



Energy Turnaround
National Research Programme NRP 70



WP 3: HP Sustainability

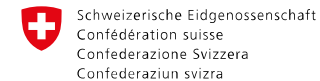
Integrated Assessment:

Hydropower in Regional Context

Werner Hediger



In cooperation with the CTI



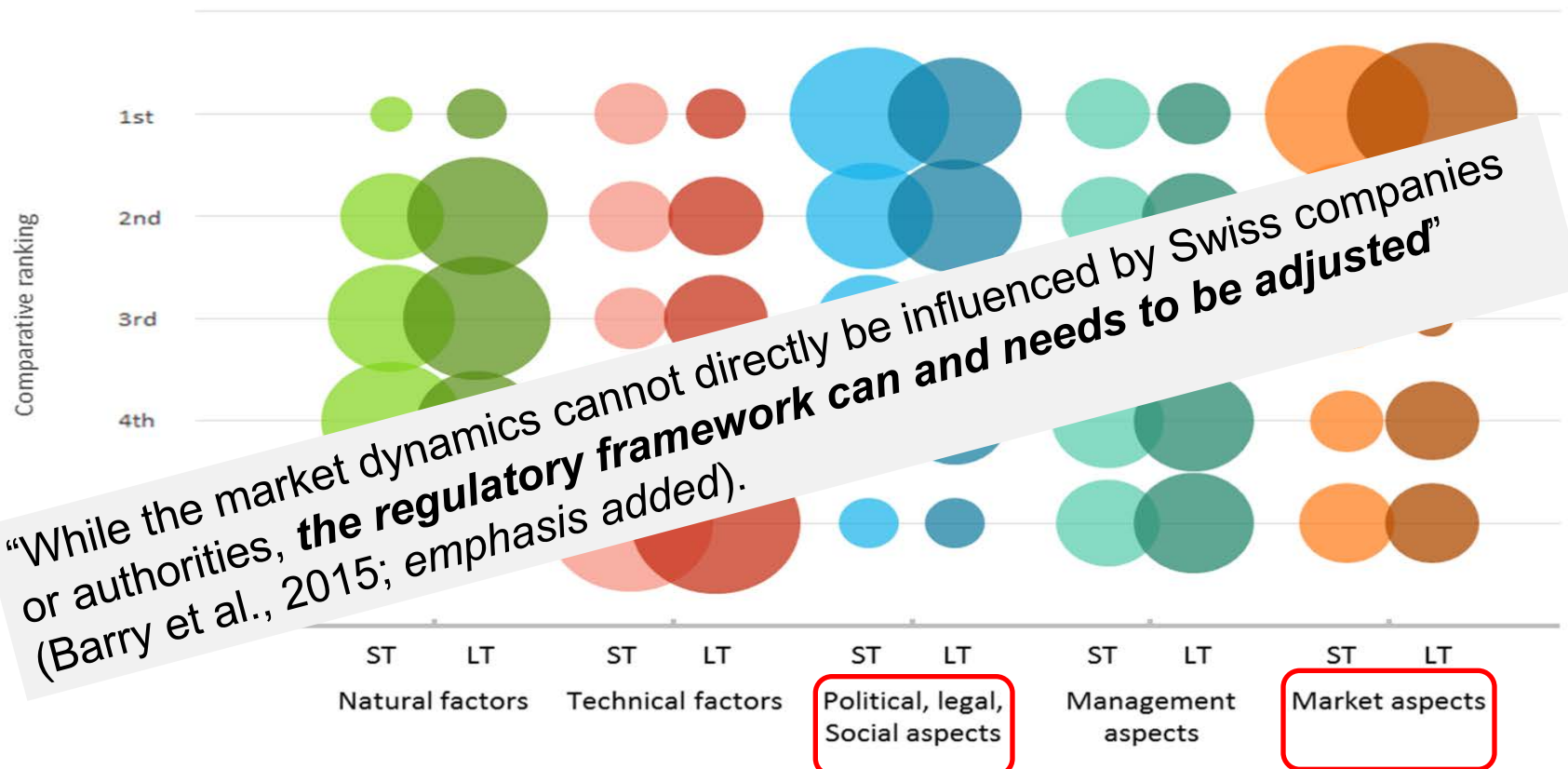
Swiss Confederation

Commission for Technology and Innovation CTI

Key Learnings/Messages (1)

1st Stakeholder Workshop Results: Main Drivers for Hydropower

Comparative ranking of drivers on the future development of Swiss HP - short (ST) and long term (LT) perspective



Key Learnings/Messages (2)

- | | |
|---|--|
| <p>a) The future of Swiss hydropower (HP) is a major challenge for sustainable development (SD) in many regions (esp. in the Alps).</p> <p>b) Market dynamics cannot directly be influenced by Swiss companies or authorities, but the regulatory framework can and needs to be adjusted.</p> <p>c) SD is also a societal search, learning and communication process that often results in regulations and legal norms, such as the revised Energy Act.</p> | <ul style="list-style-type: none"> the interplay of market, natural and socio-economic aspects water concessions and water fees are a major regulatory issues <div style="background-color: yellow; padding: 10px; margin: 10px;"> <p>to be taken into account when assessing the future of HP</p> <p>➤ sustainability assessment in regional context</p> </div> <ul style="list-style-type: none"> environmental conservation vs land/HP development when investments appear non profitable |
|---|--|

o corporate and public governance

Methodology

Sustainability Assessment:

- an evaluation and optimization approach (tool, instrument)
- aims at strengthening the integration and achievement of SD in policy, project planning and decision making
- integration of scientific (systemic, “technical”) and stakeholder („community“) perspectives

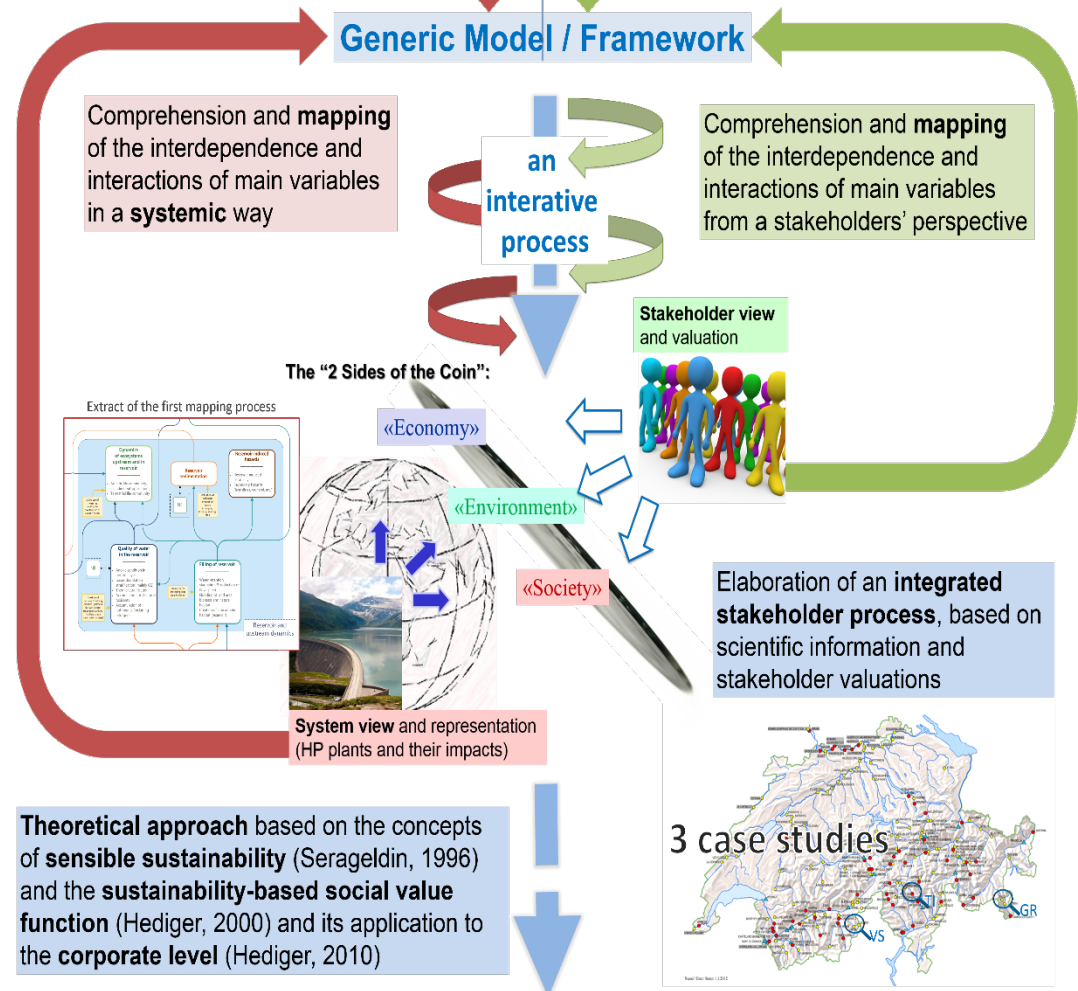
Sustainability Assessment

Generic approach, based on scientific literature review, allows the a first mapping main interdependences and interactions between hydropower and its surroundings..

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Stakeholder Dialogue

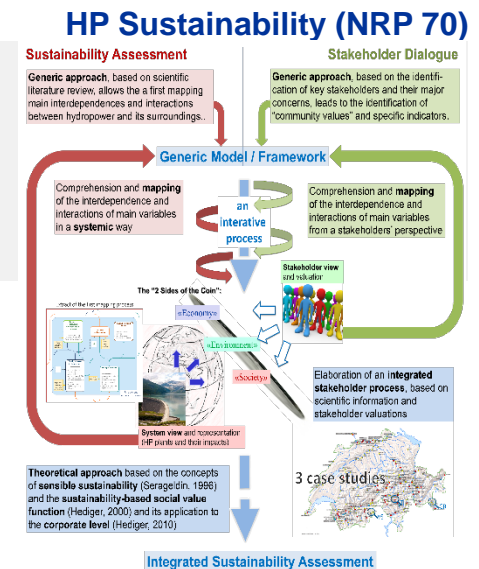
Generic approach, based on the identification of key stakeholders and their major concerns, leads to the identification of “community values” and specific indicators.



Methodology & Key Learnings: Sustainability Assessment

Learnings from/for the Generic Approach:

1. Systems of sustainability criteria and indicators:
 - Critique from an epistemological point of view
 - Incomplete for HP evaluation
2. Review of research design / procedure
 - Revised set of sustainability criteria
 - The “mapping” approach (→ *next slide*)
3. Integration with stakeholder process
 - The eminent **role of stakeholders** in HP planning (→ *separate slide*)
 - Retrospective learning in an ongoing process with stakeholders
4. Sustainability assessment vs. cost-benefit analysis (NPV maximization)
 - Trade-off profitability / return on investment vs. “community values”?
 - Beyond “green washing” and constraint profit maximization
 - **Corporate social responsibility**: integrating corporate & societal concerns



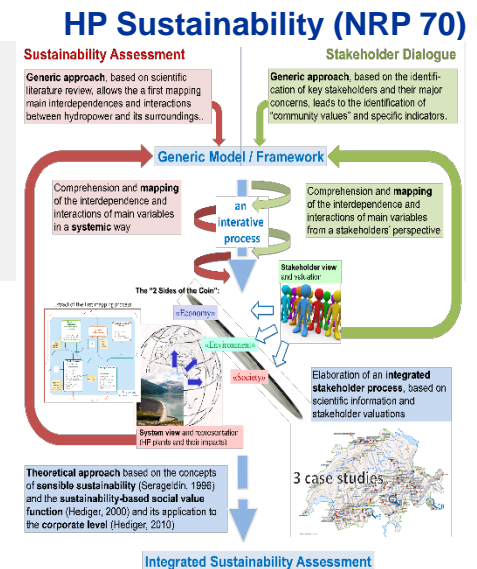
Sustainability Assessment: The “Mapping” Approach

Main purpose and background of the approach

- No common framework or list of criteria for the application of SA.
- Representation of the results of gathering various criteria and indicators from the literature in a system map.
- Generate a valuable tool and backbone for the stakeholder dialogue (conflicts of interest, areas of consensus).

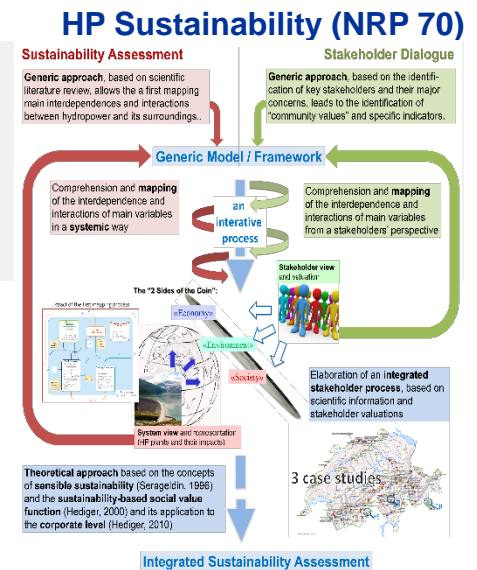
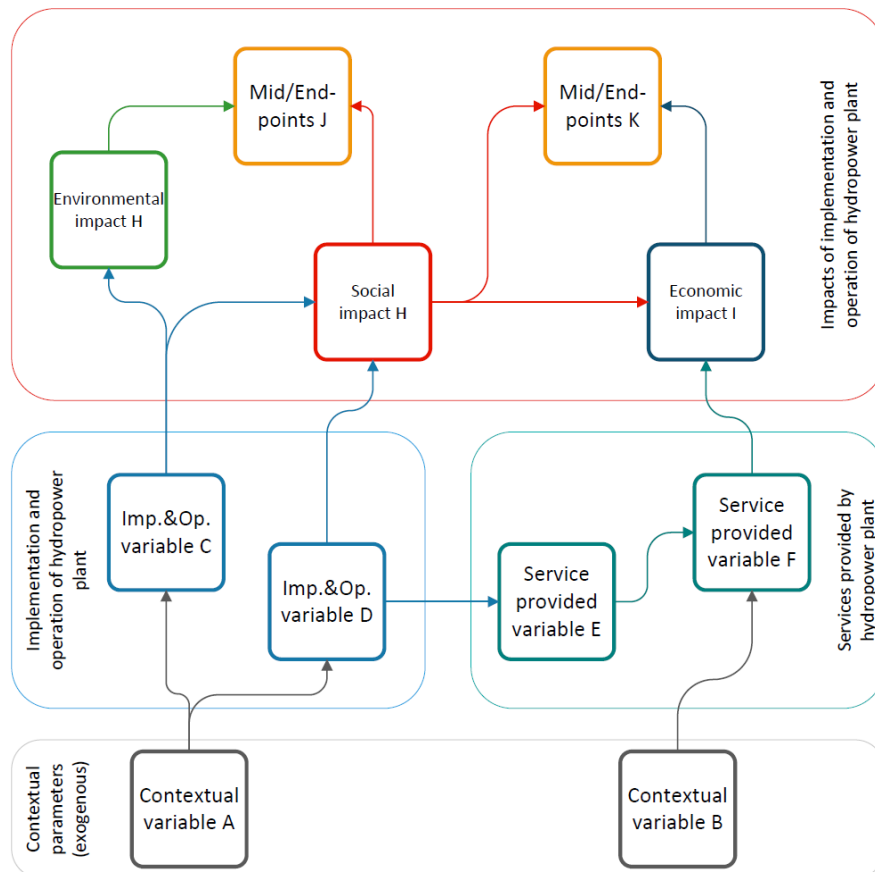
Main challenges of the mapping process

- Find a balance between a *comprehensive picture* and make it *understandable*, so that it can be used as *working material* in stakeholder dialogues.
What level of detail is needed / appropriate?
- Large diversity of approaches and relatively similar indicators/criteria that need to be merge into one single map.

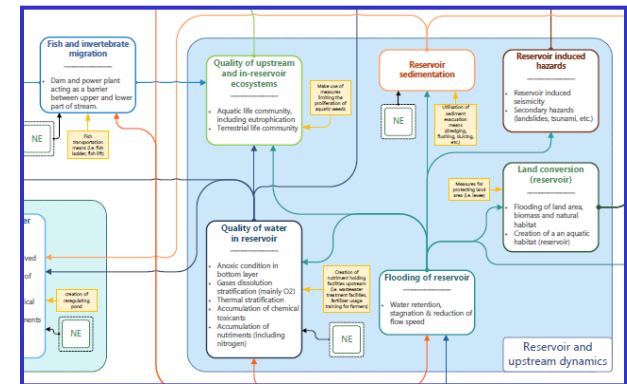


Sustainability Assessment: The “Mapping” Approach

Schematic system mapping:



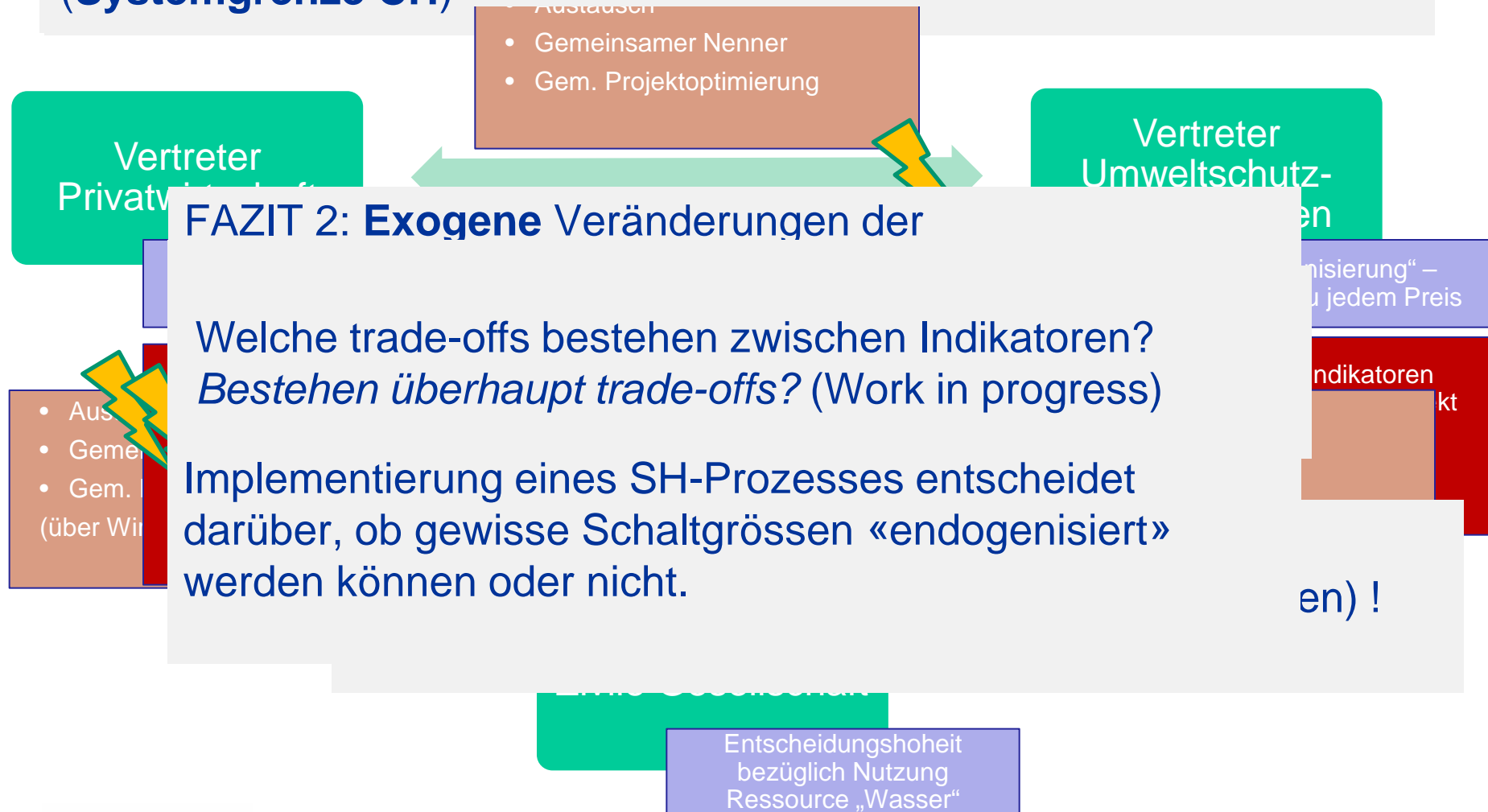
Extract from the mapping process



Learnings:

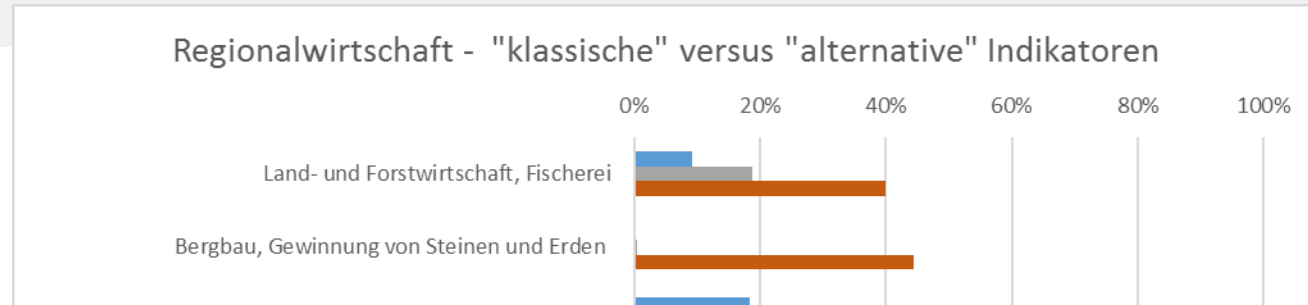
Stakeholder Processes

Entwicklungen beeinflussen die Indikatorenwerte, bzw. Schwellenwerte
(Systemgrenze CH)

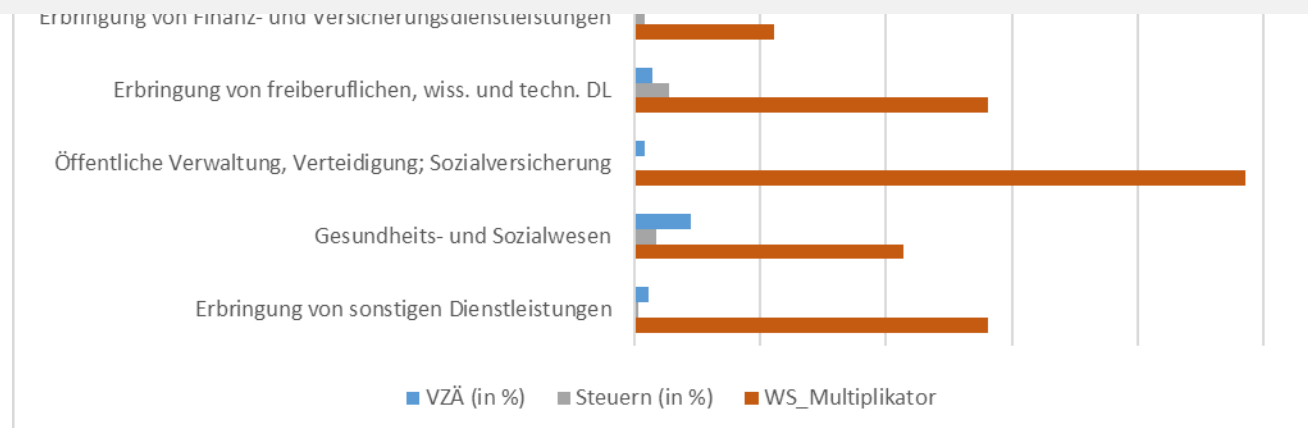


Learnings:

Detail zur NHB (SA): Indikatoren Regionalwirtschaft (Valposchiavo)



FAZIT 4: : Eine NHB ist sehr anspruchsvoll: Bei Betrachtung eines Indikatorwertes gilt es immer das partielle Bild des betreffenden Bereichs und darüber hinaus auch **das generelle Bild der gesamten Nachhaltigkeitsbeurteilung** im Blickfeld zu behalten.



Governance Issues (water fees & concessions)

The renewal of **water concessions** is an opportunity to adapt the system to the new market context. Especially the **water fee system** needs to account for the volatile market conditions and become more flexible.

These changes will **require a comprehensive stakeholder process to account for the different interests.**

Key issues involve:

- Concessions (water rights):
 - NPV (rent assessment)
 - SA (“community values”)
 - Granting process
- Water fees and taxes
- Corporate social responsibility (CSR) / corporate governance:
 - Investors/shareholder relations
 - Private-public partnership (role of the state: cantons and confederation)
 - Municipalities and public finance

Discussion

- How can investors for HP projects be attracted, given the
 - the current and expected market situation, and
 - the social, political and legal circumstances?

- How can we handle the trade-offs/synergies between corporate and societal concerns?
 - profitability & return on investment <-> externalities & distributional effects (corporate social responsibility, CSR)
 - social acceptance
 - governance issues

APPENDIX

Research Design

The stages of SA:

1. Mapping
2. Sustainability criteria and indicators
3. Comparative value analysis
4. Regional impact analysis
5. Utility analysis
6. Evaluation of tradeoffs (utility weights)
7. First synthesis & feedback with stakeholders
8. Translation of regional assessment results to corporate level ("CSR")
9. Synthesis of outcomes

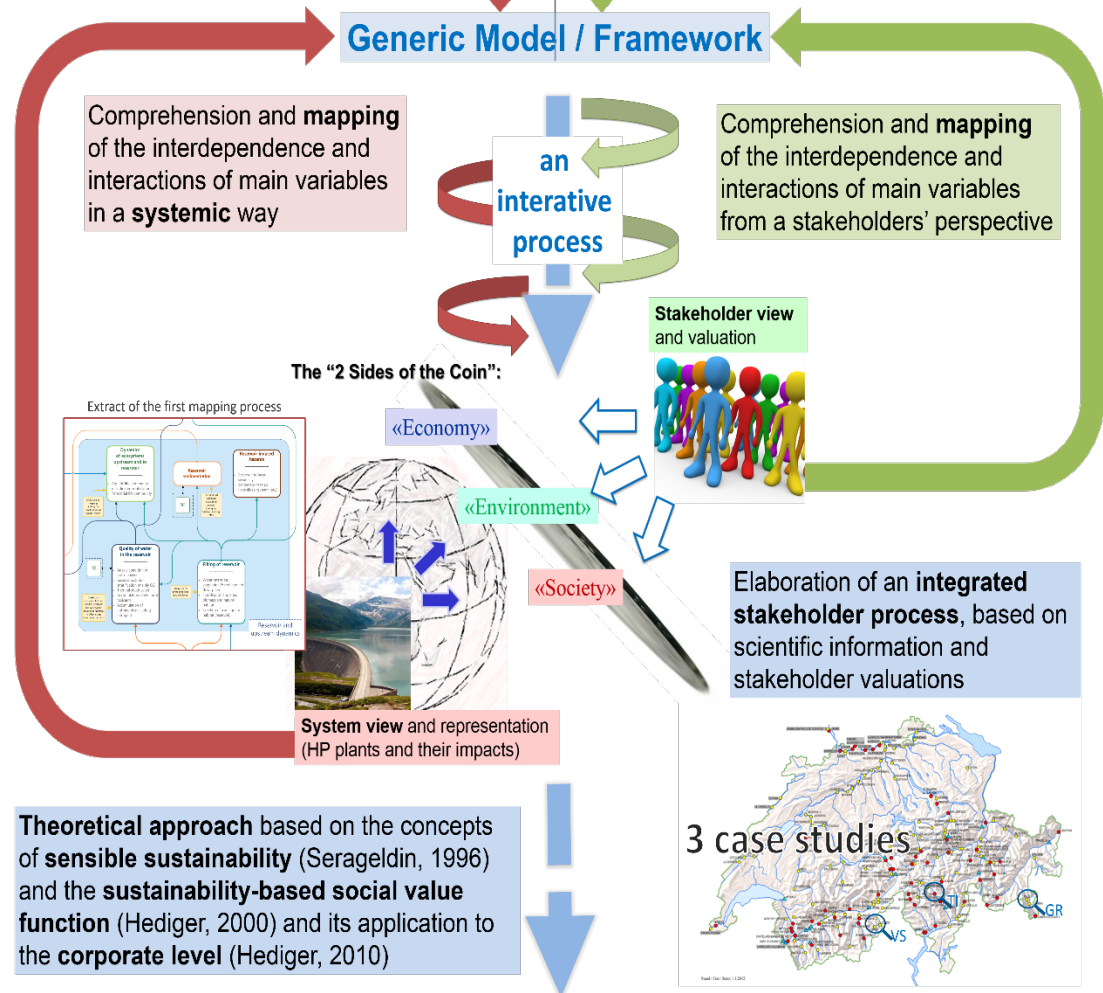
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CSR of hydropower companies

The case of Swiss mountain areas

- A socially responsible firm ...
maximizes its corporate value and at the same time maximizing the firm's contribution to other stakeholder's well-being (→ Pareto improvement).
- **Company / HP plant's total contribution to society:**

Resource rent	Change of reputation capital	total profit prospect (corporate income)
	Dividend to shareholders	
	Re-investment of revenues	
	Water fee payments	Contributions to public finance
	Tax payments	
	Wages	external evaluation of the firm's contribution to society (defined from a SD perspective), based on societal evaluation (SA, translated into monetary equivalents)
	Contributions to macroeconomic performance ... social capital ... environmental quality	

CSR of hydropower companies

The case of Swiss mountain areas

- Resource rent: $\pi_{jt} = \pi_{jt}(\mathbf{x}_{jt}, \mathbf{k}_{jt}, R_{jt}) = y_{jt} + q_t I_{jt} + \Omega_{jt} + T_{jt} = \mathbf{p}_t \mathbf{x}_{jt} - \mathbf{c}(\mathbf{x}_{jt})$

- Company / HP plant j's contribution to society:**

$$\Gamma_{jt} = \left[\sum_{l=0}^4 y_{ljt} + \varphi_{jt} \dot{k}_{jt} + \mu_{jt} \dot{R}_{jt} \right] + \left\{ \sum_{l=1}^3 \Omega_{ljt} + \sum_{l=1}^5 T_{ljt} \right\} + \sum_{l=1}^6 \left[\omega_{ljt} + \beta_M dM_{ljt} + \beta_S dS_{ljt} + \beta_Q dQ_{ljt} \right]$$

total profit prospect (corporate income) H_{jt} at time t

Water fee and tax payments to the public (municipal, cantonal, ...)

external evaluation of the firm's contribution to society (at time t), defined from a SD perspective

Consider the societal evaluation of macroeconomic, social and environmental performance in monetary (income-related) terms: β_M , β_S and β_Q .