Criteria for case studies:
Lead market factors, variables and indicators

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Explanation:
For making the case studies meaningful and comparable, some (qualitative) criteria (italics) are described here which should be discussed explicitly in each case study, and some (quantitative) indicators (normal letters) which should be used in each case study.
Each case study should at least compare one EU country with one BRICS country.

Ingredients:
1. Technology
   - *Process- or product innovation*
   - *Radical/incremental innovation; new, cutting edge technology*
   - *Innovation phase (Invention, market introduction, diffusion)*
   - *Adaptation of existing technology for emerging market context (low-tech version)*
   - *Less costly version of existing technology*
   - *Innovation dynamics of technology (e.g. patent dynamics)*
   - *role of tacit knowledge*

2. Lead Market
   - Diffusion curves

3. Lead Supplier and technological capability
   - 10 largest suppliers (firm, location)
   - Patent applications and indicators such as patent shares and intensity
   - *link of suppliers (firms) to research system*
   - *actor analysis: who are the drivers? Is a player able to fulfill the role of a system leader organizing the value chain?*
   - To be provided by ISI if available:
     - Specialisation a typical indicator for technological capability, measured with innovation indicator (e.g. RPA);
     - Specialisation in the respective sustainability technology
     - Importance of topic in research organizations (perhaps citation analysis and indicators such as RLA?)

4. Operationalise 6 Lead Market Factors

   Price advantage
   (consider innovation phase)
   - Market Growth
   - Cost advantage
   - Economies of scope
   - Economies of scale
   - Learning by Doing, Experience Curve
   - Leapfrogging

   Demand advantage
   - *Demand trend for respective innovation compared to other countries*
   - *Do lead users exist?*

Export advantage
- Total trade volume
- Export/Import ratio
- *Openness of country*

Transfer advantage
- Private and public R&D for respective innovation
- International reputation of industrial clusters for respective technology (can be measured with indicator, e.g. RCA)
- *ranking of this clusters/networks*
- *International attention*

Market structure advantage
- *Market power (price-cost-relation)*
- *Contestability (market entry cost)*
- *regulatory response in case of monopolistic bottlenecks (perhaps under regulation advantage)*
- *path dependency and lock-in of traditional technology*
- *Firm formation (new firms to number of existing firms)*

Regulation advantage*:*

Strategy
- *Can a strategy for promoting the technology be identified (explicit / implicit)?*
- *What institutions for developing strategies and strategic knowledge exist?*
- *What elements does the strategy include (environmental policy, innovation policy, industrial policy)?*
    - o *What goals and measures (Market Pull / Technology Push; Regulatory Push) does it include?*
    - o *What actors does it address?*

    - o *Environmental policy*
    Goals: credible, ambitious, realistic?
    Measures (types + stringency (relative to other jurisdictions)
    Functions
    Actors

    - o *Innovation policy*
    Goals
    Measures
    Actors

    - o *Industrial policy*
    Goals
    Measures (for example, trade policy / protectionist measures, indigenous technology requirements, policies promoting domestic technology standards, etc.)
    Actors

Policy Coordination:
    - *Which measures exist in related policy fields? What mechanisms exist for policy coordination?*

Stakeholder engagement:
- *What elements of network governance / cluster policy are used?*
- *What private-public interfaces exist for developing and implementing policy? How does the private sector influence policy in the sector? What role does civil society play?*

Monitoring and review
- *How has the policy mix evolved over time (e.g. stringency of regulations, phasing out of subsidies)?*
- *What mechanisms for monitoring and review of the policy mix exist (i.e. mechanisms to assess performance and adapt policies)?*
- *Does an exit strategy exist?*

Glossary

Cost advantage:
It describes a concept to measure the competitiveness in markets. There are two specific cost advantages:
- Absolute cost advantage: It describes that countries should specialize in the products which they can produce most advantageous than other countries.
- Comperative cost advantage: It describes the same as the absolute cost advantage with the difference that the countryshould specialize in the products which they can produce most advantageous without a comparison with other countries.

Economies of scope:
It describes the same effect as "economics of scale" with the difference that the target of lower average costs should be achieved with the producing of further products. The lower average costs result from synergies between the products, e.g. a common production line. It can be used the same calculation as in "economics of scale".

Economies of scale:
It describes the cost advantages that a business obtains due to expansion. Increasing returns of scale lead to lower average costs. It can be shown as follows:

$$f(a \cdot x_1, a \cdot x_2, \ldots) > a \cdot f(x_1, x_2, \ldots)$$

f = production function
a = increasing factor

Leapfrogging:
The concept is used to describe the acceleration of development of products/techniques by skipping development steps. It can be used the experience from other less efficient, similar products/techniques.

Learning by Doing, Experience Curve:
- Learning curve: It describes the learning success about the time. The effect is that the more times a task has been produced, the less times will be required for further production.
- experience curve: It describes that the costs per good decrease if the cumulative production volume increase.

  It can be calculated as follows:

$$K_L(p) = K_0 \cdot L^{ld(\frac{p}{P0})}$$

K = production costs
P = production volume
L = learning rate

Market Growth:
It's the percentage arise of the sales/turnover/market volume in a specific market.
It calculates as follows:

$$\text{Market Growth} = \frac{\text{additional sales-, turnover-, market - volume}}{\text{sales-, turnover-, market - volume of the previous period}} * 100\%$$

RCA;
The revealed comparative advantage is an index used in international economics for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. It is based on the Ricardian comparative advantage concept. It is commonly expressed as

$RCA_{ij} = 100 * \tanh \ln [(x_{ij} / m_{ij}) / (\sum_j x_{ij} / \sum m_{ij})]$ where:

x Exports

m Imports

i Country index

j Technology field

The scale of the RCA index encompasses ± 100 with the neutral value 0. Positive values indicate an above-average specialisation, negative values a below-average one, whereby the world average serves as a reference.

RLA:
The RLA is a specialisation index (Relative Literature Advantage). The corresponding equation is: $RLA_{ij} = 100 \tanh \ln [(Publ_{ij} / \Sigma_i Publ_{ij}) / (\Sigma_j Publ_{ij} / \Sigma_{ij} Publ_{ij})]$
Here i stands for the country and j for the field. The RLA index is so constructed that its scale of values encompasses ± 100 with the neutral value 0. Positive values indicate an above-average specialisation, negative values a below-average one, whereby the world average serves as a reference.

RPA:
Revealed patent advantage, it indicates in which domains of a country the patent share is represented strong or weak in comparison with the worldwide patent share.
Another opportunity for RPA is the comparison of the patent share of the country regarded in the sustainability technology with the patent shares of the country in all technologies.
It calculates as follows:
$RPA_{kj} = 100 * \tanh \ln [(P_{kj}/\Sigma_j P_{kj})/(\Sigma_k P_{kj}/\Sigma_{kj} P_{kj})]$
P_{kj}: share of the patent registration in country k and domain j.
The RPA assumes a positive value if there is an above average patent share for the sustainability domain.

References:
Beise-Zee, Marian und Thomas Cleff (2004), Assessing the Lead Market Potential of Countries for Innovation Projects, *Journal of International Management Vol. 10, No. 4*, 453-477.

Jänicke, M., K. Rennings; Ecosystem-Dynamics The Principle of Co-Evolution and Success Stories from Climate Policy. Working Paper No. 1 within the project: Lead Markets Funded under the BMBF Programme „WIN 2"

Quitzow, Rainer (2011): A governance framework for the promotion of lead markets for environmental innovation. Working Paper No. 2 within the project: Lead Markets Funded under the BMBF Programme „WIN 2"

Rainer Walz, Michael Krail, Jonathan Köhler, Frank Marscheider-Weidemann (2011), Towards Modelling Lead Markets in Environmental Technologies – indicators and model improvements, Working Paper No. 4 within the project: Lead Markets Funded under the BMBF Programme „WIN 2"

Rennings, K., T. Cleff (2011), First and second mover strategy options for pioneering countries on environmental markets - From national lead market to combined lead market and lead supplier strategies Working Paper No. 1 within the project: Lead Markets Funded under the BMBF Programme „WIN 2"

Rennings, Klaus und Wilko Smidt (2010), A Lead Market Approach Towards the Emergence and Diffusion of Coal-fired Power Plant Technology, *Politica Economia XXVII, n.2*, 301 - 327.