ACCEZ-ability: Paving the way for societal transitions in South Holland

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Making Minds Matter

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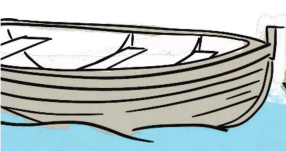
Reading Guide

This report is structured as follows. The executive summary discusses the main findings of our analysis and three recommendations for ACCEZ. In chapter 1 (1 page), we elaborate on these recommendations. Chapter 2 (2 pages) summarises the case study findings on the Coalition of the Willing, Duin en Bollenstreek and Waarde van Water name projects, structured along three categories of transition failure mechanisms. Chapter 3 (1 page) highlights the challenge of demonstrating the contribution of linking project-level dynamics to society-level transitions. Chapter 4 (3 pages) discuss the case study findings in more detail. Chapter 6 (4 pages) explains our theoretical and methodological approach. The appendix provides more details on our approach.

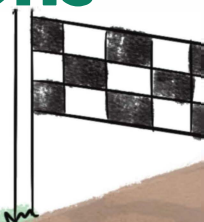
We recommend all readers who are responsible for stimulating societal transition in the province of South Holland to read the executive summary and, if time permits, chapters 1, 2 and 3. We recommend readers who aim for developing a deeper understanding of the contribution of project-level dynamics to society-level transitions to read chapter 4 as well. Readers with questions about our approach will find chapter 5 a relevant read and may want to consult the appendix as well.

Paving the way to societal transitions



Engagement with stakeholders opposed to change

Supporting institutions and rules



Integrated networks of interaction and collaboration

3

Sufficient funding opportunities

Enhanced learning and adaptability

Emerging demand articulation

2

Adequate knowledge and infrastructure

Appropriate policy coordination

Directional vision and goals

1

Appropriate knowledge and competencies

1. Serious gaming to explore a shared vision

The serious game "Bolwerken" is a powerful tool that enables participants to envision future scenarios, test interventions, and address collective challenges.
By engaging in this visual dialogue game, participants can collaboratively imagine the future of their sector and identify common ground, fostering a shared vision and more cohesive strategies for the water management industry.

2. Post Academic Training for circular economies

A course given at the Rotterdam School of Management (RSM) raises awareness among finance sector professionals about the unique requirements and concerns of farmers, entrepreneurs, and businesses striving to adopt more circular ways of functioning.
The transition towards a circular economy involves rethinking traditional business models, which presents several challenges, particularly in financing.

3. Network formation for enhanced collaboration

The evolution of a coalition from a small group into a broad collaboration, centered around shared objectives like energy, crop protection, and labor rights, highlights the transformative power of networking in achieving collective goals. This coalition has established itself as a safe space where members convene regularly, fostering a supportive environment for collaborative efforts.

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Executive Summary

Overcoming societal challenges requires transitions which are complex, multi-levelled processes that cause structural changes across different systems. These transitions involve significant shifts in behaviour, thinking, and structures, and are irreversible once completed.

Mechanisms of transition failure, such as lack of a shared vision, fragmented networks, and shortage of appropriate knowledge and skills, explain why societal transitions are slowed down or do not happen at all.

Interactions at a micro-level can help overcoming or preventing the occurrence of mechanisms of transition failure. Especially transdisciplinary collaborations, which are collaborations between researchers from various disciplines and societal actors from different sectors focusing on a societal issue are considered promising in this respect. When these interactions lead to the creation and adoption of new knowledge, ideas, and practices, they are deemed productive. Productive interactions facilitate the development of shared visions, result in networks, and enable the exchange of knowledge and skills, for instance.

This study aims to understand how productive interactions in three projects funded by ACCEZ (Coalition of the Willing, Duin & Bollenstreek, and Waarde van Water) contribute to driving societal transitions in the province of South Holland by overcoming and preventing transition failure mechanisms.

We found that ACCEZ addresses and mitigates various mechanisms of transition failures through its projects. ACCEZ primarily on overcoming and preventing structural challenges. More specifically, ACCEZ fosters cooperative interactions that enable safe spaces, mitigating issues related to fragmented networks of interaction. It also helps in facilitating discussions and cooperation among stakeholders which helps develop a shared directional vision. Additionally, ACCEZ raises awareness on new sustainable practices and invests in knowledge production, mitigating both inadequate knowledge infrastructures and limited reflexivity. However, these benefits seem to be limited to project participants. The analysis also indicated that ACCEZ's projects contributed less to overcoming transition failures related to market and behavioural challenges. Incomplete or outdated institutions and rules and the lack of supply funding ecosystems received limited attention.

If the ACCEZ steering board aims to strengthen ACCEZ' investments in driving societal transition in the province of South Holland, we recommend the following:

Recommendation 1: Continue network creation through transdisciplinary collaboration.

Recommendation 2: Address all ten transition mechanism failures in ACCEZ's project portfolio.

Recommendation 3: Invest in dissemination and implementation of results beyond funded projects.

Finally, our study demonstrates that a focus on mechanisms of transition failures as the linking pin between micro-level productive interactions and macro-level societal transition is a promising perspective for understanding the societal impact of transdisciplinary collaborations.

1 Recommendations for ACCEZ Steering Board

Through connecting partners, ACCEZ is committed to driving sustainable societal change by means of facilitating the translation of knowledge into action. To this end, it enables collaborative projects between science, government, industry, and civic society. Such collaborations are also known as transdisciplinary collaboration. The projects that ACCEZ funds aim for targeted interventions, focusing on creating structural change, behavioural and adaptive progress, and meeting market demands.

ACCEZ's work addresses societal challenges such as climate change by promoting sustainable urban development and enhancing resilience through green infrastructure projects. Additionally, it tackles sustainable agriculture by supporting innovative farming practices to improve resource efficiency and reduce negative impact on the environment.

ACCEZ takes its role in driving societal transitions seriously. It aims to map its impact on societal transitions on the one hand and further improve its future impact on the other. With these evaluative goals in mind, ACCEZ has teamed up with the strategic program Evaluating Societal Impact (ESI) of Erasmus University Rotterdam to analyse its contributions to societal transitions. The ESI program aims to develop and design comprehensive frameworks for evaluating, understanding, and enhancing societal impact.

The collaboration between ACCEZ and ESI resulted in the following recommendations for the ACCES steering board:

Recommendation 1: Continue network creation through transdisciplinary collaboration.

Our analysis shows that network formations play an important role and acts as a catalyst in facilitating transitions. Furthermore, networks enable the mitigation of other failure mechanisms such as the lack of a shared vision and shortages of appropriate knowledge, skills, and production factors. Therefore it is recommended that ACCEZ continues prioritizing investments in transdisciplinary programs and initiatives that foster network creation.

Recommendation 2: Address all ten transition mechanism failures in ACCEZ's project portfolio.

Our study demonstrates that ACCEZ addresses most mechanisms of transition failure. However, we found limited contributions to overcoming or preventing the transition failure mechanisms of "insufficient policy coordination", "incomplete or outdated institutions and rules", and "lack of supply funding ecosystem". As these failure mechanisms could stop or slow down transitions, it is recommended that ACCEZ invests in activities that address these transition failure mechanisms as well, or alternatively ensures that other stakeholders adequately address them.

Recommendation 3: Invest in dissemination and implementation of results beyond funded projects.

This study found that ACCEZ has enabled the production of outputs such as serious games and new knowledge that help to overcome or prevent the occurrence of mechanisms of transition failure. Yet, we found limited evidence of the use of these outputs beyond actors directly involved in the projects that ACCEZ has funded. This implies an untapped potential for contributions to transitions. It is recommended that ACCEZ deliberately invests in dissemination and implementation of its results beyond the projects that it funds. This stimulates broader adoption of the tools and knowledge that stimulate transitions.

2 Enabling transitions in South Holland

In this chapter, we discuss the transition mechanism failures that were countered and challenged through ACCEZ's productive interactions along three categories of transition mechanism failures.

Overcoming and preventing structural failures

ACCEZ fosters cooperative interactions and facilitates a safe space for dialogue among stakeholders, helping them create a shared vision for the future. The following interactions help mitigate failure mechanisms such as "fragmented networks of interaction" and "no shared directional vision", both of which may overlap each other at times. For instance, in projects like Duin en Bollenstreek and Waarde Van Water, ACCEZ's facilitation of the visual "serious game" establishes the groundwork needed for the transition by bringing together the unlikely stakeholders who have different levels of resistance, to be able to explore a shared vision and generate valuable knowledge. Even more apparent in the Coalition of the Willing project, strength lies in the ability to mobilize collective efforts through collaboration and the establishment of a supportive network of individuals sharing a common vision.

A project officer on the Coalition of the Willing project reflects on the progress that has been made so far, and the value of the interconnectedness of the members: "On a personal level for this group of eight to ten people, on how they look at things, going from the managerial mindset to a transformational mindset, with a lot more focus on system thinking and being better listeners, and that's only on a personal level. But since they have a lot of outreach to other people in the sector. It could help a lot, and it's a necessary step to reach a bigger group".

To mitigate the challenge of "inadequate physical knowledge and infrastructure", projects funded by ACCEZ addresses this by investing in raising awareness on new and emerging sustainable practices, such as cost-effective soil quality testing methods, as well as the Natuurwaarde Kaart that allows stakeholders to do informed policy decisions. Additionally, a course at the Rotterdam School of Management of Erasmus University Rotterdam educated financial professionals on challenges in adopting circular practices and needs of farmers in relation to loans. Such efforts raise awareness and enable the dissemination of knowledge on practices and needs. A participant reflects on the importance of the network formation to generate further knowledge:

"So new knowledge comes from each other, when you are sitting with each other on the table, and when you are really having the discussion. Then you see that there's much more knowledge in people that you did not know in advance. And people in a setting like the "serious game" are willing to share this when it's safe environment."

A prevalent theme that emerged across all projects is the shift in individuals' perceptions of themselves and others within the context of the problem and solution framework. A collective mindset, changing from the individual "I" to the inclusive and collective "we" has come about, deepening the significance of building networks and interconnectedness. Collaborations among diverse stakeholders, such as researchers, farmers, and other industry professionals, have also impacted researcher's approaches, as they now understand further the on the ground needs.

It is worth noting that in Waarde Van Water, the shift in mindset was not as explicit as in other projects. The project serves more as an "initiator" rather than an "accelerator" within the water management sector. It establishes the groundwork needed for additional efforts to drive substantial progress.

Our analysis did not reveal that the three projects effectively addressed the issues of "outdated institutions and rules". If projects that are complementary to projects funded by ACCEZ do not address these issues either, existing legal arrangements may hinder the desirable behavioural change to fully take place.

Overcoming and preventing market and demand related failures

One of the reasons why a transition is difficult to occur is that it lags "demand articulation", meaning there is limited demand from either governmental or broader society for actors to move toward changing, as there is too much uncertainty and dependencies. In the ACCEZ context, all three projects are relevant to today's societal issues and come as a response to a growing need for practices to change into becoming more circular and sustainable. Leaders of the horticultural sectors, farmers and growers all feel the pressure and urgency by European markets and buyers to adhere to the changing "license to produce" criteria, which is becoming more demanding for greener practices.

Furthermore, projects funded by ACCEZ address market and demand related challenges, particularly the shortage of appropriate knowledge by introducing innovative solutions, taking measures to equip actors with the necessary resources to facilitate transitions to more sustainable practices. For example, as mentioned above, one of the projects introduced new ways to test soil quality, as well as created infographics that highlight the sustainable benefits of growing diverse tulip bulbs together (as opposed to growing the same breed), all of which promotes the adoption of new practices based on learned knowledge. It is not clear at this stage if the infographics are still being utilized.

Furthering contributions to "appropriate knowledge and competencies", Waarde Van Water stimulates interest in surface water and promotes the development of new solutions, such as creating "green blue" corridors in agricultural areas and implementing water collection systems in water parks. These initiatives not only address water scarcity issues by generating new knowledge on how to tackle these issues, but also offer opportunities for collaboration between urban and rural environments, demonstrating the potential for solutions to bridge gaps in resource availability across different sectors, which further reiterates ACCEZ's role in network creation.

Although there are limited examples of productive interactions that address the lack of supply funding, the RSM course offered at the university can highlight the need for change in the financial ecosystem.

Overcoming and preventing behavioural and adaptive improvements

As certain actors perceive risks to their income and profits, thereby resisting change, ACCEZ projects leverage their knowledge dissemination efforts to encourage adoption of new practices. For instance, farmers have started adopting innovative tulip-growing methods because of the knowledge shared by the Duin en Bollenstreek project, but also due to their participation in creating these new solutions. Additionally, as the Coalition of the Willing members represent a significant portion of the sector, they serve as influential channels for spreading awareness on their goals and agendas, such as embracing greener practices.

In the Waarde Van Water project, the visual dialogue game was generally very successful and received positive feedback from those involved. However, it was noted that in one instance, some of the participants were vocally negative and extremely resistant to change, expressing strong opinions about the sector and its future. Despite the initial resistance, by the end of the evening they claimed to have been happy to participate in the activity and recognized its value. Here, we see the "opposition by transition losers" be challenged, where individuals who defend the existing system begin to shift their perspective.

ACCEZ also initiated pilot projects to further test and validate these practices, thereby addressing the reflexivity and adaptability among the stakeholders. Another form in which participants become more adaptable is through their new collaborations with unlikely partners, such as non-governmental organizations.

A coalition member reflects on the importance of stakeholders to be ready to make changes: “knowledge is important, competencies are important, but also the mindset that you are open to work on this”. The concept of societal impact, as understood by ESSB staff, involves engaging in societal discussions and influencing environments outside the university to effect change. However, the term impact" itself was problematised by many respondents, who emphasised its often diffuse and long-term nature. The notion of impact being a "two-way street" was frequently mentioned, highlighting the reciprocal relationship between the university and society.

As one respondent put it, impact is not always immediately recognisable or quantifiable. Soft changes and ripple effects can take years to manifest. This view underscores the need for a nuanced understanding of impact that goes beyond simplistic, unidirectional models. Instead, impact should be seen as a collaborative and co-creative process, involving continuous exchange and dialogue between academia and society.

Comparative analysis across three case studies

The results of the analysis of the contribition of productive interactions to overcoming and preventing transition failure mechanisms vary across the three projects. This variation is due to differences in each project’s characteristics, such goals,types of partners involved, and duration.

In the Coalition of the Willing project, although new knowledge, such as on the soil testing method, was developed, the amount of newly developed knowledge was less compared to the other two projects. This is because the Coalition project primarily focused on creating a strong network with a robust directional vision among indsutry professionals and providing sector representation, without the direct involvment of researchers, or even policy makers.

In the Duin en Bollenstreek project, we observed numerous failure mechanisms being targetted. The project's multifaceted approach linked researchers and farmers, facilitated discussions, and targeted financial professionals. This led to the creation of knowledge, networks, and visions, as well as behavioral adaptability. Additionally, the development of the Natuurwaarde Kaart tool helped overcome insufficient policy coordination by enabling users to make informed decisions.

In the Waarde Van Water project, we observed that a significant amount of new knowledge was developed as well, including solutions for surface water and connecting the “city” with the “countryside”. However, there was limited adaptability and behavioral change among participants. This is because the project is set up more as an 'initiator' rather than an accelerator, unlike the other two projects where we witnessed changes in behavior and adaptability in addition to knowledge acquisition.

3 Shifting the focus on contributions to assess ACCEZ's impact on transitions

The recommendations in chapter 1 and the findings presented in chapter 2 follow from a study that was guided by the following research question: *How do productive interactions in transdisciplinary collaborations funded by ACCEZ contribute to societal transitions?*

Societal transitions

Overcoming societal challenges such as climate change and requires macro-level transitions in society. Societal transitions are "multilevel, multiphase processes of structural change in societal systems"[1]. They include notable changes or shifts that takes place in different areas, such as the social, political, economic, cultural, and environmental realms. These shifts can manifest themselves in different forms, including a change in behaviour or way of thinking, structures, and systems, and once the transition has been completed, it is very unlikely that the societal structures will go back to their original state.

For instance, to promote sustainable urban development, shifting to renewable energy sources is needed and requires a transformation of energy systems and market structures. Another example is the transition to sustainable food systems, which demands adopting new practices and reducing the reliance on chemicals to create a more resilient agricultural landscape.

Productive interactions

Driving transitions around a societal issue requires micro-level interactions embedded in collaborations between researchers from multiple disciplines and other societal actors from industry, government, and civic society by integrating their knowledge, experiences, and perspectives, also known transdisciplinary collaboration[2]. If micro-level interactions between and beyond the direct collaborators lead to the development and adoption of new knowledge, technologies, ideas, and practices by the collaborating partners, they are productive[3].

Shifting the focus to contributions

The impact of productive interactions on transitions, however, is challenging to evaluate. A first-well known hurdle is the issue of attribution. Transitions are driven by a multitude of actors, making it impossible to attribute the final transition to single actors. A second well-known hurdle is the time-lag between productive interactions and societal transitions. Typically, it takes years, if not decades, for impacts to materialize[3]. Many intermediate steps are required for productive interactions to result into societal transitions. This complicates the establishment of causal relationships between the two for accountability and learning purposes. These hurdles can be overcome by shifting the focus from attribution to contribution and from result to process[3].

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[1] Loorbach, D. (2010). "Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework." In: *Governance 23*, no. 1: 161–83.

[2] Jong, S.P. L. de, T. Wardenaar, and E. Horlings. (2016). "Exploring the Promises of Transdisciplinary Research: A Quantitative Study of Two Climate Research Programmes." In: *Research Policy 45*, no. 7: 1397-1409.

[3] Spaapen, J., and L. van Drooge (2011). "Introducing 'Productive Interactions' in Social Impact Assessment." In*: Research Evaluation* 20, no. 3: 211–18.

4 A deep dive into Coalition of the Willing, Duin & Bollenstreek and Waarde van Water

Coalition of the Willing

The Coalition of the Willing project, spanning from November 2021 to this day, is a collaborative effort involving key leaders in the Dutch greenhouse horticulture such as Growers United, Glastuinbouw Nederland, and Harvest House. Recognizing the significant societal challenges faced by the changing "license to produce" by the industry, these leaders have united under the name of "the coalition of the willing" to drive a fundamental transformation towards sustainability and circularity in the sector. ACCEZ guides this journey, by facilitating monthly sessions where members engage in open dialogue, explore innovative solutions, and collaborate on experiments aimed at addressing various solutions.

Central to the project's approach is the recognition of the need of transformative thinking and actions to accomplish a fundamental transformation into a sustainable and circular cluster. The coalition acknowledges the limitations of past approaches, such as relying on lobbying and policy makers to find solutions for them. Instead, it embraces a proactive mindset, seeking to build better practices such as growing greener and engaging in dialogues with different stakeholders, like leaders in the horticulture industry and entrepreneurs, to shape the future of the greenhouse horticulture industry.

Notable outcomes were observed in terms of changes in actions, attitudes, and awareness. Initially, the coalition was a small group. Over time, it expanded into a broader collaboration that focused on shared objectives such as energy, crop protection, and labour rights. Today, the coalition exists as a safe space where members meet monthly. Members of the coalition advocate for fossil and pesticide free approach to promote people's health and encourage farmers in their respective organizations and co-ops to adopt greener practices. Furthermore, there was a significant shift in attitude and actions, leading to the emergence of new collaborations previously deemed unlikely, such as partnerships with NGOs, which was previously viewed as an incompatible alliance, due to perceived differences in vision. New practices were adopted, such as pilot projects with Koppert that focused on innovative pest management alternatives.

Discussions within the coalition opened new opportunities for societal impact beyond the horticultural sector, such as contributions to public health through addressing malnutrition, obesity, sustainable energy, and water management. These discussions led to considerations of broader issues such as public health, including addressing malnutrition and obesity, and sustainable energy and water management.

A coalition member describes how the network began and started to expand: *"The meeting started and then from that meeting on all of a sudden the different meetings happen outside that first meeting and then this whole network evolved and that became stronger and stronger."*

Duin en Bollenstreek

The project, focusing on the Duin en Bollenstreek region, aims to empower entrepreneurs and farmers to transition towards sustainable, circular business practices and ways of growing aligned with the vision for a vibrant and environmentally healthy bulb region. ACCEZ aims to play a pivotal role in this transition by engaging with key stakeholders and addressing priority issues identified by stakeholders. While acknowledging the complexity and long-term nature of this transition, the project emphasizes collaboration, knowledge mobilization, and alignment with the region's overarching ambitions.

A significant outcome was the new cost-effective soil quality testing method utilizing cotton. This holds high value for farmers and growers as the quality of the soil is very important, and the usual way of testing it is expensive:

"There is a scale for testing the quality of your soil and its' one of the things which you can do yourself without any allocated budget. So you can obviously take a sample of your soil and send it to the university, and then it costs you an awful lot, and then you have a very detailed analysis of the quality of your soil. But what you can also do is take another piece of underwear that needs to be 100% cotton. And if you take a piece of cotton and place it into the soil, then you can measure by the time it takes for it to deteriorate, in order to know the quality of the vegetation and the soil."

Moreover, the development of the Natuurwaarde Kaart tool, in collaboration with the Bollenjongens, stands out as a notable achievement. This tool offers users a visual representation of potential scenarios regarding their proposed policy, drawing from a blend of algorithms and scientific data to provide informed data. It is not clear if the tool is currently being used. Additionally, the project resulted in a course given at the Rotterdam School of Management of Erasmus University Rotterdam that raised awareness among finance professionals about the challenges confronted by entrepreneurs and growers aiming to transition towards sustain able practices.

Aside from the knowledge and tools produced, the serious game "Bolwerken" allowed unlikely participants such as growers and traders, farmers, and researchers to choose questions they want to discuss, to imagine future scenarios, test interventions, and consider collective challenges. The game provided a constructive space for stakeholders who were not well connected before to meet, fostering new relationships, debates, and diverse perspectives on the bulb sector's potential future:

"Another part of the project was the game. What we did with the serious game is not so much about knowledge, but more about the network. How can you work together on the same themes from a different perspective? The perspective from somebody in the government, somebody who is a grower, somebody as a scientist, and so on from different perspectives. And for me, the serious game was a new way of working... And as far as the knowledge questions, I think it's a good way to do it, because if it's the question the people choose themselves, you know it will work better than when I choose something for you or make up something for you."

Waarde Van Water

The Waarde Van Water project, spanning from 2021 to 2023, is geared towards tackling the pressing issues of water scarcity and quality, with a specific focus on greenhouse horticulture in Greenport West Holland. The project is centred around the main question of how to secure high quality water for the future. This initiative has been prompted by the growing challenges associated with limited water storage capacity, concerns about water quality, climate change, urbanization, and the need to explore alternative irrigation sources.
Given the increasing competition for water resources and the environmental changes exacerbating these challenges, the project aims to develop innovative strategies to address these issues, while including perspectives from relevant stakeholders such as the Greenport, PZH, the Duijvestijn Tomaten, and Delfland Water Board, among others Through action research, the project investigates innovative and efficient methods to manage water resources, ensuring the sector can continue to thrive despite the increasing pressures on water availability. Though initially tackling the horticultural sector in the region, the question of the project began to change as it was quickly apparent that many sectors are heavily affected and reliant on clean water, such as nature conservation parties and water boards.

Notably, the visual dialogue game enhanced participants' ability to envision the future of the sector and find common ground on water management issues. Previously, each stakeholder approached

the issue from their own perspective, ignoring the overlaps between different sectors, such as farming and construction:

"Through the visual dialogue people started to think differently, like not "how can I get clean and enough water" but more like "if there isn't enough water, who has the right to use it?". So, I think it broadened the perspective of, OK, it's not only me, but we are also collaborating with multiple participants. So, I think that's a change in mindset."

The visual dialogue also enticed participants to participate, as they were first hesitant to take part of the project as they did not want to be tied to the pressure of outputs and results. The game allowed them the space to think freely.

In the Netherlands, the claim on land is extremely competitive, and the need for water is highly critical. This issue is exasperated by the fact that different sectors tend to operate solely from their own perspective and are often hesitant to discuss potential solutions collectively. The visual dialogue game facilitated this necessary communication and enabled participants to address water-related issues more effectively.

For example, possible solutions that were discovered were through connecting "city" and "country", i.e.: a surplus of water in the urban environment can resolve issues of shortages in the horticulture space. New knowledge was also formed, such as the emergence of new solutions such as creating 'green-blue' corridors in agricultural areas and implementing water collection systems in business parks, both requiring multi-stakeholder cooperation.

The game enabled an understanding that it would be difficult to address the challenges effectively without bridging strengths. Furthermore, participants who were resistant to change and negatively vocal during the game, later admitted the value of participating.

5 Linking micro-level interactions and macro-level transitions through transition failure mechanisms

To assess the contribution of transdisciplinary collaborations funded by ACCEZZ, we selected a method and a framework that, in combination, allow for establishing a link between productive interactions and contributions to societal transitions. The method is the Societal Impact Assessment Method for research and funding instruments through the study of Productive Interactions (SIAMPI). The SIAMPI framework is widely used for understanding and assessing the quality of productive interactions between researchers and their collaborators in society. The framework is derived from Bolhuis' synthesis work on mechanisms that lead to transition failures. By analysing how productive interactions contribute to overcome or even prevent the occurrence of these causes, we can unravel how ACCEZ currently contributes to driving societal transition and formulate recommendations for strengthening future contributions.

Mechanisms of transition failure

Building upon the understanding of productive interactions, we turned to Bolhuis's framework of mechanisms of transition failures. Bolhuis draws insights from market failure theory and transition failure theory to tackle major social issues. Market failure theory operates on the idea that a properly functioning market, through the price mechanism, leads to an optimal equilibrium. However, for complex societal issues requiring transitions, traditional market failure theory does not address the challenges associated with such fundamental change. Transition theory presents ten mechanisms, termed "transition failures", that if left unaddressed, can lead to the failure of a transition. We grouped these mechanisms into three categories of challenges, namely structural challenges, market and demand related challenges, and behavioural and adaptive challenges. See table 1 for an overview of the mechanisms and categories in which we grouped them.

Conceptual model

We expect that productive interactions have an impact on the mechanisms that explain transition failure. For instance, consider a project with researchers from diverse backgrounds collaborating with farmers to promote sustainable farming practices that improve soil health and crops. Initially, these practices face resistance due to farmer's reliance on conventional methods and the perceived financial risk. This is an example of limited reflexivity and adaptability. The transdisciplinary research team organizes field visits and provides trainings, as well as develops financial incentives with local banks, resulting in a report and policy documents of local banks. The field visits, trainings, report, and policy documents are examples of productive interactions. These microlevel interactions help farmers understand the benefits of adopting the new practices, as well as remove their financial constraints. This leads to gradual acceptance and integration of sustainable farming practices into their norms. Thus, the transdisciplinary collaboration has contributed to overcoming the transition failure mechanism of limited reflexivity and adaptability.

In short, we assume that if interactions in the collaborations funded by ACCEZ are productive, they will contribute to overcoming or even preventing the occurrence of the mechanisms that explain transition failure. It is not necessary for all failure mechanisms to be present in the ACCEZ project to demonstrate their role in overcoming failures. See figure 1 for a visualization of the resulting conceptual model.

Table 1: Mechanisms for transition failures (adapted from Bolhuis, 2024[4])

Structural challenges	Market and demand-related challenges	Behavioural and adaptive challenges
• No (shared) directional vision. *Collective action by the actors in a value chain does not materialize because there is no (shared) dot on the horizon. Thus, focused solutions to interdependencies, individual risks and ambiguities do not emerge.* • Inadequate physical knowledge and infrastructure *Actors under-invest in infrastructure because of too low a return over too long a period - even though it is vital to accomplish the transition. (New) infrastructure has a strong coordinating effect.* • Fragmented networks of interaction *Relevant actors do not find each other, due to a 'lock-in' in existing networks and a limited external view to desirable but still unknown chain partners. This also inhibits the 'scale up' of necessary innovations for the transitions.* • Insufficient policy coordination *Governments at multiple levels communicate differently and make inconsistent - or even contradictory - policies, which inhibits fundamental behavioural change.* • Incomplete or outdated institutions and rules *Actors are discouraged or prohibited by existing institutional and legal arrangements from (enabling) desirable behavioural changes.*	• Lagging demand articulation. *Actors experience limited demand, making them reluctant to simultaneously invest or innovate in production chains (uncertainty, risks, dependencies). Demand articulation toward the transition only occurs sufficiently if the government assumes this coordinating role.* • Lack of supply funding ecosystem. *Actors, as a joint new value chain, do not have access to capital, or there is no financing toolkit, resulting in under-investment. The need to finance an ecosystem or multiple actors together -because they need to change their behaviour simultaneously - is new and unfamiliar.* • Shortage of appropriate knowledge, competencies, and factors of production. *Actors can't make the transition or can make it too late - due to a lack of knowledge, competence, and factors of production. Existing markets and their arrangement have given this outcome.*	• Opposition by transition losers. *Actors see certainties, income or profits at risk, which causes them to delay the transition and defend the existing socio technical system.* • Limited reflexivity and learning adaptability. *Actors do not sufficiently monitor progress, anticipate change to a limited extent, and learn too little, resulting in behaviours that are not adaptive. Thus, there is no timely and correct response to the uncertain developments in transitions with the unintended consequences for transition policies.*

[4] Bolhuis, W. (2024). "Beleidseconomen moeten weten wat transitiefalen is." In: *Economische Statistische Berichten 109*, no. 4831: 136–39.

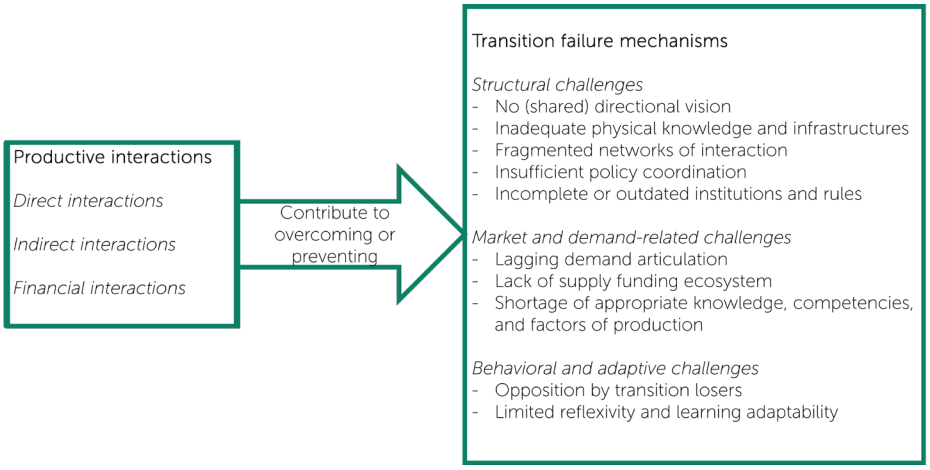

Figure 1: Conceptual model for analysing the contribution of productive interactions to overcoming or preventing transition failure mechanisms.

Data collection

We opted for a case study approach to analyse the contribution of ACEZZ to transitions[5]. This approach allows for gaining deep understanding of current developments. We selected three ACCEZ projects as our case studies: Coalition of the Willing, Duin en Bollenstreek, and Waarde Van Water. These projects were selected based on their longevity, time-lag since conclusion, the variety of stakeholders involved, and their potential for scalability and relevance to today's context.

Per case, we followed the same structured approach (see figure 2). We began with desk research. On the one hand, this helped us to familiarize ourselves with the case and on the other it provided a first data source for analysing productive interactions. The documents included project proposals and progress reports (see appendix A for an overview of studied documents per case). Subsequently, we engaged primary informants, such as project managers referred to as "accelerators", through interviews. The informants were selected based on their involvement in the project and their ability to provide a comprehensive explanation of the actions and results observed. These initial conversations served as a starting point, leading us to secondary informants directly involved in project activities, such as researchers and industry professionals. We then extended our reach to the third level of informants, including farmers, growers, entrepreneurs, and financial professionals, who were both directly involved in and impacted by activities in the respective projects. Here, informants were selected based on their different perspectives, for example a farmer taking part in project or a researcher facilitating the activities conducted. This allowed for a deeper understanding of the changes that occurred. However, it's important to note that in certain projects, reaching these stakeholders proved challenging due to various factors. This multi-level approach enabled us to capture a comprehensive view of productive interactions within the three projects.

We used an adapted version of the SIAMPI-interview protocol to ask informants about the productive interactions that occurred in the project that they were involved in (see appendix B). The protocol was structured to capture observations, project outcomes, new knowledge learned and adopted, and behavioural shifts among project participants. Informants were interviewed online. On average, interviews lasted for about sixty minutes. All interviews were recorded and transcribed prior to analysis guided by the analytical framework detailed in figure 1. Informants were provided with an information sheet and provided informed consent before the interview. Informants were promised anonymity.

[5] Blatter, J. and M. Haverland. (2012). *Designing case studies*. London: Palgrave Mcmillan.

Data analysis

The data on productive interactions in each project resulting from the document analysis and interviews was then mapped onto Bolhuis' framework on transition failures. We created a matrix with the ten causes of transition failures as rows and the three projects that serve as our cases as columns (see appendix C). We assigned each identified productive interaction to the cell that corresponds to a) the transition failure it helps of overcome or prevent and b) the case we identified it in. This process involved determining whether the interaction addressed the specific challenge, such as inadequate infrastructure or fragmented networks.

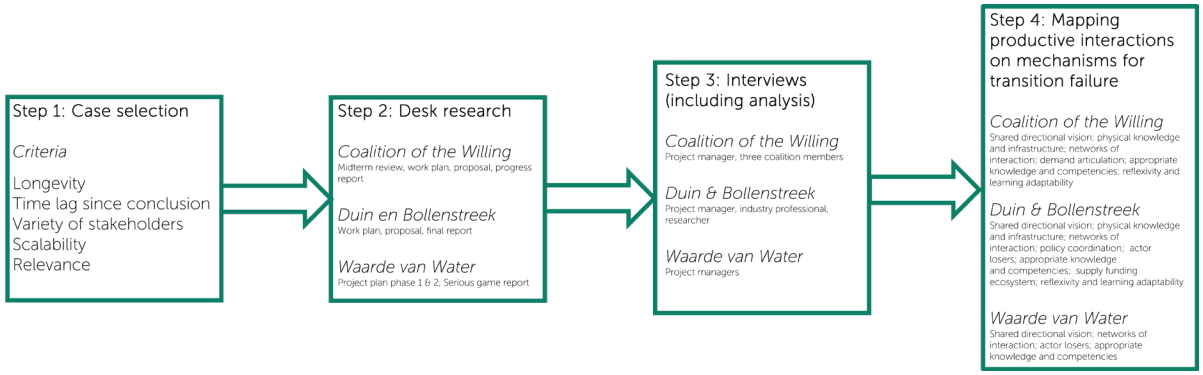

Figure 2: Methodology

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Appendix

A: Studied documents per case

Coalition of the Willing	Duin & Bollenstreek	Waarde Van Water
Midterm review	Work plan	Project plan phase 1
Work plan	Proposal	Project plan phase 2
Proposal	Final Report	Serious game report
Progress report		

B: Interview protocol

The interview guide was slightly tailored based on the individual being interviewed. The protocol aids in understanding the project's context, the issue it aimed to address, the people involved, and helps trace the results. There is also room for discussing things that did not work, and future recommendations.

1. Welcome
- Explanation of interview process and purpose
- Disclaimers
- Anonymity: all quotes in results will be de-identified.
- Freedom to withdraw participation at any time, retract and exclude statements, and share only what interviewee feels like sharing.
- No wrong or right answers.
- Ask consent for recording.
- Setting Tone

2. Establishing Context
- I have previously read about the ACCEZ project but would like to know, in your own words more about the X project.
- What were the primary objectives/goals of the project?
- What was the problem trying to solve?
- What were the activities planned? Were they implemented as anticipated?
- Who does the findings of this project benefit?

3. Project Overview
- Apart from the researchers, who were the main collaborators that you worked with?
- What was their role and how did they contribute to the project / what was their level of engagement?
- How did their contribution affect the outcomes of the project

4. Stakeholders / Collaborations
- What would you say, were the biggest findings/resolutions you achieved in this project? How were these findings communicated (policy briefs, speeches, academic papers)
- Tangible results?
- How did these findings contribute to solving the initial issues identified by your project?

5. Impact
- Were there any new collaborations or partnerships formed during the project?
- Can you describe them

- Have these collaborations contributed to the success of the project
- Do you know if these collaborations have continued after the end of the project?

6. Unexpected changes and challenges
- Were there any unexpected changes that occurred in the project?
- How did they come about?
- What kind of tensions did you encounter? Could be governmental, existing beliefs and rules, time and space constraints – how did you overcome them?

7. Lessons learned and recommendations
- Now that the project is over, are there any activities you would have done differently? How so?
- Any recommendations for second phase?

8. Lessons Learned / Recommendations
- How sustainable do you believe the outcomes of this project are?
- In what circumstances?

9. Sustainability
- How sustainable do you believe the outcomes of this project are?
- In what circumstances?

10. Closing up
- Is there anything we haven't discussed today that you would like to go over?

C: Interactions/failure mechanism matrix

Analysis of Productive Interaction through Transition Failure Lens				
Forms of Transition Failures		ACCEZ Projects		
Transition Failures	Mechanism	Coalition of the Willing	Duin & Bollenstreek	Waarde Van Water
No (shared) directional vision	Collective action by the actors in a value chain does not materialize because there is no (shared) dot on the horizon. Thus, focused solutions to interdependencies, individual risks and ambiguities do not emerge.	The coalition expanded from a small group to a broader collaboration focusing on shared objectives such as energy, crop protection, labour rights, etc	A serious game "Bolwerken" allows participants to imagine future scenarios while testing interventions and considering collective challenges	Visual dialogue game enhanced participants to envision future sector and to find common ground
Inadequate Physical Knowledge and Infrastructure	Actors under-invest in infrastructure because of too low a return over too long a period - even though it is vital to accomplish the transition. (New) infrastructure has a strong coordinating effect.		A course given at the Rotterdam School of Management (RSM) helped raise awareness among those in the finance sector about the requirements and concerns of entrepreneurs and businesses in sectors aiming to shift to more circular ways of functioning	
Fragmented Networks of Interaction	Relevant actors do not find each other, due to a 'lock-in' in existing networks and a limited external view to desirable but still unknown chain partners. This also inhibits the 'scale up' of necessary innovations for the transitions.	The coalition exists today as a safe space that members can meet regularly New partnerships with seed breeding companies and suppliers of crop protection New collaborations with "competitors" NGOs	The serious game provided a constructive space for researchers and farmers to meet, fostering debates and diverse perspectives on the sector's potential futures.	Building relationships between stakeholders with existing tensions through the visual game
Insufficient Policy Coordination	Governments at multiple levels communicate differently and make inconsistent - or even contradictory - policies, which inhibits fundamental behavioural change.		Formation of the Natuurwaardekaart-tool, with consultation from the Bollen Jongens, creating visual maps for policy questions through	

			combining algorithms and scientific data	
Lagging Demand Articulation	Actors experience limited demand, making them reluctant to simultaneously invest or innovate in production chains (uncertainty, risks, dependencies). Demand articulation toward the transition only occurs sufficiently if the government assumes this coordinating role.	Pressure and urgency to adhere to changing "License to Produce" criteria and to transition into a sustainable and circular cluster		
Opposition by Actors Losers	Actors see certainties, income or profits at risk, which causes them to delay the transition and defend the existing socio technical system.		Lack of sustainable and economically beneficial practices in the bulb growing sector encourages growers and researchers to find new solutions	Participants who were opposed and resistant to change admitted the value of taking part of the game as it allowed them to think differently
Incomplete or outdated institutions and rules	Actors are discouraged or prohibited by existing institutional and legal arrangements from (enabling) desirable behavioural changes.			
Shortage of appropriate knowledge, competencies, and factors of production	Actors can't make the transition or can make it too late - due to a lack of knowledge, competence, and factors of production. Existing markets and their arrangement have given this outcome.	Pilot projects by Koppert result in successful production, employing innovative practices like insect-based pest management Emergence of opportunities for societal impact, such as contributions to public health, addressing malnutrition, obesity, and sustainable water management	New effective and sustainable method of independently testing soil quality with cotton underwear Infographics explaining the value of growing diverse tulips together	New interest in surface water Emergency of new solutions such as creating "green-blue" corridors in agricultural areas and implementing water collection systems in business parks Possible solutions through connecting "city" and "country", i.e.: surplus of water in the urban environment can resolve issues in horticultural space
Lack of supply funding ecosystem	Actors, as a joint new value chain, do not have access to capital, or there is no financing		RSM Financial course sets forth the need for a change in the finance ecosystem	

	toolkit, resulting in under-investment. The need to finance an ecosystem or multiple actors together - because they need to change their behaviour simultaneously - is new and unfamiliar.		
Limited reflexivity and learning adaptability	Actors do not sufficiently monitor progress, anticipate change to a limited extent, and learn too little, resulting in behaviours that are not adaptive. Thus, there is no timely and correct response to the uncertain developments in transitions with the unintended consequences for transition policies.	Members of coalition influence farmers in respective coops to try and grow as green as possible	Farmers and Growers adopt learned practices of growing green and testing soil.