



AfCAP
Africa Community Access Partnership



Development of a Strategic Plan for the Establishment of Sustainable Road Research Capacity in the Research Division of Office des Routes (OdR) in the DR Congo

Final Report (Translated from French)



SMEC Kenya Ltd

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Summary

1. This Final Report is the sixth deliverable of the study. It follows up on the Inception Report, the Preliminary Report, the Report of Workshop No. 1, the Draft Final Report and the Report on Workshop No. 2. It incorporates the recommendations made by the stakeholders following Workshop 2 and AfCAP comments on the Draft Final Report. It presents again, updates and completes the five chapters of the Draft Final Report and its appendices. It is introduced by an executive summary.

2. The fifth chapter has been particularly revisited. It presents the strategic plan developed and updated by SMEC. In particular, it discusses the specific objectives, mission and organizational framework of the Road Research Center (RRC), as well as the plan for its creation and implementation. This diagram presents the three-phase strategy of the project, including the preparatory phase, the transition-start phase with the technical assistance of AFCAP to effectively change the Research and Development Department (RDD) of the Office des Routes (OdR), ex Research Division, in Road Research Center (RRC), RRC public institution and the operational phase or regular operation of RRC. The transition phase should not exceed three years. It ends with the development of a program of short, medium and long-term actions.

3. The annexes to the updated and completed report deal with the strengthening of human and material capacities, including the need for human resources and the need for funding for the Road Research Laboratory (RRL) and the database.

Keywords

Strategic Plan, Action Plan, RRC, Road Research potential Areas, Matrix of Strengths and Weaknesses, Matrix of Responsibilities, Transport Policy, Specific Objectives, Road Research Laboratory.

RESEARCH FOR COMMUNITY ACCESS PARTNERSHIP (ReCAP)

Safe and sustainable transportation for rural communities

ReCAP is a research program funded by UK Aid to promote safe and sustainable transport for rural communities in Africa and Asia. ReCAP includes the African Community Access Partnership (AfCAP) and the Asian Community Access Partnership (AsCAP). These partnerships promote the sharing of knowledge among partner countries to promote the adoption of proven and low-cost rural access solutions that maximize the use of local resources. The ReCAP program is managed by Cardno Emerging Markets (UK) Ltd.

See www.afcap.org

Acronyms

ABEDA	Arab Bank for Economic Development in Africa
AASHTO	American Association of State Highways and Transportation Officials
ACGT	Agence Congolaise des Grands Travaux
AfCAP	Africa Community Access Partnership
AfDB	African Development Bank
AOEF	Afrique Occidentale et Equatoriale Française
AsCAP	Asia Community Access Partnership
BCECO	Bureau Central de Coordination
BE	Bureau d'Etudes
BNETD	Bureau National d'Etudes Techniques de Développement (Cote d'Ivoire)
BTC	Bureau Technique de Contrôle
BTP	Bâtiment et Travaux Publics
CA	Conseil d'Administration
CDF	Congolese Franc
CEBTP	Centre d'Expertise du Bâtiment et des Travaux Publics (France)
CG	Central Government
CI	Cellule Infrastructures
CNPR	Commission Nationale de Prévention Routière
CPR	Conseil Provincial de la Route
CREN-K	Centre de Recherche Nucléaire de Kinshasa
CRGM	Centre de Recherche Géologique et Minier
CRR	Centre de Recherches Routières (Belgium)
CRR-LNTP	Cellule de Recherche Routière
CTI	Commission de Transports Intérieurs
DAFM	Direction Administrative, Financière et des Marchés
DB	Data Base
DBDP	Département de l'Informatique, de la Base des données et des Publications
DERD	Département d'Etudes, de Recherche et de Développement
DFID	Department for International Development
DG	Direction Générale
DGME	Département Géotechnique, Matériaux Naturels et Environnement
DMLB	Département des Matériaux liés et des Bétons
DPOD	Département des Ponts, Ouvrages d'art et Drainage
DRC	Democratic Republic of the Congo
DRD	Département de Recherche et Développement
DRR	Division de la Recherche Routière
DS	Direction Scientifique
DSCR	Document Stratégique pour la Croissance et la Réduction de la Pauvreté
DSRM	Département de la Sécurité Routière et de la Mobilité
DTT	Direction des Transports Terrestres
DTSR	Département des Technologies et Structures Routières
DVDA	Direction des Voies de Desserte Agricole
EPS-CRR	Elaboration d'un Plan Stratégique pour la mise en place d'une Capacité de Recherche durable sur les Routes au sein de la division de la recherche de l'office de routes en RDC
EU	European Union
FAC	Fonds d'Assistance à la Coopération
FIS	Fonds d'Intervention Scientifique
FONER	Fonds National d'Entretien Routier
GA	General Assembly of UN
GL	Graveleux latéritiques
IFSTTAR	Institut Français des Sciences et Technologies, des Transports, de l'Aménagement et des Réseaux (French institute of science and technology for transport, spatial planning, development and networks)
INBTP	Institut National de Bâtiments et Travaux Publics
INPP	Institut National de Préparation Professionnelle

ISTA	Institut Supérieur des Techniques Appliquées
JICA	Japan International Cooperation Agency
LCPC	Laboratoire Central des Ponts et Chaussées
LMSG	Laboratoire de Mécanique des Sols et de Géotechnique
LNTP	Laboratoire National des Travaux Publics
LT	Long Term
MDR	Ministère du Développement Rural
MESU	Ministère de l'Enseignement Supérieur et Universitaire
MIPWR	Ministry of Infrastructures, Public Works and Reconstruction
MPWI	Ministry of Public Works and Infrastructures
MOER	Manuel d'Opérations de l'Entretien Routier en RDC (FONER)
MPLAN	Ministry of Planning
MRD	Ministry of Rural Development
MSTR	Ministry of Scientific and Technological Research
MT	Mid Term
MTC	Ministry of Transport and Communication
NIS	National Institute of Statistics
NR	National Road
OdR or OR	Office des Routes
ONRD	Office National de la Recherche et du Développement
OVD	Office des Voiries et Drainage
PF-UNIKIN	Polytechnic Faculty of University of Kinshasa
PME	Petite et Moyenne Entreprise
PPP	Public-Private Partnership
PWC	Public Works Company
RD	Research and Development
RDD	Research and Development Department
ReCAP	Research for Community Access Partnership
RPP	Routes Provinciales Prioritaires
RPS	Routes Provinciales Secondaires
RR	Road Research
RRC	Road Research Center
RT	Road Transport
RUG	Université d'Etat à Gand (Belgique)
RVA	Régie des Voies Aériennes
SMEC	Snowy Mountains Engineering Corporation
SPE	Service Présidentiel d'Etudes (ex-Zaire)
SR	Scientific Research
ST	Short Term
SWOT	Strengths, Weaknesses, Opportunities and Threats
TFP	Technical and Financial Partners
ToR	Terms of Reference
TRL	Transport Research Laboratory
TRRL	Transport and Road Research Laboratory
UGP	Unité de Gestion des Programmes (AfCAP)
UKAid	United Kingdom Aid
UN	United Nations
UNAZA	Université Nationale du Zaïre
UNDP	United Nations Development Programme
UNIKIN	Université de Kinshasa
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
USD	US Dollar
USPRA	United States Public Roads Administration
WB	World Bank

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1 Executive summary

1. The Democratic Republic of Congo is a vast country straddling the Equator, with an area of 2,345,409 km², and shares 9,165 km of borders with 9 neighboring countries. It is divided into 26 Provinces. Its population was estimated at 85 million inhabitants in 2016, of which 70% live in rural areas, with an average age of 21.6 years.

2. Its relief is diverse with a central basin that occupies 48% of the country, plateaus that gradually rise to the mountains that stretch from the north-east to the south-east of the country and which culminate at an altitude of more than 5000 m at the Peak Marguerite of Mount RUWENZORI. The bulk of the country is on the Congo River basin which is characterized by a dense hydrography around the river and high rainfall reaching more than 2,000 mm/ year in the basin. The climate is hot and humid with two seasons of varying lengths in the country, including a longer rainy season and a dry season.

3. The DRC is a semi-landlocked country that occupies 80% of the Congo Basin, a 4,300 kilometers long river, which forms the backbone of its multimodal transport system, consisting of the four traditional modes. The 152,400 km long road network has only 5% of paved roads. For various reasons, this transport system no longer works optimally to meet the needs of the population and the development of the DRC.

4. In order to address such situations and meet the basic need for mobility of Africa's rural populations, the African Community Access Partnership (AfCAP), a research and knowledge dissemination program, was born. In order to set up expertise for research and sharing of knowledge on community access in the Democratic Republic of Congo, AfCAP, managed by Cardno Emerging Markets Ltd, has granted a request from the Government of the DRC to receive technical assistance with a view of setting up expertise for road transport research. This task was entrusted to SMEC.

5. The overall objective of the mission is to help establish the Research Division of the Roads Office (OR) within the Ministry of Infrastructure, Public Works and Reconstruction (MIPWR). This task carried out by SMEC, with the participation of road research institutions such as the Polytechnic Faculty of the University of Kinshasa, consisted of: (i) Conducting a needs assessment study, in accordance with the mandate of MIPWR, in general, and the OR in particular, for the establishment of research capacities in the DRC; (ii) Prepare a strategic framework to guide future research activities related to transportation; (iii) Prepare a strategic plan for the identification and implementation of priority research activities within the OR Research Division in the short, medium and long term.

6. This task entrusted by "Cardno Emerging Markets (UK) Ltd, AfCAP Program Executing Agency, to the Consultant (SMEC) took place in six (6) important milestones whose deliverables, defined below as in the Terms of Reference (ToRs): (i) The Inception Report; (ii) the preliminary report; (iii) Workshop 1

and Workshop 1 Report; (iv) The Draft Final Report; (v) Workshop 2 and Workshop Report 2; (vi) The Final Report.

1.1 The Diagnosis

7. Information collected on Road Transport (RT) and Road Research (RR) survey in the DRC shows the following, presented in the matrix of strengths and weaknesses drawn up for this purpose:
- i. Road transport that is not functioning properly, hampers the country's development and does not contribute to poverty reduction. There is a clear correlation between poverty and poor road conditions.
 - ii. The need for reform to clarify and improve the management of the sub-sector, whose institutional framework is characterized by a multitude of underperforming stakeholders, sometimes in competition.
 - iii. Road research has a place in the implementation of the reform, and can play a role in improving the road sub-sector to help reduce poverty in the DRC.
 - iv. The existence of Visions and Objectives of Transport and Research, is the basis for the establishment of road transport research in the DRC.
 - v. The existence of the relevant provisions for the promotion of research in Road Transport research, in the Constitution and in the Ordinance n° 17/025 of July 10, 2017 setting the responsibilities of the Ministries.
 - vi. The existence in the DRC of a summary organization of Road Research (to be improved), with its anchoring to the National Laboratory of Public Works (LNTP).

1.2 The Policy Framework for Road Research in DR Congo

1.2.1 The Road Research Policy proposed by SMEC:

8. The proposed policy aims to contribute to the realization of the DRC's vision for road transport by 2030 and beyond. The DRC's vision for the road sub-sector, based on the sub-sector reform study, is as follows: 'An all-weather road network for sustainable transport, serving national integration, economic development and poverty reduction'.
9. Thus, "The Road Research Policy is to guarantee the DRC, through a scientific approach, an all-weather road network, for sustainable transport at the service of national integration, economic development and reduction of poverty".
10. In order to contribute to better road network management, and to contribute to improving the quality and sustainability of roads, with a view of ensuring sustainable, safe and accessible all-weather transport, the Consultant has drawn up, as a guide, a list of potential areas and examples as well as RR topics.

1.2.2 The objectives of the Road Research Policy in the DRC are as follows:

- General objective: Contribution to the sustainable development of the DRC, through the improvement of the governance of the road sub-sector and the management of the road network, to maintain in good condition in all weather;
- Specific objective 1: Contribution to the improvement of the legal and regulatory framework of the governance of the road sub-sector;
- Specific objective 2: Improved management of the Road Database;
- Specific objective 3: Contribution to the protection of road assets;
- Specific objective 4: Contribution to improving the protection of road users;
- Specific objective 5: Contribution to improving the quality and sustainability of the road.

1.2.3 The Institutional Framework for the implementation of the RR Policy in DR Congo includes the following main stakeholders:

- 1) At the political level of the Central Government, the ministries to be involved are:
 - Ministry of Planning: To include RR in programs and mobilize finance;
 - Ministry of IPWR TPR: Supervision and steering of road research;
 - Ministry of Transport and Communication Channels (MTCC): To integrate RR results into national transport policy and road transport regulations;
 - Ministry of Scientific Research and Technology: To support the RR;
 - Ministry of High Studies and Universities: To contribute to the RR.
- 2) Provincial Political Level: The Governor and his Provincial Executive who, as Provincial Owner, will collect data, support RR activities and apply RR results in the field.
- 3) At operational level: The Road Research Center (RRC).
 - The CRR is the main body of road research in the DRC. The characteristics required for its proper functioning are the following: (i) Administrative and financial autonomy; (ii) Adequate, motivated and multidisciplinary staff with appropriate qualifications for the road research mission; (iii) Management principles including independent research, governance, partnership or collaboration involving all relevant or interested organizations.
 - Its institutional anchoring to MITPR and its organizational framework must facilitate the execution of its mission with efficiency, effectiveness and all the rigor of science.
 - The National Partners of the CRR are the Road Management and Exploitation agencies and the Universities, namely:
 - i. Universities through research work with professors and with students;

- ii. The Central Government and Provinces road network management organizations, including the availability of difficulties encountered and data, and the monitoring and implementation of research results;
- iii. Regulatory bodies for planning and management of road transport services, for the integration of road research results into transport policies and regulations;
- iv. Supervisory bodies and control of execution of road works.

The Consultant has drawn up the Responsibilities Matrix describing the responsibility and the role of each of the stakeholders involved in Road Research.

1.2.4 Potential sources of funding for RR in the DRC are:

- National Sources: General State Budget, Fund for Scientific Intervention, Own Funds and FONER Resources;
- External Sources: Financing provided for in SDG 17, Resources for Institutional Support Component for Infrastructure Projects and International Cooperation known as Technical and Financial Partners (TFP).

11. It should be noted that the Policy Framework presented by the Consultant takes into account two major recommendations made by stakeholders at Workshop 1 on 29 September 2017, namely: (i) The body responsible for the RR in the DRC, must have the status of a Center or Institute of RR, having a legal standing; and (ii) It must be financed mainly by: the State Budget; the Scientific Intervention Fund of the MRST, the National Fund for Road Maintenance (FONER) and own funds.

12. The first recommendation to have an organization having a legal standing takes to the removal of the agency responsible for road research from the Roads Office. This must justify, in the phase 2, the change of the title of the project as follows:

« Development of a Strategic Plan for the establishment of a sustainable research capacity on roads within the Ministry of Infrastructures and Public Works in DR Congo».

1.3 Draft RR Strategic Plan in the DRC

1.3.1 Body responsible for RR in the DRC and its Vision

13. The Road Research Center (RRC) is the body responsible for road research in the DRC. Its vision: "To be the public body contributing to ensuring, through its scientific research, the all-weather availability, of road transport, which is safe and accessible to all throughout the DRC, with a view to its integration and sustainable development".

14. Its mission is to contribute, through its research, to improving connectivity between all rural and urban localities in the country through infrastructure that ensures, all weather, regular, affordable, reliable and safe road transport services. By making available reliable to the agencies or bodies in charge of the management and the exploitation of the roads of the DRC, technical tools of

design, construction, control, maintenance and management of all the roads of the country, the main infrastructures for both national and regional integration.

1.3.2 Operational Principles of the RR Body

15. For reasons of effectiveness and efficiency of its management, the RRC must favor management principles that involve other stakeholders in the transport and scientific research sectors. It should seek synergies with road management and road transport regulators, to efficiently and cost-effectively perform actions in areas of proven competence of these bodies (e.g. with the LNTP, the OdR, ACGT, BTC, CPR in Province ... etc. It should also develop partnership agreements with University Training Institutions and other International Road Research Centers for Institutional Capacity Building.

1.3.3 Institutional Anchorage

16. The CRR is under the supervision of MITPR, which is responsible for the design, construction, modernization, development, development and maintenance of road infrastructure. The anchoring of the CRR in MITPR derives its legal basis from the provisions of the Constitution of the DRC, especially articles 202 and 203, paragraph 21, and those of the Ordinance n° 17/025 of 10 July 2017, determining the responsibilities of the ministries.

17. The RRC shall maintain collaborative relationships with all other stakeholders in the MITPR and MTVC trucking sub-sector as well as with the relevant services of the MRST, MESU and Provinces (CPR).

1.3.4 Statutory and management bodies of CRR

18. The CRR is a public institution of a scientific and technical nature which must be governed by the Law n° 08/009 of 07 July 2008 laying down general provisions applicable to public establishments. Its statutory bodies are: (i) the Board of Directors; (ii) the General Management and (iii) the Board of Auditors.

The Board of Directors of CRR will be composed of five (5) representative members of MPLAN, MITPR, MTVC and MRST, as well as the Managing Director of CRR.

1.3.5 Appointment of Senior Management and Scientific, Technical, Administrative and Financial Staff

19. The Managing Director and the Deputy Managing Director are recruited on the basis of competitions organized by the Board of Directors, based on pre-established criteria. They are appointed by the Competent Authority, on the proposal of the Board and the Minister responsible. The Scientific and Administrative and Financial Directors are appointed by the Director General on the basis of the results of the recruitment competition approved by the Board. The other members of the Scientific, Technical as well as Administrative and Financial Staff are recruited and appointed by the Managing Director, on the basis of the results of the recruitment contest organized by General Management and approved by the Board of Directors.

20. A manual of the administrative, financial and accounting procedures of the CRR will be drawn up with the technical assistance to be put in place with the help of TFPs, particularly AfCAP, in the transition and start-up phase.

21. The Staff Regulations should also be drawn up, in accordance with the legislation in force, to specify the method of recruitment, classification and benefits of CRR staff members. The conditions will be similar to those of other scientific research institutions in the country or abroad, especially in the area covered by AFCAP.

1.4 Diagram of creation and implementation of the CRR

22. The scheme for the creation and setting up of the Road Research Center comprises the following three phases:

1.4.1 Preparatory phase

- It is the consultation phase of key stakeholders for the implementation of CRR with the aim of obtaining the support of all key stakeholders in the promotion of road research in the DRC;
- It is to be initiated by the Ministry of Infrastructures, Public Works and supervision of the CRR;
- The consultation of the stakeholders must make it possible, in particular to:
 1. Approve the legal document creating the CRR by all the Ministries involved and the Provincial Executives;
 2. Approve the funding arrangements for CRR as recommended by the Road Research Policy Framework.

1.4.2 Transitional phase of starting the CRR

- This is the phase of the transformation of the Research and Development Department (DRD) from the Roads Office to the CRR, by setting up a CRR start-up unit; This cell will rely first on the LNTP not to interrupt the research activity;
- This start-up unit should benefit from AFCAP technical assistance, to ensure the successful execution of the tasks related to the preparation of the gradual implementation of the CRR, in particular the following:
 1. Prepare the legal instruments required to govern the CRR;
 2. Evaluate the priority building needs, in materials and equipment including the LRR and the BDD;
 3. Prepare a recruitment and training plan, where appropriate, for scientific, technical, administrative and financial personnel;
 4. Prepare the first five-year RR program in the DRC.

1.4.3 CRR operational phase

- Make the RRC operational by bringing together the optimal conditions for its operation, mainly the following actions to be carried out by the MIPWR:
 1. Take and make public the guidelines of creation and operation of the CRR;
 2. Provide infrastructure and furniture to house and equip the RRC;
 3. Set up the CRR Board of Directors;
 4. Recruit the Managing Director of CRR;
 5. Acquire materials and equipment necessary for the operation of the CRR;
 6. Recruit the rest of the staff;
 7. Initiate and carry out activities that contribute to the achievement of the objectives of Road Research.

1.5 Priority actions of CRR by development phase

23. The development phase of the CRR proposes the priority actions for the short term (first three years), the medium term (fourth to sixth year) and the long term. The RRC Management Bodies will be able to adapt and enrich them at the right moment.

1.6 CRR workforce by phase of development of its functions

24. Taking into account the status of the proposed RRC staff, which should be comparable to that of other research centers in the DRC and especially in the countries covered by AfCAP, needs and staffing profiles will depend on the planned road research projects. Permanent staff and non-permanent experts were proposed.

1.7 Indicative budget forecast of CRR

25. Based on previous experience on RR in the DRC and the Center for Geological and Mining Research (CRGM), the estimated general budget of the CRR in operational phase (Research, Operation and Remuneration, excluding investments), with 30 researchers as well as ad hoc technical and administrative staff, is \$ 2 million per year. This budget covers the following:

- *Staff Costs*: to be borne mainly by the State Budget: 346,165U SD per year
- *Regular operating expenses*: State budget, own funds and part of FONER resources: 93,600 USD per year;
- *Research budget (as such)*: to be partly funded by resources from FONER, internal or external initiators of ad hoc studies or research projects, own funds, by the Scientific Intervention Fund (FIS) of the MSTR and others: 1.5 million USD per year.

26. *The investment budget (equipment, materials and training of ad hoc staff)*: The total initial investment budget, excluding real estate and furniture, at this stage of the study is estimated at 7,814,245 Euro for the RR Lab and at 1,035,650 USD for the Database.

27. The real estate area requirement (offices and laboratories or workshops) is roughly estimated, by cross-checking, to 1,200 m² on the ground floor.

1.8 Action Plan with CR Implementation Schedule

28. The actions to be undertaken for the creation, for the progressive establishment of the CRR and for the accomplishment of its mission are presented in the Action Plan. This action plan specifies the person in charge, the period of implementation, the indicator to evaluate the implementation of each action.

1.9 Monitoring and Evaluation of the implementation of the RR Strategic Plan

29. To monitor and evaluate the implementation of the RR Strategic Plan in DR Congo: *(i) the monitoring procedures; (ii) Evaluation Mechanisms and (iii) Performance Indicators for the dashboard* are indicated.

1.10 Risk Factors and Mitigation Measures

30. The main risks likely to hinder or even block the implementation of this Strategic Plan for the promotion of RR in DR Congo have been identified and some measures likely to mitigate the identified risks are also proposed.

2 General

31. The Democratic Republic of Congo (DRC), a vast area of 2,345,409 square kilometers and populated of about 85 million inhabitants in 2015, is a semi-landlocked country which occupies 80% of the Congo basin. It is traversed from Southeast to Northeast, Northeast to Northwest and Northwest to Southwest by the Congo River which is 4,300 kilometers long, which, with its tributaries, is the backbone of its multimodal transport system, with the four traditional modes (fluvial-lacustrine, by road, by rail and by air). For various reasons, this transport system set up in colonial times no longer works optimally to the meet the needs of the population and development.

32. The dysfunction of DRC's transport system, particularly road transport system which affects the vast majority of the population, which is 70 per cent rural, does not facilitate the development of the economic and social sectors. This hinders the implementation of basic services and the population's access to these basic services like: education, healthcare, water, improved housing and others. It is one of the factors that hinders the development of the country and contributes to the poverty of its people.

2.1 Origin, justification and objectives of the study

33. « Quality transport is critical to reducing poverty, promoting economic and social development, and achieving other sustainable development goals. Rural people need infrastructure and transport services to access livelihoods, markets, health services, education and opportunities. »¹

34. It is in order to satisfy this fundamental need of rural populations in Africa, that the Africa Community Access Partnership (AfCAP), which is a program for research and dissemination of knowledge, was born. It is funded by the Government of the United Kingdom through its Department for International Development (DFID). AfCAP promotes safe and sustainable rural access in Africa through research and knowledge sharing between participating countries and the wider community.

35. To deepen the high-quality research agenda of which the member countries will own the results and integrate them in their future policies, and to install in African countries expertise for research and dissemination of knowledge on the subject, community access, AfCAP has established the Community Access Research Partnership (ReCAP)

36. In order to install and develop a sustainable road research capability in the DRC, AfCAP has agreed to a request from the Government of the DRC to receive technical assistance for the "development of a Strategic Plan for the establishment of a sustainable road research capacity within the Road Research Division of OdR in DRC."

¹ Paul Starkey, 2013, SLoCaT, UN-Habitat and IFRTD- Rural Transport Goals, Presentation to the Forum on Sustainable Transport / SSATP General Assembly in Dakar, Senegal..

37. This study was entrusted to SMEC. The overall objective of the mission entrusted to the consultant is to help build capacity for sustainable road research within the Research Division of the Roads Office (OdR) within the Department of infrastructure and public works (MITP) and develop a strategic plan for the implementation of its research mandate. The mission will also focus on the participation of roads research institutions such as the Faculty of engineering of the University of Kinshasa.

38. This mission aims to:

- Conduct a needs assessment study, in accordance with the mandate of MIPW, in general, and the OdR in particular, for the establishment of research capacities in the DRC. This evaluation will be carried out in the country, in consultation with the Director General of OdR and his team. Consultations with other stakeholders will take place if necessary, but with the approval of MIPW.
- Prepare a strategic framework to guide the future activities of transport research.
- Prepare a strategic plan for the identification and implementation of priority research activities within the OdR Research Division in the short, medium and long term.

39. This Final Report is the sixth deliverable of the study. It follows up on the Inception Report (IR), the Preliminary Report (PR), the Report on Workshop No. 1 (RW1), the Draft Final Report (DFR) and the Report on Workshop 2 (RW2). It incorporates the recommendations made by the stakeholders following Workshop 2 and responses to AfCAP comments on DFR.

40. As a reminder, one of these recommendations from Workshops No. 1 and No. 2 advocates for the agency responsible for road research in the DRC, the status of a Road Research Center (RRC), with legal personality and administrative and financial autonomy, in confirmation with the kick-off meeting and for a service accessible to all stakeholders managing or in service of roads in the DRC. The implementation of this recommendation results in the removal of the Road Research from OdR activities and its anchoring to MIPWR. The proposed Strategic Plan (SP) revolves around the application of this recommendation.

41. As an accompanying measure, the Consultant proposes a gradual detachment and transformation of the Research and Development Department (RDD) of the OdR, former Research Division, into a RRC during a transition and start-up period not exceeding three years. This report is therefore written from this perspective.

2.2 The Methodology followed and the Means implemented by SMEC

42. To fulfill its mission, SMEC followed the study methodology presented in its bid in accordance with the terms of reference and detailed in the inception report. This methodology was to carry out the activities around the following areas:

- information gathering;
- the processing of the information collected;

- Organization of workshops with stakeholders;
- Establishment of the team of ad hoc experts assigned to the study;
- Establishment of the schedule for carrying out the study;
- Report writing including relevant contributions from stakeholders.

2.2.1 Organization of the collection of information

43. In accordance with its methodology, SMEC collected information from the agencies likely to develop Road Research (RR) within them or to benefit from the results of the RR. And for the foreign RR agencies (outside DRC) and other organizations, the consultant resorted to research on the WEB.

44. The collection and processing of information on Road Transport (RT) and Road Research (RR) in the DRC has been structured according to the following nine (9) themes:

- 1) The general policy of Road Transport (RT) and Road Research (RR);
- 2) The institutional and administrative provisions governing RR in the DRC;
- 3) The current organization of RR in the DRC: Domains, Institutions involved, Sources of funding;
- 4) Constraints and strengths for the development of TR, particularly RR in the DRC;
- 5) Current capacities and capacity building needs of RR for human resources, infrastructure and equipment;
- 6) The potential needs (areas, themes, topics) relevant to the development of RR in the DRC;
- 7) Archiving, data bank and its accessibility as well as dissemination of RR results in the DRC;
- 8) Budget and funding of RR in the DRC;
- 9) Collaboration, cooperation and partnership with national or foreign RT and RR institutions.

45. The questionnaire, containing 87 tiered questions, was distributed to the project focal points, previously designated by the Infrastructure Unit (IC), representing the following agencies: Ministry of Infrastructure of Public Works and Reconstruction (MITPR); Roads Office (OdR or OR), the Directorate of Agricultural Roads (DVDA), the Congolese Agency of Major Works (ACGT), the National Road Maintenance Fund (FONER). The Consultant also consulted two representative structures of the sub-sub-sector of the RR, namely: the Center for Geological and Mining Research (CRGM) and the Polytechnic Faculty of the University of Kinshasa (F-P UNIKIN.).

2.2.2 Results collected and analysis of the information received

46. The results of the survey and analysis of information collected on RR in the DRC have been included in Chapter 2 of the Preliminary Report. They include the following points:

1. Simple questionnaire for the collection of information on RR in the DRC;
2. Organization of the RR survey;
3. Quality of the results of the RR survey;
4. Theme 1: The general policy of Road Transport (TR) and RR in the DRC;

- 4.1. Elements of RR policy formulation in the DRC;
- 4.2. Proposal of the general policy and objectives of the RR in the DRC as well as the vision and missions of the DRD of the OdR;
5. Theme 2: The Institutional and Administrative Provisions Governing RR in the DRC;
 - 5.1. Observations on the questioning of RR in the DRC;
 - 5.2. Brief History of RR in the DRC and its anchoring to the LNTP;
 - 5.3. Analysis of the institutional situation of RR in the DRC based on information collected;
 - 5.4. Institutional situation of RR abroad;
6. Theme 3: The current RR organization in the DRC:
 - 6.1. Structures that deal with RR in the DRC currently;
 - 6.2. Current areas of RR in the DRC;
 - 6.3. Current sources of RR funding in the DRC;
7. Constraints and strengths for the development of RR in the DRC;
 - 7.1. Constraints and strengths external to the RDD (OdR), structure in charge of RR in DRC;
 - 7.2. Results of the survey and analysis on the constraints and strengths of RR;
 - 7.3. Additional constraints and additional strengths of RR in the DRC;
8. Topic 5: Areas, Themes, Road Research Topics (RRs) that may be of great value to RR in the DRC;
 - 8.1. Evolution of RR areas and subjects outside the DRC;
 - 8.2. Proposal of potential areas of RR in the DRC.

Several of these results have been used in Chapters 3 and 4 of the Preliminary Report, which have become Chapters 2 and 3 of this draft final report, respectively.

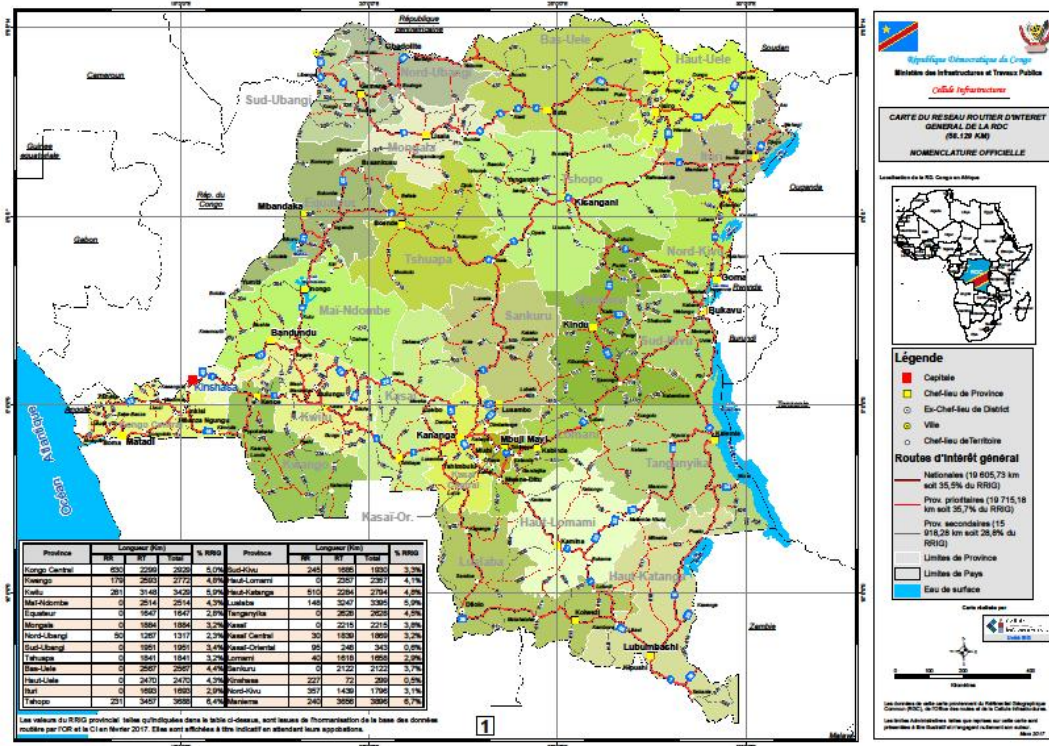
The benefit of the collection and analysis of information, reproduced in the appendix to this Final Report, essentially concerned the evaluation of human, material and financial capacities with a view of reinforcing them.

3 General context of the study

3.1 Presentation of the Democratic Republic of Congo

3.1.1 Geographical and administrative Location.²

Figure 3-1: Map of the priority road network of the DRC



47. The Democratic Republic of Congo (DRC) is a country in Central Africa straddling the Equator, between 5°20' north latitude and 13°28' south latitude on the one hand and between 12°10' and 33°27' longitude on the other hand. Its surface area is 2,345,409 km². It shares 9,165 km of borders with 9 countries, namely the Republic of Congo and the enclave of Cabinda (Angola) in the West; the Central African Republic and South Sudan to the North; Uganda, Rwanda, Burundi and Tanzania to the East; Zambia to the South-East and Angola to the South.

48. The Democratic Republic of Congo is a highly decentralized unitary state which is subdivided into 26 provinces, including the provincial capital of Kinshasa. In turn, the provinces are subdivided into 145 territories. The territories are subdivided into sectors or chiefdoms and cities.

49. The relief of the DRC is diverse. In the center is a basin which occupies 48% of the national territory and whose average altitude is 350 m. This basin is covered by a dense forest with many marshy

² National Institute of Statistics, 2014-Second Demographic and Health Survey in the Democratic Republic of Congo (EDS-DRC II), Ministry of Planning and Ministry of Public Health

areas. Around the basin there is a series of stepped platforms extending into the border countries, with the exception of the eastern part where the plateaus terminate in mountains with an average altitude of over 1,000 m. This is dominated by gravels, clays or stones.

50. The DRC has a hot and humid climate over most of its territory. In the cuvette, a high rainfall is observed, sometimes reaching 2,000 mm per year. This is accompanied by an equally high temperature with an annual average of 25°C. Rainfall and above all the temperature are lowered as we approach the mountainous relief of the east.

51. Influenced by relief, climate and hydrography, the subsoil and the soil also offer important and varied mining and agricultural potential.

3.1.2 Demographic Context³

52. In 1984, the date of the only Population Scientific Census (PSC) carried out in the country, the DRC had a population of 30.7 million people. Since then, for over 30 years, the population figures used have come from the projections made by the National Institute of Statistics (NIS) from the data of this scientific census. For example, by 2015, the total population of the DRC is estimated at 85 million, with an average growth rate of 3.3%. The country remains under-populated with only 36 inhabitants per square kilometer. However, the province of Kinshasa is characterized by a very high density, with 1162 inhabitants per square kilometer.

53. The spatial distribution of the population in 2015 shows that the DRC is still a predominantly rural country. 69.6% of the inhabitants reside in the countryside outside cities. Kinshasa comprises 13.6% of the population, and the rest of the urban area (other towns and cities) 16.8%. The distribution by age of the population presents the classic characteristics of the developing countries, with a massive preponderance of young people. Under 15 years of age constitute 46% of the population, the 15 to 59 years represent 50% and the over 60 years and more only 4% of the total population. Overall, women make up the majority (51%).

Table 3. 1 : Demographic characteristics of the population by place of residence in 2012

	Kinshasa	Other Urban	Urban Environment	Rural Environment	DRC
Population (%)	11.7	27.1	38.8	61.2	100
Age Structure (%)					
- 0–14 years	36.3	45.3	42.6	47.6	45.7
- 15–59 years	58.2	50.6	52.9	47.7	49.7
- 60 years and above	5.3	3.9	4.3	4.5	4.4
Total	100	100	100	100	100
Average Age	24.7	21.3	22.3	21.3	21.6
Median Age	21	17	18	16	16
Women (%)	52.6	50.6	51.2	50.6	50.8

Source : National Survey, 1-2-3, 2012, NIS, DRC

³ National Institute of Statistics, 2014-Global Survey Report 1-2-3, Ministry of Planning and Monitoring of Modernity, DRC

3.1.3 Household Infrastructures and Living Conditions ⁴

54. To highlight the effects of transport on people's lives, particularly their state of poverty, the following lines present the results of the 1-2-3 survey conducted by the Ministry of Planning from 2012 to 2014.

55. With regard to the comfort of housing, housing made of sustainable materials: 52.4% in urban areas and only 7.2% in rural areas.

56. Access to basic services such as water in the plot or inside housing: 32.5% in urban areas and 1.1% in rural areas.

57. The rate of access to drinking water is 85.1% in urban areas and 30.6% in rural areas.

58. The access rate to electricity is 15% for the whole country;

59. Access to school infrastructure takes more than 1 hour for 81.8% of the population.

60. With regard to access to a public or a private hospital, travel time is more than one (1) hour for 90.9% and 50% of households respectively.

61. Access to a road is more than one (1) hour for 86.4% of households. This indicator of accessibility of rural populations shows that less than 14% of households live within half an hour of a usable road as recommended.

3.2 Poverty and living conditions of households⁵

3.2.1 Overall Incidence of Poverty

62. According to the place of residence, poverty decreased by 10.6 points in rural areas, from 75.8% in 2005 to 65.2% in 2012. While in urban areas, it dropped from 61.8% in 2005 to 60.4% in 2012, a reduction of 1.4 points.

63. However, disparities remain glaring, the incidence of monetary poverty remains higher in rural than in urban areas. Poor consumption accounts for only 7.8% of national consumption. The Gini index, which was 39% in 2005, rose to 41% in 2012, reflecting an increase in inequality despite strong growth.

64. The incidence of poverty among individuals is very high in rural areas, roughly 80% compared to 31% in urban areas. This high incidence in rural areas is explained by relatively low levels of possession

⁴ National Institute of Statistics, 2014-Global Survey Report 1-2-3, Ministry of Planning and Monitoring of Modernity, DRC

⁵ National Institute of Statistics, 2014-Global Survey Report 1-2-3, Ministry of Planning and Monitoring of Modernity, DRC

of durable goods. On the other hand, it is very low in Kinshasa (6.25%) compared to all urban areas (42.11%).

3.2.2 Households causes of poverty

65. Lack of employment is the main cause of poverty. Congolese households, for the most part, consider work to be the main means of eradicating poverty, with nearly 66 per cent of them believing that lack of work is the main cause of poverty in the country. Whether they are in the public or private sector, in the formal or informal sector, or whether unemployed, retired or inactive, the finding is the same.

66. With "lack of roads", "lack of land" or "flock", the insufficiency or absence of factors of production (wages, agricultural prices) thus represent 85.3% the main causes of poverty. Congolese households know that wealth is created by production. A tiny fraction of households (4.1%) think of non-economic causes such as witchcraft or laziness.

Table 3. 2 : : Incidence of Poverty in 2005 and 2012 by Place of Residence and Province INC

Geographic Zone	Incidence of Poverty (%)			
	Monetary			Non-monetary or living conditions
	2005	2012	Gap	2012
Urban	61.8	60.4	-1.4	31.24
Rural	75.8	65.2	-10.6	79.7
Province				
Kinshasa	41.9	36.8	-5.1	6.25
Bandundu	88.5	74.6	-13.9	75.77
Bas-Congo	70.1	56.9	-13.2	59.21
Katanga	69.5	66.6	-2.9	52.44
Eastern Kasai	62.7	78.6	15.9	79.86
Western Kasai	55.4	74.9	19.5	74.81
Equator	93.7	77.3	-16.4	78.38
North-Kivu	72.8	52.4	-20.4	53.38
South-Kivu	84.8	60.2	-24.6	66.76
Maniema	59.4	62.9	3.5	83.83
Eastern Province	75.9	56.9	-19.0	70.78
DRC	71.3	63.4	-8.0	60.88

Source : NIS, 1-2-3 survey of 2005 and 2012

Table 3. 3 : Main causes of poverty by environment (% of households)

Determinants of poverty	Place of residence		
	Urban	Rural	Total
Primary Cause that determines poverty according to the respondent			
No Job	77.2%	59.1%	65.6%
No Education	3.1%	6.1%	5.0%
No Flock	0.5%	2.9%	2.0%
No Land	1.3%	3.5%	2.7%
No Road	3.9%	11.9%	9.0%
Laziness/Witchcraft	2.9%	4.7%	4.1%
Mismanagement / Corruption	5.4%	3.4%	4.1%
Insufficiency, fall in incomes (wages, prices of agricultural products)	4.4%	6.8%	5.9%
Other	1.3%	1.7%	1.5%
Total	100 %	100 %	100 %

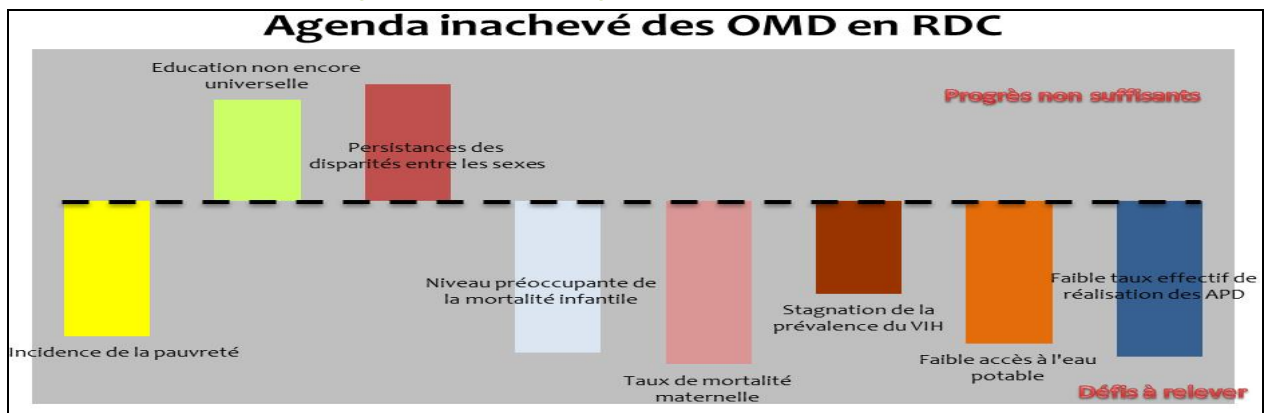
Source : NIS, 1-2-3 survey of 2012

3.2.3 Summary and lessons learned from the Millennium Development Goals ⁶

67. As a signatory to the Millennium Declaration on "Poverty eradication as an ideal means of achieving sustainable development for all", the DRC has been implementing the Millennium Development Goals (MDGs) for the period 2000-2015. Building on its commitments and despite a worrying security situation, the country has undertaken several reforms in key areas under the three Growth Strategy and Poverty Reduction Documents supported by the Government Action Programs (GAPs).

68. Despite efforts in a difficult and fragile context and despite considerable progress, the country has not achieved any of the MDGs and significant challenges remain, as illustrated in Figure 2 below:

Figure 3-2: Unfinished agenda of the MDGs in the DRC



Source : UNDP, 2016- National Report on Conceptualization and Prioritization of SDGs in the DRC, Ministry of Planning

3.3 Sustainable Development Program to 2030⁷

69. On September 25, 2015, a new set of global goals to eradicate poverty, protect the planet and ensure prosperity for all was adopted as part of a new Sustainable Development Program.

70. The Sustainable Development Program for 2030, also known as Agenda 2030 for Sustainable Development, is a set of 17 Sustainable Development Goals (SDGs) with 169 targets that are integrated and inseparable to reconcile the three dimensions of sustainable development: economic, social and environmental. This new Program is a follow-up to the Millennium Development Goals (MDGs) and aims to achieve what they have not been able to achieve, especially for the most vulnerable groups (paragraph 16). They also aim to achieve human rights for all, gender equality and the empowerment of women and girls (paragraph 20).

⁶ UNDP, 2016- National Report on Contextualization and Prioritization of SDGs in the DRC, Ministry of Planning

⁷ United Nations, Resolution 70/1 adopted by the General Assembly in New York on 25 September 2015.

3.3.1 Transport and the Sustainable Development Goals (SDGs)⁸

71. The Partnership on Sustainable, Low Carbon Transport (SLoCaT), a multi-stakeholder partnership of more than 80 organizations, including the United Nations and ReCAP, conducts studies aimed at achieving sustainable transport, to improve overall inclusive access to education and employment, reduce poverty, improve economic productivity and provide a healthier environment. The results of these studies, carried out with the support of UN-Habitat, DFID and GIZ, are reproduced in the following lines and highlight the contribution of transport to the achievement of SDGs.

72. Although sustainable transport is not represented by an autonomous SDG in Agenda 2030 for sustainable development, it is directly or indirectly integrated into many of the proposed SDGs, particularly those related to food security, health, energy, infrastructure, cities and human settlements, and climate change. Transport services and infrastructure are essential to achieve more if not all Sustainable Development Goals.

73. Transport contributes directly to five targets of SDGs: (i) road safety (target 3.6); (ii) energy efficiency (target 7.3); (iii) sustainable infrastructure (target 9.1); (iv) urban access (target 11.2) and (v) fossil fuels (target 12.c). This underlines that sustainable transport is necessary and essential to facilitate the achievement of a wide variety of SDGs.

74. It also contributes indirectly to seven SDG targets: (i) agricultural productivity (target 2.3), air pollution (target 3.9), access to drinking water (target 6.1), sustainable cities (target 11, 6), reduction of food loss (target 12.3), adaptation to climate change (target 13.1) and mitigation of climate effects (target 13.2).

3.3.2 Research and SDG

75. Targets 9.5 and 9.b of SDG 9 call for strengthening and supporting the research and development sector:

Target 9.5: Strengthen scientific research, enhance the technological capabilities of industrial sectors in all countries, especially developing countries, including by encouraging innovation and significantly increasing the number of people working in research and development for 1 million inhabitants and increasing public and private expenditure.

Target 9.b: Support the research, development and innovation activities of developing countries in the technology sector, including by creating conditions conducive to, inter alia, industrial diversification and value addition to commodities.

⁸ Phil Sayeg, Paul Starkey and Cornie Huizenga, 2014, SLoCaT Partnership, The Results Framework prepared with support from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and UN-Habitat (with funding provided by the Department for International Development, UK). Source URL: <http://www.slocat.net/sdgs-transport>

3.4 Transport Sector Context in the DRC

3.4.1 Brief presentation of the transport system and its management

76. The DRC is a semi-enclave country which occupies 80% of the Congo Basin, a 4,300-kilometer-long river, which forms the backbone of its transport system. The national transport system set up in the DRC is multi-modal, with the four traditional modes (fluvial-lacustrine, by road, by rail, by air). Infrastructure networks for the four modes consist of: 152,400 km of roads, 5,033 km of railways, 16,238 km of waterways and several airport platforms, including 54 airports managed by the Régie des Voies Aériennes (RVA) (Airways Authority), among which 4 are international class.

77. The road network of 152,400 km comprises 7,400 km of urban roads, 58,129 km of national roads and 86,821 km of local national roads commonly known as agricultural roads. National roads are divided into national highways (RN) with 20,683 km, provincial priority roads (RPP) consisting of 20,201 km and secondary provincial roads (RPS) with 17,245 km. Apart from urban roads, only 3,182 km of national roads are paved.

Table 3. 4 : Road network of countries of the Central African sub region

Country	Area Km ²	Main Road Network (RRP) Km	Paved Road Network (RRB) (*) Km	Paving rate ^(*) RRB/ RRP %	Total Road Density Km/100 km ²
Angola	1 247 000	26 000	8 000	31	2,1
Burundi	27 800	7 520	1 600	21	27,0
Cameroon	475 500	21 156	5 250	25	4,0
Central African Republic	623 000	9 307	900	10	3,0
Congo	342 000	5 047	1 675	33	1,5
Gabon	267 670	9 170	1 451	16	2,9
Equatorial Guinea	28 050	2 880	1 800	63	10,3
Democratic Republic of Congo	2 345 410	58 129	3 182	5	2,5
Rwanda	26 300	5 409	1 023	19	20,6
Sao Tomé et Príncipe	960	1 100	300	27	33,3
Chad	1 284 000	6 200	1 090	18	0,5
Total	6 666 900	147 314	21 439	15	2,2

Source : Report of the Basic Study for the Reform of the Road Sub-sector, Ministry of ITP / World Bank Dec.2015

78. Compared to other Central African countries, the DRC has the lowest paving rate in its main road network. Compared to the size of the country, the main road network has a low density of 2.5 km per 100 km², ie 25 m of road per km². This means that the territorial space is very poorly served by

roads. The access to all the territory is difficult and as a consequence, the difficulty of exploiting natural resources and the increasing poverty of Congolese populations.

79. All the networks in the transport sector are no longer harmoniously connected because of several breaks in loads; and have a low density of 0.074 km of communication channel per km². The low density of the networks and the absence of their interconnection, accentuated by the poor state of the infrastructure, have a negative impact on the functioning of the transport sector, which does not play its role as a locomotive of other economic and social sectors for the economic development of the country.

80. For various reasons, including the low level of funding mobilized, the DRC does not have a road network that meets the needs of the population and serves the economy. Barely 21.7% of the road network of the Roads Office (58,129 km out of a total of 152,400 km) are in good condition, 15.2% in fair condition and 63.1% in bad state.⁹ The road sub-sector is one of the important links in the country's transport system and its present state of affairs impedes the functioning of the whole system and prevents it from acting as the locomotive of the economy for development and reduction of poverty. The development and modernization of transport infrastructure networks, mainly roads, is an imperative necessity for the DRC's implementation of the Sustainable Development Program to 2030.

81. The various transport infrastructure networks are managed by several governmental agencies under the supervision of different Ministries. Under the constitutional provisions and Ordinance No. 17/025 of 10 July 2017 establishing the responsibilities of the Ministries, the road network is under the management of the following Ministries: (i) Ministry of Infrastructure, Public Works and Reconstruction (MIPWR) for roads of general interest and structuring roads, (ii) the Ministry of Rural Development (MRD) for local roads known as agricultural roads and (iii) the Ministry of Transport and Communication (MTC) for sector studies and planning through the Transport Studies Group (GET), as well as regulation of ground transportation services and road safety management on all roads through the National Center for Road Prevention (CNPR).

82. Under Article 203 of the current Constitution of the DRC, the Ministry of Infrastructure, Public Works and Reconstruction, which is the owner of National roads, manages concurrently the network at its expense with the Provinces, Owners of the rest of the road network (provincial and local roads)

83. For the operational management of the road network, several bodies have been established under the aegis of the aforementioned Ministries. The Roads Office (OdR) and the Office of Roads and Drainage (OVD), which are under the supervision of the Ministry of Infrastructure, Public Works and Reconstruction, are respectively responsible for National roads and urban roads. The Directorate of Agricultural Roads (DVDA), under the supervision of the Ministry of Rural Development, is responsible for local roads.

⁹ Report on the state of the general network at 31 December 2016, Office des Routes, presented by the GIS service of Cellule Infrastructures, Ministry of ITPR

Table 3.5 below summarizes and schematizes the aforementioned information.

Table 3.5 : Institutional framework for the management of road transport in the DRC

Current Road Classification (Ordinance No. 78-335 of 30 August 1978)			Current Situation (Ordinance No. 17/025 of 10 July 2017 and Statutes of Public Institutions and Public Services)		Provisions of the 2006 Constitution (Articles 202, 203 and 204)	
	Type of Road	Length of network (km)	Engineer	Owner	Engineer	Owner
Roads of General Interest (RGI)	National Roads	20.683	OoR	MIPWR - Central Government (CG)	OoR	MIPWR Central Government
	Provincial Roads	37.446			To define (CPR?)	MIPWR Provincial Government
Urban Roads	Urban Roads	7.400	OVD		To define (CPR?)	MPWI Provincial Government
Roads of Local Interest (RL)	Agricultural roads	86.871	DVDA	Ministry of Rural Development (VRD) Central Govt.	To define (CPR?)	MPWI Provincial Government
DRC Road Network		152.400	GET, ONPRA and DTT of the Ministry of Transport and Communication			

Sources : Constitution of the DRC, Ordinance No. 78-335 of 30 August 1978, Ordinance No. 15/015 of 21 March 2015, Statutes of Public Establishments, Roads Office and Basic Study Report for the Reform of the Road Subsector.

3.4.2 Need for Reform to Clarify and Improve Management

84. The presence of several players in this road subsector without coordination creates overlaps and duplication that do not allow to this important sector of economy support, to play its role as a locomotive. To improve the current situation, the Ministry of Infrastructure, Public Works and Reconstruction, with the support of the World Bank, carried out a study¹⁰ in 2015 aimed at reforming the road sub-sector in order to:

- 1° - improve the institutional, legal and regulatory framework of the subsector by complying with the Laws in force in the DRC;
- 2° - improve the performance of management agencies;
- 3° - increase the financial resources of the sub-sector (investment and maintenance) and improve their use;
- 4° - help improve the operational capacities of private entrepreneurs;
- 5° - clarify the relations of collaboration between the Ministries and the Provinces, having in their allocations the management of the road assets.

¹⁰ Basic Study Report for the Road Subsector Reform, Ministry of Infrastructures and Public Works / World Bank Dec.2015

3.4.3 The place of research to improve the road sub-sector

85. Research in this road sub-sector could help to implement the ongoing reform, particularly with regard to the organization of road network management. Knowledge of all road assets, definition of the new road classification and new technical specifications for road construction and maintenance should be the priority areas for road research, in order to ensure the sustainability of roads and their practicability in all seasons.

3.4.4 Road transport and poverty of local populations

86. The results of survey 1-2-3 carried out by the Ministry of Planning in 2012, published in 2014 and presented in Tables I.2 and I.3, indicate that the lack of all-weather roads constitutes, according to the perception of the people surveyed, the second cause of poverty, after the lack of paid work, according to the perception of those surveyed.

87. The state of the roads in the Provinces, as reported by the Infrastructure Unit's GIS Unit on the basis of the information provided by the Roads Office, gives percentages of road networks in poor condition proportional to the impact of poverty of Congolese living conditions in these Provinces. This corroborates the perceptions of those surveyed about the causes of their poverty. In other words, where roads are in poor condition, poverty is rampant because people's access to basic services is difficult. Hence the urgent need to improve road conditions to contribute to poverty reduction and the achievement of the other MDGs of Agenda 2030.

88. Chart I.1 at figure 3-3, based on data on the incidence of non-monetary poverty or living conditions presented in Table I.6 and on the state of the road network in the DRC Provinces, compiled in Table I.7, shows the correlation between the Congolese poverty status and the state of the national road network.

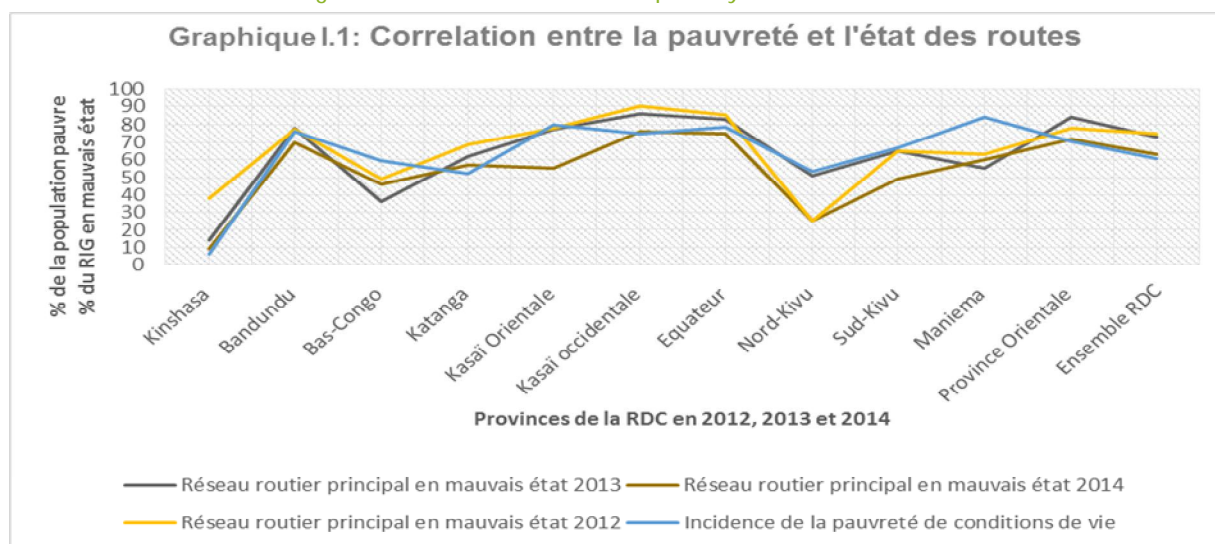
Table 3. 6 : Incidence of Poverty in 2005 and 2012 by Place of Residence and Province

Geographical Zone	Impact of Poverty in%				Road conditions as% of RIG		
	Monetary			Non-monetary or living conditions 2012 (published in 2014)	Road networks of provinces in poor condition		
	2005	2012	Gap		2014	2013	2012
Urban	61.8	60.4	-1.4	31.24			
Rural	75.8	65,2	-10,6	79.7			
Province							
Kinshasa	41.9	36.8	-5.1	6.25	9	14	38
Bandundu	88.5	74.6	-13.9	75.77	70	78	77
Lower Congo	70.1	56.9	-13.2	59.21	46	36	49
Katanga	69.5	66.6	-2.9	52.44	57	62	70
Eastern Kasai	62.7	78.6	15.9	79.86	55	77	78
Western Kasai	55.4	74.9	19.5	74.81	76	86	90
Equateur	93.7	77.3	-16.4	78.38	75	83	85
North-Kivu	72.8	52.4	-20.4	53.38	25	51	25
South-Kivu	84.8	60.2	-24.6	66.76	49	65	65
Maniema	59.4	62.9	3.5	83.83	61	55	63
Eastern Province	75.9	56.9	-19.0	70.78	72	84	78
DRC	71.3	63.4	-8.0	60.88	63	73	75

Table 3. 7 : State of the road network by Province in 2014, 2013 and 2012

Sources : NIS, survey 1-2-3 of 2005 and 2012 published in 2014 and MITPR Infrastructure Cell, Cartographic Catalog on Road Infrastructure (Note:% of networks not known and considered in poor condition: 0% in 2014, 12% in 2013 and 54.7% in 2012)

Figure 3-3: Correlation between poverty and road conditions



Sources : Graphic edited with data from the NIS and the Infrastructures Unit

4 Diagnosis of the road transport (RT) and road research (RR) sub-sector

89. Information received from the survey conducted by questionnaire, interview and on the WEB, with operational agencies in charge of service and road management in the DRC or likely to benefit from the results of RR in the DRC and their analysis constitute the essence of the diagnosis.

4.1 Current state of the road transport and research sub-sector

4.1.1 The National Vision and Existing Strategic Objectives

90. In the Growth and Poverty Reduction Strategy Paper - DSCR 2, the following is stated as regards the vision of the Government of the DRC and the Objectives to be pursued for its achievement:

4.1.1.1 For the transport sector

91. The Government's vision in the transport sector is to ensure national mobility in order to support economic growth and national security through the reform of the economic transport policy to achieve a modern transport system.¹¹

92. To realize this vision, the Government's strategy is to: (i) modernize the institutional and regulatory framework of the transport sector and sub-sectors; (ii) transform public enterprises in the sector into commercial companies in order to make them competitive, reliable and capable of providing regular and high quality services to the user; (iii) implement public-private partnerships to mobilize significant funding for infrastructure and equipment; (iv) upgrade the technical staff of the enterprises and the administration.¹²

93. For the road sub-sector, the basic study¹³ on its reform carried out by the Ministry of Infrastructure, Public Works and Reconstruction with the support of the World Bank, proposed the following vision:

" A major road network that can be used in all seasons and at the service of national integration, economic development and poverty reduction ".

94. For the realization of this vision, a strategy is proposed which is based on three axes:

- a. Improved governance of the sub-sector and management of the road network;
- b. Improving the mobilization and use of financial resources;
- c. Development of the operational capacities of the management agencies and the Entrepreneurs.

¹¹ Strategy of Growth and Poverty Reduction Document – DSCR 2, Paragraph 196, Ministry of Planning, 2011

¹² Idem, DSCR 2, Section 197

¹³ Basic Study Report for the Road Subsector Reform, Ministry of Infrastructures and Public Works / World Bank Dec.2015

4.1.1.2 For the scientific research sector

95. In its new vision¹⁴ of making scientific and technological research a tool for the sustainable development of the DRC, the Government has set itself three priority objectives:

(1) *Strengthen institutional capacity by:* (i) developing scientific and technical capabilities; (ii) development of the sector strategy; (iii) the updating of legal and regulatory texts; (iv) finalization of the Strategic Plan for the Development of Science, Technology and Innovation; (v) the finalization of the national science and technology research program and (vi) the organization of the donor round table.

(2) *Strengthening research supply capacities by:* (i) improving research infrastructure (equipment and rehabilitation of buildings housing central agencies and services); (ii) capacity building of researchers, (iii) construction of new research centers and clusters.

(3) *Strengthening the supply of scientific, technical and innovation knowledge by:* (i) carrying out studies in the key areas of life and (ii) enhancing research results.

4.1.2 The Institutional and Administrative Provisions of the Road Subsector and Research

96. The attributions of each Ministry are defined by the provisions of the Constitution as well as those of Ordinance No. 17/025 of July 10, 2017. Appendix 1 outlines the responsibilities assigned to each department. In this study, we take we concentrate on the responsibilities of the Ministries and public institutions that are considered relevant to promote road research in the DRC. The promotion of road research includes the actual activities of road research and the implementation of its results by the various agencies of the road transport sub-sector.

4.1.2.1 Ministry of Planning

- Planning and programming of the economic and social development policy of the Democratic Republic of Congo, notably through:
 - Preparation of the Economic and Social Development Plan, programming of its implementation and monitoring of its implementation;
 - Preparation of the capital expenditure budget, planning and monitoring of its execution;
- Coordination and integration of the various sectoral programs prepared by the Ministries, the Decentralized Territorial Entities and the economic and social actors;
- Study and appreciation of all the human, material and financial resources that must contribute to the implementation of the economic and social plan;
- Coordination of the mobilization of external resources and monitoring of their use to ensure their allocation to priority investments. This, at the level of development cooperation and in

¹⁴ Strategy of Growth and Poverty Reduction Document – DSCR P 2, Paragraph 280, Ministry of Planning, 2011

collaboration with the Ministries that have Finances and International Cooperation in their attributions; and monitoring their use to ensure allocation to priority investments.

4.1.2.2 Ministry of Infrastructure, Public Works and Reconstruction (MITPR)

- Design, construction, modernization, development, management and maintenance of road infrastructures, ports, airports, railways, hydroelectric power plants, school, health, social, tourist and sports, buildings and public buildings in collaboration with sectoral ministries concerned with infrastructure projects, where appropriate;
- Design, construction, management and maintenance of national drainage, sewerage and anti-erosion works;
- Development of building standards;

4.1.2.3 Operational Management agencies for the MIPWR Road Sub-Sector

A- Office des Routes (OdR)

97. Public enterprise created by Ordinance n° 71-021 of 26 March 1971 and transformed into a public institution by Decree n° 09/47 of 3 December 2009 fixing its statutes, the Roads Office has for its object the management of the network of national roads and related markets. It is the Government Consulting Engineer for all matters relating to national roads. In this capacity, it is:

- the conduct of studies and maintenance, development, modernization and construction of national roads network;
- the development, construction, maintenance and upgrading of civil engineering structures and ferries or road crossing points;
- intervention in the planning, construction, maintenance and modernization of other roads, civil engineering works and ferries attached to it, at the request of the Minister having public works in his / her jurisdiction;
- management of the National Laboratory of Public Works Publics ;
- the preparation, within the framework of national planning, of short, medium- and long-term programs aimed at achieving its objectives.

98. The organizational agency of the Roads Office comprises: a Board of Directors, General Management, a Board of Auditors, seven (7) entities directly attached to the General Management and five (5) operational departments, in charge of Research and Development which manages the National Laboratory of Public Works. This public establishment employs 3,956 people, comprising 756 executives.

B- Office des Voiries et Drainage (OVD)

99. Public enterprise created by Order no. 87-331 of 16 September 1987 and transformed into a public establishment by Decree n° 09/47 of 3 December 2009 fixing its statutes, the Roads and Drainage Office has as its objectives:

- to design, construct, maintain, control and monitor, develop, modernize and develop urban road and drainage infrastructure;
- to carry out or have carried out all the studies necessary for the definition, planning and realization of all road works and drainage works in conurbations, compatible with its financial, material and human resources;
- to carry out or have carried out the new or maintenance works relating to the road networks and drainage of conurbations following the programs established or proposed by the decentralized territorial entities;
- ensuring the supervision of works and studies;
- to participate, as a Technical Council, in the preparation of urban development plans for conurbations.

100. In its organization, the Roads and Drainage Office has a Board of Directors, a General Management, a Board of Auditors and ten (10) operational divisions, including the Board of Studies and Projects. It currently employs 988 people, 202 of whom are over 60 years of age.

C- National Road Maintenance Fund (FONER)

101. Public administrative and financial Institution, created by Laws n° 08/006-A and 08/009 of 07 July, 2008 and made operational by Decree n° 08/27 of 24 December, 2008 establishing and creating a public institution called Fonds National d'Entretien Routier, the mission of FONER is to collect and to administer the funds intended to finance actions relating to the maintenance and protection of the national road heritage. These funds are used to finance works and actions related to the maintenance and protection of national road assets. These include:

- carrying out studies of any kind, and in particular technical, economic and environmental studies prior to the establishment of a road maintenance program;
- carrying out routine maintenance and periodic maintenance work on the national, urban and rural priority road network, including bins, road structures and other related infrastructure, including roads and streets, sewage treatment;
- the construction, operation and maintenance of weigh stations and toll booths, rain gates and other control devices for the proper use of the road heritage;
- the execution of the actions of the Masters of Works committed to the maintenance and protection of the road heritage, in particular:
- public awareness campaigns; network inspection; the establishment of road maintenance contracts; qualitative and quantitative control of road maintenance works.

- the promotion of operations to improve the maintenance and conservation of road assets.

102. The organizational structure of the FONER includes: a Board of Directors, a General Management, a Board of Auditors and Central Directorates at headquarters in Kinshasa as well as Provincial Directorates.

D- Cellule Infrastructures (CI)

103. The Infrastructure Unit is a sectoral institutional support structure created by Ministerial Decree No. CAB / TPI / 024 / MN / FK03 / 2004 of 07 October 2004. Its main task is to provide institutional support to the MIPWR in its role as project owner of the infrastructure projects that fall within its docket, and to ensure the capacity building of public administrations and enterprises in the Public Works and Infrastructure sectors. It performs the following specific tasks in relation to assistance in the design, implementation and monitoring of investment and maintenance projects and programs in the Public Works and Infrastructure sector:

- Analysis and coordination of the presentation of investment projects and programs to different donors;
- Monitoring and definition of sector strategies in the medium and long term;
- Contribution to the technical, financial framework of the identified projects;
- Reconstruction of a technical documentary fund on all studies in the field of Public works and infrastructure;
- Representation of the Client, sectoral coordination of projects and interface with bilateral and multilateral donors for infrastructure and other projects under the Ministry of Public Works and Infrastructure;
- Management of reintegration to permanent public agencies, administration of public works, Roads Office, Roads and Drainage Office, BEAU for the management of previously outsourced infrastructure projects.

104. The organizational framework of the Infrastructure Unit comprises a Coordination, five (5) operational sections (Roads, highways, Public Buildings, Institutional Support and Administration and Finance) and 5 specialized services (Procurement, Financial Management, Internal Audit, Environmental and Social, and Geographic Information System (GIS), which manages a road data base.) It employs 56 people.

E- Agence Congolaise des Grands Travaux (ACGT)

105. The purpose of the ACGT is to coordinate, supervise and monitor the implementation of infrastructure projects specified in the Conventions and Collaboration Agreements signed between the Democratic Republic of Congo and the Chinese partners.

To this end, it is responsible for the following specific tasks:

- the creation of a technical documentary fund on all projects;
- the definition and planning of the infrastructure program;

- approval of feasibility studies (budgets, technical options, environmental and social impact assessments, etc.) after validation by the government's permanent agencies;
- designation of the perennial agency concerned, in this case the Roads and Drainage Office (OVD) and the Office des Routes as the contracting authority for each project, except where the expertise has not been established;
- the preparation of works contracts to be submitted for signature by the Minister of Infrastructure, Public Works and Reconstruction;
- supervision and coordination of the execution of the work;
- monitoring invoices and payments for works in collaboration with Sicomines or any other Chinese partners;
- the interface of the Projects with sectoral ministries and other public agencies;
- representation of the Client and sectoral coordination of projects under the Ministry of Infrastructure, Public Works and Reconstruction;
- facilitation of all matters related to the projects.

106. The ACGT employs 135 people, 8 of whom are over 60 years of age. Its organizational structure includes: a Management Committee, a General Management and seven (7) operational divisions, including the Department of Studies and Development. "It moves far more towards a design office for major road, railway, airport, port, hydroelectric and real-estate infrastructure projects. In its vision of a consulting firm, the ACGT trains its engineers in the areas it wants to develop and finance the acquisition of the appropriate equipment and software for the accomplishment of its new mission. Given the evolution of the ACGT to a government advisory office following the Ivorian model (National Bureau of Technical Development Studies "BNETD"), the text that governs it must imperatively be revised to adapt it to its new mission".¹⁵.

F- Bureau Technique de Contrôle (BTC)

107. The Technical Control Office, in the name of BTC, is a public service of a technical nature placed under the supervision of the Minister responsible for Infrastructure and Public Works. It was created in 1983 by Presidential Order No. 087-134 of 24 April 1987. The Technical Board of Control "B.T.C. has as mission:

- a) The technical and financial control in progress and the compulsory counter-evaluation of studies and civil works on behalf of the State and public enterprises. In other words:
 - 1°. analysis and evaluation of contracts prior to implementation, ie review of studies according to the terms of reference;
 - 2°. checking orders and works; of the work during and also after their execution with a view to their conformity with the studies and orders;
 - 3°. the preparation of monthly reports and the final report on the supervision of works;

¹⁵ Basic Study Report for the Road Subsector Reform, Ministry of Infrastructures and Public Works / World Bank Dec.2015, page35.

- 4°. the preparation of the expertise report and counter-expertise in the field of civil engineering (road, real estate, airport, etc.)
- b) The revision of the price variation formula commission and the updating of the general rules on public procurement.

4.1.2.4 Ministry of Transport and Communication (MTC)

The MTC's attributions are as follows:

- Organization and management of transport (air, land, river, lake and maritime transport);
- Operation of road, rail, marine, river, lake, airport and meteorological infrastructure;
- Accreditation of road, rail, marine, river, and lake transport and civil aviation equipments ;
- Qualification of technical personnel in road transport, in rail, in fluvial transport and civil aviation;
- Development of national transport policy;
- Coordinated development of all means and facilities of public transport.

4.1.2.5 The MTVC agencies involved in the management of the road sub-sector

G- Transport Study Group (GET)

108. The Transport Study Group (GET) was established by Ministerial Order No. 409 / CAB / MIN / TC / 029/91 of 11 July 1991 of the Minister of Transport and Communications, its organization and its current operation are governed by the Minister of Transport and Communications its current organization and functioning are governed by Order No. 409 / CAB / MIN / TC / 0119 / IKK / 2006 of December 13, 2006. Under the direct authority of the Minister of Transport and Communications, the task of the Transport Study Group is to:

- to provide advice to the Minister of Transport and Communications on transport sector development policies and strategies, by providing the necessary information, analysis and proposals for decision-making, as well as by working papers, summaries and application documents;
- develop a medium- and long-term development plan for the national transport system in line with national economic and social development objectives and targets;
- monitoring implementation and preparing the implementation report of the plan and proposing the necessary adjustments;
- to harmonize and coordinate the studies and planning of companies, services and organizations involved in the transport sector;
- to monitor developments in the transport sector through the organization, implementation and management of an integrated information system on the sector.

109. The organizational framework consists of a Management Committee, a General Management and five (5) Directorates, including the General Studies, Planning and Coordination Committee.

H- *Commission Nationale de Prévention Routière (CNPR)*

110. Established by Ordinance No. 78/478 of 26 December 1978 and currently governed by Ministerial Decree No. 409 / CAB / MIN / TVC / 0134/2006 of 18 December 2006, the National Road Safety Commission "CNPR", is a specialized technical service of the Minister of Transport whose activities cover the whole of the DRC. Its mission is to propose to the Government a concerted road prevention policy and to coordinate all studies and sectoral actions with a view to improving safety throughout the national road network.

111. The CNPR comprises a Steering Committee composed of five (5) members (President, Vice-President, Director of Studies, Technical Director and Chief Financial Officer) and is represented in each of the Provinces of the country by a Provincial Directorate comprising 19 entities administrative bodies representing all the stakeholders involved in road safety.

112. Confronted with organizational and resource problems, the CNPR needs to be restructured as recommended in 2005 to adapt it to global road safety management requirements¹⁶. It will not be able to contribute to the achievement of SDG 3, target 3.6. If this challenge is not addressed.

I- *Direction des Transports Terrestres (DTT)*

113. The Directorate of Land Transport (DTT) is responsible for:

- monitoring the application of the regulations on road and rail transport;
- monitor public infrastructure, equipment, road, rail and rail equipment, etc.;
- monitor the safety of road and rail transport of people and property;
- issuing security, ownership, suitability and operating licenses for road and rail transport.

114. The Directorate of Land Transport is organized into three divisions, including the Road Transport Operations Division, which is responsible for:

- apply and follow road transport regulations;
- monitoring road transport agreements and conventions;
- participate and follow the Internal Transport Commissions (CTI);
- carrying out technical surveys and issuing opinions on requests for authorization from public transport operators and auxiliary bodies (freight forwarders, garages, technical inspection bodies for motor vehicles, driving schools, travel agencies, cargo dealers, motor vehicle dealers, automotive aftermarket sales houses);
- develop national and regional transit planning plans;
- issue intercity, interregional and international transport permits;

¹⁶ Basic Study Report for the Road Subsector Reform, Ministry of Infrastructures and Public Works / World Bank Dec.2015, page24.

- issue freight authorizations;
- registration of motor vehicles and trailers;
- issue approvals for vehicle prototypes;
- maintain the statistics.

4.1.2.6 Ministry of Rural Development (MRD)

The MRD's attributions are:

- Development and implementation of rural development policies and strategies;
- Development, construction, rehabilitation, maintenance of basic socio-economic infrastructures in rural and peri-urban areas, including:
 - Agricultural roads and watercourses;
 - Sources of water, granular adduction and well drilling;
 - Rural electrification;

in collaboration with ministries of public works and infrastructure as well as electricity in their allocations.

4.1.2.7 The Operational Structure of the Road Sub-Sector under the MDR

J- *Direction des Voies de Desserte Agricole (DVDA)*

115. The DVDA, specialized service established on 21 January 1987 by Ministerial Decree No. 87/002 under the name of National Service of Roads for Agricultural Services (S.N.R.D.A.) and become the Directorate of Agricultural Roads" D.V.D.A. by the Ministerial Decree n ° 003/98 of May 20, 1998, has the missions: for the construction, rehabilitation and maintenance of 87,000 km of local roads and, with the assistance of the Régie des Voies Fluviales (RVF), the development and maintenance of 11,000 km of navigable waterways to promote exchanges between agricultural production territories and consumer centers.

116. With technical and financial support mainly from UNDP and the International Labour Organization (ILO), the DVDA has developed expertise in the execution of road works through the use of labor-intensive methods "HIMO" and "organization of the interview with local entities called CLER (local maintenance and rehabilitation committee). It is an important asset to capitalize for the maintenance and maintenance of the road network.

4.1.2.8 Ministry of Scientific Research and Technology (MSRT)

The MSRT's attributions are:

- Negotiation and follow-up of scientific and technical cooperation agreements in collaboration with the Ministry having international cooperation in its responsibilities;
- Promotion of scientific and technological research;
- Orientation of scientific and technological research to support the reconstruction and development efforts of the country;
- Stimulation and promotion of an ethic and a culture of scientific and technological research;

- Publication and dissemination of the results of scientific and technological research, ensuring that, from a practical point of view, they contribute to the development of the country;
- Management of a Special Fund for Intervention for Research.

4.1.2.9 Operations Research Center

K- *Centre de Recherche Géologique et Minière (CRGM)*

117. The CRGM is a Public Institution placed under the supervision of the Ministry in charge of Scientific Research. It was created under Ordinance No. 82-040 of 5 November 1982 on the organization of Scientific and Technological Research.

118. The CRGM is a Public Service with a scientific and technological character, with legal personality and enjoying administrative autonomy. It is an executing agency of the Government in the field of geological and mining research.

119. Vision of the CRGM: Become leader of the Congolese geo-scientific institutions, able to respond to the societal demand of various origins related to the ground and the Congolese subsoil.

120. Mission of the CRGM: To design and execute geological research projects for a good knowledge of the subsoil of the DRC. Undertake any other activities related to the geological service mission. This mission can be translated into:

- Promote, implement and coordinate scientific research in the geological field;
- Conduct geological surveys and surveys for the development of geological and geological maps;
- Producing geological and mineral prospecting for all substances throughout the national territory;
- Collect, process and disseminate basic geological and mining information through databases;
- Provide various services to economic operators to researchers and students.

4.1.2.10 Ministry of Higher Education and Universities (MHEU)

The MHEU attributions are as follows:

- Organization of Higher and University Education;
- Negotiation, monitoring and management of scholarships and internships abroad in collaboration with the Ministry of Foreign Affairs and International Cooperation;
- Promotion of applied research;

L- *University of Kinshasa*

121. The University of Kinshasa was created by Ordinance No81-142 of October 3, 1981. It has 12 Faculties including the Polytechnic Faculty. The Polytechnic Faculty has 4 Departments, including the civil engineering department where RR is located.

4.1.3 Current Research Organization in the DRC

4.1.3.1 Brief history of RR in the DRC and its link to the LNTP

122. The brief history covers both the colonial period and the post-independence period.

a) The colonial period :

123. The Direction of Bridges and Highways of the time had adapted, for the "Belgian Congo", the specifications of unpaved roads published by the US HIGHWAY PUBLIC BOARD, and later taken up by the AMERICAN ASSOCIATION SOCIETY OF HIGHWAYS AND TRANSPORTATION OFFICIALS '(AASHTO) as well as the specifications of French West Africa and Equatorial Africa (AOEF), notably the work of A. REMILLON.

124. Around 1955, local (Belgian) researchers published and applied the results of RR, including the following:

- Slimming of plastic gravel soils by VAN GANSE;
- Improvement of crumbly plastics by the addition of a hard hard by VANHEULE;
- Paving of the TSHELA-BOMA road using the asphalt sands of MAVUMA.

125. The recommendations and standards of the time were and are still retained in the current LNTP.

b) For the post-colonial period (1961-2000):

126. After independence in 1960, the country (ex Belgian Congo, DRC, then Zaire in 1971) continued to exploit the technical achievements of the Belgian Congo until 1980 when the Congolese Road Research Unit was established (CRR-LNTP), through the creation of the Roads Office (OdR), separate from the LNTP, in 1971 and then in 1974 by the signing of a collaboration or partnership agreement between the LNTP and the Center of Building and Public Works (CEBTP) of the French Cooperation, thanks to the Fund of Assistance to the Cooperation (FAC). For this period, there are publications of the results of RR, notably for the construction of the "Kinshasa - Nsele Highway" and the National Road 1 (RN1), Kinshasa - Kikwit section, the following titles:

- 1976 : CAUWELAERT EN: Use of stabilized cementitious sands in the base layer of the NDJILI-MALUKU highway, ONRD;
- 1980 : Road Research Unit of the OdR: Report CR 06/80 - Sands cements in Zaire;

127. 1981 - 1990 : The LNTP is integrated into the OdR, the Road Research Unit (LRN-CRR) compiles the LNTP archives and publishes several results of RR particularly under the label " Zairian Road Design " which covers several areas including roads, bridges and drainage as well as several topics including the classification and acceptability of Zaire (Congolese) soils on unpaved and / or paved pavements and the catalog of road structures not and / or covered in Zaire (DRC));

128. During the same period RR continued outside the LNTP-RRC and issued several publications including:

- 1981 : SPE - The axle load in Zaire;
- 1987 : Paul TSHIULA T / UNAZA- Contribution to the study of the mechanical behavior of lateritic gravels treated with hydraulic binders - PhD thesis at the State University of Ghent (RUG), Belgium;

129. From 1990 to 2000: At the end of the CEBTP-LNTP / OdR Partnership in 1990, the Road Research Unit (CRRC-LNTP) was converted into the Road Research Division (DRR) a major slowdown and was not visible due to the lack of publications. In academic circles, RR has continued with several publications in the Annals of the FP-UNIKIN and in the form of final dissertations (TFE), including the following:

- 1993: Paul TSHIULA T and KABEYA KANA K / UNIKIN - Effective lime content - Explanatory factor for the dispersion of mechanical performance of lime-treated gravel pits;
- 1993: ROZEMOND TOZIN, BENDEBENDE M and KABENGELE M / UNIKIN - Cement stabilization of Kimuenza red soil and Kindele yellow (Kinshasa Region). An overview of the design of semi-rigid pavements.

c) For the recent period

130. 2001-2017: RR did not have much visibility. After the transformation of the DRR of the OdR into the Department of Research and Development (DRD) in 2011, the structured RR resumed at the OdR, within the DRD but without particular funding and with little visibility for lack of publication of results in assigned bodies. This RR particularly focused on the following topics:

- Concrete from the sand;
- Sand from molten plastic waste,
- Stabilization of soils to acrylic polymers for use as a base coat on coated pavements;
- Pavement surfacing using materials bound by bitumen-polymer emulsions;
- Maintenance and repair of pavements with bituminous surface, a manual of which is being drafted with the assistance of the Japanese Cooperation (JICA);
- Road standards in the DRC.

131. During the same period, several Polytechnic Faculty of University of Kinshasa (PF-UNIKIN) final dissertations were devoted to RR and the CRGM published in its Bulletin Volume XI of December 2014 articles related to RR.

d) Analysis of the history of RR in the DRC

132. The synthesis of the history of RR in the DRC shows that:

- The history of RR in the DRC is intimately linked to that of the LNTP since the colonial period and to that of the OdR since 1981;

- The periods of high productivity of RR in the DRC coincided with the intensification of international aid, in equipment and consumables, supported by foreign cooperation, mainly from the European Union and more recently from Japan, and in financing the operation of either the International Cooperation (TFP) or the Government of the DRC for the period before 1990.
- Congolese engineering researchers, trained in appropriate institutions, especially foreign ones, have always been able to initiate or participate actively in RR;
- The RR has always had as institutional tutelage, first the Direction of Bridges and Roads and then its heir the MIPWR. It never had any connection with the MRST. It focused on infrastructure and not mobility issues such as traffic conditions on roads and road safety.
- RR has not been organized or conducted by other agencies responsible for the service or management of the road including the DVDA, OVD and the ACGT.

133. At present, the need for the restoration, or restoration, of structured road research (RR) is felt with eagerness. It includes:

- (i) the requirement for national or even local standardization of technical tools for the design, construction, control, maintenance and management of roads;
- (ii) the use of new materials, particularly those treated with new chemical binders;
- (iii) and legislation on axle loads and rain barriers.

4.1.3.2 Areas currently covered by RR

134. The areas currently covered by RR are given in table No.3.1 below:

Table 4. 1 : Current RR domains in the DRC

No	Current Areas	Themes
1	Road Traffic	Charges and damaging factor of tires and axles
		Counting and Design Traffic
2	Protection of road dependencies	Protection of rights-of-way, roads and public areas of roads as well as erosion control
3	Road building materials (Careers, Acquisition, Formulation, Acceptability, Implementation)	Untreated natural materials
		Concrete flooring
		Natural materials treated with hydraulic binders (Lime, Cement, Pozzolanas)
		Natural materials treated with hydrocarbon binders (bitumen, molten plastics)
		Natural materials stabilized to new chemical binders (Acrylic polymers)
		Surface dressings
		Bituminous concrete
		Concrete cement
4	Design and reinforcement of	Soils reinforced with geosynthetics
		Reinforcement testing

No	Current Areas	Themes
	road structures	Structural design of unpaved roads
		Structural (multilayer) design of paved roads with low traffic
		Structural design (multi-layer) of roads under heavy traffic
5	Road Drainage	Hydraulic design flows
		Retention and Storm Basins
		Rain gates
6	Foundations of bridges, civil engineering structures and other road works	Improvement of soft soils
		bridge abutments in reinforced soils
7	Maintenance of roads and civil engineering works	Maintenance of dirt roads
		Maintenance of asphalt pavements, auscultation and monitoring of bridges
8	Standardization	Guidelines
		Catalogs of road structures
		Recommendations
		Standards
9	Road Tunnels in Kinshasa	Geometry and Technology
		Geometry and Stability

4.1.3.3 Institutions involved in RR currently

135. Annex No. 1 (survey and analysis of information collected on RR in the DRC) to the report presents the institutions involved in RR for the last 5 years, namely: the RD through its DRD; the PF UNIKIN through its DGC and the CRGM by its researchers.

4.1.3.4 Current RR Funding Sources

136. RR in the DRC is not currently funded. Annex No. 1 to the report presents the current potential sources of funding for RR: the MRST Scientific Investment Fund, the own revenues of the agencies, the operating funds for agencies and the FONER.

4.1.3.5 Current system for the collection, management and operation of road data

137. There is no single structured system for collecting current road data. The Cellule Infrastructures has among its missions the conservation of all road studies for the DRC and it develops a database of various road studies.

4.1.4 Advantages and Disadvantages for the Development of Road Research in the DRC:

138. The Strengths and weaknesses external to and internal to the DRO of the OdR for the development of RR in the DRC are summarized in table No 4.2 of the matrix of strengths and weaknesses of RR by the DRD.

4.1.5 Matrix of RR's current strengths and weaknesses in DRC

Table 4. 2: RR's Current Strengths and Weakness Matrix in DRC

STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> 1. Institutional presence of MSTR and operating public organizations, beneficiaries of RR in DRC and may contribute to its operation and its financing (OR, OVD, DVDA, ACGT, BTC FONER, Universities ...) 2. Existence of an operational unit of RR, in particular the DRD within the OdR, and a history or experience of RR that is more than 30 years old; 3. Availability of qualified studies and research staff within the DRD and road agencies and local universities, including FP-UNIKIN; 4. Availability of infrastructures of the National Laboratory of Public Works and of its several branches in provinces, likely to house the road research service across the country; 5. Availability of certain experienced technical staff within the LNTP and its few provincial offices; 6. Presence of young university engineers applying to the profession of researcher; 7. Existence of endogenous financing potential of RR; 8. Existence of a basic start of road data within the Cellule Infrastructures; 9. The payment of 100 per cent of the salaries of research staff by the Government; 10. Existence of a wide range of fields of road study and research. 	<ol style="list-style-type: none"> 1. Lack of will, ignorance or incompetence of the decision-making chain to develop RR in the DRC; 2. Absence of a national vision, policy and strategy on road research; 3. Lack of a transversal organization and cooperation between the Ministries and the agencies or agencies responsible for the service or management of roads in the DRC; In general, the lack or inadequacy of current institutional texts; 4. Inadequacy of RD, ODR, DRD and LNTP missions; 5. Lack of programming and research plans prepared and budgeted to international standards; 6. The containment of RR to some infrastructure-related themes and the lack of openings to mobility, security and quality of life issues; 7. Inadequate solicitation of specific funds for RR in particular with the MRST and the FONER; No direct funding from RR on the LNTP's own revenues; 8. Aging of experienced researchers and lack of structured training for succession; Aging and inadequate infrastructure; 9. Lack of a specific and motivating career plan for research staff; Low Incentives; 10. Lack of visibility and scientific advancement through publications of the results of RR; 11. Lack of collaboration or partnership with universities, particularly engineering faculties, which have researchers and prepare tomorrow's researchers through their programs to adapt to the needs of industry; Lack of cooperation with the construction contractors' organization;
OPPORTUNITIES	THREATS
<ol style="list-style-type: none"> 11. Possible technical and financial support from AfCAP to install expertise for road research that could support road projects financed by the TFPs (WB, ADB, EU, JICA, BADEA ...). 12. Presence of international cooperation, including Japanese JICA and British UKaid; 13. Commitments of financial assistance from the International Community to the developing countries for the implementation of the SDGs (SDG No. 17); 14. Potential for bilateral cooperation and national and international partnerships. 15. Existence of a contract and RR request.in DRC 	<ol style="list-style-type: none"> 12. Poor macroeconomic environment, prolonged insecurity over much of the national territory, and sustained political uncertainty. 13. The large extent of the country and the mobility difficulties that keep researchers and LNTP away from the problem areas and burden the cost of RR; The inadequacy of the new division of the country in 26 provinces; 14. Chronic shortcomings, irregularities or lack of state funding for the road sub-sector, resulting in the difficulty of planning or organizing and the abandonment of road research; 15. Drastic reduction in operating costs requested by the State budget and non-release of funds legally granted after the said draw down; 16. Lack of interest of national decision-makers in the scientific research sub-sector in general and road research in particular.

4.2 Diagnosis and Strategic Recommendations for the DRC and the DRD of the OdR

Table 4. 3 : Diagnosis and Strategic Recommendations for the DRC and the DRD of the OdR

DIAGNOSTIC		RECOMMENDATIONS
FINDING	CAUSES	
AT THE LEVEL OF THE ORGANIZATION OF ROAD RESEARCH AND THE INSTITUTIONAL FRAMEWORK		
Bad macroeconomic, political and security environment; Failure to implement budget; Large extent of the country and mobility difficulties;	Uncertain global environment and internal policy management ; Insufficient infrastructures and national transport services	- Establishing an internal healthy political, social, economic and financial environment ; - Mitigate the adverse sectorial effects of the international context; - Contribute to the improvement of transport infrastructures and services.
Low level of scientific research in DRC, especially RR by DRD ;	Ignorance of scientific research impact on development; Lack of will or incompetence of the decision chain; Low level or lack of funding.	- Sensitize the decision chain - Formalize the demand for reforms by OdR / MIPWR ; - Benefit from the support of UKaid (AFCAP) to the reform of DRD; - Budget and fund the RR primarily through national resources.
Lack of vision, policy and national development plan for RR in the DRC, or even SAR in general ;	Absence of culture and scientific tradition, Lack of foresight for the immediate benefit of a lack of a governance framework for the transport sector.	- Initiate texts on the vision, the policy and the strategy of the RR by the MIPWR and propose them for adoption and approval by the decision chain; - Define accompanying measures, of monitoring and regulation.
Lack of transversal organization of RR for the benefit of ministries and national road agencies involved in the service and management of roads in the DRC ;	Lack of coordination, of spirit and of partnership policy, neglect or protection of personal micro-interests by those concerned; Spirit of wanting to do everything by oneself.	- Regulate by legal texts the area of competence, collaboration, partnership or exclusivity of different agencies and road services and ensure an efficient arbitration at the level of common supervision; - Stop the propensity to want to do everything by oneself; - Sensitize the decision chain and initiate a working group by the MIPWR, or other ministries concerned, at the request of beneficiaries (OdR DVDA, OVD, ACGT, GET, CNPR,...);
Lack of a development plan by RR in the ODR and DRD ;	Consequence of the absence of Vision, Policy and RR development strategy Centralization of functions as different as studies:	- Provide in the Strategy for the creation of a specific RR structure to develop an RR development plan for the decision chain; - Develop short, medium and long-term programs, with budgets compatible with

	procurement, execution and monitoring of works, monitoring and control as well as scientific research within the same entity.	available or mobilizable funding.
Lack of scientific visibility (Publication of scientific results) and promotion for RR in DRC ;	Lack of credible or competitive RRs at regional and international scales; Lack of internal publication (newsletter) and / or funding magazine;	<ul style="list-style-type: none"> - Define performance contracts with performance requirements (publications) as in all SAR institutions; - Establish a Scientific Council within the DRD with RR program mission and validate the results of the RR; - Create internal support for scientific publications or facilitate access to existing bodies; - Quickly find funding for the publication of any results awaiting publication;
Difficulties accessing existing databases and above all broadband Internet; Lack of a proper database; Archaic methods of RS (Libraries and archives hard).	Lack or insufficiency of connectivity to the information at local, national and international level; The non-digitization of all the achievements of the local RR.	<ul style="list-style-type: none"> - Facilitate access to broadband Internet either through a local modem network or an interconnected server; Get subscriptions to certain sites or scientific servers ...; - Create a digital database and acquire adequate software; Interconnect it to other databases in the same domain or related domains - Fund and start the digitization of all the achievements of the RR in the DRC; - In the meantime, see the possibility of using the Cellule Infrastructures database.
Absence of a road research laboratory and difficulties to have access (without any fee) to the LNTP	Weakness related to the historical anchoring of the RR to the LNTP where it is only an appendage next to lucrative activities.	Have a proper road research laboratory (LRR); Create it if necessary.
AT THE LEVEL OF THE LEGAL AND REGULATORY FRAMEWORK GOVERNING THE RESEARCH SECTOR and DRD		
Absence of the status of the RR (legal texts at ministerial level and at the level of road agencies, even the OdR), as well as within the DRD itself.	Absence due to the anchoring of the RR in DRC to the LNTP and OdR without significant means and also related to the general situation of the SR in the DRC	<ul style="list-style-type: none"> - Define status of RR and research staff; - Initiate and formulate proposals by the DRD, to be submitted to the decision chain; - Protect the status of RR staff.
Lack of status of the RR and the status of researchers within the OdR; Lack of a proactive recruitment and training policy for young university graduates.	History of RR in the DRC and its anchoring to the LNTP and the OdR; Some confusion between scientific and administrative careers due to several reasons in the decision chain;	<ul style="list-style-type: none"> - Define and protect the status of the RR researcher; Initiate and formulate the proposals by the DRD, to submit to the decision chain; - Raise awareness about the RR and the career of the RR researcher; - Develop a recruitment and training policy

		and plan for the RR; Recycle the researcher.
Lack of Diagnosis / Internal and external technical Audit of DRD ;	Lack of statutory text defining the specificity of internal and external technical audits of the RR; Lack of specialist technical auditors;	Create a Scientific Committee which will take charge of the development of research programs and which will ensure their monitoring and evaluation.
AT THE LEVEL OF FINANCING		
Absence of predefined endogenous funding mechanisms for RR, and DRD in particular; Absence of a budget of the RR and drowning within that of the OR.	Lack of political will expressed by the lack of interest, and the expectation of TFP intervention; Lack of initiative by managers and inadequate justification of financing needs.	<ul style="list-style-type: none"> - Sensitize, promote (marketing) and introduce credible files to all potential funding bodies of RR; - Prepare projects and research plans to international standards; - Starting self-financing
Low level of mobilization and lack of funding for RR ;	Bad government budgeting of the RR; Poor implementation of voted budgets; Absence of self-financing and very few services offered to third parties.	<ul style="list-style-type: none"> - Sensitize the internal decision-making chain to the OdR and external governmental; - Have the OdR study the possibility of financing the RR on own funds; - Exploit the eligibility of RR FONER funds and the benefit of scientific intervention fund by the MSTR ; - Promote the service to third parties, including the partnership with the various agencies involved. - Master the procedures of the donors in terms of mobilization and use of financial resources.

5 Road research (RR) policy framework

139. The Democratic Republic of Congo, despite its immense natural resources and the youth of its population, two major assets for the production of wealth, presents a gloomy picture for the well-being of its inhabitants. It is a country of paradoxes.

140. By comparing the incidence of poor Congolese living conditions in the different provinces with the state of the road network in the same provinces (paragraph 47 and graph I.1), there is an undeniable link between the two situations : The poor state of the road network increases poverty proportionally. In order to contribute to the sustainable reduction of Congolese poverty, coherent and permanent action must be taken in the transport sector in general and particularly in road transport, which concerns the vast majority of the 70% rural Congolese population.

141. Several analysis and studies carried out recommend a particular attention to the maintenance in good condition of the road networks. "Having well-maintained road networks that ensure the level of service expected by road users has become a key factor in Africa's development strategies today".¹⁷

142. Indeed, the existence of well-maintained road network allows the establishment of efficient transport services, which facilitate the installation of basic services and access of the population to basic services that are : education, health care, water, improved habitat and others. This is one of the attractive assets for investors and contributes to sustainable economic growth by supporting production activities and reducing poverty through the facilities and job opportunities offered.

143. Since the DRC's terrain, hydrography and flora do not make the entire national territory accessible by road, the interconnection of all the networks makes it possible to make the transport system function smoothly and thus guarantee the mobility of all the inhabitants of the country. The wealth is not evenly distributed in the country, to meet the needs of all, it is essential to ensure the integration of economic entities of the country to make them complementary to contribute to poverty reduction, by the rehabilitation, modernization and interconnection of all networks.¹⁸

5.1 DRC's Vision for Road Transport

144. The basic study on the road sub-sector reform proposed the following vision for this transport sub-sector by 2035 : "A major road network that can be used in all seasons, for sustainable transport in the service of national integration, economic development and poverty reduction"

¹⁷ Brushett Stephen, 2004-Gestion et financement des infrastructures de transport routier en Afrique, Programme de politiques de transport en Afrique subsaharienne (SSATP), Région Afrique Banque mondiale

¹⁸ Document Cadre de Politique des transports et plan d'action de la RDC, Projet RDC/Banque Mondiale TF027359, GET, juillet 2002

145. And for the realization of this vision, a strategy is proposed which is articulated on three bullet points:

- a. Improved governance of the sub-sector and management of the road network ;
- b. Improved mobilization and use of financial resources ;
- c. Development of the operational capacities of management agencies and entrepreneurs.

146. A feasible network in all seasons facilitates the implementation of several things that eliminate the sources of poor living conditions, stimulate the economy and promote national and regional integration. In particular,:

- a. the operation of safe transport services, which improve the movement of people and goods, thereby enabling the population to have physical access to schools, hospitals, markets and other basic services.
- b. The connection of production environments to those of consumption that stimulates production and trade, the source of part of the state income (taxes on products and various services);
- c. Integration of economic and administrative entities to constitute a large national market which valorizes domestic production against imported products, often of poor quality for the health of the population.

147. The road research to be promoted in the DRC should contribute to the realization of this vision, in line with the strategic axis n°1 : Improving the governance of the road sub-sector and management of the road network.

5.2 Objectives of the Road Research Policy to contribute to the realization of the vision of the road sub-sector by 2030

148. The Road Research Policy is to ensure, through a scientific approach, that the country has a road network that can be used in all seasons, for sustainable transport in the service of national integration, economic development and reduction of poverty"

5.2.1 Objectives of the Road Research Policy in DRC

5.2.1.1 Overall objective: Contribution to the Sustainable Development of the DRC, by contributing to the improvement of the governance of the road sub-sector and the management of the road network, to remain usable in all weather conditions.

149. Road research must not only contribute to the realization of the vision of the road sub-sector, but must also be one of the scientific tools of the Congolese Government for achieving the Sustainable Development Objectives (SDGs), in particular Objectives n°3, 9 et 11.

5.2.1.2 Specific objective 1: Contribution to improving the legal and regulatory framework of the governance of the road sub-sector.

150. The results of the road research to be carried out should be the scientific basis for drafting certain legal and regulatory texts, based on the facts verified and not on the empirical considerations. Among the priority actions for this objective, the results of road research will contribute to the following:

- a. The definition of the new road classification and the priority network, and the distribution of road network management responsibilities between the various entities of the Central Government and the Provinces on the basis of precise and objective criteria.
- b. The definition of elements of assessment for the accreditation of private public works laboratories;
- c. Update of the guidelines relating to the protection of road assets, in particular the axle load and the rain barriers. For example, the duration of the prohibition to travel on a dirt road during and after the rain must be fixed according to the geotechnical characteristics of the materials constituting the pavement and its structure and the local rainfall; The accepted axle load must incorporate tire configuration and size.
- d. The revision of the Highway Code by incorporating aspects relating to the state of the road.

5.2.1.3 Specific objective No 2: Improved management of the Road Database:

151. It is essential to design and implement a management system (conservation and dissemination) of the results of road research and information and statistics on road assets that includes scientific and technical assets and physical assets. Such a system, or database, will, among other things, provide a more informed decision-making framework for the use of available resources for the management of investment programs, maintenance and operation of the road network, especially the reduction of the costs of studies and research. The road database must be at the heart of this road management system.

152. To enable sub-sector stakeholders to access reliable and up-to-date road data for multiple purposes, including network management, project preparation and work execution, the database must be regularly updated and accessible. It should contain current and geo-referenced information, in particular :

- a. The repertory and the location of the material sources with their geotechnical characteristics resulting from the research;
- b. The state of the road network, including roads and civil engineering structures throughout the DRC;
- c. The evolution of traffic in order to adapt the type of interventions to be programmed to the traffic.

5.2.1.4 Specific objective No 3: Contribution to the protection of road assets

153. As the protection of road assets requires, among other things, knowledge and proper use. The results of road research should be used to improve this knowledge and the best conditions of use of works. As an indication, the following parameters can be updated:

- a. The road network number, which includes, for each road section, its geo-spatial location (geodesic coordinates), its geometric characteristics (plan layout, transverse profile, longitudinal profile), structures (materials and thicknesses), drainage structures, bridges (geometry, structure, capacity), traffic, the current state of the works and the interventions carried out and recommended, the availability of deposits and quarries for materials;
- b. The technical classification of the roads based on, among other things, the destination, the geometry (templates), the structure and the lift as well as the operating conditions (maximum speed, maximum tonnage, legal axles, etc.), traffic, particularly its aggressiveness;
- c. The schedule of the maintenance of each road according to the structure in place, the environmental conditions (rainfall, temperature, local materials...) and their change, traffic (current and forecast)... ;
- d. Codes for good maintenance practice.

5.2.1.5 Specific Objective 4: Contribution to improving the protection of road

154. The results of road research should help to improve the safety of road users and residents. They must help reduce the number of accidents, especially fatal or disabling. This improvement in road safety can result from the good geometry of the road, the good layout of the road surface, especially at intersections, or the use of good equipment and street furniture such as flexible side rails absorbing the energy of collisions and well-designed speed bumps

155. The National Commission of Road Prevention (CNPR) will have to rely on the development of geometric design standards for the road and its construction, particularly the installation of construction sites and pollution by the works. For example, the geometric standards of roads to be prescribed for the protection of road users must take into account the mentalities and habits of local populations while referring to international standards.

156. A road safety audit template for the entire road network, by the competent services, is to be programmed. The audit will refer to the Highway Code, national technical requirements and international geometrical design standards for the protection of road users.

5.2.1.6 Specific objective No 5: Contribution to improving the quality and sustainability of the road

157. It is a recurring fact that DRC road infrastructure has a very short lifespan compared to international standards. It is a subject that deserves thorough research in order to know its causes and to adopt appropriate measures to remedy it.

158. The causes of this weakness must be sought at the level of design (materials, parameters and sizing methods, software), at the level of execution (technology, adequacy of specifications, rules of art, fraud...), at the level of the control (operating modes, rigor, fraud ...), at the level of use (conditions of use, devices for protection ...) or to that of maintenance. Depending on the causes of the early degradation, the solutions to recommend to improve the quality and the durability of the road will include:

- a. Resizing and/ or reinforcing roadways based on available materials, traffic and drainage conditions;
- b. The use or development of technical requirements for road construction materials (formulation, implementation, acceptability);
- c. A stricter supervision of the operating procedures, the frequency and the type of control tests of the work to be prescribed for the different structures and layers of the roadway;
- d. The establishment of clear and binding guidelines for sustainable preventive maintenance of the road. Among others.

159. In order to declare bad practices, the specifications (general and specific) must be well-made, well referenced and readable for contractors and design offices, particularly for construction SMEs. The RR must provide relevant elements to the drafter of the specifications.

160. The RR must produce new materials, new technologies and new technical tools that are more economically and / or technically competitive. It must develop innovation.

161. The annexed Table 2.4 of the Preliminary Report, annexed to this report, gives some RR areas for the DRC. RR can be about updating the existing, adapting or innovating. In this regard, we can build on the achievements of the defunct Road Research Cell of the OdR.

5.2.1.7 Specific Objective 6: Community Service Development

162. The RR must be able to respond to specific requests from partners and third parties for specific road studies or researches. Clients can be private companies, consulting firms, technical and financing partners (TFP), public companies and institutions, public institutions (Presidency of the Republic, Ministries, Provinces) etc.

163. In this role of consultant, the RR will develop collaborative, cooperative or partnership, consultancy or subcontracting relationships with third parties. Among these third parties, Congolese

universities, specifically the Polytechnic Faculty of the University of Kinshasa, FONER, South-South relations and relations with the PFT (European, American, Asian) are choices. If necessary, the RRC will multiply scientific exchanges, support in various human resources (expertise), material (laboratory equipment) and financial, and the scientific visibility of RRC (scientific publications).

164. The community service which will be the source of its own revenue and the self-financing of the RRC will be accompanied by the promotion (marketing) of the RR in order to mobilize funding.

5.3 Institutional Framework for the Implementation of Road Research Policy

165. For the implementation of different actions that must contribute to achieving the various objectives aimed at promoting road research in the DRC, the following actors must be fully involved.

5.3.1 Political level of Government: Ministries involved

5.3.1.1 Ministry of Planning

166. The Ministry of Planning is involved in integrating road research into priority programs of Government and mobilizing internal funding as well as external one.

5.3.1.2 Ministry of Infrastructure, Public Works and Reconstruction

167. The Ministry of Infrastructure, Public Works and Reconstruction is the technical supervisory authority for the organization and execution of road research in the DRC. This choice is justified by the concern to coordinate all the operational organizations in the management of the road sub-sector: research, studies, planning, implementation, financing and control and also the request of partner organizations (See Workshop No. 1).

5.3.1.3 Ministry of Transportation and Communication

168. The Ministry of Transportation and communication, which has the task of regulating transport services, has an important role to play in integrating the results of road research into national transport policy, particularly with regard to road safety, the limitation of the axle load and the introduction of intermediate means of transport adapted to rural areas and the legislation of protecting road asset.

5.3.1.4 Ministry of Scientific Research and Technology

169. The Ministry of Scientific Research and Technology is involved in the promotion of road research through its mission of strengthening research supply capacities. Road research must be integrated into the priority programs of scientific research, in order to mobilize the necessary funding. It must benefit from the Scientific Intervention Fund (SIF).

5.3.1.5 Ministry of Higher and University Education

170. The Ministry of Higher Education and University is involved in the organization and execution of road research through universities that have scientific research activities and have partnerships with the construction industry.

5.3.2 Provincial Executive Level

171. Provinces, in their capacity as Provincial and Local Highway Owner, have a major role to play, in particular for the operation of the Provincial Road Entities, for the collection of road data and for the mobilization of FONER resources, essential for road maintenance and preliminary studies.

5.3.3 Operational level

172. At the operational level, organizations that implement road activities are distinguished for making the results available to the general public, and the agencies that use these results in carrying out the missions are devolved to them.

173. The first group includes the Road Research Center (RRC) to be set up and the National Universities. In the second group, organizations involved in the management of the national road network can be mentioned, financial and technical partners, consulting firms and contractors of the Building and Public Works sector.

5.3.3.1 Road Research Center (RRC)

174. The Road Research Center is the master agency for research in the DRC. It must have managerial capacities as well as the human, material and financial resources required to fulfill its mission of conducting quality road research for the DRC's contribution to the implementation of the World Program for Sustainable Development to 2030.

175. The required characteristics of the Road Research Center are:

- a. Administrative and financial autonomy to enable it to carry out its activities in accordance with the program adopted by its statutory bodies ;
- b. A sufficient number of staff, motivated and multidisciplinary with the skills adapted to the mission of road research ;
- c. Its management principles are the research works in governance, in partnership or in collaboration to involve all agencies that have comparative advantages in specific fields.

176. Its institutional link allows the accomplishment of its mission by providing the infrastructure to house a Road Research Laboratory (RRL), staff and facilities for the mobilization of financial and material resources.

177. Its organizational framework must enable it to carry out its mission effectively, efficiently and with the utmost rigor of science.

5.3.3.2 National Partners: Road Service or Management Agencies and Universities

178. The Road Research Centre (RRC) is called upon to work in partnership and in collaboration with the following agencies :

- a. Universities for research work with professors and students;

- b. National Road Network Management Organizations (Central Government and Provinces) for the collection of data and information and for the implementation of research results.
- c. Regulatory, planning and management bodies for road transport services, for the integration of road research results into transport policies and regulations ;
- d. Supervisory and control bodies for the execution of roadworks.
- e. Third parties for communities' service.

179. Partnership or collaboration protocols are necessary in order to define the outline of the obligations of the Road Research Department and its partners for better results.

5.3.4 Matrix of Allocations and Responsibilities of stakeholders in RR

Table 5. 1 : Matrix of Allocations and Responsibilities of Stakeholders in RR

Level of intervention	Type of intervention	Actors	Roles / Responsibilities
National	Policy	Government	Policy support and resource mobilization at the state and international community level in the context of the implementation of Agenda 2030 for sustainable development.
		Ministry of Planning	Ministry leader for the mobilization of domestic and external financial resources
		Ministry of Infrastructure and Public Works	Owner of national roads, manages the organization and execution of road research.
		Ministry of Transportation and Communication	Integrates research findings into national transportation policy
		Ministry of Scientific Research and Technology	Ensures the promotion of road research through its mission of strengthening the capacities of the research offer in the DRC
		Ministry of Higher Education and University	Ensures the realization of the research through the universities involved and integrates road research into the training curriculum for engineers
	Politics and technology	Technical and financial partners	For the establishment of cooperation and partnership with international institutions and support for the mobilization of technical and financial support from the international community.
	Operational	Directorate of Road Research	Organization that conducts road research in partnership with other road transport management actors and universities
		Roads Office	Preferred partner organization for road research in its capacity as manager of the national roads current manager of the National Laboratory of Public Works
		Technical Control Office	Partner for the implementation of research results for effective control of road works.
		Transport Study Group	Partner for the integration of research results into

Level of intervention	Type of intervention	Actors	Roles / Responsibilities
			the national transportation policy, including rural areas.
		CNPR	Partner for the integration of research results in the management of road safety adapted to rural areas
		Universities	Research partners with the Directorate of Road Research
Provincial	Policy	Provincial Government	Provincial and Local Road Authority, Presidency of the Provincial Road Commission (CPR), oversees provincial road research actions.
	Operational	Provincial Highway Commission (CPR) and its technical secretariat	Participate in road research activities, in particular for the collection of the necessary data and the application of the research results.
		Provincial Directorates of the OdR, DRR, the CNPR and operational provincial agencies	Masters and members of the Provincial Road Commission (CPR), support the FONER in its mission to mobilize resources for research.

5.4 Sources of funding for Road Research

5.4.1 National funding sources

180. The promotion of road research in the DRC should be supported by funding from national sources in order to ensure continuity of actions, institutional capacity building and motivation of researchers to increase the supply of research. The foreseeable national sources are the general budget of the State and the resources of the FONER and own resources.

5.4.1.1 General government budget

181. The Ministries involved in the construction and implementation of the results of road research are obliged to provide, each in their own right, budget lines to be entered in the general budget of the State. Taking into account the lack of interest of the budgetary authority in certain activities such as research, it is in the interest of the Ministries concerned to form a common front for advocacy with decision-makers. They will be better heard if they act in a concerted manner. The Ministry of Planning, which coordinates the mobilization of external resources and the capital budget, plays the lead role.

5.4.1.2 FONER Resources

182. In its task of collecting and administering funds intended to finance actions relating to the maintenance and protection of the national road heritage, in particular "carrying out of studies of any kind and more particularly technical studies, economic and environmental preliminary to the establishment of a road maintenance program", FONER has an interest to finance road research. The road research results will improve the durability and quality of roads, from design to roadwork. Workshop No. 1 established that the RR is eligible for funding provided that the prescribed procedures are followed scrupulously. (Articles 31 and 32 of Decree No.13/053 amending and supplementing Decree No. 8/27 of 24 December 2008; Article 3 of Decree No. 8/27 of 24 December 2008 on the

establishment and status of a public institution called the Fonds National d'Entretien; §2.2.3 and §3.4.1 of the Road Maintenance Operations Manual in the DRC).

183. Improving the sustainability and quality of roads will have the beneficial effect of reducing the amount of road maintenance work and consequently reducing the related budget. Thus, FONER can increase the linear network maintained. This is likely to keep the main road network in good condition and in all weather.

5.4.1.3 Own Funds

184. Through its services, the RRC, like the LNTP, can generate revenues and contribute to its financing through its own funds.

5.4.2 External Sources

185. As road research is one of the tools for the implementation of the Sustainable Development Program to 2030, the DRC is eligible for funding to be mobilized by the international community under the finance component of SDG 17. It is up to the competent bodies to formulate and introduce funding requests at the relevant windows.

186. With regard to external resources, road research should be included in the institutional support component of all road infrastructure projects, in order to strengthen institutional capacities and researchers.

5.4.3 International cooperation

187. The RRC is required to establish exchanges with road research centers operating abroad and with Geotechnical and Soil Mechanics Associations.

6 Proposal of the Strategic Plan for the Implementation of Road Research in the Democratic Republic of Congo

188. At the end of Workshop 1, during which the diagnostic and the draft Road Transport Research Policy Framework were presented, stakeholders made two key recommendations for the promotion of Road Research in the DRC, namely:

- a. The new road research structure in the DRC will have to be a public service, having a legal basis and enjoying administrative and financial autonomy, to be at the service of all road transport stakeholders. It is under the supervision of MITPR. It has the denomination of institute or Center of Road Research of the DRC (IRR CD or CD-RRC);
- b. It will benefit from national financing from the potential sources of financing identified, mainly: (i) the State Budget, (ii) the Scientific Intervention Fund (FIS) of the MSTR and (iii) the road maintenance fund (FONER).

6.1 The RRC Vision for the Development of the Road Sub-Sector

189. Taking into account the vision of road transport and the policy of road research that the structure to be established is responsible for implementing, it is proposed the following vision for this national structure:

«The RRC is the public body helping to ensure, through its scientific research, the availability of safe and accessible road transport throughout the DRC, for its integration and sustainable development.

6.2 The mission of RRC to contribute to the objectives of the Road Research Policy in the DRC

190. The mission of the Road Research Center (RRC) is to contribute to improving connectivity between rural and urban areas, through infrastructure that ensures in all seasons regular, affordable, reliable and safe road transport services, by making available to the bodies in charge of the management and the exploitation of the roads of the DRC, reliable technical tools for design, construction, control, maintenance and management of all the roads of the country, main infrastructures of both national and regional integration.

191. To fulfill its mission, aimed at ensuring the sustainable development of all communities, through better access of both rural and urban people, to health care, education, and other social and economic activities., the RRC, is responsible for carrying out, in particular, the following:

- To gather and synthesize the achievements of RR in the DRC, especially to inventory the existing technical tools for design, construction, control, maintenance and management of roads. These technical tools include: (i) statistical information (road network number, traffic, geotechnical ...); (ii) the classification, formulation, acceptability and implementation of materials; (iii) geometric, structural and drainage design approaches; (iv) recommendations, circular notes and guidelines, standards, draft orders, decrees, ordinances and laws, relating to roads in the DRC....

This work can be done with the support of AfCAP's Program Management Unit (PMU) which is already working on "revised country standards and specifications";

- Perform applied RR and update or adapt existing technical tools for design, construction, control, maintenance and management of roads in light of recent advances in science and technology and the environment ;
- Continue the RR, progressively complete and/ or innovate all technical tools for the design, construction, control, maintenance and road management of the DRC;
- Maintain and disseminate all the results of the RR as well as texts and documents defining all technical tools for the design, construction, control, maintenance and road management of the DRC;
- Provide ongoing training for its road research staff to achieve one of AfCAP's objectives to "build local expertise for road research." The training service can be done in partnership with national academic institutions, especially the Polytechnic Faculty of the University of Kinshasa (FP-UNIKIN).
- Develop and provide public service (to public agencies) and service to individuals: individuals, companies or communities, experiencing technical difficulties in the design, construction, control, maintenance or management of roads in the DRC and in the region.

The service in question may include the tasks of studies, technical audit, expertise, counter-expertise, political advice and training.

6.3 The operational principles of the National Center for Road Research

192. For reasons of efficiency and effectiveness of its management, the Road Research Center (RRC) must favor management principles that involve other stakeholders in the transport and scientific research sectors. The objective for the RRC is not to try to do everything alone, but rather to look for synergies, by systematically developing partnership or collaboration agreements and subcontracting opportunities with road transport regulators and road management organizations, Universities or road transport operators, which have already proved their effectiveness in certain areas of RRC's competence. An entity ahead of time in a given area may be designated by the RRC to entrust it with the implementation of actions in this area.

6.3.1 Partnership with beneficiaries of the road sub-sector

193. The RRC will develop partnership or collaboration agreements with road management and road transport service regulators to efficiently and cost-effectively carry out actions in areas of proven competence of these bodies. These include: the LNTP for geotechnical tests, the OdR and the Provincial Executives, particularly their Provincial Road Commissions (CPR), for the collection of information and data on the road network, the CNPR for information and traffic data and the units or units responsible for implementing infrastructure projects that are responsible for monitoring the evolution of certain indicators.

6.3.2 Cooperation and collaboration with University Training Institutions and other International Road Research Centers

194. The RRC will also develop cooperation or collaboration agreements with University Training Institutions, other International Road Research Centers and learned geotechnical and soil engineering societies, particularly for institutional capacity building.

6.4 Organizational Framework of the Road Research Center

6.4.1 Institutional Anchorage

195. The RRC is under the supervision of the Ministry of Infrastructure, Public Works and Reconstruction, which is responsible for the design, construction, modernization, development, planning and maintenance of road infrastructure.

6.4.1.1 Legal basis for anchoring RRC within MITPR

196. The institutional anchoring of the RRC within the Ministry of Infrastructure, Public Works and Reconstruction, is based on the provisions of the Constitution of the DRC, especially on Articles 202 and 203, paragraph 21, and the provisions of Ordinance No. 17/025 of 10 July 2017 setting out the responsibilities of ministries.

6.4.1.2 Hierarchical and Collaborative Relationships

197. Pursuant to the provisions of article 202, paragraphs 21 and 33 of the Constitution, the RRC carries out matters that fall within the exclusive competence of the Central Government. And in accordance with the provisions of article 202, paragraph 21 of the Constitution and Ordinance No. 17/025 of 10 July 2017 determining the responsibilities of the ministries, the RRC is placed hierarchically under the supervision of the Ministry having the responsibility for the design, construction, modernization, development and maintenance of road infrastructure.

198. In fulfilling its mission to help ensure the availability of an all-weather road network for sustainable road transport, the RRC must establish collaborative relationships with all other actors in the road sub-sector under the supervision of the Ministry of ITPR and the Ministry of Transport and Communication.

199. With reference to the provisions of Article 202, paragraphs 21 and 33, and those of article 203¹⁹, paragraph 21²⁰ of the Constitution, the RRC shall, develop cooperative relations with the competent departments of the Ministry of Scientific and Technological Research and Provincial Executives for the performance of its mission.

6.4.2 Statutory and Management Bodies of RRC

200. SMEC has taken note of several legal texts relating to the organization of scientific research in the DRC. These include Ordinances Nos. 67/311/312 and 313 of 10 August 1967

¹⁹ Article 203 of the Constitution states: Without prejudice to the other provisions of this Constitution, the following subjects are of concurrent jurisdiction of the central government and the provinces

²⁰ Paragraph 21 of Article 203: road traffic, motor traffic, construction and maintenance of roads of national interest, collection and distribution of tolls for the use of roads constructed by central government and/or by the province;

and Law 82 of 05/11/1982 respectively on the organization of the Scientific Policy in the DRC, creation and organization of the National Office for Research and Development (ONRD), creation of specialized sections of ONRD and organization of Scientific and Technological Research (STR). All these texts, which predate the administrative reform of 2008, organize scientific research by the Centers and the Research Institutes. These centers or institutes are public institutions, with administrative and financial autonomy.

201. According to the texts consulted, the Centers and Institutes of Research are responsible for carrying out studies, scientific and technological research, experiments and, in general, any work related to their respective objectives.

According to the CRGM, updated texts are being drafted.

202. Referring to matters that constitute its mission, the RRC is a public institution of a scientific and technical nature which must be governed by Law No. 08/009 of 07 July 2008 laying down general provisions applicable to public establishments.

203. The organic structures of the RRC, according to the Law n° 08/009 of July 07, 2008 laying down general provisions applicable to public establishments are:

- the board of directors ;
- the general direction ;
- the board of Auditors.

6.4.2.1 Composition of Statutory Bodies

204. The Board of Directors is made up of five high-level scientific members, representatives of Ministries in charge of national development planning, road management, regulation of road transport services or scientific research.

205. The General Management, known as the Management Committee in the current terminology of universities and research centers, comprises of the Director General, the Scientific Director and the Administrative and Financial Director, as well as the services attached to the Director General, including the Internal Audit and the Scientific Committee. It is led by a Managing Director, possibly assisted by a Deputy Managing Director.

206. The Board of Auditors is composed of two people from different professional structures, with proven technical and professional knowledge in the control of RRC's financial operations.

6.4.2.2 Method of appointment of members of statutory bodies

207. The members of the statutory bodies are appointed in accordance with the provisions of Law No. 08/009 of 07 July 2008 laying down general provisions applicable to public establishments and other policies governing the RRC.

6.4.2.3 Method of appointment of the members of the management bodies of the RRC

208. The Managing Director and the Deputy Managing Director are recruited on the basis of examinations organized by the Board of Directors, based on criteria of moral integrity,

scientific qualification and professional experience in the field of roads and research. They are appointed by Decree of the Competent Authority, on the proposal of the Board of Directors and the opinion of the Minister in charge. The Director General, the Deputy Director General and the Scientific Director will hold a postgraduate degree, at least a master's degree in applied sciences, civil engineering or geotechnical engineering fields. They will have at least 10 years relevant experience in scientific research.

209. The Scientific, Administrative and Financial Directors are appointed by the Managing Director on the basis of the results of the recruitment competition approved by the Board of Directors.

210. The other members of the scientific, administrative and financial staff are recruited and appointed by the Managing Director, on the basis of the results of the recruitment examinations organized by the General Management and approved by the Board of Directors.

6.4.3 Organization chart of RRC

211. In light of its mission, the organizational chart of the RRC would include, the following components:

- a. The Board of Directors
- b. The General Direction to which the Scientific Committee and the Internal Audit Service are attached,
- c. The Administrative, Financial and Markets Department,
- d. The Scientific Direction which includes the following departments:
 - The Geotechnical, Natural Materials and Environment Department (DGME): To deal in particular with soil issues and foundations, deposits and quarries of materials, natural materials and soil concretes.
 - The Department of Bonded Materials and Concretes (DMLB): To deal with issues such as reinforced or reinforced soils, binders (black products, hydraulic binders, chemical binders...), bound or stabilized soils, bituminous concrete (BB) and cement concretes.
 - The Department of Road Technologies and Structures (DTSR): To deal in particular with structural design, implementation of materials, control of works and monitoring, maintenance and management of the RRC laboratory.
 - The Department of Road Safety and Mobility (DSRM): To deal in particular with vehicles, personal safety, traffic, traffic control, geometric design as well as road equipment and safety devices.
 - The Department of Informatics, Database and Publications (DBDP): To deal in particular with the computer service, the software, the database, the dissemination and publication of the results of the research and development and RRC Bulletin.

- The Department of Bridges, Structures and Drainage (DPOD): To deal in particular with bridge decks and the hydrological and hydraulic design of drainage works.

Depending on the level of implementation of the RRC and the constraints at the moment, some departments could be merged.

6.4.4 Regulations and administrative, financial and accounting procedures

212. In the transition/ start-up phase of RRC implementation, a manual of RRC administrative, financial and accounting procedures will be developed with the assistance of the Technical Assistance to be set up by AFCAP, with a view to clarifying all procedures likely to allow transparent, effective and efficient management of the RRC.

6.4.5 Staff Regulations, Recruitment Methodology and Career Plan within RRC

213. During the same transition/ start-up period, the Staff Regulations must also be drafted, in accordance with the legislation in force, to specify the method of recruitment, classification and benefits of RRC staff members. Their career plan within the RRC will be defined.

6.4.5.1 Staff status of the National Road Research Center

214. However, given the scientific and technical mission of RRC, its staff members should be placed in conditions similar to those of staff of other scientific research institutions in the country or abroad, particularly in the area covered by AFCAP.

6.4.5.2 Recruitment of RRC staff

215. The other staff members of RRC are recruited in accordance with the Management Procedures manuals approved by the RRC Board of Directors.

6.4.5.3 Career Plan for RRC Staff

216. To motivate researchers and other RRC staff to better fulfill their responsibilities with rigor and excellence, a plan for their career is to be elaborated by referring to what exists in the scientific research institutions of the country and the region covered by AFCAP.

6.4.5.4 Integrity, Ethics, Sanctions Scale and RRC Staff Screening Procedures

217. In order to cultivate excellence in the work of RRC staff members to better accomplish their mission, a document which describes the professional ethics, integrity, Sanctions Scale and RRC Staff Control Procedures will be developed, with AFCAP Technical Assistance.

6.5 Diagram of creation and implementation of the RRC

6.5.1 Preparatory phase

218. It is recommended that a key stakeholder consultation framework be established for the establishment of the National Road Research Center (RRC). The goal is to secure the

buy-in of all key stakeholders in promoting road research in the DRC. Thus, it is essential that the Minister of Infrastructure, Public Works and Reconstruction, supervision of the RRC, initiates a consultation of all the Ministries involved, Provincial Executives and technical and financial partners of the DRC. This consultation will, in particular:

1. To approve the legal document creating the RRC by all the Ministries involved and the Provincial Executives;
2. Approve the funding arrangements for RRC as recommended by the Road Research Policy Framework.

6.5.2 RRC transition and start-up phase

219. To start the activities of the RRC, it is recommended to the Minister of Infrastructure, Public works and Reconstruction, in its capacity as the RRC supervisory authority, proceed with the establishment of a starting unit of the RRC based on the National Laboratory of Public Works (LNTP), currently under management of the OdR.

220. The establishment of the RRC start-up unit based on the LNTP, involves the definition and application of the transitional measures accompanying the transfer of the Research and Development Department (DRD) of the OdR in RRC , and its exit from the roads Office. This action concerns in particular the human resources and their careers, the material resources, particularly the assets of the RRC (real estate, furniture, RR archives) and financial resources including staff compensation, operating and capital costs, use of the LNTP facilities and the creation and installation of a RRC- specific RR lab.

221. The aim is to lay the foundation for the successful operation of the RRC in the DRC, by good preparation of tools for its management and its progressive implementation. The unit to be set up within the National Laboratory of Public Works (LNTP) is responsible for preparing the effective implementation of the RRC. This start-up unit shall benefit from the AFCAP Technical Assistance to carry out tasks related to the preparation of the progressive implementation of the RRC , in particular:

1. Identify all amendments to be introduced in all guidelines governing the Ministries and agencies that are part of the institutional framework for the implementation of the road research policy in the DRC;
2. Prepare drafts of required legal instruments in particular, those amending the guidelines governing the Ministries and bodies involved in the RR ;
3. Preparing guidelines clarifying resource mobilization to fund RRC activities;
4. Prepare the RRC Administrative, Financial and Accounting Procedures Manual;
5. Evaluate the priority real estate needs, in materials and equipment necessary for the operation of the RRC;
6. Evaluate priority needs for equipments, road research laboratory and database equipments;
7. Preparing the Staff Regulations and their career plan within RRC;
8. Develop the document that describes the Ethics, Sanctions Scale and RRC Staff Screening Procedures;

9. Prepare a recruitment plan for RRC technical and administrative staff;
10. Prepare the first training plan for building the capacity of the legacy staff of the LNTP and the new units.

6.5.3 RRC operational phase:

222. In order to ensure that the RRC is operational in the optimal operating conditions, it is recommended that buildings, equipment and facilities necessary for its operation be procured; recruiting and capacity building of the staff responsible for carrying out road research activities.

223. The Ministry of Infrastructure, Public Works and Reconstruction, the supervisory authority of the RRC, will make the necessary arrangements to :

1. Take and make public the guidelines of creation and operation of the RRC;
2. Provide premises to house the RRC;
3. Set up the RRC Board of Directors;
4. Recruit the General Manager of RRC;
5. Acquire materials and equipment necessary for the operation of the RRC;
6. Recruit staff other than those inherited from the Roads Office;
7. Launch activities that contribute to achieving the policy objectives of the Road Research.

6.5.4 Operational phase: Priority actions of the RRC by development phase

224. The strategic line of the RRC at the operational level is the support of the achievements, the safeguarding and the evaluation of the existing scientific assets and the development of new technical tools of conception, control, construction, exploitation, maintenance and management of the DRC's roads for the benefit of sustainable, safe, economic road transport in the service of national integration, environmental protection and the reduction of poverty. It is reflected in the following priority actions grouped into three sub-phases, namely short-term, medium-term and long-term beyond a few overlaps.

6.5.4.1 Short-term priority actions:

225. The short term covers the first three years of the project. At the operational level, it includes the following priority actions:

- (1) Continuation of ongoing research activities within the Department of Road Research and Development (DRR), including:
 - Finalization of the Maintenance and Repair Manual for Asphalt Pavements with the assistance of Japan Cooperation (JICA);
 - Stabilization of soils with acrylic polymer binders, particularly the monitoring of experimental sites and structures underway in Kinshasa in light of the experience of South Africa;
 - The economical cover of agricultural, or low traffic roads, particularly experimental sites in the various geotechnical zones of the DRC with the assistance of AfCAP ;

- (2) The constitution of a provisional scientific committee or unit, in the form of a consultancy, whose mission is to validate the results of the various past and current research projects with a view of their insertion in the database and/ or their publication in scientific journals, for the visibility of the RRC, in particular with the assistance of AfCAP;
- (3) The retraining, upgrading or training of RRC researchers through thematic seminars or internships;
- (4) Inventory, collection, digitization, formatting, indexing, classification of existing road research results for the DRC, which implies the acquisition of appropriate computer hardware for future integration into the database, with the assistance of the Congolese Government and the Technical and Financial Partners (TFPs);
- (5) In synergy with the Infrastructure Unit, the inventory of all road studies conducted for the DRC and the establishment of a directory;
- (6) The needs assessment of the RRC road research laboratory;
- (7) The needs assessment of the RRC database and of software;
- (8) Development of a technical classification of roads in the DRC with the assistance of the CI and FONER.
- (9) Study of certain urgent issues, including:
 - Regulation of vehicle loads including axle load in relation to the technical classification of roads;
 - The regulation of rain barriers according to the geotechnical and climatic zones of the country and the technical classification of roads;
 - Other priority issues from partners;
- (10) Development of a five-year road research program in the DRC and initial annual planning;
- (11) Mobilization of funding from all potential sources.

226. Pending the completion of the internal capacity building of the RRC, these actions can be carried out either within the DRR of the OdR by relying on the LNTP, or by subcontracting or in partnership. They are part of or constitute in themselves full-fledged road research projects.

6.5.4.2 Medium-term priority actions:

227. Overall, the medium term is from the fourth to the sixth year. The following priority actions are foreseen:

- (1) Ongoing training of researchers through thematic seminars and internships with the assistance of the Scientific Committee;
- (2) The creation and launch of the (scientific) bulletin of the RRC with the assistance of the Technical and Financial Partners;
- (3) The acquisition and installation of the RRC Comprehensive Database with the assistance of the Congolese Government and Technical and Financial Partners;
- (4) The acquisition and installation of a complete own research laboratory with the assistance of the Congolese Government and the Technical and Financial Partners;

- (5) The development of DRC road numbers using GIS techniques, i.e. a geo-referenced technical directory including, among other things, all roads, all bridges and drainage structures as well as all the deposits of materials and quarries of the DRC;
- (6) Updating the achievements of road research in the DRC, publication of ad hoc manuals, including good practices, recommendations and technical guidelines on various technical tools for design, control, construction, operation, road maintenance and management in the DRC as well as road standardization and revision of legal guidelines;
- (7) The certification of road materials and products particularly in relation to their toxicity and other aggressiveness;
- (8) The technological compliance of equipment, particularly road safety and civil engineering laboratories, and the preparation of private road laboratory approvals;
- (9) Charged Service to partners and the profession, especially to construction contractors and consultancies at their request;
- (10) The development of partnerships;
- (11) Mobilization of financing.

The investment needs assessment for the road research laboratory and the database is set out in the appendix.

6.5.4.3 Long Term actions:

228. The long term refers to the period beyond 6 years.

Most long-term priority actions are a continuation of those listed in the medium term and those related to the research areas listed in Annex Table 2.3, with emphasis on:

- (1) Innovation;
- (2) continuing education;
- (3) Programming, planning, monitoring and evaluation of road research projects;
- (4) the mobilization of endogenous financing;
- (5) The development of partnerships;
- (6) RRC's visibility through high-quality scientific and standardization publications;
- (7) National integration, including the development of provincial branches, and African regional integration, particularly through the harmonization of norms and legal guidelines with the countries of the region and the interconnection of databases.

6.5.5 RRC workforce by phase of development of its functions

6.5.5.1 Current situation

229. The information received by the Consultant during the collection of information (see annexes) shows that it is necessary to go through the reinforcement of human capacities in the sense that the current research staff of the DRD of the OdR is either insufficient in number, either aging, or under qualified in relation to the missions and actions planned for the RRC to set up. In addition, the status of research staff in MSTR and MHSU, which is the

one proposed for RRC research staff, defines recruitment and career development criteria for both researchers and research technicians. The main criteria are the university or basic degree, usually with distinction, and the publication of articles in listed scientific journals or that of books approved by the Scientific Committee.

On the other hand, many management and administration functions are globalized within the OdR. They are not achieved by the DRD. Detaching the part from road research will require a lot of precautions.

6.5.5.2 Forecast situation

230. Taking into account the status of the staff of the proposed RRC, which is different from that of the OdR, it will be necessary to align the current research staff within the DRD, distinguishing in particular the researcher from the research technician, and by harmonizing the nomenclature of grades, in particular by distinguishing between research assistants, research fellows, research supervisors and research directors. This work may be the responsibility of the Provisional Scientific Committee (see transition/ start-up cell).

231. In addition, research activity is usually done by project or objective. It therefore has a short life span and is often multidisciplinary. The members of a research team may have different statuses among the following: Permanent Staff, Consultant and Temporary Staff. The global trend today is to reduce the number of permanent staff and to work in partnership with other structures, particularly universities. In other words, staff numbers will only be set when research projects are scheduled and planned. It must be recognized, however, that this type of organization is, however, difficult to implement in the current administrative environment of the DRC, where public funding is limited only to the payment of permanent staff salaries.

6.6 Indicative budget of the National Center for Road Research

6.6.1 Estimated expenditure budget

232. The collection and analysis of information (see Chapter 2 of the Preliminary Report and annexes to this report) has shown that DRD or in other words road research within the OdR does not have a proper laboratory, database, buildings and furniture. At the organizational level, it is expected that the supervisory authority, the MITPR, i.e. the DR Congolese Government, would endow the RRC with buildings and furniture. The acquisition of a clean road research laboratory and database equipment, which comes under the investment budget, would be carried out concurrently by the Congolese Government and by the Technical and Financial Partners..

6.6.2 Staff Expenses

233. Staff costs will be borne by the State Budget according to the salary scale of the OdR for the transitional and start-up period, and according to the proposed scale, which will have to be fixed in the texts which will govern the RRC, in particular, the statutes of its staff, in the operational phase.

Based on the experience of the CRGM and on the basis of 30 researchers, SMEC estimated the staff costs (remuneration), normally included in the general budget and fully borne by the State Budget at 346,165 (three hundred and forty six thousand one hundred and sixty-five) USD per year.

6.6.3 Ordinary Operating Expenses

234. Expenses for the ordinary operation of the RRC will be borne by the State Budget and possibly, if necessary, partly by other sources, including the revenue resources of the RRC, FONER and the Technical and Financial Partners.

Based on the CRGM forecasts and the update, this ordinary operating budget is estimated at 93,600 (ninety three thousand six hundred) USD per year.

6.6.4 The research budget

235. The budget for road research, including all expenses related to the execution of research projects or studies, will be borne by the external initiator of the project and by resources from FONER for large public utility projects and/ or cooperation with technical and financial partners for one-off projects.

236. Based on past budgets of road research in the DRC, particularly by the defunct Road Research Unit, the Consultant estimated the research budget of RRC at 1.5 million US \$ per year (see Chapter 2 of the Preliminary Report). This budget covers only the expenses of the operation of the projects as well as the actual research work.

6.6.5 The investment budget (equipment, materials and buildings)

237. The Consultant estimated (in annexes) the budget for the first investment for the acquisition of a road research laboratory and equipment for the database.

The acquisition of a research laboratory is estimated at 7,814,245 (seven million eight hundred and fourteen thousand two hundred and forty-five) Euros without transport and customs charges.

The acquisition of equipment and software for the database is estimated per phase of development at 568,650 USD for the first phase (first 4 years) and 395,000 USD for the second phase (4 years later).

To these BDD amounts, 24,000 USD and 48,000 USD are to be added for staff training for the first and second phases respectively.

The total investment for the BDD is estimated at: 1,035,650 (one million thirty-five thousand six hundred and fifty) USD without freight and customs charges.

As for the operating cost of the BDD, it is estimated at: 320,000 (three hundred and twenty thousand) USD per year in the operational phase (2nd phase).

The need for real estate (offices and laboratories or workshops) is roughly estimated, by cross-checking, to 1,200 m² on the ground floor.

6.7 Action Plan presenting the RRC Implementation Schedule and the progressive development of its functions

238. The actions to be undertaken for the establishment, for the progressive implementation of the RRC and for the accomplishment of its mission are presented in the Action Plan below. The persons in charge and the period of implementation are indicated.

Table 6.1: Action plan

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
Preparatory phase: Creation of a framework for consultation of key stakeholders for the establishment of the RRC											
Obtaining the support of all key stakeholders in the promotion of road research, through the consultation to be initiated by MITPR, supervision of the RRC.	- Consult officials of Ministries involved in the promotion of Road Research	MIPWR								Acceptance of key stakeholders	PP consultation report
	- Approving the legal document for the creation of the RRC by all the Ministries involved and the Provinces.	MPLAN, MITPW, MTC, MSTR, MHSU, HVK								Guidelines to create the approved RRC	PP consultation report
	- Approve the RRC funding arrangements as recommended by the RR Policy Framework	MPLAN, MIPWR, MSTR, FONER								Financing mechanisms adopted	PP consultation report
	- Consult the technical and financial partners to obtain their adhesion to the promotion of RR	MIPWR								TFPs committed to supporting RRC	TFP Aide Memoires
	- Obtain Government support and approval	MIPWR								Decision to create the approved RRC	Government report
Transition and start-up phase: Setting up a RRC start-up unit relying on the National Roads Laboratory (LNTP / OdR) with AFCAP Technical Assistance (TA / AFCAP)											
Lay the foundation for the successful operation of the RRC in the DRC, through a good preparation of the tools of its management and its gradual implementation.	- Establish a unit responsible for preparing the effective implementation of the RRC, based on the LNTP,	MIPWR and OdR								The operational CD/ RRC	The activity reports of the CD/ RRC
	- Identify all changes to be introduced into national legislation and Prepare draft legal instruments required	CD / RRC and TA/AFCAP								Draft legal instruments approved and published	Reports from MIPTR and CD/ RRC
	- Prepare guidelines clarifying the mobilization of resources to finance the activities of the RRC	CD / RRC and TA/AFCAP								Funding mechanisms defined and approved	Reports from MIPTR and CD/ RRC
	- Prepare the RRC Administrative and Financial Procedures Manual	CD / RRC and AT/AFCAP								Approved and available procedures manual	Reports from MIPTR and CD/ RRC
	- Evaluate the priority real estate needs, in materials and equipments necessary for the operation of the RRC	CD/ RRC and AT/AFCAP								State of priority needs approved for acquisition	Reports from MIPTR and CD/ RRC
	- Evaluate priority needs for research laboratory equipment and material	CD/ RRC and AT/AFCAP								The CAD for the available supply	Reports from MIPTR and CD/ RRC
	- Prepare the Staff Regulations and Career Plans within RRC	CD/ RRC and AT/AFCAP								The statutes and the approved career plan	Reports from MIPTR and CD/ RRC

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
	- Develop the document that describes the Ethics, Sanctions Scale and Control Procedures for RRC Staff	CD/ RRC and TA/AFCAP								The signed document on integrity, ethics and sanctions.	MIPTR and CD/ RRC reports
	- Prepare a recruitment plan for RRC technical and administrative staff	CD/ RRC and TA/AFCAP								The Approved RRC Staff Recruitment Plan	MIPTR and CD/ RRC reports
	- Prepare the first training plan for building the capacity of the legacy staff of the LNTP and the new units.	CD/ RRC and TA/AFCAP								1st approved and available staff upgrade plan	MIPTR and CD/ RRC reports
<i>RRC operational phase: Acquisition of premises, materials and equipment; Recruitment and capacity building of staff and execution of road research activities</i>											
Make the RRC operational in optimal operating conditions	- Take and make public the guidelines on creation and operation of the RRC	Government								The texts governing the RRC published in OJ	Official Journal of the DRC
	- Provision of premises to house the RRC	MIPWR and OdR								Premises available and occupied by RRC	RRC Activity Reports
	- Establishment of the RRC Board of Directors	Government								The operational Board of Directors	Reports of the Board of Administration sessions.
	- Recruitment of the Director General of RRC	MIPWR and Board of Directors								The DG appointed and posted to the RRC	Reports of the Board, the RRC and the Official Journal
	- Acquisitions of RRC equipment and materials	MD/ RRC and TA/AFCAP								Equipment and materials in place	RRC Activity Reports
	- Recruitment of staff other than the ones inherited from the Roads Office	MD/ RRC and Board of Directors								Staff recruited	Board reports and RRC activities
	- Execution of activities that contribute to the achievement of RR policy objectives	MD and all RRC staff								Operational RRC	Board reports and RRC activities
<i>Specific objective number 1: Contribution to improving the legal and regulatory framework of the road sub-sector governance</i>											
Base the development of legal and regulatory texts on the results of road research based	- Advise the legislator in the drafting of the guidelines relating to the management of the roads	RRC and other relevant actors								Legislative guidelines drafted with the assistance of the RRC published	Official Journal, Reports of Board and RRC Activities
	- Write the digital number of the road network of the DRC (Identity of any road, bridge, house materials ...)	RRC and other relevant actors								Road number in the BDD for the geo-localized	Accessible RRC database

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
on verified facts and not on empirical considerations										search of the entire road network of the DRC	
	- Develop a price series for road works across the country	RRC and other relevant actors								Market price list and Available Price Series	Board reports and RRC activities
	- Define the elements of assessment for the accreditation of private public works laboratories	RRC and other relevant actors								Compliance of laboratory results with standards	Board reports and RRC activities
	- Contribute to updating the guidelines relating to the protection of the road assets like the axle load and the rain barriers	RRC and other relevant actors								Stop the rapid degradation of roads	Board reports and RRC activities
	- Contribute to the revision of the Highway Code by integrating the aspects relating to the geometry of the road.	RRC and other relevant actors								Elements for the New Highway Code including the defined route	Activity reports from RRC and partners
<i>Specific objective number 2 : Improved management of the Road Database.</i>											
Enable road sub-sector actors to access reliable and up-to-date road data for their multiple uses, including network management, road project preparation and execution of works.	- Establish an internal Scientific Committee to evaluate and validate current and future RR programs and results at RRC	Board of Directors and RRC								Scientific Committee created within the RRC to conform the results of the RR in the DRC to international standards	Board Reports and RRC Activity Report
	- Train staff members for the documentation	Competent persons								The BDD operational and efficient	RRC Activity Reports
	- Acquire and install the computer equipment for the database (BDD).	RRC and other relevant persons								The BDD well equipped and operational	RRC Activity Reports and Publications
	- Collect, digitize, format, classify, index and enhance the results of the existing RR in the DRC to date	RRC and other relevant persons								RR results in DRC available in all formats and accessible	RRC Activity Reports and Publications
	- Identify all road studies already conducted in the DRC and establish a structured directory including titles, authors, year, availability and summary.	RRC and other relevant persons								Road studies already conducted in the RRC database	RRC Activity Reports and Publications
	- Create a RRC newsletter and regularly publish indexes or summaries of RR results and road studies. This newsletter may be electronic or hard.	RRC and other relevant persons								Frequency of publication of the RRC bulletin for visibility, promotion and	Regularly published newspaper issues

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
										results VALUATION	
	- Collect, store and disseminate systematically all new results of the DRC RR and Study Index	RRC and other relevant persons								All the results of the RR in the BDD for visibility, promotion of the RRC and valuation of the results of the research and studies of the roads	RRC publications available in the DB
<i>Specific objective number 3: Contribution to the protection of road assets.</i>											
Serve as a basis for the development of technical requirements, legal and regulatory policies applicable for the protection of road assets at all levels: construction, maintenance and operation.	- Technically classify roads and structures according to the structures (physical) in place and their bearing capacity and the conditions of their operation. ²¹	RRC and other relevant actors								Classification of roads and engineering structures cast in standard and applied	RRC Publications, DRC Gazette and Study Reports
	- Elaborate the number of roads and bridges of the DRC including numbering, location, geometric and structural characteristics, the drainage, the traffic ... etc.	RRC and other relevant actors								elaborated, available and exploited registration of works	RRC Publications, and Study Reports
	- Write the various regional manuals / guides related to: the proper execution of road works; good supervision and control of road works; the evolution of the residual characteristics of pavements and bridges; road maintenance (roads, drainage and outbuildings).	RRC and other relevant actors								Pavement durability manuals developed, available and applied	RRC Publications, DRC Gazette and Reports of Studies and Works

²¹ Example: (1) Seasonal agricultural tracks and small transverse structures for less than 5 tons single axle twin wheels and 2.5 tons single axle single wheels; (2) Permanent low-traffic (<50 vehicles per week) low-traffic (unpaved) and medium cross-over for 8-ton twin-axle single axles and 4-ton single-wheel axles; (3) Permanent high-density earth roads (up to 100 vehicles per day) and medium transverse structures for 8-ton twin-axle single axles and 4-ton single-wheel axles; (4) Permanent thin-surfaced roads with a surface coating and long-span overhead structures, traffic <300 vehicles per day, 9-ton twin-axle single axles and single-wheel axles of 4.5 tons; (5) Permanent high-density asphalt concrete (BB) or cement concrete (BC) roads, traffic > 300 vehicles per day, 9-ton twin-axle single axles and single-wheel axles of 4.5 tons; (6) Heavy permanent roads for single axles with twin wheels over 9 tons, or even 13 tons and even 15 tons, particularly in ports and at railway stations

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
<i>Specific objective number 4: Contribution to improving the protection of road users.</i>											
Establish the technical requirements relating to the geometric design of roads, the quality of the road surface and the road safety devices to be enforced for the protection of road users.	- Define the parameters of the geometry of roads and intersections according to road types as well as the drafting of recommendations/ standards. This includes harmonizing or linking the base or project speed, maximum permitted speed, ramps, slopes, skew, longitudinal visibility, braking/ stopping distance, visibility of traffic signs and other vertical and transverse markings.	RRC and other relevant actors								- Technical requirements on defined and applied road geometry - % decrease in accidents due to road improvements	- RRC Publications, DRC Gazette and Reports of Studies and Works ; - CNPR reports.
	- To guarantee the durability of the surface characteristics of pavements with the design of which: the adhesion (tires) particularly in the rain, the plainness and the resistance to wear and to certify it to implementation	RRC and other relevant actors								- defined and applied Technical requirements for the use of pavement paving products; - % decrease in accidents due to pavement improvements.	- RRC Publications, DRC Gazette and Reports of Studies and Works; - CNPR reports
	- Adapt or design different equipment/ products (durable) for the protection of vehicles and road users, including wheel flaps/ stops, longitudinal rails made of steel, plastic or cement concrete, central berms, speed breaking devices such as speed bumps, signs, paints and other marking products. Develop electromechanical and electronic tools for automatic circulation regulation.	RRC and other relevant actors								- defined and applied Technical requirements for new road safety devices on vehicles;	- RRC Publications, DRC Gazette and Reports of Studies and Works ; - CNPR reports on the rate of accident reduction due to pavement improvements
	- Guarantee the physiological, health and environmental non-toxicity of road materials/ products, especially during their production, handling, storage, application and during road operation.	RRC and other relevant actors								- Technical requirements on the acceptability and use of road products / equipment ;	- Official newspaper - RRC Publications

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
<i>Specific objective number 5: Contribution to improving the quality and durability of the road.</i>											
Ensure the quality and sustainability of roads to ensure all-weather sustainable, safe and accessible transportation	- Continue and complete the publication of the results of ongoing research, particularly those related to soil stabilization with new chemical/ polymer binders (see soilfix South Africa),	RRC								Soil stabilization results attesting to improved lift of local soils available	Reports from the LNTP, RRC, OdR and OVD
	- Pursue and complete the publication of the results of ongoing research on the coceptiolisation and design of economical road structures with local materials and thin and economical coating (see AfCAP),	RRC								available and applied results of design and sizing of economic road structures with local materials and thin and economic coating.	RRC Publications, Reports from the LNTP, the OVD OdR and the TP SMEs
	- Continue and complete with the publication of the results of ongoing research for the drafting of an asphalt pavement maintenance and repair manual (see JICA) and the drafting of road standards.	RRC								Available and Applied Manual Asphalt Pavement Maintenance and Road Standards,	RRC Publications, Reports from the LNTP, the OVD OR and the TP SMEs
	- Update or adapt old RR results in the DRC and RR results from other countries (foreign) as well as writing manuals/ monographs to conform to recent scientific and technological achievements or to comply with local conditions.	RRC								Early and current results of the RR are up-to-date or adapted to the state of science and technology and / or local conditions, available and applied.	- RRC Publications, DRC Gazette and Reports of Studies and Proceedings.
	- Bring technological, technical and /or material innovation in order to (i) improve the mechanical and safety performance of road works and structures (roads that are stronger and more stable in local climatic and geotechnical conditions, safer roads and structures); (ii) reducing construction costs (more economical roads); and (iii) Standardization.	RRC								- New tools for design, control, construction, operation, maintenance and road management in the DRC; - New materials; - New technologies and techniques; - to improve the quality and durability of	- RRC Publications, DRC Gazette and Reports of Studies and Proceedings.

Actions to achieve the Strategic Objectives of the Road Research Policy in the DRC		Implementing officers	Period of implementation (year)							indicators	Means of verification
The goals			1	2	3	4	5	6	Beyond		
										roads,available and applied.	
	- To carry out the five-year programming and annual planning of the RR including a choice of areas, themes and subjects of the RR to develop, with a timetable, expected results, performance indicators, budgeting and mobilization of human, material and financial resources.	- RRC								- Road Research Programs developed, validated, published and applied.	- Activity reports of the RRC and its Board of Directors.

7 Monitoring and evaluation of the implementation of the Strategic Plan for the establishment of Sustainable Road Research Capacity within MIPWR in the Democratic Republic of Congo

7.1 Need to monitor and evaluate the implementation of the Strategic Plan for Road Research.

239. In order to ensure the realization of activities that contribute to the objectives of the road research policy in the DRC, and to ensure better visibility of road research, it is imperative to establish a system for monitoring and evaluating the implementation of the Strategic Plan. The set of activities to be carried out must aim at the following main objectives:

- Check that the implementation process is going according to plan;
- Evaluate the results of planned actions to determine whether they have actually contributed to the achievement of the objectives of the road research policy;
- Analyze these results in order to highlight the lessons learned and facilitate their ownership by the stakeholders in the implementation of road transport improvement actions in the DRC;
- Evaluate, in the mid and long term, the impacts of road research on road transport;
- Analyze the political and socio-economic context in order to reorient the policy, if necessary, to correct the deviations or adapt to new situations that have occurred during implementation.

7.2 Monitoring and evaluation procedures

7.2.1 Monitoring procedures

240. The monitoring will be carried out through the periodic reports on the implementation of the Strategic Plan for Road Research which will be established regularly by the Road Research Center, if necessary, with the assistance of the Infrastructure Unit and the Roads Office.

241. During the implementation of the Strategic Plan, four main reports will be prepared:

- A half-yearly report on the execution of the activities and the fulfillment of the actions;
- An annual report including a more in-depth analysis of the Strategic Plan taking into account the results of the critical reflections issued during the annual meeting.
- An assessment report after each phase presenting a summary of the activities and the results of a self-evaluation of the past period.
- A final report in 2030 summarizing activities, achievements, impacts and lessons learned.

242. The purpose of these reports is to provide updates on achievements against the indicators. Among other things, they will be able to present the analysis on the following:

- Data on expected accomplishments based on initial planning;

- Data on actual achievements;
- Comparison of achievements with forecasts and clearances;
- Identification of causes of deviations;
- Proposal of corrective measures or alternatives.

7.2.2 Evaluation Mechanisms

243. The Strategic Plan will be subject to two external evaluations and two internal periodic evaluations as part of critical reflections during periodic meetings or cross-cutting studies. The approach taken to conduct the evaluation will be to program two evaluation reports: one mid-term and one at the end of the implementation of the road research policy in 2030.

244. Mid-term evaluation: An independent mid-term evaluation will be conducted at the end of the sixth year of implementation of the Strategic Plan. This assessment will determine not only the level of performance in achieving results and the corrective actions to be taken for the remaining period, but will also decide on the relevance of current strategies, level of efficiency, key lessons and impacts.

245. Final evaluation: An external final evaluation will be conducted 6 months before the end of the implementation of the Strategic Plan. The final report will be a documentation of the resources used, the results and progress made against the initial objectives of the road research policy and the commitments made. Above all, it will make it possible to capitalize on the experience gained in order to better value it in the next stage.

7.3 Performance indicators and score card

246. Monitoring and evaluation of the Strategic Plan will be done on the basis of a list of performance indicators to be established by the RRC with the participation of stakeholders, both in the choice of these indicators and in the definition of the responsibilities of each other.

247. The objectively verifiable indicators presented in the Action Plan can be refined to assess the implementation performance of the Strategic Plan for Road Research. Other indicators to measure the efficiency, effectiveness, impact, relevance and sustainability of the actions carried out will be defined, with a view to determining the impacts of road research on road transport in the DRC.

248. The practical arrangements for conducting the monitoring and evaluation will be defined by the Road Research Center, which will be responsible for this, after consultation with other stakeholders. It will be responsible for defining a general score card of the execution of the Strategic Plan, both technically and financially.

8 Risk Factors and Mitigation Measures

249. One of the essential elements of the elaboration of any project is the consideration of the risks that it may incur. It is in this context that it is then necessary to identify at this stage, the main risks likely to hinder or even block the implementation of this Strategic Plan for the promotion of road research in the DRC. In addition to identifying risk factors, some mitigation measures are also proposed.

Table 8.1: Risk Factors and Mitigation Measures

Risk factors	Mitigation measures
<p><u>Political risks</u> :</p> <p>1. Institutional crises, post-election conflicts that may lead to political instability and the breakdown of peace.</p> <p>Political instability and the breakdown of peace hamper the functioning of the Institutions and the implementation of the actions provided for in the Strategic Plan. This cannot achieve the objectives of the adopted Road Research Policy.</p> <p>2. Failure to take the political decisions envisioned because of resistance to change.</p> <p>Many projects important reforms have not been followed by effects. The same can be true for the RRC if the political decisions envisaged, in particular on the creation of the RRC, on the provision of premises and on financing, are not taken in a timely manner.</p>	<p>The best answer, and probably the only one, is to promote management based on a democratic culture around the values that make up the motto of the DRC: Justice, Peace, Work.</p>
<p><u>Institutional risks</u></p> <p>3. Maintaining the current institutional status</p> <p>To start the RRC, institutional changes are needed, notably within the OdR, to benefit from what has already been done in the field of road research.</p> <p>4. The absence or weak capacity of steering structures and monitoring reforms.</p> <p>To achieve the objectives set in this project, aside from the financing aspect, the development of human resources is an important factor for the revitalization of the actions to be undertaken. To this end, the prior establishment of a monitoring and steering body led by competent and motivated staff is essential.</p>	<p>The Minister of Infrastructure, Public Works and Reconstruction, the supervisory authority, which is responsible for steering the process of building the capacity of road research in the DRC, will take the appropriate measures to mitigate these risks. It will be able to rely on the Cellule Infrastructures for this task.</p>

Risk factors	Mitigation measures
<p><u>Economic risks _ and financial</u></p> <p>5. The absence or weak mobilization of internal and external resources to finance the recommended actions</p> <p>Ideas can be as brilliant as desired, but when you do not have the appropriate means to make them come true, they are dead. Hence, the need to undertake actions of great scales to mobilize access to financial resources at both the national institutions at the level of technical and financial partners of the DRC.</p>	<p>The ways to mitigate these risks are, in particular :</p> <ul style="list-style-type: none"> - The establishment within the State of good economic and financial governance based on respect for the chain of Planning, Programming, Budgeting, Implementation, Monitoring, Evaluation, Aid Effectiveness. - The rational use of own resources and FONER ones; - Technical and financial assistance from AFCAP.
<p><u>The risks inherent in the absence of consultation and coordination at all levels</u></p> <p>6. Absence of regular and orderly consultation between the stakeholders of road research, on one hand, and between these same stakeholders and the technical and financial partners;</p> <p>7. Lack of consultation between the technical and financial partners, which can lead to a high risk of overlapping projects in the same transport sector.</p>	<p>To mitigate these risks, it is necessary to:</p> <ul style="list-style-type: none"> - Establish a coordination framework for objective and sustainable dialogue between stakeholders to combat the overlap of missions in the agencies in charge of road transport ; - Implement the Paris Declaration on Aid Effectiveness, which advocates the principles of alignment and harmonization for donors and development partners.

9 Appendices

9.1 Table 2.3 : Potential areas of road research

250. The table is taken from Chapter 2 of the preliminary report.

Table 9.1: Potential areas of RR in the DRC

No.	Potential Areas	Examples of themes	Sample topics
1	Traffic road (motor vehicle, non-motorized vehicle, pedestrian)	Vehicle Classification;	Classifying vehicles depending on the overall tonnage ; in depending on the axle load intensity, function gauges
		Axle load intensity	Equivalent axle load intensity ; permissible axle ; penalization for axle overload
		Traffic count and design traffic	Traffic for geometric and structural design
		Equipment / Furniture security	Urban Guardrails, Urban speedbreaker devices and large rural centers
2	Road geometry (Standardization, classification: recommended Parameters and Values)	Typical cross-section according to road types or classes	Soil type and max slope inclinations; Min and max tilts for semi-trailers.
		Longitudinal profile Depending on types or classes of roads	Ramps and max slopes; Radii for semitrailers.
		Rights of way and public areas of roads	Non-built spaces according to road classes;
3	Road construction materials (extraction, processing, formulation, acceptability, working, control	Untreated natural materials	use of fine sands in pavement layers;
		Concrete floors	Slimming of fine clay soils ;
		Natural materials treated with hydraulic binders	Explanation of the large dispersion of resistances of cement stabilized soils
		Natural materials treated with hydrocarbon binders	Determination of the fine sands used in the base layer of

No.	Potential Areas	Examples of themes	Sample topics
			pavements
		Natural materials stabilized with chemical binders	Increasing the cohesion of fine sands by the use of stabsoil and soilfix binders.
		Surface dressings	Contribution of two-layer coatings to the structural stability of base layers of crushed gravel
		Bituminous concrete	Fatigue of bituminous concretes; Cold worked BB
		Concrete cement	Surface roughness of cement concretes in equatorial and tropical wetlands; Load transfer devices at unreinforced concrete joints on compressible soils
		Reinforced Soil	Improvement of the lift of muddy soils by geo-synthetic reinforcement
		Use of mining slag in road structures	Base layer of Lubumbashi mining slag
4	design of road structures	Structural design of unpaved roads	Structural design of Roads in Tropical Rainforest;
		Structural design of paved roads with low traffic	Structural design of national roads with fewer than 50 vehicles per week;
		design roads under heavy traffic	Structural design of port roads
5	Road Drainage	Hydrology and hydraulic design floods according to local rainfall	Runoff coefficients for roads in DRC; Concentration time for retention basins for roads in DRC.
		Storm retention basins;	Clogging time of retention ponds according to the nature

No.	Potential Areas	Examples of themes	Sample topics
		Small transverse road drainage works and Ditches by geotechnical regions	of the soil; Partial retention and infiltration wells in urban areas
		Rain barriers	Soil type and drying time
6	Foundations of bridges, civil engineering structures and other road structures	Bridges abutments	Risk of collapse of bridge abutments in marshy environments
		Deck stacks	Scouring of batteries in fine sandy media
		culverts	Flexibility and rigidity of the road culverts
7	Bridges: Aprons for hydraulic road works	Aprons of small road hydraulic works; Protection of bridge decks	Physical and mechanical properties of wood for road decks in an equatorial environment; Pre-stressed wooden aprons for small road works in humid tropical environments
8	Maintenance of roads and civil engineering works	Maintenance of earth roads; Indicators for monitoring residual pavements	Soil compaction by HIMO techniques based on geotechnical parameters; Depth and length of unpaved ditches as a function of local rainfall.
		Maintenance of thin bituminous pavements;	Repair of alopecia on base layer sol cement
9	Road environment	Abandoned quarry Management; Protection of animals in villages crossings	revegetation of quarries after use. Road crossings for animals, speed bumps
10	Standardization, monitoring and control (materials, structures, works, safety ...)	Standards for road signs, road geometry, road traffic, compaction works ...)	Recommendations / standards on: on hydrocarbon binders for road works in the DRC ...) speed bumps on the ground

9.2 Human Capacity Building Needs

251. The additional information gathering, after the workshop No1, showed the following situation concerning the human resources of the DRD of the OdR to be transformed into RRC.

Before dealing with and proposing the reinforcement of the human capacities of the DRD with a view of its transfer to the RRC, it is necessary to present the organizational chart of the OdR which houses within it, inside and outside the DRD, several functionalities essential to the good functioning of the RRC to be created.

9.2.1 Current Road Board Organization Chart and the DRD Position Performing RR

252. The organization chart of the OdR included in 2014 the three major groups:

- The General Directorate (DG) and the strategic and control entities attached to the DG;
- Operational entities of the Central Administration or Departments;
- Provincial Operational Entities or Provincial Directions (DPs.).

a) The General Management group includes:

- Managing Director,
- Deputy Managing Director,
- College of Advisors,
- Inspection and Protection of Road Infrastructures Unit,
- Projects Management Unit,
- Directorate of Legal Affairs,
- Internal Audit Department,
- Organisation and Management Control Department.

b) The Operational Entities Group of the Central Administration includes:

- CPD: Department of Roads and Bridges,
- DRD: Department of Research and Development,
- DFI: Financial Department,
- DAG: Department of General Administration,
- DGM: Department of Management and Maintenance of Materials.

c) The set of Provincial Operational Entities comprises the 11 Provincial Directorates (DPs) prior to the administrative division into 26 provinces.

d) The DRD which is in charge of the RR within the OdR includes within it the following subdivisions:

- The LNTP Directorate, which deals more specifically with the RR,
- The Directorate of Planning and General Studies.

The LNTP Directorate includes:

- Geotechnical Research Division (DRG),
- The Physico-Chemical Research Division (DRPC),
- Administrative and Financial Division (DAF).

253. With regard to its vision and mission, the RRC should include new departments to replace those of the DRD. Proposed departments are listed below. The task of programming and planning the RR will be entrusted to a Scientific Committee which will also have the task of validating all RRC publications.

9.2.2 Proposed organization chart for the RRC in its operational phase (long-term)

254. The organizational chart of the RRC would include, in light of its mission, the following components::

- The General Directorate to which the Scientific Committee, Internal Audit and the Assistant to the DG are attached;
- The Administrative, Financial and Projects Department with its various divisions;
- The Scientific Directorate with its various departments (technical) including:
 - The Geotechnical, Natural Materials and Environment Department(DGME): It will deal in particular with soil and foundations, deposits and quarries, natural materials and soil concretes;
 - The Department of Bonded Materials and Concretes (DMLB): It will deal in particular with reinforced or reinforced soils, binders (black products, hydraulic binders, chemical binders ...), bound or stabilized soils, bituminous concretes (BB) and cement concretes;
 - The Department of Road Technologies and Structures: It will deal in particular with the design and geometric and structural design, the implementation of materials, the control of works, monitoring and maintenance, and also the management of the RRC laboratory;
 - The Department of Road Safety and Mobility: It will deal with vehicles, safety of people, traffic, traffic circulation and regulation, geometric design and road equipment and security devices;
 - The Department of Computer Science, Database and Publications (DBDP): It will deal in particular with the Scientific Secretariat of the RRC, the Management of the results of studies and research, software, the database of data, the Dissemination / Publication and the RRC Bulletin;
 - The Department of Bridges, Structures and Drainage (DPOD): It will take care in particular of bridge decks and the hydrological and hydraulic design of drainage works.

255. Depending on the level of implementation of RRC and the constraints at the moment, some departments may be missing from the organization chart or are merged.

9.2.3 Current situation of the research staff of the DRD of the OdR

256.

- a) The educational level of current RR staff is as follows:

- Master's degree (postgraduate) M : 2 Officers,
- University degree (4 or 5 years of university courses) : 7 Officers,
- High School degree (3 years of courses) : 4 Officers,
- Secondary level (considered as a house engineer) : 4 Officers.

Total 16 RR Officers

b) The basic specialty (university exit) is the following for levels M and L2:

- Geology and geochemistry : 4 officers,
- Building and Construction Engineer : 1 officer,
- Oil and Gas Engineer : 1 officer,
- Pedagogy in technology : 1 officer,
- Chemistry : 1 officer,
- Physics : 1 officer,

c) The age of the research staff is as follows:

- More than 65 years old: 4 officers including 2 at the bachelor level and above,
- From 60 to 65 years old included: 3 officers including 1 of license level,
- From 50 to 60 years old: 2 officers, all licensed,
- From 30 to 50 years old: 6 officers including 2 at the bachelor level and above,
- Under 30 years old: 1 licensed officer.

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257. The information received by the Consultant shows that it is necessary to go through the reinforcement of human capacities in the sense that the current research staff of the DRD is either insufficient in number, ageing, or under qualified in relation to the missions and actions planned for the RRC to put in place. In addition, the status of researchers within the MRST and the MESU defines recruitment and career development criteria for both researchers and research technicians. The main criteria are the basic diploma, usually with distinction, and the publication of articles in catalogued scientific journals or books approved by the Scientific Committee.

9.2.4 Human Resources Capacity Building Needs

258.

a) Preliminary remarks

- Taking into account the recruitment and career requirements of researchers by the MRST, it will be necessary to distinguish among current research personnel within DRD who is a researcher and who is a research technician. Researchers will also have to separate research assistants (1st term, 2nd term), research supervisors and research directors. This work may be the responsibility of the Scientific Council.
- The research activity is usually done by project or objective. It therefore has a short life span and is often multidisciplinary. The members of a research team may have different statuses among the following: Permanent Staff, Consultant, and Temporary Staff. The global trend today is to reduce the number of permanent staff and to work in partnership with other agencies, particularly universities. This type of organization, however, is difficult to implement in the current administrative

environment of the DRC where public funding limits only to the payment of permanent staff salaries.

- The following human capacity building proposal is based on profiles of current research staff in DRD and the proposed RRC organizational chart. It mainly concerns researchers Heads of Department. The staff to be recruited will have at least a L2 diploma (BAC + 5), preferably obtained with distinction.

b) Profiles of Researchers to recruit and / or train for RRC

- Given the current staffing of DRD researchers and other departments of the OdR, the three departments of RRC that can benefit from the existing experience are:
 - DGME: Geotechnics, Natural Materials and Environment,
 - DAFM: Administration, Financing and Marketing,
 - DPOD: Bridges, Structures and Drainage.

It should be added to this list the Internal Audit (AI) which is attached to the General Management. Human capacity building will be limited to a few thematic seminars and immersion courses.

- The proposed Scientific Committee should specify the training program required for the selected or recruited staff. Human capacity building needs or profiles are as follows:
 - DGME (Geotechnics and environment): Engineering or License (L2) in applied geology or civil & construction engineering;
 - DMLB (Related Materials and Concretes): civil & construction engineering or License (L2) in chemistry - organic chemistry;
 - DTSR (Technologies and Road Structures): civil & construction engineering – buildings and structures;
 - DSRM (Road Safety and Mobility): Road Traffic Engineer or Road Engineer;
 - DBDP (Database and Publications): Computer Engineer – specifically Database with knowledge of Publications and possibly in civil engineering;
 - DPOD (Bridges and Drainage Works): civil & construction engineering - buildings and structures.

9.3 Career plan for RRC staff to create

259. For reasons of motivation and harmonization on one hand, and following the recommendations of Workshop 1, on the other hand, the status of the staff of the RRC should be that of the staff of the scientific research centers of the MRST, which is attached to that of the staff of the public universities of the DRC.

260. According to Ordinance-Law No. 82-040 of November 5, 1982, on the organization of scientific and technological research, in article 34: The personnel working in different Centers and Research Institutes includes the officers in scientific fields than those of the administrative and technical fields.

261. The career plan of scientific staff is hierarchically as follows:

- Research Director

- Research Master
- Researcher
- Research Associate
- 2nd Principal Research Assistant
- 1st Principal Research Assistant

The advancement of scientific staff is by scientific merit, reflected in the number of scientific publications fixed to move from one grade to another.

262. The career plan of the technical staff is as follows:

- Chief Technical Director
- Technical director
- Qualified research technician
- Master research technician
- Research Technician

The advancement of technical staff is linked to the research projects and scientific publications in which they participate.

263. The career plan of the administrative staff of the Road Research Center is as follows:

- Director
- Head of Section
- Office manager
- 1st class officer
- Second class officer
- 1st class office clerk
- 2nd class office clerk

The advancement of the rank of administrative staff meets the criteria of the Civil Service.

9.4 Material Capacity Building Needs

264. The information-gathering supplement, after Workshop No. 1, showed that the RR in the DRC, in its present state, has neither a road research laboratory (RRL) nor a database. It will be necessary to equip it with these two indispensable tools for its operability.

9.4.1 *Equipment needs of the road research laboratory to be created*

265. A list of the necessary equipment has been received from the DRD of the OdR and has been completed by the SMEC in order to have an RRL capable of fulfilling its mission. The list is very long and is not included in this document but attached in the following appendices.

9.4.2 *Equipment requirements of the data bank to be created*

266. SMEC has developed a sub-study to define the list of equipment needed for the RRC database. Given its volume, this study is not included in the body of this Final Report, but rather in the following appendices.

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