MINISTRY OF SCIENTIFIC RESEARCH AND TECHNOLOGICAL INNOVATION

# SCIENCES & TECHNOLOGICAL INNOVATIONS BULLETIN

NATIONAL SCIENTIFIC COUNCIL

To the

## Discovery

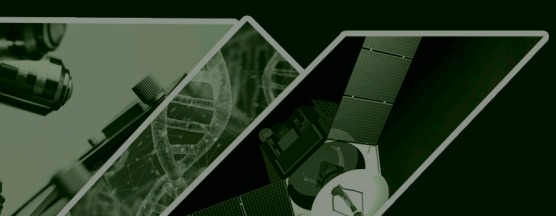
## Of the cultivation of

# Maize in DRC

66 prototypes presented by Gilbert KABANDA to the Council of Ministers

Goat milk in Luputa: good for health and the local economy

Universal antidote mwabi: an effective medicine for treating people who have been poisoned



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Editorial

# Innovating for emergence

*Professor Pius MPIANA TSHIMANKINDA*
*NSC President,*

The history of prosperous nations is often marked by constant reinvention. These nations have understood that emergence is more than a destination: it is an ongoing process, fueled by the spark of innovation. For the DRC, this spark has become a blaze, lighting new paths toward development, resilience, and economic sovereignty.

This bulletin is full of concrete examples of this dynamic. It reflects a deep conviction, echoing a new era dawning on the Democratic Republic of the Congo (DRC). The resolute commitment of the Minister of Scientific Research and Technological Innovation, Dr. Gilbert Kabanda, is a true catalyst for this energy. The presentation of the 66 Congolese prototypes to the Council of Ministers sent a strong signal: our local genius is not only capable of imagining, it is also capable of creating tangible solutions to meet our specific challenges.

The 66 prototypes are not just a number, they are a true symphony of national ingenuity that resonates in each of them. Indeed, whether it touches on the mysteries of our public finances, industrialization, health, or agri-food, each prototype is a seed sown in the fertile field of our potential. We see in these innovations the promise of a diversified economy, where the DRC, with its strong know-how, will regain the leading position it deserves on the continent.

The presentation of an electronic tax system, the work of Congolese scientific genius, to the government of the DRC on May 15, 2025, is a perfect illustration of this, promising greater transparency and efficiency in the management of our public finances, a crucial lever for economic development. Such a system, the cornerstone of sound governance, is a promise of transparency and orthodoxy that will dispel the shadows of uncertainty in the financial sector of the Democratic Republic of the Congo.

The country's commitment to emergence is also reflected in Minister Kabanda's international engagement at the GEO Global Forum 2025 in Rome from May 5 to 9, 2025. It demonstrates that global challenges, food security, and ecosystem preservation can only be addressed with collective intelligence, where the voice of the DRC counts and resonates loudly on this road to progress. There is no doubt that the National Scientific Council (NSC) continues to be a tireless pilgrim on this road. The participation of its President, Professor Pius MPIANA TSHIMANKINDA, in the Mbujimayi symposium illustrates the determination of this structure to spread knowledge throughout the national territory. Through this issue, the NSC also celebrates the commitment of researchers to awareness and action.

Among them, some challenge the status quo, reminding us that intelligence has no gender and that the full participation of women is an invaluable strength.

Others are invisible architects who strengthen the foundations of the scientific community, ensuring that every researcher is equipped with the tools to shine and extend the visibility of their work beyond the borders of the Democratic Republic of Congo. The Science and Technological Innovations Bulletin is also a window onto the harvests of research institutions, presenting their findings. This is revealed by promising observational clinical trials of pharmaceutical products, born of the generosity of the local pharmacopoeia, but whose effectiveness has been validated beyond national borders. They are proof that the legacy of our ancestors, coupled with modern science, can offer vital solutions. At the heart of this innovative effervescence, the discovery of an effective universal antidote to treat poisoned people is also a glimmer of hope. This drug is living proof that Congolese science is capable of responding to society's deepest ills, transforming pain into relief and enigma into solution. Similarly, the reflections of our researchers, exploring such vital topics as improving corn cultivation in the DRC and promoting goat's milk as a lever for health and the local economy, demonstrate their pragmatism. These researchers also demonstrate that they continue to weave the complex web of knowledge that will lead to sustainable emergence by addressing topics such as rare earths, the invisible keys to our technological future, and the ancestral wisdom of nighttime eating. These reflections prove that in this great symphony of human progress, innovation is not a mere fleeting note, but the essential melody that orchestrates the march toward a better future.

For the scientific research and technological innovation sector in the Democratic Republic of Congo, this melody is now the leitmotif, because emergence is not a distant destination, but the fruit of daily sowing: that of ingenuity and audacity. May this newsletter continue to convey this spirit of innovation leading to a better future, and may the pursuit of excellence continue to be the driving force that propels all researchers toward emergence.

# Activities of the Minister of SRTI

## Gilbert KABANDA presents an electronic tax device to Jean-Lucien Busa.

***The Minister of Scientific Research and Technological Innovation, Gibert KABANDA, presented an electronic tax device designed by Congolese scientific genius to his colleague Jean-Lucien Busa in Kinshasa on May 15, 2025.***

During the event, Minister Gilbert KABANDA KURHENGA congratulated his colleagues Jean Lucien Busa and Julien PALUKU KAHONGYA from the Ministry of Foreign Trade for being the first members of the government to respond to the call of President Félix TSHISEKEDI TSHILOMBO, who is keen to ensure that the inventions and innovations of Congolese scientific genius are consumed by the Republic. According to him, it is on this momentum that the DRC will diversify its economy and regain its place as a leader in the African economy.

Gilbert KABANDA also expressed his desire to see public companies return to the pre-1960 era, when they contributed to the greatness of the Belgian Congo with a gross domestic product (GDP) of $1,400 per capita, far higher than today's $400.

For his part, Minister Jean Lucien Busa pointed out that the countries that are advancing more quickly are those that base their policies on scientific research. He recalled that during the States General of the State Portfolio, it was recommended that companies in this sector take into account the various innovations produced in the scientific research sector. "Today, we are faced with an application that has the advantage of helping companies digitize their management systems," he said.

Jean Lucien Busa noted that among the challenges blocking the country's development is the lack of orthodoxy in financial management in general, but also the issue of transparency in management, which must be reflected in the quality of our financial statements.

In conclusion, he insisted that Congolese innovation, the subject of the activity, will improve management and the quality of information and make transparency in business management an important lever. As a Congolese innovation, he added, Jean Lucien MBUSA will be available to establish a roadmap for implementing this tax measure. The stated objective is to increase efficiency, transparency, and orthodoxy.

For the next step, Minister Gilbert KABANDA is waiting for his colleagues, who have received one or another invention or innovation from Congolese scientific genius, to invite him to explain how they can appropriate it and use it in the socio-economic life of the Democratic Republic of Congo.

It should be noted that the electronic tax system in question is the work of a multidisciplinary team of experts in accounting, public finance, and information technology, including economics expert BAKUTUTALANGA KUDILA, who is the team's spokesperson.

***Communication Unit of the Minister of SRTI***

## 66 prototypes presented by Gilbert KABANDA to the Council of Ministers

***The Minister of Scientific Research and Technological Innovation, Gilbert KABANDA, marked a decisive turning point in the promotion of Congolese scientific genius by presenting, at the last Council of Ministers meeting, sixty-six (66) prototypes of inventions and innovations resulting from national research.***

In a statement praised for its ambition, the minister emphasized that each of the prototypes presented had undergone rigorous evaluation. This preliminary analysis made it possible to assess the relevance of these innovations to the ministry's missions, as well as their potential impact on several other strategic sectors in the country.

"These inventions demonstrate cross-cutting potential and are in line with the sectoral policies of several ministries. They represent a real opportunity to invest in the development of the DRC," he told the Council.

The areas affected by these technological advances are vast, including public finance, industrialization, health, agri-food, and energy. They are local solutions designed by Congolese researchers and aim to meet priority socioeconomic needs and promote the development of national resources and local expertise.

By placing this initiative within a broader dynamic of structural transformation, the ministry intends to make research, invention, and innovation a lever for growth and competitiveness for the national economy. This approach is part of the vision of an emerging DRC capable of building a diversified, resilient, and knowledge-based economy.

"We are at the dawn of a new era. Science and technology must be at the heart of our country's progress. These initial results are just the beginning. The DRC has the potential to become an African leader in the knowledge economy," the Minister concluded.

This strong gesture in favor of national scientific innovation could well pave the way for a more aggressive policy in terms of research support, funding for local talent, and the industrialization of scientific results.

***Communication Unit of the Minister of SRTI***

## Minister Gilbert KABANDA KURHENGA represents the DRC at the Global Forum on Earth Observation, Geo-2025

***The Minister of Scientific Research and Technological Innovation, Gilbert KABANDA KURHENGA, participated in the Global Forum GEO 2025 in Rome from May 5 to 9, 2025.***

The theme of this five-day conference was "The Earth Speaks." This leading global event aims to inspire society and world leaders on the need to harness the Earth's intelligence to promote informed and ambitious actions to ensure food security, restore ecosystems, prevent disasters, and address the global crisis by turning sustainable development goals into a achievable reality.

The plenary session, which included a ministerial segment, served as the centerpiece of the event, where the GEO community experienced three important moments. The first was the launch of a dynamic platform to advance Earth intelligence for all. Second, the celebration of GEO's 20th anniversary, marking two decades of multilateral collaboration, innovation, and impact. Finally, the adoption of the post-2025 strategy implementation plan to achieve the ambitious goals of GEO's post-2025 strategy.

On this occasion, the Minister of Scientific Research and Technological Innovation, Gilbert KABANDA KURHENGA, focused his communication on the DRC's strategic orientation within GEO and on the government's political commitments to advance Earth intelligence over the next five years.

On the sidelines of the forum, Minister Gilbert KABANDA KURHENGA met with Ms. YANA GEVORGYAN, Secretary General of GEO. On the agenda for their meeting was the level of implementation of the commitments made by the DRC as part of the global strategy to achieve the SDGs.

The two officials also discussed possibilities for supporting the DRC in implementing priority areas in accordance with GEO's mission and mandate. A memo outlining all of the DRC's concerns requiring GEO's support will be submitted to the Technical Secretariat for appropriate responses.


***Communication Unit of the Minister of SRTI***

NSC Activities

# Madeleine MUANJI,

## a woman involved in social work at PS/NSC

***"Feminizing the public service is also a way of promoting access to public employment and professional careers for women on an equal footing with the men with whom we sometimes studied. That is the view of Ms. Madeleine MUANJI TUDIMUMWE, head of the Social Affairs Office at the Permanent Secretariat of the National Scientific Council.***


*With a degree in Management Information Systems from the Commerce Higher Institute (ISC/Gombe), Madeleine MUANJI strongly emphasizes that scientific research is a field that requires a combination of intelligence and skills. "When we talk about intelligence or skills, we are not talking about gender, but rather the abilities that agents called upon to contribute to the scientific research sector must have.*

*This means that women have the intelligence and abilities to work in this sector, which is so important for the life of a nation. I have studied and I have something to contribute to the development of my department, especially since the field of management information technology, which is my area of expertise, allows me to contribute modestly to the growth of scientific research, or rather to the National Scientific Council of my country," she emphasized.*

*This ISC/Gombe graduate is very attentive and passionate about a job well done. "At work, I always feel that I am serving the nation. Because the NSC is for the nation, just like the Ministry of Scientific Research. That's why I don't like to do things half-heartedly, but rather do a job well done to avoid criticism from my superiors," she said.*

*As for her home life, Madeleine MUANJI TUDIMUMWE manages well with her work. "My daily tasks as a housewife do not interfere with my work. Not at all, because everything has its time. Here's how it works. Every day, I wake up early to take care of my home. I arrive at work at 8:30 a.m., and nothing interferes with my job or my housework," explained the head of the Social Affairs Office at the PS/NSC. She added, "On Sundays, I devote myself to giving thanks to God. On other days, I go to church in the evening."*

*As head of the Social Affairs Office at the Permanent Secretariat of the National Scientific Council, this kind woman works like a man.*

***ASUKA Jacques NSC***



# CREPPAT pharmaceutical products: observational clinical trials in South Africa, Tanzania, and Burkina Faso

***The Director General of the Center for Research in Phytotherapy, African Pharmacopoeia, and Pharmaceutical Technology (CREPPAT), Pharmacist Constantin BASHENGEZI, recalled that the Congolese Scientific Engineering Conclave held in Kinshasa in 2023 had targeted an antiviral called DUBASE-C and the anti-cancer drug CANCUR.***

According to him, these products, which are approved by the Ministry of Public Health in the DRC, are made from plants harvested in the areas surrounding Kinshasa, in Central Kongo, Kivu, and Equateur. He said that during an international conference recently co-organized in Burkina Faso by the South African Ministry of Science and Technology and KIZERBO University in Ouagadougou, he presented the results of his research. This attracted other countries to take an interest in the work done by Congolese researchers in a wide variety of fields.

CREPPAT (Center for Research in Phytotherapy, African Pharmacopoeia, and Pharmaceutical Technology) is a young pharmaceutical company dedicated to producing modern, standardized, and stabilized medicines from Congolese natural substances to semi-finished and finished products.

To this end, the center conducts chemical research to identify the molecules and their active structures found in medicines. Once the structures have been elucidated, their pharmacological properties are highlighted, i.e., their impact on targets such as the HIV virus, COVID-19, hepatitis B and C, etc.

The Congolese Scientific Engineering Conclave held in Kinshasa in 2023 focused on two flagship drugs, DUBASE-C and CANCUR. But the range is only expanding.

Constantin BASHENGEZI says that the second anti-cancer drug is BASICS C. CREPPAT also manufactures drugs for gastritis, gastroduodenal ulcers, and cutaneous mucosal ulcers, called GASTRO-C. This laboratory also produces a drug for rheumatoid arthritis, a disease that affects older women. There is also a drug for lopetia. Work is underway in the laboratory on drugs for high blood pressure and diabetes.

A first in the DRC. Constantin BASHENGEZI began research on DUBASE-C in 1986 at the Faculty of Pharmaceutical Sciences at the University of Kinshasa. Having been involved in this field for almost 40 years, he says he has never seen a minister or member of the government so committed to promoting scientific and technological research as Dr. Gilbert KABANDA KURHENGA, Minister of Scientific Research and Technological Innovation.

He also recalled that he had the opportunity to meet President Félix TSHISEKEDI TSHILOMBO on two or three occasions, from whom he sensed the same motivation, determination, and political will to make science and technology the driving forces behind the development of the Democratic Republic of Congo. "We cannot develop by consuming what we do not produce or by consuming what others produce. We would be slaves," he concluded.

***Communications Unit of the Minister of SRTI***

# CNRSBD Chief Executive Officer NYIMI BUSHABU participates in a workshop in Accra

***The Director General of the National Center for Research in Oral Sciences (CNRSB) and Vice Dean for Research and Specialization at the Faculty of Dental Medicine at the University of Kinshasa, Professor Fidèle NYIMI BUSHABU, participated in a workshop held in Accra from May 5 to 8, 2025, for university leaders, faculty members, and research center directors.***

This event was organized by the Association of African Universities under the main theme "Positioning your university for global visibility." Several scientific themes were also explored during the event. These included: facilitating transnational education (TNE), a global model for TNE, promoting research excellence and scholarly works, digital marketing strategies and the visibility of research works in Africa, and open access publishing.

*MAZONO Christian/NSC*

## At the time of Innovation

# Universal antidote mwabi: an effective medicine for treating people who have been poisoned

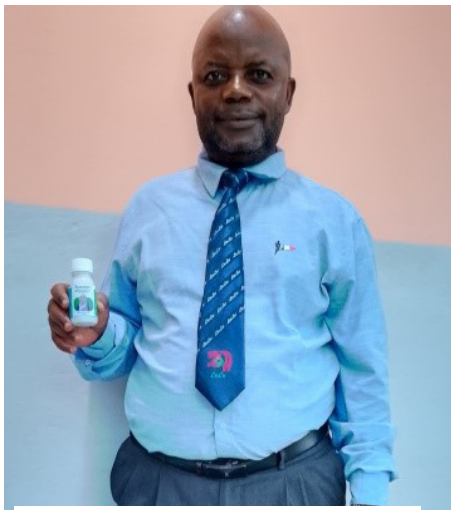
***For more than two decades, cases of poisoning have been reported in the Democratic Republic of Congo (DRC), a phenomenon whose origin remains unknown to this day. In fact, poisoning is suspected in cases where patients test negative on all biomedical tests prescribed by doctors, yet continue to suffer. In most cases, anemia is recorded due to a decrease in hemoglobin levels in the patient's blood.***

This situation caught our attention in 2015, when we began conducting investigations that revealed some signs and symptoms of poisoning, including: generalized fatigue affecting all joints even though no heavy work had been done the day before, internal chest pain without radiation to the back or left shoulder, acute abdominal pain, incurable headaches, recurrent fever and typhoid fever, dry mouth, weight loss, darkening of the skin, loss of appetite, and a lump in the throat that persists even when drinking water or eating a banana (indicating dilation of the esophagus, a phenomenon that promotes blood clotting, causing some poisoned patients to vomit blood and eventually defecate blood if not treated in time).

The concern was to find out the cause of all these signs and symptoms, the results of diagnoses by certain doctors who prescribed medication to poisoned patients but did not lead to recovery. Discouraged by this desperate situation, many patients resort to traditional medicine, known as natural medicine or alternative medicine, where traditional healers first test for poison using several methods before prescribing any kind of medication.

In January 2018, a survey conducted with a person who requested anonymity revealed four types of poisons, three of which are solid and one liquid but more harmful than the other three. Among the raw materials used to manufacture these three types of solid poison (Karuho) are products of animal origin (chameleon, Bufo toad, human placenta, and crocodile bile), and plant-based products ( datura stramonium, wild cucumber, window powder, sulfuric acid from old vehicle batteries, cadmium, and white mercury). Throughout this period, I continued to treat several patients who had been referred to me by the first patient. Aware of this problem and keen to find a solution to this scourge, we decided to conduct more in-depth research as part of a doctoral thesis entitled Evaluation of the efficacy of animal biomass-based antidotes in neutralizing a biological poison (bufotenin) extracted from toads. This work examined the effectiveness of two types of antidotes, A1 and A2, in neutralizing the effects of bufotenin extracted from toads, tested on guinea pigs (Cavia porcellus).

The study concluded that antidote A1 was more effective than antidote A2 in neutralizing the effects of bufotenin. In light of this result, it was deemed appropriate to assign A1 the trademark AUM, which stands for "Antidote Universel Mwabi" (Mwabi Universal Antidote) and is currently used by the inventor to treat patients in Kinshasa. It is important to note that AUM is a drug identified and certified under the number: No. RSIT-SG/183/Ful/037/2025.



*Prof. Dr. MWABI NGAMA Alexandre*
*Inventor of the Mwabi Universal Antidote (MUA)*



# To the discovering of the cultivation of Maize in the

***Maize is the third most important food crop in the DRC after cassava and bananas. It is a valuable food source for humans (flour, oil, beverages) and livestock (fodder). It is considered richer than wheat, although its consumption must be supplemented by other foods.***

In Kinshasa, for example, annual consumption (kg/capita) of corn grain rose from 2.84 kg in 1975 to 6.68 kg in 2000, an increase of 235%. Corn flour is increasingly being mixed with cassava flour in the preparation of "fufu."

Maize is grown for human and animal consumption, but also for numerous uses in the textile and pharmaceutical industries, in the production of biodegradable plastics and biofuel.

Maize cultivation is widespread in the DRC, and national production has continued to increase despite climatic and social disruptions, rising from 1,101,130 tons in 1996 to 1,154,570 tons in 2002, a growth of 4.85%.

At the same time, during the same period, the area under cultivation increased from 1,378,135 to 1,808,948 hectares, representing growth of 31%. However, this shows that the increase in corn production is dependent on the increase in cultivated land. Average national yields remain low (0.8 to 1 t.ha-1) compared to those of countries such as Italy (9.53 t.ha-1), Canada (6.63 t/ha), China (4.57 t/ha), and Argentina (5.65 t/ha).

This is partly due to the low use of improved varieties and agricultural inputs and the significant damage caused by various pests.

Although Katanga province ranks first among the provinces of the DRC in terms of maize production (22% of national production), overall demand in 2008 was 988,156 tons and supply was 500,854 tons, giving a supply/demand ratio of approximately 0.5. This situation creates food insecurity for around 9 million inhabitants.

This permanent deficit is generally filled by imports from southern Africa. In Katanga, the average corn yield in rural areas ranges from 800 to 1,000 kg/ha, compared to 3,000 to 4,000 kg/ha and 6,000 to 8,000 kg/ha in large farms and research stations, respectively. Research has therefore focused on improving cultivation techniques to increase grain maize yields in Lubumbashi. In the United States, 60% of the 100% increase in corn yields is linked to genetic improvement, with maize yields rising from 1 t.ha-1 in the 1930s to 7 t.ha-1 in the 1990s.

In France, 58% of the progress in corn yields is due to genetic improvement. In the context of Katanga province, local varieties adapted to climatic conditions have degenerated and no longer produce good yields.

In addition, with the climate change observed in recent decades, the desired corn genotypes must have both good tolerance to this stress and good grain yield potential compared to local varieties.

### *Soil type*

Maize adapts to a variety of soils, but yields well in deep, well-drained soils. It does not thrive in sandy or heavy clay soils. It requires nutrient-rich soils, and the addition of organic matter improves yields in poor, degrading soils. Given its requirements, it prefers to come at the head of a rotation or after a legume.

### *Site preparation*

In forested areas, trees need to be felled. To open the field, the following work is required: clearing, cleaning and ploughing (20 - 30 cm deep). Before sowing, the soil must be sufficiently clean.

### *Sowing*

As with all other crops, maize should be sown at the start of the rainy season, but care must be taken to ensure that flowering and fruiting coincide with the peak (maximum) rainfall. 2 to 3 seeds are sown per poquet (seed hole) at a spacing of 80*50 cm or

75*25 cm, requiring 15 to 20 kg of seed/ha. Sowing depth is 5 to 7.5 cm.

### *Maintenance*

Maintenance begins with : Replanting, i.e. sowing in places where seeds have not grown (7-10 days after sowing). Weeding: go through the field; wherever there are three plants, remove one and leave two to avoid competition. The plants removed can be used to fill in the gaps. Caution: do after rain.

Weeding (3) at 15, 30 and 45 days after sowing.

Mounding: consolidate the soil around the plant when it is 40 - 50 cm high or when the adventitious roots have emerged.

Weeding: whenever weeds can hinder normal plant growth. Care is also taken to remove diseased plants, malformed or aborted ears. Cultivation takes 3 - 5 months, with late varieties being the most productive.

### *Harvest*

Harvesting time depends on the product required. For flour preparation or seed production, harvest at full maturity. When the leaves turn yellow and the spathes dry out. In traditional farming, the crop is harvested by hand, cob by cob, dried and de-stemmed by hand. Yields rarely exceed 1,000 kg/ha (1 tonne/ha). But with late varieties and rich soils, yields can reach 1.5 to 3 tons/ha and even more. The addition of organic matter and irrigation can boost yields to over 3 T/ha.

### *Pests and diseases*

Maize is attacked by a number of diseases, the most serious of which are stripe disease, smut, etc. Attacks come from stalk-boring caterpillars, cob borers and weevils, which attack stored maize.

### *Notes on seed production*

Seed production requires the same technical operations, but a few practical rules must be observed :

To preserve the genetic purity and the characteristics of the cultivated variety, you must never make a field where there is a mixture of varieties.

A minimum distance of 200 metres must be maintained between two fields of different varieties.
A seed field may not be combined with other crops.

Seed must be collected from vigorous plants, free from signs of disease or attack, and the ears must be 14 - 16 rows long.

To collect the seed, cut about 2 cm from the base of the ear and 5 cm from the top of the ear, using the middle part as the seed source.

How to protect the seed

Generally speaking, there are two ways of storing seeds: In spathes : selected ears are kept with their spathes and stored in a dry, well-ventilated place, e.g. on shelves or on the roofs of houses.

In grain form: in bags stored in a good, well-ventilated, dry, weevil-free place.

Seed protection

Corn seeds are often attacked by weevils.

Good hygiene in the field, good choice of seed cobs and good storage help to limit attacks. Insecticides can be used to protect seeds.

Farmers use insecticide plant powders (chilli, pyrethrum, eucalyptus, tobacco, etc.), oils and ashes.

***Afpde, Nyembo Kimuni Luciens, Useni Sikuzani Yannick, Mpundu Mubemba Michel, Kyungu Kalilo, et Baboy Longanza Louis***

# Goat's milk in Luputa: good for health and the local economy

***Located in the heart of the Lomami Province, in the center of the Democratic Republic of Congo (DRC), Luputa benefits from a favorable climate for goat breeding, enabling trade in goat milk, meat, skin and sometimes hair. The chief town of Luilu therefore lives to the rhythm of a modest agricultural activity, but one that is nonetheless buoyant in terms of goat breeding. Although the region is not on the map of the country's major economic hubs, it is nonetheless a neglected but strategic mine for goat's milk.***

In this region, where the supply chain is still precarious and dietary diversification stunted, goat's milk is much more than a simple foodstuff: it's an essential and highly economical source of nutrition. In fact, nutritionists claim that goat's milk is rich in essential nutrients such as protein, calcium, iron and vitamins, making it a valuable ally in the fight against infant malnutrition. However, goat's milk production remains marginal, despite the nutritional and economic advantages offered by locally produced goat's milk. Goat's milk is highly prized in Luputa for its nutritional qualities, notably that it is easier to digest than cow's milk, rich in calcium, short-chain fatty acids and vitamins A and D, and is used as a supplementary food for chronically malnourished children. Several rural health zones, supported by local and international non-governmental organizations, recommend the regular consumption of goat's milk by pregnant women and young children. The nutritional richness of this milk is not just an asset, but a necessity of life. In addition to its health benefits, goat's milk is also a real economic opportunity. Many families, living on subsistence food crops, integrate goat farming into their agro-pastoral system, sometimes on a small and sometimes large scale.

Statistics show that a goat can produce up to 2 liters of milk a day during the lactation period, enabling some households to generate additional income by selling the surplus on local markets.

Successful examples elsewhere on the African continent can serve as a model for Luputa. In Senegal, a study showed that yoghurt made from goat's milk could help overcome stunted growth in malnourished infants. In Burkina Faso, the introduction of red goats, a dairy breed, has improved nutrition and income for rural families.

However, the sector is not very professionalized, as goat-breeding in Luputa is still based on the survival of a few households, and enables them to pay for their children's schooling, buy basic necessities, etc. The sector has no support from the local authorities. The sector has no formal institutional support. On the other hand, breeders have set up informal cooperatives where mutual aid is paramount. As a result, the supply of animal feed, access to rudimentary veterinary care and the management of goat breeding are carried out on an artisanal basis, albeit with surprising dexterity.

Women play a central role in this dynamic. Responsible for milking and often for marketing, they are becoming players in a rural economy that is often invisible in national statistics. Some of them are even starting to process milk into artisanal cheeses, which are still less widely consumed locally.

Despite its potential, goat's milk production in Luputa remains hampered by a number of structural obstacles, including a lack of technical training, the absence of appropriate conservation infrastructures (refrigeration, hygiene), difficulty in accessing the regional market, etc., all of which limit the sector's prospects for expansion.

These obstacles are compounded by climatic instability, which disrupts the rhythm of rainfall, making fodder scarcer and considerably reducing the milk productivity of animals in general, and goats in particular.

Support from the local authorities, although tentative at present, could change all that. Structuring the sector through veterinary training programs, the introduction of more efficient dairy breeds and logistical support,

would enable the sector to achieve

sustainable profitability. A number of rural development players are also calling for this sector to be integrated into provincial food security policies.

In an economy dominated by informality and local initiatives, goat's milk in Luputa embodies a form of rural resilience. Discreet but regular, artisanal but indispensable, it illustrates how modest resources, well managed, can bring about significant transformations.

This local product, still far from its full potential, is undoubtedly one of the forgotten pillars of family farming in Lomami. Time will tell whether the necessary investment and support will enable it to reach a wider scale. But already, in the hills of Luputa, the goat has become a silent symbol of survival and hope.

To develop goat's milk production in Luputa, several actions can be envisaged :

- selection and dissemination of suitable dairy breeds: the introduction of breeds such as the Saanen or Alpine, known for their milk yield, could improve production;
- farmer training: training programs on good husbandry practices, feed and animal health are essential to ensure the quality and quantity of milk produced;
- creation of mini-dairies: setting up local structures to process milk into by-products (yoghurt, cheese) can add value and create jobs ;
- Consumer awareness: promoting the benefits of goat's milk to the local population will encourage demand and support the industry.

The development of the goat's milk industry in Luputa could have several positive spin-offs :

- Improved food security: by providing a local source of protein and essential nutrients ;
- Job creation: processing and marketing of dairy products in livestock farming ;
- Empowerment of women: often involved in goat breeding, women could benefit directly from the income generated;
- Poverty reduction: by diversifying sources of income for rural households.

Goat milk production represents a strategic opportunity for Luputa. By drawing inspiration from successful initiatives in other African regions and adapting strategies to the local context, Luputa can develop a sustainable goat dairy industry, beneficial to public health and economic development.

*Héritier TSHIAMA / RCSARP*
*and Consort BELESI/NSC*

# Rare earths: the invisible keys to our technological future

***Your smartphone vibrates, an electric car starts silently, the wind turbine in the distance captures the force of the wind. Behind these feats of modernity lie elements with strange names: neodymium, dysprosium, lanthanum... Welcome to the fascinating world of rare earths. Far from being abundant and easy to extract, these 17 metals with their unique properties are becoming the invisible keys to our technological future, fuelling the energy transition and the digital revolution. But this growing importance raises a crucial twofold question: are we ready to meet the complex challenges associated with their exploitation, and how is the race for control of these strategic resources redrawing the global geopolitical map? Why "the invisible keys to our technological future"?***

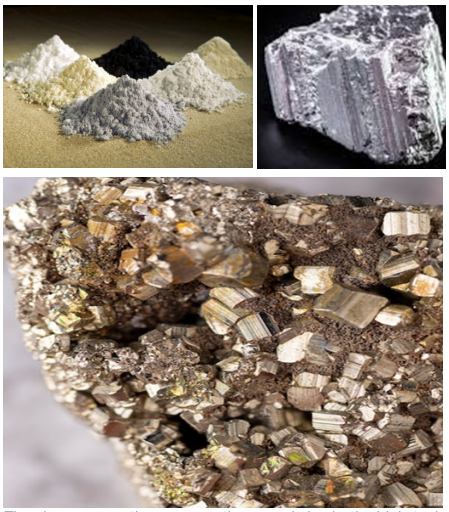
The 17 metals - Scandium (Sc), Yttrium (Y), Lanthanum (La), Cerium (Ce), Praseodymium (Pr), Neodymium (Nd), Promethium (Pm), Samarium (Sm) and Europium (Eu) - contrary to what their names suggest, are not particularly rare in the Earth's crust in terms of total abundance. Some are even more abundant than common metals such as copper or lead.

Their "rarity" lies more in the economic concentration of exploitable deposits and the complexity of their processing, especially when they were discovered between the early 18th and 19th centuries.

The world currently produces around 390,000 tonnes per year, which means that with reserves of around 90,900,000 tonnes, the world has at least 233 years' consumption. The world's major reserves include China, Brazil, Russia, India, Australia, the USA and Greenland.

In the DRC, these metals are not rare, as several sources mention indications of the presence of minerals containing rare earths. For example, occurrences of monazite (a mineral containing rare earths) have been reported in some of the country's pegmatites (magmatic rocks), notably in the Numbi, Manono, Kitotolo, Kobokobo, Kampene and Lugulu regions.

These metals are the architects of green technologies. Imagine wind turbines without the powerful neodymium magnets that optimize energy production, or less efficient electric vehicle motors without the magnetic torque of praseodymium.



*The key magnetic rare earths, used in both high-tech and medical imaging, are : Nd and Pr are crucial for the permanent magnets used in many high-tech devices and, to a lesser extent, in some medical lasers. Dy is an important additive to enhance the performance of these magnets. Gd has a unique and vital application as a contrast agent in MRI, while Sm is used in specific magnets and in radiotherapy.*

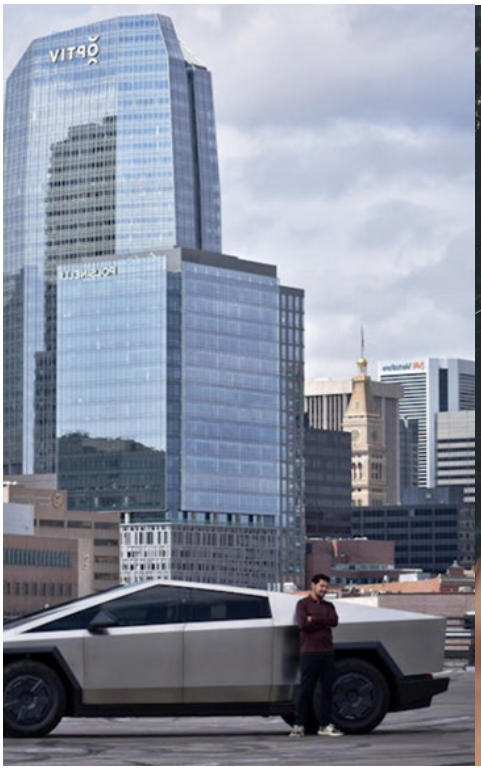
Rare earths are the discreet but essential artisans of green technologies, making cleaner energy and sustainable mobility possible.

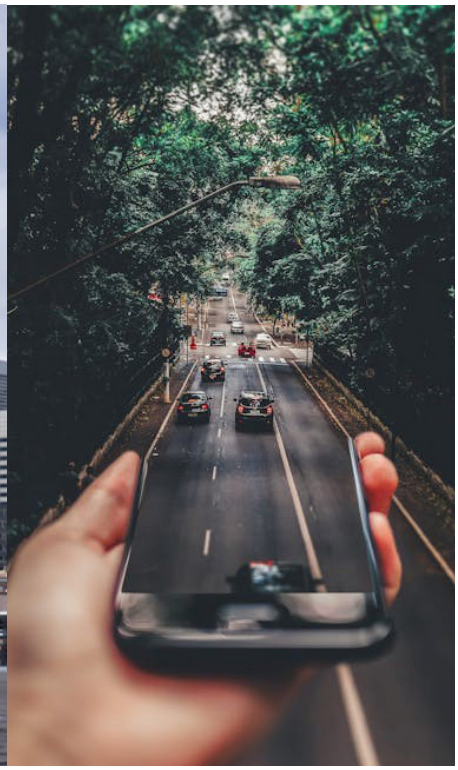
Lanthanum, for example, is used in the nickel-metal hydride batteries of certain hybrid vehicles.

Rare stones are at the heart of electronics.

Our brightly colored screens, whether for smartphones, televisions or computers, owe their luminosity and fidelity to the luminescent properties of europium and terbium. Scandium, meanwhile, is used in high-performance displays. Without these elements, our digital world would lose its brilliance.

Rare stones are used for alloys with unrivalled performance. In fields as varied as aerospace and armaments, rare earths are used in the composition of alloys with exceptional heat and corrosion resistance properties. Samarium and cobalt are used in permanent magnets for specific applications in these sectors.





There are, however, challenges in the shadow of this promise, not least complex and costly exploitation. While rare earths are not geologically rare, their exploitable concentrations are limited and often mixed with other elements, including radioactive substances such as thorium and uranium.

Extracting and separating each element requires complex, energy-intensive and costly chemical processes. In addition, traditional extraction methods can lead to significant deforestation, soil and water pollution due to the use of harsh chemicals, and the production of potentially toxic and radioactive waste. Managing these significant environmental impacts is a major challenge.

The geopolitical stakes involved in the global control of rare earths fuel global politics and the race for strategic resources. Indeed, the distribution and control of rare earth deposits have become a major geopolitical issue in the 21st century. Several factors explain this strategic importance:

• Chinese domination: For decades, China has largely dominated the extraction, processing and production of rare earths, controlling a significant share of the world's supply. This quasi-monopoly has given Beijing considerable economic and potentially political leverage, as demonstrated by international concerns following export restrictions in 2010.

- Dependence of industrialized countries: The United States, Europe and Japan, heavy consumers of technologies requiring rare earths, find themselves in a situation of dependence on China. This vulnerability has prompted these nations to seek alternative supplies and develop their own extraction and transformation capacities.
- The race for new sources: Faced with dependence and trade tensions, a global race for new sources of rare earths is underway. The exploration of deposits outside China (United States, Australia, Africa, Greenland), as well as interest in extraction from secondary sources such as electronic waste, testify to this desire for diversification.
- Trade and diplomatic tensions: Rare earths have become a potential sticking point in international trade relations. Export policies, tariffs and attempts to secure supply chains are key elements in these tensions. The European Union and the United

States have implemented strategies to reduce their dependence and reinforce their autonomy in this strategic sector.

- Impact on defense: Rare earths are crucial to many high-tech military applications (missiles, guidance systems, radar, etc.). Controlling their supply is therefore a matter of national security for many countries.

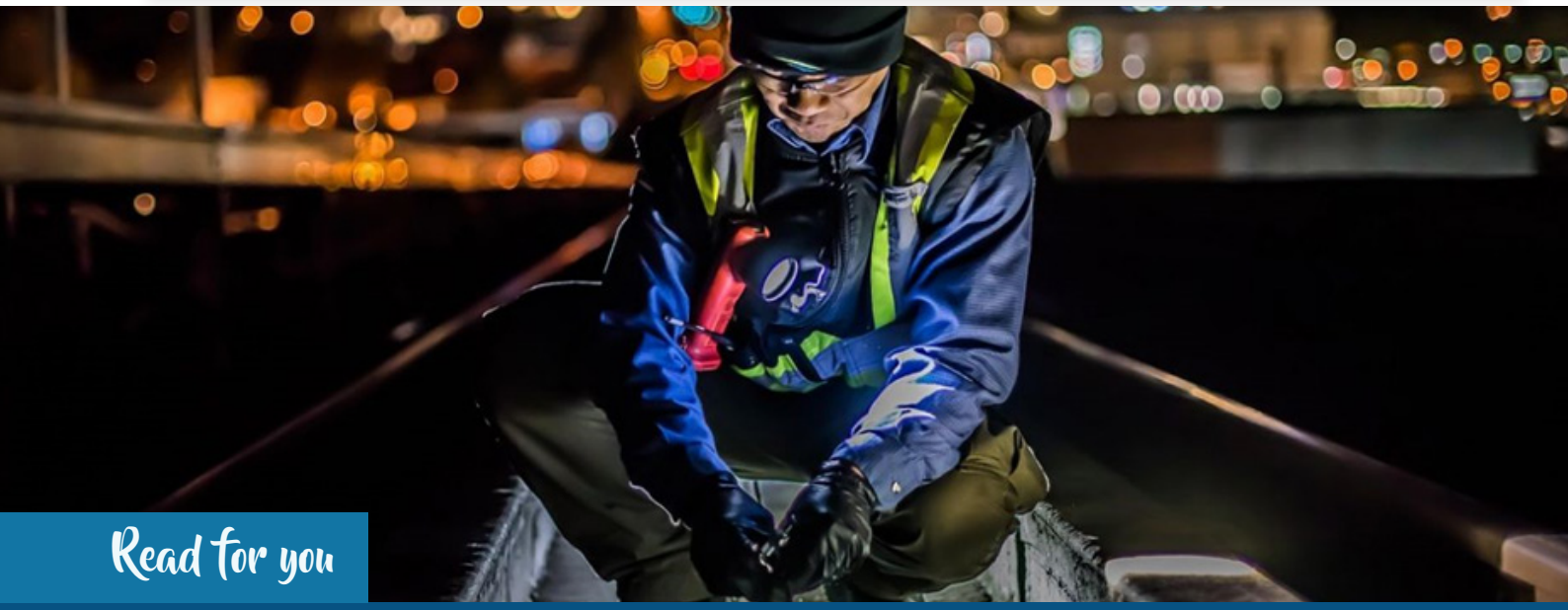
It is therefore necessary to adopt a circular economy for a more sustainable supply of rare earths. Faced with the challenges of exploitation and geopolitical stakes, the search for substitutes, the reduction of consumption and the development of rare earth recycling techniques are becoming imperative to ensure a more sustainable supply that is less dependent on geopolitical hazards.

The future of rare earths is intrinsically linked to global geopolitical dynamics and our ability to innovate responsibly. Competition to secure access to these strategic resources will influence international relations and the industrial strategies of the major powers. Innovation in extraction and recycling processes, diversification of supply sources and the implementation of international regulations will be essential to avoid a "rare earth war" and ensure a more stable and equitable technological future.

Rare earths are much more than just chemical elements; they are at the heart of a new technological era and a complex global power game. Their crucial role in energy transition, digitalization and defense makes them coveted strategic resources. Understanding both the technical challenges of their exploitation and the geopolitical stakes of their control is essential to anticipate the challenges and opportunities of our future.

How the world manages access to these invisible keys will inevitably shape tomorrow's technological advances and international relations..

*Jean-Luc BALOGIJE SELENGE MDRC/Bunia and BELESI Consort/NSC*



Read for you

## Night shift: eating during the day may reduce heart risks

***Night shift work is associated with higher cardiovascular risk than day shift work. But eating during the day may reduce this risk, according to a new study.***

Night work accounts for around 15% of all work in industrialized countries. It affects a wide range of sectors, from transport and healthcare to the food industry and many others. But night work is not without risk to cardiovascular health. Several studies have established the link between a period of night work and a higher risk of heart disease.

The cause is circadian desynchronization, i.e. the body's central circadian clock is no longer synchronized with the waking and sleeping cycles. But mealtimes could be one of the keys to reducing these negative effects. A recent study published in the journal Nature Communications shows that in night-shift workers who only take their meals during the day, and therefore do not eat at night, the heart seems to be preserved from the negative effects of night shifts.

It's too early to say that daytime meals actually cancel out the negative effects of night shifts. But the work carried out at Mass General Brigham in the USA is a step in the right direction, even if it was not carried out directly on night shift workers. To this end, 20 participants underwent a two-week experiment, during which they were all kept in an environment devoid of natural light and external clues as to the time of day. No sunrise, no access to watches or electronic devices. These conditions enabled us to isolate the effects of circadian rhythms from other factors that could disrupt the experiment.

*Science and the future*

# PUBLIC-SECTOR RESEARCH CENTERS AND INSTITUTES IN THE D.R. CONGO

### RIHS (Research Institute in Health Science)

*Objective: To improve the state of health of the population through research in the following fields: pharmaceutical, medical, anthropological, psychological or socio-cultural.*
*Address: 9, Av. Lukusa C/Gombe; E-mail: dnyembo@gmail.com; Tel: 0824580211*

### ATSRC (Applied and Technologic Sciences Research Center)

*Objectif: Mettre au point des matériaux , des appareils , des méthodes ou procédés Objective: To develop materials, equipment, methods or processes with a view to finding solutions to the population's urgent problems in various fields: housing, rural development and the modernization of the society.*
*Address: 106, Blvd du 30 Juin, C/Gombe; E-mail: Jeannoel.mputu@gmail.com; Tel: 0821138261*

### RCHS (Research Center in Human Sciences)

*Objective: To ensure the human development of the Congolese people through the study of its social, economic and political dimensions with a view to identifying the factors that have a positive or negative influence on its development.*
*Address :33,Av.comité urbain C/ Gombe; E-mail: mingashang@yahoo.fr; Tel: 0819377821*

### *RCMT (Research Center in Mathematics Teaching)*

*Objective: To carry out research in the field of mathematics teaching with a view to improving quality.*
*Address: 84, Av. des Ambassadeurs C/ Gombe; E-mail: mabelamatendorostin@gmail.com; Tel: 0815031877*

### GRC (Geophysical Research Center)

*Objective: To provide the country with a national geophysical observation network, for the global study of the internal behavior of the earth in the DRC.*
*Address: 44, Av. de la démocratie, C/ Gombe( within GMRC); E-mail:tondozi@gmail.com; Tel: 0854426228*

### AIPS (African Institute of Prospective Studies)

*Objective: To carry out forward-looking studies in order to propose solutions to crises and problems linked to the evolution of African societies.*
*Address: Av. Cardinal Malula, C/ Lemba; E-mail: mgrtarcibangu@yahoo.fr; Tel: 0996658741*

### *MDRC (Multidisciplinary Development Research Center/Matadi)*

*Objective: To carry out operational research in central Congo in the field of applied linguistics of African cultures and applied sciences*
*Address :Hôtel de la porte Matadi; E-mail: Mwanzanicolas5@gmail.com; Tel:0815037949*

### *NCPIR (National Committee for the Protection of ionizing Radiation)*

*Objective: - Regulatory authority for protection against the dangers of ionizing radiation in the DRC management of radioactive sources of radioactive materials such as uranium.*

*Address: 4675, Av. Colonel Ebeya, Immeuble Quitus 2ème niveau; Email: Flory1963@gmail.com; Tel: 0816684665*

### AEC (French Atomic Energy Commission)

*Objective: To carry out, promote and coordinate scientific and technical research in various fields of science and industry, concerning the use of atomic energy and space research.*
*Address: UNIKIN building; E-mail: Steve.muanza.kamunga@gmail.com; Tel: 0808643248*

### CGI (Congo Geographic Institute)

*Objective: Production of the base map of the DRC at a scale of 1/50,000 and its derivatives.*
*Address: 106, Blvd du 30 Juin, C/Gombe; E-mail: Fidele.balibuno@unikin.ac.cd; Tel: 0974449240*

### GMRC (Geologic and Mining Research Center)

*Objective: To carry out studies and analyses to improve knowledge of the soil and subsoil of the national territory.*
*Address: 44, Av. de la démocratie, C/ Gombe; E-mail: rolandkakule@gmail.com; Tel: 0851506161*

### NIASR (National Institute for Agronomic Study and Research)

*Objective: To promote the development of agriculture in the Congo. To maintain varieties, multi-local trials, and its farmers, management and conservation of germplasm.*
*Set up a program to monitor and evaluate research activities.*
*To disseminate new varieties. Give the emerging technical department*
*its reason for being, with a view to producing basic and pre-basic seed.*
*Resume publication of the agricultural magazine to disseminate research results.*

*Address: 13, Av. des Cliniques, BP :2037 KINSHASA , C/Gombe; E-mail: domikankonde@yahoo.fr; Tel: 0818248620*

### *RCALC (Research Center into African Language and Culture)*

*Objective: To coordinate and carry out all research projects concerning African languages and cultures.*
*Address: 53 C, Av. Makiso, blvd du 30 juin, Kisangani/ Tshopo. Tel: 0851934320*

### AFRC (Agro-Food Research Centre/Lubumbashi)

*Objective: To identify processes for processing and preserving basic local agricultural products.*
*To improve the quality of imported or locally produced foodstuffs by applying approved standards and quality control.*
*Help the technological development of the existing agro-industry by providing them with technical assistance wherever possible.*
*Address: 1, Av. Président ILEO, Q/CRAA, C/Lubumbashi; E-mail: Julesnkulu@gmail.com; Tel: 0997131002*

### SSRC (Social Science Research Center / Bandunduville)

*Objective: to carry out practical scientific research into major socio-economic and cultural issues.*
*To promote sustainable aquatic development.*
*Address: 29, Av. de la mission, Q/Salongo, C/Basoko. BANDUNDUVILLE, BP. 223; E-mail:akuzituka@gmail.com; Tel: 0815898971*

### FERC (Forest Ecology Research Center /Mabali)

*Objective: Scientific research on plants, aquatic species and animal species.*
*Address: D.S/MBANDAKA D.S/MBANDAKA/PROVINCE OF ECUADOR; E-mail: bosomboependi2@gmail.com; Tel: 0825241704*

### *NDRC (Nutritional Diseases Research Center/Gemena)*

*Objective: Research into diseases linked to malnutrition, such as related diseases by isolating certain molecules, such as SYZYSIUM GUINESIE to combat amoebic yeasts and diarrhea in South Ubangi.*

*Address: Mobutu n° 220/A. GEMENA/ SOUTH UBANGI PROVINCE; E-mail: cherusangi@yahoo.fr; 0992416091*

### NSRC (Natural Sciences Research Center /Lwiro)

*Objective: To carry out, promote and coordinate research in the fields of science, technology and industry throughout the DRC.*

*Address: LWIRO LWIRO , TERRITORY OF KABARE/SUD KIVU; E-mail: robert.kasisi@umontreal.com; Tel: 0996806699.*

### MDRC (Multidisciplinary Development Research Center /Bunia)

*Objective: To carry out operational research in the north-east of the DRC in the fields of applied linguistics, African cultures and applied sciences.*
*Study of nature, fauna, flora and protection of endangered species.*

*Address:BUNIA/ITURI; E-mail: Kermwathomas@gmail.com; Tel: 0997717070*

### HRC (Hydrobiology Research Center in Uvira)

*Objective: To program, coordinate and monitor research activities in hydrobiology, limnology and hydrology.*
*hydrobiology, limnology and fisheries in all ecosystems.*

*Address: 115, AV. du Congo, Q/Kimanga, C/Kalundu, UVIRA / SUD KIVU; E-mail: bidakamuhoza@gmail.com; Tel: 0997716307.*

### CBRNEC (Chemical, Biological, Radiological and Nuclear Excellence Center)

*Objective: To contribute to the mitigation of chemical, biological, radiological and nuclear risks.*

*Address: 106, Blvd du 30 Juin, C/Gombe; E-mail: coe.cbrn.rdc@gmail.com; Tel: 0817742543.*

### GVO (Goma Volcanological Observatory)

*Objective: Prevention of volcanic risks by monitoring volcanoes and Lake Kivu.*
*Kivu; Management of natural risks; scientific research.*

*Address:142, Avenue Du Rond Point ; Quartier Les Volcans ; Commune de Goma ; Ville Goma; North-Kivu; E-mail: mavotulu@gmail.com; Tel: 0998584734*

### WERC (Water and Environment Research Center)

*Objective: To serve as a training and research center focusing on water and environmental management.*
*To propose solutions to problems that could arise around water. Create a national network of Congolese scientists and researchers to analyze and disseminate information on the impact of climate change in the DRC. Promote education and the right to the environment.*

*Address: 44, Comité Urbain C/ GOMBE; E-mail: ngelipatience@gmail.com; Tel: 0818105625.*

### *RCSARP (Research Center for the Selection and Adaptation of Ruminants and Pigs)*

*Objective: To carry out studies and research in the field of ruminant and pig breeding*

*Address: 45, Av. Lumumba, Q/de la gare, LUPUTA/ KASAI-ORIENTAL; E-mail: tshamalagabriel@gmail.com; Tel: 0851817370*

### NCRS (National Center for Remote Sensing)

*Objective: Research in remote sensing.*
*Address: PLACE ROYAL IMMEUBLE PLACE ROYAL IMMEUBLE KASAI; E-mail: davidngindub@gmail.com; Tel: 0815103502*

### *NCROS (National Center for Research in Oral Science)*

*Objective: To carry out studies and research in the field of oral health.*
*Address: 13, 10ème Rue, Industriel Quarter, C/Limete; E-mail: Cnrsbd.rdc.@gmail.com; Tel: 0822244152; 0811835159; 0840922982*

### CAS(Congolese Academy of Sciences)

*Objective: Promotion and dissemination of science, technology,arts and letters. Support for inventive initiatives.*
*Address: Sciences Faculty/ UNIKIN local 28; E-mail: jjmuyembet@gmail.com; Tel: 0813330242*

### MIPRC (Matadi Interdisciplinary Pedagogical Research Center)

*Objective:--Information science.*
*Address: The buildings of the Matadi Higher Pedagogical Institute; Tel: 0896501462*



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