Republic of Botswana

STATUS OF CARBON CAPTURE AND STORAGE IN BOTSWANA - LEGISLATION AND PROGRAM

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BOTSWANA

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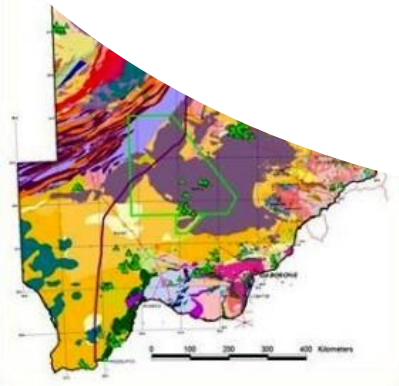

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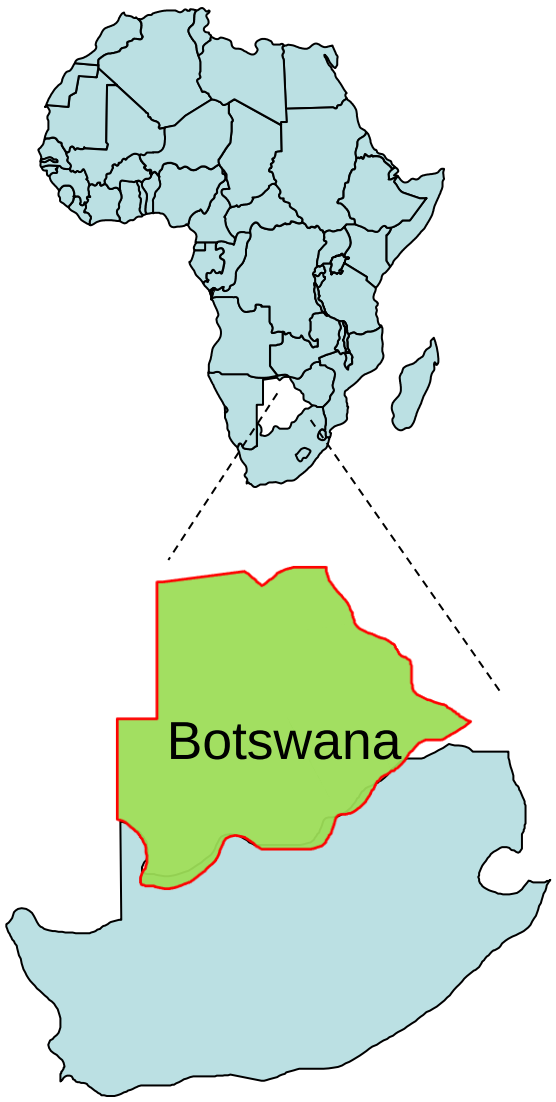
Introduction - Botswana at a glance



- Area size; 582 000 square kilometres
- Population size; about +/- 2 million

- Economically, Botswana is an upper middle income country with her economy mainly driven by diamond mining (contributing ~40% to the GDP).

- In her quest to diversify the economy, Botswana has identified a number of strategies for growth, e.g.:

  ✓To attain the capacity to supply SADC region with coal & coalbed methane (CBM) based electricity

  ✓To create a range of support industries and activities from these resources.

Botswana is to diversify from heavily reliant on diamonds to safeguard its social and economic accomplishments

- Botswana is heavily reliant on diamonds as source of revenue,

- Therefore economic diversification away from diamonds is urgent and prudent for Botswana in order to:

  - safeguard its social and economic accomplishments and meet its remaining challenges.

Botswana's own resource options from Diamonds include……

- **coal:**
  - Coal is extensive (estimated at over 200 billion tonnes) but mostly undeveloped because of South Africa's already well developed and competitive coal mining industry.

- **Solar:**
  - Botswana has considerable solar potential in the Kalahari Desert and solar is already used for off-grid power generation. Solar power is still expensive, and energy storage is unproven at large scale and hence requires backup generation for night time supply.

- **Prospective coal-bed methane (CBM);**
  - Botswana has large inferred CBM resources which could potentially be also a low- to medium-cost source of power. But these are largely unexplored and thus not yet available for base-load generation. When proven, Botswana's CBM could be a very attractive low-carbon energy resource in the future, serving the sub-regional needs.

Botswana's approach is therefore to develop an energy portfolio including, , *e.g.:*,

- CBM and possible coal gasification and
- No-carbon (*e.g.*, CSP) technologies and
- Also to examine CCS,

All of which support economic diversification and also have the potential to make demonstrative impact on the countries in the region in mitigating climate change.

Botswana‘s energy sector strategy is conceived on the premise of responsible development of coal & support a low-carbon growth path, which aims to;

- Minimize the climate change impacts.
- Lead the other countries in the sub-region towards adopting and developing low-carbon growth strategies.
- Given Botswana‘s energy endowment, its cleaner fuel options are to:
  - **Develop coal-bed methane and to explore solar thermal, while examining prospects for carbon capture and storage as a means to mitigate climate change impacts.**

Countries including Botswana are small GHG emitters.

- However, to meet electricity demand more power stations need to be put in place in the next 2-3 yrs going towards 2020.
  - Therefore, emissions will increase.
- And as such measures has to be put in-place to mitigate such emissions
- The GoB is in the process of conducting a CCS pilot feasibility study of which the purpose is to:
  - **Assess the opportunities for CCS in Botswana &**
  - **Make recommendations as to the legal and regulatory environment necessary**

Funded by IBRD (World Bank) under the Morupule B Generation And Transmission Project.

However like any other country, Botswana is challenged by Issues surrounding CCS, namely…

- **Cost**:
  - High costs of CCS per tonne are a serious challenge to its deployment in the short term. The large share of the costs is incurred during the capture stage. A more energy efficient capture technology is currently at an experimental stage and not expected to be commercially available in the next five years.

- **Legal and Regulatory Issues**:
  - Due to the nature of the technology, deployment of CCS at a large scale across many countries will require a well-defined regulatory structure

- **Long-term risk assumption**:
  - Many CCS bodies have taken a position favoring governments to assume long-term risk liability but consensus has yet to be reached on the best model of this risk transfer.

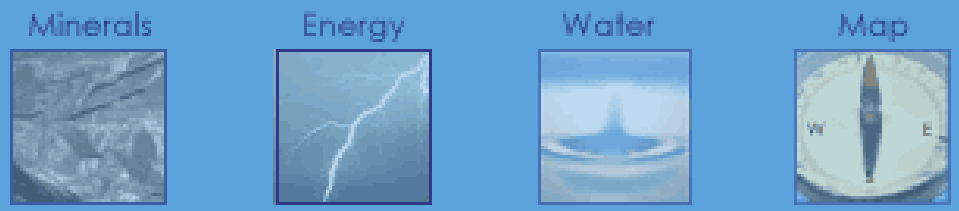
….and inadequate geological and geophysical data in most countries & public awareness issues.

- Since there was no need for carbon storage earlier, the geological and geophysical data that would be required for a storage project has never been collected in most countries, Botswana included.

- CCS is not expected to be an easy sell to communities. It will take concentrated education and awareness efforts to make local communities comfortable with having huge amounts of buoyant gas underground in the proximity of their homes and farms.

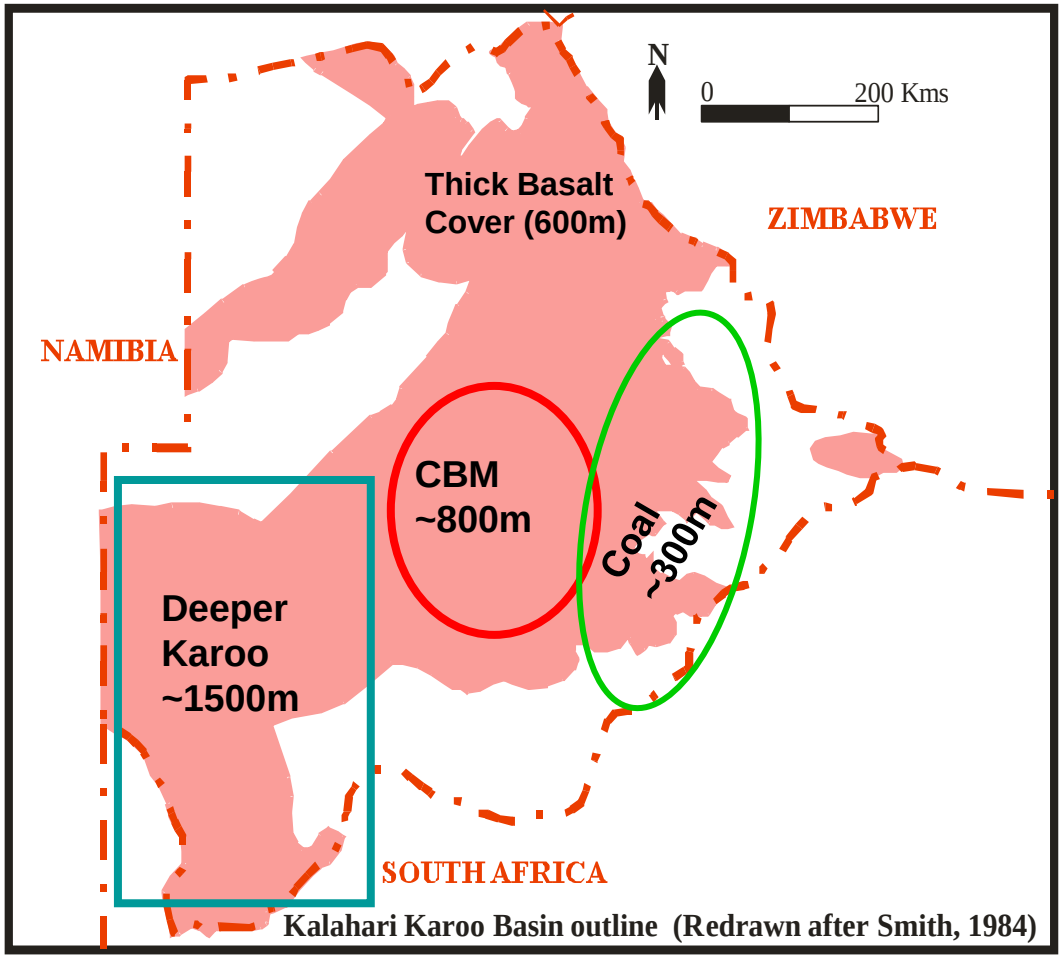
However Botswana is not left behind with CCS initiative and programs …..

- There was a workshop held in Botswana in April 2010.
- A number of concerns that were identified by stakeholders as requiring regulation, among them were:
  - Possible CO2 leakage and related contamination of groundwater,
  - Specifications of the CO2 to be stored and
  - Suitability of storage sites,
  - Related energy penalties for CCS and licensing of the pore space.
  - Etc.



Is The Geological Environment of Botswana Suitable for CCS?

- Botswana has prospective sedimentary basins, with:
  - The Karoo Supergroup (with av. thickness not exceeding 1000 – 1500 m) covering ~70% of the country, but is poorly exposed.



However Detailed investigations will need to be undertaken to expose where the potential is , e.g.,

- Conducting geological storage assessment, i.e.,
  - Is the geology suitable for CCS?
- Key crucial elements
  - Is there sufficient underground porous reservoir space (capacity & injectivity) at sufficient depths with;
    - ✓ Appropriate containment (cap rock to avoid leakage)
- Is there sufficient data to analyze these parameters and/or are they freely available?

Summary

- It is partly through such further geological investigations and a wide consultative process that stakeholders will be informed about how best to proceed, if at all, with CCS in Botswana.

- In addition, given the current lack of regulatory and limited human capacity to regulate CCS, **the regulatory capacity will therefore have to be enhanced – an on-going process with World Bank**

THANK YOU!