The scientific assessment of shale gas development in South Africa

The 6th CSIR Conference
Ideas that work for industrial development

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Outline

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   - South African context
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   - Integrated project governance
   - Public outreach
   - Scope and methodology
3. Outcomes
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5. Conclusions - Learning and looking ahead
## Background

### The need for an assessment

- Global cautious approach to shale gas development (SGD)
- Need for trusted and transparent information gathering and sharing process

### 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.

- Global cautious approach to shale gas development (SGD)
- Need for trusted and transparent information gathering and sharing process
Background

The South African context

2010
Exploration right applications to explore for shale gas in the Karoo

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

Integrated project governance

PROJECT EXECUTIVE COMMITTEE
Mandate: Project management

PROCESS CUSTODIAN GROUP
Mandate: Process oversight

- Government

- NGOs

- Research & academia

- Industry
Scientific assessment

Public outreach

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

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

**Scope – Topics**

**CSIR CAPABILITIES**

- Air quality and greenhouse gases
- Water resources (geohydrology)
- Human health
- Geophysics (seismicity)
- Waste management
- National energy planning
- Spatial planning & infrastructure
**Scientific assessment**  
*Methodology – Scenarios*

## Shale gas scenarios

<table>
<thead>
<tr>
<th>Reference case</th>
<th>Exploration only</th>
<th>Small Gas</th>
<th>Big Gas</th>
</tr>
</thead>
</table>
| • Dynamic Karoo in absence of shale gas development | • Seismic surveys  
• Test wells | • 5 tcf economically recoverable gas  
• 1x combined cycle gas turbine | • 20 tcf economically recoverable gas  
• 2x combined cycle gas turbine  
• 1 x gas-to-liquids plant |
Scientific assessment
Methodology – Risk & Opportunity

Risk assessment

- Assess without- and with mitigation, which assumes:

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Consequence</th>
<th>Without mitigation</th>
<th>With mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely - 1:1</td>
<td>low risk</td>
<td>Inadequate governance capacity</td>
<td>Effective implementation of best-practice principles</td>
</tr>
<tr>
<td>Likely - 1:2</td>
<td>moderate risk</td>
<td>Weak decision-making</td>
<td>Adequate institutional governance capacity</td>
</tr>
<tr>
<td>Not likely - 1:20</td>
<td>high risk</td>
<td>Non-compliance with regulatory requirements</td>
<td>Responsible decision-making</td>
</tr>
<tr>
<td>Very unlikely - 1:100</td>
<td>very high risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely unlikely - 1:10000</td>
<td>very low risk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% reduction of non-human species populations or habitat, or reduction in a desirable attribute, resource or service
Outcomes

Key risks

- 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
- SGD would deliver jobs → not very many (< 1 000) for unskilled local people
- 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
Overarching findings

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

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

• Avoidance is best
  o Most risk can be mitigated, even at production scale, if basic avoidance best practice principles are maintained
Outputs to support responsible decision-making

Spatial sensitivity and risk modelling

Limits of acceptable change

Minimum Information Requirements

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
Conclusions

Learning and looking ahead

- Scientific Assessment based on principles of saliency, legitimacy, credibility → effective for complex issues
- Produced evidence-based outputs to guide responsible decision-making on industrial development
- Strengthened CSIR capability in facilitating large, complex assessments that are of national interest
- Learning is being applied in other strategic and industrial development initiatives in support of the National Development Plan, such as:
  - Aquaculture development
  - Gas pipeline corridors
Thank you

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

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