Origins of Leading Sector Technology in South Africa: Coal-Based Synthetic Fuels and Cyanide-Based Gold Extraction (destructive creation, national development and its challenges for transformation)

Thomas Pogue – University of the Pacific & TUT/ieri

Peter Hilsenrath – University of the Pacific
Two Cases of Knowledge Intensification in South Africa’s Resource Sector

- Cyanide-based gold extraction
  - Use of cyanide to extract non-oxidized gold deposits, usually well below surface levels

- Coal-based synthetic fuels (Sasol)
  - Production of petrol, diesel, aviation fuel, industrial waxes, ethylene and other products
Development of Kimberley Diamond Field
Kimberley Diamond Mining Legacy

- Physical infrastructure
- Urbanisation
- Finance System
- Mining Labor Organisation
- Social Capital & Networks
- System of Innovation
- Political Lobby
The Witwatersrand Basin is an ancient inland sea around 3 billion years old and roughly 350km long by 150km wide.

Most of the basin is covered by younger rocks of considerable depth, but tectonics exposed the northern edge.

On that edge, in a region known as the Central Rand, mining of the Witwatersrand Basin began.
Gold is deposited with other minerals in host rock that requires metallurgy to separate.

Initially, naturally oxidized gold bearing deposits were crushed and passed over mercury plates with gold sinking into mercury.

At greater depth, gold bearing host rock not oxidized and so mercury based extraction ineffective.
Cyanide Technology & Witwatersrand

• Successfully industrialised

• Globally developed

• Open system of innovation
More than 40% of all mined gold ever from Witwatersrand Basin
Coal-based synthetic fuels
Hydrogenation of coal

- Developed in early 20th century France and especially Germany
- Direct vs indirect catalytic liquefaction
- High ash content of South African coal led to indirect liquefaction
Operations in 38 countries – 33,400 employees – Revenue over $20b U.S.
Path Dependency & Resource Trajectory

- Production system/distinct form of capital accumulation
- Facilitated development
- Entrenched system of capital accumulation
- Explicit consideration needed in era of economic transformation of this legacy
- More general importance in the analysis of resource based economic development