"Comment les chaînes de valeur minières (en particulier en RDC) peuvent concilier les objectifs africains et européens"

- des archives minières de Tervuren à l'exploration et l' extraction des minerais, à leur transformation et à la fabrication de technologies modernes (+ commercialisation et recyclage)

Mémoires du Congo - FORUM n° 364

27 février 2026 (zoom session)

Georges Van Goethem (Dr. Ir.)

Royal Academy for Overseas Sciences of Belgium (ARSOM – KAOW)
ex- EC DG Research and Innovation / Dir. Energy /
(email : georges.m.vangoethem@gmail.com)

Archives minières congolaises de Tervuren (Africamuseum) 1/2

PROUDLY MADE IN AFRICA

Documents accessibles au bénéfice de la recherche scientifique, des autorités congolaises et, le cas échéant, d'acteurs privés, dans un cadre non exclusif

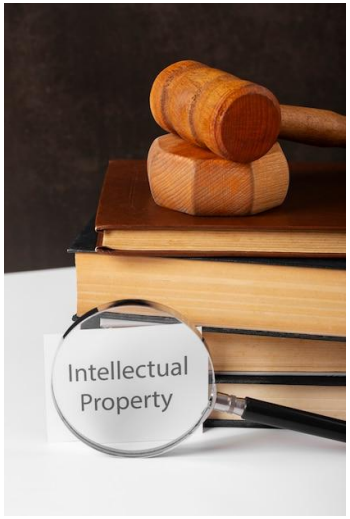
Numérisation : Le musée procède actuellement à la numérisation de millions de documents, notamment des archives géologiques de la RDC, un processus qui dure depuis deux ans.

- **500 mètres d'étagères qui représentent une mine d'infos pour la prospection minière.**

Un accord signé entre USA et Congo ?
"Le président Tshisekedi a promis beaucoup de choses"

« La Belgique ne peut pas accorder un accès privilégié et exclusif à une société privée étrangère avec laquelle elle n'a aucun lien contractuel, ce qui impacterait la recherche et la consultation publique. » (février 2026)

Vanessa Matz, ministre fédérale en charge du Numérique et de la Politique scientifique (Engagés)



Source : "Tintin au pays des archives" : pourquoi les millions d'archives belges de l'Africa Museum intéressent Bill Gates et les Américains » par La Première (RTBF – la radio généraliste de référence en Belgique francophone) - journal de 19h30 du 14 février 2026 - https://www.rtbf.be/article/tintin-au-pays-des-archives-pourquoi-les-millions-d-archives-belges-de-l-africa-museum-interessent-bill-gates-et-les-americains-11678579
+ « Du sous-sol d'un musée belge aux mines congolaises: l'enjeu des archives géologiques de la RDC » par Radio France Internationale (RFI) - 24 février 2026) - https://www.rfi.fr/fr/podcasts/afrique-économie/20260223-du-sous-sol-de-l-africamuseum-aux-mines-congolaises-l-enjeu-des-archives-géologiques-de-la-rdcne-s

Archives minières congolaises de Tervuren (Africamuseum) 2/2

Documents accessibles au bénéfice de la recherche scientifique, des autorités congolaises et, le cas échéant, d'acteurs privés, dans un cadre non exclusif

Photo - Signature d'un accord de principe entre le directeur de la filiale congolaise de KoBold Metals (à g.) et le ministre des Mines d'alors, le 17 juillet 2025, à Kinshasa

Source : « Dans la Copperbelt, KoBold Metals teste la reconquête minière américaine en Afrique » - Jeune Afrique (3 février 2026) - https://www.jeuneafrique.com/1755434/economie-entreprises/dans-la-copperbelt-kobold-metals-teste-la-reconquete-miniere-americaine-en-afrique/

Archives minières congolaises de l' Africamuseum

De quoi s'agit-il ? – Le fonds du problème

- **la numérisation des archives de l'Africa Museum concernant les richesses minières de l'Afrique centrale et leur localisation**

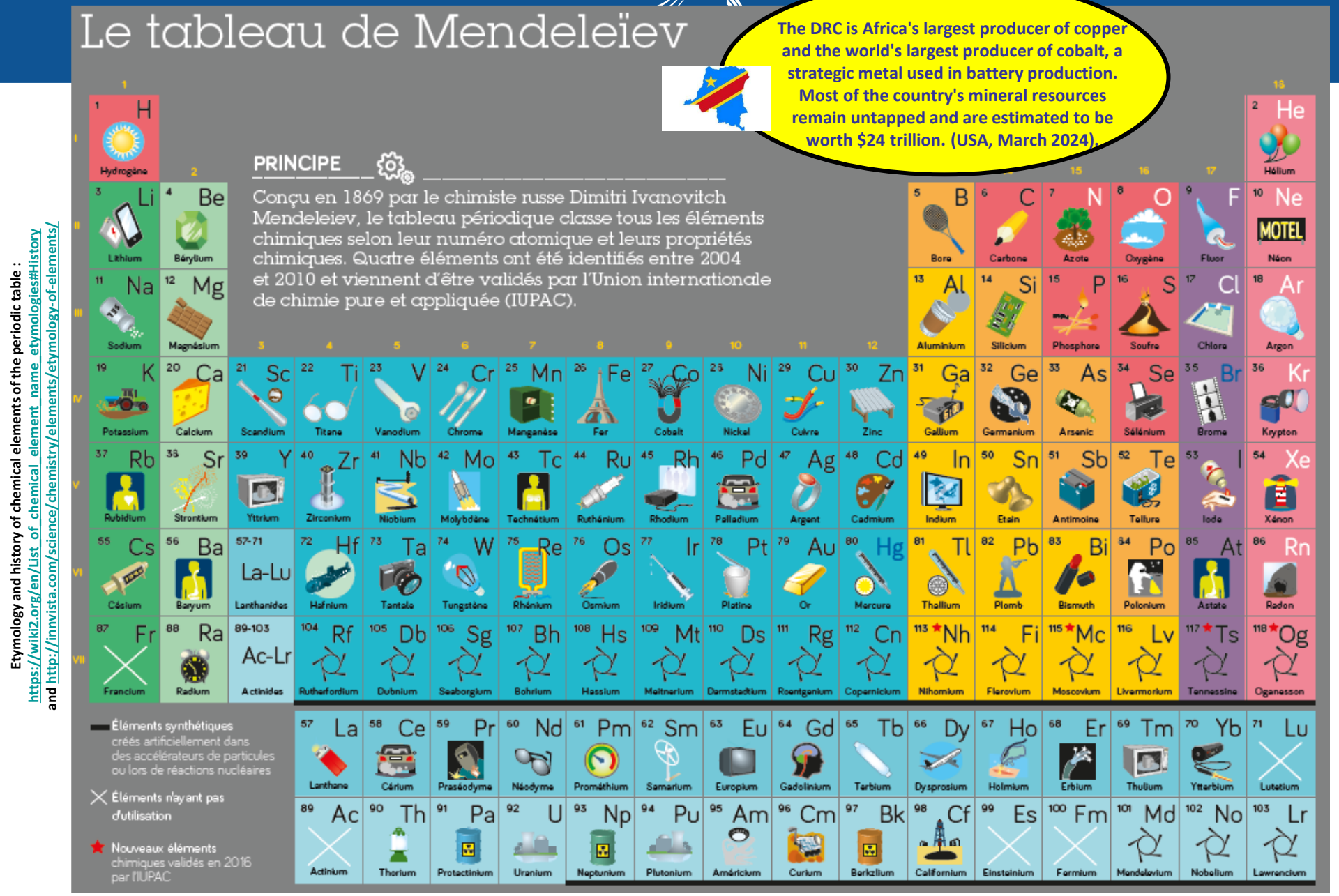
- **un bras de fer entre la Belgique, la République Démocratique du Congo et une société privée américaine (KoBold Metals)**

- **KoBold Metals est une entreprise américaine d'exploration minière soutenue par Bill Gates et Jeff Bezos, implantée en RDC pour rechercher des métaux critiques (lithium, cuivre, cobalt) à l'aide de l'intelligence artificielle.**

- **KoBold Metals est une junior américaine, fondée en 2018 par Kurt House, Josh Goldman et Jeff Jurinak, trois entrepreneurs de la Silicon Valley. Elle a réalisé en quelques années une percée dans les projets miniers stratégiques sur le continent, en particulier en RDC (notamment la zone de Manono, située dans la province du Tanganyika, issue de l'ex-province du Katanga en RDC).**

- **Collaboration Académique ? : Partenariat avec l'Université de Lubumbashi (UNILU) lancé fin 2025 pour numériser les archives géologiques et transférer des compétences en IA minière.**

Le tableau de Mendeleïev: « Une merveille de l'esprit humain »



The DRC is Africa's largest producer of copper and the world's largest producer of cobalt, a strategic metal used in battery production. Most of the country's mineral resources remain untapped and are estimated to be worth $24 trillion. (USA, March 2024).

Etymology and history of chemical elements of the periodic table : https://wiki2.org/en/List_of_chemical_element_name_etymologies#History and http://innvista.com/science/chemistry/elements/etymology-of-elements/

http://www.cea.fr/multimedia/Documents/infographies/posters/defis-du-cea-211-infographie-tableau-de-mendeleiev.pdf

RD Congo, un énorme potentiel de matières premières "un véritable scandale géologique" (56% du tableau de Mendeleïev)

ÉLÉMENTS PRÉSENTS DANS LES MINÉRAUX DE LA RDC

A : nombre de masse
Z : numéro atomique
M : masse atomique en g.mol^{-1}

$^{A}_{Z}X$
Nom
M

RICHESSES NATURELLES DE LA RDC

Semaine de la Science et des Technologies

11 et 12 avril 2014, Institut de la Gombe

I	II										III	IV	V	VI	VII	VIII
^{1}H Hydrogène 1,01																^{4}He Hélium
^{7}Li Lithium 6,94	^{9}Be Béryllium 9,01										^{11}B Bore 10,8	^{12}C Carbone 12,0	^{14}N Azote 14,0	^{16}O Oxygène 16,0	^{19}F Fluor 19,0	^{20}Ne Néon 20,2
^{23}Na Sodium 23,0	^{24}Mg Magnésium 24,3										^{27}Al Aluminium 27,0	^{28}Si Silicium 28,1	^{31}P Phosphore 31,0	^{32}S Soufre 32,1	^{35}Cl Chlore 35,5	^{40}Ar Argon 39,9
^{39}K Potassium 39,1	^{40}Ca Calcium 40,1	^{45}Sc Scandium 45,0	^{48}Ti Titane 47,9	^{51}V Vanadium 50,9	^{52}Cr Chrome 52,0	^{55}Mn Manganèse 54,9	^{56}Fe Fer 55,8	^{59}Co Cobalt 58,9	^{58}Ni Nickel 58,7	^{63}Cu Cuivre 63,5	^{64}Zn Zinc 65,4	^{69}Ga Gallium 69,7	^{74}Ge Germanium 72,6	^{75}As Arsenic 74,9	^{80}Se Sélénium 79,0	^{79}Br Brome 79,9	^{84}Kr Krypton 83,6
^{85}Rb Rubidium 85,5	^{88}Sr Strontium 87,5	^{89}Y Yttrium 88,9	^{90}Zr Zirconium 91,2	^{93}Nb Niobium 92,9	^{98}Mo Molybdène 95,9	^{4}Tc Technétium 99,0	^{102}Ru Ruthénium 101,1	^{103}Rh Rhodium 102,9	^{106}Pd Palladium 106,4	^{107}Ag Argent 107,9	^{114}Cd Cadmium 112,4	^{115}In Indium 114,8	^{120}Sn Étain 118,7	^{121}Sb Antimoine 121,6	^{128}Te Tellure 127,5	^{127}I Iode 126,9	^{129}Xe Xénon 131,3
^{133}Cs Césium 132,9	^{138}Ba Baryum 137,3	57 à 71 lanthanides	^{180}Hf Hafnium 178,5	^{181}Ta Tantale 180,9	^{184}W Tungstène 183,9	^{186}Re Rhénium 186,2	^{192}Os Osmium 190,2	^{193}Ir Iridium 192,2	^{195}Pt Platine 195,1	^{197}Au Or 197,0	^{202}Hg Mercure 200,6	^{205}Tl Thallium 204,4	^{208}Pb Plomb 207,2	^{209}Bi Bismuth 209,9	^{210}Po Polonium 210	^{218}At Astate 210	^{222}Rn Radon 222
^{223}Fr Francium 223	^{226}Ra Radium 226,1	89 à 103 actinides															

Ra

lanthanides	^{139}La Lanthane 138,9	^{140}Ce Cérium 140,1	^{141}Pr Praséodyme 140,9	^{144}Nd Néodyme 144,2	^{61}Pm Prométhium 145	^{152}Sm Samarium 150,4	^{153}Eu Europium 152,0	^{158}Gd Gadolinium 157,3	^{159}Tb Terbium 158,9	^{163}Dy Dysprosium 162,5	^{165}Ho Holmium 164,9	^{166}Er Erbium 167,8	^{169}Tm Thulium 168,9	^{174}Yb Ytterbium 173,0	^{175}Lu Lutétium 176,0
actinides	^{227}Ac Actinium 227	^{232}Th Thorium 232,0	^{231}Pa Protactinium 231	^{238}U Uranium 238,0	^{237}Np Neptunium 237	^{242}Pu Plutonium 242	^{243}Am Américium 243	^{247}Cm Curium 247	^{247}Bk Berkélium 247	^{249}Cf Californium 249	^{254}Es Einsteinium 254	^{255}Fm fermium 255	^{256}Md Mendélévium 256	^{254}No Nobélium 254	^{257}Lw Lawrencium 257

Tous les métaux mentionnés dans le célèbre «tableau des éléments chimiques» du russe Mendeleïev se trouvent bel bien dans le sous sol de la République Démocratique du Congo (RDC).

C'est « un véritable scandale géologique » comme s'écrièrent les géologues belges au début des années 1900 (découvertes successives de cuivre, plomb, fer, or, platine, diamant, étain, charbon, cobalt, radium /1920-1940/, uranium, zinc, cadmium, germanium, manganèse, etc).

« Saviez-vous que près de 56% des éléments chimiques du tableau périodique de Mendeleïev se retrouvent sous forme de richesses naturelles en RDC ? Il n'y a probablement que la Russie qui fait mieux. Le tableau ci-joint, présenté lors de la première édition de la Semaine de la Science et des Technologies de Kinshasa en décembre 2014, reprend les éléments du tableau de Mendeleïev présents en RDC. »
Raissa Malu, Ministre d'État de l'Éducation nationale et Nouvelle citoyenneté en RDC depuis mai 2024 (anciennement Professeure de sciences, Ambassadrice du Next Einstein Forum) (https://www.nexteinstein.org/).

Source: wikipedia - https://fr.wikipedia.org/wiki/Ra%C3%AFssa_Malu et "LA SCIENCE COMME LANGAGE COMMUN, ICI ET LÀ-BAS" - **INVESTING IN PEOPLE ASBL** – Kinshasa RDC, avril 2024 - https://www.semainedelasciencerdc.org/ et **African shapers** - https://africanshapers.com/raissa-malu-les-stim-ne-sont-pas-plus-difficiles-que-les-langues-leconomie-ou-les-sciences-humaines/

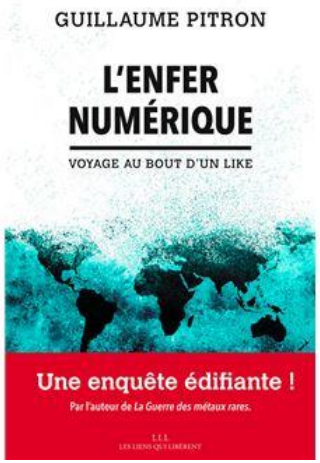
African Shapers

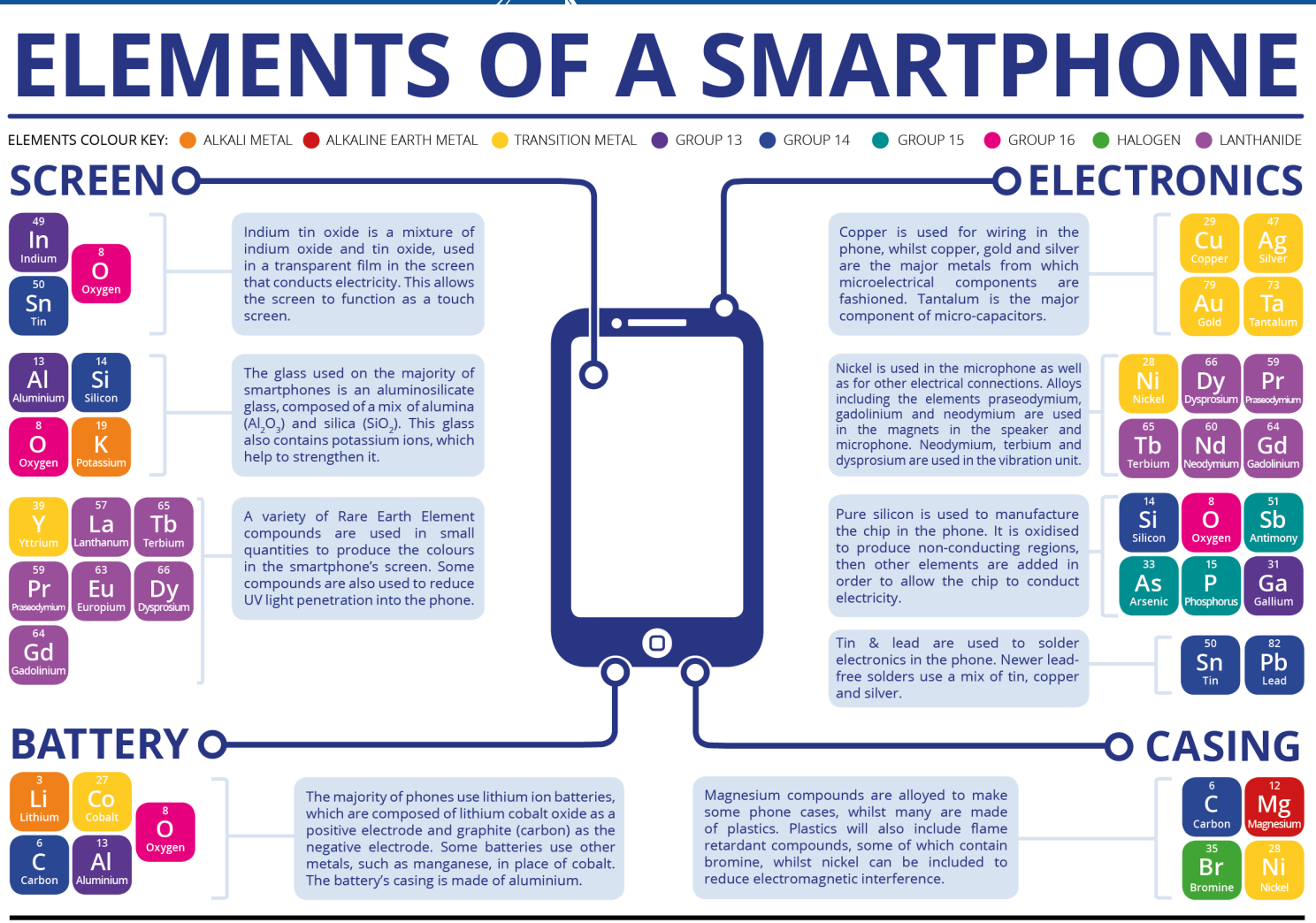
Africa SCIENCE WEEK
NEXT EINSTEIN FORUM

Le cycle de vie du smartphone : lourds dégâts aux quatre coins du monde

• The Screen / • The Battery / • The Electronics / • The Casing

Source : "The Chemical Elements of a Smartphone" by Compound Interest (February 19, 2014) https://www.compoundchem.com/2014/02/19/the-chemical-elements-of-a-smartphone/





<u>Un exemple, la composition d'un smartphone</u>. Quand on regarde les métaux qui composent cet objet, l'on se rend compte que 60% à 80% d'entre eux, figurent dans le tableau périodique (table de Mendeleïev) donc tous les éléments chimiques de base que l'on peut trouver sur terre. Si un vient à manquer, la marge de substitution est faible car ils ont été choisis par efficacité et extraction « facile ». Quand on cherche d'où viennent ces métaux, nombreux viennent de Chine (terres rares, germanium, fluorine, tungstène, gallium…), certains d'Afrique (cobalt en RDC et platine en AFS), et d'autres d'Amérique du sud (le lithium au Chili)… Et quand on s'interroge sur la criticité de ces ressources, la réponse est assez brutale, il n'y en a plus pour très longtemps (accessibles et exploitables)…

« Quand le numérique détruit la planète » Longtemps l'idée d'une industrie numérique propre car « immatérielle » a dominé les esprits. Contre les géants du pétrole et de l'automobile, la Silicon Valley semblait l'alliée naturelle des politiques de lutte contre le réchauffement climatique. Cette illusion se dissipe. Une enquête conduite sur plusieurs continents révèle le coût environnemental exorbitant du secteur des hautes technologies. - Guillaume Pitron (sept 2021) - https://collectif-accad.fr/site/wp-content/uploads/2021/10/Pitron_Quand-le-numerique-detruit-la-planete_octobre2021.pdf

Element Scarcity

- Green because it is plentifully available.
- Red because it will very shortly cause serious problems if we do nothing to restrict its use.
- Grey because it can come from conflict resources

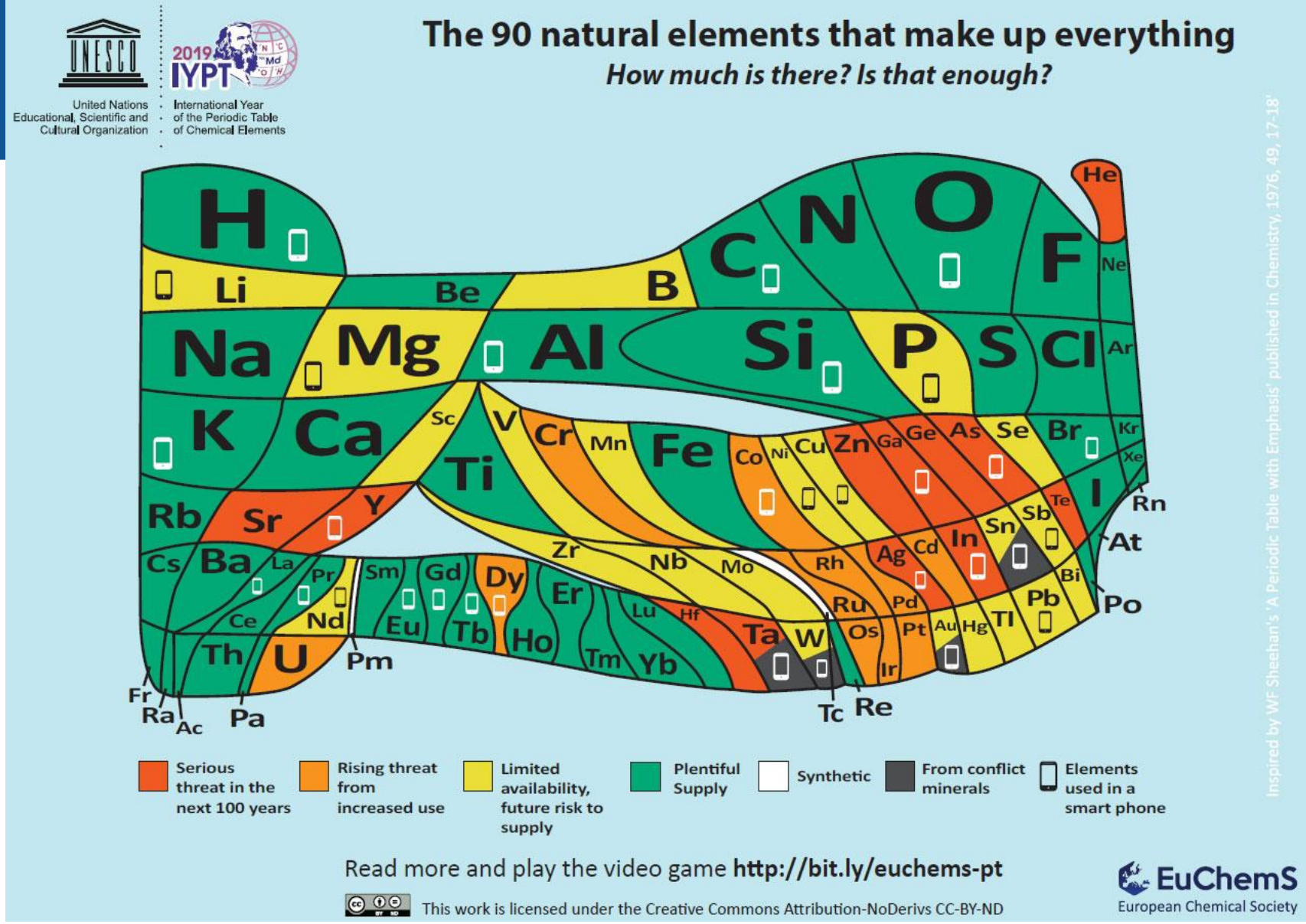


Figure : An updated periodic table compiled by the European Chemical Society (EuChemS) highlights important chemical elements that could experience future supply shortages.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has named 2019 the Year of the Periodic Table of Chemical Elements, in recognition of the 150th anniversary of Dmitri Mendeleev's original publication of the table in 1869. A number of items prominent on above "endangered-species list" of chemical elements are important materials for electronics and integrated photonics.
Source : An "Endangered List" for Chemical Elements – January 2019 – https://www.euchems.eu/euchems-periodic-table/

Africa is rich in mineral resources but poor in energy to exploit them

"Mineral resources are considered as "Earth heritage", their exploitation must then be conducted in such a way to ensure sustainability for future generations."

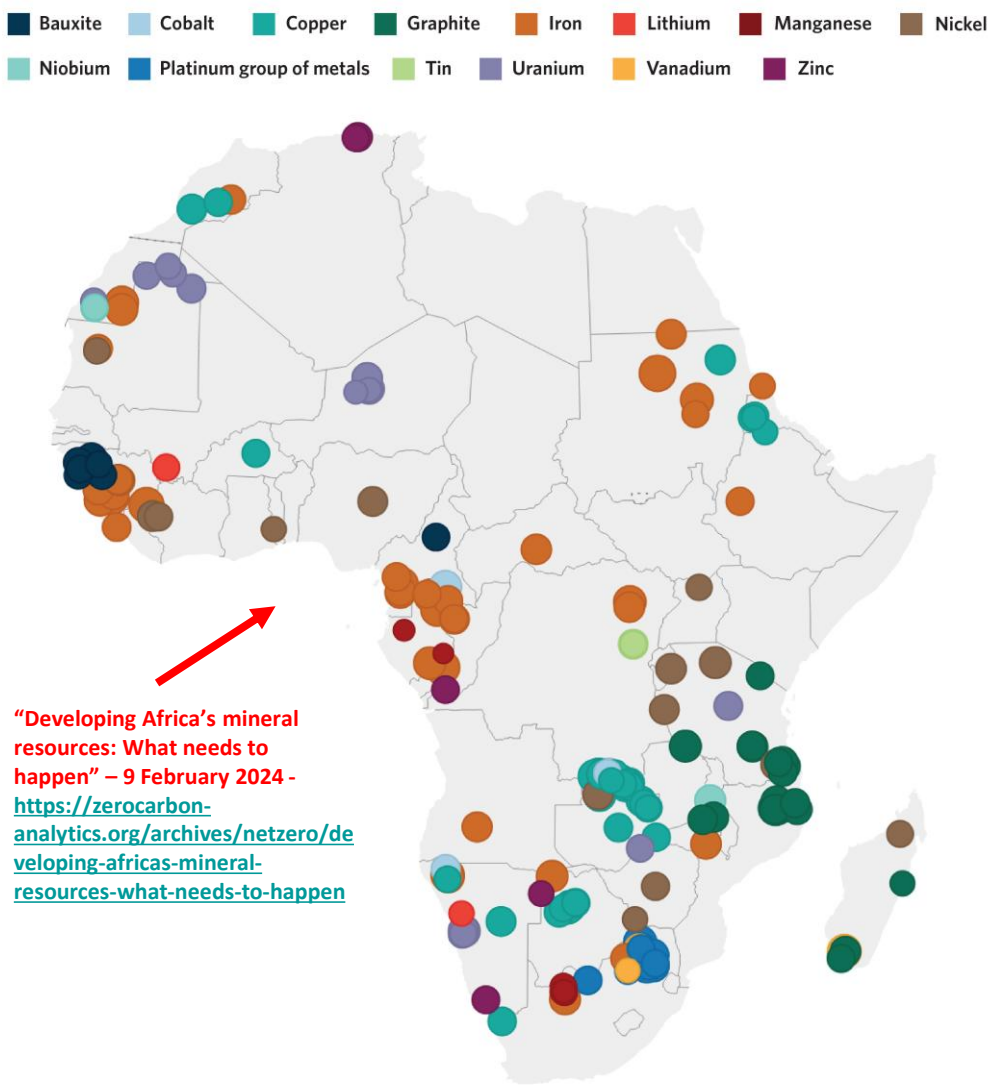
"The development of African countries relies mostly on the production of raw materials from natural resources: agriculture or mining.

Specifically, the production of mineral resources and their transformation implies the use of great amount of energy (e.g. use of furnaces or electro-winning in metallurgy)."

…The most recent boom in mineral commodities prices showed a big development of artisanal mining in Africa (2 to 3 million people in DRC) to supply industrial companies in the World."

Source : Jean-Pierre Tshibangu, UMons, Faculty of Engineering, Dpt of Mining Eng., RAOS member

Select Transition Mineral and Metal Deposits Discovered in Africa, 1990–2019

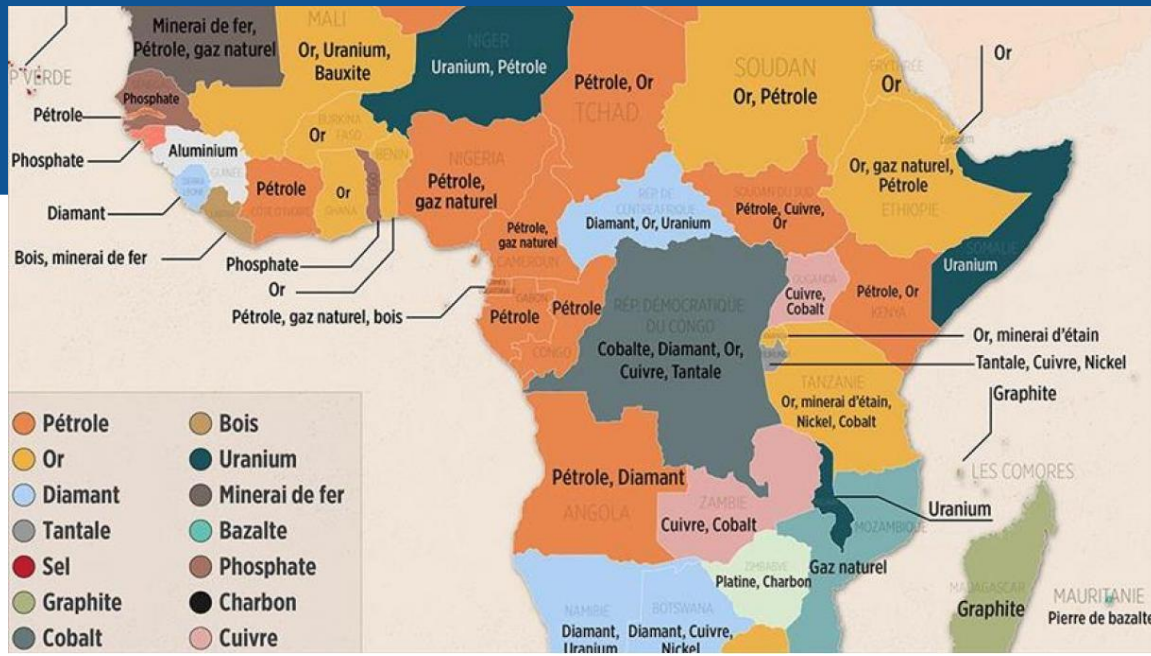


"Developing Africa's mineral resources: What needs to happen" – 9 February 2024 - https://zerocarbon-analytics.org/archives/netzero/developing-africas-mineral-resources-what-needs-to-happen

Source: Adapted from James Cust and Albert Zeufack, eds., *Africa's Resource Future: Harnessing Natural Resources for Economic Transformation During the Low-Carbon Transition* (Washington, DC: World Bank, 2023), 9.

"Regional before global: A value chain approach to industrialisation in West Africa", 24 November 2016, M. Weigert (Strategy and Policy Department of the African Development Bank) - https://www.tralac.org/news/article/10879-regional-before-global-a-value-chain-approach-to-industrialisation-in-west-africa.html

Africa map 1/2 : oil, mineral and natural resources



Thanks to natural resource endowments and technology improvements, Africa could pursue a much less carbon-intensive development model than many other parts of the world have.

The challenges and opportunities differ widely across a diverse continent.

- ***But renewables, together with natural gas in many areas, are poised to lead Africa's energy consumption growth as the continent moves away from the traditional use of biomass that currently accounts for almost half of final energy consumption.***

Mining resources in Africa : an invaluable asset

Africa conceals more than 60 different types of minerals, covering 1/3 of the world's mineral reserves, including vital resources for technological development, like rare earths.

For example, it has 90 % of the platinum reserves; 80 % of the coltan; 60 % of the cobalt; 70 % of the tantalum; 46 % of the diamond reserves; 40 % of the gold reserves and 10 % of the oil reserves. (Source : Bank of Africa, 2023)

Africa has the most extensive biomass burning in the world, yet only emits about 10 % of the world's total carbon dioxide emissions.

« Les pays africains possèdent une part importante des réserves mondiales de ressources naturelles » - Même si un développement notable est observé dans l'économie africaine grâce à l'exploitation des ressources naturelles, cela à très peu de retentissement sur le quotidien de la population. See also : CIA The World Fact Book - https://www.cia.gov/the-world-factbook/countries/ and https://visual.ly/community/Infographics/economy/world-commodities-map-africa

makala

Africa is rich in oil, mineral and natural resources

(Africa's enormous energy and agricultural potential is vastly untapped)

The natural resources in Africa are used practically in many industries and in many countries every day - https://www.miningafrica.net/natural-resources-in-africa/

European Union (27 Member States)

- ***Europe relies on foreign raw materials to power its green and digital future.***

- ***Now Europe wants to mine them at home. The EU plan in 2020 is to start mining in the EU itself, for battery-related raw materials such as lithium, nickel, cobalt, graphite, and manganese.***

NB : Coltan (short for columbite–tantalites) from which are extracted the elements niobium and tantalum. Tantalum from coltan is used to manufacture tantalum capacitors which are used for mobile phones, personal computers, automotive electronics, and cameras as well as in high-temperature alloys for jet engines (e.g. Airbus and the 787 Dreamliner). Le coltan est au cœur de la guerre en République démocratique du Congo depuis 2000, l'un des conflits les plus meurtriers depuis la Seconde Guerre mondiale avec plus de 5 millions de morts.

Africa map 2/2 : minerals essential to modern energy transitions

Many of the minerals essential to modern energy transitions

Platinum-Group Metals (PGM):

- **Palladium for autocatalysts, electronics, dental and chemical reagents (South Africa and Ethiopia) ;**
- **Platinum for jewelry and for autocatalysts (South Africa and Zimbabwe) ;**
- **Rhodium for autocatalysts (South Africa and Zimbabwe) ;**
- **Iridium ; Osmium ; Ruthenium (South Africa)**

("Le cobalt est le nouveau pétrole »)

Cobalt is primarily used as a cathode material in lithium-ion batteries, and in the manufacture of magnetic, corrosion/wear-resistant and high-strength alloys (e.g. for aircraft engine parts).

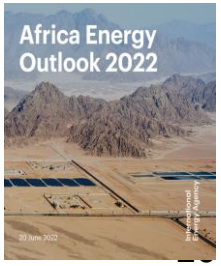
Cobalt is essential to many living creatures and is a component of vitamin B12.

Cobalt-60 is a commercially important radioisotope, used as a radioactive tracer and for the production of high-energy gamma rays.

Picture : Four critical minerals – lithium, cobalt, copper, nickel – will underpin the energy transition.

For many African countries, mineral exploration and production constitute significant parts of their economies and remain keys to economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of platinum-group metals (PGM) and cobalt, as well as bauxite, diamond (about two-thirds of the world's supply), phosphate rock, vermiculite (a soil amendment), and zirconium. Many other minerals are present in quantity.

Source : https://en.wikipedia.org/wiki/Mineral_industry_of_Africa and "Top 10: Mineral Producing Countries in Africa" (August 28, 2024) - https://miningdigital.com/top10/top-10-mineral-producing-countries-in-africa



"Africa's Population: In Search of a Demographic Dividend" (John F. May, 2017)

Prof. Dr. John F. May, Dept. International Health, Georgetown University and Population Reference Bureau, Washington, DC is a renowned demographer.

He analyzes Africa's potential for a demographic dividend—economic growth from a rising working-age population—in the book "Africa's Population: In Search of a Demographic Dividend" (Springer, 2017), He emphasizes that accelerating fertility decline and investing in education, health, and job creation are crucial for the continent to capitalize on its changing age structure.

His research highlights that for Africa to replicate the success of East Asia, it must focus on structural economic changes and empowerment.

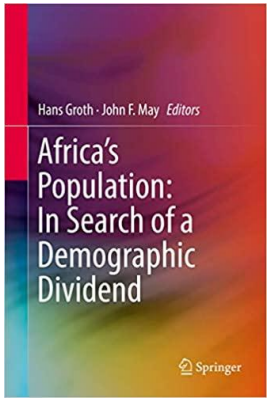


Figure : Demographic dividend at the country level, a virtuous cycle.

The concept of demographic dividend at the macro level is usually presented as a virtuous cycle in which fertility decline has an impact on the age structure, changing the "dependency ratio", which should lead to more savings and, therefore, more investments and more economic growth.

The key parameter of this relationship is the "dependency ratio"—that is, the ratio of the non-active population (consumers only) to the active population (producers and consumers). The lower the dependency ratio, the higher the expected economic advantage (more producers per consumer).

To harness the demographic dividend, May emphasizes that African leaders and their partners must prioritize investments in four key areas, often referred to as "building human capital":

- ***Health: Improving health indicators, particularly by strengthening reproductive health and family planning to accelerate the fertility decline.***
- ***Education: Investing in high-quality education and skills training to ensure the workforce is productive and employable.***
- ***Employment: Creating sufficient jobs and a conducive environment for entrepreneurship to absorb the growing working-age population.***
- ***Governance: Enhancing transparency, accountability, and the rule of law to create a stable environment for economic growth***

Source : « The Demography of Africa: Impacts on Economy, Energy, and Governance » by Prof Dr John F. May - SE4A-2017 Keynote speech on 23 October 2017 –

- **Youtube presentation (17min 30sec) - https://www.kaowarsom.be/en/SustainableEnergy4Africa_May**
- **PPT presentation (24 slides) - https://www.kaowarsom.be/documents/Energy4Africa/SustainableEnergy4Africa_May.pdf**

SE4A-2017 event : « Sustainable Energy for Africa - 2017, October 23 – 25, Brussels » – Int'l Conference organized by the "Royal Academy for Overseas Sciences" of Belgium (ARSOM – KAOW)

- **Guest Editors: Georges Van Goethem & Bernard Mairy**
- **SE4A-2017 proceedings (302 pages): https://www.kaowarsom.be/documents/PUBLICATIONS/SUSTAINABLE_ENERGY_AFRICA.pdf**

Minéraux critiques et sécurisation des chaînes d'approvisionnement pour la transition énergétique

Image - Extraire les matières premières qui font marcher une voiture électrique ou un smartphone devrait être source de richesse pour les mineurs en RDC. En réalité, les mineurs « informels » (souvent des enfants) s'épuisent dans une vie de labeur pour des salaires de misère. Les gouvernements et les grandes marques ont le pouvoir de faire changer cette situation.

Lire également « RDC – Lualaba : Exploitation artisanale de cobalt, l'enfer sur la terre » (media congolais « mines.cd » / 6 novembre 2022) - https://mines.cd/monsieur-rdc-lualaba-exploitation-artisanale-de-cobalt-lenfer-sur-la-terre/

Les publications couvrant les minéraux critiques, l'exploitation minière et l'énergie en 2025-2026 se concentrent sur la sécurisation des chaînes d'approvisionnement pour la transition énergétique (y compris la fabrication de batteries – voir image), la diversification des sources (loin de la Chine), et l'impact des nouvelles technologies.

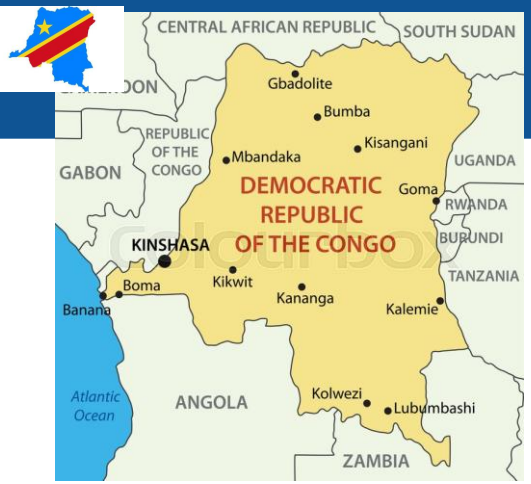
Les publications majeures, rapports et analyses couvrant ces domaines proviennent d'organismes gouvernementaux (par ex. Ministère des Mines), d'institutions internationales (par ex. WB et AfDB) et d'ONG spécialisées (par ex. AFREWATCH). ***Voir liste non exhaustive dans « DRC Critical Minerals & Industrialisation Forum » - https://fr.wearevuka.com/mining/critical-minerals-forum/media-partners/***

mines.cd
LA RÉFÉRENCE DE L'ACTUALITÉ MINIÈRE EN RDC

MINES.CD est le premier média congolais spécialisé, offrant une information fiable et quotidienne sur le secteur minier et les énergies en RDC.

Il couvre l'actualité des entreprises, la gouvernance, l'exploitation artisanale et les investissements, se positionnant comme une référence pour le secteur.

Conflict Minerals 1/2 : Tin, Tantalum, Tungsten, and Gold (3TG)



TIN

TANTALUM

TUNGSTEN

GOLD

Most people are aware of "Blood Diamonds" mainly due to the 2006 movie "Blood Diamond" starring Leonardo DiCaprio, but you may not be familiar with section 1502 for the US Dodd-Frank Wall Street Reform and Consumer Protection Act concerning Conflict Minerals. Perhaps you are curious as to what blood diamonds and conflict minerals have in common: both are used to finance conflict within the Democratic Republic of the Congo (DRC) and specified adjoining countries (Angola, Burundi, Central African Republic, the Republic of Congo, South Sudan, Tanzania, Uganda, and Zambia). The fighting in DRC has continued over 15 years, driven by the illegal trade in valuable minerals.

Conflict Minerals generally refer to cassiterite (tin); Columbite-Tantalite, also known as coltan (from which tantalum is derived); wolframite (tungsten); gold; or their derivatives; or any other mineral or its derivatives determined by the competent authority. The US Dodd-Frank Act requires certain corporations to report their use of "Conflict Minerals" in the manufacture of their product. Source : "The Dodd-Frank Act and Conflict Minerals", April 5, 2018 - https://blog.samtec.com/post/the-dodd-frank-act-and-conflict-minerals/

The EU "Conflict Minerals Regulation" promoting responsible sourcing (EU law, passed in 2017, applicable since 1 January 2021)

A new EU law to stem the trade in conflict minerals 3TG – to stop:

- conflict minerals and metals from being exported to the EU;
- global and EU smelters and refiners from using conflict minerals, and;
- mine workers from being abused.

https://policy.trade.ec.europa.eu/development-and-sustainability/conflict-minerals-regulation_en

What are the 3TG (tin, tantalum, tungsten and gold) conflict minerals used for ?

Source : *https://www.3blmedia.com/news/conflict-minerals-101-tin-tungsten-tantalum-and-gold*

Tin (derived metal : cassiterite)	Tantalum (Columbite) (coltan)	Tungsten (Wolframite)	Gold
Often used to coat other metals to prevent their corrosion and to create alloys.	Stores electricity and is used in alloys for its strength.	Commonly used in tools, cell phones, and high-temperature situations, also used in alloys for its strength.	Malleable, not highly corrosive, and highly conducive to electricity and heat.

UMICORE - Our metals - Here you can find brief descriptions of the history, physical properties and main active applications of the metals used by our various Business Units - https://www.umicore.com/en/about/our-metals/ and About the Sustainable Procurement Charter 2017 - https://www.umicore.com/storage/main/umicore-sustainable-procurement-charter-2017.pdf

Conflict Minerals 2/2 : EU takes an ethical stance on buying minerals from Africa

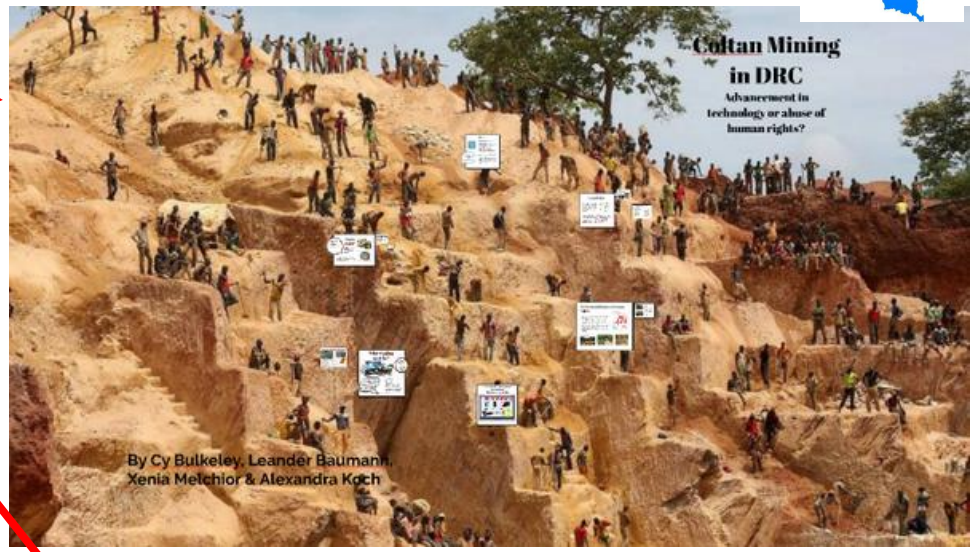
European Union
EXTERNAL ACTION

EU takes an ethical stance on buying minerals from Africa

The Conflict Minerals Regulation (EU law, 1 January 2021) - promoting responsible sourcing.

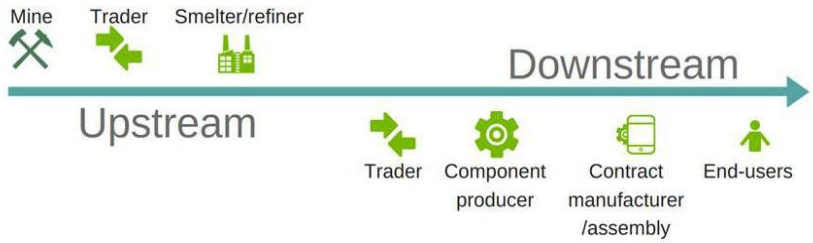
The so-called 'conflict minerals' such as tin, tungsten, tantalum and gold, also referred to as 3TG, can be used in everyday products such as mobile phones and cars or in jewellery. The new EU law aims to help stem the trade in these four minerals which sometimes finance armed conflict or are mined using forced labour.

The EU regulation covers tin, tungsten, tantalum and gold because these are the four minerals that are most often linked to armed-conflicts and related human rights abuses, so it makes sense to focus on them.
Reminder : warlords in Kivu (DRC), trafficking coltan - Congo's Neglected Crisis Leaves 5.4 Million Dead (1998-2003) - Dr Denis Mukwege, a world-renowned gynaecologist, human rights activist and Nobel Peace laureate from east DRC.



The EU regulation sets out different rules for upstream and for downstream companies:
*** Upstream companies have to comply with mandatory rules on due diligence when they import, as this is the most risky part of the supply chain.**
*** Downstream companies fall into two categories:**
- **those importing metal-stage products also have to meet mandatory due diligence rules; and**
- **those operating beyond the metal stage do not have obligations under the regulation, but they are expected to use reporting and other tools to make their due diligence more transparent, including, for many large companies, those in the non-financial reporting directive.**

NB The US also has legislation on conflict minerals: Dodd-Frank Wall Street Reform and Consumer Act of 2010. It covers the same four products.



Source : The Conflict Minerals Regulation (EU law, 1 January 2021 – https://policy.trade.ec.europa.eu/development-and-sustainability/conflict-minerals-regulation_en

Beneficiation or value-added processing

from a raw mineral (e.g. iron ore) to final products (e.g. a car)

Like other mineral producing countries, South Africa has considered implementing beneficiation policies to stimulate development.

Beneficiation (or value-added processing) entails the transformation of a primary mineral (or a combination of minerals) to a higher value product. It's therefore about the downstream processing of a mineral product – all the way from a raw mineral (such as iron ore) to final products (like a car).

The logic behind beneficiation is that raw minerals don't, on their own, have high value added.

Exporting them unprocessed means that they don't contribute that much to the economy.

The idea of beneficiation is to capture more value from minerals by processing them locally before exporting them.

There are lots of examples of beneficiation policies across the world.

- China implemented policies to force the downstream processing of rare earth elements – essential raw materials for a range of products including magnets, catalysts, alloys and glass.
- South Africa made De Beers mining licence dependent on diamonds being cut and polished in the country.
- Indonesia restricted and considered banning the export of certain unprocessed minerals.
- Many other countries, including the Philippines and Zimbabwe, have all considered policies like this at one stage or another.

The beneficiation of diamonds has brought great benefits to Botswana.

Obstacles facing the mining industry in Africa

- **Low industrialization** of the mining sector: Although Africa is the most endowed region in terms of mineral resources, the continent remains under explored. Furthermore, most of the minerals produced in Africa are still exported without downstream processing, thereby reducing their potential value added.
- **High degree of dependency**: Many African countries depend on the production of metal and mineral products. Moreover, most African mining products are exported as raw materials. Their dependence on mineral rent is too high.
- **Environmental and social impacts**: Mining has often been associated with deforestation, land degradation, air pollution, and disruption of the ecosystem.

Source : "Beneficiation is touted as a silver bullet. Why it might not be" - March 12, 2019 - Stellenbosch University and KU Leuven - https://theconversation.com/beneficiation-is-touted-as-a-silver-bullet-why-it-might-not-be-110224

DEPLOYING THE BATTERY WORKFORCE INITIATIVE (US DOE)

Training the current and future workforce for advanced batteries

"While I remain concerned about our dependence on China and other foreign countries for key parts of the lithium-ion battery supply chain, engaging our strong and capable workforce to manufacture batteries domestically is a critical step toward reducing our reliance on other countries and ensuring we are able to maintain our energy security.

I look forward to seeing this initiative grow, and we will continue to work closely together to ensure we can onshore the rest of the battery supply chain."

U.S. Senator Joe Manchin, Chairman of the Energy and Natural Resources Committee (March 18, 2022)

National Guideline Standards

Battery Machine Operator Competency Areas

U.S. DEPARTMENT OF ENERGY

BWI Battery Workforce Initiative

Safety	• Policies & Procedures • Working with Chemicals • High-Voltage Safety
Mixing	• Manufacturing Cathodes • Manufacturing Anodes
Electrode Prep	• Drying • Calendaring • Slitting
Cell Assembly	• Cylindrical • Prismatic • Pouch
Formation & Testing	• Charge-Discharge Cycles • Quality Testing

Battery Cell Production Machine Operator National Guideline Standards

The US DOE Battery Workforce Initiative finalized the National Guideline Standards for the Battery Machine Operator occupation, providing a detailed list of skill requirements and competencies.

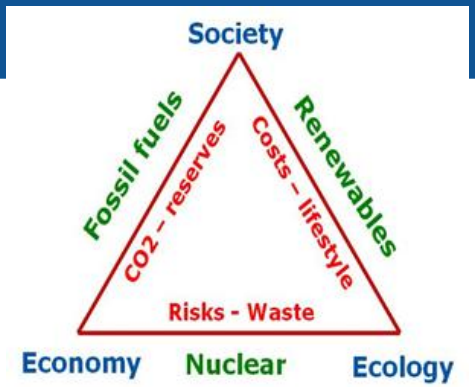
Driving Battery Manufacturing Forward

- ***The United States is expected to double its manufacturing capacity by 2025, with more than 10 new battery manufacturing plants expected to be operational in the next five years.***
- ***To keep up with this demand and retain a competitive manufacturing base, the United States needs a robust supply chain and skilled workforce to produce state-of-the-art, reliable EV and grid storage batteries at scale.***

Source : "DOE Announces $5 Million to Launch Lithium-Battery Workforce Initiative" - Energy.gov (March 18, 2022) - https://www.energy.gov/articles/doe-announces-5-million-launch-lithium-battery-workforce-initiative
+ « The U.S. DOE's Critical Minerals and Materials Program: Building Secure Supply Chains for America's Energy Future » – January 2025 - https://www.energy.gov/sites/default/files/2025-01/critical-minerals-materials-program-january2025.pdf

Three sources of primary energy : Energy mix

(renewables, fossil, fissile : pros and cons)



There are three sources of primary energy in the world: renewables, fossil, fissile. Each source has its strengths and weaknesses. The optimal energy mix in any country world-wide depends on a number of socio-political as well as scientific-technological factors, to be discussed with all stakeholders involved. Energy efficiency is of course crucial in this debate. The ultimate common goal is to build robust, equitable and socially acceptable energy systems at national and regional level.

- **Mainstream technologies of renewable type are e.g. wind power, hydropower, solar energy, geothermal energy and bio energy (the developing world has a number of advantages in access to some renewable energy sources) - renewable electricity production, however, is sometimes criticized for being variable or intermittent.**

- **Fossil fuels contain high percentages of carbon and include coal, petroleum and natural gas - they are abundantly available (especially in Africa) and used throughout the world to power everything from cars to lights in the home (easy to set up technologies) but they are considered as having severe consequences on the climate.**

- **Nuclear (or fissile) energy also has a number of pros and cons – pros are low pollution (no discharge of greenhouse gases) and low operating costs during the up to 60 years' normal life, while cons are risk of terrorism activities (including proliferation) and possible health effects on people and environment in case of very extreme accidents.**

Five major segments (primary = > final)

ENERGY VALUE CHAIN

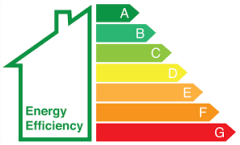
Republic of South Africa

Integrated energy planning seeks to consider all the key elements of the energy value-chain

PRIMARY ENERGY/ RESOURCES	CONVERSION TECHNOLOGIES	SECONDARY ENERGY CARRIERS	END-USE TECHNOLOGIES	DEMAND FOR ENERGY SERVICES
• **RENEWABLES** • Solar • Wind • Biomass • Hydro • **FOSSIL FUELS** • Coal • Crude Oil • Natural Gas • **NUCLEAR FUELS** • Uranium • Resources extraction and sourcing	• **POWER GENERATION** • Conventional Coal Plant • Nuclear • CCGT • OCGT • Solar • Wind • **FUEL PROCESSING** • Oil refineries • GTL • CTL • **REGASIFICATION**	• Electricity • Heat • Refined Petroleum Products 24/7/365	• **INDUSTRY** • Steam boilers • Furnace • Machinery • **COMMERCE** • Air Conditioning • Light Bulbs • **HOUSEHOLDS** • Space Heaters • Refrigerators • Stoves • Geysers • **AGRICULTURE** • Irrigation pumps • **TRANSPORT** • Vehicles • Aircraft • Rail	• **INDUSTRIAL SECTOR** • Process Steam • Motive Power • **COMMERCIAL SECTOR** • Electronic Communication • Cooling • **RESIDENTIAL SECTOR** • Space Heat • Refrigeration • Cooking • Hot water • **AGRICULTURAL SECTOR** • Water supply • **TRANSPORT SECTOR** • Person kms

24/7 SERVICE ?

• **Primary** energy = energy available in the natural environment
• **Secondary** energy = energy ready for transport or transmission
• **Final** energy = energy which the consumer buys or receives
• ***Useful** energy = energy which is an input in an end-use application.*



+ circular economy and efficiency w.r.t. resources and energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

Energy storage technologies : pumped hydro ; electrochemical storage (batteries); hydrogen ; thermal storage (molten salt) ; mechanical storage ; superconducting magnetics + demand side management (DSM), etc

"The Energy Planning Framework considers all energy carriers, all technology options and all key national policy imperatives and proposes an energy mix and policy recommendations which ensures that the energy sector can help achieve these in the most optimal manner." (IEA)

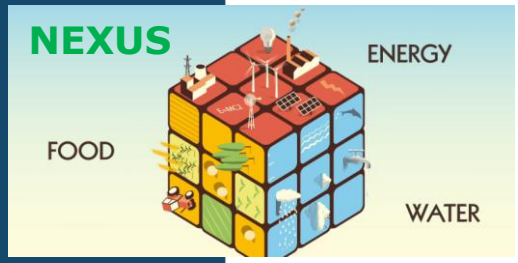
***Source :** "Integrated Energy Plan (IEP) for South Africa - Department of Mineral Resources and Energy (DMRE) – Government Gazette / Staatskoerant No. 40445, 25 November 2016 - optimal mix of energy sources and technologies - https://www.gov.za/sites/default/files/gcis_document/201611/40445gon1430reduced.pdf*

+ PPT presentation associated with IEP and 8 key energy planning objectives - 22 November 2016 - https://www.dmre.gov.za/Portals/0/Energy_Website/files/IEP/presentations/Integrated-Energy-Plan-22-Nov-2016.pdf and https://www.gov.za/sites/default/files/gcis_document/201611/40445gon1430reduced.pdf

Energy, a primary driver for human development

Goal 7 is about ensuring access to affordable and clean energy, which is key to the development of agriculture, business, communications, education, healthcare and transportation.

The lack of access to energy hinders economic and human development.



The multiplier effect of energy access - Energy as an enabler

Energy is an enabler to foster economic development, create jobs, facilitate education and health services, empower women, ensure food production and water supply and perform many other actions required for overall development of societies (NEXUS). The relationship of energy with "Human Development Index" (HDI) is well known and established.

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

"Agenda 2063
the future that Africa wants"

In 2015, the Heads of State and Governments of the African Union adopted the Agenda 2063.
It sets out a vision for "an integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the international arena".
Closely linked to the United Nations "Sustainable Development Goals" (SDGs), it is an ambitious vision and one which will require significant political will if its goals are to be realised.

Agenda 2063, the continent's inclusive and sustainable vision for accelerated economic and industrial development

Agenda 2063 builds on previous Pan-African initiatives, but is distinct in many respects:

- it sets out clear goals, implementation plans and targets alongside elements of accountability;
- it identifies key flagship programmes as well as monitoring and review mechanisms;
- and it proposes a clear resource mobilisation strategy.

Successful delivery of Agenda 2063 is likely to depend on good governance, transparency and effective intra-African co-ordination, among other things. It will also depend on resources being available to implement it and in particular on the mobilisation of private sector resources.

Energy-related targets contained in the framework for the first ten years include increasing access to electricity by at least 50% compared to 2013 levels and increasing the efficiency of household energy use by at least 30% before 2023.
As a reminder, the SDGs include full access to electricity and clean cooking by 2030 and a significant reduction in premature deaths related to pollution.

Source : IEA - Africa Energy Outlook 2022 - Key findings - (Revised version, May 2023) - https://www.iea.org/reports/africa-energy-outlook-2022/key-findings

Projet MAKALA

AfDB's high 5s for the People of Africa :

1 Light up and Power Africa; 2 Feed Africa; 3 Industrialize Africa; 4 Integrate Africa; and 5 Improve the Quality of Life.

The High 5 for transforming Africa
The High 5 pour transformer l'Afrique

1 - Light up & power Africa

https://www.afdb.org/en/the-high-5/light-up-and-power-africa--a-new-deal-on-energy-for-africa

2 - Feed Africa

https://www.afdb.org/en/the-high-5/feed-africa

3 - Industrialize Africa

https://www.afdb.org/en/the-high-5/industrialize-africa

4 - Integrate Africa

https://www.afdb.org/en/the-high-5/integrate-africa

5 - Improve the quality of life for the people of Africa

https://www.afdb.org/en/the-high-5/improve-the-quality-of-life-for-the-people-of-africa

AFRICAN DEVELOPMENT BANK GROUP
Building today, a better Africa tomorrow

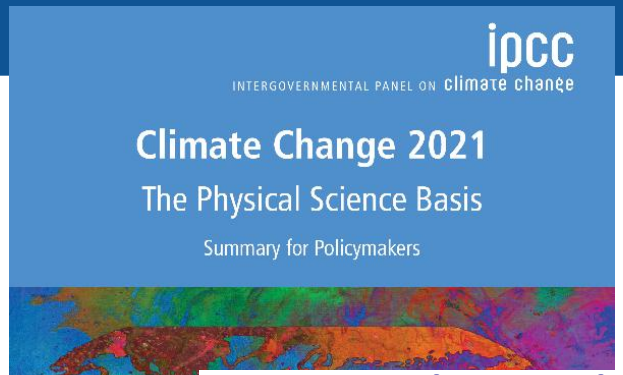
African Development Bank Group (AfDB)'s High 5s: A game changer in Africa's development discourse (consistent with the United Nations agenda on Sustainable Development Goals (SDGs)

– AfDB CEO in Sept 2015 : https://www.afdb.org/en/high5s and May 2024 : https://www.afdb.org/en/documents/annual-report-2023

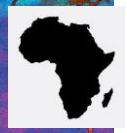
+ African Development Bank Group - Communication and External Relations Department - Abidjan (Côte d'Ivoire) - Web: www.afdb.org

“Intergovernmental Panel on Climate Change” (IPCC)

2022 Sixth Assessment Report (August 2021, February and April 2022)



Despite its climate vulnerabilities, Africa was highly underrepresented in the last IPCC cycle



Increased funding is needed for research on climate impact drivers in Africa; adaptation and loss and damage; climate justice and equity; indigenous and local knowledge; culture and social norms and a better understanding of the hazards, risks, impacts and vulnerabilities of people and ecosystems to climate change. To engage in this next cycle, African governments will need to support their scientists’ participation in the IPCC’s Working Groups so as to contribute to the work.

Climate Analytics – May 2024 - https://climateanalytics.org/comment/how-africa-can-be-better-represented-in-the-next-cycle-of-ipcc-reports-and-why-it-matters

Working Group I
“The Physical Science Basis”

(released on 9 August 2021)

The IPCC Working Group I (WGI) aims at assessing the physical scientific basis of the climate system and climate change.
The scientific topics assessed by WGI include: greenhouse gases and aerosols in the atmosphere; temperature changes in the air, land and ocean; the hydrological cycle and changing precipitation (rain and snow) patterns; extreme weather; glaciers and ice sheets; oceans and sea level; biogeochemistry and the carbon cycle; and climate sensitivity.

Working Group II
“Impacts, Adaptation and Vulnerability”

(released on 28 February 2022)

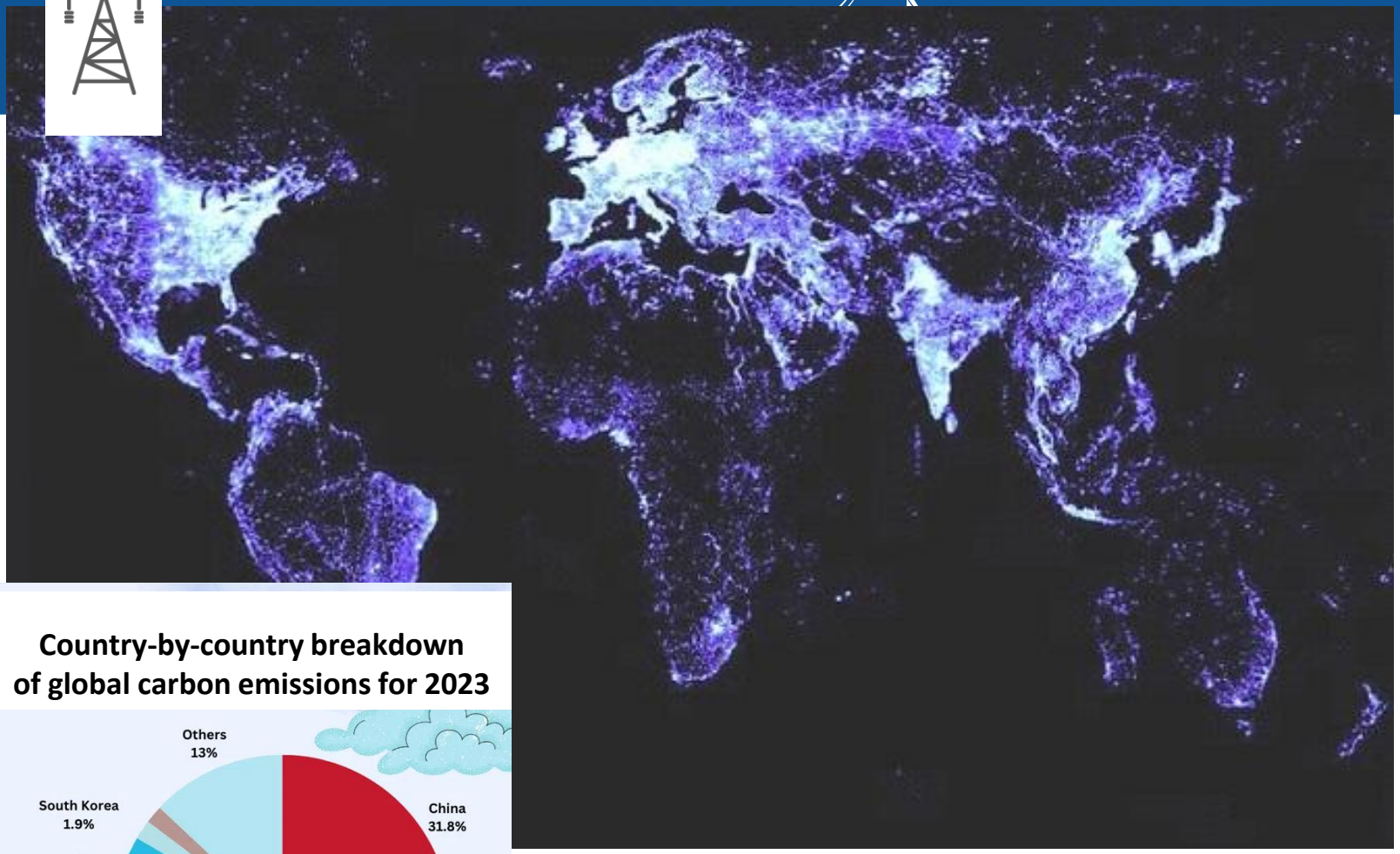
The IPCC Working Group II (WGII) assesses the impacts of climate change, from a world-wide to a regional view of ecosystems and biodiversity, and of humans and their diverse societies, cultures and settlements. It considers their vulnerabilities and the capacities and limits of these natural and human systems to adapt to climate change and thereby reduce climate-associated risks together with options for creating a sustainable future for all through an equitable and integrated approach to mitigation and adaptation efforts at all scales.

Working Group III
“Mitigation of Climate Change”

(released on 4 April 2022)

The IPCC Working Group III (WG III) assesses options for mitigating climate change. Climate change mitigation is achieved by limiting or preventing greenhouse gas emissions and by enhancing activities that remove these gases from the atmosphere. Greenhouse gases can come from a range of sources and climate mitigation can be applied across all sectors and activities.
These include energy, transport, buildings, industry, waste management, agriculture, forestry, and other forms of land management.

Electricity and GHG distribution in the world in 2023

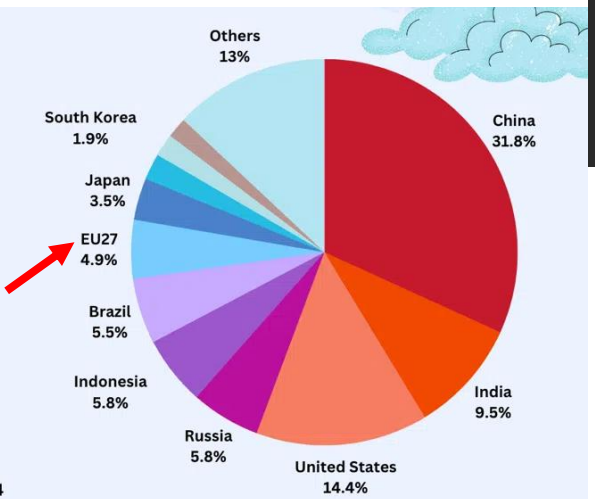


The amazing image right shows a picture of earth taken at night from outer space.

The street and house lights illuminate the countries and give an idea of how electricity is well or poorly distributed in the world.

Source 2001: The World Atlas of Artificial Night Sky Brightness, by Univ. Padova, Italy, and NOAA National Geophysical Data Center, Boulder, USA - https://www3.astronomicalheritage.net/index.php/show-theme?idtheme=21

Country-by-country breakdown of global carbon emissions for 2023



Comprising about 18 % of the world's population, Africa contributes just 4 % of global carbon emissions from energy and industrial sources.

Yet it suffers some of the worst effects of rising global temperatures (UNFCCC).

Union of Concerned Scientists

The world's countries emit vastly different amounts of heat-trapping gases into the atmosphere. The chart (left) shows data compiled by the IEA, which estimates carbon dioxide (CO_2) emissions from the combustion of coal, natural gas, oil, and other fuels. The picture that emerges from these figures is one where—in general—developed countries and major emerging economy nations lead in total carbon dioxide emissions.

Source : "Each Country's Share of CO2 Emissions", Union of Concerned Scientists, Jan 14, 2022 - https://www.ucsusa.org/resources/each-countrys-share-co2-emissions

African electricity lines : planned and existing

The Electrification Situation

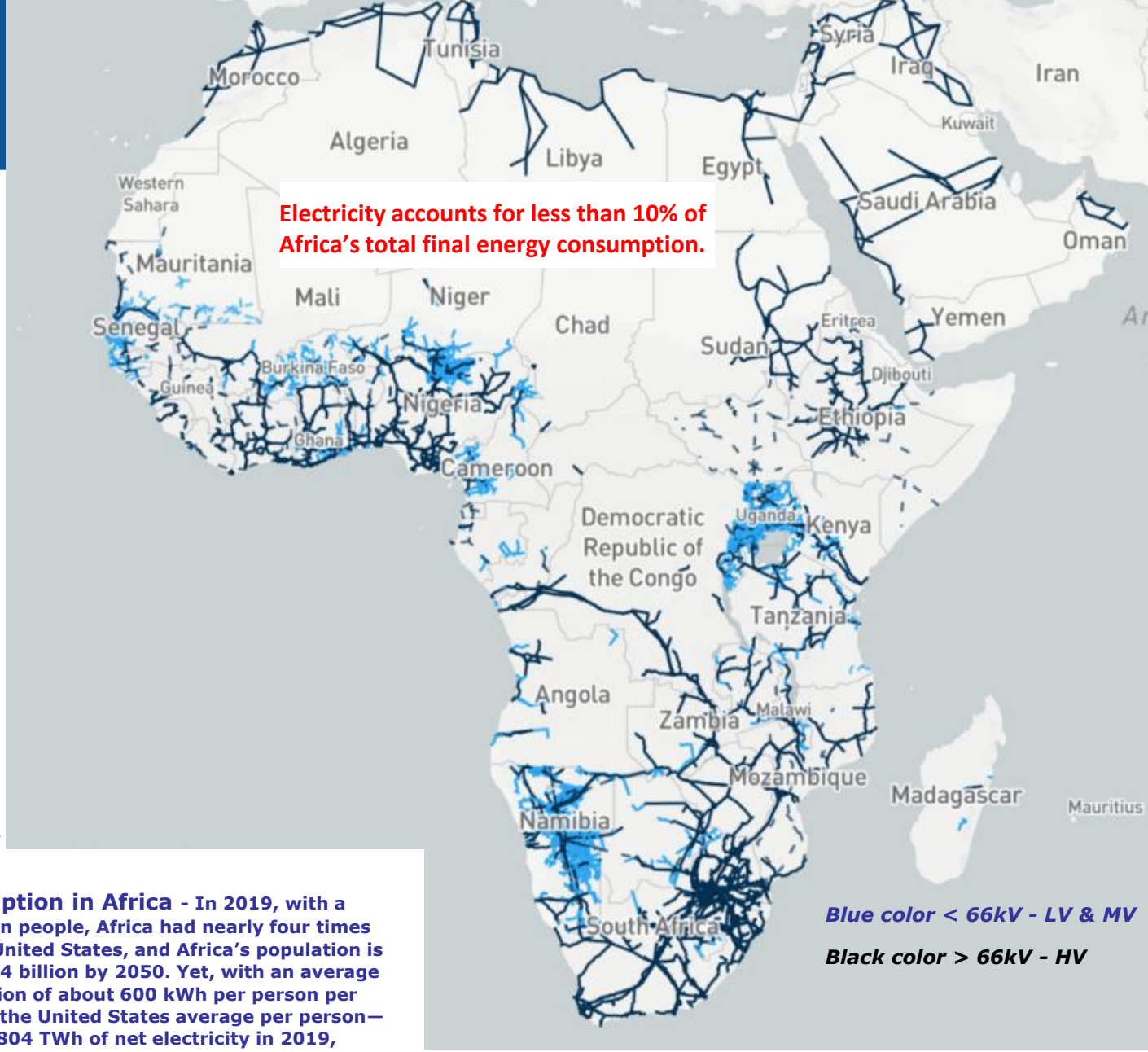
According to Power Africa, there is a long way to go to 100% electrification.

*** Kenya is only 65% electrified by the national grid; this percentage is significantly higher than neighboring countries...and still far from the Vision 2030 target of 100% of the population with electricity access**

*** In contrast, Nigeria (45%), Ethiopia (40%) and Rwanda (30%)**

*** South Africa takes the lead with 86% electrification**

Source : "Electrifying Africa: A Brief Introduction to Solar & the Opportunities", Feb 7, 2019, I-DEV International - https://medium.com/i-dev-insights/electrifying-africa-a-brief-introduction-to-solar-the-opportunities-article-1-of-3-9604dc450301

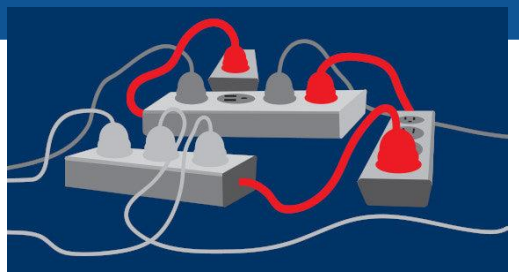


Electricity consumption in Africa - In 2019, with a population of 1.3 billion people, Africa had nearly four times the population of the United States, and Africa's population is expected to grow to 2.4 billion by 2050. Yet, with an average net electricity generation of about 600 kWh per person per year—less than 6% of the United States average per person—Africa generated only 804 TWh of net electricity in 2019, 20% of the United States total that year.

Source : "International Energy Outlook 2020 - Africa" - U.S. Energy Information Administration (EIA), October 14, 2020 - https://www.eia.gov/outlooks/ieo/section_issue_Africa.php

Source : Screenshot from the "Africa Electricity Grids Explorer", World Bank Group - http://africagrid.energydata.info/

The power you need, when you need it ?



Solar and wind power are playing an increasingly important role in solving Africa's energy deficits .. but petrol or diesel generators are also needed.

While much of the world is looking at how it can use more green energy and cut C02 emissions, *across Africa the challenge is somewhat different*.

Using (polluting) generators to meet the energy needs

- **Diesel generators are great for long-term power generation - Typically, they are installed in rural areas where they are connected to a power grid and can be utilized as a primary power source or as a backup power source.**

- **Petrol generators for powering your home and small office spaces – They are a great option for home owners who wish to power a few vital appliances during irregular power outages - they are generally more affordable than diesel generators.**

Source : Business Insider Africa (February 2022) - https://africa.businessinsider.com/local/lifestyle/africas-best-generators-to-buy-in-2022/dezx90b

STRATEGIE - RDC : souveraineté énergétique, industrielle et alimentaire

…. et décarbonation de l'économie 1/2

ASSEMBLEE NATIONALE – SEANCE PLENIERE DU MERCREDI 05 AVRIL 2023
INTERPELLATION DU DIRECTEUR GENERAL DE SNEL SA
FABRICE LUSINDE WA LUSANGI KABEMBA

SUD SOUDAN

2022
BILAN ÉNERGÉTIQUE PAYS

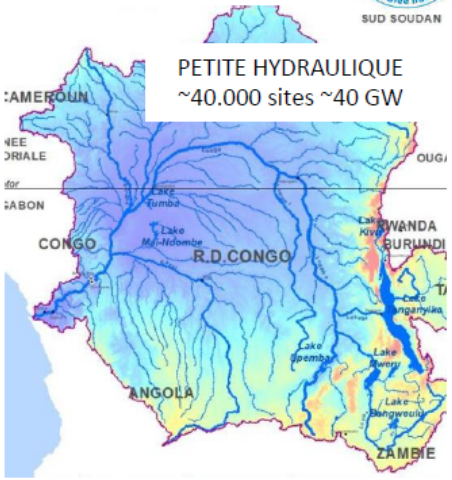
BOIS ÉNERGIE
« MAKALA » 93%
~ 29.000 ktep
4-5 milliards $
DÉFORESTATION

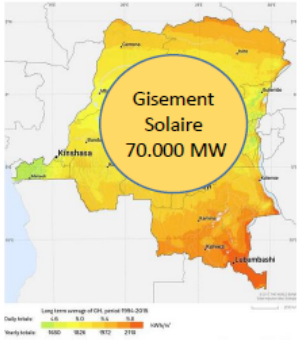
SUBSTITUTION BOIS ÉNERGIE 2023-2030-2050
POLITIQUE INDUSTRIELLE ET ENERGETIQUE VERTE ET FORMATION DES ENERGETICIENS
De 100 millions à 200 millions d'habitants

SUBSTITUER LE BOIS – ÉNERGIE
RÉDUCTION DÉFORESTATION
RÉDUCTION ÉMISSIONS GES

2050
OBJECTIFS
SOUVERAINETÉ ÉNERGÉTIQUE

5%





ÉLECTRICITÉ
~ 1.000 ktep
dont 10% importés
~ 1 milliard $

GAZ ET PRODUITS PÉTROLIERS
> 1.000 ktep
dont 100% importés
~ 1 milliard $

3%

PETITE HYDRAULIQUE ~40.000 SITES
SOLAIRE PHOTOVOLTAIQUE + STOCKAGE
HYDRO TAILLE MOYENNE + STEP
GRAND INGA

90 %
ELECTRICITÉ

+ EAU H_2O → H_2

INDUSTRIE VERTE
INDUSTRIE CHIMIQUE
AGRO-INDUSTRIES
TRANSFORMATION MÉTAUX STRATÉGIQUES

4%

RÉDUCTION IMPORTATIONS
RÉDUCTION EMISSIONS GES

ELECTROMOBILITÉ

2-3 %

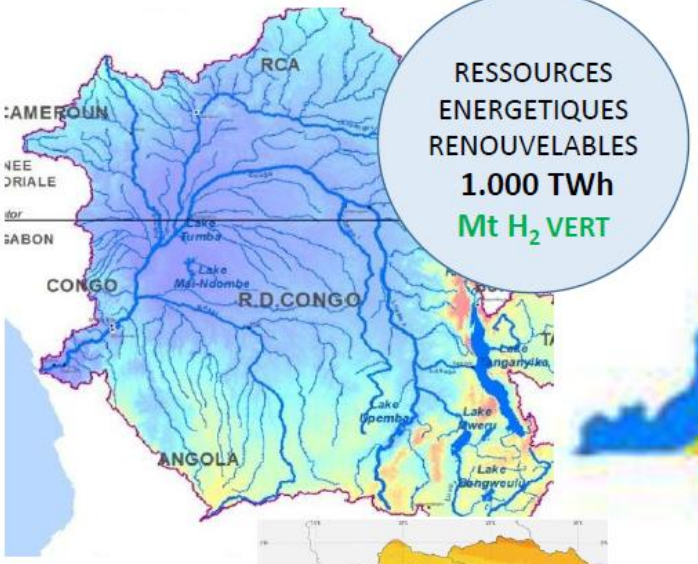
SOUVERAINETÉ ÉNERGÉTIQUE ALIMENTAIRE ET INDUSTRIELLE ELECTROMOBILITÉ

4

« La « Société Nationale d'Electricité » (SNEL) est avant tout chose un bien commun de Tous les Congolais ! Elle constitue le principal Outil industriel de l'Etat pour retrouver Notre Souveraineté Energétique que nous avons perdu : aujourd'hui, 20% de l'électricité que nous consommons est importée, 100% des produits pétroliers sont importés et chaque jour, faute de produire suffisamment d'électricité, 90% de l'énergie consommée dans nos foyers à travers les 145 territoires est constituée par le makala ou le bois de chauffe. »

Source : Fabrice_Lusinde DG_SNEL - interpellation_Assemblée_Nationale_RDC (« Notre Souveraineté Energétique ») – Kinshasa 5_avril_2023

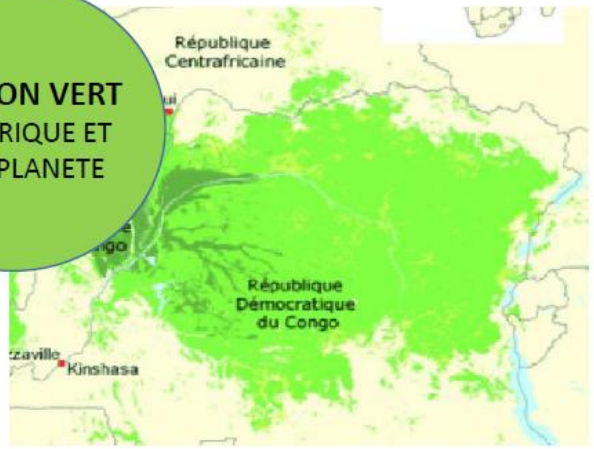
SOUVERAINETÉ ENERGETIQUE, INDUSTRIELLE ET ALIMENTAIRE DE LA RDC ET DECARBONATION DE L'ÉCONOMIE MONDIALE

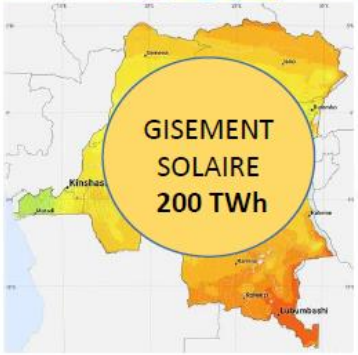


RESSOURCES ENERGETIQUES RENOUVELABLES
1.000 TWh
Mt H_2 VERT

RDC PAYS SOLUTION

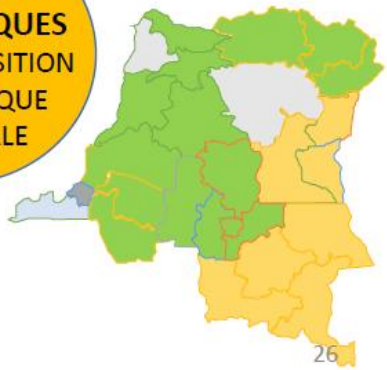
POUMON VERT DE L'AFRIQUE ET DEL A PLANETE





GISEMENT SOLAIRE
200 TWh

MÉTAUX STRATÉGIQUES DE LA TRANSITION ÉNERGÉTIQUE MONDIALE



Énergie : Face aux enjeux climatiques, Fabrice Lusinde présente la SNEL comme l'une des solutions « D'ici 2050, une politique énergétique et industrielle doit être mise en place pour mettre fin à la déforestation. L'électricité ne sert pas seulement à allumer la lumière, à charger des téléphones portables ou à brancher d'autres appareils domestiques. On doit concevoir la production de l'électricité pour permettre de créer des biens et des valeurs afin de générer de l'emploi »

Source : Fabrice_Lusinde - https://environews-rdc.net/2022/12/07/energie-face-aux-enjeux-climatiques-fabrice-lusinde-presente-la-snel-comme-lune-des-solutions/

DRC : Busanga Hydroelectric Power Plant = 240 MW capacity (170 MW for copper and 70 MW for SNEL)

Congo DR officially inaugurates a 240 MW dam - Congolese President Félix Tshisekedi opened the floodgates (9 Oct 2023)

Sino-Congolaise Hydroélectrique de Busanga, a joint-venture between Chinese state-owned companies China Railway Resources Group (CRR) and Power China Resources (PCR) (75%) and Congolese investors (25%), comprising the Congolese state-owned mining company Gécamines, its affiliate Simco, and Congo Management (Coman), have officially inaugurated the 240 MW Busanga hydropower plant. This new hydropower station is located on the Lualaba River in southern Lualaba province's copper/cobalt belt (110 km from the mining town of Kolwezi in the south-east of the DRC).

Construction started in 2017 and commissioning took place in 2021. The project was built by the two Chinese firms under the build-operate-transfer (BOT) model with an investment of US $ 656m. Out the 240 MW capacity, 170 MW (71%) is supplying Sino-Congolese Sicomines, a copper mining company (majority owned by Chinese state-owned groups), and 70 MW (29%) is allocated to the country's national power utility SNEL.

Hydro accounts for most of the country's capacity with circa 95 % of its power generation.

Source : Enerdata (12 October 2023) - https://www.enerdata.net/publications/daily-energy-news/congo-dr-officially-inaugurates-240-mw-dam.html and China Global South (9 October 2023) - https://chinaglobalsouth.com/2023/10/09/drc-president-inaugurates-new-chinese-built-hydropower-plant/

The Busanga project is part of the massive $6 billion "deal of the century" that led to the creation of the Sino-Congolese joint venture Sicomines. Construction of Busanga hydroelectric is primarily to supply Sicomines company, which needs an additional 170MW to run its Kolwezi plant at full capacity and double production to 250,000 t/yr of copper.
Despite being endowed with minerals of every kind, DRC continue to struggle with serious shortage of electricity. The DRC Chamber of mines has identified shortage of electricity as a major impediment to copper mining in the country.
DRC is leading copper producer in Africa and the world's top cobalt producer. Despite this mineral position, majority of citizens in the country live below the income poverty line.

Source : "Busanga Hydroelectric Power Plant Inches Closer to Completion" – World Energy - 31 Jul 2020 - https://www.world-energy.org/article/11120.html

RDC SNEL: Fabrice LUSINDE (oct 2022)

DG de la Société nationale d'électricité

« Electricité : l'appui de l'Autorité de régulation (ARE) à la SNEL et les droits de consommateurs au centre des discussions entre les DG Sandrine MUBENGA et Fabrice LUSINDE »

https://are.gouv.cd/electricite-lappui-de-lare-a-la-snel-et-les-droits-de-consommateurs-au-centre-des-discussions-entre-les-dg-sandrine-mubenga-et-fabrice-lusinde/

"Le Grand Inga – 40 GW"

Hydro-electricity
(low-carbon, predictable and dispatchable … but …too big to be constructed ?)

"Le Grand Inga", méga-barrage, sur le deuxième fleuve du Monde, 40 GW (2 x le barrage chinois des Trois Gorges), coût total estimé à environ 80 milliards USD (including 10 billion USD, cost of the transmission lines needed to carry its power across Africa and potentially to Europe)

« Parmi toutes les énergies renouvelables, c'est l'hydro-électricité qui est la plus économique, car compétitive sans subventions couteuses, et sans problème d'intermittence ni de stockage pour les gestionnaires des réseaux électriques. Elle offre de plus des avantages uniques pour la gestion du réseau électrique (réglage de la fréquence et de la tension).
Par ailleurs les besoins en eau douce, en eau potable et en irrigation, vont aussi beaucoup augmenter, avec le changement climatique annoncé. …Les infrastructures de stockage d'eau sont considérées comme des outils indispensables à la fois pour le développement durable et pour l'adaptation au changement climatique.» **Source : Henri Boyé, US-AID Electrification Advisor**

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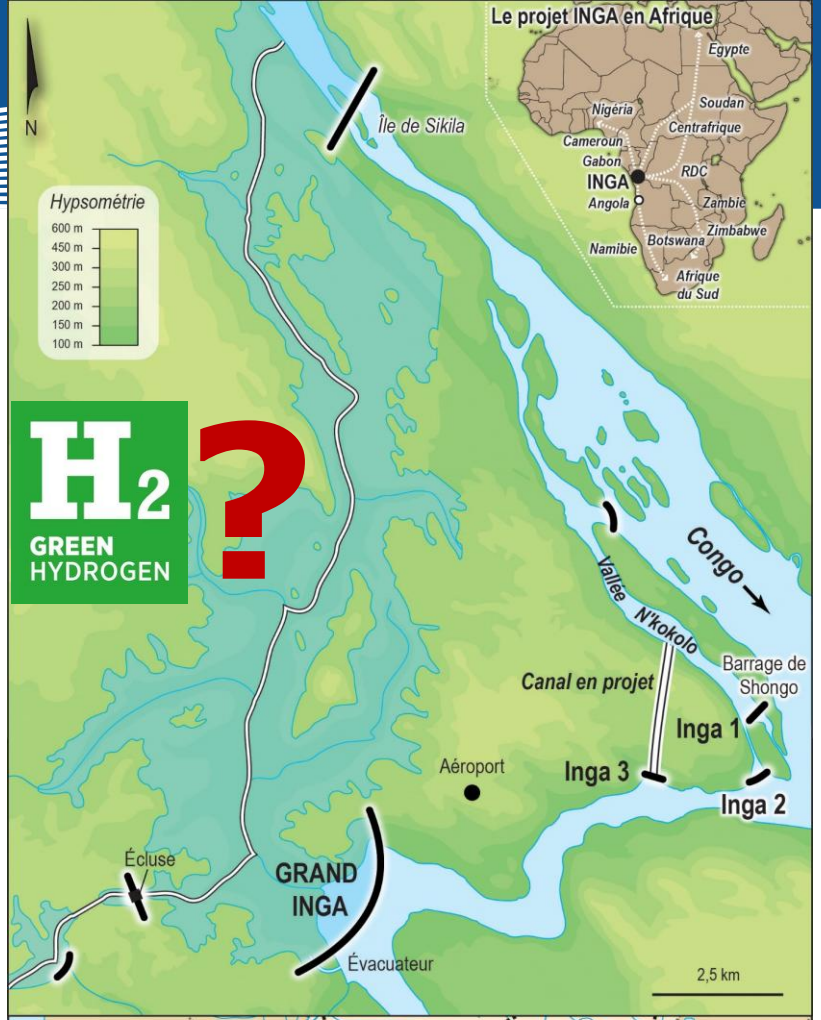
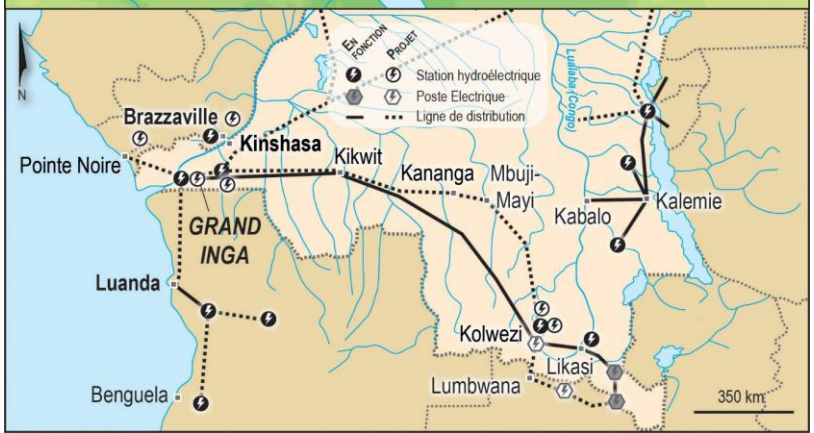
Five development finance institutions (primarily from South-Africa) have banded together to find a way to develop the world's biggest electricity-generation project, the planned Grand Inga hydropower complex in the Democratic Republic of Congo that's been stalled for decades – by Bloomberg - 16 July 2024 - https://www.engineeringnews.co.za/article/development-banks-seek-to-revive-worlds-biggest-power-project-2024-07-16

ABUNDANT RENEWABLE ENERGY RESOURCES
LOCATED CLOSE TO POTENTIAL DEMAND CLUSTERS

DRC has rich hydro resources distributed across the territory and some of this potential is in close proximity to extractive industries and population centers. The DRC hydrological technical potential is estimated to be around 100 GW among which 70 GW have already been specifically localized and most of this potential (64 GW) being concentrated in Kongo-central Province.
…… Unfortunately, the focus on expanding the Inga power plant has tended to delay the development of other hydro-power sites, especially smaller ones.

Source : "Increasing access to electricity in the Democratic Republic of Congo - Opportunities and challenges", Washington, DC - World Bank 2020 - http://documents1.worldbank.org/curated/en/743721586836810203/pdf/Increasing-Access-to-Electricity-in-the-Democratic-Republic-of-Congo-Opportunities-and-Challenges.pdf





"Le Grand Inga et les projets de connexion internationale - https://dei.hypotheses.org/494

Lire aussi : "Inga III: Nous sommes en train de nous préparer pour que la première pierre soit posée par le président de la République en 2021", 16 novembre 2020 – Extrait : « Nous travaillons pour que l'énergie d'Inga III soit disponible (…) avant 2030. Inga III va générer 11.000 MW qui vont être repartis comme suit: 3.500 MW sont réservés à l'Afrique du Sud, 4000 MW reviendront à Aluminium corporation of China, une des plus grandes entreprises chinoises de production d'aluminium qui va produire, tout près d'Inga, dans le Bas-Fleuve, dans un premier temps, 1 million de tonnes d'aluminium pour un investissement de 6 milliards de dollars » - https://www.politico.cd/encontinu/2020/11/16/inga-iii-nous-sommes-en-train-de-nous-preparer-pour-que-la-premiere-pierre-soit-posee-par-le-oresident-de-la-republique-en-2021-bruno-kapandji.html/72218/

A new EU-Africa Strategy - a partnership for sustainable and inclusive development

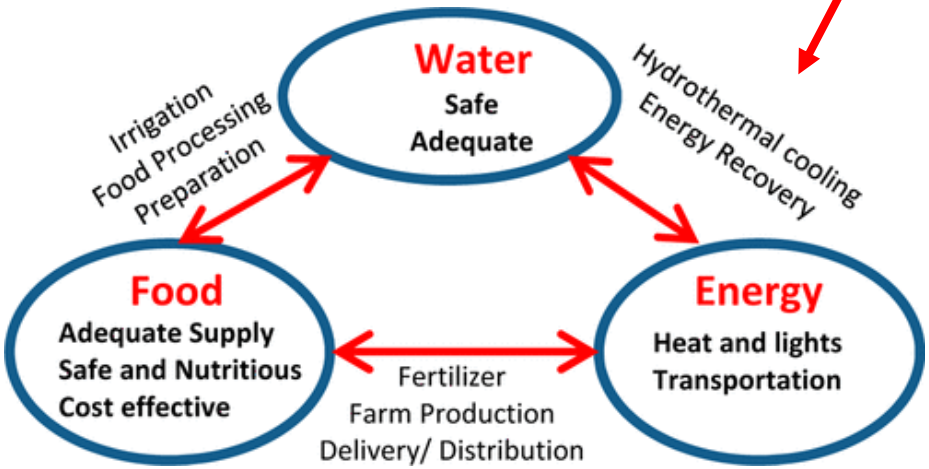
Africa Knowledge Platform (EC JRC)

EU "Africa Knowledge Platform"

A gateway to data and information on Africa's social, economic, territorial and environmental development, developed by the Joint Research Centre of the EC.
(https://africa-knowledge-platform.ec.europa.eu/)

A series of stories illustrates how scientific research can support policies, such as:

Energy :
- **Energy Production**
- **Clean & Renewable Energy**
- **Energy Access**
- **Rural Electrification**
- **Fossil Fuels**



Water-Energy-Food Ecosystem

- ***Unleashing clean energy potential in Africa***
"How geospatial knowledge can drive sustainable energy interventions"
SDGs: GOAL 09: Industry, innovation and infrastructure / GOAL 07: Affordable and clean energy / GOAL 06: Clean water and sanitation / GOAL 01: No poverty / GOAL 13: Climate action

- ***African Isobioclimates - SDGs: GOAL 13: Climate action***

- ***Water-Energy-Food-Ecosystems Nexus (WEFE): a delicate balance - SDGs: GOAL 07: Affordable and clean energy / GOAL 06: Clean water and sanitation / GOAL 02: Zero hunger / GOAL 15: Life on land / GOAL 12: Responsible consumption and production***

- ***Hydrological Basins in Africa***
SDGs: GOAL 06: Clean water and sanitation

- ***High-input agriculture (areas of concern)***
SDGs: GOAL 15: Life on land

- ***Irrigation (areas of concern) - SDGs: GOAL 15: Life on land***

- ***Livestock density (areas of concern) - SDGs: GOAL 15: Life on land***

EU Science Hub - JRC Digital Media Hub - https://visitors-centre.jrc.ec.europa.eu/en/media/tools/wefe-delicate-balance

European Commission
JOINT RESEARCH CENTRE

AFRICA KNOWLEDGE PLATFORM

African Union

2024 Edition of the Africa's Dynamic Development Report

"Improving access to, and the quality of, skills development will help Africa harness the growth potential of a fast-growing and increasingly skilled workforce of young Africans.
Eighty-five percent of the total expected increase in the global working-age population by 2050 will be in Africa. The working-age population (15-64 years old) will almost double in Africa by that year, from 849 million in 2024 to 1.56 billion in 2050."

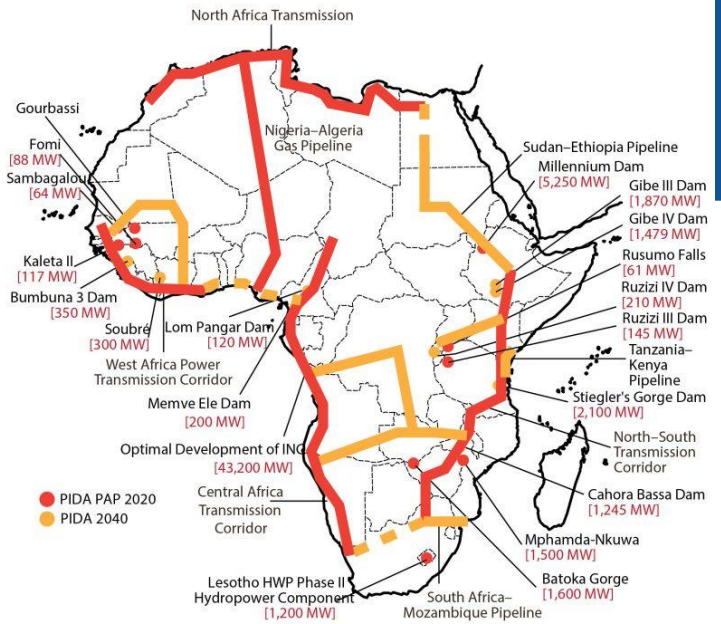
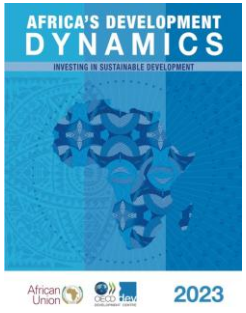


Figure - "PIDA's Energy Impact" from the African Union's vision statement (NB PIDA = "Programme for Infrastructure Development in Africa": Interconnecting, Integrating, and Transforming a Continent)

H.E. Amani Abou-Zeid,
Egyptian, is the Commissioner for Infrastructure and Energy of the African Union Commission.
H.E. Abou-Zeid was elected in 2017 and re-elected in 2021.
(AU - Infrastructure & Energy - https://au.int/en/ie)



Sustainable investments are essential for Africa's economic, social and environmental development.

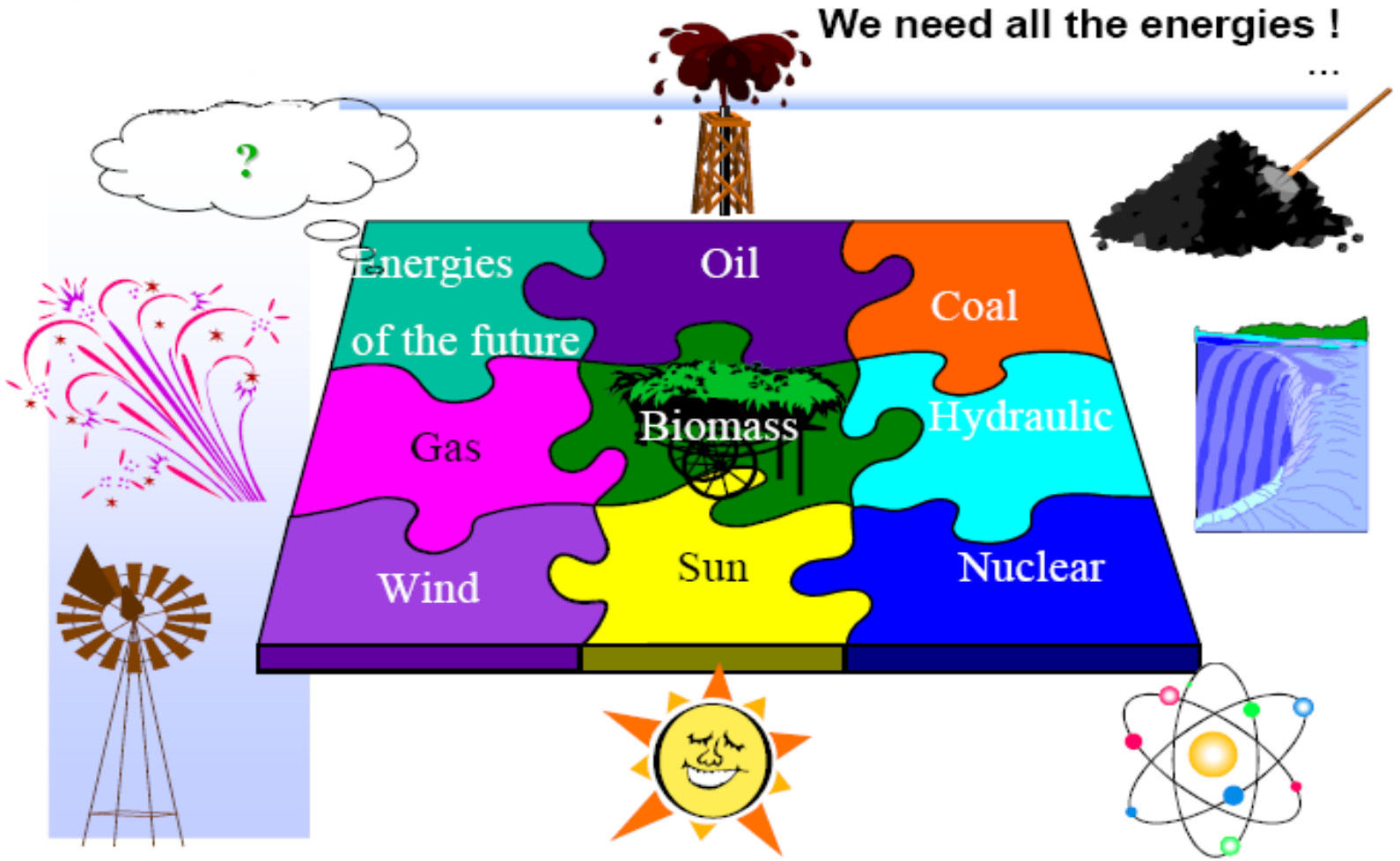
Investments are sustainable if their economic, social and environmental benefits outweigh their total cost.

The report argues that when mobilising and allocating investments, African countries need to manage tensions between economic, social and environmental goals such as productive transformation, social inclusion and resilience to climate change.

This includes balancing energy production and carbon mitigation, developing agricultural land use and conserving ecosystems, or creating mass employment while promoting labour standards. The report therefore provides an evidence-based analysis of Africa's investment landscape and identifies important investment-related policies that promote sustainable development on the continent as a whole and in each of its five regions.

Source : "OECD - "Africa's Development Dynamics 2023: Investing in Sustainable Development" - 7 Jul 2023 - https://www.oecd-ilibrary.org/development/africa-s-development-dynamics-2023_3269532b-en (in collaboration with AU Commission) - see also "OECD - Africa's Development Dynamics 2024: Skills, Jobs and Productivity" - 5 July 2024 - https://www.oecd.org/en/about/news/press-releases/2024/07/Investing-more-in-skill-development-is-key-to-making-African-economies-more-productive-.html

All energy sources have positive and negative effects

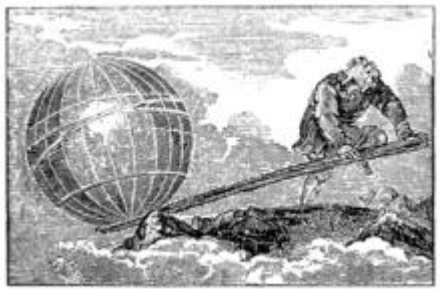


IPCC pretty much concluded that renewables alone are most probably not going to be enough and fast enough to avert the climate crisis, so we're going to need both renewables and nuclear (Figure right). ***(IPCC Fifth Assessment Report 2014 : https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_summary-for-policymakers.pdf)***

Discours de Mr Hoesung Lee, Président du GIEC, à la Conférence "Atoms4Climate" de l'AIEA, 2019 - https://scienceenfrancais.wordpress.com/2019/10/19/discours-du-president-de-la-conference-de-laiea-hoesung-lee-president-du-giec/

Social Media and Society: The Good, The Bad and The Ugly

100% RENEWABLE ?



Too often, climate advocates claim a consensus on the feasibility and affordability of 100 % renewable power globally when such a consensus simply does not exist — certainly not among energy systems experts, when they consider real-world constraints. On top of that, most 100 %-renewables studies simply do not acknowledge the additional challenges faced by poor countries.

- In these optimistic models, it is simply assumed that continent-spanning power lines will spring into existence.
- Clean technology costs are assumed to decline quickly and steadily.
- Vast battery networks appear, as do hydrogen and other renewable fuels sourced from excess electricity, making it possible to easily manage intermittent wind and solar generation.
- Solar farms and hydrogen hubs—a complex, high-cost technology—multiply across poor countries without any consideration for limited capital, missing infrastructure, or the absence of a large construction and engineering workforce.

Source : "Why False Energy Hopes Are Bad for Africa" – authors from Breakthrough Institute (Berkeley, California) – Foreign Policy - October 5, 2023 - https://foreignpolicy.com/2023/10/05/africa-climate-energy-transition-renewable-wind-solar-fossil-fuels-net-zero/

Recherche, innovation et formation en Afrique - une partie de la solution

African Physics Newsletter: July 2023

"Scientific African" is owned by the Next Einstein Forum (NEF) and operated by the NEF Community of Scientists - https://www.journals.elsevier.com/scientific-african/

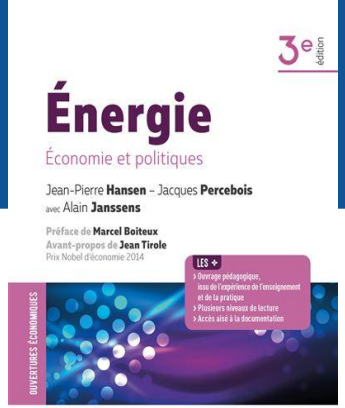
"the next Einstein would be from Africa"

"My wish is that you help us unlock and nurture scientific talent across Africa, so that within our lifetimes we are celebrating an African Einstein", said Neil Turok. https://blog.ted.com/the-next-einstein-forum-begins/ and https://www.nexteinstein.org/

"Can you imagine a thinker who combines the brilliance of Einstein and the compassion of Mandela?" - TED 2008 talk (February 2008, 25 min duration, with transcript in 27 languages) : https://www.ted.com/talks/neil_turok_makes_his_ted_prize_wish

Neil Turok (1958 -), founded in 2003 the "African Institute for Mathematical Sciences" (AIMS) in Muizenberg (a small seaside suburb of Cape Town, South Africa). AIMS centre of excellence offers a creative STEM education to African students and aims to improve the statistic that less than 1% of global research is done in Africa. Since then, through the AIMS Next Einstein Initiative (AIMS-NEI), AIMS centres have opened in Sénégal (2011), Ghana (2012), Cameroon (2013), Tanzania (2014) and Rwanda (2016). "Our goal is to have 15 AIMS centres of excellence in operation across Africa by 2023."

Références bibliographiques



(1) « Energie : Economie et politiques » de Jean-Pierre Hansen et Jacques Percebois (Auteurs), Marcel Boiteux (Préface), Jean Tirole (prix Nobel d'économie 2014, Introduction), Editions De Boeck, 2010, ré-éditions en 2015 et en 2019, 756 pages

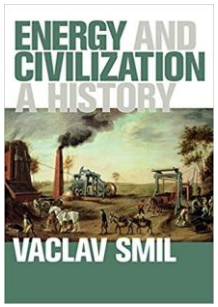
(2) "Energy and Civilization", 2017, Vaclav Smil - A comprehensive account of how energy has shaped society throughout history, from pre-agricultural foraging societies through today's fossil fuel–driven civilization (1943 - / Manitoba Univ., Canada), MIT Press, 568 pages

(3) "Connaissance des Énergies" a pour objectif de favoriser la connaissance des énergies auprès du grand public. Environ 170 fiches pédagogiques couvrant : énergies fossiles (pétrole et gaz), renouvelables (solaire) et nucléaire, ainsi que systèmes de stockage et d'économies d'énergie - https://www.connaissancedesenergies.org/notre-ambition

(4) IEA « The World Energy Outlook (WEO) » - the world's most authoritative source of energy-market analysis and projections since 1977 – report 2025 issued in November 2025 - https://www.iea.org/events/world-energy-outlook-2025

(5) IEA "Africa Energy Outlook 2022" - (Revised version, May 2023) - https://www.iea.org/reports/africa-energy-outlook-2022

(6) "Africa Knowledge Platform" - A gateway to data and information on Africa's social, economic, territorial and environmental development – EC Joint Research Centre (Ispra) - https://africa-knowledge-platform.ec.europa.eu/

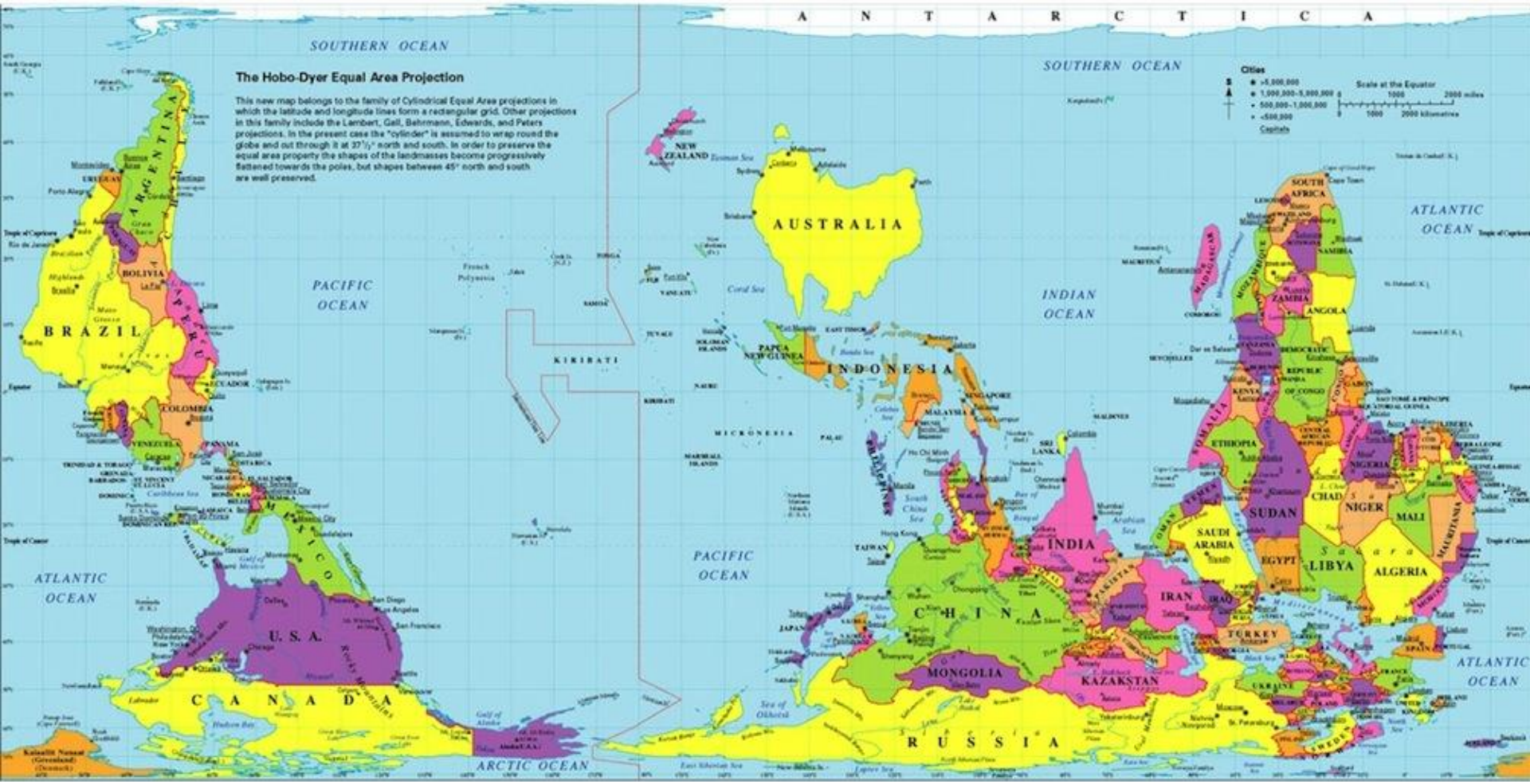


(7) "Sustainable energy for Africa" – International (Belgian - African) Conference - 23-25 Oct. 2017 – Brussels – G. Van Goethem and B. Mairy et al. - Royal Academy of Overseas Sciences of Belgium (ARSOM - KAOW) - https://www.kaowarsom.be/en/SustainableEnergy4Africa_presentations&videos and *https://www.kaowarsom.be/en/acta_se4a*

(8) "ÉNERGIE ET DÉVELOPPEMENT EN AFRIQUE" – G. Van Goethem - 9 Nov 2023 et 27 nov 2024 – cours-conférence au Collège Belgique (Académie royale de Belgique) – Bruxelles - https://lacademie.tv/conferenciers/georges-van-goethem et chaîne YouTube de l'Académie : https://www.youtube.com/watch?v=iE-QbFLFxhs

Royal Academy for Overseas Sciences

Africa upside-down map - why is north usually at the top ?



This map puts the Global North – Europe and North America – at the bottom of the map and to the peripheral corners, seriously shifting typical perspective of most maps.

NB - The Hobo-Dyer Equal Area Projection is a way of placing the three dimensional Earth onto a two dimensional map without significantly changing the relative areas of land and water => the actual relative sizes are depicted.

Source: "Transpacific Project" (June 2011) - http://www.transpacificproject.com/wp-content/uploads/2011/06/SouthUpMapr.jpg
and "Digimap for Schools - thematic maps and map projections" - Geographical Association – Univ. of Edinburgh, 2020
https://digimapforschools.edina.ac.uk/files/resource-hub/downloads/721201_themes_projections_and_world_regions_ks2_resource10.pdf