Uranium and Thorium Resources in the Democratic Republic of the Congo: Historical and Current Status

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Agenda

- Historical Events
- Uranium Occurrences
- Uranium Today and Tomorrow
- Conclusions and Perspectives
Mineral Resources Mapping
Uranium from the beginning to Congo

1789 : U discovery by German Chemist Martin Klaproth.
1789 - 1939 : U has little commercial value and no strategic importance. (Pottery and Glass)
1898 : Curies discovered that U ore also contains Ra and Po (More than U).
1898 to 1925 : Ra is used to make dials glow in the dark, and to shrink malignant tumors. Ra becomes the most valuable substance on earth sold for 120,000 a gram. Ra is mined in Czechoslovakia, England, France, Russia and the Colorado Plateau (USA).
Uranium from the beginning to Congo

1925 to 1930:
By mining rich deposits in the Congo, a Belgian company drives the price of radium down to about $75,000 / g, forcing its competitors out of business and achieving a world monopoly.

July 1942:
The US Army orders another 350 tons of uranium from Eldorado.

September 1942:
The U.S. Army acquires 1200 tons of rich U concentrates from the Congo.

December 1942:
The U.S. Army orders another 500 T of U from Eldorado. Eldorado interrupts its delivery of Canadian U to the US and begins processing the Congolese U instead. U from the Congo, refined at Port Hope, dominates the Manhattan Project.
Uranium from the beginning to Congo

1943 to 1945:
- U from Canada, Colorado, and the Congo is used in the WW II Atom Bomb Project:
  - U is enriched and used as a nuclear explosive in the Hiroshima bombs
  - U is used as metallic fuel for the world's first Reactors
  - A fraction of the U fuel is converted into Pu which is then extracted and used as a nuclear explosive in the Trinity and Nagasaki bombings
- Po extracted from U ore is also used, in combination with Be to provide neutrons needed to detonate both the Hiroshima and Nagasaki bombs.
- 1906: Discovery of Shinkolobwe deposit (Union Minière)
- 1915: U is discovered as a yellow ore and confirmed that the deposit was very rich in Uranium Oxide and Lead
Uranium from the beginning to Congo

- **1924:** Highly concentrated Ra & U are discovered and commercialized. Belgium monopolized the world market.
- **After WW I:** Only Radium is mined, stored at Panda and sent to Oren in Belgium.
- **1937:** Shinkolobwe site is closed. 2000 tons of 65% U₃O₈ are stockpiled to supply the world demand for 20 years.
Uranium from the beginning to Congo

- **Up to 1937:** Canadians and Belgians compete to control Ra market. Ra prices decline from $70,000 to 25,000 per gram.
- **1938:** UMK & Eldorado Gold Mines joined in cartel with 60% of the world market to the Belgium. Radium price rises to US$2,000 /g.
- **1938:** U is sent to USA to prevent it from Germany possession.
- About 25,000 tons of U were produced from the site.
The Manhattan Project and the DRC Uranium

• The U.S. assembled a team of nuclear scientists from several countries to work on atomic weapons

• Their work, known as the Manhattan Project, resulted in the first nuclear explosion at the Trinity test site in New Mexico in July 1945.

• 1939: 1st Einstein letter to Roosevelt to discuss development of nuclear weapon and suggesting the use of U from Belgian Congo
The Manhattan Project and the DRC Uranium

- **August 1939**: Leo Szilár Memo to Roosevelt to use U from Belgian Congo in the development of nuclear weapons
- **1940**: Stockpile of U bearing ore is shipped to the USA
- **August 15, 1942**: Manhattan Project Director General Lislie Groves purchased 1250 ton of Belgian Congo U to UMK
- **August 1945**: Japan Cities of Hiroshima and Nagasaki were bombed and destroyed.
- The world became aware of the enormous destructive power of nuclear weapons

The United States has only very poor ores of uranium in moderate quantities. There is some good ore in Canada and the former Czechoslovakia. While the most important source of uranium is Belgian Congo.

In view of the situation you may think it desirable to have more permanent contact maintained between the Administration and the Group of physicists working on chain reactions in America. One possible Way of achieving this might be for you to entrust with this task a person who has your confidence and who could perhaps serve in an unofficial capacity. His task might comprise the following:

- a) to approach Government Departments, keep them informed of the further development, and put forward recommendations for Government action action, giving particular attention to the problem of securing a supply of uranium ore for the United States;
- b) to speed up the experimental work, which is at present being carried on within the limits of the budgets of University laboratories, by providing funds, if such funds be required, through his contacts with private persons who are willing to make contributions for this cause, and perhaps also by obtaining the co-operation of industrial laboratories which have the necessary equipment.

I understand that Germany has actually stopped the sale of uranium from the Czechoslovakian mines which she has taken over. That she should have taken such early action might perhaps be understood on the ground that the son of the German Under-Secretary of State, von Weizsäcker, is attached to the Kaiser-Wilhelm-Institut in Berlin where some of the American work of uranium is now being repeated.

Your very truly,
Uranium Occurrences

- Katanga Province
  - Shinkolobwe,
  - Kalongwe
  - Musoshi
  - Musonoi
  - Swambo
  - Luiswishi
  - Kambove Principal
  - Kambove west
  - Kalongwe
Uranium Occurrences
Uranium Occurrences

- Province of South Kivu
  - Kobokobo
## Uranium Deposit and Resources Evaluation

<table>
<thead>
<tr>
<th>U Deposit</th>
<th>Resources Evaluation</th>
<th>Mineralization</th>
<th>Mining</th>
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</thead>
<tbody>
<tr>
<td>Shinkolobwe</td>
<td>1000 T - 3000 T of U₃O₈</td>
<td>Uraninite, Uranium associated with Cu, Co, Ni, Gold and REE</td>
<td>Mining started in 1921 (U extracted from Ra). Ra mined in 1922. U mined from 1939 until 1960. The mine was closed in 1961</td>
</tr>
<tr>
<td>Swambo</td>
<td>255,000 T of ore yielding 600 T of U₃O₈, other sources report some 2000 T of U₃O₈ in ore grading between 0.1 and 1%</td>
<td>Uraninite, Uranium is associated with palladium and Gold</td>
<td>Never mined</td>
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<td>Kalongwe</td>
<td>500 T U₃O₈ in ore grading 0.1%; (100 to 200 T U₃O₈ in ore grading 2% U₃O₈).</td>
<td>Pitchblende. U associated with Cu and Gold. Kalongwe belongs to SHINKOLOBWE-type</td>
<td>Never mined</td>
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16,600 T of ore with 0.19% U-Oxides.
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<td>MUSOSHI</td>
<td>-</td>
<td>Torberite, Uranophane. At 370 m depth uraninite is associated with pyrite, molybdenite, quartz, albite, microcline and carbonate.</td>
<td>Never mined</td>
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Session I CCPMQ/CGEA MAI 2010
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<td>KAMBOVE WEST</td>
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<tr>
<td>KAMBOVE PRINCIPAL</td>
<td>-</td>
<td>Francevillite, uranium,</td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td>cuprosklodowskite, Torbernite.</td>
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<tr>
<td>MUSONOI</td>
<td>-</td>
<td>Torbernite, and Cuprosklodowskite. Selenium is closely associated to uranium.</td>
<td>-</td>
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<tr>
<td>KAMOTO</td>
<td>-</td>
<td>Uranophane</td>
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Uranium in the DRC Today 1

- 1982 COGEMA prospected U
- U is not mined anymore in the DRC since 1942
- Most Cu and Co mines contain amount of low to moderate grade of U & Th
- U ore is classified as restricted material by a Presidential Decree
- Monitoring is conducted to prevent illegal mining in some mining sites
Uranium in the DRC Today 2

- In July 2007: Brinkley Mining Company (UK) agreed with the DRC for the production of uranium and for financial assistance to halt uranium smuggling.
- The deal established a joint venture between Brinkley and the Congo Atomic Energy Commission (CGEA) to develop the country's uranium sector.
- The joint venture concerned exploration and mining of uranium deposits of Shinkolobwe mine, Mirindi, Kalongwe & Kasompi.
- September 2008: Agreements were terminated
Uranium in the DRC Tomorrow

• More interest is shown by several countries in exploring and mining U in the DRC
• **March 2009** an agreement was signed by Areva CEO Anne Lauvergeon and the Congolese Government of the DRC
• Agreement implies creating a Joint commission to develop a technical prospecting programme, detailed inventory of U mining sites and an update of database
• Agreement is based on “win-win partnership” to develop the country’s mining resources
• Areva estimated that DRC’s “size and geographical profile have given it major uranium reserves”
Perspectives and Conclusions

• U was mined only from Shinkolobwe mine
• U exploration and mining have never been performed using conventional methods and techniques;
• U mineralization is always associated with other minerals (Monazite, Strontium, Palladium, Thorium Phosphates)
• There is a strong need for advanced exploration Methods and Techniques, including Expert assistance to design exploration programme, Equipment provision, Capacity Building in U Resources Evaluation
• Legal and Regulatory Infrastructure to include Mining
Thanks for your Kind Attention