Scientific Assessment of shale gas development in South Africa

_Presentation to Portfolio Committee on Science and Technology, Parliament, Cape Town_  
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1. Background
   - South African context and need for an assessment

2. Scientific assessment
   - Collaboration and coordination
   - Integrated project governance
   - Public outreach
   - Scope and Methodology

3. Outcomes
   - Key risks, opportunities and over-arching findings
   - Support for responsible decision-making

4. Way forward
   - Future shale gas research needs?
   - Learning from this assessment?
Acknowledgements

Collaboration & partnerships

We acknowledge the collaboration amongst national and provincial government:

We acknowledge our partners in the Scientific Assessment:
Background

*Previous presentations to Parliament*

**May 2015:** launch of the Strategic Environmental Assessment for shale gas development at parliament by DEA, DST, DOE, DWS and DMR

**May 2016:** presentation to parliament on draft outcomes

**Nov 2017:** presentation to parliament on outcomes and way forward
South African context

What is the key problem statement?

Shale gas development and “fracking” a polarised and contentious issue in SA → Difficult for society and government to interpret

Potential opportunities
- Economic benefits;
- Energy security;
- Reduced greenhouse gas (GHG) emissions (e.g. when replacing coal).

Potential risks
- Industry outpaces research, regulation, governance & infrastructure;
- Increased GHG emissions (leakage);
- Water use, contamination & legacy risk;
- Surface disturbance by physical infrastructure.

Need for trusted and transparent information gathering and sharing process that addresses the core question of “what are the risks and opportunities of shale gas development in the central Karoo?”
Need for a Scientific Assessment
Evidence to inform decision making

2010
Exploration Right applications to explore for shale gas in the Karoo submitted to DMR

How to adjudicate in an informed & responsible manner?


2015
Government commissions independent scientific assessment
Scientific assessment

Collaboration and coordination

- 18 month independent scientific assessment
- Phase 2 of an overarching Strategic Environmental Assessment

1) Preparation phase
Admin, governance groups, author teams, databases, library, Scenarios and Activities Chapter

2) Scientific Assessment
Organise relevant information per chapter, investigate, assess, write-up, peer review, revise and communicate, review by experts and stakeholders, review, publish

3) Decision Support Framework
Risk mapping, best practice principles, minimum information requirements, monitoring frameworks

Engagement with government, stakeholders, governance groups, media communication
Scientific assessment **Principles**

- **Saliency**: the topic must be widely viewed as important and address the material issues raised by stakeholders.
- **Legitimacy**: an independent, transparent, participatory and fair process, that is mandated by the ultimate decision-makers.
- **Credibility**: multi-author teams led by reputable experts, rigorous peer review and evidence-based outcomes.
Scientific assessment

Project governance

PROJECT EXECUTIVE COMMITTEE
Mandate: Project management

PROCESS CUSTODIAN GROUP
Mandate: Process oversight
Scientific assessment

Public outreach

- ~600 stakeholders registered on the database
- Scientific assessment chapters for review
- Two rounds of public meetings (Graaff Reinet, Beaufort West and Victoria West)
- Project website [http://seasgd.csir.co.za/](http://seasgd.csir.co.za/) for project updates and access to presentations, notes, and documents for comment
- Communication tools: Website, sms, radio, public meetings
Scientific assessment

Scope and methodology
<table>
<thead>
<tr>
<th>1) Scenarios &amp; activities for SGD</th>
<th>10) Economy</th>
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<tr>
<td>2) Energy planning</td>
<td>11) Social fabric</td>
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<td>3) Air quality &amp; greenhouse gases</td>
<td>12) Human health</td>
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<td>4) Seismicity</td>
<td>13) Sense of place values</td>
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<td>5) Surface &amp; groundwater resources</td>
<td>14) Visual, aesthetics and scenic resources</td>
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<td>6) Waste planning &amp; management</td>
<td>15) Heritage</td>
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<td>7) Biodiversity &amp; ecology</td>
<td>16) Noise</td>
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<td>8) Agriculture</td>
<td>17) Electromagnetic interference with SKA</td>
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<td>9) Tourism</td>
<td>18) Spatial &amp; infrastructure planning</td>
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Scientific assessment

Scope and methodology

- 18 chapters
- 146 authors
- 75 peer reviewers
- x3 expert workshops
Scientific assessment

*Expert inputs from “team SA”*

**CSIR Capabilities**

- Air quality and greenhouse gasses
- Water resources (geohydrology)
- Human health
- Geophysics (seismicity)
- Waste management
- National energy planning
- Spatial planning & infrastructure

**Partners**

- SANBI
- Council for Geoscience

**Other leading contributions:**

- Wits University (Prof Bob Scholes)
- Nelson Mandela University
- University of Cape Town
- University of the Western Cape
- University of Free State
- University of Pretoria
- North West University
- National government depts (e.g. DAFF)
- Provincial govt (e.g. Western Cape DEA&DP)
- Square Kilometre Array (SKA)
- National Renewable Energy Laboratory
- SAEON
- WWF
- Shell
- EnviroServe
Scientific assessment

**Methodology - scenarios**

### Shale gas scenarios

#### Reference case
- Dynamic Karoo in absence of shale gas development

#### Exploration only
- Seismic surveys
- Test wells

#### Small Gas
- 5 tcf economically recoverable gas
- 1x combined cycle gas turbine

#### Big Gas
- 20 tcf economically recoverable gas
- 2x combined cycle gas turbine
- 1x gas-to-liquids plant
Scientific assessment
Methodology - risks and opportunities

Risk assessment

Assess with- and without mitigation, which assumes:

<table>
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<th>Without mitigation</th>
<th>With mitigation</th>
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<tr>
<td>Inadequate governance capacity</td>
<td>Effective implementation of best-practice principles</td>
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<tr>
<td>Weak decision-making</td>
<td>Adequate institutional governance capacity</td>
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<tr>
<td>Non-compliance with regulatory requirements</td>
<td>Responsible decision-making</td>
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During the scenario period, including exploration, operation and closure as appropriate.
Outcomes

Risks from exploration and production

- Existing local water sources fully allocated → no water available for SGD
- Surface spills → most likely source of water contamination
- Local municipal landfills and water treatment facilities → not currently equipped to dispose of SGD liquid and hazardous waste
- Achievement of long-term macro-economic benefits → depending on how the proceeds from SGD are used
- Large investments in small towns → ‘boomtown’ conditions
- Increased volumes of heavy vehicles → deterioration of roads, necessitating higher levels of maintenance, law enforcement and traffic management → potential for rail
Outcomes

Opportunities from exploration and production

- New **geohydrological data** for the central karoo, especially at depth
- New **knowledge**, skills and industrial development
- **Energy** independence, diversity and security
- Reduced **GHG emissions** with best practice
- Regional biodiversity **conservation, tourism and service infrastructure** planning and enhancement
- **Diversification of local economy** and associated social impacts e.g. improved health services
- Integrated and **aligned planning** with renewable energy and SKA priorities
Outcomes

Possible employment opportunities?

Exploration Phase (seismics):
• Total eventual jobs: 500 - 750
• Local, direct jobs (initially, due to highly technical nature of work): 100 - 150

Exploration Phase (appraisal and drilling):
• Total eventual jobs = 520
• Initial local, direct jobs = 80 – 180

Small Gas:
• Direct jobs: 210
• Total eventual jobs (direct and indirect): 420, e.g. at power station (80 – 150)

Big Gas (by 2050):
• Direct jobs: 1400
• Total eventual jobs (direct & indirect): 2 800
• Examples of indirect jobs: 300 at power stations and 750 – 900 at GTL plant
Scientific assessment

**Overarching findings**

- **Avoidance is best**
  - Most risk can be mitigated, even at production scale, if basic avoidance best practice principles are maintained

- **Build institutional capacity**
  - The ability of South Africa to manage the risks of SGD depends on the strength of its institutions

- **Exploration risks are manageable**
  - There are no fatal flaws associated with exploration activities, even those undertaken at a high intensity

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**PLANNING**

**MITIGATION**

**GOVERNANCE**

**CAPACITY**
Outputs

**Support responsible decision-making**

Spatial sensitivity and risk mapping

Limits of acceptable change

Decision Support Framework

Minimum Information Requirements in terms of the National Environmental Management Act (107 of 1998) as part of the application for an Environmental Impact Assessment (EIA) for Environmental Authorisation related to onshore shale gas exploration activities

Strategic management actions
Opportunities identified at three levels:

- **National scale** → consolidate and coordinate a national Shale gas R&D programme
- **Central Karoo scale** → data management and coordination, including data from baseline monitoring, regulatory processes, research and exploration activities
- **Local scale (“sweet spot”)** → generate an inter-active spatial 3D simulation model (surface and subterranean) that integrates outputs from all studies
Way forward

Learning from this Scientific Assessment?

- Value of the Scientific Assessment in providing an integrative, impartial, science-based process that provides credible input to inform decisions and policy-making
- Manages risks and saves costs to South African society
- Appropriate approach for controversial issues in the national interest
- CSIR is applying this approach on other national scale science-based assessments for government:
  - Aquaculture development (part of Operation Phakisa, with DAFF and DEA)
  - Gas corridors (with DPE, DOE, DEA, Transnet, Eskom & iGas)
Thank you

http://seasgd.csir.co.za/