Principles, Criteria & Indicators framework for sustainable subsurface development

By DIAMONDS

Dynamic Integrated Assessment Methods fOr sustaiNable Development of the Subsurface

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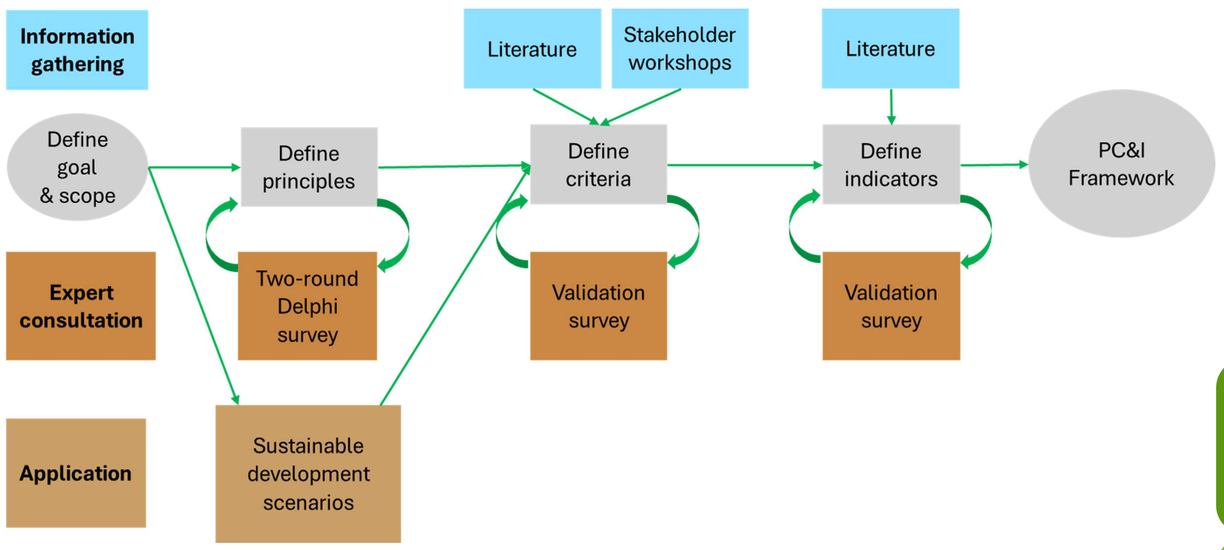
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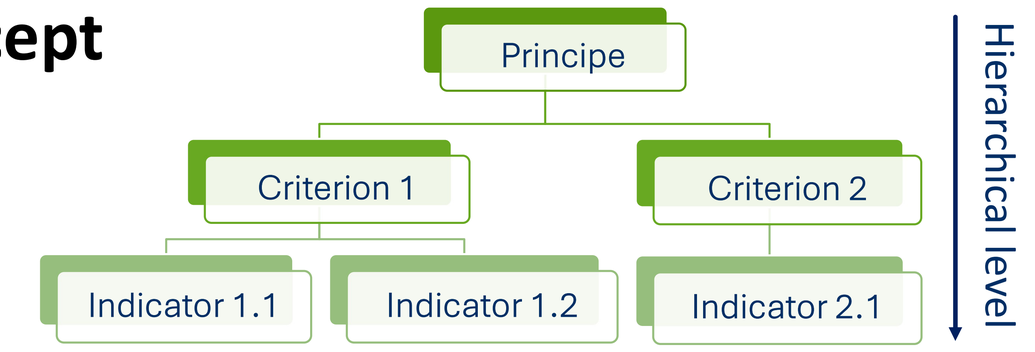
Setting: Decision makers are increasingly looking at applications in the **subsurface** to accomplish the urgent energy and climate transition. This causes a true **sustainable development and management challenge**, especially given the many **uncertainties** in this relatively unknown medium. The research is done in a **multidisciplinary team** with experts from (hydro)geology, economy, engineering and sociology to cover all aspects of sustainability following the **triple bottom line** in the context of **ecological economics**.

Overall objective: To develop an **integrated scientifically underpinned decision framework to evaluate the sustainability of long-term and multifunctional subsurface use and interfering subsurface activities while accounting for a plurality of values**. The Campine Basin (Belgium) forms a test case, but the resulting framework will serve as a blueprint for basins worldwide.

Method



Concept



Definitions

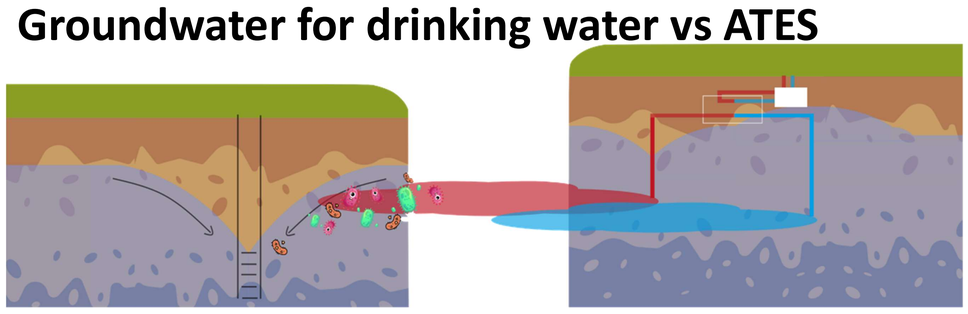
Principle: Universal value that determines sustainability

Criterion: Measurable condition for the level of applicability of the principle; qualitative or quantitative

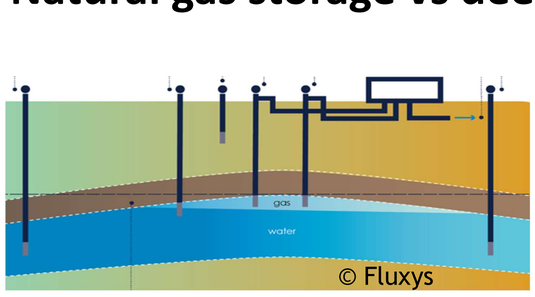
Indicator: Observable expression that describes the characteristics of the real situation using one or more variables to compare to a reference value/benchmark; **qualitative or quantitative**

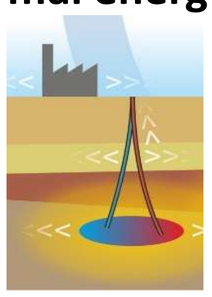
Sustainable development scenarios

① **Groundwater for drinking water vs ATES**

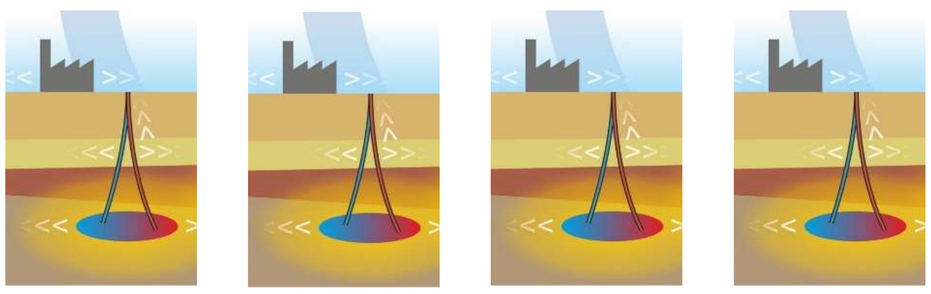


② **Natural gas storage vs deep geothermal energy**





③ **Multiple deep geothermal energy doublet systems**



Principles

1. Principle of conserving resources and assimilative capacity
2. Principle of efficient allocation
3. Principle of fair (or just) distribution
4. Principle of transparency
5. Principle of inclusive governance
6. Principle of responsible risk management

University of Antwerp | ENVECON | Environmental Economics Research Group Engineering Management

University of Antwerp | CRESC | Centre for Research on Environmental and Social change

University of Antwerp | EMIB | Energy and Materials in Infrastructure and Buildings

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