Renewables and Research in Kazakhstan: Uneasy Choices?

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The Svevind Energy GmbH Hydrogen project in KZ

- The German-Swedish company Svevind, specialising in renewables (wind power) is expected to cover 8% of Sweden’s energy market by 2026

- **KZ**: $40 \text{ GW}_e = \text{wind (70\%)} + \text{solar (30\%)}$

- **Technology**: water intake and desalination, followed by the splitting of water ($\text{H}_2\text{O}$) by electrolysis into hydrogen ($\text{H}_2$) and oxygen ($\text{O}$)

- **Production capacity**: 2 million tons of hydrogen, converted into 11 million tons of ammonia used as an energy vehicle in 2030-32

- **Investments**: USD$40\text{Bn - 50Bn}$

- **KZ buyout**: up to 25% share.
Project Features:

• An autonomous system of energy production and transportation.
Major Concerns:

Water consumption:

- 2 million tonnes of H2 would require 18 million tonnes of water, given the molar weights of hydrogen (2g) and water (18g).

- The Caspian sea (area of 78,000 km³) contains 78 trillion tonnes of water. The project will therefore use 0.0002% of sea volume annually.

- Continued use of water may have a cumulative environmental impact considering the already decreasing sea volume.

  ➢ Sea levels have decreased by 28.1 meters since 2005 (Bukharizin, 2022)
Major Concerns:

- **Heavy infrastructure**

- **High cost** (The project area is equal to half of Belgium)

- **Efficiency** (3-stage process: desalination, electrolysis and reverse conversion of ammonia)
Wider Questions:

- Does the project reflect a **dependency** on singular technology?
  - (e.g.: oil and gas in the 20th century?)

- Does the current project posses the capacity to **evolve** and **adapt** to the global development of Science and Technology?
Policy for Critical Minerals and Energy

• Kazakhstan requires a holistic approach through comprehensive and multi-angled policy aimed at Education, Science and Technology.

➢ Inclusion of Hydrogen energy can combine the three fields, while promoting further research.

• The project is to be closely supervised and regulated by Kazakhstan’s authorities with the support of appropriate, high-level, domestic expertise.
The Algebra of Development *(a conventionally linear one)*

**Ecosystem** (social and educational development) --->

**Science** (the grasping of nature’s principles) and **Culture** (a distinct form of human intellectual activity) --->

**Engineering** (the application of science) --->

**Technology and Innovation** (Integration of engineering for public good and/or commercial gain) --->

**Industry, Economy and Finance** (contribution to development).
Natural options

Polymer and oxide semiconductor devices

• Light-emitting diodes
• Solar cells
• Transistors

• Cheap deposition of polymers by printing
• Improve devices by understanding physics
• Successful spin-out of technologies

We do have the sun! and also the plastic!
From silicon electronics:
Objectives of the ACAST:

• To establish a linked fundamental science laboratory

• To establish a commercialisation platform via certification

• To nucleate an innovation ecosystem focused on the mining, metallurgy and agriculture industry sectors of Kazakhstan
Natural wealth of vast materials and metals is a driving factor in the \textbf{new era} of electronics, refrigeration and energy-storage.

- All of which underpin all the other areas of technology and thus global sustainable development.

Hydrocarbons and Silicon-based technologies in particular

The Centre will also provide research and services relevant to most technically reliant industrial and manufacturing sectors, particularly those which rely on materials, R&D and analysis.
References

