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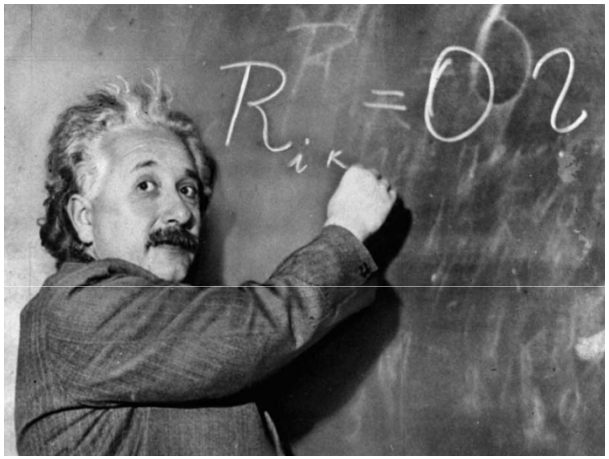


Tilling the fields of knowledge in sustainability-oriented science

Challenges of transdisciplinary knowledge integration against the backdrop of common scientific practice and prevailing scholarly skills of post graduate researchers

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Modes of knowledge production in transdisciplinary sustainability research

Science type:	traditional ideal of science	formative and evaluation research	problem and solution oriented research
Position of observant:	non-participating observant	participating observant	observing participant
Construction of reality:	independent from observant	varies according to understanding of science -	observable world is dependent on observant

Source: Jahn (2001)

Confrontation of characteristics

- In **disciplinary basic research**, problems are perceived through the perspective of a certain discipline.
- ➢ *"Problems" and their "solution"* refer to explanation and empirical registration of processes, which are structured by the conceptual instruments of that discipline.
- In the realm of **applied mission oriented research**, problems are structured by the perspective of relevant actors.
- ➢ *"Problems" and their "solution"* refer to the effective and efficient advancement of procedures of these (selected) actors, with recourse to situation-specific adjustments of knowledge from different disciplines.
- In contrast, the initial point of **transdisciplinary research** can be described as a certain problem, which – if it could – would be the 'client'. The question which actors and which disciplines should be included, cannot be answered before a thorough analysis of the problem. Of course, the problem does not speak for itself, but always can be related to the perspectives of certain actors and disciplines.
- ➢ From this point of view, *"problems" and their "solution"* are primarily related to the demand for the enhancement of problems for grounds of common welfare.

Core elements of knowledge production within research for sustainability

- **Problem orientation:** Translation of existing societal problems into ensembles of scientific problems.
- **Actor orientation:** consideration of actors‘ constellations and their possible ways of action // proactive design of problem horizons instead of repairing of damages
- **Problems of integration** form the focus of interest.
- **Self-reflexivity**: Making substantial normative premises and interests transparent // Reflexion of knowledge boundaries / limits.

➲ **transdisciplinary, participative model / understanding of science**

Source: Jahn (2001)

Everyday Knowledge	Science Knowledge
is used for orientation in the world	is used to understand and explain the world
knowledge is not derived systematically or test-based	is systematically derived and verified through research and experimentation
immediacy of everyday practice	systematic distance to every day practice
avoidance of doubt	systematization of doubt
assurance of what is known	doubt in the known
avoidance of alternatives	detection and search for alternatives
experience-near language	language distant from experience
findings repealed in the subjective and/or collective consciousness and especially communicated verbally	findings predominantly communicated in writing

Source: *Adomßent (2013: 19), adapted from Hierdeis/Hug (1997); Matthiesen (2005); Stehr (2006)*

Quality criteria in science

Necessary, …

- **Objectivity**: the extent to which a test result cannot be influenced by the principal investigator with regard to implementation, evaluation and interpretation; or if several/many researchers are producing matching results.

- **Reliability:** an investigation / a measurement method is described as reliable if a repetition of the measurement under the same conditions and at the same objects comes to the same conclusion.

- **Validity**: quality criterion that indicates the degree of accuracy with which a test records what it's supposed to record (e.g., personality traits or behaviors).

…but no longer sufficient conditions in order to guarantee validity of knowledge.

- **Accountability of research**: more than ever science has to take its own implications and limitations more into account.
- **Responsibilisation** of researches: social control through (self-) control and (self-) ascription of responsibility

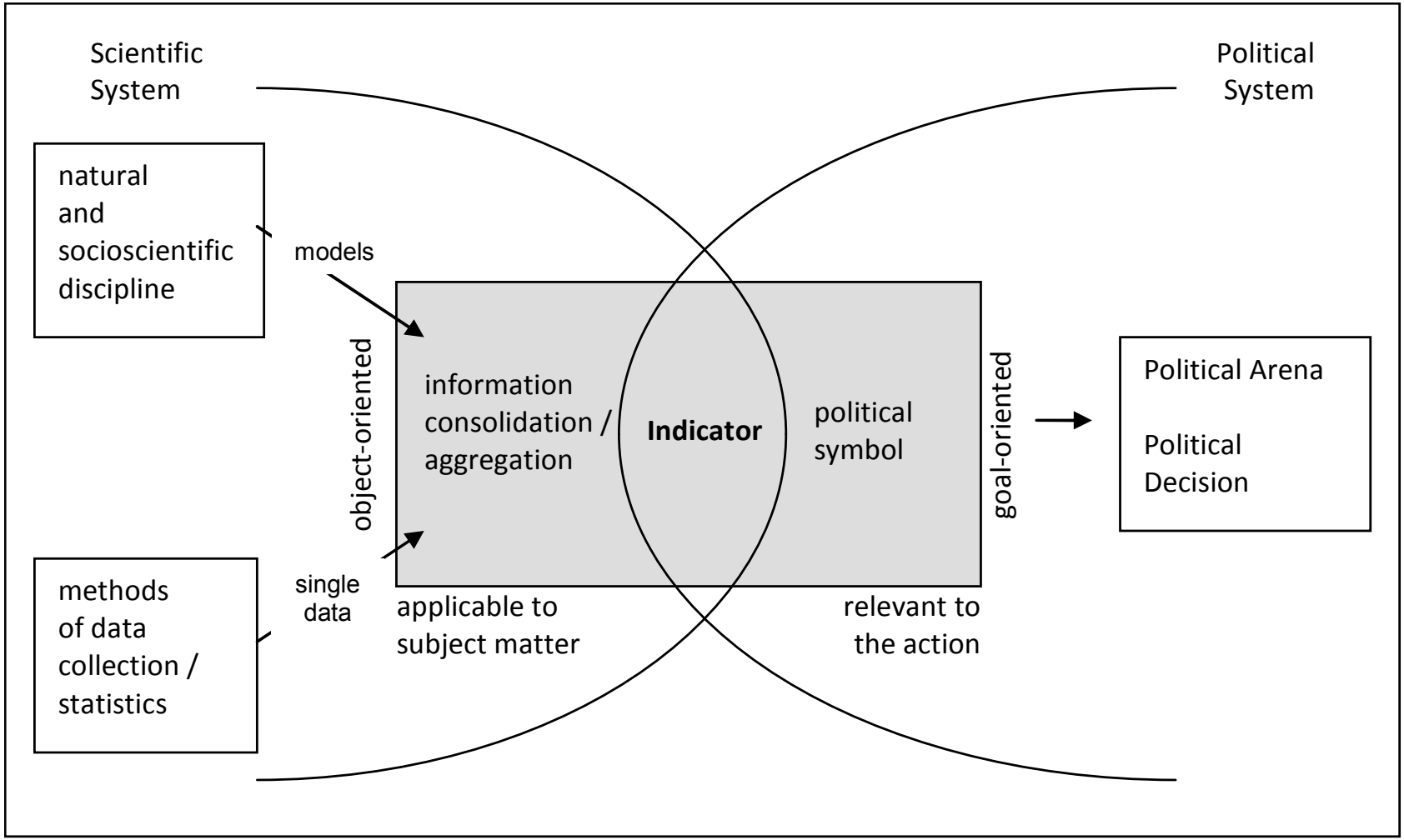
cf. Power (1997) and Jasanoff (2006)

Example: Co-producing a set of indicators on ESD …

- … that is potentially **suitable** for national educational reporting
  - Federal Report on ESD (since 2002, up to now not indicator-based)
- … set of ESD indicator that is **acceptable**
  - indicator set aims to be *manageable* and *meaningful*, *relevant*, *functional* as well as *applicable*
  - Acceptance and credibility as prerequisites for implementation
- …deepened understanding of **knowledge transfer** that is related to processes of development and application of indicators
  - What expectations do different groups of actors have with regard to development and application of indicators?
  - What resonance do indicators bring about in different groups of actors?
  - How is indicator-based information interpreted?

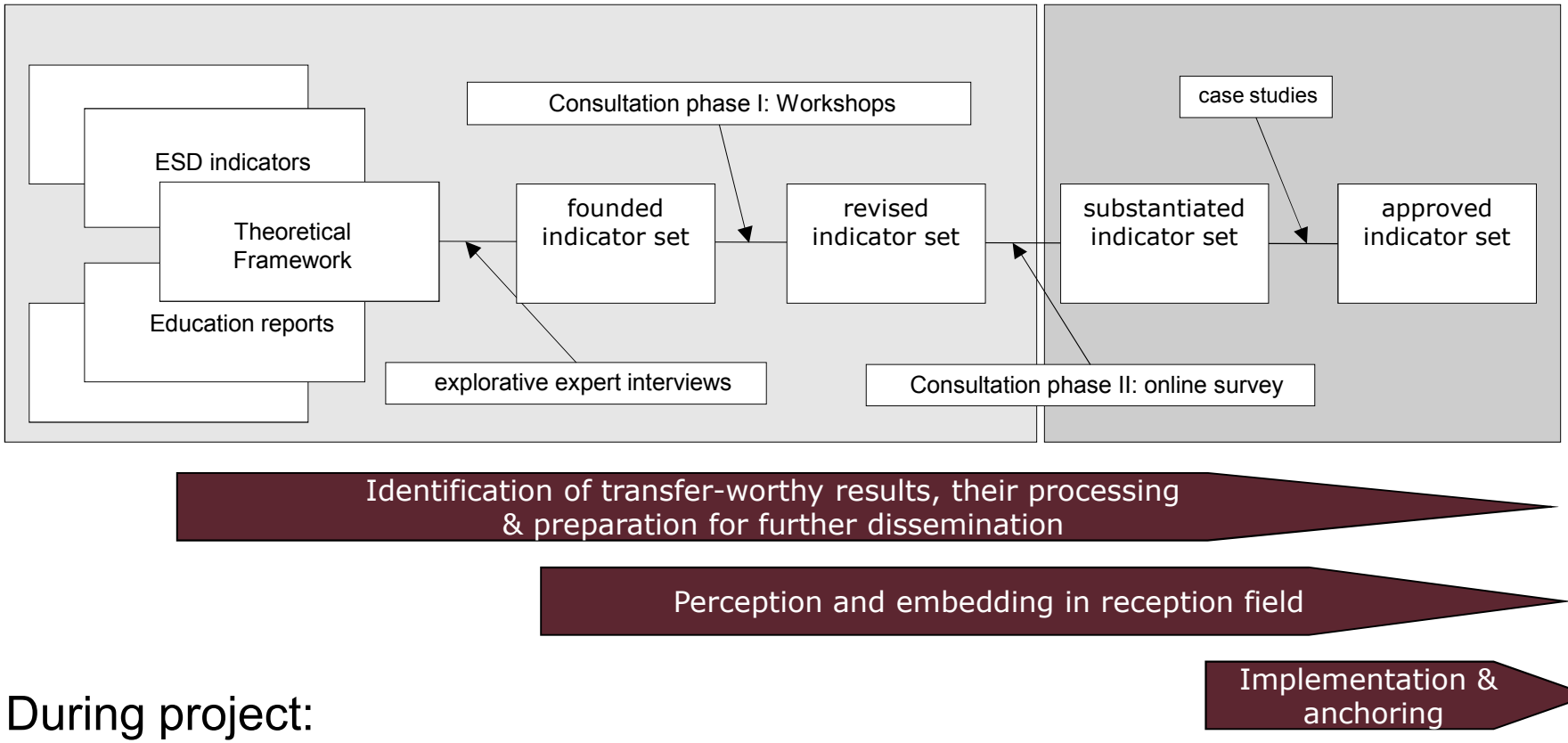
Source: Di Gulio et al. (2012)

(Sustainability) indicators: boundary objects between science and politics



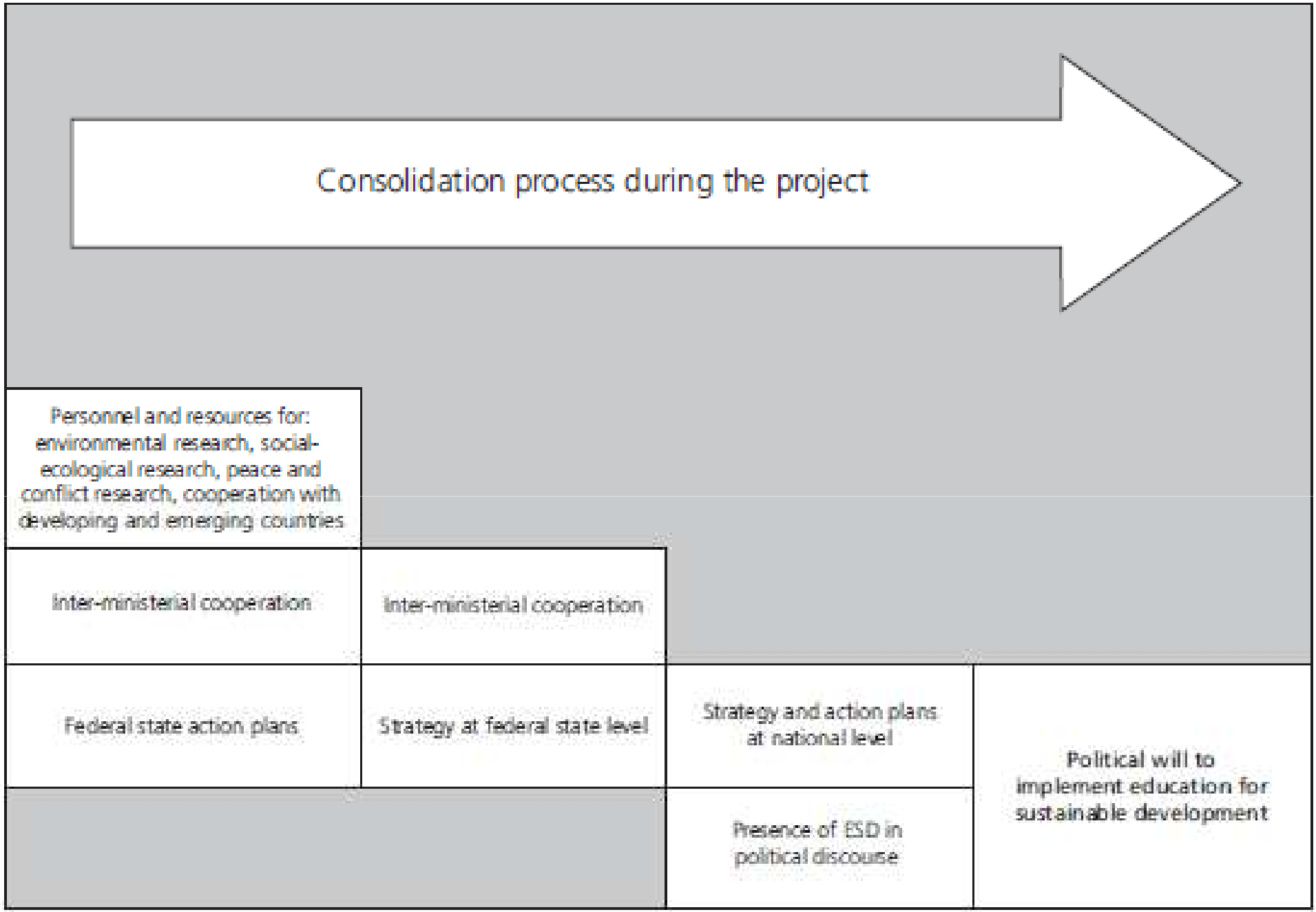
Adomßent (2013: 19), adapted from Zieschank (2003)

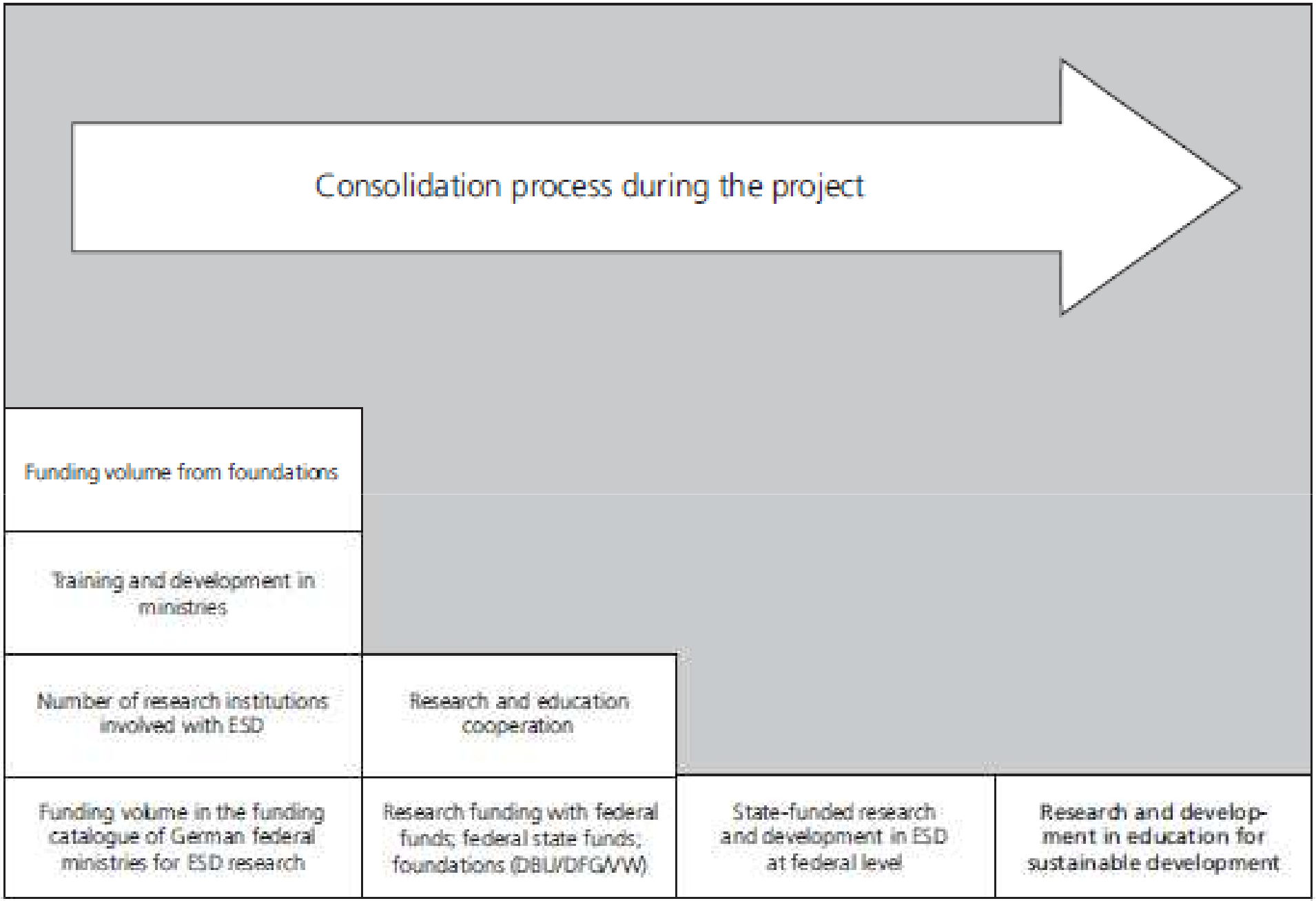
Project schedule



During project:

➲ overlap of subject matters and concerns in different phases of transfer


Consolidation process during the project
Personnel and resources for: environmental research, social-ecological research, peace and conflict research, cooperation with developing and emerging countries
Inter-ministerial cooperation
Inter-ministerial cooperation
Federal state action plans
Strategy at federal state level
Strategy and action plans at national level
Presence of ESD in political discourse
Political will to implement education for sustainable development


Consolidation process during the project
Funding volume from foundations
Training and development in ministries
Number of research institutions involved with ESD
Research and education cooperation
Funding volume in the funding catalogue of German federal ministries for ESD research
Research funding with federal funds, federal state funds, foundations (DBU/DFG/VW)
State-funded research and development in ESD at federal level
Research and development in education for sustainable development

Research levels …

- On the **analytical level**, interrelated fields of problems are reconstructed, their embeddedness in society and nature is analysed, and influencing factors and development dynamics are examined and the impacts of different options for action are estimated.
- On the **normative level**, the point is to clarify the goals of sustainable development, to reconstruct the societal sustainability discourse and to contribute to its advancement.
- On the **operational level**, research for sustainability deals with the examination of practical terms and conditions for operational activities, the elaboration of strategies for sustainable development according to the analysed conditions and their societal implementation.

cf. Nölting et al. (2004)

… and related knowledge dimensions

The challenges arising from the need for fundamental societal transformations do not only concern knowledge; they also involve value conflicts.

- To solve such problems ***system knowledge*** of the processes which led to the problem and which could negatively affect future developments is necessary.
- At the same time, ***target and orientation knowledge*** is required which allows actors to decide which goals and purposes can be justified.
- Finally, ***shaping or transformation knowledge*** is needed in order to be able to change framework conditions in a way that leads to the goals desired.

cf. NN (2012)

Questions for (self-)evaluation (1)

Handling the demands of normativity

- Which values and objectives do the actors in the analysed field of action have? How are they analysed empirically?
- How does the project relate to sustainable development? To which goals and normative orientations is it connected?
- Which role does the project take within the societal discourse on the concept of sustainable development?

cf. Nölting et al. (2004)

Questions for (self-)evaluation (2)

Handling the demands of integration

- Which interrelations that are suppressed by disciplinary science does the project focus on? Which conceptions does it use?
- Which assets and forms of knowledge (like theories, analyses, experiences) does the project integrate? With which concepts?
- What social differences are bridged within the research process? By what methods?
- How are the subtasks coordinated and the results brought together? How does the project find a balance between focusing single aspects and keeping an eye on the project as a whole?

cf. Nölting et al. (2004)

Questions for (self-)evaluation (3)

Handling the demands of participation

- What functions do the actors of practice have for the research process? Which role do they play within the project?
- By which criteria are actors of practice selected? By which means are they integrated into the project procedures?
- How are the actors‘ perspectives included into the project results? Can they be linked to their daily routines?
- Which interrelationships of interests of power can be bound in the field of practice and how does the project deal with them?

cf. Nölting et al. (2004)

Characteristics of a Community-of-Interest in contrast with those of a Community-of-Practice (after Fischer & Ostwald, 2005)

Characteristic	Community-of-Practice	Community-of-Interest
Nature of problems	Different tasks in the same domain	Common task across multiple domains
Members	From the same domain (novices and experts)	From different domains (stakeholders)
Knowledge development	Exchange of knowledge within the practice; refinement of domainspecific knowledge system	Exchange of knowledge between domains; integration of multiple knowledge systems
Learning	Growing from novice to expert	Reaching shared understanding
Major objective	Growth in domain-specific knowledge	Resolving a complex problem
Threat	group think	No real communication
Opportunity	Fast progress due to shared background	Creative and robust solutions by making all voices heard

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Sustainability science will need to do the following:

1. span the range of spatial scales between such diverse phenomena as economic globalization and local farming practices,
2. account for both the temporal inertia and urgency of processes like ozone depletion,
3. deal with functional complexity such as is evident in recent analyses of environmental degradation resulting from multiple stresses; and
4. recognize the wide range of outlooks regarding what makes knowledge usable within both science and society." *(Kates et al. 2001)*