North Kivu InfraSAP:
Main Report

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North Kivu InfraSAP: Main Report

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Contents

Figures

Tables

Executive Summary

The aim of this InfraSAP is to support informed decision-making with respect to building out and rehabilitating the critical infrastructure needed to support growth and stability in North Kivu. As an extended core diagnostic of the World Bank, InfraSAPs examine the status quo of infrastructure provision to assess gaps and critical needs; the context for that provision in terms of governance, funding, financing, and delivery of infrastructure; and the key actions needed to overcome constraints and unlock sustainable investment. For North Kivu, given severe constraints on public sector delivery, this diagnosis has focused on the potential to scale up private sector delivery and the potential roles for the Provincial and the National government to address existing both immediate and longer-term constraints. This report constitutes the final deliverable for the InfraSAP.

Context: the multi-layered challenges and opportunities of North Kivu

The Province of North Kivu, in Eastern DRC, presents a critical development challenge, by many measures. North Kivu covers an area of around 60,000 km^2 and is home to 6.6 million people—more than twice the land area and just over half the population of neighboring Rwanda—of which 3.2 million live in extreme poverty. Around 2.5 million people live in the largest urban areas of Goma (around 1.2 million), Butembo (690,000), and Beni (570,000), although demographics shift rapidly, making accurate estimates difficult to obtain. North Kivu has seen some of the most intense and lasting conflicts in DRC, and violence and insecurity persist, with over 120 armed groups active across Eastern DRC in shifting constellations. The Province is also home to more than a million internally displaced people (IDP) as a legacy of the ongoing conflict in the region. Instability is compounded by natural disaster risks, such as the 2002 and 2021 eruptions of Mount Nyiragongo volcano, and pandemic risks such as the Ebola outbreak from August 2018 to June 2020, as well as the current COVID-19 pandemic, whose impact in the region is still unknown.

Despite these layered constraints and challenges, North Kivu shows signs of a dynamic private sector and considerable growth potential. The Province is rich in agricultural and mineral resources such as tin, gold, and coltan. However, the widespread insecurity and weak rule of law have meant much economic activity is illicit, particularly in mining and natural resource extraction. Most of the population still relies on subsistence farming. Recent years have seen the tentative reemergence of cash crops such as tobacco, coffee, tea, cocoa, and palm nuts, and the arrival of mechanized mining. While North Kivu is over 1,500 km from Kinshasa as the crow flies and remains largely disconnected from the rest of the DRC, its position bordering Rwanda and Uganda makes it well-placed to benefit from regional and international trade to the east, benefiting from the relative stability and prosperity of neighboring markets. The World Bank's 2018 Systematic Country Diagnostic attributes the relatively well-distributed growth in the Kivus over the late 2000s and early 2010s to a reduction in conflict allowing reemergence of economic activity—benefiting from the significant presence of UN forces and donors including to stimulate demand for services, and social cohesion that supports formal and informal private sector development.

Infrastructure in North Kivu: glaring gaps and failures of public sector provision and governance have created both opportunities and significant constraints for the private sector

The poor state of infrastructure in North Kivu is a significant constraint on growth, development, and stabilization, with a large majority of the population lacking access to basic infrastructure services. While reliable access numbers are not available, the electrification rate in North Kivu is estimated to be around eight percent, and mobile penetration around ten percent. Access to improved water sources is

similarly limited, and where water supply systems are in place in a few urban areas, these supply only an estimated ten to twenty percent of demand. Transport, particularly by road as the dominant form, is expensive and highly unreliable. Unsurprisingly, lack of reliable infrastructure is a significant constraint on business operations, and hence investment and growth. A survey of Small and Medium Enterprises (SMEs) in North Kivu cited access to reliable energy and the quality and cost of transport as the third and sixth most significant constraints on operations respectively, rising to the top of the list for those based in rural areas. These constraints were echoed by the major economic operators consulted for this InfraSAP.

The public sector remains responsible on paper for the large share of infrastructure provision but faces significant operational and financial constraints in delivering on this responsibility. Delivery of public infrastructure assets and services is primarily in the hands of national state-owned enterprises (SOEs). In North Kivu, this includes the electricity SOE, SNEL, which operates a small grid in Goma connected to generation assets near Bukavu and serves some border areas with imported power, and the water SOE, REGIDESO, which supplies some areas of Goma, Butembo, Beni, and Walikale. Both SNEL and REGIDESO have legacy networks in other urban areas that are in disuse. In transport, the train and port SOE, SNCC, retains six of 11 quays at Goma port of which it operates one, and the airport SOE RVA operates Goma and Beni airports. On paper, these are commercial enterprises. However, tariffs are generally set below cost-recovery levels, while bills of public entities go unpaid. These SOEs are loss-making and/or carry heavy debt and arrears burdens, and struggle to finance new investments. In practice, most financing is provided by development partners and falls far short of needs. Moreover, the SOEs are highly centralized, with limited resources or incentives for local teams to improve services, even where investment could be viable. In the road sector, a range of Government departments have responsibilities for investment and maintenance of different parts of the network; under-funding of these activities is a critical issue.

A range of private sector operators has emerged to fill the yawning gaps in public provision. The absence of service from national operators, dependent on but disconnected from Kinshasa headquarters, together with a Provincial Government willing to try new models, and strong donor presence and support, has created a conducive space into which private providers have entered. A handful of these entities are fully commercial; most have been established with donor support in varying forms. They include:

- **Electricity mini-grid operators**, whose collective capacity has surpassed that of the electricity SOE, SNEL. These comprise Virunga SARL, created by the foundation that manages the nearby national park, which operates hydro generation and distribution around the park and in Goma and is transitioning from an initial grant-based to a more commercial model; SOCODEE, which is owned by a consortium of Goma's main economic operators and distributes Virunga-generated power within Goma; and Nuru and Energie du Nord Kivu (ENK) which operate solar-powered mini-grids in Goma and Butembo respectively with a combination of equity and grant finance
- **Providers of standalone solar systems** from international company BBOXX to Altech (based in Kinshasa) and Weast Energy, a private family business in South Kivu
- **Two small-scale water companies**, Congo Maji SARL and Yme Jibu, managing standpipes and some home connections in Goma—in both cases with donor funding for the initial investment
- A wide range of **digital infrastructure providers**, including DRC's three international mobile network operators (Artel, Orange, and Vodacom); two international wholesale fiber providers, Liquid Telecom and BCS, connecting to their pan-African networks, and a range of smaller-scale wireless broadband providers and ISPs

- Local **lake transport operators** operating from individual quays within Goma port that are either on privately-owned land or under concession from the national SOE, SNCC.

The Province is also experimenting with a form of partnership with **local construction companies for basic road maintenance**, through fixed-period contracts paid by a combination of tolls and public funding.

These operators are making progress in the face a wide range of constraints, including chaotic regulatory environments, lack of local financing options, lack of inter-related infrastructure services, and ultimately, the limited ability of the population to pay cost-reflective tariffs, as follows:

- **Weak governance** is a major constraint in all sectors. In the water and energy sectors, reforms have been initiated but not completed, with key decrees and/or sector entities missing, and the allocation of responsibilities between National and Provincial governments partially defined, creating an unstable regulatory environment. Reforms to the national SOEs that would align with new sector structures are pending, complicating the definition of potential concessions. ICT and Transport remain largely national competencies. Planned reforms are pending in telecoms to allow and regulate private investment in fixed broadband other than on an ad hoc basis; while in Transport, complex institutional arrangements create both overlaps and gaps in responsibilities
- **Lack of transparency** across sectors compounds weak governance, including with respect to the processes and terms of concession arrangements, and allocation of resources
- **Limited capacity** to plan and manage infrastructure concessions is a constraint across the board—particularly at the Provincial Government level
- **A lack of coordination** connects challenges across sectors—for example, the unreliability of power supply causes operational problems for water pumping stations
- **Unavailability of financing** is a challenge in the context of minimal local financial markets, with maximum tenors of less than 12 months. Those operators without access to international corporate balance sheets are primarily financed by equity, supplemented by donor contributions in various forms. Only Virunga SARL has accessed commercial bank debt
- **Inadequate funding** remains a significant constraint, between a massive shortfall for publicly funded provision and the limited ability to pay cost-reflected prices for connections and services, particularly for low-volume and high-cost users in rural areas.
- **Insecurity** remains a concern in large parts of rural areas of North Kivu, with a direct impact on accessibility and attractivity for private investments.

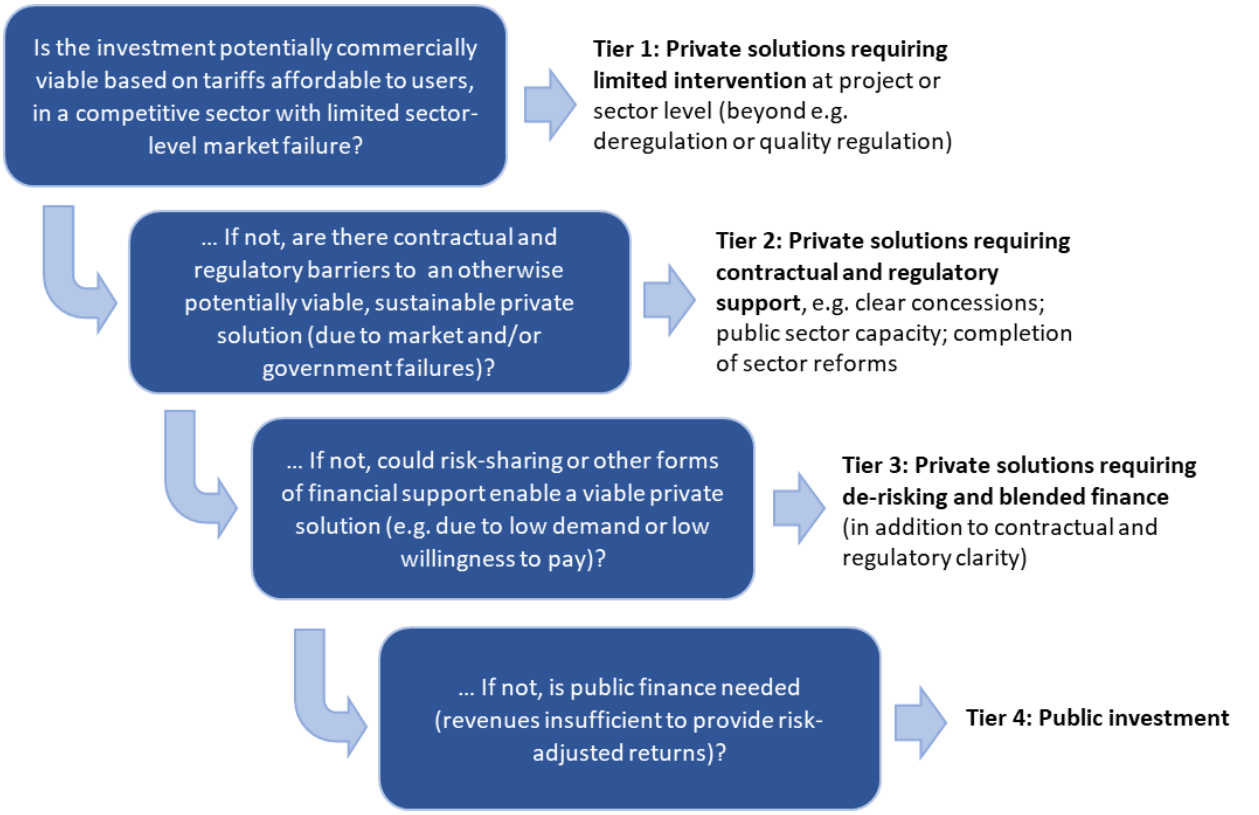
In the context of significantly limited public sector resources and capacity, a key challenge is to determine how these private sector solutions can be scaled up. This requires business models that are viable in an environment of high regulatory, security, and other risks, while having the potential to grow or replicate to collectively build sustainable and coherent provision of infrastructure services in their respective sectors as the environment stabilizes. It will also require concerted effort to overcome the above challenges through continued efforts on sector reform, capacity-building, and a combination of financing and subsidy support.

Roadmap: key steps to expand infrastructure provision in North Kivu

Prioritizing infrastructure investments in North Kivu is challenging, given limited data and huge needs—this InfraSAP takes a qualitative approach, based on making judicious use of scarce public resources. There is insufficient information to use cost-benefit analysis to prioritize the potential investments

identified in this InfraSAP. Assessment of potential investment priorities and associated actions are therefore based on a combination of expressed priorities of the Provincial Government, informed by stakeholder consultation, and complemented by a "cascade" approach that sorts potential investments into tiers, according to the potential for sustainable private sector solutions, and the type and intensity of action needed to enable those solutions, as illustrated in Figure i below. While imperfect, this approach provides a basis for assessing next steps that would represent valuable progress for infrastructure provision in the Province. The table in Figure ii below presents an overview of investment priorities by sector following this approach.

Figure i: Cascade approach to infrastructure financing



Source: Adapted from WBG/IMF Development Committee Paper Maximizing Finance for Development: Leveraging the Private Sector for Growth and Sustainable Development, September 2017

This approach reveals priorities for public investment and helps identify and prioritize actions needed to unlock potential private sector solutions. Clear priorities for public investment are rehabilitation and maintenance of priority roads, and safety investments for airports. In the electricity and water sectors, the emphasis is on enabling private sector solutions—starting with the most viable urban areas, where contractual and regulatory clarity may be sufficient to unlock additional investment, allowing for models to be tested before rolling out more widely along with the subsidies that will be needed to make services affordable to most residential customers. As a national competence, digital development does not appear among Provincial Government priorities. Still, the potential to build on recent progress in connectivity provides a significant impetus for the reforms needed to put viable private investment on a more solid regulatory footing. Across all sectors, expanding coverage, particularly in urban areas, will require some

form of public funding—creating a cross-sector challenge of how to design government and donor support mechanisms to make efficient use of public resources.

Addressing the constraints in North Kivu to enable these infrastructure investments will require action by both National and Provincial Governments—supported by development partners. Given the history of weak coordination between National and Provincial Governments, it is helpful to distinguish where progress may be possible independently at the Provincial level, and where there are clear interdependencies between actions, considering implications for sequencing. This InfraSAP focuses on actions specific to infrastructure sectors. Broader investment environment and financial sector reforms are not discussed. The World Bank Group's Country Private Sector Diagnostic (CPSD) provides analysis and recommendations in these areas, as well as references to a broad range of analytical work.

In this context, key Provincial Government actions and potential priorities for Development Partners support are as follows, in rough priority order:

- Resolve ongoing issues with **energy** concessions in Goma, with adjudication and support from the National Government as needed, and re-issue concessions on a sustainable basis.
- Establish and invest in the capacity of a small team with responsibility for managing concession arrangements in infrastructure on a **cross-sector** basis; equip the team with basic transparency tools, such as a website to publish information on concession arrangements.
- Identify and prepare the next generation of concessions for **energy** mini-grids and **water** services, focusing on unserved urban areas. These concessions could be based on national standard contracts if these are already available (or otherwise feed into the subsequent development of those standards) and should be designed with the contractual flexibility to allow for further regulatory changes. This is likely to require piloting funding/financing mechanisms to reduce risk and support viability, which could feed into subsequent design of national-level systems. In the water sector, this may depend on some further development of the sector framework to clarify the right of the Provincial Government to issue concessions
- Identify and advocate for opportunities to coordinate **cross-sector** infrastructure planning and implementation, including feeding into efforts at the National level.

Key National Government actions and potential priority areas for support from Development Partners are as follows:

- Pursue planned rehabilitations for priority **road** corridors and complete ongoing **airport** safety infrastructure investment, building in consideration of models involving risk transfer to private sector to ensure adequate maintenance (particularly in roads) and opportunistic investment in related infrastructure (laying fiber alongside road rehabilitations)
- Provide support as needed to adjudicate on existing **energy** concession arrangements in Goma
- Publish new **telecommunications** law in the Official Gazette to enable competition in fixed broadband sector, and put in place minimum necessary regulatory arrangements
- Complete updates to **water** sector legal framework, and finalize and adopt revised National Water Policy, to provide a sufficiently stable institutional and legal basis for concessions
- Complete National Electrification Plan in **energy** to provide basis for mapping out future concession arrangements

- Clarify roles going forward for both SNEL (**energy**) and RIGIDESO (**water**) under the newly reformed sectors and complete the necessary contractual and institutional arrangements
- Establish/strengthen regulatory agencies and other **energy** and **water** sector entities per reform plans; develop and adopt standardized approaches to technical requirements and concession contracts based on pilot experiences so far
- Develop and fund national mechanisms (e.g., access funds) to fund rural infrastructure development in **energy**, **water**, and **telecommunications**, based on pilot experience.

Table i: Overview of potential priority investments per sector

Sector	Potential Investments	Provincial Priority Level	Cascade Analysis
Energy	Continued **expansion of grids in Goma** supplied by **least-cost generation sources**	High priority; first priority within sector	**Tier 2** in wealthier urban areas, or serving anchor off-takers or commercial customers—**Tier 3** otherwise
	Rollout of **standalone mini grids in towns with a viable customer base**	Butembo and Beni as second priority, then smaller towns	
	Rollout of **Solar Home Systems (SHS)** to lower income households and in more remote areas	High priority (lower priority within sector)	**Tier 1** for higher-income customers or more accessible locations (financing likely a constraint); **Tier 3** for lower-income and/or remote users
Water	Rehabilitation and upgrade of **water supply system in Goma**	First priority within sector	**Tier 4**, with risk transfer to private operators. Potential for future transition to **Tier 3** once major upgrades complete.
	Rehabilitation and/or buildout of **water supply systems in other urban areas**	Butembo and Beni as second priorities within sector	
	Investment in **bulk water supply**	N/a	**Tier 4**
Digital	Fiber network investments in **international connectivity** to improve quality; **domestic backbone connections** between population centers; and **metro fiber rings** in Goma and elsewhere	N/a (national competence)	**Tier 1-2**. Liberalization through new sector law needed. Opportunistic PPPs could reduce costs, e.g., fiber alongside road works
	FTTX or other last-mile solutions to connect to urban fiber grids		**Tier 1-2** (quality regulation needed)
	Expansion of **rural 3G/4G networks**		**Tier 3**
Ground Transport	**Rehabilitation of high-priority roads** (national roads then priority provincial road sections—further prioritization needed for latter)	**Top priority**	**Tier 4**, with potential for increasing risk transfer to contractors

Sector	Potential Investments	Provincial Priority Level	Cascade Analysis
	Ongoing investment in **adequate, timely maintenance** for rehabilitated sections	**Top priority**	**Tier 4**, with potential for increasing risk transfer to contractors
	Improvement in **lake transport safety**	Low priority as relatively well-performing subsector	**Tier 1-2** (safety regulation needed)
	Investment in **lake port infrastructure**		**Tier 2**
Air Transport	Improve Beni and Goma airport infrastructure and equipment	Beni as highest priority within sector, followed by Goma	**Tier 4**
	Upgrade passenger and freight terminals	Lower priority	Potentially **Tier 2** for management and ancillary revenue generation, depending on evolution of security context and military presence

Source: InfraSAP analysis; consultations with North Kivu Provincial Government officials

1. Introduction

The Democratic Republic of Congo (DRC) represents a critical development challenge by many measures. The DRC covers a vast area rich with natural resources—including listed deposits of more than 1,100 minerals and precious metals; 80 million hectares of fertile land; and the second-largest forest in the world after the Amazon. It is also home to a large population, of over 80 million, growing rapidly at 3.3 percent per year, of which 73 percent lives in extreme poverty. DRC has been in a state of conflict and fragility for decades. There have been recent positive signs, including the election in 2019 of a new President, Félix Tshisekedi, through a peaceful, albeit contested, democratic transition, although this has been followed by a period of relative political turmoil as political power bases continue to shift. Economic growth increased in 2018 to 4.1%, reflecting recovery from a previous recession caused by a decline in global prices of DRC's main export commodities, but remains reliant on the performance of extractive sectors. The economic impact of the COVID-19 pandemic has yet to be felt but is likely to be significant, especially on commodities markets[1].

The Eastern DRC region, and particularly the Province of North Kivu, mirrors and magnifies national characteristics and challenges. North Kivu covers around 60,000 km^2 and is home to 6.6 million people—more than twice the land area and just over half the population of neighboring Rwanda. It is the second largest of the 26 provinces of DRC by population, after Kinshasa, and one of the more densely populated**,** having seen rapid urbanization during the 1990s and 2000s. An estimated 2.5 million people live in the three largest urban areas of Goma (around 1.2 million), Butembo (690,000), and Beni (570,000), while a handful of smaller towns, such as Rutshuru and Lubero, have populations of over 50,000[2].

North Kivu has seen some of the most intense and lasting conflicts in DRC, and violence and insecurity persist, compounded with other risks. The regional wars of the mid-1990s and 2000s ravaged Eastern DRC, destroying previously established industries and infrastructure. Violence, conflict, and instability have persisted in the province and slowed or blocked rehabilitation and recovery. Over 120 armed groups are active in Eastern DRC in shifting constellations[3], and violent incidents are frequent in many areas of North Kivu, showing a significant increase during 2020 in the context of recent political turmoil. The Province is also home to a still-growing number of internally displaced people (IDP) as a legacy of the ongoing conflict—an estimated 1.6 million new displacements were recorded in Eastern DRC in 2020[4]. This instability is compounded by natural disaster risks, such as the 2002 and 2021 eruptions of Mount Nyiragongo volcano, and pandemic risks, such as the Ebola outbreak from August 2018 to June 2020, as well as the current COVID-19 pandemic, whose impact in the region is still unknown.

Despite these layered constraints and challenges, North Kivu shows signs of a dynamic private sector and is among the regions of DRC with the highest growth potential, as described further in Annex F. The

[1] A Shock Like No Other: The Impact of COVID-19 on Commodity Markets, World Bank Commodity Markets Outlook, April 2020

[2] 2020 Population estimates based on Africapolis, DLR World Settlement Footprint, and Worldpop data. All estimates are highly approximate given lack of accurate data and significant population movements in the region.

[3] Democratic Republic of Congo Risk and Resilience Assessment, World Bank, March 2021

[4] Ibid.

Province is rich in agricultural and mineral resources such as tin, gold, and particularly coltan, of which the Eastern DRC is home to an estimated 80 percent of the world's resource. However, the widespread insecurity and weak rule of law have meant much economic activity is illicit, particularly in mining and natural resource extraction. Most of the population still relies on subsistence farming. The relative stability and reduced violence of recent years has seen the reemergence of investment in cash crops such as tobacco, coffee, tea, cocoa, and palm nuts, as well as the recent arrival of mechanized mining. North Kivu is over 1,500 km from Kinshasa as the crow flies and remains largely disconnected from the rest of the DRC. This position presents both a constraint with respect to integration with the DRC economy, and an opportunity by way of independence to chart its own course—particularly with respect to infrastructure provision, as described further below. North Kivu's position bordering Rwanda and Uganda makes it well-placed to benefit from regional and international trade to the east, including via existing corridors to ports on Africa's east coast, and to piggy-back on the recent relative stability and prosperity of these closely neighboring markets.

Poverty rates are extremely high—with almost half of North Kivu's population living in extreme poverty—but have been falling with economic growth in recent years. 3.2 million people live in extreme poverty in North Kivu, while an estimated 29 percent of the population face acute food insecurity[5]. However, economic growth has had an impact on poverty rates—the poverty incidence in North Kivu dropped by 20.4 percentage points between 2005 and 2013, more than three times the DRC-wide average reduction of 6.7 percentage points. The World Bank's 2018 Systematic Country Diagnostic attributes the relatively well-distributed growth in the Kivus over this period to a reduction in conflict allowing reemergence of economic activity, benefiting from the significant presence of UN forces and donors including to stimulate demand for services, and a degree of social cohesion that supports formal and informal channels of distribution and private service provision[6].

Expansion of economic opportunities through inclusive growth is seen as key to building resilience to conflict and violence in the region—and will require conflict-sensitive investment in infrastructure assets and services. The World Bank's Risk and Resilience Assessment for the DRC identifies economic growth and diversification, and in particular creation of economic opportunities for young people, as among the key "resilience drivers" that could help mitigate risks of conflict and violence—and highlights the importance of improved infrastructure to this end. There is also potential for infrastructure improvements to contribute to other resilience drivers, such as by building confidence in the state. In both cases, investment in rural areas, where the risk of escalation of violence is the greatest, is expected to contribute most to stabilization. Better rural connectivity to domestic and international markets can help create broad-based jobs in agriculture, while the current lack of road access hinders efforts to project positive state presence, as well as military reach into remote armed group-controlled territories. Conversely, infrastructure investment will need to be sensitive to the fragile environment, for example with careful consideration of the potential impact of proposed investments on conflict dynamics, a focus on smaller-scale investments and distributed systems where feasible (which may also contribute directly

[5] DRC Global Humanitarian Overview, UN Office for the Coordination of Humanitarian Affairs (OCHA), 2021

[6] Policy Priorities for Poverty Reduction and Shared Prosperity in a Post-Conflict Country and Fragile State, WBG, March 2018

to job creation in target areas, for example through the growing solar home system and minigrid sectors), and parallel investment in institutional strengthening[7].

The relative dynamism of the private sector in North Kivu is reflected in its infrastructure sectors, which represent some of the few examples of private investment in infrastructure in DRC[8]. While overall the state of infrastructure in North Kivu remains poor, the near-complete absence of service from national operators, dependent on but disconnected from their Kinshasa headquarters, together with an encouraging provincial government willing to try new models, and strong donor presence and support, has created a conducive space into which some private providers have entered. As described further in Section 4 below, these include electricity mini-grid operators and providers of standalone solar systems; small-scale providers of water services in urban areas; a wide range of digital infrastructure providers including multinational companies; and local operators of port infrastructure. The Province is also experimenting with new forms of partnership with the private sector to improve and maintain road infrastructure. These operators are making progress in the face of a wide range of constraints, including insecurity, chaotic regulatory environments, lack of local financing options, lack of inter-related infrastructure services, and ultimately, the limited ability of the population to pay cost-reflective tariffs.

In the context of limited public capacity, a key challenge is how these private sector solutions can be scaled up. This requires business models that are viable in an environment of high regulatory, security, and other risks, while having the potential to grow or replicate to collectively build sustainable and coherent provision of infrastructure services in their respective sectors as the environment stabilizes. It will also require concerted effort to improve the investment environment through clarifying legal, regulatory, and institutional frameworks and building capacity at both central and provincial levels, in a way that will foster a healthy competitive dynamic once the private market takes shape or takes off at scale. In most sectors, targeted public financial support will be required to enable such private sector solutions to reach the rural population that remains the majority in North Kivu and is currently largely unserved. Development partners will have a critical role throughout this process: to support nascent businesses as they grow and transition to viable service providers; and to support the Government in building the enabling environment to allow those businesses to expand and thrive.

The purpose of this InfraSAP is to support informed decision-making with respect to building out and rehabilitating the critical infrastructure needed to support growth and stability in North Kivu, particularly through an expanded role for the private sector. This involves reviewing the status quo of infrastructure service provision to assess the critical needs and investment priorities. It involves looking at the experience of private provision in infrastructure in North Kivu to understand the opportunities and constraints on further investment in the current context. It requires delving into the institutional complexities of that context, such as incomplete processes of decentralization and sector reform, and considering both how these can be resolved, and what is possible in the meantime. Finally, it involves identifying actions that the provincial and national governments could take to expand investment opportunities and overcome constraints, with the support of development partners.

[7] Supporting Infrastructure Development in Fragile and Conflict-Affected States: Learning from Experience, Stephen Jones and Simon Howarth, UKAID, 2012

[8] Other experiences of private sector involvement in infrastructure concentrated around Kinshasa and Lubumbashi, the two largest poles of economic and private sector activity in DRC.

This report constitutes the final deliverable for the InfraSAP. Work began on this activity in November 2019, with technical missions to North Kivu between December 2019 and March 2020—plans for further technical missions were disrupted by the global COVID-19 pandemic, and research and analysis for this report were completed virtually. A Decision Review Meeting was held in July 2020, following which additional in-country consultations were held once internal travel again became possible, in late 2020 and early 2021. The remainder of this main report is structured as follows:

- **Section 2: Connectivity and Infrastructure Needs** describes the current status of infrastructure provision and touches on investment needs and priorities across the sectors covered by this InfraSAP: energy, water, digital infrastructure, ground transport (roads and lake), and air transport
- **Section 3: Infrastructure Governance** describes the legal, regulatory, and institutional context for infrastructure provision in these sectors in North Kivu
- **Section 4: Infrastructure Delivery, Funding, and Finance** provides an overview of the entities currently involved in delivering infrastructure services—including state-owned enterprises, government entities and public bodies, and the private sector—and their operational and financial performance and constraints
- **Section 5: Roadmap for Scaling Up Infrastructure Investment in North Kivu** recaps on sector priorities and the types of investment needed, filters those investments through a "cascade" approach to assess both the potential for private participation and the current binding constraints, and on that basis sets out recommended actions to strengthen infrastructure provision in North Kivu, by maximizing financing as well as technical resources to that end. These include actions at cross-cutting and sector levels, and by national and provincial government entities, as well as potential contributions of the WBG and other development partners.

This report is accompanied by six Annexes. **Annexes A to E** provide a more detailed picture of the current status, governance, service delivery, including private sector participation, and outlook and roadmap for infrastructure provision in the Energy, Water, Digital Infrastructure, Ground Transport, and Air Transport sectors, respectively. **Annex F** provides more information on the cross-cutting context and constraints for private sector participation in infrastructure in North Kivu and DRC as a whole: an overview of the economic context describing key economic sectors; the broader investment environment and access to finance; the environment for managing public investment at the provincial level; and DRC's nascent framework for managing Public-Private Partnerships (PPPs).

2. Connectivity and Infrastructure Needs

The poor state of infrastructure in North Kivu is a constraint on growth, development, and stability, with a large majority of the population lacking access to basic infrastructure services. While reliable access numbers are not available, the electrification rate in North Kivu is estimated to be around eight percent and mobile penetration around ten percent. Access to improved water sources is similarly limited, and where water supply systems are in place in a few urban areas, these supply only an estimated 10 to 20 percent of demand. Transport, particularly by road as the dominant form, is expensive and highly unreliable. Unsurprisingly, lack of reliable infrastructure is a significant constraint on business operations, and hence investment and growth. A survey of Small and Medium Enterprises (SMEs) in North Kivu cited access to reliable energy and the quality and cost of transport as the third and sixth biggest constraints on operations respectively, rising to the top of the list for those based in rural areas as described in Annex F. These constraints were echoed by the Goma section of the Congo Business Federation (Fédération des Entreprises du Congo – FEC), and major economic operators consulted in the preparation of this InfraSAP.

This section provides an overview of the status of infrastructure provision in North Kivu and outlines potential approaches to improving access and services. For each of the sectors covered by this InfraSAP—energy, water, ICT, ground transport (by road and lake), and air transport—this section describes the nature and coverage of infrastructure networks and services, bottlenecks and gaps in terms of access and quality, and an initial assessment of the types of investment that could address those gaps. This report does not attempt to prioritize either within or between sectors, for which further data and analysis would be needed. This work is underway in some sectors—in energy and water sectors, for example, national policies are in development that are expected to articulate target service levels by area and the types of solutions envisaged to meet those targets based on an assessment of available resources. Given the huge service gaps, limited available information, and severely limited financial capacity of the public sector, this report focuses primarily on identifying the sub-sectors, investments, and business models where there may be potential for a scale-up of services through private participation. In some cases, this InfraSAP focuses on a subset of priority subsectors where private participation is more likely—for example, the urban water sector and the national road network—as described further in the relevant sections below.

Energy

The electrification rate in North Kivu is around eight percent, and those that are connected to a grid experience unreliable power. According to the latest figures from PowerAfrica, 1.25 million out of 1.36 million households in North Kivu are without access to grid electricity[9]. Moreover, the quality of service for those that are connected is poor, with outages common. Manufacturing firms in DRC source almost half of their electrical power from generators at high cost ($1 per kWh is not unusual because of transportation cost, which can double the cost of fuel) and lose, on average, 11 percent of annual sales

[9] Power Africa Offgrid Project, 2019. Off-Grid Solar Market Assessment - Democratic Republic of the Congo. Electrification estimates vary due to lack of reliable data.

due to electrical outages[10]. Both rural and urban North Kivu households report an average of between 6 and 7 hours of connectivity per day, and 20 blackouts per week.

The Eastern Grid of the national electricity utility (Société Nationale d'Électricité – SNEL) meets a small fraction of demand in the Province, serving around 30,000 customers. Eastern DRC is not connected to the primary national grid, with significant geographical barriers in the shape of long distances and mountainous terrain. SNEL supplies a peak capacity of 7 MW of electricity and an average of around 4 MW—roughly 5 percent of total demand in Goma, estimated in the 60 to 80 MW range—from the Ruzizi I and II hydro plants via the Bukavu-Goma transmission line. Its distribution grid covers less than 10 percent of the city of Goma, as well as areas adjacent to the transmission line including Sake, Kiroche, Shasha, Minova, Bweremana, and Bibatama.

There are several standalone grids, mostly run by private companies, serving over 12,000 customers—and potential for further expansion. While SNEL is no longer operational in most of the Province north of Goma—legacy diesel thermal power stations in other cities such as the towns of Butembo, Beni, and Oicha, are no longer operating—it imports power from the Ugandan network to serve certain border localities, including Kasindi in North Kivu. Standalone mini-grids in Goma, Butembo, and Beni are run by private small-scale grid operators or concessionaires, described in Section 4 below, which own production and/or distribution licenses, and are currently trying to expand their operations of low and medium-voltage networks and hydro or solar plants. Overall, at the time of writing these private operators have about 32 MW of generation capacity, serving around 12,000 customers—however, they continue to face significant constraints in growing their businesses, as described further in Section 4.

DRC's off-grid systems sector is still in a relatively early stage of development, but is growing rapidly, with around 40,000 solar lanterns and 7,000 solar home systems sold in the Eastern region at the time of writing. Solar technology is relatively new for most households: according to a survey of household energy access[11], over 80% of the households sampled obtained their solar devices in the past five years. A handful of private companies are currently in operation in the country, including three in the Kivus (Altech, BBOXX, Weast Energy) described in Section 4. Most solar lantern sales to date have been made via cash, but PAYGO offers and sales are starting to pick up, especially for larger capacity solar home systems. Solar home systems are likely to be the only viable energy source for most of North Kivu's rural population.

[10] DRC Country Private Sector Diagnostic, WBG, 2020

[11] World Bank, 2019. Household Survey Multi-Tier Measurement of Energy Access Democratic Republic of Congo

Table 1: Primary energy source for households

Primary Energy Source (percent of households)	DRC	Kinshasa	North Kivu	North Kivu (Urban)	North Kivu (Rural)
Connection to the national grid	49	62.8	5.5	11	1.4
Connection to the local minigrid	2	1.3	4	3.1	4.7
Electric generator	0.4	0.5	0.2	0.2	0.2
Rechargeable battery (e.g., car battery)	1.4	1.4	1.5	1.9	1.1
Dry-Cell Batteries	18	13.1	33.8	13.9	49
Solar lantern	1.9	0.9	5	8.5	2.4
Solar product with several light points	5.7	0.9	20.8	24.5	18
Solar home system	4	0.8	14.1	21.6	8.4
Non-applicable	17.6	18.3	15.1	15.3	14.9

Source: World Bank, 2019. Household Survey Multi-Tier Measurement of Energy Access Democratic Republic of Congo (DRC)

With such a large unelectrified population, the priority for the energy sector should be to increase access to reliable electricity—the focus of the current World Bank Electricity Access and Service Expansion (EASE) project in DRC. Given the limited extent of the existing grid in North Kivu, the challenging terrain, and the context of fragility and insecurity, this is unlikely to take the form of expanding grid infrastructure. Distributed, vertically integrated models with lower investment costs and more localized customer bases are more likely to be resilient, reliable, and viable. A National Electrification Plan is currently being developed, which will set out in more detail the sector objectives in terms of access and service levels, and the types of technical solutions that are considered best-suited to deliver on those objectives in the different environments across DRC.

In urban areas, expanding access is expected to involve scaling up investment in grids and mini grids under various models. In Goma, this could mean improvements and expansion of existing grids and mini grids to reach a higher proportion of the population. There is also significant further potential for isolated, vertically integrated grids in North Kivu, in the shape of nine towns totaling approximately 1.6 million people[12] that are likely large enough to support a grid solution, are beyond 50 km from the existing grids, and have limited or no current service. In some, such as Butembo and Beni, this could include rehabilitating the currently dormant SNEL grid, and building on nascent private mini grids that are already in place covering limited areas. Two of these towns (Beni and Katwa) are within 20 km of potential hydro sites, and could be candidates for new hydro-powered isolated grids with limited transmission investment if the local security situation permits and if logistical constraints allow the construction and maintenance of such facilities. Others could be served with localized battery-equipped solar plants. Each of these mini grids could be potentially viable as private investments in the right conditions, as discussed further below. However, creative funding and financing solutions will be needed to keep new connections affordable and the overall systems viable in a context of very low average usage per customer.

[12] In descending order: Butembo (690,000), Beni (570,000), Lubero (81,000), Rutshuru (66,000), Kirumba (57,000), Katwa (35,900), Kanyabayonga (32,700), Kayna (28,900) and Walikale (18,800)

In more isolated and rural areas, the only viable option will be to increase adoption of standalone household systems. The solar household system market is currently served entirely by the private sector, as described in Section 4 below. Companies continue to expand the range of systems on offer, and the use of credit to enable lower-income customers to spread the cost over time. Affordability nonetheless remains a challenge to meet the lowest-income customers, particularly in remote rural areas. Expansion of this market is constrained in turn by the poor coverage of infrastructure in other sectors. Low mobile penetration, particularly in remote areas, reduces the potential for PAYGO solutions using mobile money accounts—only 42% of households in North Kivu are estimated to have a mobile money account (63% in urban areas, 27% in rural areas)—meaning that most sales in rural areas require cash payments. High transport costs due to poor road infrastructure are also a constraint on sales in more remote locations. Financial support will therefore also be needed in certain segments of this sub-sector. Further analysis is needed to estimate the associated costs and hence establish costed and viable rural electrification goals, which should be developed as part of the forthcoming National Electricity Policy.

Water

Across DRC, water networks have failed to keep pace with urban growth or have been in decline—offset in urban areas by an increase in access to shared public water sources. The portion of the population with access to home connections or private water sources dropped dramatically from around 72 percent in 2010 to below 52 percent in 2018[13]. This decline is due to a combination of the high rate of urban growth (4.6 percent annually) and the declining size of networks in certain cities—that is, connections and networks being abandoned. The decline has been offset by increased availability of shared public water sources, including standpipes, improved springs, and water points that are in regular use, such that overall access to improved water supply in urban areas, estimated at over 80 percent in the 1990s, has continued to rise in the decades since to reach 91 percent in 2018[14]. Access to basic drinking water in rural areas remains low, at an estimated 23 percent in 2018[15].

Piped water supply systems exist in only four towns in North Kivu—Goma, Butembo, Beni, and Walikale—and have limited reach. In Goma, the current water system is a mix of pumping and gravity-fed systems, while those in Butembo, Beni, and Walikale are solely gravity-fed. In each case, these piped water systems reach only a fraction of the population, for example:

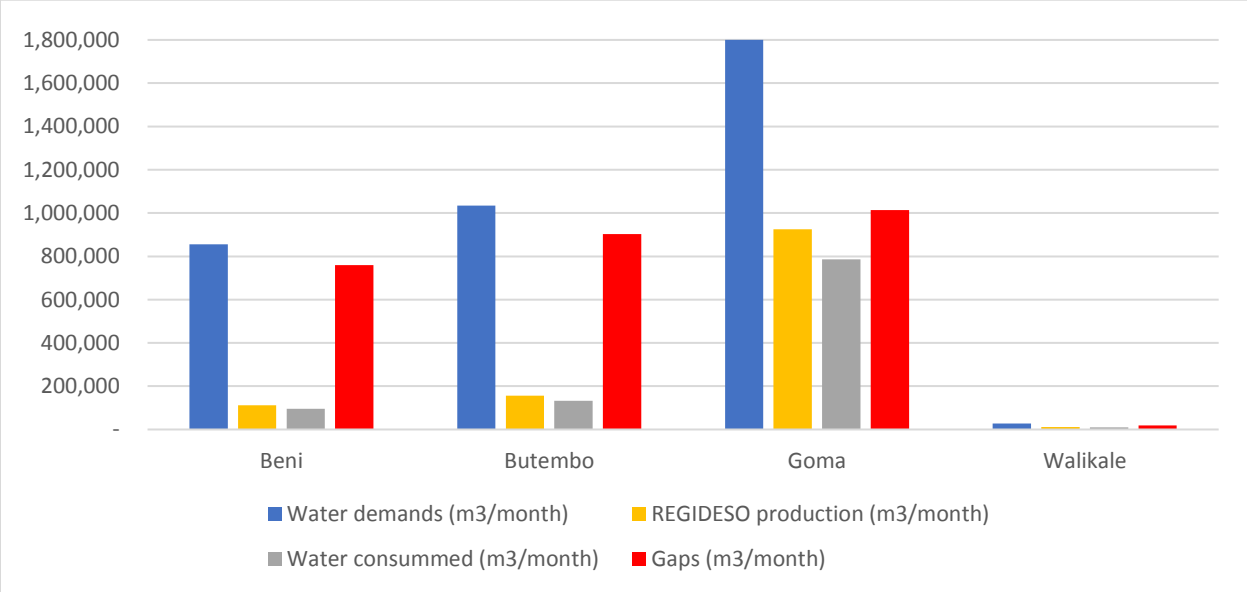
- In **Goma**, the main piped water network consists of around 15,000 household connections plus around 160 standpipes, operated by the state-owned water utility (Régie de Distribution d'Eau – REGIDESO). Parts of this network have been operated in recent years in partnership with an NGO-supported private company, Congo Maji SARL, as described in Section 4 below. A second privately operated network in the west of Goma comprises 322 household connections and 39 standpipes. Together these networks cover around 90 percent of the geographic area of Goma, although their combined output is well below what would be required to meet demand, as noted below.
- In **Butembo**, REGIDESO currently supplies water to about 15 percent of the population of the city through a network that covers about ten percent of its geographic area. While around 6,000

[13] UNICEF Multiple Indicator Cluster Surveys (MICS) 2010 and 2018
[14] UNICEF Multiple Indicator Cluster Surveys (MICS) 2018
[15] World Development Indicators

households have a private connection[16], only 6 percent of these connections are currently functional and billed; the remainder of REGIDESO's coverage consists of standpipes.

These water supply systems are inadequate to meet the growing water demand in these towns, while reliability and quality of supply are poor. Based on recent REGIDESO production figures (from January 2020), and considering that due to leakages and non-accounted water, only 55 percent of produced water is currently consumed and paid for[17]. The monthly water deficit for these towns can be estimated and is shown in Figure 2. Reliability of supply is poor across the REGIDESO networks due to a combination of electricity supply failure and facilities in poor repair. Water quality is also poor, with challenges including raw water hardness, algae, and unreliable and insufficient chlorination.

Figure 1: Overview of water supply system production and demand in North Kivu's urban areas



Source: InfraSAP team analysis using population estimates based on Africapolis, DLR World Settlement Footprint, and Worldpop data; water demands estimated using an average of 50 liters per day per person

Urban areas unserved by water supply systems, and the limited rural areas that have access to improved water supply, rely on shared public water sources, typically in the form of Autonomous Water Systems (AWS). These Autonomous Water Systems (AWS) supply peri-urban and rural areas in North Kivu, using mostly standpipes. In Butembo, for example, an estimated eight AWS operate gravity-fed systems outside REGIDESO's perimeter, serving a total of approximately 13 percent of the population. A 2015 national study on AWS[18], identified 105 AWS in North Kivu operating 3,042 functional standpipes, which are gravity-fed, from either surface water (80 percent), or groundwater (20 percent) sources. The report estimates that these AWS serve an estimated 1.2 million people, representing about 20 percent of the North Kivu population. AWS often rely on community-based management, typically with technical or financial support from local and/or international NGOs.

[16] REGIDESO operational figures, 2018
[17] REGIDESO (2020) : Rapport de production du mois de janvier 2020
[18] Province du Nord Kivu (2015) : Rapport de l'atelier de présentation de l'étude nationale sur les réseaux autonomes

Parallel investment is needed in improving both access and quality of water supply in North Kivu. As in the electricity sector, this could involve a range of approaches depending on population density and available water resources—a forthcoming National Water Policy[19] will set out priorities for new investments in water supply in both urban and rural areas, as described further in Section 3 below. Within the water sector, this InfraSAP focuses on urban water supply as the subsector most conducive to private sector participation in the short term. Parallel effort will be needed to expand water supply in rural areas through investment in distributed, small-scale shared water resources such as those provided by AWS[20].

In urban areas, the most viable starting point will be to strengthen and build out the existing water supply systems. In Goma, for example, this will involve filling in current gaps in areas that are sparsely served by standpipes to achieve a density of around one standpipe per 250 people, while gradually shifting more densely populated areas from standpipes to private connections. In Butembo, a study is underway to assess the balance of standpipes and private connections needed to respond to user demand; rehabilitation of the existing non-operational network will be a priority. In all cases, investment will also be needed in the distribution network to improve quality and reduce losses. Parallel improvements will also be needed in other infrastructure sectors—in particular, to ensure reliable electricity supply to pumping stations.

Digital Infrastructure

DRC's digital infrastructure market is underdeveloped compared to its neighbors. Mobile penetration at 42% and mobile internet penetration at 17% are among the lowest rates in the region. Prices are high, sitting at 58th out of 61 countries on affordability (compared with Uganda 36th, Nigeria at 19th). In terms of absolute cost of access, 1 GB of internet subscription costs an average of $10.71, compared to $3.17 in Burundi and $4.19 in Kenya. The build-out of fiber at a national level is in its early stages, with a single operational route connecting a landing point at Kinshasa to Lubumbashi via the southern provinces. Most areas remain unserved by fiber and rely on microwave backbone to support mobile networks or on satellite in more remote areas.

Within this context, North Kivu is relatively well-served, particularly around Goma—although penetration rates are low. Goma benefits from its proximity to fiberoptic networks of East Africa, with two companies providing high-capacity international bandwidth totaling 20 Gbps, of which only 5 Gbps is currently being used. This international bandwidth allows for higher-quality mobile network service through better connectivity for cell towers via fiber, and regional and international backhaul. It also serves a small but growing fiber to the home or business (FTTX) market in Goma via recently installed metro rings which have the potential to reach around 80 percent of Goma's urban population. The market is becoming more competitive, albeit including through a boom in unlicensed internet service providers. Wholesale connectivity pricing in Goma—at $100 per Mbps for shared bandwidth—is a third of the going rate in Kinshasa, but end-user costs for data (from licensed operators) are still too high for poorer households. Moreover, several areas remain unserved, including larger populations such as Beni and Butembo with

[19] Politique Nationale du Service Public de l'Eau, PNSPE, currently under preparation by the Ministry of Water Resources and Electricity (Ministère des Ressources Hydrauliques et l'Electricité – MRHE)

[20] As explored for example in a forthcoming report on Social Entrepreneurship for Inclusive Growth in the Democratic Republic of Congo (WBG, 2020)

respect to fiber connectivity, and connectivity of any sort in most rural areas is very limited. Overall, mobile penetration is estimated by one operator at around 10 percent, or half the national average.

Investment in digital infrastructure is ongoing at a rapid rate in key markets—however, sector economics will prove a constraint on significant expansion of rural coverage. Another international link is planned to improve redundancy, while one of the two wholesale fiber infrastructure companies is now extending the fiber backbone south towards Bukavu. The rollout of fiber networks within Goma continues, including through partnerships between fiber and mobile operators to increase options for last-mile connectivity. According to feedback from operators, many are targeting expansion to other towns along the Eastern DRC border, either by additional domestic backbone connections or served from Rwanda and Uganda. However, none have plans to deploy further inland, citing an unfavorable balance of risk and returns, given a sparse customer base, uncertain security situation, and unreliable or absent electricity and road connections. The lack of communication in rural areas is a major constraint on investment in those areas. Major investors, such as Alphamin in the Walikale region, can build their own cell phone towers to ensure coverage. Smaller-scale operations and individuals do not have this option, undermining the possibility of building stronger and better-connected supply chains, particularly in agriculture.

Further work is needed to assess the technical options available to bridge the access gap and inform the design of regulatory and financial support mechanisms. Laying fiber alongside road rehabilitation significantly reduces the cost to connect urban areas and improves the quality and range of coverage for cell towers along the routes. This option is planned under the forthcoming World Bank PACT project, as described further below. Newer technologies such as Open Radio Access Network (Open RAN) can service multiple networks with shared infrastructure, reducing the cost of extending mobile networks. In both cases, regulation to govern infrastructure sharing arrangements will be needed, while ultimately reaching the most remote users is expected to require subsidy funding of some sort.

Ground Transport

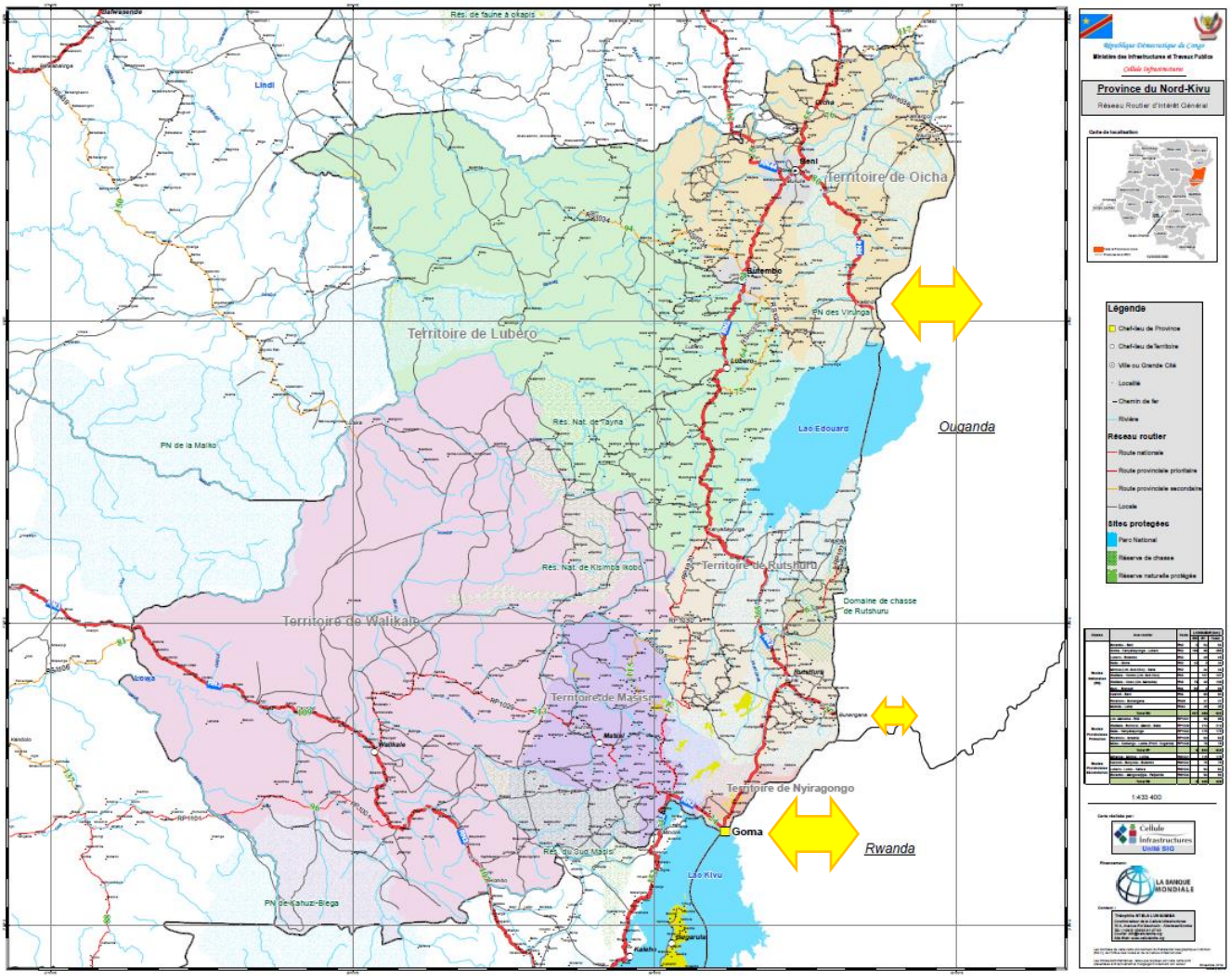
Ground transport in North Kivu, for both freight and passengers, is largely by road, with lake transport providing a limited alternative. The road network, shown in Figure below, consists of 1,746 km of "general interest" roads, which are the focus of this InfraSAP—classified as National Roads (823km), Provincial Priority Roads (534km) and Provincial Secondary Roads (389 km)—along with 2,306 km of agricultural feeder roads, and urban road networks. The national roads within North Kivu run mainly along the eastern side of the province, with the RN2 connecting North Kivu's capital Goma to the towns of Butembo and Beni, continuing to Bukavu in South Kivu, and linking via the RN4 to Bunia in Ituri province to the north. Road connections towards western DRC via the intermodal connection at Kisangani are indirect and long: either via South Kivu (on RN3, which passes back through the Walikale territory in the west of North Kivu) or via Ituri to the North (on RN4). Onward river transport from Kisangani towards Kinshasa also remains unreliable. The only alternative form of ground transport within North Kivu is water transport on the lakes on the Eastern border: principally on Lake Kivu, which serves as the primary route for passenger and freight traffic between Goma and Bukavu in South Kivu.

North Kivu is well connected to regional and international markets, with the road network connecting to the Rwandan and Ugandan borders, and onward to eastern ports via international corridors. Key connection points, marked in Figure below, are as follows:

- **Goma** lies on the Rwandan border and connects to regional and international markets via the "central corridor" through Rwanda and Tanzania to Dar Es Salaam port—a road journey of 1,600km that takes around 12 days, including 5 days of customs clearance.
- Beni or Butembo and surrounding areas connect via **Kasindi** to the "northern corridor" through Uganda and Kenya. Since this 1,650km journey by road and rail takes 21 days, including two days of customs clearance, it is generally less competitive; however, corridor has benefited from recent security improvements and connects to the relatively more efficient Mombasa port.

As described in Annex F, imports along these routes come mainly from the subregion and include cement, construction material, fertilizers, gasoline, rice, and processed food such as flour. Exports include fruit and vegetables and timber for regional markets, and tea, coffee, and minerals for the international market via the East coast ports. Overall, import and export to and from DRC through the central and northern corridors in 2016 were estimated at 850,000 tons and 624,000 tons, respectively.

Figure 2: North Kivu road network



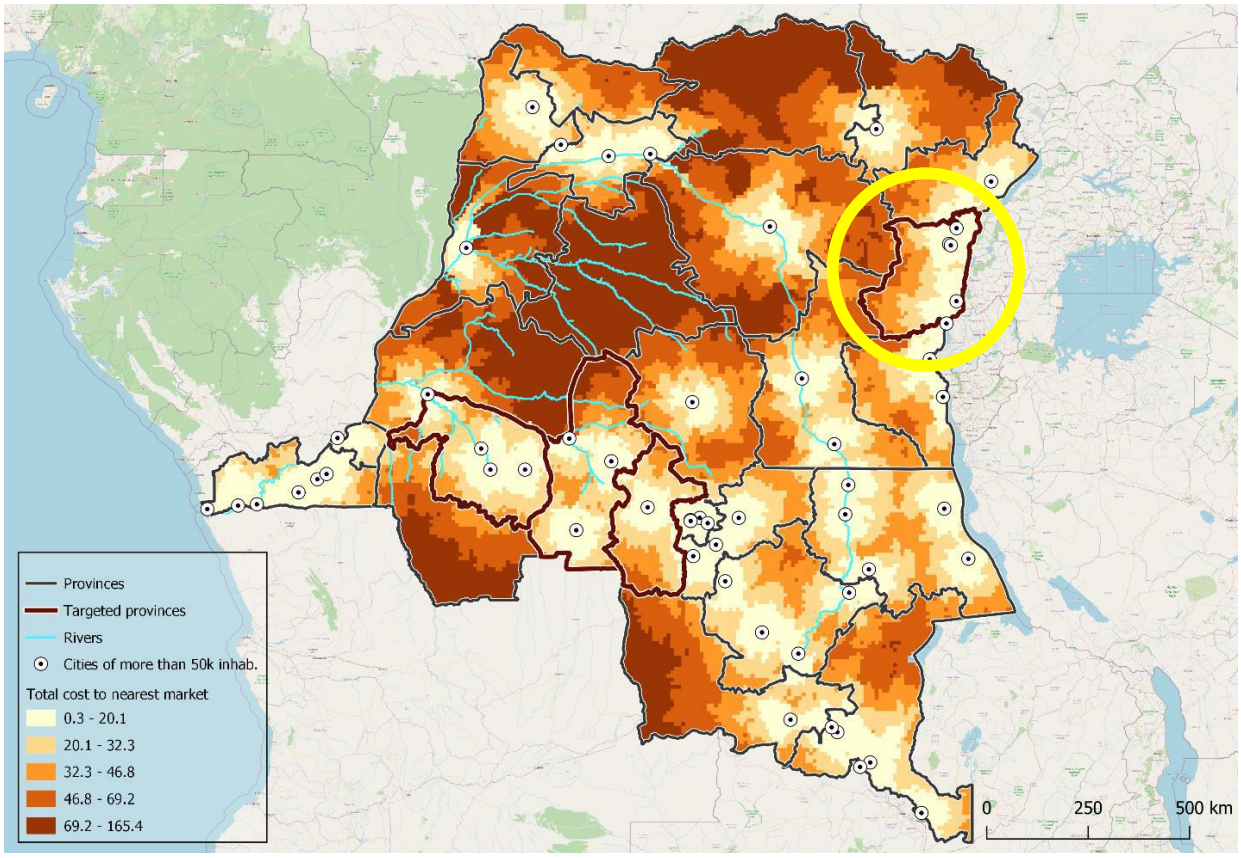
Source: Cellule Infrastructure

National roads in North Kivu are generally in serviceable condition, having seen substantial and ongoing donor-financed investment, although most remain unpaved, meaning regular maintenance is required. The World Bank financed the rehabilitation of priority roads in North Kivu through the High-Priority Roads Reopening and Maintenance Project (Pro-Routes): the Sake-Kavumu section of RN2 between Goma and Bukavu (146 km, of which 20km in North Kivu); and the length of RN4 within North Kivu, from Kasindi at the Uganda border through Beni to the border with Ituri province (total of 138km) and on to Kisangani. The African Development Bank plans to intervene on the RN2 section from Goma to Rutshuru, and on to Bunagana (a more southerly border point with Uganda, shown in Figure with a small arrow). The forthcoming World Bank Transport and Connectivity Support Project (PACT) also plans to focus on the RN2, from Rutshuru north to Beni (240 km). As currently defined, the project would finance the paving of this road, which is currently in medium to good condition. The RN2 segment crossing the Virunga National Park (52km) would not be financed under the proposed project activities and would remain unpaved.

In practice, despite these investments, road transport within and from North Kivu is cited by most private economic operators as the number one constraint on their operations. Unpaved roads require regular maintenance and careful management, which has often been lacking. One trucking company owner noted that the travel time from Beni to Kisangani (mostly outside North Kivu itself) takes four days in the dry season but as long as 20-25 days in the rainy season. Unreliable maintenance has been compounded by overloaded trucks and failure to deploy rain barriers to protect from degradation in adverse conditions. Formal and informal roadblocks and checkpoints are also common which add further risk and uncertainty to road travel—a 2017 study found 198 roadblocks in the Kivus (486 in North Kivu) of which 71 percent had a presence of government actors at various levels; 22 percent were manned by non-state armed groups[21]. None of these challenges are unique to North Kivu—indeed, ground transport cost in the province compares favorably to that in neighboring provinces, as shown in Figure below.

[21] Schouten, Murairi and Kubuya "*Everything that moves will be taxed: the political economy of roadblocks in North and South Kivu*" IPIS, 2017, Antwerp/Copenhagen

Figure 3: Cost of transport to nearest market in DRC ($ per ton)



Source: Barra and al. (World Bank, 2016)

Most of the provincial road network (both priority and secondary roads) is in poor condition, with some impassable sections. As a result, road connectivity to the more sparsely populated western areas of North Kivu is relatively poor, as also shown in Figure . No systematic analysis of priorities at the provincial level has been carried out. Nonetheless, both private companies and provincial government officials interviewed for this InfraSAP highlighted the currently impassable Provincial Road R539 linking Sake, west of Goma, to Walikale, as a major "missing link" in the province's road network. According to its proponents, this section could potentially support the transport of output from the Walikale region to Goma and thence to the east for export (in particular mining, particularly with the recent arrival of Alphamin, North Kivu's first industrial tin mine; as well as timber and agriculture), as well as shortening the travel time from Goma to Kisangani to connect to western DRC and Kinshasa[22].

Both Lake Kivu and Lake Edward are navigable, with Lake Kivu serving as the main route between Goma and Bukavu as a cheaper and more reliable option than road, although safety is a challenge. Given more reliable transit times and much lower costs, most direct Goma-Bukavu passenger and freight traffic travels by lake, with the alternative RN2 road primarily serving intermediate destinations along its route. The lake route between Goma and Bukavu is 106 km and takes 6 hours (during the day; 12 hours by night and 3

[22] As this report is being finalized the WB team has received notice that a concession agreement has been signed for this section by the national Office des Routes under the Ministry of Infrastructure and Public Works with a South Africa-based firm. Further details are being sought and will be added.

hours on fast passenger boats), costing around $15-25 per ton. In 2019, around 180,000 passengers both embarked and disembarked at Goma port; 33,000 and 20,600 tons of freight embarked and disembarked, respectively. The 214km of RN2 road from Bukavu to Goma, by comparison, takes around six hours in good conditions, although transit times are highly variable depending on the time of year; a ton costs $379 to transport with a 3-ton truck, or 1.77 $/ton/km. Traffic levels on this section of road are around 2,000 vehicles and 300 trucks per day. Economic operators interviewed for this InfraSAP underlined the importance of the Goma-Bukavu lake route but noted that safety is a concern given limited regulation and frequent accidents.

Both the Provincial Government and local economic operators agreed that the continued improvement of the road network is a top priority in North Kivu. This will require to continue with rehabilitation and reopening of priority roads as rapidly as possible, while also taking steps to secure the quality of maintenance to ensure the gains are lasting. There is some debate over the relative benefits of upgrading to pavement, with a more dramatic impact on travel times but allowing a much more limited scope of investment. More work is also needed to identify priority segments beyond the national roads on which work is already completed, ongoing, or planned. In carrying out any such analysis, care is needed to assess the potential impacts in terms of destructive as well as productive economic activity that may be enabled by better transport access—as highlighted in Annex F. For example, mostly illegal logging sites tend to stretch along access roads. While most, if not all investment will need to be publicly financed—traffic and potential toll revenues cover only a fraction of costs—there may be potential to expand resources and risk allocated to the private sector, as described further below. The outlook in lake transport is less clear, with the scale of demand depending on the state of competing road connection, principally Goma-Bukavu. Recent investments, such as the move by the brewery to establish its own port infrastructure, suggest that for now, demand continues to grow, and port capacity may be a constraint. The Provincial Government does not count lake transport among its priorities; nonetheless, investments in improving safety appear to be well justified.

Air Transport

Air transport is the primary means of transport for goods and people from North Kivu to Kinshasa and other areas of DRC given limited ground connectivity; international air traffic to Goma has also been growing. Goma International Airport ranks third in DRC for traffic, behind Kinshasa and Lubumbashi airports. In 2019, Goma saw 230,575 passenger trips and 17,402 tons of cargo, both around 13 percent of DRC totals, and 19,101 or nearly 20 percent of aircraft movements (suggesting smaller aircrafts than average)[23]. Passenger traffic has been growing steadily, notwithstanding a dip in 2019, while freight has been declining over the last decade (likely driven by MONUSCO logistics, included in freight figures). Table 2 below lists monthly scheduled flights to and from Goma, which is served domestically by two DRC-based airlines, Compagnie Africaine d'Aviation (CAA) and Congo Airways. International connectivity arrived with Ethiopian Airlines in 2015, with flights from Addis Ababa, some via Entebbe. North Kivu is also served by Beni/Mavivi airport, one of DRC's 34 secondary airports, with flights to seven domestic destinations[24]. In 2019, 19,492 passengers and 143 tons of cargo traveled by 8,786 aircraft movements—a high frequency, suggesting demand for larger-capacity craft than can currently be accommodated. Both airports are also

[23] Combined traffic numbers of three commercial companies with regular schedule: CAA, Congo Airways and Ethiopian; Source: *RVA/Service Statistiques/Division Transport Aérien*, 2020

[24] Scheduled commercial services from FlyCAA and MALU aviation; other destinations are not monitored by RVA.

supported and used extensively by the United Nations mission MONUSCO, as described further below. While not yet captured in the figures, the current COVID-19 crisis is resulting in a steep drop in air passenger traffic globally, which will also impact the North Kivu airports, with considerable uncertainty around how and when traffic levels will recover.

Table 2: Scheduled flights at Goma International Airport per month

	Destination/Origin	Dep.	Arr.			Destination/Origin	Dep.	Arr.
National					7	Kindu (KND)	8	9
1	Kinshasa (FIH)	32	30		8	Lubumbashi-Luano	4	1
2	Bunia (BUX)	19			9	Kisangani-Bangoka	2	11
3	Kisangani (FKI)		18		International			
4	Beni (BNC)	8	8		10	Addis-Ababa (HAAB)	6	1
5	Bukavu (BKY)	9	8		11	Entebbe (EBB)	13	13
6	Kalemie (FMI)	7	10		12	Lilongwe (LLW)	1	1

Source: RVA, 2020

Goma airport suffered from decades of conflict and underinvestment compounded by severe damage during 2002's volcanic eruption. While decades of conflict and frequent rebel control of the airport have had a toll on its operations, the most significant damage of the airport's key infrastructure resulted from the 2002 eruption of Mount Nyiragongo. Lava flow buried 1,150 meters, or more than one-third of the sole runway, and isolated the terminal and apron. Humanitarian aid flows, UN operations, and passenger and cargo transport were severely constrained by the limited capacity of the damaged airport and the non-compliance of the airport with basic safety and security standards.

Substantial investment to rehabilitate, expand, and improve the safety of Goma airport is a priority for the Provincial Government, and is ongoing. Reconstruction began in 2009, with donor and DRC government-funded works to clear lava and reconstruct and strengthen the remaining runway. MONUSCO has also helped equip most airports used by its operations in DRC with basic equipment to ensure safe operations—including Goma, which now supports about 70 percent of MONUSCO's logistics in DRC. Through its Goma Airport Safety Improvement Project (PASAG), due to close in 2020, the World Bank is financing the extension of the runway to 3,000 meters and other interventions to improve the safety of ground and air operations, with work still ongoing. The forthcoming DRC Transport and Connectivity Support Project (PACT) is expected to provide further support to airports, focusing in Goma on drainage works and aviation safety equipment.

Like most secondary airports in DRC, facilities at Beni airport are limited. The 2,100m runway was built by MONUSCO in 2006-2007 with laterite material and then paved by MONUSCO in 2016-2018. The airport is equipped with a temporary control tower provided by MONUSCO, and is not connected to water or electricity, which is provided by a generator. MONUSCO continues to be a key user of Beni airport for its operations in the Province and has identified several investment needs, including asphalting and extending the runway and taxiway; construction of a control tower and associated systems; several safety investments; terminal and facilities for passengers and freight; and proper surrounding infrastructure. Undertaking these improvements is also identified as a priority by the Provincial Government. The World Bank PACT project is also expected to finance some smaller-scale infrastructure at Beni.

3. Infrastructure Governance

Incomplete reforms, complex institutional arrangements that create both overlaps and gaps, and public sector capacity constraints contribute to a challenging context for infrastructure provision in North Kivu. This section describes the legal and regulatory context across infrastructure sectors. It also describes the allocation of responsibilities and resources for sector planning, oversight, and management—particularly in the context of the decentralization process, which is still ongoing in DRC.

Legal Frameworks

The legal framework for most infrastructure provision in DRC is in a state of flux, with the electricity, water, and telecommunications sectors all undergoing processes of reform and liberalization. Reforms to liberalize provision and formalize regulation of services in these three sectors are underway at varying stages, but are in all cases incomplete:

- **The energy sector is most advanced, based on the Electricity Sector Law of 2014 and its implementing decrees**. This law eliminated the legal SNEL monopoly in the sector, opening the ownership and operation of grids to the private sector under concessions. It attempted to clarify the allocation of powers in the sector between central and provincial governments set out in the constitution, as described further below. It also mandated the creation of the sector regulatory entity and rural electrification agency described below—these have been formally established by decree but are not yet fully operational at the time of writing.
- A **Water Law was enacted in late 2015** with similar objectives—to introduce private provision under the purview of sector regulation, and to decentralize control of the sector, as described further below. However, key implementing decrees, including that establishing the regulator, have yet to be promulgated.
- In the **telecommunications sector, a 2002 law remains in force**, as a new legal framework awaits publication in the Official Gazette, having been recently promulgated by the President after a long delay. The Framework Law No. 013/2002 On Telecommunications opened the mobile telecommunications sector for private operators under license, and introduced an independent regulator for the sector, established in practice under a subsequent Law No. 014/2002 as described further below. However, under this law, the national operator retained a monopoly on fixed telecommunications infrastructure, including fiber. Subsequent decrees issued by the regulator and the ICT ministry have allowed for the issuance of licenses to fiber operators on an ad-hoc basis, as also described further below. The new law will liberalize this aspect of the sector and provide a sound legal basis for private investment in fiber infrastructure. However, further ancillary legislation will be needed to clarify key regulatory issues such as infrastructure sharing, to allow for a wider range of business models in the sector, and deal with other emerging issues and industry verticals such as data protection, cybersecurity, and ecommerce.

The legal framework for transport is more stable, albeit extremely complex and in some cases internally inconsistent. There are 119 texts regulating road transport, with no overarching sector framework law as is found in other infrastructure sectors. Besides the 2006 constitution, which allocates responsibilities between national and provincial levels as described further below, key texts touch on the creation of the

Road Agency (Office des Routes – OR, dating from 1971), road classification and traffic laws (both 1978), revenue generation and collection methods (2004), the creation of the National Road Maintenance Fund (Fonds National d'Entretien Routier – FONER, by decree in 2008), and protective measures for road assets such as axle load limits and road tolls (by Inter-Ministerial orders in 2011 and 2014). Inconsistencies and redundancies are common. For example, an "Infrastructure Development Fund" created in 2001 by ministerial decree had most of the same roles and resources as the subsequently created FONER. The earlier fund was neither established in practice nor repealed, leaving an overlap in the legal framework.

The legal framework for the use of Public-Private Partnerships (PPPs) in DRC is also in development, although this does not apply to most infrastructure sectors. The DRC adopted a PPP Law on July 9, 2018 (Law n°18/016), with a view to setting a clear legal basis for the use of all types of PPPs (including "user-pays" PPPs typically in the form of concessions, and "government-pays" PPPs), building capacity to implement them in the form of a central PPP Unit under the Ministry of Planning, and ensuring quality through requirements on processes and content of PPP arrangements. This framework is not yet operational, with implementing decrees yet to be adopted—the first decree, to establish the PPP Unit by retooling the existing SOE reform unit (Comité de Pilotage de la Réforme des Entreprises Publiques – COPIREP), is currently in draft form. Moreover, according to the PPP Law, it does not apply to "PPP contracts governed by specific laws." This exclusion would apply to PPPs in most sectors covered by this InfraSAP, except transport, under the legal frameworks set out above. The further development of this framework may nonetheless provide an opportunity to build capacity, including at the provincial level, in managing all types of PPP.

Regulation

The only infrastructure sector with an operational regulatory entity is the ICT sector. As described above, the Regulatory Authority of Post and Telecommunications (Autorité de Régulation de la Poste et des Télécommunications – ARPTC) was established in the Law No. 014/2002 under the Ministry for Post, Telecommunications, and ICT (Ministre des Postes, Télécommunications et Nouvelles Technologies de l'Information et de Communication – PTNTIC), based on the 2002 Telecommunications Law. ARPTC is responsible for granting radio frequencies and regulating the spectrum as well as other technical specifications, establishing pricing ranges for mobile network operators, and supervising compliance with regulations, all with a view to balancing the interests of government, industry, and consumers.

However, the ICT sector regulatory framework has several weaknesses in practice. Operator licenses are issued on an ad-hoc basis by the Ministry for Post, Telecommunications, and ICT—prospective licensees in Nord Kivu must travel to Kinshasa or wait for a long time for approval. In the absence of an updated law, the ministry has also been using decrees to introduce changes to the regulatory framework, including new sector taxes and fees, creating uncertainty for investors. Overall, the costs of licenses (at $500,000 for national ISPs) and fees are high. Moreover, the ARPTC's reach is limited, particularly in North Kivu—unlicensed Internet Service Providers (ISPs) using forbidden frequencies continue to proliferate, despite efforts such as registration amnesties. The ARPTC has a regional agency based in Bukavu but must often fly in technicians from Kinshasa to intervene on sites in Goma, discouraging on-the-ground intervention given the high cost.

In the energy and water sectors, regulatory agencies have been mandated by the respective sector laws described above but are not yet fully operational. The electricity regulatory agency (Autorité de Régulation de l'Électricité – ARE) has been enacted by decree and assigned functions of technical

regulation and tariff-setting, as well as establishing specifications for the allocation of concessions. At the time of writing ARE is in the process of operationalizing, with a recently-appointed board and some staff in place, building on aspects of the regulatory framework that have been prepared by an on-going sector reform project. In water, the decree to create the regulatory agency (Autorité de Régulation du Service Public de l'Eau – ARSPE), has not yet been issued. Absent these entities, those regulatory functions that do exist are subsumed into broader sector policy-setting, planning and oversight, largely by the Ministry of Water Resources and Electricity (Ministère des Ressources Hydrauliques et l'Electricité – MRHE) in both sectors. Price-setting is ad-hoc by contract, with no consistency between different providers. There is no standardization of contractual conditions for concession arrangements, no technical regulation to ensure quality or enable interconnectivity between networks, and no transparency or public disclosure of concession arrangements.

There is no independent regulatory function in the ground transport sectors. Infrastructure delivery remains fully public, as described further below. Transport services are under the purview of the Ministry of Transport and Communication (Ministère des Transports et Voies de Communication – MTVC). Regulatory functions, including licensing transport operators and vehicles, surveillance, and safety, are managed by MTVC through the national Directorate of Land Transport (Direction des Transports Terrestres – DTT) in the roads sector. The Directorate of Marine and Waterways (Direction de la Marine et des Voies Navigables – DMVN) plays comparable functions in the water transport sector, along with oversight of port infrastructure. Permitting, monitoring, and safety checks on the ground are managed by provincial branch offices of these national MTVC directorates: land transport offices and maritime, river and lake transport offices (known as commissariats) for road and lake transport and ports, respectively. These entities have an administrative relationship with the Provincial Government, as they are hosted by the Provincial Ministry of Transport, but for technical purposes report at the national level. The allocation of responsibilities between national entities and local offices or commissariats is not always well-defined.

Air transport infrastructure is fully publicly provided and not subject to independent regulation, although air transport services are regulated for safety by the Civil Aviation Authority. The Congolese Civil Aviation Authority (Autorité de l'Aviation Civile – AAC) was created by Decree n°49/B/2003 of 30 March 2003 and established with legal, administrative and financial autonomy by Decree No. 011/29 of 10 June 2011. AAC oversees air safety, including safety requirements and testing for aviation equipment, and operator licensing.

Sector Oversight and Management

The functions of public sector oversight and management of infrastructure in DRC are distributed between the national and provincial governments. As described in Annex F, the 2006 Constitution sets the overall framework for decentralization, including broadly allocating responsibilities for the sectors included in the scope of this InfraSAP as national, provincial, or shared, as follows:

- **National competence:** post and **telecommunications**; **water transport**; **air transport**; **roads** linking two or more provinces or to foreign territory, or otherwise declared of national importance
- **Shared national and provincial competence:** production, transmission, and use of **energy**; road traffic, construction and maintenance of **roads** of national interest, and collection and allocation of tolls for roads built by either the national or provincial governments
- **Provincial competence:** production of drinking **water**; exploitation of non-nuclear **energy** sources; **transport networks** within a province.

These allocations have been further developed, in some cases, in the sector-level laws described above. In energy, for example, the 2014 law further specifies that the allocation of concessions is the responsibility of provincial governments if the concession area lies entirely within a province, and of the central ministry if the area lies across more than one province. In water, the 2015 law allocates central government powers over policy, standard-setting, and financial support of rural water services; and assigns to provincial governments, local authorities, or user associations the role of asset owner and responsibility for investments, and for delegating service provision to public or private entities. A forthcoming National Water Policy, envisaged under the 2015 law and currently being prepared with World Bank support, is expected to further clarify the allocation of responsibilities between these decentralized entities.

The aims of decentralization were, among others, to improve governance and accountability and promote local development[25]; however, its implementation so far has fallen far short of these goals. Even where allocation of responsibilities is legally clear, which is not always the case, decentralization is functionally incomplete. As a result, in most infrastructure sectors (all but air and water transport and digital infrastructure which remain fully centralized), institutional responsibilities are complex and confusing, as described in turn in the following paragraphs. Moreover, as described in Annex F, even where responsibilities have been decentralized, budget allocation has not followed, with most public investment budgeting and execution still managed centrally. Unsurprisingly in this environment, provincial institutions remain weak, with neither the financial nor technical resources to deliver on those roles that are allocated to them on paper.

Water

The water sector is the most decentralized by law, with responsibility for service delivery entirely at Provincial level—however, the pace has been slow, and the key step of decentralizing control of REGIDESO assets has yet to happen. A gradual approach was planned given capacity constraints at the local level, with the two Kivus among the "pilot" provinces. In North Kivu, responsibility for the water sector sits under the Provincial Ministry of the Economy, Commerce, Portfolio, Energy, Hydrocarbons, and Water Resources. A Provincial Water Council (Conseil Provincial de l'Eau) has been established as an interim arrangement for coordination in the sector as the institutional structure set out in the law is still being built, comprising the Provincial Ministry, Provincial divisions of the national-level entities described below, representatives of REGIDESO and AWS providers, and other stakeholders. The 2015 Water Law required the creation in each province of an entity ("Régie Provinciale") responsible for planning and managing the contracting of waterworks and services. This entity has not yet been established in North Kivu (or in any province), and the decree under the Water Law that would transfer REGIDESO assets to the provinces has yet to be signed.

Moreover, at the national level, the institutional landscape for oversight of the water sector remains fragmented. The Ministry of Energy and Water Resources (Ministère de l'Énergie et des Ressources Hydraulique – MERH) is responsible for overall water sector policy and oversight, while the management of rural water supply issues rests with the Ministry of Rural Development, and responsibility for quality regulation for drinking water falls under the Ministry of Health. A National Water, Hygiene and Sanitation Action Committee (CNAEHA), housed at the Ministry of Planning, coordinates technical aspects of water

[25] Addressing Decentralization Challenges in the DRC, Policy Note DRC Subnational Governance assessment, the World Bank Group, 2018

sector policy and reforms across these relevant ministries. As for all SOEs, REGIDESO sits under the Ministry of Portfolio, and some aspects of reform and performance improvements are managed by the Ministry of Portfolio's SOE reform committee, COPIREP. The 2015 law also envisages the creation of a Congolese Water Board (Office Congolais de l'Eau, OCE) under MRHE, taking over responsibility for the management of water resources, which currently sits primarily with REGIDESO. In the absence of a regulator, those regulatory functions that are being fulfilled are spread across entities. REGIDESO tariffs are set at the national level by the Ministry of Economy in consultation with MRHE, although other tariffs are set locally; as noted above, the Ministry of Health regulates drinking water quality. This legacy of fragmentation remains after the passage of the 2015 law. Ultimately, revisions to the law may be required, but in the short term and given the long timeframe of legal changes (the 2015 law took eight years), the National Water Policy is seen as a key vehicle for clarifying sector governance.

Energy

In the energy sector, the sharing of responsibilities creates a challenge for the coherent management of concession arrangements, while capacity is needed in the Provincial government. At the national level, the Ministry of Energy and Water Resources (MERH, as above) retains responsibility for concessions that cross provincial lines. This means SNEL's contractual arrangements sit with the central government, necessitating close coordination between national and provincial levels in areas with SNEL presence. It also creates confusion with respect to concessions close to provincial borders. Concessions within the Province—including all the mini-grids described below—are the responsibility of the North Kivu government, under the Provincial Minister for Mines and Energy. This ministry lacks experience and bandwidth to manage these concessions, particularly absent any regulatory body and standard contracts. As described below, several points of contention have arisen from inadequate or unclear concession arrangements in Goma.

Institutional responsibilities for planning and oversight under the 2014 law are still incomplete, meaning more institutional change to come. The 2014 Law created a Rural Electrification Agency (Agence Nationale des Services Énergétiques Ruraux – ANSER), which has yet to be established in practice. This agency would also have a role in defining and managing the concession process for all rural areas, creating a further overlap of responsibilities that will require clarification. Clarity of allocation of resources is also needed. The 2014 law commits the DRC Government to support the financial viability of the sector as needed, but this is not matched by commitment of resources; most current concessions have relied on forms of subsidy from third parties, as also described further below. A rural electrification fund has been proposed to this end, to be created with World Bank support, and to provide results-based funding for new connections across a range of technologies.

Road transport

Responsibility for planning and managing road infrastructure is also shared—the constitutional allocation of competencies is unclear, with sector legislation adding further complexity. Per the constitution, "Roads linking more than one province, or to external territories" fall under national government control—this corresponds to the National Road network. However, construction and maintenance of these roads ("roads of national interest"), as well as collection and allocation of tolls for both national and provincial roads, are shared competencies. Management of roads within a province, which would include the provincial road network as well as urban and agricultural feeder roads, is a provincial competency according to the constitution.

In practice, management of road infrastructure remains highly centralized, primarily under the Ministry of Infrastructure and Public Works, with a proliferation of responsible entities. Three operational agencies are responsible for planning, as well as implementation: the Road Office (Office des Routes – OR) for roads of general interest (national and provincial) and the Urban Roads and Drainage Office (Office des Voiries et Drainages – OVD) for urban roads, both under the Ministry of Infrastructure and Public Works (Ministère des Infrastructures, Travaux Publics et Reconstruction – MITPR), and the Rural Roads Office (Office des Voies de Desserte Agricole – OVDA) for rural feeder roads under the Ministry of Rural Development. Given weak capacity at the Office des Routes, additional units have been set up under MIPWR to manage donor-funded projects and, in practice, contribute to sector planning and oversight as well as project implementation, particularly for national roads. Funding for road maintenance is administered and allocated by another national entity, the National Road Fund (FONER). These entities are described further in Section 4 below.

In North Kivu, the General Commissariat for Reconstruction under the Provincial Ministry of Planning contributes to road management from the perspective of the Province and has been proactively expanding its role. Until recently, road construction and maintenance have been solely through the local branches of the national road offices. As described further in Section 4, the Provincial Government, through this commissariat, has started to experiment with directly contracting with local private operators for the maintenance of both national roads within the province, and urban roads within Goma.

Air and water transport

Responsibility for planning and management of air and water transport remain fully centralized. For air and water transport, as well as road transport services, the national Ministry of Transport and Communications (MTVC) is responsible for national policy and strategy, as well as taking on several regulatory functions through the relevant entities, as described above. The Provincial Government therefore has very little influence in these sectors at the local level, limited to lobbying the relevant national entities on issues in the provincial interest.

Digital infrastructure

Similarly, policy and planning for digital infrastructure are centralized, although the institutional structure will develop under the new sector law. Policy and planning in the sector have been the responsibility of the national ICT Ministry (PTNTIC). As noted above, this Ministry has also intervened in aspects of regulation and has been responsible for issuing licenses to operators. The involvement of provincial governments in the sector is limited: in North Kivu, the Provincial Governor's office liaises with operators and national entities through an advisor but has no decision-making role. However, sector responsibilities are evolving. A new Digital Ministry (Ministère du Numerique) has been introduced, but its role and relationship to the existing Ministry for Post, Telecommunications, and ICT not yet defined. A new national digital development agency is also envisaged under the sector law, with wide-ranging responsibilities for both digital infrastructure development and digitization of government services. According to the forthcoming law, the role of this agency is intended to include establishing in practice a universal access fund, to which mobile operators have been nominally contributing (at two percent of revenues) although to date these resources have been absorbed by the national treasury. This digital development agency is envisaged to have regional branches under provincial governments, although given the constitutional allocation of responsibilities for infrastructure in the space, the role at the provincial level is expected to focus more on digitization aspects.

4. Infrastructure Delivery, Funding and Finance

This section describes the range of entities involved in delivering infrastructure in North Kivu, and how those entities are funded and financed. On the public sector side, these include State-Owned Enterprises run on a "commercial" basis—that is, which generate resources independently by charging users for services and are hence financially independent of government at least in theory—as well as direct involvement by government departments and other public bodies that are funded from general or earmarked taxation. It also includes a range of private sector operators: from large, multinational companies, to smaller specialist firms operating in a handful of geographies in Africa, to home-grown DRC enterprises. Some of these entities are operating fully commercially; many have been established with support from or in partnership with donors and/or Non-Governmental Organizations (NGOs).

Commercial State-Owned Enterprises

Delivery of public infrastructure assets and services is primarily in the hands of large, national state-owned enterprises (SOEs)—in energy, water, telecommunications, rail and ports, and airports. These consist of the national electricity utility (Société Nationale d'Électricité – SNEL); the national water utility (Régie de Distribution d'Eau – REGIDESO); the national post and telecommunications company (Société Congolaise des Postes et Telecommunications – SCPT) in fixed line telecommunications, including fiber; the national rail company (Société Nationale des Chemins de Fer du Congo – SNCC) in rail as well as inland waterway transport infrastructure, including lake ports; and the national airport and air traffic management company (Régie des Voies Aériennes – RVA). Table 3 below presents some overall financial and operational indicators for these SOEs and describes their operational presence in North Kivu.

Table 3: Infrastructure sector SOEs and operational presence in North Kivu

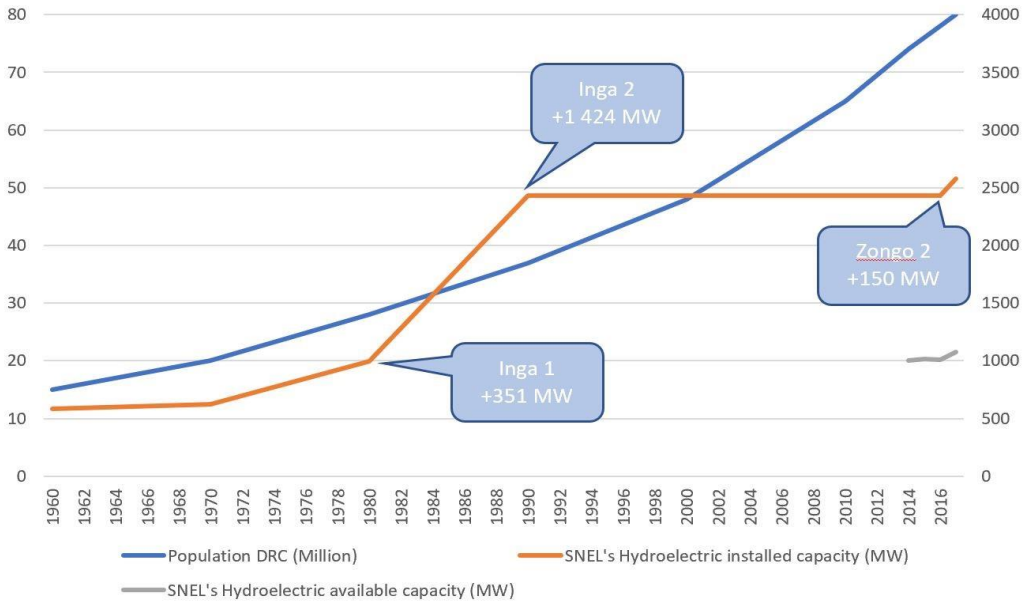
SOE	Key Financial and Operational Indicators 2017			Operational Presence in North Kivu
	No. Employees	Net Income ($ million)	Debt & Arrears ($ million)	
Electricity: SNEL	6,500	3.8	2,123	• Grid in Goma (30,000 customers) supplied via transmission line from Ruzizi hydros near Bukavu; areas along the line also served • Some border areas (e.g., Kasindi) served with power imported from the Ugandan network • Other former grids and diesel power stations (e.g., Butembo, Beni, and Oicha) not operational
Water: REGIDESO	5,030	(15.7)	111	Owns and operates limited water supply systems in Goma, Butembo, Beni, and Walikale. Operation of some standpipes in Goma under concession to a private operator

SOE	Key Financial and Operational Indicators 2017			Operational Presence in North Kivu
	No. Employees	Net Income ($ million)	Debt & Arrears ($ million)	
Telecoms (Fixed Line): SCPT	1,121	0.2	406	No operational presence; legacy office remains in Goma
Trains and Ports: SNCC	7,141	(150.6)	356	Owns six of 11 quays at Goma Port; operates one (the other five remaining in SNCC ownership being under concession to private operators)
Airports: RVA	3,045	(6.1)	101	Operates Goma and Beni airports

Source: DRC SOE Governance Diagnostic Report (World Bank, 2019); InfraSAP team research

These SOEs typically operate at a loss and carry heavy debt and arrears burdens, and struggle to finance new investments in their respective sectors. On paper, these are commercial SOEs that are financially independent based on revenues from fees charged for services. However, permitted tariffs are often set well below cost-recovery levels (and below the level at which private operators can charge—as described in the following section), while persistent non-payment of bills by most public entities also undermine revenues, exacerbating poor commercial performance. In practice, most financing for capital investment is provided by development partners and falls well short of needs. SNEL, for example, has not carried out significant new investment in production since the 1990s; as noted in Section 2, its assets are generally limited and in poor repair, and in some areas in North Kivu have fallen into disuse. Figure 4 shows SNEL's national installed capacity over time and its available capacity in recent years, reflecting the gradual deterioration of facilities. REGIDESO investment between 2010-2015 of around $280 million, 98 percent financed by development partners, was less than one third of the estimated needs to meet service targets.

Figure 4: SNEL installed hydropower generation capacity 1990–2018



Source: Increasing Access to Electricity in the Democratic Republic of Congo: Opportunities and Challenges, World Bank 2020

Moreover, finances for these national SOEs are managed centrally, with limited resources or incentives for local teams to maintain existing infrastructure or invest in improved services, even where such investments could be financially viable. For example, in the Energy sector, the SNEL Goma office is awaiting central funding to roll out customer metering, even though the cost of this investment would be fully recovered by improved revenue collection locally as well as allowing for better demand management to improve services. SNCC's Goma office reported similar challenges: what local revenues are collected are remitted centrally; funding transferred back covers recurrent costs leaving no resources for investment in infrastructure improvements[26].

The presence of nationally owned and controlled SOEs also presents a challenge in planning and implementing new modes of infrastructure delivery at the provincial level. In water and electricity, the existing networks of RIGIDESO and SNEL respectively cover significant parts of urban areas, although in many cases, these are under-delivering or non-operational. This constrains the ability of the provincial government to grant concessions, which must either involve SOE assets over which the provincial government has no jurisdiction, requiring a three-way agreement (as is the case for the private company Congo Maji's participation in the water sector in Goma as described further below), or work around those areas to which the SOE is nominally providing service, even if this results in a suboptimal allocation of concession areas and highly differentiated services and pricing (as is the case in energy). Even where an SOE is wholly operationally absent, it can present a complication. According to interviewees in the telecommunications sector, the Goma-based SCPT team, which has no operations, objected to and physically interfered with the installation of fiberoptic cables within Goma by private sector investors.

SOE reform is needed to support decentralized decision-making in the energy and water sectors—these reforms are envisaged in the respective legal frameworks but have not yet been implemented. In both cases, the intention was that the introduction of private provision and decentralization would be accompanied by SOE reform. For the energy sector, this requires SNEL to obtain concessions for all its areas of operation; however, the structure of these concessions (and hence, whether these should be awarded by national or provincial government per the decentralization arrangements in the sector) has yet to be defined. Similarly, in the water sector, REGIDESO should have obtained concession contracts for all its operations—in this case signed with the provincial governments, to whom REGIDESO assets should have been transferred, as described above.

Government and Public Bodies

Direct government involvement in delivering infrastructure in the sectors covered by this InfraSAP is limited to roads—delivery entities take a range of forms, funded mainly or entirely from general or earmarked taxation rather than user charges. As mentioned above, a range of operational entities in the roads sector is responsible for the design, construction, and maintenance (or for contracting and supervising works). These have various institutional structures with different levels of operational autonomy. Unlike the above SOEs, they have no independent revenue sources, so they depend on central government budget allocations for operating and capital expenditures or allocations of earmarked taxes from the national road fund described below:

[26] Meeting with SNCC Goma, February 2020.

- The Roads Office (Office des Routes – OR) is a public body with independent legal status under the tutelage of the Ministry of Infrastructure and Public Works (MITPR), created in 1971. Formerly a public enterprise, the Roads Office was transformed in 2009 into a public establishment
- The Urban Roads and Drainage office (Office des Voiries et Drainages – OVD) is a State-Owned Enterprise (SOE) of a technical nature established in 2008, also under MITPR
- The Rural Roads Office (Office des Voies de Desserte Agricole – OVDA) was formally a department of the Ministry of Agriculture and Rural Development (MADR). It was established as an office with administrative and financial autonomy, still under MADR, in 2019, enabling it to engage directly with development partners to implement investment projects.

Each of these entities has local offices or representatives at the provincial level to carry out their functions in the field. In North Kivu, these offices liaise with the Provincial Government's General Commissariat for Reconstruction. In the few examples of Public-Private Partnerships being used in the roads sector (none in North Kivu), the national MITPR has been the contracting authority on the public sector side.

Capital investment for rehabilitating or upgrading priority national roads has been largely financed in recent years by development partners. In practice this means that the relevant project implementing units within the MITPR have a substantial role in delivering road investment projects, as well as contributing to planning functions as described above. These include the Infrastructure Unit (Cellule Infrastructure – CI) for World Bank projects and the Large-Scale Works Agency (Agence Congolaise des Grands Travaux – ACGT) for Chinese-funded projects.

Maintenance funding for roads is collected and administered through a National Road Maintenance Fund (Fonds National d'Entretien Routier – FONER). FONER was established in 2009 as a public administrative and financial institution. Its role is to collect funds; finance the maintenance and protection of national roads and urban roads of national interest; and allocate funds to Provinces for the maintenance and protection of provincial priority and secondary roads. 98 percent of FONER's funding is from fuel levies, at 10c per liter (compared to a Sub-Saharan African average of around 25c per liter). In addition, it receives toll revenue from toll posts on national roads, charges on weighbridges, and penalties for overloading or other misuses. These levies and charges are collected at the Provincial level and remitted to FONER. It can also receive and channel donor funding or transfers from the national budget.

The total amount of resources collected by FONER is insufficient to fund adequate road maintenance and is further undermined by a lack of transparency and apparent misuse. FONER resources increased from $60 million in 2009 to a peak of $122 million in 2015, falling back to $92 million by 2018. This has been enough to fund at least some annual maintenance on around 8,000-9,000 km of roads—representing less than 14 percent of the 65,000km of national, provincial, and urban roads; and only 55 percent of the 15,800km national roads designated as "high-priority". This large funding gap results in under-maintenance at all levels of the network, undermining the effectiveness of rehabilitation efforts. The funding gap is exacerbated by FONER funds being diverted to other uses—some potentially productive although not intended, such as new infrastructure construction projects; some less so. The Director General of FONER is currently on trial for large scale corruption.

Moreover, FONER resources are inefficiently allocated, and maintenance slow and unresponsive as a result. An overall maintenance program is defined annually by the Ministry of Infrastructure and Public Works, without a clear policy of allocation between different road types or conditions. Funding is allocated

by FONER through a non-transparent process to the various road offices that are charged with managing maintenance contracts. From the perspective of the North Kivu government, the funds feeding through this chain to meet maintenance needs have been slow and unpredictable as well as insufficient, increasing the overall cost of maintenance as minor problems become more major ones when left unaddressed.

Faced with these flaws in the centralized system, the North Kivu Provincial Government has been experimenting with a new model. Rather than remit to FONER revenue collected at toll points on national roads within the Province, the Provincial Government is retaining these resources, and allocating them for the performance of routine maintenance works. The province has contracted directly with local companies to carry out this work, under one-year renewable contracts for maintenance of specific sections, as described further below; work is supervised by the Provincial Office des Routes. Toll funds are funneled into accounts managed jointly by the public and private partners to cover the cost of works undertaken in a transparent manner. If the amount of the maintenance work is higher than the net toll revenue (which is typically the case), the difference is sent to the central government for payment. This arrangement was introduced unilaterally by the Provincial Government; it was not initially well-received by FONER but secured high-level political support in Kinshasa. FONER now describes the arrangement as a "pilot".

Private Sector

In most infrastructure sectors, there are examples of private or non-state actors that have emerged in North Kivu to fill the gaps left by limited public investment. All digital infrastructure in North Kivu is private, with the national public operator absent, as noted above. Most of the examples of private provision of energy infrastructure in DRC are found in North Kivu, where private operators have collectively surpassed the limited capacity of SNEL, in most cases with donor financing. In water, there are two examples of private operators delivering water services in Goma, both with NGO support: one by arrangement with REGIDESO using parts of its network, and the second providing a basic service in areas unserved by the national public operator. Almost all lake port infrastructure is privately owned and/or operated, in some cases having usurped a very weakened SNCC. Airports and roads remain publicly-provided—although even in the roads sector, the Province is pioneering in partnering with the private sector in delivery. This section describes the private sector entities involved in delivering infrastructure assets and services in North Kivu.

While sector dynamics vary, there appear to be some common factors to the relative dynamism of private infrastructure investment in North Kivu. First, significant economic activity and potential, as described in Annex F, with rich natural resources and strong access to regional and international markets to the east. This proximity also helps with infrastructure delivery, particularly for digital infrastructure piggybacking on networks in neighboring countries. Conversely, the distance from the capital means the dominant and moribund SOEs are less present, creating more space for the private sector to fill. There is a strong donor and NGO presence in the region—both creating demand and providing a source of support to nascent efforts. Finally, the Provincial Government has been proactive in encouraging private sector participation and shown willingness to take risks and try new models—even if capacity to manage the results can be lacking.

Equally, many private providers face common constraints in expanding their operations. Ill-defined contractual arrangements and regulatory environments are a constraint across the board, although this takes different forms depending on the sector governance structure. Combined with a near-complete lack

of availability of local bank lending at terms longer than a year, as described in Annex F, this means that smaller-scale operators are limited to financing investment through equity or donor contributions—beyond the international ICT companies, only one energy operator has succeeded in raising some commercial debt. Ultimately, most operators are constrained in the scope of potential expansion by the ability of new users to pay cost-reflective tariffs. The sector-specific manifestations of these constraints are described in turn below.

Electricity

Five years after enactment of the law for the electricity sector, Eastern DRC is the region with the highest private sector participation. At the time of writing, the four private grid operators in North Kivu of varying scales (ENK, Virunga SARL, SOCODEE, and Nuru) have surpassed the operations of SNEL, the state-owned power utility with a total capacity of 32 MW, reaching 12,000 customers in Goma and surrounding areas, as well as in Butembo and Beni. There are three active solar home systems distributors (Altech, BBOXX, Weast Energy), and one grid installer (Goshop). Table 4 below provides a summary of these providers and their ownership, operations, and financing approaches.

Mini-grid operators have a range of organizational and financial structures. Virunga SARL was initiated as a development project linked to the Virunga National Park, with initial investments largely financed by donor grants. Virunga is shifting towards a more commercial model and has accessed both Development Finance Institution (DFI) and local commercial bank financing (the only of the eight companies listed below known to have done the latter). Nuru has been successful in raising finance internationally, mainly from impact investors, as well as some grants. SOCODEE and EDK are the most purely commercial ventures, having been funded by investor equity of local and DRC-based economic operators, respectively (supplemented by grants in the case of EDK).

Contractual arrangements for mini grids are inconsistent, and in some cases, contested. For the city of Goma, there are ongoing disputes regarding the scope and nature of allocated concessions between all three mini-grid operators (Virunga SARL, SOCODEE, and Nuru). Interconnections between adjacent grids are limited, and agreed on a bilateral basis (namely, between Virunga SARL and SOCODEE for the supply of power to SOCODEE's medium-voltage line) with no standard requirements.

The Solar Home System market equally sees a range of providers: from international company BBOXX to home-grown companies of different scale and sophistication. None have sought bank credit domestically, relying on equity, as well as international debt, including from impact investors, and grants in the case of BBOXX and Kinshasa-based Altech. As described below, the experience of Weast energy shows the challenge of raising finance for those entities that operate at a scale too small to attract DFIs. While financing requirements are less intensive for home system providers or EPC companies compared to grid providers, working capital finance is key to enable companies to, in turn, offer financing to customers to spread the cost of systems (typically requiring repayment duration from 12 to 36 months), and hence expand offerings to lower-income households. Even these short durations exceed the typical term of bank lending in DRC today.

Table 4: Private sector actors in the electricity sector in North Kivu

Operator	Ownership	Operations	Funding and Financing
Mini Grid Operators			
Virunga SARL	Created by the Virunga Foundation, which manages the national park, with a mixture of local development and commercial objectives	• Generation capacity of nearly 30 MW from two hydropower sites • Directly serves 9,300 customers, including 2,700 in Goma and 400 SMEs on own-constructed distribution grid, under concession from Provincial Government • Sells power wholesale to SOCODEE to supply Goma	Initial funding was raised largely on a grant basis; transitioning towards more commercial financing: • **Capital grants/subsidies** from: European Union (80 percent of Mutwanga power plant CAPEX, $2.5m for Matebe power plant); EASE World Bank project ($5m); Power Africa (Power Sector Reform, $200,000); Schmidt Family Foundation (grants for meters) and the Buffett Foundation • **Loans** from Commonwealth Development Corporation ($2.5m for Matebe grid) and The Merchant Bank (TMB)
Société Congolaise de Distribution de l'Eau et de l'Electricité (SOCODEE)	Created in 2016 as a for-profit company by five of the main economic operators in Goma	• Built and operates 5MW MV transmission line and distribution grid in Goma; buys power from Virunga SARL • Supplying 3 MW to 1,100 wealthy residential and commercial customers, under concession from Provincial Government	**Equity** financed by owners
Nuru (formerly Kivu Green Energy)	Established as a private company based in Goma in 2015; expanding into other areas of DRC	• 1.3 MW solar/battery plant targeting 4,000 customers in Ndosho, a poorer district of Goma, with pricing model adapted to lower incomes • Planned project to extend grid to Himbi, a wealthy neighborhood, was interrupted by competing SOCODEE installation; other extensions are now planned • Operates a 65kVA solar plant in Beni serving 60 wealthy residential and commercial customers	Financed primarily by **impact investors (equity and concessional debt)** with some grants. Investors include: • Energy Access Ventures (EAV) and Gaia Impact Fund, both private equity and venture capital providers • Electrification Financing Initiative (ElectriFI), an investment fund owned by the European Union ($0.93m shareholder loan and $0.5m equity to finance Goma mini grid)
Energie du Nord Kivu (ENK)	JV between STS, a Kinshasa-based private electrical engineering company, and the Provincial Government	• Operates a 1.8 MW solar-powered system in Butembo; extended a power line connection to also serve Beni • Serves approx. 1,050 customers; struggling to increase client base due to affordability issues	Primarily **equity-financed**; received grants from Power Africa ($200,000) to connect households in Butembo. Provincial Government holds a small minority stake.

Operator	Ownership	Operations	Funding and Financing
Solar Home System (SHS) Providers			
BBOXX	British-owned company operating internationally (over 150,000 SHS sold worldwide, including 10,000 in the DRC)	• Active in Goma since October 2017 with 5,000 customers; 7 stores in the Kivus (Goma, Bunia, Bukavu, Uvira, Kavumu, Sake, Rubaya) • Offers SHS at: 20 Wp, 50 Wp (with television; 70% of users), 300 Wp (with refrigerator; customers include smalls shops or bars; 5% of sales) • A 2018 attempt to implement a 30kW mini grid for a school was abandoned for lack of regulatory clarity	• Primarily funded by international **private equity** ($6m) based on international size and scope; also raised $2m in **debt** and $1m in **grants** • Has not sought financing from Congolese banks; collateral requirements seen as a barrier
Altech	Kinshasa-based private company founded in 2013 by local entrepreneurs	• DRC-wide lantern and SHS distributor (over 120,000 solar lanterns sold through 300 resellers); generates around 40% of sales in Eastern DRC • Targets the poorest households with solar lanterns • Partnered with Vodacom in 2019 to market SHS of 11 Wp (with 4 bulbs and chargers) and 75 Wp (with 6 bulbs, radio, and a torch) in Kinshasa, Goma and Lubumbashi through PAYGO (with mobile money). Over 300 units were sold by end-2019.	• Financed by a range of equity, **grants** (from the Shell Foundation and Swiss Re Foundation), and **impact investor loans** • Has not contracted commercial debt to date
Weast Energy	Private family business	• Originally a renewable energy engineering company, now a distributor specializing in higher-capacity solar systems for productive uses (irrigation, refrigeration), including for community centers • Over 1,500 systems installed since 2017 in several villages, primarily in South Kivu • Developed its own customer credit mechanism	Financed by **equity** ($50,000) but now seeking **loan financing** ($800,000 to $1.2m)—cannot borrow from local banks today, nor does it have access to international financial institutions given small scale of financing needs
Grid installer (EPC contractor)			
GoShop	Family business founded in 1980	• Supplies and installs PV panels since 2007 on various projects (stock, B2C, B2B—including a 100kWp solar-hybrid micro grid recently installed on Idgwi Island on Lake Kivu in South Kivu) and sells solar lanterns • Has accumulated a stock of solar PV panels and turbines for micro hydro power plants and is seeking concessional funding to develop community projects	**Investor equity**

Source: InfraSAP team research, including interviews with operators

Water

In the water sector, private participation is beginning to help improve the quality and viability of service provision. There are two private operators of water supply systems currently active in Goma: Congo Maji SARL, which signed a management contract with REGIDESO in 2018 to manage standpipes within REGIDESO's operating area that have been upgraded or built with funding from DFID under a Mercy Corps program; and Yme Jibu Sa, a local private company with international donor equity support that signed a contract with the City of Goma in 2019 for water service delivery through a gravity-fed network of standpipes and a few home connections in the western part of the city, beyond the REGIDESO area.

Table 5: Private sector actors in the water sector in North Kivu

Operator	Ownership	Operations	Funding and Financing
Yme Jibu	Goma-based private company, 50% owned by Fontes, a Swiss startup funded under a Swiss Agency for Development and Cooperation project	• Operates a network of 322 household connections and 39 standpipes in an area comprising poorer neighborhoods in the west of Goma with a total population of 68,000 (10,000 additional users come from adjacent areas) • Initial network assets, including pumping stations, owned by Goma City Hall, and operated under 25-year delegated management contract formalized in 2019 • Currently investing in extending operations to additional areas under existing contract • Tariffs approved by Goma City Hall and the Provincial Government at cost recovery levels	• Initial network assets publicly owned, having been funded by various NGOs • Current operations are financially viable, revenues around $312,000 in 2019 • Financing for planned network extensions raised from a local bank in Goma, leveraging Fontes equity • Total Fontes investment around $75,000
Congo Maji SARL	Established with support from Mercy Corps; owned by UK charity Enterprise for Impact (E4i), on whose board Mercy Corps sits as an observer	• Operates standpipes within REGIDESO-served area, under a management contract with REGIDESO, signed in 2018 for duration of 5 years, renewable twice • Contract sets performance indicators with penalties but has no contractual performance targets positively linked to remuneration • Currently operates 100 standpipes: 49 existing REGIDSEO plus 51 new built by Mercy Corps. REGIDESO's remaining 60 standpipes to be transferred in coming years. Bulk water provided by REGIDESO	• Infrastructure built under Mercy Corps-run program funded by DFID • Current operations are financially viable

Source: InfraSAP team research, drawing on operator interviews and contractual documents

Private water supply system operators differ in their organizational and financial structures, although both have relied heavily on donor funding for investment. Congo Maji SARL is owned by a UK charity, having been established off the back of a program delivered by an international NGO; whereas Yme Jibu is a local privately-owned company with a donor-funded international equity investor. In both cases initial capital investment to rehabilitate or upgrade standpipes has largely been donor-funded. Operations and maintenance are financially viable based on tariffs agreed independently by each entity at the Provincial level. These tariffs are around five to ten times higher than those REGIDESO is allowed to charge under national regulation—at around \$2.22 per m^3 at the standpipe for Congo Maji, and \$2.12 per m^3 at the standpipe and between \$1.21-\$2.12/m^3 for household connections for Yme Jibu, compared to \$0.29-\$0.53/m^3 for household connections for REGIDESO.

The contractual structures of these arrangements differ and may need to be adjusted to comply with the water law as implementing decrees are enacted. Congo Maji's contract is with REGIDESO, with no contractual relationship with the Provincial Government—this is not aligned with the requirements of the 2015 water law. Yme Jibu's contract with the City of Goma relies on ambiguous provisions of the 2015 water law with respect to the rights and responsibilities of Decentralized Territorial Entities (Entités territoriales décentralisées – ETDs) such as Goma City government to allocate concessions within their boundaries, versus those of Provincial Governments. These law provisions are expected to be clarified by a forthcoming decree on concession contracting and the National Water Policy. As in the energy sector, there has been some disagreement arising from lack of clarity over concession boundaries—in this case, with respect to provision of water by Yme Jibu on agreement with the Mayor's office to five avenues of Kyeshero, an area which was originally covered by REGIDESO network but which was inoperative.

Digital Infrastructure

In digital infrastructure and telecommunications, private operators have long been the sole providers of infrastructure and services in North Kivu. The most significant investors in infrastructure are the national Mobile Network Operators (MNOs) and, more recently, two international wholesale fiber providers—often working in partnership. These networks, in turn, support a range of independent Internet Service Providers (ISPs); and are complemented by wholesale providers of wireless broadband and satellite connections. All are funded and financed on a fully private basis—in the case of the MNOs and fiber providers, typically on the back of international corporate balance sheets. There has been no use of subsidies to date to incentivize investments; indeed, as described above, telecommunications providers in DRC are subject to fees and taxes that are considered relatively high.

The three largest Mobile Network Operators in DRC—Airtel, Orange, and Vodacom—are present in North Kivu, having extended their national backbone networks to the Province on microwave links, and deployed a combined total of about 140 cell tower sites. These are DRC subsidiaries of large, multinational companies, investing typically on a corporate finance basis. With the arrival of fiber, MNOs' short-term priorities in North Kivu are to improve service quality in urban areas through fiber international backhaul and connection of cell towers to fiber metro rings (being developed in partnership with the wholesale fiber providers described below). MNOs are also active in the home internet market, particularly in Goma building on the new fiber infrastructure. For example, Vodacom is partnering with Liquid Telecom to build an access network using GPON (Gigabit Passive Optical Network) technology that will extend connectivity from existing fiber connection points to clients' premises.

Fiberoptic networks are being rolled out by international wholesale providers Liquid Telecom and BCS, extending their existing pan-African networks. Both have built 10Gbps links to Goma via Rwanda, serving MNOs' international backhaul needs as key customers, and financed as part of the companies' international operators. Both are building local networks or "metro rings" within Goma—of 40km and 50km respectively—to serve MNO cell tower networks, as well as ISPs providing services to the premises (BCS's 50km metro ring was built in partnership with Vodacom and Airtel, initially to connect the cell sites of these MNOs). Interviews in Goma with market participants suggested Liquid is also planning to extend its fiber backbone network south to Bukavu, along the N2 road. While further expansion may come to other accessible areas close to the borders, these companies are expected to focus on strengthening and monetizing these newly built links.

A range of companies provide wireless broadband connections across a broader geographical area over microwave or satellite connections—directly or on a wholesale basis. There were at least ten high-quality microwave (WiMAX) providers operational in DRC at end-2016, most of which have some presence in North Kivu, ranging from subsidiaries of international companies to smaller domestic operators: namely, Vodacom Congo, Raganet, Microcom, Global Broadband Solutions (GBS), Afrinet, Cielux, Cybernet, AND, DATCO and Congo Broadband Network. Elsewhere, other less prominent companies are known to use the unlicensed 5GHz bands to operate pre-WiMAX wireless networks. O3b Networks, financed by Google, Liberty Global, Inc., and HSBC Principal Investments, provides voice and data communications over satellite to mobile operators and internet service providers.

Internet Service Providers (ISPs) include the MNOs and some WiMAX providers, as well as independent ISPs, some of which are smaller, domestic, or local companies. The leading ISPs besides the MNOs are Microcom and GBS (both providers of WiMAX and satellite connections), and FastNet, a DRC-based company headquartered in Kinshasa. Acel, a US-based pan-African operator, offers satellite connection services in Goma, Butembo, and Beni on O3b's network.

Transport

Private participation in transport infrastructure in North Kivu is relatively limited but may have the potential to expand. The only subsector with significant private involvement in both financing and delivery is lake transport infrastructure. Airport infrastructure remains fully public. The roads sector remains fully publicly financed, although there may be potential to introduce more private sector risk-sharing.

Lake transport infrastructure, in the form of Goma Port, is de facto largely private despite a formal state monopoly, with a fragmented structure that constrains investment for operational efficiency. Of the twelve operational quays at Goma port, eleven are in private hands: six on land that is now privately owned, having been acquired "during the chaos of the conflict years" by local economic operators, according to current local SNCC management. A further five are operated by private companies under some form of concession with SNCC, although these concessions follow no standard format, being for example of indeterminate length. Private quay operators are generally also ship owners accommodating their own freight and passenger vessels. This fragmented structure provides limited possibility for investment to improve efficiency of operations and capacity. Each quay is operated separately on a manual basis; no single firm has the space or incentive to invest in mechanized operations. Absent a major effort to rationalize the port structure, which given the nature of the sector would need to be on the part of the national government, it seems likely expansions in port capacity will involve greenfield investments.

For example, the brewery Bralima (part of Heineken group) recently moved its port terminal from Goma to the Port of Kituku where it built its own facilities and installed equipment, such as lifts and pallets.

While the roads sector remains fully public, recent developments could be laying the foundations for more private sector involvement. As described above, the Provincial Government has introduced a new approach to basic road maintenance in partnership with the private sector. Under this scheme, eight private contractors, all local construction companies, have been awarded one-year renewable contracts for maintenance of specific sections of unpaved but recently-rehabilitated national roads—covering a total of 540km. These contracts are funded primarily by the collection of tolls, which are funneled into accounts managed jointly by the public and private partners. The main purpose at present is to bypass the inefficient chain of central government maintenance funding allocation and implementation; while there is some sharing of responsibility, no risk is transferred to the private companies under this scheme. Finally, there are some examples in North Kivu of larger private economic operators undertaking ad-hoc repairs of road segments or bridges critical to their business. For example, Alphamin, as described in Annex F, is creating a small but potentially motivated additional set of private sector stakeholders.[27]

[27] As this report is being finalized the WB team has received notice that two concession agreements have been signed by the national government for sections of road in North Kivu: with a South African company for rehabilitation of the Walikale-Sake section of Provincial Road R529, and with a Ugandan company for the Beni-Kasindi section of National Road R4., which had been rehabilitated under the Pro-Routes project. The team is seeking more information on these concessions.

5. Roadmap

This section sets out a roadmap for scaling up infrastructure investment in North Kivu. The starting point is a recap of high-level investment priorities, based on current gaps as described in Section 2, stakeholder feedback, and a "cascade" approach—that is, an approach that prioritizes private sector solutions where possible, preserving scarce public resources for where they are most needed, and focuses on identifying the binding constraints on investments of different types based on the analysis of governance, funding, financing, and delivery set out in Sections 3 and 4. This analysis, in turn, helps identify and prioritize actions needed to address those constraints, set out below in a series of action plans—both cross-cutting, where shared solutions can be found to common problems or where coordination between sectors is needed, and sector-specific in the energy, water, digital, ground transport, and air transport sectors.

Addressing the constraints on infrastructure investment in North Kivu will require action by both National and Provincial Governments—supported by development partners. The roadmaps describe actions needed at each of these levels to address constraints and enable priority investments. Given the history of weak coordination between National and Provincial Governments, the roadmaps emphasize where progress may be possible independently at the Provincial level, as well as where there are clear interdependencies between actions, and consider implications for sequencing. The focus throughout is on actions specific to infrastructure sectors. Broader investment environment and financial sector reforms are not discussed. The World Bank Group's Country Private Sector Diagnostic (CPSD) provides analysis and recommendations in these areas, as well as references to a broad range of analytical work.

This roadmap is built on existing needs and does not reflect the potential impact of COVID-19 in North Kivu. Flexibility will be needed to adapt priorities and solutions as this impact becomes clearer. As noted in the introduction, the impact of COVID-19 in North Kivu and DRC is not yet known but could be significant. Some sectors are likely to see a sustained drop in demand due to response measures, particularly in air transport, while an overall economic slowdown may further hamper demand and ability to pay for infrastructure services across sectors, as well as further contracting access to credit for investors. On the other hand, certain subsectors may see increased demand or priority. Annex A notes the solar home system providers with inventory available that could be used to power health centers.

Overview of Infrastructure Priorities

Prioritizing infrastructure investments in North Kivu is challenging, given limited data and huge gaps—this InfraSAP takes a qualitative approach, based on making judicious use of scarce public resources. Section 2 identified types of investment that could respond to identified service needs and bottlenecks. There is insufficient information to prioritize between these using analysis of costs and benefits under the scope of this InfraSAP. Assessment of investment priorities and potential actions is therefore based on a combination of expressed priorities of the Provincial Government, informed by stakeholder consultation, and complemented by a "cascade" approach[28] that emphasizes enabling private sector solutions,

[28] As set out for example in the WBG/IMF Development Committee Paper Maximizing Finance for Development: Leveraging the Private Sector for Growth and Sustainable Development, September 2017.

described further in Box 1 below. While imperfect, this approach provides a basis for assessing next steps that would represent valuable progress for much-needed infrastructure provision in the Province.

Box 1: Applying the Cascade Approach to Infrastructure Investment in North Kivu—Overview

The scale of the infrastructure gap in North Kivu, together with severe constraints on public sector resources, create an imperative to mobilize private investment to meet infrastructure needs, as well as to make the most efficient use of public resources to that end. The case for private sector solutions is compounded by the need for adequate maintenance to ensure access and service gains from new investment or rehabilitation are lasting—a persistent challenge in DRC in the face of under-funding and weak institutional incentives in public providers. Business and contractual models that incentivize maintenance can help—including private investment that depends on user charging, such that service breakdowns undermine revenues, or contracts that bundle construction and maintenance along with performance-based payments such that remuneration is linked to adequate maintenance over time.

In this context, a "cascade approach" to assessing the constraints to investment can help prioritize use of public resources and maximize finance for development in North Kivu. Experience documented in this InfraSAP suggests there is potential to mobilize private investment in most of the focus sectors. What it will take to do so will depend on the nature of the service and its prospective users, the investments required, and the potential investors. The cascade approach involves sorting potential investments into groups or "tiers" according to the potential for private sector solutions and the nature of intervention needed to enable them, to prioritize the use of public resources, as follows:

- **Tier 1: Private solutions requiring limited intervention**—commercially viable investments based on tariffs that are affordable to prospective users, in competitive sectors with limited sector-level market failures. Some may happen without intervention, where investors can access equity or international markets, and are well enough connected to overcome governance issues. Others may be constrained by the generally challenging environment in DRC—in particular, lack of access to finance, challenges navigating permitting systems, and punitive fiscal regimes. In either case, regulation for quality, or deregulation to foster competition may also be needed.
- **Tier 2: Private solutions requiring contractual and regulatory support**—potentially viable investments requiring credible and clear contractual and regulatory frameworks to overcome market and government failures. In North Kivu, support would be needed in the short term to improve the clarity of concession or other PPP arrangements (both the contracts and the basis for their allocation in terms of sector plans and procurement); build capacity at provincial level to manage these contracts; and complete reforms and stabilize sector regulatory frameworks.
- **Tier 3: Private solutions requiring de-risking and blended finance**—investments that could be undertaken on a commercial basis but that, in addition contractual and regulatory clarity, will need financial support to be financially viable—due for example to low demand per user, or low ability of users to pay. This could include subsidy and/or risk reduction through some combination of capital or connection subsidies, concessional loans, or credit enhancements.
- **Tier 4: Public investments** that are unlikely to be able to attract significant volumes of private capital, for which revenues are insufficient to provide risk-adjusted returns. The challenge remains to achieve efficient use of public resources. This will could nonetheless include involving the private sector to bear more risk (including through providing limited financing), incentivize investment in adequate and timely maintenance, and/or benefit from technical expertise.

Table 5 below presents an overview of investment priorities by sector following this approach—presenting priorities identified during consultations, and allocating potential investments into tiers according to potential for private sector solutions and the type and intensity of intervention that would be needed to that end, as described in Box 1. A clear priority for public investment is rehabilitation and adequate maintenance of priority roads and basic safety investments for airports. In the electricity and water sectors, the emphasis is on enabling private sector solutions—starting with the most viable urban areas, where contractual and regulatory clarity may be sufficient to unlock additional investment, allowing for models to be tested before rolling out more widely. As a national competence, digital development does not appear among Provincial priorities, but the potential to build on recent progress in connectivity provides a significant impetus for the reforms needed to put viable private investment on a more solid regulatory footing. Across all sectors, expanding rural coverage will require some form of public funding—creating a shared challenge of how to design government and donor support mechanisms to make the most efficient use of public resources. The following sections go into more detail on these actions.

Table 5: Potential priority investments per sector

Sector	Potential Investments	Provincial Priority Level	Cascade Analysis
Energy	Continued **expansion of grids in Goma urban area** supplied by **least-cost generation sources**, progressively interconnecting within Goma, and then with other mini grids across the region	High priority, and first priority within sector	**Tier 2** in a few cases—wealthier urban areas or serving anchor off-takers or commercial customers (potentially including other infrastructure installations)—**Tier 3** otherwise
	Rollout of **mini grids in towns with a viable customer base**, taking into account local anchor off-takers which could include infrastructure facilities (cell towers, water pumping stations). In larger urban areas (Butembo and Beni) this will likely involve more than one grid and will need to incorporate existing operators, as in Goma; in some towns it may involve rehabilitating existing but disused SNEL infrastructure. Includes investment in least-cost local generation (expected to be largely hydro- and solar-powered) with minimal to no transmission infrastructure until mini grids between cities interconnect	Butembo and Beni as second priority within sector, followed by other mini-grid areas	
	Rollout of **Solar Home Systems (SHS)** of varying capacities (including large capacity to power productive users) in more remote areas	High priority (lower priority within sector)	**Tier 1** for higher-income customers or more accessible locations such as peri-urban areas, although broader business constraints including access to finance likely to apply; **Tier 3** for lower-income and/or remote users
Water	Rehabilitation, densification and upgrade of **water supply system in Goma**	First priority within sector	**Tier 4**, with risk transfer to private operators. Potential for future transition to **Tier 3** once major upgrades complete.
	Rehabilitation and/or buildout of **water supply systems in other priority urban areas,** particularly Butembo and potentially Beni, with a combination of standpipes and household connections to meet expected demand	Butembo and Beni as second priorities within sector	

	Investment in **bulk water supply** (production and storage) to meet growing system needs	N/a	**Tier 4**
Digital	Fiber network investments, including: • Continued investment in **international fiber connectivity** to improve quality • Investment in **domestic fiber backbone connections** between population centers • Continued investment in **metro fiber "rings"** within Goma and other urban areas once connected	N/a (national competence)	**Tier 1-2**. Liberalization through new telecommunications law required to enable market entry. Potential for opportunistic PPPs to reduce costs, e.g. laying fiber alongside road rehabilitation works
	Continued investment in **FTTX or other last-mile solutions** to connect to fiber grids in urban areas, to support productivity and enable development of digital economy		**Tier 1-2** (quality regulation needed)
	Expansion of **3G/4G mobile networks in rural areas** including through new models such as Open Roaming Access Networks		**Tier 3**
Ground Transport	**Rehabilitation of high-priority roads**, consisting initially of national road sections and subsequently priority provincial road connections (further work on prioritization needed, including road surface options, paved or unpaved)	**Top priority**	**Tier 4**, with potential for increasing risk transfer to contractors
	On-going investment in **adequate, timely maintenance** for rehabilitated sections	**Top priority**	**Tier 4**, with potential for increasing risk transfer to contractors
	Improvement in **lake transport safety**	Low priority as relatively well-performing subsector	**Tier 1-2** (safety regulation needed)
	Investment in **lake port infrastructure**		**Tier 2**
Air Transport	Improve Beni and Goma airport infrastructure and equipment to comply with international standards	Beni as highest priority within sector, followed by Goma	**Tier 4**
	Upgrade passenger and freight terminals to increase capacity and improve customer transit	Lower priority	Potentially **Tier 2** for management and ancillary revenue generation, depending on evolution of security context and military presence

Source: InfraSAP analysis; consultations with North Kivu Provincial Government officials

Cross-Cutting Actions

While sector dynamics vary, there are areas where action at a cross-cutting level makes sense—where there is a benefit to coordination, or the potential for shared solutions to common problems. Coordination in sector planning is needed to capitalize on synergies between sectors and enable business models that rely on those synergies. Examples span the sectors in this InfraSAP, and include:

- **Coordinated infrastructure rollouts to serve new potential anchor customers** to ensure complementary investments align. This could include, for example, the proposed "SME Center" model, which would require reliable connection to energy, water, and digital infrastructure networks. In practice, this would mean early publication of plans for such developments, proactive coordination with existing concessionaires, and/or inclusion of that information in procurement documents for new concessions;
- **Infrastructure providers as anchor customers for other infrastructure services**. In particular, water pumping stations and cell towers could serve as anchor or core customers for the rollout of energy mini grids—a BBOXX project to develop mini grids using Orange telecom towers as anchor load is already underway. These models can only succeed where energy providers can be assured of payment for services—a relatively safe bet in telecommunications, but in the water sector likely to need alignment with new business models that secure the financial viability of the operators, given the history of non-payment between the existing SOEs in these sectors. This coordination will be facilitated by transparency in sharing information to inform investor decision-making such as national plans, as well as in planning and allocation of concessions in water and energy; there may be scope for more proactive engagement to connect prospective investors; and
- **Synergies in physical installation**, particularly laying fiber along all major road works, as described further in the digital infrastructure section below.

Most of this coordination, particularly involving the water and energy sectors, will be under the purview of the Provincial Government. The National Government can help by widely disseminating key underlying information included in National Plans. The exception is coordinating road and digital infrastructure, where given the centralized nature of both sectors this will fall to the national government.

The need for coordination, and the shared need to build Provincial Government capacity across sectors, points to a cross-sectoral institutional solution for managing infrastructure at the Provincial level as a high priority. This is particularly relevant in the water and energy sectors, where the decentralization of significant responsibilities and ambition for substantial increase in private sector participation means similar skill sets will be needed within the provincial government to define and manage concession arrangements across these sectors. These two sectors sit under the same ministry at provincial level, which could be a focus for dedicated capacity-building—the preferred approach of the Provincial Government. This cross-sector approach could be deepened by establishing the entity required by the Water Law to manage water sector assets and contracts at the provincial level ("Régie Provinciale") as a cross-sector entity with responsibilities at least in the water and energy sectors. At the same time, the need for coordination and capacity-building cuts across all sectors and the management of public as well as private infrastructure investment, suggesting a value in creating a broader committee or network encompassing representatives of planning and finance ministries, as well as potentially the governorate, to benefit from capacity-building and institutional strengthening.

A lack of transparency and accountability is a common constraint across sectors that could have shared solutions, particularly at the Provincial level. As noted in the sector discussions below, particularly as overall regulatory frameworks evolve, transparency around concession arrangements will be needed to build investor confidence in the contractual and regulatory frameworks. The Provincial Government could consider common approaches to achieving this transparency, such as a cross-sector online platform for sharing key details about concession arrangements.

Finally, there is scope for the World Bank Group and other development partners to take a cross-sectoral approach to address key constraints. Cross-sector coordination of technical assistance to planning and capacity-building will help support the synergies described above. This could also apply, for example, for programs aiming to improve access to finance, where risk-sharing facilities or other approaches to support bank credit lines could target smaller-scale infra providers across a range of sectors: SHS providers; boat operators; energy and water grid or mini-grid providers. In parallel, technical assistance to banks to better understand the sector could help raise their appetite for lending.

Energy

Ultimately, improving access to reliable electricity is expected to require a combination of investment in interconnected grids in urban areas, isolated mini-grids, and distributed systems (mainly solar home systems), as described above. As for all sectors, a combination of action at national and provincial levels is needed. Table 6 below summarizes these actions in the North Kivu context, distinguishing those that fall to National and Provincial Governments, and the ongoing or potential support of the World Bank Group or other development partners.

The immediate short-term priority in the energy sector in North Kivu is to resolve the current conflict around concessions in Goma and clarifying the plan for future development of the sector. These are linked, in that resolving the Goma situation will require clarity at a technical level with respect to development of the sector in the city, including the area of operations of SNEL in the short term, which could evolve as reform proceeds. As de facto regulator, this adjudication falls to the national MRHE, and technical work to that end is ongoing with World Bank support; follow-through at Provincial level to reissue concessions should be managed carefully and transparently.

Completing the ongoing planning process for future development of the sector is also important in the short term to provide context for further investment in new concessions. MRHE is preparing a national electrification plan with World Bank support that will set out preferred electrification approaches by area, based on demand and resources, and develop a prospectus of mini grid projects. This is a key step to inform prioritization at the Provincial level for new grid concessions, and design of incentive schemes for standalone systems. Sharing this information widely will provide the private sector a valuable resource for business planning.

The next wave of mini grids is likely to focus on urban centers, where demand is concentrated, including from larger economic operators. Defining and allocating these concessions will fall to the Provincial Government and could be pursued independently, although ideally, it could be based on standard contracts adopted at national level (for example, based on mini-grid contracts that have been developed

for bankability under a pilot project in Northern DRC[29]). The World Bank Group could provide a package of support for this process, including support in tendering and a stapled financing package based on an assessment of private sector needs[30]. As described above, coordination between sectors will be valuable in defining these concessions—for example, with the establishment of "SME centers" that could provide anchor demand across sectors, or to identify where telecommunications providers or (newly financially viable) water providers could serve as anchor customers for electricity providers.

There is significant work to do to finalize the national-level institutional framework for energy—this will take time, and interim approaches are needed. Operationalizing the regulator (ARE) and rural electrification agency (ANSER), as well as articulating the role of SNEL in the sector and implementing the necessary reforms, are crucial for medium-term regulatory stability and will require ongoing support from development partners. These steps will take time, however, while the urgent needs in the sector demand action in the meantime. This puts the onus on the national ministry, MRHE, to take on national-level actions in the short term, including those that would later fall to ARE and ANSER, in coordination with provincial governments. An emphasis on transparency will be crucial to build investor and public confidence in this interim period—for example, through publication of revised contracts—while flexibility in early contracts will also be needed to allow for subsequent updates to the regulatory framework.

In parallel, steps can be taken to enable and incentivize the continued rollout of Solar Home Systems, where they are the least cost solution. This is likely to involve a combination of support to enable access to finance (including credit lines or risk-sharing programs with local financial institutions—in particular to lower collateral requirements and lengthen terms from the typical twelve months to enable operators to provide more generous credit offerings and improve affordability) and subsidy through results-based financing systems. An electrification fund is proposed, with technical and financing support from the World Bank under the current EASE project, to deliver subsidy support for SHS and eligible new mini grid connections. Other innovative financial support mechanisms may be available, such as the Peace Renewable Energy Credits (P-RECs) offered by private company the Energy Peace Partners to leverage corporate social commitments to climate finance to fund investments in renewable energy in conflict-affected settings, for which the first investment is a street lighting project in Goma with Nuru.

Capacity-building will be needed at all levels and should be built into all WBG engagements. This will include developing the capacity of newly established agencies at the national level, and significant support and hand holding at the Provincial Government level. As described above, cross-sectoral approaches could be valuable, particularly at the Provincial Level, where similar investment in capacity building is needed across several infrastructure sectors.

[29] The ESSOR project for development of private solar hybrid mini grids in three provincial capitals: Bumba, Gemena, and Isiro

[30] The World Bank team is working with IFC and MIGA to design and apply the recently approved "Scaling Mini Grids" program in DRC, based on the now well-established "Scaling Solar" model.

Table 6: Energy sector actions

Action	Central Government role	Provincial Government role	WBG and development partners role
Establishing clear contractual and regulatory frameworks for investment			
Resolve immediate concession arrangements for Goma	Adjudicate on the conflicting concessions in Goma based on ongoing technical advice	• Reallocate proper concession contracts to operators for Goma based on adjudication result • Publish key contractual information online to promote transparency and reduce regulatory risk to private operators	TA support for technical advice to resolve concessions (ongoing)
Plan	• Complete **national electrification plan**, assessing demand profiles and least-cost electrification options and identifying zones for grid extension, mini grids, and OGS • Disseminate to private sector with supporting data (demand and resource studies)	• Define Provincial-level priorities based on national plan • Communicate with private sector and other stakeholders at Provincial level around vision for the sector • Coordinate across sectors to capture synergies	• Technical Assistance (TA) to support development of national electrification plan (ongoing) • Support at Provincial level to implement planning
Initiate "next wave" of concession arrangements	[Ideally] Adopt standard concession contracts for mini grids	Prepare structured and transparent process for competitive allocation of new concession contracts for priority zones (initially outside SNEL-served areas; could include SNEL assets as reforms progress), using standard contracts if available	Support preparation and tender process for initial pilot concessions to establish model, working with National and Provincial governments—could be with "stapled" WBG financing package as noted below
Build institutional capacity to manage concessions		Designate/create team under Provincial Ministry of Energy with responsibility for concessions—could be defined jointly with water	Capacity-building for Provincial authorities through hand holding and training—could be cross-sectoral as described above

Action	Central Government role	Provincial Government role	WBG and development partners role
Clarify SOE role	• Draft Policy Letter defining objectives for SNEL reform and roadmap for restructuring • Revise SNEL tariffs • (Depending on SNEL reform plan) Regularize SNEL role in North Kivu through concession contract(s) for aspects crossing Provincial borders	(Depending on results of SNEL reform plan) regularize SNEL role in North Kivu through concession for aspects lying within Provincial borders	• Launch a tariff study • Study new PPP models for SNEL outside Kinshasa, such as wholesale vendor to private distribution companies
Clarify future concession arrangements	• Adopt standard concession contracts for mini grids • Allocate concessions for interprovincial mini grids transparently and in coordination with Provincial government—to include concession contract with SNEL in North Kivu		Ensure pilot experience feeds into development of standard arrangements
Establish regulator and other sector entities	• Name heads of ARE and ANSER • Develop and implement business plan for ARE and ANSER; allocate institutional budget		TA to support development of business plan for ARE
Blended finance or subsidies			
Financing	Ramp up the provision of Results Based Financing (RBF) through electrification fund to bridge affordability gap—subsidies to operators for each household connected (could depend on technology; geography)		• Increase IDA allocation to RBF fund and line of credit • TA to local private firms in preparing business plans seeking bank credit, based on results-based financing approval and/or under EASE line of credit • Structure “stapled” WBG financing packages for pilot mini grid concessions, based on market sounding to assess risks (RBF; capital grant; commercial lending and/or risk mitigation mechanisms—could involve WB, IFC, MIGA, CGF)

Water

Significant investment is needed to both expand access and improve quality of water supply systems in urban areas, which may be most effectively delivered through expanded private sector involvement. As in the power sector, there is an opportunity to build on early experiences to roll out more widespread PPP arrangements in urban areas in North Kivu, most likely starting in Goma and Butembo. Further analysis is needed to assess potential PPP models, which could involve one or more operators in each city. It is likely that most, if not all, investment will need to be financed publicly from concessional sources. Private operators could be introduced as investment is completed, under affermage contracts for operating and maintaining infrastructure and delivering services; alternatively, and more likely, Design-Build-Operate-Maintain (DBOM) contracts could be used, bundling the latter aspects along with rehabilitation and new construction works financed by capital grants. In some cases, there may be scope for more private sector risk-bearing (for example, substituting upfront capital grants with results-based financing) and ultimately finance—to an increasing extent as the regulatory structure stabilizes and sector performance improves.

Preparatory work will be needed at both national and provincial levels to follow through on the water law and firm up the legal and institutional basis for PPPs in the water sector in North Kivu. At the national level, prerequisites will include finalizing the National Water Policy to clarify roles and responsibilities in the sector, including between provincial governments and decentralized entities such as city halls, as well as setting out the levels of service expected over time in urban and rural areas, clarifying the types of water concessions expected. The 2015 Water Law will need to be operationalized by approving implementing decrees and preparing and adopting the decree or Organic Law that will transfer water supply asset ownership to the provinces. In turn, the Provincial Government needs to prepare to become an asset owner and build capacity to develop and implement delegated operations for water assets across North Kivu. This includes the key step of establishing in some form the legally required provincial entity to be responsible for water sector management (Régie Provinciale). As noted above, this could in practice be established as a cross-sector entity and focus for capacity-building at the Provincial level in managing infrastructure investments and concessions.

Preparation of PPP arrangements will also take time and could progress in parallel with completion of reforms. In the short term, the Provincial Government could commission the work needed to begin the process of preparing PPPs in Goma and Butembo: updating plans and priorities to align with the National Water Policy, undertaking preliminary financial analysis of potential PPP structures, as well as wide public and stakeholder consultation and market sounding, with the support of qualified advisors. This will include at least tentatively defining the future role of REGIDESO in these cities—the extent to which reaching a conclusion on this point is a prerequisite for moving forward with PPP arrangements will depend on the intended structure of the latter, and whether there is scope for starting in areas outside REGIDESO's current operations, as would be envisaged in the energy sector. In Goma, PPP arrangements will also need to take account of existing private operators. For Congo Maji this could involve a managed exit following completion of the current five-year contract in 2023. For Yme Jibu this will depend on the outcome of the National Water Policy's definition of roles and responsibilities—at a minimum, Yme Jibu's concession arrangements may need regularizing with the Provincial Government.

Once the preferred PPP models have been selected and institutional and legal prerequisites are in place, PPP transaction processes could be prepared and launched, with support from the WBG and development partners. This will require more detailed feasibility studies based on updated city

masterplans, and development of contracts and transaction processes and documents. As noted above, the latter would ideally involve collaboration with a newly established national regulator responsible for setting common approaches; if the regulator is not in place this could be supported by MHRE. Financing will also need to be secured, given the expectation that much of the capital expenditure will need to be public, which could be channeled in part via the proposed national water fund if this is in place. As in the energy sector, a package of WBG support is being developed to this end, including technical assistance throughout the process of developing PPP structures, and provision of concessional finance along with use of results-based financing structures where possible.

Further steps to fully operationalize the institutional framework at the national level are likely to take more time. These includes operationalizing and building the capacity of the sector regulator (ARSPE) and the water resource management entity (OCE). It also includes reform of REGIDESO—developing and implementing a plan for its revised role and operating models under the sector's new decentralized structure, which may vary by geography, and improving operational and financial performance to enable it to participate successfully in an increasingly open market. As in the energy sector, interim arrangements will be needed in the meantime. The national ministry, MHRE, will need to continue to act as de facto regulator, working with provincial governments to help ensure a degree of consistency across PPP or other contractual arrangements being developed at the provincial level. Clarity on sector financing and funding arrangements is also needed; this could include establishing a "national water fund", as has been proposed under previous World Bank technical assistance engagements to support infrastructure development and access expansion.

Table 7: Water sector actions

Action	Central Government role	Provincial Government role	WBG and development partners role
Establishing clear contractual and regulatory frameworks for investment			
Complete updates to sector legal framework	• Approve all decrees linked to the Water Law • Prepare and adopt the decree or organic law transferring ownership of water supply infrastructure to provincial authorities		Approval of decrees and adoption of law to transfer asset ownership supported as action and trigger respectively under DPO
Clarify plans and institutional responsibilities	• Finalize and adopt revised National Water Policy to clarify sector roles and responsibilities under decentralization (including between national, provincial, and city governments) and set out target levels of service	• Define Provincial-level priorities based on national plan, building in cross-sector synergies • Communicate with private sector and other stakeholders at Provincial level around vision for the sector	Ongoing TA to support development of National Water Policy, alongside bilateral donors
Prepare PPP arrangements	• Eventually, develop standard concession contracts (under regulator); in the interim, coordinate between Provinces on development of contracts to foster consistency	• Undertake initial sector structure and PPP options analysis based on financial model of potential PPP structures and wide consultation • Engage with relevant stakeholders (including REGIDESO, City Hall, and operators) to normalize or otherwise transition existing contracts in water sector in Goma • For preferred PPP options, prepare detailed studies, contractual and tender documents, and conduct transparent, competitive process to select operators	Support preparation and tender process for initial pilot PPPs to establish model—could be with “stapled” WBG financing package as noted below

Action	Central Government role	Provincial Government role	WBG and development partners role
Build institutional capacity to manage concessions		• Define and establish by decree the entity (Régie) responsible for contracting water services, as required by the 2015 Water Law. As noted above this could in practice be established as a cross-sector entity for managing infrastructure sector assets and contracts • Build capacity of the Régie, including towards transitioning into an Asset Holding Company (subject to results of analysis of sector structure options)	• Technical Assistance support to define institutional arrangements for Régie Provinciale • Capacity-building for relevant Provincial authorities on all stages of developing and implementing concessions through hand holding and training—could be cross-sectoral as described above
Clarify SOE role	REGIDESO to plan and implement revised operating models and necessary supporting reform, supported by COPIREP	Engage with REGIDESO to agree role per city and sign appropriate contractual arrangement	TA to support development of National Water Policy ongoing and expected to continue under future sector IPF
Establish regulator and other national-level sector entities	• Approve decrees establishing ARSPE and OCE • Operationalize ARSPE and OCE, including appointing regulatory board and management team, developing business plans and allocating budget • Build ARSPE capacity and tools, particularly in tariff-setting		• Approval of decree establishing ARSPE already supported as action under DPO • Financing for operationalization and Technical Assistance for capacity-building to ARSPE, could be incorporated in future IPF
Blended finance or subsidies, and/or public investment			
Financing	Establish national water fund and define modalities (could include combination of capital grants and results-based subsidies)		Provide financing packages for pilot PPPs—could involve a combination of concessional financing for upfront capital grants and results-based financing

Digital Infrastructure

With the arrival of international fiber connectivity, North Kivu is seeing rapid investment in digital infrastructure. Mobile network operators are taking the opportunity to strengthen existing networks, and along with independent internet service providers are offering a wider range of options for home or office connections based on the expanding city-wide fiber network. Prices have started to drop, but remain high compared to neighboring countries, and out of reach for many households.

To foster competition and maximize the benefits to users from these developments, updates to the legal and regulatory framework are urgently needed. First and foremost, the new Telecommunications Sector Law needs to be published in the Official Gazette. This law will formally liberalize the fiber sector, removing current barriers to entry (besides for those that are able to secure ad-hoc licenses), providing a sounder legal basis for investment, and enabling more competition in the sector. Ancillary law and policy will be needed to support this law, further ensure competition such as by setting out open access requirements for new fiber infrastructure, as well as to establish the legal basis for some of the bus models described below to extend or accelerate investment in expanding access. Regulatory oversight also needs streamlining and strengthening, both to reduce hurdles facing prospective market entrants to gain licenses, and to ensure quality standards.

The next priority for digital infrastructure development in North Kivu's urban areas will be to extend the reach of fiber connectivity. This will require investment in the "middle mile" consisting of backbone connections between urban areas, and build-out of metro rings in newly connected towns to support similar improvement and expansion of services as is currently being seen in Goma. Such investments are likely to happen anyway up to a point, as mobile network operators continue to strengthen networks by replacing existing microwave connections for cell towers with fiber (with the benefit of improving the quality and range of cell service along the routes)—particularly to larger population centers where a critical mass of business or higher-income residential users can justify the capital investment. Adjustment to fiscal regimes to simplify, reduce overlaps and improve transparency can help tip this balance, without necessarily reducing the overall revenue generated.

This process can be accelerated by taking advantage of planned road works to dramatically lower the cost of laying fiber between urban centers and to benefit communities along the routes. The World Bank's forthcoming PACT project provides an opportunity to develop and pilot an appropriate institutional and contractual model for this kind of co-investment, build on previous World Bank experience. Options would include financing the upfront cost as part of the road project and transferring the asset to a state agency to commercialize the fiber through a PPP—for example, the recently-established Congolese Fiberoptic Company (Société Congolaise de Fibre Optique – SOCOF) which is playing a similar role elsewhere in DRC—or structuring a PPP upfront under which the concessionaire would be responsible for the initial investment. Ancillary legislation under the new sector law would be needed to enable this kind of contractual structure in the sector.

However, the reach of networks developed on a purely commercial basis will remain limited—significantly expanding access will require public financial support. Under the new sector law, a Universal Access Fund is envisaged as a structure through which results-based financing or other forms of subsidy would be delivered. This fund needs to be operationalized, including establishing the national digital development agency to be charged with managing it. This should include analysis of connectivity gaps and

the best technical options to close those gaps, to minimize the public resource required to incentivize access growth. For example, this would include assessing the limits of viable fiber connectivity rollout. It could also include incentivizing innovative models for last-mile connectivity in more remote areas, such as Open Radio Access Networks (ORAN), under which all mobile networks use common cell tower infrastructure.

The centralized nature of the telecommunications sector in DRC means most of these actions fall to national government entities, as summarized in Table 8 below. The role of the Provincial Government is primarily one of coordination of activities and stakeholders across sectors, as described above, as well as advocating for a focus on the needs of the North Kivu in the priorities for funding or work programs of national entities. As the regulatory framework evolves to enable a wider range of partnerships for investment in fiber assets, the Provincial Government could potentially take a more proactive role in enabling investments, for example alongside any road or other infrastructure developments being undertaken at the Provincial level.

Table 8: Digital infrastructure actions

Task	Central Government role	WBG and development partners role
Liberalization to unlock commercial prospects (while ensuring adequate regulation for security)		
Complete updates to sector legal and regulatory framework under new sector law	• **Publish law** in the Official Gazette • Ministry of ICT to **develop ancillary legislation and policies**, including to clarify requirements for infrastructure sharing and to allow for models such as PPPs • ARPTC to **adjust regulatory practice to implement new law** by authorizing qualified entities to build international fiber breakouts (including mobile network operators)	• Technical Assistance (TA) to help draft ancillary legislation and policies on infrastructure sharing • DPO to support further regulatory developments, in particular with respect to open access
Rationalize fiscal regime	Adjust licensing and fees to simplify and to incentivize middle-mile investment (without net change in revenue), including: • Design separate licensing and taxation regimes for the first or second licensee on fiber backbone projects linking cities • Reduce or restructure taxes and royalty fees for extra frequencies and numbering (to enable investment in microwave middle mile)	
Streamline and strengthen regulatory oversight	• Ministry of ICT to empower provincial offices of ARPTC to fulfil aspects of licensing • Enhance ARPTC regional presence to strengthen oversight	Capacity building for ARPTC reduce frequency interference and clean up unlicensed providers
Establishing clear contractual and regulatory frameworks for investment		
Structure PPPs for laying domestic fiber backbone alongside road works	[Ministry of ICT and Ministry of Infrastructure and Public Works] to develop institutional model and PPP arrangements for laying fiber alongside all road rehabilitation or major works	Under new road rehabilitation project (PACT): support development and implementation of model to lay fiber alongside works, including additional financing cost as needed
Blended finance or subsidies		
Operationalize Universal Service Fund (USF) to support rural connectivity in under-served areas	• Establish a national digital development agency as provided for under the new law to manage the USF and allocate USF revenues received from operators to the fund • Improve coordination of coverage planning between mobile operators and the government. Operators should	TA to support the establishment of the digital development agency, and design and planning for the USF, including assessing potential for new models for rural provision

Task	Central Government role	WBG and development partners role
	submit roll out plans to the regulator or ICT Ministry twice a year • Prepare a national plan to identify connectivity gaps and viable technologies and business models to fill those gaps, to inform design of USF instruments	

Ground Transport

The clear priority in the ground transport sector in North Kivu is to continue to improve the road network, and to make the best use of scarce public resources to that end. As described in Section 2, this will involve a combination of continued investment in rehabilitating and reopening priority roads and adequate and timely maintenance, as well as regulation of road use, to ensure gains are maintained. A large majority of this investment will need to be publicly financed, given the low level of traffic and hence toll generation potential across most of the network, although further work is needed to assess toll levels and willingness to pay, particularly if more closely linked to improved maintenance in practice. Actions in the road sector therefore focus on how to make most efficient use of public resources.

As is being tested in North Kivu, decentralizing aspects of road management and maintenance could improve reactivity and efficiency. North Kivu's unilateral adoption of a decentralized system for basic road maintenance should be regularized, by amending the FONER law to enable provinces to collect and use tolls to fund basic road maintenance. As the Provincial Government is demonstrating, it is more efficient that toll resources generated on roads at the provincial level are collected and managed at the provincial level instead of being transferred to and from the central level, particularly given the correlation between road use and hence toll rates and regularity of basic maintenance needs, and the resultant more closely observable link between toll payments and maintenance quality. This would need to be accompanied by broader clarification of roles and responsibilities between central and provincial governments.

Better and more transparent planning and implementation of maintenance works will also improve efficiency of use of resources in the road sector. Currently, the allocation of FONER resources to the national road network is extremely opaque. Better planning of works will ensure better preservation of the road assets and will provide visibility to the Provincial Government for involving the private sector in basic road maintenance. For example, this could involve the regular publication of information on road status and maintenance plans, along with systems to allow for accountability for implementation of those plans in practice.

While investment is likely to remain largely public in the foreseeable future, contracting models that transfer more risk to the private sector could also improve efficiency in the sector. The most recent World Bank road sector project, Proroutes, already introduced performance-based contracting, under which part of the payment to the works contractor was a monthly payment based on a contractually specified service level being maintained over a period of three years after completion of the rehabilitation works, with penalties applied if the specifications were not met. This experience should be replicated and extended for future rehabilitation investments under the PACT project—potentially with longer durations and/or a larger proportion of payment through the performance-based mechanism to transfer more risk to the private contractors. There may also be scope for the Provincial Government to adopt elements of performance-based contracting in its contracts with private operators for basic road maintenance.

Lake transport infrastructure appears to be a lower priority, despite potential to improve safety—moreover, progress to this end would likely require reform improve sector management so is likely to take time**.** Further work is needed to understand the extent to which port capacity is a current constraint, and the likely expansion needs. As noted in Section 4 above, given the fragmented nature of Goma's current port operations, absent significant investment of effort and political capital in regularizing and rationalizing existing operators, expansion is likely to take the form of new greenfield sites; private

companies such as the Bralima brewery are already pursuing this option. The level of (mostly public) investment needed in safety improvement is relatively limited but is constrained by the sector's complex institutional structure. Previous World Bank engagements have set out a broad potential program of reform to this end (including reform of DMVN and creation of a funding mechanism for RVF) but there has been limited interest on the part of the relevant National Government entities to follow through. If this situation unblocks and stronger safety requirements are introduced, lake operators may also benefit from programs to support access to finance to enable continued fleet upgrade.

Air Transport

The short-term priority for investment in air transport infrastructure is to improve safety and security to comply with international standards for airport operations. This investment is already underway for Goma Airport, under the national airport company, RVA, with substantial support from MONUSCO and the World Bank, under a broader national program to improve DRC airports. The expectation is that these improvements will attract a wider range of air carriers to serve Goma; indeed, some carriers have contacted RVA and positioned themselves to create a presence at Goma once infrastructure work is completed and equipment is installed and operational.

Future upgrade passenger and freight terminals could potentially involve private sector participation, although attracting substantial private investment in the short to medium term is unlikely. Once safety improvements are completed, further investment is needed to increase cargo handling capacity and space and to provide safe transit for passengers. These investments could be financially viable based on fees charged, with ancillary revenue from improved services on the passenger terminal side providing upside potential. However, traffic volumes are smaller than would typically be considered attractive to a private operator, with the current COVID-19 crisis contributing to significant uncertainty around volumes in the near future. Most importantly, the presence of military troops and weapons (MONUSCO) within the airport perimeter is a significant deterrent to private investors, making private involvement unlikely in the short term. In practice, these investments are most likely to depend on the national priorities of RVA; the Provincial Government could play a proactive role in lobbying to that end.

Table 9: Transport sector actions

Action	Central Government role	Provincial Government role	WBG and development partners role
Improving efficiency of public investments			
Road Transport			
Reform the legal and regulatory framework to support more effective decentralization	• Amend the FONER law to enable provinces to collect and use tolls to fund basic road maintenance • Clarify roles and responsibilities of entities involved at central and provincial levels		Forthcoming road transport project (PACT) expected to include Technical Assistance (TA) components to support wide-ranging road sector reform
Strengthen planning of maintenance works	Improve planning of major maintenance works on the national network by the Office des Routes (OR) and FONER through more transparency of prioritization criteria and plans		TA under PACT project to support capacity-building by OR and FONER to improve planning
Adapt contracting to improve efficiency of road expenditures	Expand and extend use of performance-based contracting bundling road rehabilitation and maintenance	Review and refine model for contracting basic road maintenance	Continue to incorporate and strengthen performance-based contracting in the implementation of the new PACT project, working with OR and Cellule Infrastructure at the National Level. TA on performance-based contracting at the Provincial Government level could be incorporated subject to demand
Air Transport			
Complete safety and security upgrades	RVA to complete planned upgrades		Financing support under ongoing airports project