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Deliverable report

Deliverable n°	2.1.1
Deliverable name	Characterization of the relevant markets and actor groups
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1 Deliverable content and references

The research goals of D2.1.1 were addressed in two peer-reviewed papers which have been published in the Journal of Cleaner Production. The present document contains the bibliographic information and abstract for these two papers:

S. Hafner, M. Speich, P. Bischofberger, and S. Ulli-Beer, "Governing industry decarbonisation: Policy implications from a firm perspective," *J. Clean. Prod.*, p. 133884, Sep. 2022, doi: 10.1016/j.jclepro.2022.133884.

Industry is responsible for around 1/3 of annual global greenhouse gas emissions. To limit global warming, many nations, including Switzerland, have committed to a (near) net-zero emission industry target by 2050. While the policy relevance of an industry transition increases, specific knowledge on the key barriers and drivers towards industrial decarbonisation is still largely missing. With the objective to contribute to the decision basis for effective policy development and based on 17 semi-structured interviews with firms from the Swiss industry, we investigate the key factors that hinder or accelerate a timely adoption of decarbonisation technologies. We relate the identified barriers and drivers from our interviews to an adapted St. Gallen Management Model (SGMM), a well-known, system-oriented management framework. Our study shows that the SGMM categories technology & economy (e.g. high technology costs), state & policymakers (e.g. emission price) and finance & controlling (e.g. pay-back periods) are most frequently mentioned by the interviewees and that the firms' decarbonisation decisions are influenced by both the firm itself as well as external stakeholders, such as the government, consultants, customers, NGOs or suppliers. Therefore, we conclude that the firm itself and each of these stakeholders must play a key part in fostering industry decarbonisation. We suggest future research to (1) quantitatively assess the importance of the identified barriers and drivers and (2) investigate how policy actions of the relevant stakeholders could be effectively orchestrated and incentivised.

M. Speich and S. Ulli-Beer, "Applying an ecosystem lens to low-carbon energy transitions: A conceptual framework," *J. Clean. Prod.*, p. 136429, Feb. 2023, doi: 10.1016/j.jclepro.2023.136429.

Business model innovations aiming at systemic change influence the speed and direction of low-carbon transitions, thus supporting public decarbonization policies. However, their potential is often limited by institutional settings or a lack of alignment with potential partners. Therefore, to exploit the potential for systemic change of business model innovations in socio-technical systems, it is necessary to consider their interactions with their wider environment. In this conceptual study, we explore the mechanisms through which business activities interact with public policy goals under low-carbon energy transitions. We take an ecosystem lens to analyze value creation at the levels of customers, business, inter-organizational networks and the public. Based on an integrative literature review, we build a conceptual meta-model specifying the constitutive elements, dynamics and environmental dimensions describing regional energy ecosystems under transition. The main constitutive element of the ecosystem is the value network, i.e. the interlinked business models of collaborating organizations exchanging money, goods, services, information or intangible benefits. The value network interacts dynamically with a pool of resources (assets, capabilities and intangible resources) that improves the ecosystem's ability to enact systemic change. Orchestration is a crucial process to steer the ecosystem's development towards creating value for customers as well as for the public. Finally, the relevant environmental dimensions include policy, culture, markets, industry structure as well as potential future members or resources. We illustrate our conceptual model with the case of the development of low-carbon district heating to decarbonize space heating in a Swiss city. This illustrative case study shows that the ecosystem perspective combined with public value theory is well suited to describe the dynamics of a low-carbon energy transition and provides valuable insights on the prospects of novel business models.