy, natural environment protection and gender mainstream-ing	1.2.1. Conducting an economic and environmental impact assessment to determine the profile of industries in terms of raw materials needs, resource efficiency and environment protection. 1.2.2. Through the Cleaner Production and Climate Innovation Centre (CPCIC), providing technical assistance and conducting advocacy for industries on resource efficiency and environmental protection. 1.2.3. Liaising with stakeholders to establish joint and complementary services for quality testing and compliance with standards. 1.2.4. Initiating and developing a youth and women mainstreaming strategy in industrial technology development.
	1.3. Promotion of start-up micro and small industries	1.3.1. Identifying and promoting enabling conditions supporting small and medium sized industries along special economic zones and industrial parks across the country. 1.3.2. Providing special technical advice and support to start-up micro and small industries to help them emerge, survive and grow. 1.3.3. Establishing a specific program to promote and address specific challenges facing Micro and Small industries in their growth and graduation. 1.3.4. Identifying and promoting various technological incentives in support to other Government's initiatives to attract Foreign Direct Investment.

The pillars and priority areas are translated into outcomes and outputs as summarised in Table 10.

Table 10: Translating pillars and priority areas into outcomes and outputs

Pillars	Priority areas	Outputs	Outcomes
Science, technology, and innovation for the growth of industries	Technology mapping and foresight	Increased number of technonologies and industrial products	Competitive and diversified industrial development
	Technology and product development in the tone of strengthening the “Made in Rwanda” Brand.		
	Investment in technology development labs and facilities.	Increased investment in R&DI at the firm level	
Private-led technology development, innovation and partnership for industrial development	Private-led support to industries development	Improved private sector’s contribution to industrial development in targeted and supported value chains.	Private-led and sustainable industrial development
	Demand-driven technology development.		
	Technology acquisition and commercialisation	Industrial modern technologies are acquired, transfered and commercialized for bigger impacts	
Governance and institutional arrangements for industrial developmemnt	NIRDA’s institutional capacity development to strengthen industries’ capabilities	NIRDA’s institutional capacity is enhanced	Improved conducive environment for industrial development.
	Promotion of start-up micro and small industries	Specific programs to promote SMIs are initiated.	
	Industry’s resource efficiency and natural environment protection	Industrial green growth and environment protection are incorporated in industrial development interventions	

3.5. NIRDA’S THEORY OF CHANGE

This section describes NIRDA’s theory of change reflecting the expected changes to be brought by the interventions proposed in this strategic plan,describing the key challenges or strategic ssues identified and sets some underlying assumptions in addressing them. The logic of this throry of change is to show a direct causal linkage between the activities or strategic ations proposed and the outputs and how these translate into outcomes as NIRDA achieves its desired impact in terms of competitive and diversified industries.

3.5.1. Challenges faced by industries and underlying assumptions to overcome them

As has been explained earlier, the industrial sector face followings key challenges:

- It is less diversified in terms of quantity and quality of industrial products;
- Investments in R&D are marginal and non-existent for most of industries;
- The value added of Rwanda’s manufacturing industry remains low in comparison to that of neighbouring countries;
- Domestic industries are less competitive on both local and export markets.

To overcome the challenges listed above, the following assumptions were proposed through new strategic orientations:

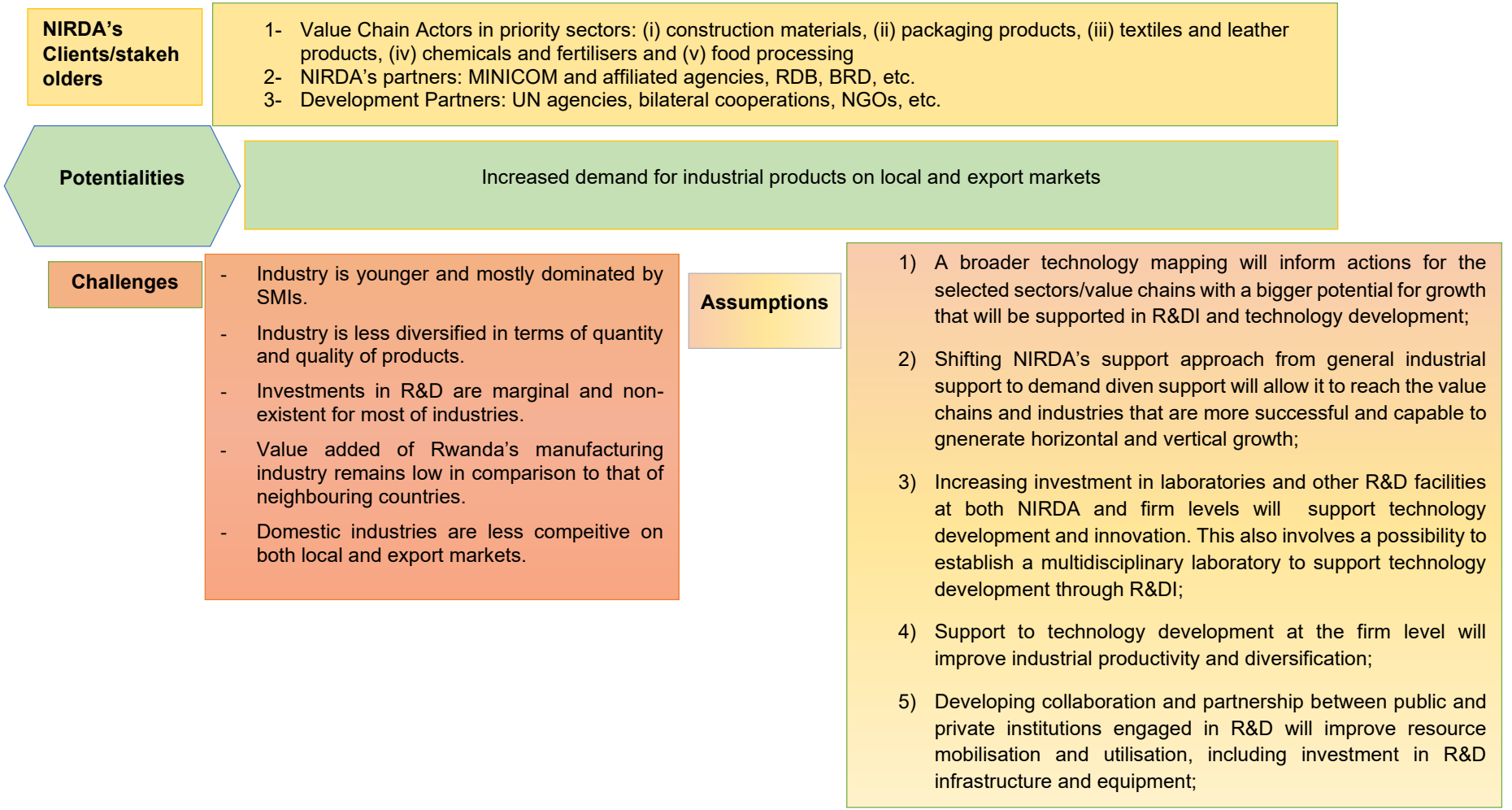
- A broader technology mapping will inform actions for the selected sectors/value chains with a bigger potential for growth that will be supported in R&DI and technology development;
- Shifting NIRDA’s support approach from general industrial support to demand diven support will allow it to reach the value chains and industries that are more successful and capable to gnenerate horizontal and vertical growth;
- Increasing investment in laboratories and other R&D facilities at both NIRDA and firm levels will support technology development and innovation. This also involves a possibility to establish a multidisciplinary

laboratory to support technology development through R&DI;

- Support to technology development at the firm level will improve industrial productivity and diversification;
- Developing collaboration and partnership between public and private institutions engaged in R&D will improve resource mobilisation and utilisation, including investment in R&D infrastructure and equipment;
- The coordination of all the stakeholders involved in technology development will contribute to efficient resource use towards the development of micro, small amd medium sized industries and SMIs.

As summarised in Figures 5 and 6, these assumptions will guide NIRDA's strategic actions to start the process of industrial sector change. Further, the need for diversification of the industrial sector is motivated by the increasing demand on local and export markets, which adds value to recapturing local market opportunities. During the implementation of this strategic plan, NIRDA will also build on collaboration and partnership with VC actors, government institutions and local and international development partners.

Figure 6: Challenges faced by industries and assumptions guiding NIRDA's actions



3.5.2. The process of industrial change

The long term goals guiding NIRDA's actions are:

1- Increasing the manufacturing value added to respond to local, regional and international market demand;

2- Improve the competitiveness of manufacturing industries on the export market.

To achieve these goals, NIRDA will undertake strategic actions categorized under three pillars and nine priority areas as described in previous sections. The process of change will pass through intermediate targets as they are translated into outputs and outcomes (see Figure 6). The table in Aannex 2 provides details on the pathway to the changes expected from NIRDA's strategic actions.

Figure 6: NIRDA's Theory of Change

Anticipated Impact	**J**		**K**
	Improved competitive, diversified and private-led industries	**Increased capacity of industries to respond to the market demand**	
Strategic Outcomes	**G**	**H**	**I**
	1. Competitive and diversified industrial development	**2. Private-led and sustainable industrial development**	**3. Improved conducive environment for industrial development**
Strategic Outputs	**D**	**E**	**F**
	1.1. Increased number of technologies and industrial products **1.2.** Increased investment in R&DI at the firm level	**1.1.** Increased private sector's contribution to industrial development in targeted and supported value chains. **1.2.** Industrial modern technologies are acquired, transfered and commercialized for greater impacts	**1.1.** NIRDA's institutional capacity is enhanced. **1.2.** Specific programs to promote SMIs are initiated. **1.3.** Industrial green growth and environment protection are incorporated in industrial development interventions
NIRDA's ACTIVITIES	**A**	**B**	**C**
	(1) Mapping innovation and technology needs across priority sectors. **(2)** Establishing a data repository of technology needs and solutions for industries and young entrepreneurs. **(3)** Establishing credible performance guidelines for technology development and acquisition. **(4)** Developing NIRDA's industrial research and innovation agenda based on emerging and potential industrial sector needs. **(5)** Conducting a comprehensive assessment on industrial products to respond to Domestic Market Recapturing to inform the actions on industrial products development. **(6)** Target value chains with a big potential across mapped priority sectors to be developed and contribute to horizontal and vertical growth of industries. **(7)** In collaboration with the private sector, developing new products to address industrial gaps identified through technology incubation and acceleration. **(8)** Initiating and facilitating collaboration and partnership in technology development between domestic industries, academia, foreign industries and international scientists, including the Rwanda diaspora. **(9)** Promoting industries' technology upgrading through different incentives provided to create and develop R&D and innovation units at the firm level; **(10)** Promoting collaboration between research institutions, private entities and industries in joint investment in R&D infrastructure and equipment, resource efficiency and technology development;	**(11)** Buildinging the needed and customized capacity of the companies operating in priority industrial sectors; **(12)** Defining the partnership model between NIRDA and the private sector, academia, government institutions and other actors in industrial capacity development. **(13)** Establishing a platform for technology transfer and commercialisation, and for knowledge sharing and management among industries; **(14)** Liaising with key government institutions to identify and establish the areas and modalities of NIRDA's support. **(15)** Conducting an activity to cluster and rank industries across priority industrial sectors to inform NIRDA's foreseen technical support. **(16)** Developing a clear strategy for raising seed grants to support industries' technology development through a private-public partnership model. **(17)** Conducting advocacy on identified challenges facing industries, and liaising with other Government institutions and private sector for awareness campaigns on industrial related issues. **(18)** Creating spaces for the private sector active engagement in technology commercialization, transfer and knowledge sharing among local industries, and between domestic and foreign industries.	**(19)** Conducting a comprehensive skills and competencies audit to inform a specific long-term capacity development programme for NIRDA's staff. **(20)** Assessing and identifying relevant law and regulations reforms that are needed to create a conducive environment for service delivery by NIRDA in order to enhance research, innovation and technology development of industries. **(21)** Defining and proposing improvement in NIRDA's support system to achieve its mandate, and fully operationalise CPCIC. **(22)** Enhancing and equiping NIRDA's administrative and R&D infrastructure, and other facilities to operationalise its STEM and life science laboratories. **(23)** Conducting an economic and environmental impact assessment to determine the profile of industries in terms of raw materials needs, resource efficiency and natural environment protection. **(24)** Through the Cleaner Production and Climate Innovation Centre (CPCIC), providing assistance and advocacy to industries in terms of resource efficiency and environment protection. **(25)** Liaising with stakeholders to establish joint and complementary services for quality testing and compliance with standards. **(26)** Initiating and developing a youth and women mainstreaming strategy in industrial technologies development. **(27)** Identifying and promoting enabling conditions supporting small and medium sized industries along special economic zones and industrial parks across the country.

	(11) Initiating collaborations and partnerships between NIRDA, academia and other R&D institutions for efficient use of, and investment in, R&D infrastructure and equipement; **(12)** Developing an appropriate strategy for resource mobilization to support R&D and technology development at both NIRDA and firm levels.	**(19)** Promoting the adaptation of imported technologies and providing technical advisory and coaching support to private enterprises. in priority sectors to permit them adopting modern technologies **(20)** Assisting and facilitating SMIs in acquiring and transferring IPs for technologies and new industrial products development or upgrading existing ones **(21)** Liaising with other relevant government institutions to facilitate industries's access to raw materials and packaging materials.	**(28)** Providing special technical advice and support to start-up micro and small industries to help them emerge, surve and grow. **(29)** Establishing a specific program to promote Micro and Small industries and address specific challenges they are facing in their growth and graduation. **(30)** Identifying and promoting various technological incentives in support to other Government's initiatives to attract Foreign Direct Investment.

Note: Reading this theory of changes starts with the group of activities (A,B,C), which lead to the strategic outputs (D,E,F) also leading to the group of strategic outcomes (G,H,I) towards the anticipated impacts (J &K).

4. The results Framework and performance indicators

The table in Annex 1 summarises the results framework and key performance indicators of this strategic plan.

4.1. INSTITUTIONAL ARRANGEMENTS FOR IMPLEMENTATION AND COORDINATION

The success implementation of this Strategic plan is dependent on its acceptance and ownership by NIRDA's staff and stakeholders. Thus, before its implementation, this Strategic Plan should be disseminated to allow all stakeholders and staff in all departments to be familiar with its content. Further, it will be operational through Annual Actions Plans prepared and implemnented in accordance with an appropriate Monitoring and Evaluation system; these actions are integrated in a suitable budgeting process.

In addition, some existening procedures will be revised and adapted. Thus, some ajustements constitute a pre-condition for the implementation of this strategic plan. These adjustments mainly include the revision of NIRDA's organisation structure in light of the capacities and skills needed to udertake proposed actions. Indeed, the review of the Strategic Plan 2018-2022 pointed to missing positions and proposed a detailed skills and competency needs assessment to inform the job profiling. Further, the functions of planning, monitoring and evlaution need to go beyond a project along the technology audit to form part of the overall service delivery framework and functioning of NIRDA's units.

In addition, to successfully implement this strategic plan, NIRDA should recruitskilled and motivated staff to fill the vacant positions or those whose occupants are acting. Further, a deep analysis of staff job description should be conducted to align staff daily duties to this strategic plan, including their redeployment in other departments. In addition, a skills and competencies audit should be conducted to inform new recruitments and staff development activities to upgrade skills of the current staff

4.2. THE MONITORING, EVALUATION AND REPORTING FRAMEWORK

The proposed monitoring and evaluation and learning framework is aligned to this strategic plan and does not consider the operational monitoring of targeted industries and firms. The MEL framework will play a pivotal role in the implementation of this strategic plan by tracking performance in the achievement of the strategy's objectives and targets. It will also help make needed adjustements and accommodation of emerging opportunities and challenges in meeting planned targets. Thus, NIRDA's M&E system will be result-based and all reports will compare the achived performance to targets as well as draw lessons to inform subsequent annual planning activities.

A M&E committee will be established to coordinate the reporting system. At the begining of the financial year, the M&E committee and the senior management (DG and HoDs) will convene a meeting to design an implementation work plan of the strategic plan. The M&E committee will meet every quarter to evaluate the progress of the implementation work plan. In this context, all the required information will be collected, including that from secondary sources for an appropriate analysis of the Strategic Plan implementation.

With reference to the reporting system, four types of reports will be produced: quarterly reports, mid-year reports, a mid-term report and a final report. Quarterly reports will provide information on the progress made on Key Performance Indicators vis-à-vis quarterly targets. They will also identify causal factors, recommend appropriate remedial actions to be undertaken, including adjustements of objectives and strategic interventions if necessary. Mid-year report are similar to the quarterly reports, with the added value being its cumulative nature.

The mid-term report will assess the whole Strategic Plan implementation during the first two years and half and can propose the revision of strategies and targets if needed. The final report will be produced at the end of this strategic plan implementation period, and will serve as the baseline for the next Strategic Plan.

5. Overall Budget

The total budget allocated to the implementation of this Startegic Plan is estimetad at 47.240 billion RWF. 56.12% is dedicated to investment in R&DI at both NIRDA and firm levels while 38.23% will be used for industrial governance (including special programs to support micro and small industries). As this Strategic Plan focuses on empowering private compagnies to play an active role in generating and using technologies, only 5.65% of the budget will be allocated to increasing and diversifying local industrial production (the MiR brand). Table 11 summarise the weighting of the overall budget by outputs and outcomes.

Estimations have been done assuming two sources of fundings: the Government and development partners. Details on costed activities over the next five years are illustrated in Annex 2. The distribution of the planned budget shows that a considerable share (about 55% of the overall budget) will be used in the second year of the Strategic Plan. This is justified by an existing project of a joint STEM laboratory between NIRDA and UR, for which the funding source is already identified and will be spent in the very second year (see item no. 10).

Figure 7: Distribution of Budget Planned Over Five Years of the Strategic Plan

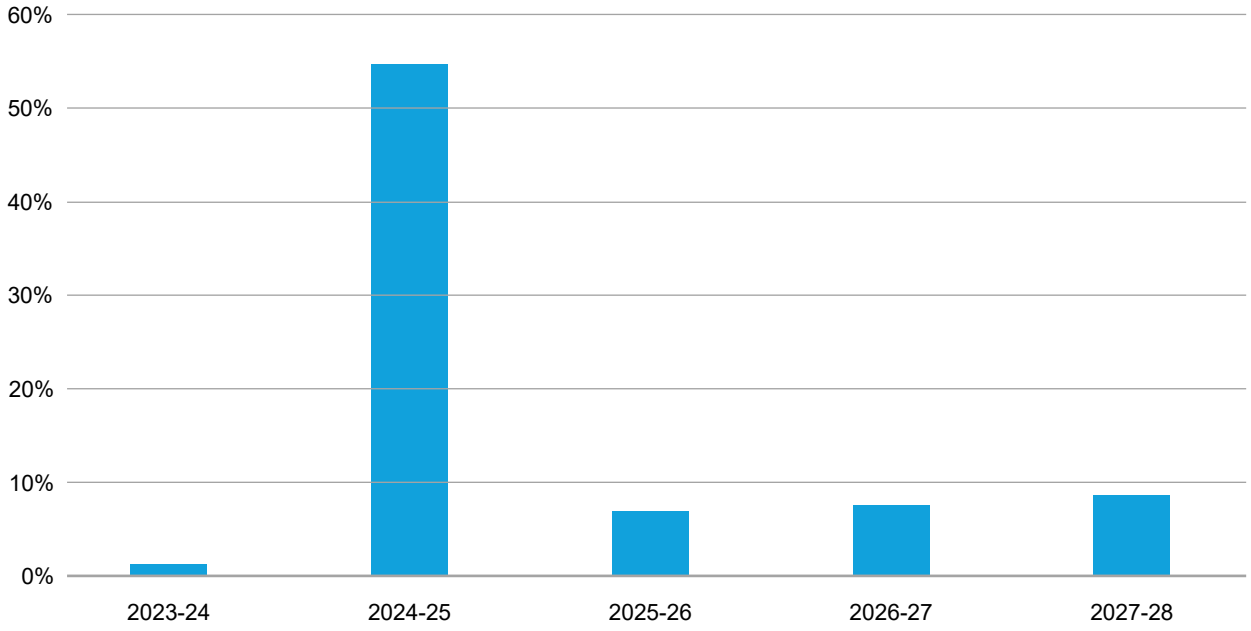


Table 11: Strategic Plan Budget over Five Years

STRATEGIC OBJECTIVES		Total cost per output	
OUTCOMES	**OUTPUTS**	**(FRW Million)**	**Percentage**
Pillar 1: Science, technology, and innovation for the growth of industries			
Competitive and diversified industrial development	Increased number of technologies and industrial products	560	1,19%
	Increased Investment in R&DI at the firm level	25 950	54,93%
	S/Total 1	**26 510**	**56,12%**
Pillar 2: Private-led technology development, innovation and partnerships for industrial development			
Private-led and sustainable industrial development	Increased private sector's contribution to industrial development in the targeted value chains	2 070	4,38%
	Industrial modern technologies are acquired, transferred and commercialized for a greater impact	600	1,27%
	S/Total 2	**2 670**	**5,65%**
Pillar 3: Governance and institutional arrangements for industrial development			
Improved conducive environment for industrial development	NIRDA's institutional capacity is enhanced	395	0,84%
	Industrial green growth and environment protection are incorporated in industrial development interventions	345	0,73%
	Specific programs to promote SMIs are initiated	17 320	36,66%
	S/Total 3	**18 060**	**38,23%**
	Grand Total	**47 240**	**100%**

ANNNEXES

Annex 1: The results framework and performance indicators

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Baseline	Annual Targets					Unit Responsible	Reporting/ Periodicity
OUTCOMES	OUTPUTS	S/N					Yr1	Yr2	Yr3	Yr4	Yr5		
Pillar 1: Science, Technology, and Innovation for the growth of industries													
Competitive and diversified industrial development	Increased number of technologies and industrial products	1	Mapping innovation and technology needs across priority sub-sectors	200	Number of priority sub-sectors mapped	3	2	2	1	-	-	Knowledge Management	Annually
		2	Establishing a data repository of technology needs and solutions for industries and young entrepreneurs	20	Number of technology data repositories developed	0	-	1	-	-	-	Knowledge Management	Annually
		3	Establishing performance guidelines for technology development and acquisition	50	Number of guiding documents on technology development and acquisition	0		1	-	-	-	Applied R&D	Annually
		4	Developing NIRDA's industrial research and innovation agenda based on emerging and potential industrial sub-sector needs	20	Number of industrial research and innovation agendas developed	0	-	1	-	-	-	Applied R&D	Annually
		5	Conducting a comprehensive assessment on industrial products to respond to Domestic Market Recapturing in order to to inform the actions on industrial products development	20	Number of assessment studies conducted	0	-	1	-	-	-	Applied R&D	Annually
		6	Identifying and targeting value chains across mapped priority sub-sectors/sectors with a bigger potential to develop and contribute to horizontal and vertical growth of industries (see no.14)	-	Number of value chains identified/ targeted	14	5	5	8	5	2	Knowledge Management	Annually

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Baseline	Annual Targets					Unit Responsible	Reporting/ Periodicity
		7	In collaboration with the private sector, developing new products to address the industrial gaps identified, through technology incubation and acceleration	200	Number of new products developed	10	0	2	5	2	1	Applied R&D	Annually
		8	Initiating and facilitating collaboration and partnership in technology development between domestic industries, academia, foreign industries and international scientists, including Rwanda diaspora	50	Number of collaboration agreements signed	1	0	3	3	2	2	Applied R&D	Annually
	Increased Investment in R&DI at the firm level	9	Promoting industries' technology upgrading through different incentives provided to create and develop R&D and innovation units/ functions at the firm level	200	Number of incentives created for industries to establish R&D units/functions at the firm level	0	0	1	1	1		Applied R&D	Annually
		10	Promoting collaboration between research institutions, private entities, and industries in joint investment in R&D infrastructure and equipment, resource efficiency and technology development	25 000	Number of joint investment/Resource sharing agreements in infrastructure	1	-	1	-	1	1	Applied R&D	Annually
		11	Initiating and promoting collaboration and partnership between NIRDA, academia and other R&D institutions for efficient use and investment in R&D infrastructure and equipment	100	Number of partnership agreements signed	1	0	3	2	-	-	Applied R&D	Annually
		12	Developing an appropriate strategy for resource mobilization to support R&D and technology development at both NIRDA and firm levels	50	Resource mobilization strategy is developed	0	1	-	-	-	-	Applied R&D	Annually
		13	Creating and operationalising incubation centres for innovation and technology development to support new and modern industrial products development, responding to existing and future market needs	600	Number of incubation centres created	1	1	-	1	-	1	Applied R&D	Annually
			S/Total Budget 1	**26 510**									

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Baseline	Annual Targets					Unit Responsible	Reporting/ Periodicity
Pillar 2: Private-led technology development, innovation and partnerships for industrial development													
Private-led and sustainable industrial development	Improved private sector's contribution to industrial development in targeted and supported value chains	14	Buildingthe needed and customized capacity of companies operating in priority industrial sectors	1 800	Number of companies supported in capacity building	280	60	70	80	50	40	Technology Acquisition	Annually
		15	Defining the partnerships model between NIRDA and the private sector, academia, government institutions and other actors in industrial capacity development	20	Number of partnerships engaged in	0	0	1	1	0	-	Technology Acquisition	Annually
		16	Establishing a platform for technology transfer and commercialisation, and for knowledge sharing and management among industries	50	Number of platforms established	0	1	1	1	1	1	Technology Acquisition	Annually
		17	Liaising with key Government institutions to identify and establish the areas and modalities of NIRDA's support	20	Number of workshops organised	0	1	1	1	1	1	Technology Acquisition	Annually
		18	Conducting an activity to cluster and rank industries across priority industrial sectors to inform NIRDA's foreseen technical support	50	Number of clusters created	0	5	5	8	5	2	Technology Acquisition	Annually
		19	Developing a clear strategy for raising seed grants to support industries' technology development through a private-public partnership model	30	A strategy document for seed grants	0	1	-	-	-	-	Technology Acquisition	Annually
		20	Conducting advocacy on the identified challenges facing industries, and liaise with other Government institutions and the private sector for awareness campaigns on the industrial related issues	100	Number of advocacy compaigns conducted	3	1	1	1	1	1	Technology Acquisition	Annually

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Baseline	Annual Targets					Unit Responsible	Reporting/ Periodicity
	Industrial modern technologies are acquired, transferred and commercialized for greater impacts.	21	Creating spaces for the private sector active engagement in technology commercialization, transfer and knowledge sharing among local industries, and between domestic and foreign industries	80	Number of technology access linkages facilitated for commercialization, transfer and knowledge sharing	0	0	1	1	1	1	Technology Acquisition	Annually
		22	Promoting the adaptation of imported technologies and providing technical advisory and coaching support to private enterprises in priority sectors to help them adopting modern technologies	360	Number of imported technologies adapted.	0	0	3	3	3	3	Technology Acquisition	Annually
		23	Assisting and facilitating SMIs in acquiring and transferring IPs for technologies and new industrial products development or upgrade of existing ones	60	Number of industries facilitated for IPRs.	0	0	1	1	1	1	Knowledge Management	Annually
			S/Total Budget 2	**2 670**									
Pillar 3: Governance and institutional arrangements for industrial development													
Improved conducive environment for industrial development	NIRDA institutional capacity is enhanced	24	Conducting a comprehensive skills and competencies audit to inform a specific long-term capacity development programme for NIRDA's staff	50	Number of assessments conducted	0	-	1	-	-	-	DAF	Annually
		25	Assessing and identifying relevant law and regulations reforms needed to crate a conducive environment for service delivery by NIRDA in order to enhance research, innovation and technology development of industries	30	Number of laws, regulations and reforms proposed.	0	0	1	2	2	1	DG office	Annually

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Baseline	Annual Targets					Unit Responsible	Reporting/ Periodicity
		26	Defining and proposing improvement in NIRDA's support system to achieve its mandate, and fully operationalise CPCIC	15	Vacant positions are filled	80.8%	90%	100%	-	-	-	DAF	Annually
		27	Enhancing and equiping NIRDA's administrative and R&D infrastructure, and other facilities to operationalise its STEM and life science laboratories	300	Level of operationalization of the STEM and life science laboratory	20	25	35	55	60	75	DAF	Annually
	Industrial green growth and environment protection are incorporated in industrial development interventions	28	Conduct an economic and environmental impact assessment to determine the profile of industries in terms of raw materials needs, resource efficiency and natural environment protection	100	Number of assessments conducted.	0		-	1	1		CPCIC	Annually
		29	Through the Cleaner Production and Climate Innovation Centre (CPCIC), providing assistance and advocacy to industries in terms of resource efficiency and environment protection	185	Number of industries supported.	33		20	30	30	25	CPCIC	Annually
		30	Liaising with stakeholders to establish joint and complementary services for quality testing and compliance with standards	10	Number of collaboration agreements signed	0	-	1	-	-	1	Technology Acquisition	Annually
		31	Initiating and develop a youth and women mainstreaming strategy in industrial technologies development	50	Youth and Gender mainstreaming strategy is in place	0	-	1	-	-	-	DG office	Annually
	Specific programs to promote SMIs are initiated	32	Identifying and promoting enabling conditions for small and medium sized industries along special economic zones and industrial parks across the country	10 000	Number of SMIs supported.	0	30	30	30	30	30	Technology Acquisition	Annually
		33	Providing special technical advice and support to start-up micro and small industries to help them emerge, survive and grow	7 200	Number of start up and MSMIs supported	0	-	10	15	15	20	Technology Acquisition	Annually

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Total Cost (FRW million)	Indicator	Base-line	Annual Targets					Unit Responsible	Reporting/ Periodicity
		34	Establishing a specific program to promote and address specific challenges facing micro and small industries in their growth and graduation	100	MSMI support Program is in pace	0	-	-	1	-	-	Technology Acquisition	Annually
		35	Identifying and promoting various technological incentives in support to other government's initiatives to attract foreign direct investment	20	Number of technological incentives identified and promoted.	0	-	-	1	-	1	Technology Acquisition	Annually
			S/Total Budget 3	**18 060**									
			TOTAL BUDGET	**47 240**									

Annex 2: Detailled budget over five years (2023-2028)

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUTPUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
Pillar 1: Science, technology and innovation for the growth of industries												
1	Competitive and diversified industrial development	Increased number of technologies and industrial products	Mapping innovation and technology needs across priority sub-sectors	Number of priority sub-sectors mapped	40	80	80	40			200	Reference to the previous tech audit approximate cost per value chain
2			Establishing a data repository of technology needs and solutions for industries and young entrepreneurs	Number of technology data repositories developed	20		20				20	Reference to previous developed systems
3			Establishing performance guidelines for technology development and acquisition	Number of guiding documents on technology development and acquisition	50		50				50	Reference made to the simular consultancy fees previously paid

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
4			Developing NIRDA's industrial research and innovation agenda based on emerging and potential industrial sub-sector needs	Number of industrial research and innovation agendas developed	20		20				20	Desk review and consultative workshops
5			Conducting a comprehensive assessment on industrial products to respond to domestic market rcapturing to inform the actions on industrial products development.	Number of assessment studies conducted	20		20				20	Survey, desk review and consultative workshops
6			Identify and target value chains across the mapped priority sub-sectors/sectors with a big potential to develop and contribute to horizontal and vertical growth of industries (see no.14)	Number of value chains identified/ targeted							-	Desk review of existing value chain documents
7			In collaboration with the private sector, developing new products to address industrial gaps identified, through technology incubation and acceleration	Number of new products developed	20		40	100	40	20	200	Raw materials, testing services and consumbles as per the products developed previously
8			Initiating and facilitating collaboration and partnership in technology development between domestic industries, academia, foreign industries and international scientists, including the Rwandan diaspora	Number of collaboration agreements signed	5		15	15	10	10	50	Travel and workshop costs based on partnership cost in baseline

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
9		Increased Invest-ment in R&DI at the firm level	Promoting industries' technolo-gy upgrading through different incentives provided to create and develop R&D and innovation units/ functions at the firm level	Number of in-centives created for industries to establish R&D units/functions at the firm level	50	0	50	50	50	50	200	Financial and non financial assistance to R&D units
10			Promoting collaboration between research institutions, private entities, and industries for joint in-vestment in R&D infrastructure and equipment, resource efficiency and technology development	Number of joint investment/Re-source sharing agreements signed in infra-structure			23000	0	1000	1000	25 000	Reference is made to the fesability study conducted on the joint STEM laboratory
11			Initiate and promote collaboration and partnership between NIRDA, academia and other R&D insti-tutions for efficient use of, and investment in, R&D infrastructure and equipment	Number of part-nership agree-ments signed	20		60	40			100	Operational-isation of the agreement including travel and workshop cost
12			Developing an appropriate strategy for resource mobilization to support R&D and technology development at both NIRDA and firm levels	Resource mobili-zation strategy is in place	50	50					50	Consultancy and workshop fees
13			Creating and operationalise incu-bation centres for innovation and technology development to support new and modern industrial prod-ucts development, responding to existing and future market needs	Number of incu-bation centres created	300	0	300	300	0	0	600	Consumables and pilot machines at in-cubation based on baseline incubation cost
			S/Total Budget 1			130	23 655	545	1 100	1 080	26 510	
			Percentage of S/Total Budget 1								56,12%	

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
Pillar 2: Private-led technology development, innovation and partnerships for industrial development												
14	Private-led and sustainable industrial development	Improved private sector's contribution to industrial development in targeted value chains	Building the needed and customized capacity of companies operating in priority industrial sub-sectors	Number of companies supported in capacity building	6	360	420	480	300	240	1 800	Reference made to the previous technical and business training and coaching
15			Defining the partnership model between NIRDA and the private sector, academia, government institutions and other actors in industrial capacity development	Number of partnerships engaged in	10		10	10			20	Workshop & transport
16			Establishing a platform for technology acquisition, transfer and commercialisation, and for knowledge sharing and management among industries	Number of platforms established	10	10	10	10	10	10	50	Logistics facilitation
17			Liaising with key government institutions to identify and establish the areas and modalities of NIRDA's support	Number of workshops organised	4	4	4	4	4	4	20	Logistics facilitation
18			Conducting an activity to cluster and rank industries across priority industrial sectors to inform NIRDA's foreseen technical support (see no. 6)	Number of clusters created	2	10	10	16	10	4	50	Logistics facilitation
19			Developing a clear strategy for raising seed grants to support technology development of industries through a Private-Public Partnership model	A strategy document for seed grants is in place	30	30					30	Technical Assistance

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
20			Conducting advocacy on the identified challenges facing industries, and liaising with other government institutions and the private sector for awareness campaigns on the industrial related issues	Number of advocacy compaigns conducted	20	20	20	20	20	20	100	Logistics facilitation
21		Industrial modern technologies are acquired, transferred and commercialized for a greater impact	Facilitating the creation of spaces for the private sector's active engagement in technology commercialization, transfer and knowledge sharing among local industries, and between domestic and foreign industries	Number of technology access linkages facilitated for commercialization, transfer and knowledge sharing	20		20	20	20	20	80	Logistics facilitation
22			Promoting the adaptation of imported technologies and providing technical advisory and coaching support to private enterprises in priority sectors to help them adopting modern technologies	Number of imported technologies adapted.	30		90	90	90	90	360	Operationalisation and Logistics
23			Assisting and facilitating SMIs in acquiring and transferring IPs for technologies and new industrial products development or upgrading existing ones	Number of industries facilitated for IPRs.	15		15	15	15	15	60	Logistics facilitation
			S/Total Budget 2			434	599	665	469	403	2 670	
			Percentage of S/Total Budget 2								5,65%	

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
Pillar 3: Governance and Institutional Arrangements for Industrial Development												
24	Improved conducive environment for industrial development	NIRDA's institutional capacity is enhanced	Conducting a comprehensive skills and competencies audit assessment to inform a specific long-term capacity development programme for NIRDA's staff	Number of assessments conducted	50		50				50	Reference to previously conducted assessments.
25			Assessing and identifying relevant laws, regulations and reforms needed to create a conducive environment for service delivery by NIRDA in order to enhance research, innovation and technology development of industries	Number of laws, regulations and reforms proposed.	5		5	10	10	5	30	Logistics facilitation
26			Defining and proposing areas for improvement in NIRDA's support system to achieve its mandate, and fully operationalise CPCIC	Missing positions are integrated and filled							15	
27			Enhancing and equiping NIRDA's administrative and R&D infrastructure, and other facilities to operationalise its STEM and life science laboratories	Level of operationalization of STEM and life science laboratory		40	80	80	50	50	300	Reference is made to existing laboratories (equipment and other accessories.)
28		Industrial green growth and environment protection are incorporated in industrial development interventions	Conducting an economic and environmental impact assessment to determine the profile of industries in terms of raw materials needs, resource efficiency and natural environment protection	Number of assessments conducted.	50			50	50		100	Reference is made to previous assessment
29			Providing assistance and advocacy to industries in terms of resource efficiency and environment protection	Number of industries supported.			40	50	50	45	185	Reference is made to previous training and coaching

STRATEGIC OBJECTIVES			NIRDA'S ACTIVITIES/STRATEGIC INTERVENTIONS	Indicator	Annual Budget (FRW Million)							Observation/ Assumption
S/N	OUTCOMES	OUT-PUTS			Unit Cost	Yr1	Yr2	Yr3	Yr4	Yr5	Total Cost	
30			Liaising with stakeholders to establish joint and complementary services for quality testing and compliance with standards	Number of collaboration agreements signed	5		5		5		10	Reference is made to previous signed agreements.
31			Initiating and developing a youth and women mainstreaming strategy in industrial technologies development	Youth and gender mainstreaming strategy is in place.	50		50				50	Reference is made to the previously paid consultancy fees.
32		Specific programs to promote SMIs are initiated	Identifying and promoting enabling conditions supporting small and medium sized industries along special economic zones and industrial parks across the country	Number of SMIs supported.	67	30	30	30	30	30	10 000	To be discussed.
33			Providing specific technical advice and support to start-up micro and small industries to help them emerge, survive and grow.	Number of start up and MSMIs supported			1 200	1 800	1 800	2 400	7 200	Reference is made to the previous support
34			Developing a specific program to promote and address specific challenges facing Micro and Small industries in their growth and graduation.	MSMI support Program is in place				100			100	Reference is made to previously paid consultancy fees.
35			Identifying and promoting various technological incentives in support to other government's initiatives to attract foreign direct investment	Number of technological incentives identified and promoted.	10		10		10		20	Logistics facilitation
			S/Total Budget 3			70	1 470	2 120	2 005	2 530	18 060	
			Percentage of S/Total Budget 3								38,23%	
			TOTAL BUDGET			**634**	**25 724**	**3 330**	**3 574**	**4 013**	**47 240**	
			PERCENTAGE OF TOTAL BUDGET			**1,34%**	**54,45%**	**7,05%**	**7,57%**	**8,49%**	**100%**	