Deliverable 3.3

Innovative business model proposals (T3.3)

Authors

Jan Macháč (UJEP)

David Ellerbrake (TUDO)

Lenka Slavíková (UJEP)

Land4Climate

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Deliverable 3.3

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Executive Summary

Deliverable 3.3 develops proposals for innovative business models to promote nature-based solutions on privately owned land and thereby strengthen climate resilience. Since a large proportion of suitable land is privately owned, the motivation of landowners to implement nature-based climate adaptation measures is crucial. Based on a literature review of 16 relevant policy and market instruments and participatory consultations, six instruments were selected, including sub-sidies, land swaps, biodiversity offsets and payments for ecosystem services. These were translated into a serious game format that captures preferences, decision-making behaviour and potential barriers to acceptance in realistic, hypothetical scenarios. The playful simulations are supplemented by structu-red discussions to gain practical insights. The aim is to develop effective, locally adapted business models that combine ecological effectiveness, economic viability and social acceptance.

Keywords

Innovative Business Models; Motivation and Incentives; Preferences; Serious Game; Landowners

1. Introduction

Climate change is increasingly affecting European landscapes, exposing both rural and urban areas to risks such as floods, droughts, soil erosion, wildfires, and heatwaves. In this context, **nature-based solutions (NBS)** (such as restoring natural water retention, supporting ecological corridors, or adapting land use practices) are crucial components of resilient climate adaptation strategies. However, a large proportion of land where such NBS are most needed is under **private ownership.** This creates a fundamental implementation gap: although public authorities may design strategic plans and protective frameworks, their success often hinges on the willingness of private landowners to actively cooperate.

There are already positive examples across Europe of landowners who engage in voluntary agreements and implement NBS on their own land and implementing NBS on their own land. This is mostly driven by personal conviction, a strong connection to the land, or long-term stewardship values. These cases show that collaboration is possible. However, such "altruistic engagement" represents only a narrow portion of the overall potential. The broader challenge remains: **how to effectively motivate a wider range of private landowners**, especially those who are currently hesitant or unwilling to take action due to economic, legal, or other barriers. Despite the existence of policy instruments such as agri-environmental schemes, subsidies, or voluntary land-use agreements, many of these instruments have not proven sufficiently attractive, flexible, or targeted to mobilize broader private involvement. Other economic instruments can play an important role in this area. Although they are well described in theoretical literature, their practical use is rather rare. There is therefore **a need to rethink and redesign the currently used approaches**, with a focus on **innovative business models** that can offer more compelling incentives while respecting landowners' autonomy and values and balancing ecological effectiveness, economic feasibility, and social acceptability.

In this context, this deliverable **D3.3: Innovative Business Model Proposals**, developed as part of the Land4Climate, explores how serious game design can serve both as a **tool for testing and validating these models** in controlled (hypothetical) but realistic scenarios, and followed as a participatory method for identifying realistic models of landowner engagement. Serious games are game applications that combine role play and rule-based game mechanisms with specific learning objectives that players can benefit from in their everyday lives. In the game, players are confronted with complex challenges and encouraged to experiment in a risk-free environment and learn from their mistakes. In transdisciplinary scenarios, serious games can provide a motivating application context, as they often allow players to gain better knowledge of specific content or systems (e.g. cities, water collection systems, social or ecological interdependence, risk assessment) or to develop skills (negotiation, exchange of opinions, coalition building). They therefore promise interactive learning from one another.

The game presented in this deliverable exposes landowners to specific environmental challenges, policy instruments, and land-use decisions, capturing their responses, preferences, and reasoning.

The aim of this report is therefore not to evaluate already implemented solutions, but rather:

- To **identify and select suitable policy instruments** for motivating private landowners, based on literature review done within WP3 and taking into account the specific needs and priorities of the project partners;

- To **propose their potential application as innovative business models** in a hypothetical territorial context including municipalities, peri-urban zones, and rural areas outside administrative boundaries;
- To **translate these instruments into a serious game**, which enables **initial testing through hypothetical decisions** made by players and subsequent validation through structured post-game discussions taken into account the real-world implementation;

This report thus **focuses on the design of the serious game**, the proposed application of selected innovative business models within that framework, and the collection of empirical data through gameplay and player feedback. Based on the game structure described in this deliverable. a game protocol with detailed scripts and step-by-step instructions will be created. This will enable LAND4CLIMATE partners to run games with participants in their regions.

2. Innovative business model proposals: From theory to practice

The aim of this chapter is to present the process of identifying and selecting potentially suitable policy instruments that can be used as a basis for designing innovative business models. It is based on two activities carried out earlier in this project. The first is an extensive review of the current application of policy instruments in relation to nature-based measures, followed by a selection made by consortium members within consortium meeting in Vienna.

2.1 Results of the literature review

As part of WP3, a systematic literature review was conducted to support the development of innovative business models for nature-based solutions (NBS) on privately owned land. The review forms a key analytical basis of Deliverable D3.2: Mobilizing Private Land for NBS Implementation, with the objective of mapping the current international discourse around policy instruments that enable or incentivize the implementation of NBS across diverse land ownership contexts.

The literature search focused on identifying relevant academic literature using two major scientific databases: Scopus and Web of Science (WoS). The search strategy was designed to cover a broad spectrum of relevant publication types, including articles, reviews, conference papers, book chapters, books, and short surveys. The focus was placed on documents explicitly referring to individual policy instruments linked to NBS.

A set of 16 policy instruments was used as keyword categories for the systematic search. These included both regulatory and market-based tools, namely: (i) land swap; (ii) land consolidation; (iii) land readjustment; (iv) transferable/tradable development right; (v) land easement or conservation easement; (vi) land covenant or conservation covenant; (vii) land expropriation; (viii) conservation concession; (ix) biodiversity offset; (x) mitigation bank; (xi) green bond; (xii) endowment fund; (xiii) payment for ecosystem service; (xiv) land buyout; (xv) land compensation; (xvi) land mobilisation.

After removing overlapping entries and duplicates across databases and categories, a total of 289 unique publications were identified and further analysed. The final list of 54 publications provide a representative overview of the current conceptualisation, practical implementation, and evaluation of these instruments in various global and local contexts.

Among the most frequently discussed instruments were: payment for ecosystem services; land compensation; land mobilisation; and biodiversity offset.

These instruments appear prominently across disciplines, particularly in environmental economics, land-use planning, and conservation policy. **Moreover, in terms of degree of innovation**, the following instruments stood out: **payment for ecosystem services; land compensation; tradable development rights; and biodiversity offsets**.

These tools were often framed not only as financial mechanisms but also as platforms for contractual, voluntary cooperation between public actors and private landowners. They also demonstrate significant potential for flexible application and local adaptation, which is essential when designing context-sensitive business models for NBS implementation.

This literature review has informed the selection of instruments for further exploration and testing within the serious game framework described in Deliverable D3.3. The game scenarios build on these findings to simulate realistic policy interactions and evaluate landowner preferences.

2.2 Refinement of instrument selection through consortium feedback

To complement the findings of the literature review (chapter 2.1) and ensure alignment with real-world applicability across different national contexts, a participatory **validation of policy instrument selection** was conducted during the 4th LAND4CLIMATE Consortium Meeting, held in Vienna on 10 and 11 March 2025.

As part of a dedicated session focused on the development of innovative business models and the upcoming serious game framework (Deliverable D3.3), the project team **presented the initial game concept**, including its objectives, target group (private landowners), and intended testing format. This was **followed by the presentation of a shortlist of five selected policy instruments**, chosen based on their prominence in the literature and potential for innovation:

- Payment for ecosystem services (PES)
- Land compensation
- Tradable development rights (TDR)
- Biodiversity offsets
- Land swap (added to the list due to its conceptual simplicity)

Each instrument was briefly introduced. The presentation specifically addressed how each instrument functions. Following the presentation, a live voting session was conducted among consortium members using a color-coded card system to express individual assessments of each instrument (Figure 1). Participants were asked to rate the preferences of implementation of these instruments based on:

1st Round: **Current applicability** – considering present legal, institutional, and administrative constraints.

2nd round: **Future potential** – assuming that key legal and policy barriers could be addressed or reformed

Each participant could cast their opinion for each instrument using coloured paper cards (see following photographs):

- Green: Positive assessment (applicable/promising)
- Orange: Neutral or uncertain assessment
- Red: Negative assessment (inapplicable/unsuitable)

Figure 1. Feedback from consortium members in form of voting (Source: Lenka Dubová, 2025)

This voting exercise provided valuable qualitative feedback from across the consortium, reflecting diverse territorial, institutional, and disciplinary perspectives. The aggregated results are summarised below in Table 1.

Instrument	Current conditions	If legal/policy barriers removed
PES	38%	38%
Land compensation	51%	64%
TDR	13%	44%
Biodiversity offsets	50%	87%
Land swap	74%	61%*

** In this case, the negative attitude was completely eliminated, but some of those who had previously rated positively moved to the neutral group.*

Table 1. Results from consortium feedback (percentage of participants who rated the instrument positively – i.e. green card)

The results show a clear divergence in how instruments are perceived under present versus improved/changed regulatory conditions. Biodiversity offsets emerged as the most promising tool in the long term, with support rising from 50% to 87% when assuming legal and policy adaptations. Similarly, tradable development rights, while rated as least applicable under current conditions (13%), showed a significant increase in perceived potential (44%) if systemic barriers could be addressed – indicating their perceived innovation potential despite limited current use.

Land swaps received the highest support under current conditions (74%), reflecting their familiarity and operational simplicity, though support slightly declined in the idealised future scenario (61%), possibly due to limitations in scale or flexibility. Land compensation gained moderate support in both settings, rising from 51% to 64%. Interestingly, PES maintained the same level of support (38%) in both settings, which may indicate either a recognition of persistent limitations in funding and administration, or a stable but cautious level of confidence in its utility.

The outcomes of this session were used to prioritize instruments for game development, ensuring that selected tools are both theoretically grounded and practically relevant to partners' national contexts. The feedback also informed the design of in-game scenarios and actor motivations, enhancing the realism and transferability of the serious game as a tool for testing innovative policy approaches.

3. Implementation of selected innovative policy instruments

Based on the outcomes of the literature review (Deliverable D3.2) and feedback from project partners during the 4th Consortium Meeting, a set of six policy instruments has been selected for inclusion in the serious game developed under Deliverable D3.3. These instruments reflect a balance between **commonly used mechanisms** (such as subsidies) and **innovative approaches** (e.g. tradable development rights or biodiversity offsets) that require further exploration.

To support gameplay clarity and gradual familiarisation with game mechanics, the **subsidy instrument** is intentionally used in the first scenario. This tool is broadly understood by most landowners and allows players to engage with decision-making processes without needing to immediately process more complex or unfamiliar instruments. The other innovative business models are gradually introduced in subsequent scenarios to allow comparison and reflection. The definitions are provided based on guide for practitioners created within WP3. The six instruments potentially used in the game are defined as follows:

3.1 Subsidy (Public grants/ Public financial support)

Local, regional, or national authorities may provide direct financial support to landowners to implement nature-based measures (e.g. wetlands, retention areas, tree planting). These grants aim to encourage landowners to take action that aligns with broader public goals, such as flood prevention or climate resilience. The grant typically covers part or all of the initial investment costs, without requiring compensation in return

Basic principle in the context of innovative business models: Landowner receives funds from the state authority and implements the required measures in return.

3.2 Land swap

Agreements where two parties exchange parcels of land without using money, typically to achieve better land use, conservation, or development outcomes. Land swaps are used to enable the implementation of nature-based solutions in locations where they provide the greatest ecological, social, or economic benefit.

Basic principle: Two landowners (one could be also municipality) exchange land to enable nature-based measures on more suitable land.

3.3 Biodiversity Offsets

Companies whose activities result in negative environmental impacts and/or are publicly perceived to harm the environment (e.g. companies active in resource extraction) may fund biodiversity protection measures elsewhere in exchange for permission to proceed with their operations.

Basic principle: Landowner receives funding from a company to implement and maintain measures that compensate for biodiversity loss caused elsewhere.

3.4 Payment for ecosystem services

In exchange for maintaining or restoring ecosystem services (e.g. water filtration, carbon sequestration, biodiversity), landowners may receive ongoing payments from beneficiaries such as residents, municipalities or other entities such as private companies (e.g. who benefit from the services provided by measures such as the elimination of pollution of water used for drinking purposes). These schemes are often locally negotiated and can help maintain ecosystem functions while generating revenue.

Basic principle: Landowner receive ongoing payments from the positively effected entity to implement and maintain measures connected with the provided ecosystem services.

3.5 Transferable development rights (TDR)

Landowners in areas where development is restricted due to environmental or spatial planning priorities (e.g. floodplains or protected zones) can sell their unused development rights to other landowners or developers, who may use them to increase development intensity in designated receiving areas. This is possible if the original landowner implements an additional measure that generates a significantly higher environmental effect than required such as retaining more water or improving soil infiltration capacity, thereby compensating for impacts that would occur elsewhere.

Basic principle: Landowner sell development rights to another landowner in return for compensation and commits to implement stronger environmental measures.

3.6 Land compensation

When a project or activity causes the loss of ecosystem services such as water retention, biodiversity, or carbon storage in one location, the responsible party may be required to finance compensatory measures elsewhere. Landowners in other areas are then paid to implement actions that restore or enhance these same ecosystem services, effectively replacing the lost value. These measures must provide an equal or greater ecological effect, such as retaining more water or supporting more biodiversity than what was lost.

Basic principle: Landowner is paid to implement measures that compensate for nature-based value lost due to activities elsewhere.

4. Game mechanisms and data collection

4.1 Using serious gaming as a tool for data collection

Games used for transdisciplinary cooperation are known as serious games and are designed to convey “serious” learning, transfer and research objectives by combining the emotional experiences of learners with educational and interactive components (Figure 2). Although “serious games” are a topic that is frequently explored in the field of educational technology, studies in areas such as psychology, health sciences, environmental sciences, ecology, public environmental and occupational medicine, rehabilitation, business administration and psychiatry show that “serious games” are also a popular topic for studies in various disciplines (Çiftci 2018). Serious games have become increasingly established in recent years as learning tools for concepts such as edutainment, game-based learning or lab-scale game simulations. Furthermore the use of games and game elements is also becoming increasingly interesting for transdisciplinary and **co-creative practices**

of knowledge production and anticipatory governance (Vervoort et al. 2022). As immersive technologies, digital and analogue games provide a space for experimentation that is geared towards innovative knowledge gain. At the same time, by **"drawing" participants into the learning context**, they can create an interactive and realistic experience in which, in the best case scenario, they have no choice but to learn something (Dörner et al. 2016: 10).

Figure 2: Educational and psychological framework of Serious Games (Bates 2022: 561)

Serious games as a way of testing NBS acceptance and attitudes are not a panacea, but work best when they are integrated into a **comprehensive process (see below).** There are already many positive examples of the meaningful use of games to **impart and consolidate knowledge** in the fields of urban and spatial planning and flood risk management (Mittal, Scholten, Kapelan 2022; Medema et al. 2019; Chew, Lloyd, Knudsen 2015). Serious games can be used to bring democracy to life, explore solutions to climate change and even test new laws (Lopez-Merino 2023).

Deliberation, social learning and transformation are part of the co-creative production of solutions for climate change adaptation. The focus of attention in the game is on shifting the focus from the self to the community and the environment, thereby replacing the primacy of scientific reductionism and the calculation of coherence in the narratives and interpretations of the participants (Lopez-Merino 2023). In order to enable a strong process orientation and the consolidation of knowledge, it is necessary to **(i)** take into account the real, urgent and conflicting issues surrounding land use change through policy measures and NBS, and **(ii)** address these issues in a playful space free from real concerns and constraints regarding their implementation, and develop them in a playful manner.

This means that the use of the game developed within the framework of Deliverable D3.3 aims to largely **break down knowledge hierarchies** between landowners, the academic providers of the game and state or business agents. Instead of forms of knowledge exchange that are essentially structured and managed by silos of experts responsible for specific sectors or disciplines, game technologies have the potential to create new structures with collaborative development and management, in which individuals are motivated to take individual responsibility for shaping their own lives and collective responsibility for contributing to sustainable models for society as a whole (Wortley 2015: 56).

The aim of developing a game for landowners and practitioners in the field of risk management and spatial planning is therefore to **place greater emphasis on the connection between participation,**

social learning and change. In line with the educational motto ‘We learn best when we play.’ the hypothetical innovative business models in the game presented here are to be used as a model to model a user's characteristics, profiles, and patterns of behaviour in order to support or challenge the performance of individuals. Behaviour recording has been studied and used in the game industry for a long time (Ketamo 2015: 57). The aim is to involve landowners by not treating them as mere research subjects. The aim is to use the skills of volunteers to solve scientific problems or contribute to action projects in which participants can engage in social issues and thus act not only as economic actors but also as citizens with an interest in issues that are important to the public.

The serious game therefore aims to confront farmers with complex challenges in the game and encourage them to experiment in a risk-free environment and learn from potential (and perceived) mistakes. At the same time, they should be encouraged to share open information about their acceptance of NBS measures. With serious games, it can be expected that this understanding will improve dialogue and mutual understanding between the actors involved by reflecting on possible conflicts and promoting cooperation (Gugerell 2023: 292). Serious games also shift the focus of control in learning from the teacher to the player and create an environment that stimulates learning, often resulting in an increase in self-learning and knowledge retention (Chew, Lloyd, Knudsen 2015: 30) This is where game thinking comes in as a method for increasing the motivation and participation of practice partners who are involved and challenged to varying degrees. In a broader sense, games or the implemen-tation of game-based strategies can be understood as communication tools. These make it possible to remove the complexity from complex issues in order to convey them in a playful, simpler way and make them tangible (Barth et al. 2025).

The serious game developed within the framework of Deliverable D3.3 is designed as a research and engagement tool to explore how private landowners respond to various innovative business model aimed at supporting the implementation of nature-based solutions (NBS). Its primary objective is to test hypothetical but realistic scenarios representing diverse climate-related risks (e.g. flooding, erosion, drought, wildfires) and land-use contexts (e.g. peri-urban areas, agricultural land, marginal land), and to examine how landowners make decisions when offered different types of incentives or constraints.

The use of game-based mechanisms allows participants to interact with simplified representations of real-world decision-making situations in a structured yet engaging format. Each scenario includes contextual information, a description of climate risks, and a set of available policy instruments. The game enables players to compare different options, consider trade-offs, and choose preferred strategies under limited information and resource constraints. This approach helps to elicit genuine behavioural responses that reflect individual preferences, values, and reasoning, beyond what would be obtained through declarative surveys.

The game is played in individual or small-group sessions facilitated by a moderator. It progresses through several rounds (scenarios), each introducing new challenges or policy instruments. Players are asked to make decisions regarding the use of their land in response to changing environmental and institutional conditions. Their choices, justifications, and reactions are carefully documented throughout the process.

The following text provides more detailed information about the purpose and definition of the games and scenarios, a description of the game itself, and the method of data collection, including its evaluation and verification.

4.2 Goal of using game mechanisms and hypothetical scenarios

4.2.1 Goal of using game mechanisms

The use of serious game in this project serves multiple interrelated objectives, all aiming to improve the design, targeting, and real-world applicability of innovative business models for mobilizing private land for nature-based solutions (NBS).

First and foremost, the game is designed as a testing ground for responses and acceptance of innovative instruments such as biodiversity offsets, tradable development rights, or payments for ecosystem services. Traditional policy design often assumes rational and linear decision-making; however, in practice, landowners' responses are shaped by a mix of economic, emotional, social, and contextual factors. Through the game, it becomes possible to capture these complex motivations in a structured yet flexible environment.

Secondly, the use of serious game helps to reveal underlying preferences and perceived trade-offs that would remain hidden in standard interviews or questionnaires. Players are confronted with concrete situational choices often under conditions of uncertainty or limited resources, which simulate the constraints of real-life land management. By comparing responses across different scenarios, it becomes possible to identify not only which instruments are generally preferred, but also under what conditions and by which types of landowners they are seen as acceptable or feasible.

A third objective is to stimulate reflection and learning both for players and for researchers. For players, the game introduces unfamiliar innovative business models (policy instruments) in a low-risk environment, enabling them to explore their implications before encountering them in real-world policy. For researchers and policymakers, the game generates qualitative insights that support the refinement of business model proposals, adapted to local realities and motivation drivers. The interactive format helps to identify barriers to implementation, such as lack of trust, perceived administrative burden, or doubts about long-term returns.

Finally, the game also functions as a participatory co-creation tool, where the feedback from players (through their actions and subsequent discussion) directly contributes to the iterative development of policy recommendations. This aligns with the overall aim of WP3 to integrate stakeholder knowledge and preferences into the design of effective, acceptable, and transferable solutions.

4.2.2 Game mechanisms to test NBS acceptance

The aim of the game is to make conclusions about the willingness and motivation of private landowners to implement climate change adaptation measures. This places the game within the context of NBS acceptance, which encompasses a variety of factors that influence how people perceive, support or reject NBS.

Previous work in LAND4CLIMATE therefore highlights the relational and process-related factors associated with the acceptance of NBS (see Deliverable 2.4 and Deliverable 2.5). Deliverable 2.5 therefore establishes a multidimensional understanding of NBS that takes into account not only relevant influencing factors such as trust and governance, awareness-raising about NBS and economic factors, but also social and cultural factors.

> *"Acknowledging this important correlation between public and social acceptance, for LAND4CLI MATE, we adopt an expanded understanding of public acceptance – encompassing not only local communities and citizens but also local stakeholders and landowners. This approach goes beyond*

> *attitudinal perspectives to consider the roles of processes, governance, and trust (see Section 4.2). Acceptance is recognised not as a binary outcome, but as a socially embedded and evolving negotiation among diverse actors (see Section 4.4).”* (Brogno et al. 2025: 40)

An important prerequisite for the game is therefore to limit it to a few mechanisms that can be tested in the game. To this end, the focus will be on economic incentives that will control the game play. In this way, individual game decisions become the starting point for discussing these decisions in the subsequent group discussion. In order to make statements about the acceptance of the policy measures, only the decisions made in the game itself can be taken into account. This is to avoid generalising the results to public acceptance in general, which could lead to unverifiable conclusions about other factors of social acceptance.

Rather, the hypothetical game scenarios are intended to provide landowners with a space to discuss issues relating to their individual willingness to adapt to climate change *per se* and to highlight the potential of policy instruments based on these assessments. No further scalable statements will be made about the relevance of the game decisions for NBS acceptance in the FFRs and other application contexts.

4.2.3 Hypothetical scenarios

To explore the acceptability and potential implementation of policy instruments across diverse land use contexts, the game is structured around three distinct hypothetical landscape scenarios, each reflecting specific environmental risks, landowner motivations, and governance challenges. These scenarios represent typical situations faced by private landowners in Central and Eastern Europe and serve as the contextual backbone for decision-making within the game.

Within each hypothetical scenario, the game unfolds over several rounds (game turns), during which players representing private landowners are confronted with evolving environmental challenges and are given opportunities to respond through the implementation of various policy instruments. Each round introduces a new situation or decision point, reflecting either increased climate risk or an opportunity to change land management.

In each round, a single policy instrument is offered to each player, along with a short explanation of its function, conditions, and expected consequences. The instrument is always introduced by an "agent", a fictional representative of an institution or organization that, in real-world contexts, would be responsible for delivering or facilitating that specific measure. The goal is to simulate realistic communication and negotiation patterns while simplifying the complexity for gameplay.

After each offer is presented, players must decide whether to accept, reject, or renegotiate the proposed deal. Their choices influence both their own game outcomes (e.g., environmental score, economic return, social perception) and the collective development of the scenario landscape. This structure ensures that individual preferences and priorities are captured, while allowing for structured comparison across players and rounds.

1. Peri-Urban Landscape: Flooding and Soil Erosion

This scenario represents the transitional landscape between urban settlements and open countryside typically composed of small-scale agricultural plots, scattered residential developments, and remaining fragments of semi-natural habitats. In this context, the main risks addressed are flooding from adjacent rivers and land degradation due to soil erosion on sloped or poorly managed parcels.

Players in this scenario must consider how their land management decisions including the implementation of different NBS, which can contribute to flood risk mitigation and landscape stability. This scenario includes five owners who own various plots of land differing in size (from 1 to 6 ha), slope, and current use (arable land vs. meadows and pastures) (Figure 3). This scenario highlights tensions between agricultural productivity, and public safety, making it ideal for exploring policy instruments. For each plot, one type of NBS is proposed as ideal (Table 1). Their possible implementation is shown in Figure 4.

Figure 3. Illustration of the initial situation for hypothetical scenario 1, highlighting the land owned by individual players (Design: Matouš Bělohoubek)

Landowner	Land area	Current land usage	Possible measures
Landowner A (local commercial farmer)	5.0 ha	Arable land (intensive farming)	Polder
Landowner B (rents the land to a farmer)	1.0 ha	Arable land (intensive farming)	Baulks with trees and shrubs
Landowner C (rents the land to a farmer)	1.7 ha	Meadow/pasture	Agroforestry
Landowner D (smallholder farmer)	3.0 ha	Arable land (extensive farming)	Exclusion of crops such as corn
Landowner E (rents the land to a farmer)	6.0 ha	Meadow/pasture	Meanders and Wetlands

Table 2. Overview of land and possible measures

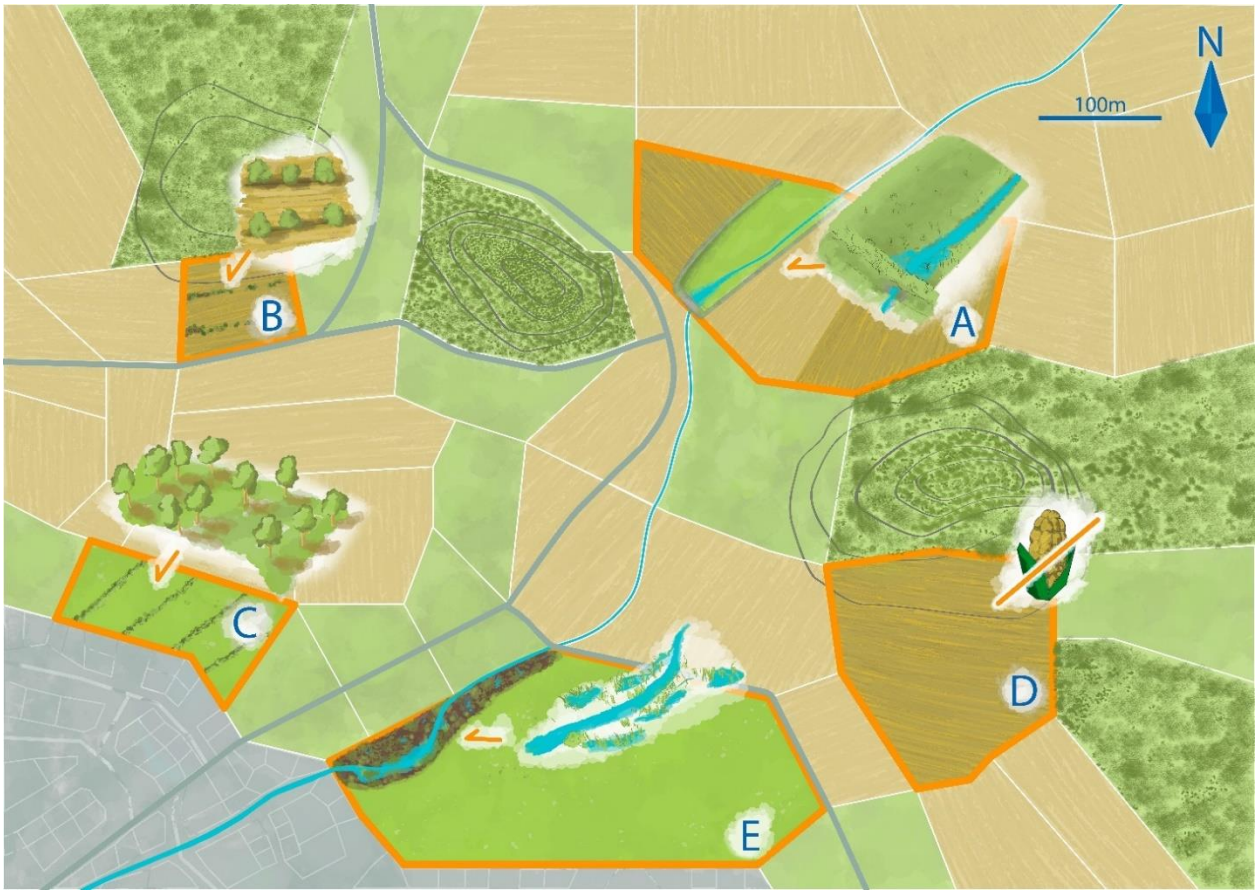

Figure 4. Initial situation for hypothetical scenario 1 with possible measures assigned (Design: Matouš Bělohoubek)

In addition to the players, the first scenario involves three types of agents, who will be represented in the game by a second moderator.

- Municipal agent introduces tools such as subsidies or land swaps, representing the role of local authorities aiming to enhance local climate resilience.
- State agent offers instruments like land compensation, reflecting public efforts to mitigate environmental losses through targeted compensation schemes.
- Corporate agent represents companies involved in biodiversity offsetting or private PES, seeking collaboration with landowners to fulfill environmental or regulatory obligations.

Only in the case of Transferable Development Rights, players engage in direct negotiation with one another allowing them to explore a peer-to-peer transaction dynamic where one landowner's restriction enables another's development potential.

2. Urban Environment: Heatwaves and Pluvial (Flash) Flooding

This scenario focuses on inner-city or suburban areas where land is already highly urbanized or sealed. Here, the challenges are driven by extreme heat events (urban heat island effect) and/or potential flash flooding caused by intense rainfall and insufficient drainage infrastructure. Private landowners may include owners of residential gardens, commercial properties, or unused vacant plots (see Figure 5).

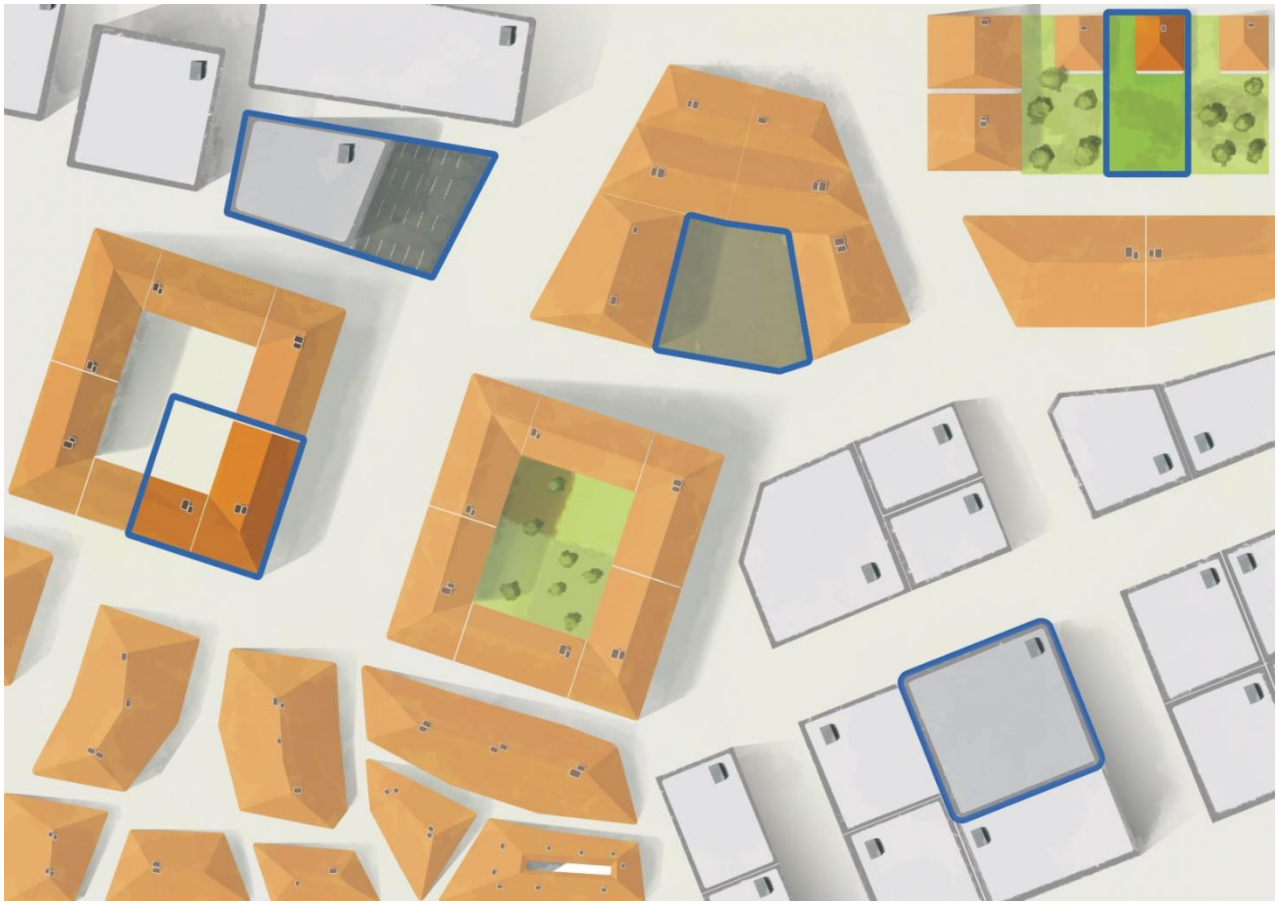

Figure 5. Illustration of the initial urban situation for hypothetical scenario 2, highlighting the land owned By individual players (Design: Matouš Bělohoubek)

The game places players in situations where they can implement green infrastructure elements such as green roofs, rain gardens, tree planting, or replacement impermeable surfaces with permeable ones (Table 3 and Figure 6). Main goal is to consider how these may be supported by targeted instruments. The scenario also opens space for discussing non-financial incentives, regulations, or public-private partnerships. Instruments such as subsidies, private PES schemes, or TDR may be particularly relevant here.

Landowner	Description – initial situation	Possible measures
Landowner A (Apartment Building with Courtyard)	Multi-unit rental apartment building with internal courtyard, currently used partly for parking	Rainwater retention and courtyard greening
Landowner B (Mixed-Use Building with Medical Practice)	Mixed-use building with private medical offices (including owner's) on lower floors and rental flats above suffered from summer overheating	Green roof
Landowner C (Retail Building with Asphalt Parking)	Ground-floor household electronics shop with private asphalt forecourt for parking	Potential for permeable redesign and greening

Landowner D (Vacant Development Plot)	Currently undeveloped urban plot, maintained only through seasonal mowing	Nature-based urban development
Landowner E (Detached House with Sloped Garden)	Private house with large, partially sloped garden poor maintained	Creation of terraces and planting of trees and other greenery

Table 3. Overview of landowners and possible measures

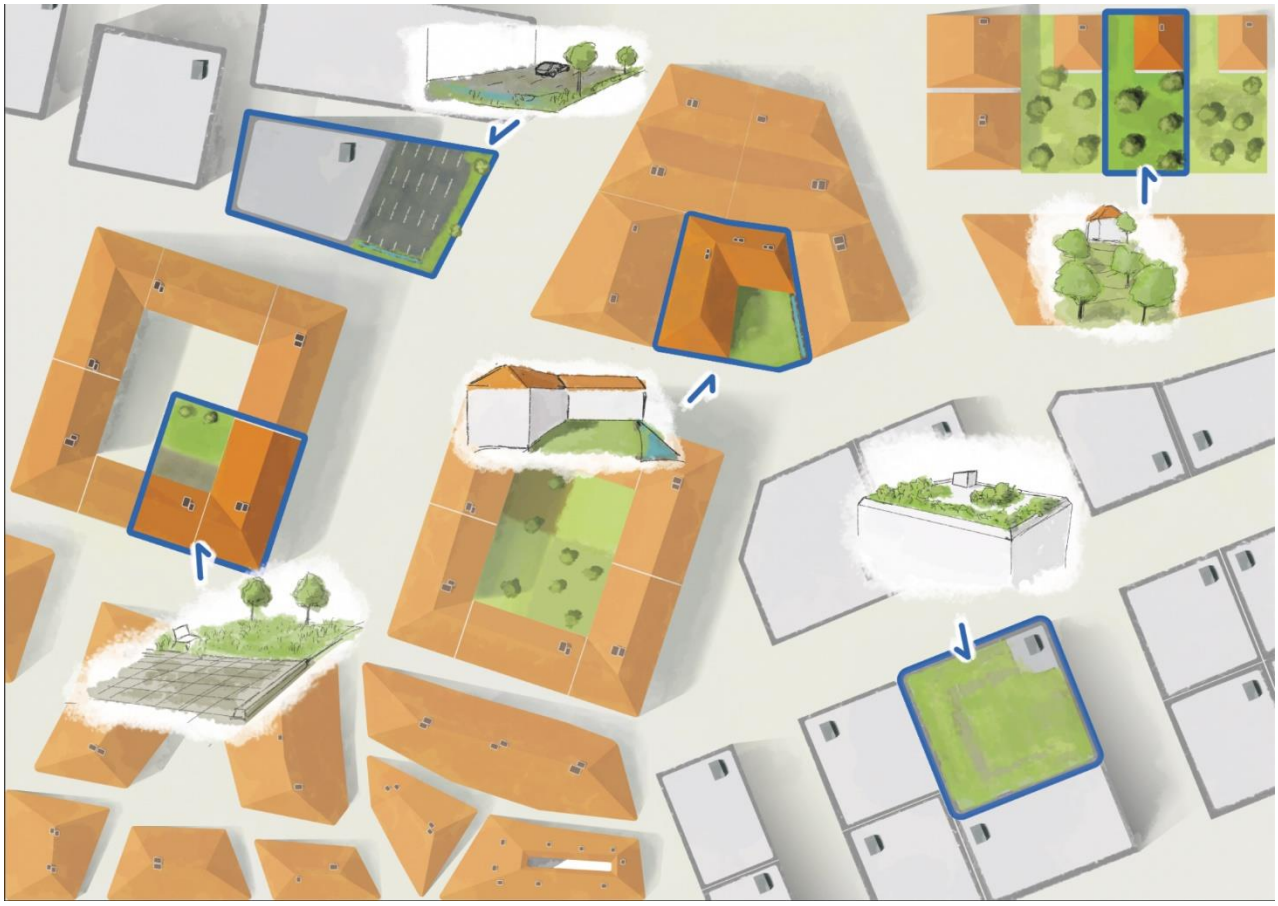

Figure 6. Initial urban situation for hypothetical scenario 2 with possible measures assigned (Design: Matouš Bělohoubek)

As in the previous scenario the scenario involves three types of agents, who will be represented in the game by a second moderator.

- Municipal agent providing subsidies, representing local authorities' efforts to improve urban climate resilience through support for green roofs, tree planting, or permeable surfaces.
- Corporate agent represents companies involved in biodiversity offsetting or private PES schemes, offering financial support to property owners who implement nature-based solutions that compensate for environmental impacts elsewhere.
- Utility agent (e.g. water or energy companies) acts within private PES schemes, seeking collaboration with property owners to implement measures that improve stormwater retention or reduce heat stress in urban areas.

Only in the case of Transferable Development Rights, players negotiate directly with one another simulating a peer-to-peer exchange where one owner agrees to forgo building capacity in exchange for compensation, while another benefits from increased development potential.

3. Rural and Natural Landscape: Wildfires and Drought

Set in remote, extensive, or marginal lands such as forests, pastures, or abandoned agricultural areas, this scenario addresses increasing risks of wildfire and long-term water scarcity (drought). Players must evaluate how different management strategies such as controlled grazing, fuel break establishment, forest thinning, or water retention interventions can reduce vulnerability to these hazards.

Because these areas often generate limited direct economic return, the scenario explores the potential of innovative business models such as biodiversity offsets, land compensation, or PES schemes. It is particularly suited for investigating motivations of landowners who may be passive, disinterested, or economically constrained in their engagement with climate resilience strategies.

As in the previous scenarios the scenario involves three types of agents, who will be represented in the game by a second moderator.

- Municipal/regional agent introduces subsidy schemes aimed at supporting firebreak creation, agroforestry systems, or the planting of drought-resistant vegetation, reflecting the role of local governments in building landscape-level resilience.
- State agent offers land compensation instruments, targeting areas where natural values are being lost due to increasing climate pressures and where ecosystem restoration is needed to maintain public environmental goods.
- Corporate agents represent companies involved in biodiversity offsetting or private PES mechanisms, providing funding for landowners to maintain or enhance landscape features that reduce wildfire risk or improve water retention.

Only in the case of Transferable Development Rights, landowners engage in direct negotiation, where one party agrees to preserve high-risk or ecologically valuable land, enabling another to intensify land use in a lower-risk zone.

4.3 Game process

The following section describes the structure and sequence of the serious game as it is aimed to be used in direct interaction with stakeholders. The individual steps of the game are presented, along with how the various policy instruments are operationalised for the game. It is explained how these instruments can be used and tested in a playful manner, based on the defined characteristics of land ownership and the roles assigned to the players.

4.3.1 Gaming conditions and framework

4.3.1.1 Game mechanism

The game mechanism unfolds through playing through various game scenarios, which include negotiations on the policy instruments to be tested. It is a **role-playing game guided by economic incentives**. The game is based on **decision-making and negotiation**, where a relatively large

degree of freedom is allowed – **the rules are therefore not tightly binding**, but open up various modes of action and communication.

The general game mechanism consists of the hypothetical presentation of one negotiation scenario per round, each of which relates to one of the five politically supported promotion sce-narios for NBS implementation. The aim is to challenge and test the landowners' willingness to negotiate the basic conditions for possible implementation of the measures.

The given land for the landowners is asymetric. Each player will receive a description card about their land holdings, which will be assigned to them at random. The players will retain ownership of their land through the rounds of the game. The plan is for each scenario to be played once, but twice if possible in terms of time resources. In the negotiation situation, the landowners negotiate with a fictional businessman or municipality leader and have two options:

- *to continue in current land use*
- *to adapt (accept the offer)*

After each round, participants are asked whether a decision differs from the previous round. This allows previous decisions to be indirectly revoked.

4.3.1.2 Cross-scenario game concept and game consistency

As an essential component of game immersion, each scenario is linked to a location on the (city) map. The (city/land) map is central to the players' orientation in the hypothetical space of the addressed properties. In this way, the following **characteristics of the fictional game environment** are identified and highlighted for the players:

- the asymmetry of the different properties (linked to different land use options and manage-ment costs);
- it‘s locations (in visible proximity to adjacent areas, e.g. for housing or public places);
- the importance of the area for public urban areas;
- the interconnection of the areas within the municipality, which is directly and indirectly affected by various environmental impact scenarios.

Each game round will deal with one scenario (policy instrument application, see section 4.3.2.3) The sequences therefore begin with short videos showing two perspectives:

- someone with a **specific and explicit interest in the implementation of an NBS** (landowner, business or municipality),
- and someone who is **able to give the necessary economic effects** resulting from the application of the respective policy instruments.

At the end of each round of the game, the players will see the implementation of nature-based solutions in relation to land use on the original property. The visualisation is linked to the **specific characteristics of the negotiation situations**:

1. economic incentives (to bear the costs of land use change through NBS)
2. property rights (which are important for negotiations, for example in the context of land swaps)
3. possible mitigation effects of environmental happenings (which address the purchasing and usage behaviour of landowners)
4. collaboration with landowners (to fulfil environmental or regulatory obligations and intentions)

In this way, a short story becomes visible in each scenario. After negotiations between landowners, corporate agents and state agents have been completed, there will be a link back to the incentives. In most scenarios, this means that landowners will receive money if they agree to the adjustments, followed by a short preview of the consequences that climate change adaptation has for the relationship between each landowner and the residents of the city. This will be done by **presenting participants with a fictional newspaper article after each round of the game**, which will represent the future environmental impacts, taking into account the adaptation measures that have been negotiated in each round (see section 4.3.2.4). This way, the **socio-economic impact that decisions have on urban society** will be shown. For example, it could become clear which properties are affected by a flood disaster and what impact this will have on the public urban area.

4.3.1.3 Group setting and role descriptions

The group of people participating in the game is divided into two groups. These two groups form the two relevant player agencies, i.e. the two player positions, which are equipped with the same possibilities to actively shape the course of the game. No additional moderators are called in for each round so that everyone will be part of the game.

- *1. type of player:* Landowner play landowners
- *2. type of player:* Moderators play business/municipality (as providers)

Depending on the number of players, groups of different sizes can be formed. **There are various options for varying the types of property and scenarios dealt with in the game:**

1. The number of scenarios to be played can vary depending on the time available in each stakeholder meeting. For example, in some cases, only three scenarios can be played, while in others four or five can be played. Game playing can thus selectively incorporate land properties that most closely resemble the real circumstances of the participants within their neighbourhoods.
2. Furthermore, they can also be varied according to the environmental risks to be avoided that correspond to the real background of the participants.
3. The game playing situation is also flexible to react reflecting on the legislation different possibilities for the feasibility of measures in the respective country.
4. In addition, it is possible to divide the landowner roles between landowners in cities and those with agricultural land, insofar as there are differences between urban and rural areas in terms of land use and the associated risk situation for environmental events.

Similarly, the variability of contextualize the hypothetical game situations refers to the degree of commitment to the moderator roles, which covers the roles of the business and municipality representatives.

5. The options relate to the active roles in each game situation. For example, three moderators can act in each game round, inculding one person representing the community, another representing an entrepreneur and a third person moderating the interaction. This mainly plays a role in scenarios where land swaps and compensation measures are involved.
6. Moderators who represent the community's perspective are subject to strict restrictions regarding their willingness to sell or give away land. (Decisions include clear decisions such as: subsites - yes or no, compensation - yes or no, tradable rights - yes or no. In the case of land swap transactions, the land will only be provided with approval of the exchange.)
7. Depending on the scenario, it will also be determined whether business representatives will participate passively, observe all scenarios, or whether the game scenarios will represent safe spaces in the respective negotiation constellations.

4.3.1.4 Interaction mode

The interaction mode of the various game rounds is linked to the goal of using hypothetical scenarios to spark communication about the policy instruments. This interaction type aims at revealing the preferences of the players in an environment that is not directly linked to economic or social constraints or decision-making chains in land use issues. Therefore, the game-play in each round represents a situation in which every participant (player and moderator) is invited to “fight” symbolically and performatively arguing about the “romance” of the instruments.

The playful interaction should therefore enable realistic negotiation of the benefits of policy adaptations based on economic incentives. At the same time, this should be as far removed as possible from economic calculations and assumptions from specific problem-solving scenarios in the past, which the participants may have perceived as impossible to communicate or to successfully being negotiated.

The analytical aim of the game is therefore not to quantitatively categorise or scale up the landowners' behaviours with implementing NBS, as they are associated with multiple positive or negative assumptions and experiences about NBS. Instead, the focus is on examining the possible consequences of the decisions in the hypothetical game environment and relating them to the observed acceptance of policy-based implementation measures.

4.3.1.5 Analytical goal

Successful game interaction requires that there are conflict issues in every round. Landowners recognise themselves in specific adaptation issues:

- either they're negatively affected or indirectly negatively influenced by (a lack of) adaptation measures,
- or/and they reflect on their own decision-making in game situations, which may have led to a mitigated impact of individual environmental events despite economic expenditure to implement adaptation measures.

On this basis, we expect the participants to express considerations about their willingness to accept policy instruments used in the game. This makes it necessary to discuss the players' perceptions and impressions of the hypothetical game situation with them after the game play (see section 4.3.3) and conclude it’s comparability into the real world (see section 4.3.4).

Three dimensions are central to analytical conceptualisation:

1. Contextualisation of NBS acceptance:

One approach to gaining insight into the feasibility of policy instruments is to relate climate change impact or risk to individual willingness to implement protective measures:
Which business models work (beeing communicated situationally between landownders and the opposite part), which not?

The following dimensions are key here:

- Situate the decisions made by players in hypothetical urban areas: How do residents relate their play decisions to the spatial, economic and social characteristics of the hypothetical city?
- Neighbourliness and interdependencies that become apparent in this hypothetical space: Do landowners take into account the impact on other landowners and public infrastructure (e.g. in relation to different types of land use and between private land properties and public spaces)?
- Socio-economic context: How are economic decisions weighed up in light of their social impact in the event of devastating environmental events?

2. Testing the limits of the feasibility of individual policy instruments:

The aim of the determinative decision-making situations in the game is to test whether people are willing to overcome barriers or to “remove” them. This reveals fundamental attitudes in the respective stakeholder constellations towards the practical applicability of the policy instruments.

3. Examine the influence of external effects on decision-making:

The implementation of the policy instruments discussed as innovative business models involves a number of externalities that could, for example, hinder their feasibility. These should be taken into account by adding a few elements into the discussions about the outputs of the game. The aim is to examine the extent to which the willingness to adapt measures is influen-ced and, if necessary, reduced by procedural characteristics.

Several sub-tasks will mentioned in the group discussion and participants are asked which ones are important for their purposes. For example, the moderators will mention: ‘If you apply for subsidies, you need to fill out the application.’ This serves to show that it can be a laborious process to implement a policy instrument into one's own land use.

The following restrictions may play a role here that do not appear in the negotiation itself:

- Application procedures as a possible restriction for submitting applications (applies to: subsidies);
- Lack of knowledge about measures taken by other landowners;
- Further political or economic support measures or funding beyond the five policy instruments;
- Further factors to be determined.

4.3.2 Steps and elements of the game play

4.3.2.1 Opening

The game-play scenario begins with an illustration and visualisation of the types of land (using a designed map of the hypothetical area) and a presentation and explanation of the policy instruments used in the game. In addition, players are given an initial insight into the basic feasibility of NbS adaptations through short video clips. The clips will feature people who **1)** have experience with environmental events that have had an impact on the entire city area and **2)** demonstrate possibilities for NbS implementation within the framework of the policy instruments and also have the financial resources and implementation options at their disposal.

Pitching scenarios:

- each scenario comes up with a position on a (**city/land) map**
- each scenario (policy instrument application) will show a short **animation video**

Creating videos:

1. video about one person who would really benefit from the effects of policy instruments, it represents the “suffering” (e.g., of a farmer who searches for subsidies after suffering an environmental disaster that has destroyed the land)
2. another person who could provide the effects (business person/state funding actor)

The short explanatory videos are designed to introduce players to the game situation and give them an initial opportunity to think about the importance of their own land holdings for climate adaptation measures. The opening sequence demonstrates how the policy instruments used in the game can enable the feasibility of NbS. At the same time, this fictional “consequence assessment” opens up the economic framework of the game itself. It shows that there are two central interest groups who are opposed to each other but potentially can work together: someone who would like to invest in policy-driven NbS measures on one side, and on the other side someone who possibly welcomes the effects of the policy instruments for adaptations on their own land. The first player willing to invest (a company or municipality representative) can for instance approache the landowner and ask for offsets, thereby initiating a potential cash flow. This dynamic intents to highlight the various interest groups and addresses the central conflict that is intended to drive the game as a whole: the consideration and reflection of pos-sible consequences, that the decisions of the landowners can have on the hypothetical city.

With both every **action** and **inaction** towards a potential application of the policy instruments, the players determine a possible output for the city. This decision may be reflected in the concret impact on future environmental disasters (such as flood disasters) in the hypothetical area. This way, the players are introduced to the game mechanism by illustrating that the implementation of policy instruments can reduce the risk of negative environmental impacts.

4.3.2.2 Individual Questionaire

In the next step, a questionnaire will be distributed to the landowners participating in the game. The aim of the questionnaire is to determine the status of each player-landowner in the real world. It asks

what type and amount of land is owned by the player and what the purposes of the landownership are, etc.

The central categories of questions cover the following topics:

1. Thinking on your land ownership: How do you currently assess the risks that climate change could have on it?
    - *Directly affected:*
      you are flooded? Fires? Heat waves? Health impacts? Economic impacts?

      Please explain: _____
    - *Indirectly affected:*
      Quality of life? Use in everyday life? Economic impacts?

      Please explain: _____
2. What type of land do you own? (multiple choice)
    - **O** agricultural land
    - **O** housing
    - **O** wetlands
    - **O** forest
    - **O** *etc.*

- Where is the land you own? (multiple choice)
    - **O** municipality land
    - **O** affluent suburbs
    - **O** agricultural/forestry land near to city
    - **O** agricultural/forestry land far to city
- *Area of land owned:*
  How many hectares (ha) do your properties cover? (Please specify separately for each property.)

  Please explain: _____
- Are you satisfied with the current state of property's adaptation to climate change in your municipality/administrative region?
    - **O** yes
    - **O** rather yes
    - **O** neutral
    - **O** rather no
    - **O** no
    - Are measures implemented only on property owned by municipality/state?

      Please explain: _____
    - Should also private owners be included?

      Please explain: _____

- Are you satisfied with the instruments provided (we don't distinguish among local/regional/national instruments), which supported the implementation of measures?

  Please explain: _____

- Are you feeling responsible for adaptation/mitigation of climate change?

  Please explain: _____

- *Ask for a personal assessment and possible preconceptions:*
  In case you own different land properties: Which of them is for you most useful?

  Please explain: _____

4.3.2.3 Example of game material related to the game scenario 1 for peri-urban landscape: Flooding and Soil Erosion

The game itself consists of playing through the individual measures. The playing cards shown below are handed over to the participants in the respective rounds. The cards shown here are based on the figures used for the first test runs of the game. Both the landowner cards used per scenario and the determination of the initial and annual costs can be adjusted according to the regions and EU countries in which the game is played. Based on the game structure described in this deliverable, a game protocol with detailed scripts and step-by-step instructions will be created. This will enable LAND4CLIMATE partners to run games with participants in their regions.

4.3.2.3.1 Public Grant for Nature-Based Measures (Subsidy)

Principle: *landowner receives funds from the city/state and implements measures in return*

Players: *3-5 landowners (players) and 1-2 municipality representatives (moderators) who possibly provide subsidies*

Cards used for this round are presented in Figure 7.

Landowner A:	S1
Options:	
1. to continue in current land use	2000 EUR
2. to create a polder on your land (0.2 ha)	
Initial costs:	85000 EUR
Public Grant:	85000 EUR
New annual income:	1940 EUR

Landowner D:	S1
Options:	
1. to continue in current land use	1200 EUR
2. to change the crop rotation (exclusion of crops such as corn)	
Initial costs:	200 EUR
Public Grant:	200 EUR
New annual income:	1100 EUR

Landowner B:	S1
Options:	
1. to continue in current land use	400 EUR
2. to build baulks with trees and shrubs (0.075 ha)	
Initial costs:	3600 EUR
Public Grant:	3600 EUR
New annual income:	370 EUR

Landowner E:	S1
Options:	
1. to continue in current land use	1200 EUR
2. to create a wetland (0.75 ha) managed by the municipality	
Initial costs:	60000 EUR
Public Grant:	60000 EUR
New annual income:	1050 EUR

Landowner C:	S1
Options:	
1. to continue in current land use	320 EUR
2. to introduce agroforestry (rows of fruit trees - 0.5 ha)	
Initial costs:	2500 EUR
Public Grant:	2500 EUR
New annual income - first 3 years:	240 EUR
New annual income - after 3 years:	400 EUR

Figure 7. Options of all players represented landwoners in form of game cards in case of subsidies

4.3.2.3.2 Land swap

Principle: *landowner exchange land with the municipality with the aim of acquiring land on which adaptation measures will be implemented.*

Players: *3-5 landowners (players) and 1-2 municipality representatives (moderators) which possibly invests in the measures*

Cards used for the round focusing on land swap are presented in Figure 8. There are different levels of offer from the municipality side (see Table 4).

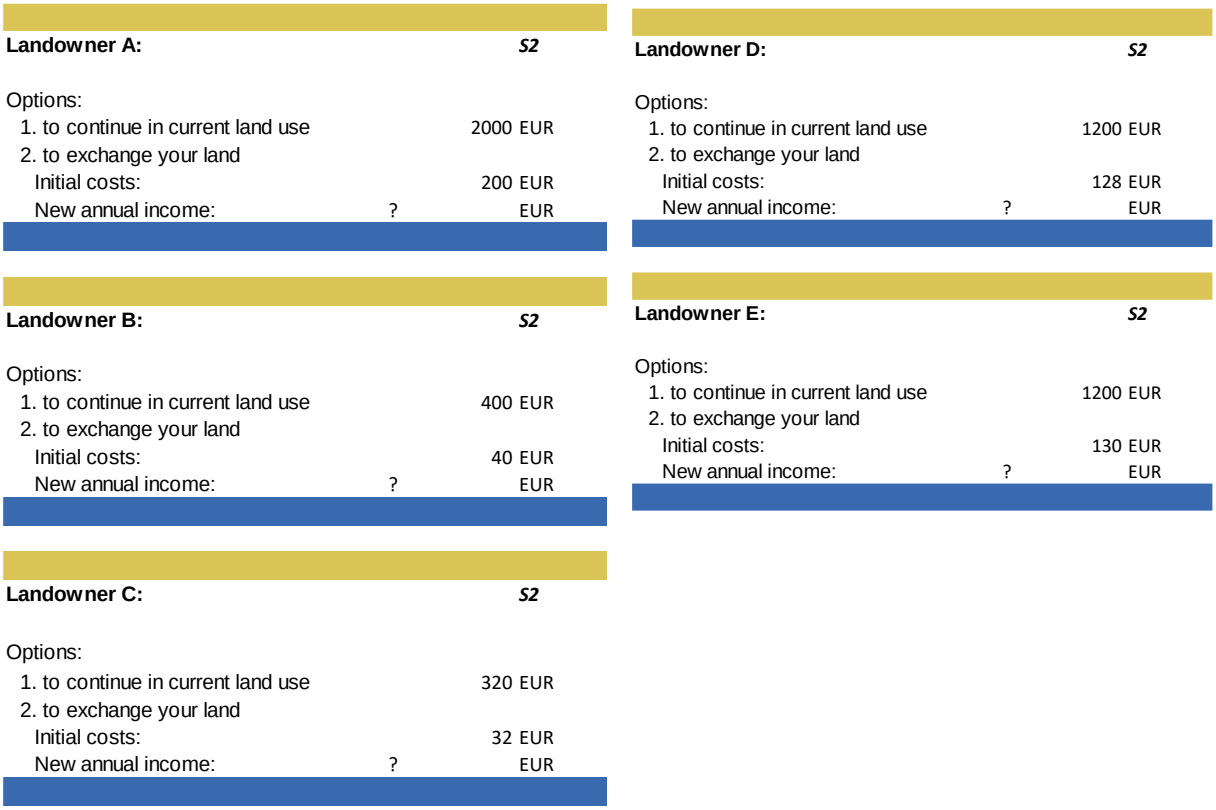

Figure 8. Options of all players represented landwoners in form of game cards in case of land swap

Land-owner	Current state	Offer Level 1 (default)	Offer Level 2
A	5.0 ha; Arable land; Annual income: 2000	5.2 ha; Arable land; Annual income: 2080	1.5 ha; Arable land; Annual income: 600; suitable for housing
B	1.0 ha; Arable land; Annual income: 400	1.2 ha; Arable land; Annual income: 480	1.4 ha; Arable land; Annual income: 560
C	1.7 ha; Pasture; Annual income: 320	1.8 ha; Pasture; Annual income: 360	1.2 ha; Arable land; Annual income: 480; suitable for housing
D	3.0 ha; Arable land; Annual income: 1200	3.2 ha; Arable land; Annual income: 1280	3.5 ha; Arable land; Annual income: 1400
E	6.0 ha; Pasture; Annual income: 1200	6.5 ha; Pasture; Annual income: 1300	3.0 ha; Arable land; Annual income: 1200; in future suitable for housing

Table 4. Overview of potential offers from the city for land swap

4.3.2.3.3 Biodiversity offsetting

Principle: *landowner receives funds from the company for implementation and maintenance of measure which compensate*

Players: *3-5 landowners (players) and 1 entrepreneur (moderator) who possibly invests in the offset*

Cards used for the round focusing on offsets are presented in Figure 9.

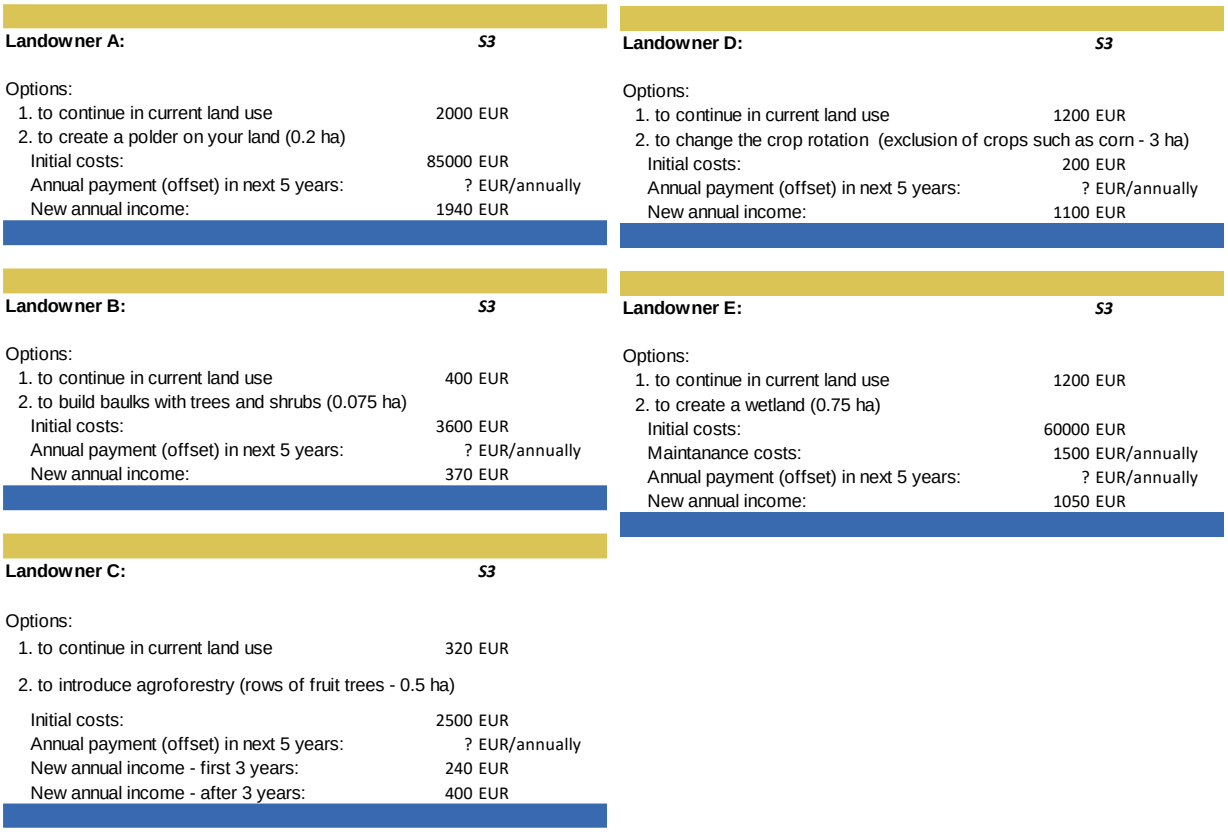

Figure 9. Options of all players represented landwoners in form of game cards in case of biodiversity offsetting

4.3.2.3.4 Land compensation for lost nature-based values

Principle: *Landowners are paid by landowners, municipalities or state agency from different areas to implement actions that restore or enhance ecosystem services that effectively replace the lost value in the area of the financiers.*

Players: *3-5 landowners (players) and 1 representative of state agency (moderator) who mitigates environmental losses through targeted compensation schemes.*

Cards used for the round focusing on land compensation are presented in Figure 10.

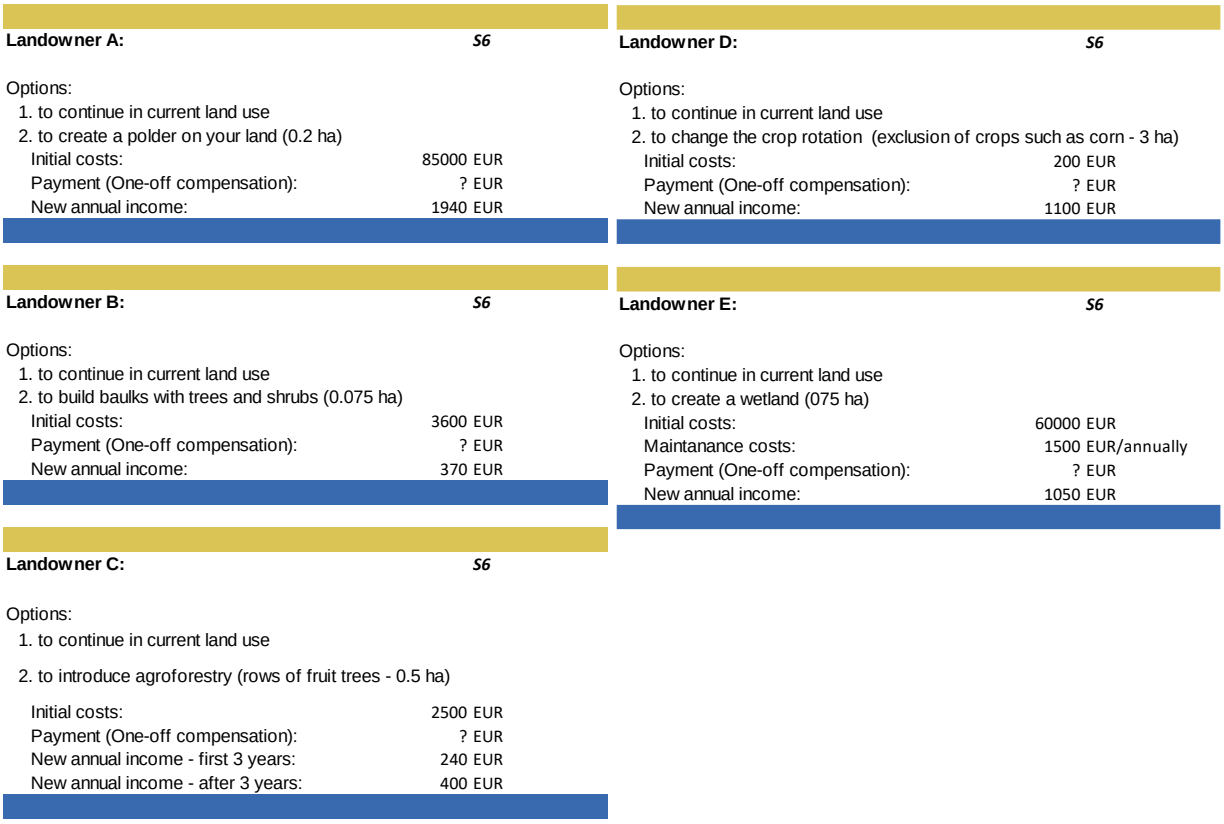

Figure 10: Options of all players represented landwoners in form of game cards in case of land compensation

4.3.2.3.5 Transferable development rights (TDR)

Principle: *Landowners A-D can sell their unused development rights to other landowner E, who may use them to develop own land.*

Players: *3-5 landowners (players), one of them plays the role of owner E, who can use the land for new housing*

Cards used for the round focusing on land compensation are presented in Figure 11.

Landowner A: *S7*

Options:
1. to continue in current land use
2. to create a polder on your land (0.2 ha)

Initial costs:	85000 EUR
Payment from Landowner E	? EUR
New annual income:	1940 EUR

Landowner B: *S7*

Options:
1. to continue in current land use
2. to build baulks with trees and shrubs (0.075 ha)

Initial costs:	3600 EUR
Payment from Landowner E	? EUR
New annual income:	370 EUR

Landowner C: *S7*

Options:
1. to continue in current land use
2. to introduce agroforestry (rows of fruit trees - 0.5 ha)

Initial costs:	2500 EUR
Payment from Landowner E	? EUR
New annual income - first 3 years:	240 EUR
New annual income - after 3 years:	400 EUR

Landowner D: *S7*

Options:
1. to continue in current land use
2. to change the crop rotation (exclusion of crops such as corn - 3 ha)

Initial costs:	200 EUR
Payment from Landowner E	? EUR
New annual income:	1100 EUR

Landowner E: *S7*

Options:
1. to continue in current land use
2. to negotiate agrrement with other owners for a partial reduction

Pottential new annual income:	45000 EUR

Figure 11. Options of all players represented landwoners in form of game cards in case of TDR

4.3.2.4 Output of Game decisions: Impacts/Risks

An essential component of the game mechanism is that decisions and negotiations in hypo-thetical scenarios are not tested as an end in themselves. Instead, the measures are taken in conjunction with an awareness of their possible usefulness in real-world scenarios. Therefore, after each round of the game, the impact of the decisions is presented, which is shown by the extent of destruction to be expected in the respective city areas of the participating landowners.

The extent of this fictitious consequence/impact assessment is based on the ratio of land-owners who have agreed or disagreed to the implementation of the respective measure. If, for example, several landowners have agreed to a nature-based adaptation measure on their property, the impact shown will reveal significant effects of mitigation of otherwise potentially catastrophic flooding and erosion. To determine the extent, an impact matrix will be created specifically for each climate risk.

After each round, participants are asked whether a decision differs from the previous round. This allows previous decisions to be indirectly revoked. In this context, highlighting the possible consequences plays a decisive role. The potential scope of individual decisions in the game is to be presented to the group of players, demonstrating the ecological and socio-economic ‘criticality’ of decisions that may be associated with a low approval rate for land use change.

The aim of visualizing impact thus is to create opportunities to discuss the game participants' preferences and acceptance of the measures - with implications beyond their own property. This includes addressing the following controversial issues that may be discussed between landowners:

- The role of private and public land affected, as revealed in the impact assessment;
- Disputes between landowners who are affected to varying degrees by the impact, either directly or indirectly;
- Perceived inequality about who benefits most from the successfully implemented measures;
- Perceived inequality regarding who is responsible for promoting climate resilience in urban society and how much weight is given to this responsibility when the negative effects are severe;
- Conclusions about the economic role of private and public landowners in avoiding a predicted disaster as far as possible.

In this way, the inclusion of the impact assessment provides a basis for the analysis question: **Would landowners raise money for the subsidies or not?**

In order to differentiate between the various degrees to which landowners are affected, the possible impacts are divided into different categories and presented in the form of newspaper articles based on the results of the individual rounds of the game. A distinction is made between:

- Environmental events (e.g. erosion, flooding, heavy rainfalls): *occurred* vs. *did not occur*
- Implementation of measures: *yes* vs. *no*
- Long-term effects: *impact today* vs. *impact in 10 years*

The following grid determines the risk of environmental damage, which, in conjunction with the degree of destruction from the impact matrix, determines the scenario that is shown after each round of the game:

1. [heavy rainfall] **event has occurred** + the measures **were implemented** = **no high risk**
    - conclusion for current impact
    - conclusion for Impact in 10 years
2. [heavy rainfall] **event has occurred** + the measures **were not implemented** = **high risk**
    - conclusion for current impact
    - conclusion for Impact in 10 years
3. [heavy rainfall] **event has not occurred** + **the measures were implemented** = **no high risk**
    - conclusion for current impact
    - conclusion for Impact in 10 years
4. [heavy rainfall] **event has not occurred** + the measures **were not implemented** = **high risk persists**
    - conclusion for current impact
    - conclusion for Impact in 10 years

The specific examples briefly described in the newspaper articles are currently being develop-ed and visualised by a graphic designer. Depending on the background of the participants, headlines will be selected that have a realistic impact on the real region from which the players come.

4.3.3 Group discussion

Once the individual rounds of the game have been completed, the stakeholder workshop moves from the gaming phase to a feedback and discussion phase. In an initial round of open dialogue about the policy instruments, the aim is to pick up on the participants' experiences from the game and acknowledge them as actions that have no influence on relevant decisions in the real world.

The aim of this approach is to draw attention to the relevance of the hypothetical scenarios in real-life applications without introducing limiting factors at this stage, such as legislative, political or financial considerations and knowledge. For this reason, the quality or 'richness' of the gaming experience should be enhanced through the use of high-fidelity graphics and media that create an impact that sets the content apart from competing sources (Wortley 2015: 51). Therefore, there should be a feedback loop and discussion about the impressions participants gained based on the visualisations of the map and the newspaper articles. In this context, the 'free' gaming experience should be valued by the moderators as a space for experimentation and a safe space, without directly asking about consequences for real-life implementation scenarios. Instead, the focus is on whether the participants are actually convinced by the hypo-thetically presented measures.

1. The discussion should therefore explore two dimensions:

- Applicability of measures and the policy instruments used in game (hypothetical dimension)
- Willingness to accept policy instruments used in game (real conclusions)

The focus of the discussion is narrative and should be used to facilitate qualitative data analysis. The following questions and suggestions will be integrated into the discussion:

2. Feedback on gaming experiences:

- Were you surprised? How hypothetical were the situations for you? Or were you already familiar with such negotiations?
- Has a particular measure caught your attention? Who might find it interesting? (Focus not on your own land ownership)
- How does the map strike you? Do the impact scenarios make you feel as if the municipality is at risk if no measures are taken?

3. Abstract assessment of the public usefulness of policy measures:

- A part of the hypothetical city in the came is, that erosion in the vicinity has increased the risk of flooding for the city. What you think: What is the best way to support the policy instruments that can contribute to the elimination of flooding/erosion?

4. Reflection on decision-making in hypothetical situations:

- *Please imagine:*
  You are responsible for city planning and development. Your task is to recommend a subsidy option to a landowner. This landowner happens to be using his land for the same purpose as you are in reality. What would you recommend to him?
- *Please imagine:*
  A disastrous event has taken place in your neighboring city. There has been a lot of damage and disruption. The mayor of your town is now trying to explore all possible policy instrument needed to get the municipality back on its feet as quickly as possible. Think about your land holdings. Which of the instruments would you accept?

4.3.4 Focus groups

In a second round of discussions, the aim is to gain deeper insights into the perspectives of the target group, which will be related to their respective professional approaches to possible adaptation measures on their actual property.

Focus groups are a qualitative research method in which a small group of people, led by a moderator, come together in a moderated group discussion to exchange opinions, experiences and attitudes on a specific topic. They can be used to investigate the acceptance of decisions or products, for which the discussion can be used to raise not only rational arguments but also emotional arguments. (Misoch 2024: 141f.). Focus groups are a suitable application area for exploratory study design, as they can yield new and unexpected results, which can in turn generate new hypotheses related to the acceptance of policy instruments.

It has been shown that focus groups achieve the best results when the participants are relatively homogeneous in terms of socio-economic and demographic aspects, as the common basis of experience and action increases the participants' willingness to communicate (Block et al. 2010). Therefore, it will be necessary to assess on a case-by-case basis how large the groups should be and whether different focus groups should be opened if necessary. For example, rural residents could be divided according to whether they own property in a rural or urban area in order to encourage a homogeneous discussion atmosphere between them. The following knowledge-based objectives should be implemented in the focus groups.

- <u>Transfer from acceptance to willingness:</u>

  Testing the transferability of the settings from the hypothetical games to the willingness to make one's own country available for the policy instruments.
- <u>Economic feasibility:</u>

  Testing the extent to which the instruments tested are economically relevant for
  1.) legitimizing economic incentives (what are the limits?) and
  2.) negotiation situations relevant to the real lives of landowners
  (where do landowners stop, when do they ‘come out of their shell’?).
- <u>Real-world limitations:</u>

  Testing the limitations of policy instruments with regard to
  1.) specific measures,
  2.) economic impact,
  3.) role/self-image of landowners

The moderators will guide the discussion in such a way as to encourage narrative openness. Participants should therefore be able to freely develop topics in dialogue and respond to aspects raised by others. For this reason, narrative questions are provided as possible guidelines before the focus group discussions. These can only be written in relation to the specific workshop situation, as all scenarios are related to different risks associated with various application contexts.

4.4 Data requirements and verification

4.4.1 Data requirements

Data collection consists of four main components:

(i) Ex-ante survey in form of basic questionnaire: the status of each player-landowner in the real world. Which type and amount of land is owned by the player, what is the purposes of the landownership etc.
(ii) Structured recording of in-game decisions: which instruments were chosen, under what conditions, and with what stated motivation.
(iii) Observation and note-taking by moderators: focusing on player behaviour, reactions, and moments of uncertainty or discussion.
(iv) Post-game reflection and debriefing discussions: used to clarify reasoning, verify interpretations, and identify potential for real-world transferability of preferred options.

This combined qualitative-quantitative approach allows for the **triangulation and verification of data**. It ensures that the insights gathered from the game reflect not only the players' surface choices, but also the underlying motivations, perceived barriers, and possible points of resistance or acceptance. These findings serve as the basis for refining the proposed innovative business models and informing further development of policy instruments tailored to the needs of private landowners.

4.4.2 Type of data

As already outlined in the section on the purpose of the serious game (section 4.1), the structure and mechanisms of the game (section 4.3.1.1) the main result will not result as a quantitative figure, but rather as different descriptions and qualitative results regarding the potential acceptability of these instruments. This approach gives rise to a holistic approach to data analysis, which is based on the game process itself.

Every reference value and data that will be taken into account is of the game, but not the result itself. Whether the result of the game is awareness of disaster impact or the communication about implementation options bases on the fact of whether it is considered a result of the game or not. The data resulting from the game therefore only finds its immanent reference value in the game itself, although it is relevant to everyday life due to the hypothetical design of the game's application scenarios.

The aim of data collection therefore is to identify the limits within the game that might prevent the implementation of the policy instruments. At the same time, this means that we are not aiming to evaluate data based on the output of the game results. Since there are no scaled game elements such as rankings, point systems or clear feedback loops, it is not forseen to evaluate the success of implementation measures retrospectively, nor can this be transferred to a "target standard", which can be given to landowners as a guide. The aim is therefore not to conduct a comparative analysis

of scalable game results, but rather to measure important legitimacy and limitation factors that can be observed in the context of NBS acceptance with the implementation of innovative business models.

4.4.3 Methodology

Since all relevant data is derived from the game play itself, there are a number of consequences for the methodological processing and analysis of the data that need to be taken into account for the qualitative investigation of the acceptance of the policy measures. For this purpose, social research from the field of network research is used.

1. NBS acceptance as result of interactions and relationships:

Firstly, the motivation of landowners cannot be viewed as a static concept that is already integrated into the behaviour of the participants. Motivation merely comes to the fore in the course of the hypothetical game dynamics themselfes. In this sense, it is important to consider the multidimensional factors influencing the acceptance of NBS (see section 4.2.2). These factors are constantly evolving under social negotiations about the implementability and legitimacy of innovative business models. A particular focus is therefore on the dynamics of social negotiations, which both limit and enable the flow of information about the effectiveness of economic incentives. This provides insight into the advantages and disadvantages of the applicability of policy instruments that emerge in the game situations themselves.

This means, first of all, that data is not ‘discovered’ by our research process, but rather reflect the negotiation processes themselves (Töpfer, Behrmann 2021). Agreement and behaviour towards policy instruments are therefore not only transferred directly through individual experience in game situations, but also mediated by other individuals (groups) outside of the game (such as families, neighborhoods, city administration, legislative actors), thus allowing conclusions to be drawn far beyond the game itself.

2. Significance of the negotiation situation:

Secondly, the *situation* in which the game is played takes on special significance. Stegbauer (2016) argues that a fundamental openness is necessary for the constitution and reconstitution of relationships. This openness means that relationships and their structure open up new opportunities for negotiation in every situation. In the context of the game, this means to take the participants' situational behaviour seriously. Although every hypothetical situation in linked to diferent situations in the real-world - which means that not everything has to be and can be renegotiated - the possibility to do so nevertheless exists. It can be assumed that the perspective on new policy instruments and thus the motivation to implement them will only solidify over time. However, this does not mean that this acceptance will remain unshakeable; rather, it will be reconstituted again and again in social encounters (Mercken et al. 2012). This occurs in social situations, which the hypothetical game scenarios can provide insight into.

3. (Success) stories and communication channels:

As described in section 4.3.1.2, the individual hypothetical game scenarios aim to make a short story visible in each round. This is achieved by linking the players' decisions to short stories in the form of impact scenarios (in the newspaper articles). The participants in each game situation thus become

an active part of a storytelling process that relates to the everyday significance of climate change adaptation. This highlights the constructive function of stories. Bamberg & Georgakopolou (2008: 379) argue that stories should not (only) be seen as “tools for reflecting on (parts of) life”. Rather, they are constructive, what means that are important in the creation of characters and roles in the game. These positions are in turn important for the communications between participants, once the players start discussing decisions for or against policy measures. Therefore, the expression of preferences is centrally linked to the interaction context iteself. The analysis should clarify which interactive contexts are necessary in the real world in order to assume that the new business models can be effective. The willingness to consider political instruments as a measure is subject to interpret-tation (i.e. social meanings, or rather attributions of meaning), which is why the outcome of the game situation itself receives less attention.

In order to adequately consider the negotiations, constellations of individuals and narrative functions of the game situations, **social network analysis (SNA) is proposed** to describe and visualise the conditions and prerequisites for real-world implementation of the game decisions. Social network analysis is “an approach and set of techniques used to study the exchange of resources among actors” (Haythornthwaite 1996: 323). It can be assumed that network structures between the partici-pants say something about the behaviour of the individual people (Yang, Keller, Zheng 2017: 3). Even if the decisions are based on the autonomy and decision-making of the individual landowners, they are nevertheless dependent on their social environment. This refers to both individuals and institutional embeddings.

The defining feature of social networks is the relationships between members and the network structure they induce. According to Clarke (2012: 114), the basic assumption of qualitative social network research is that everything in a situation constitutes and influences everything else in that situation - in some way or another (or in several ways) (ibid.). The actions of actors are thus not determined by the forms and structures of networks, but rather actors actively negotiate positions and their meanings depending on their relevance in encounters between people and their life stories.

In general, it makes sense to view social relationships and social networks – in the sense of ‘proces-sual ordering’ (Strauss 1993: 254) – as an interactive negotiation process from a dynamic perspec-tive. The networking of landowners – refering to their structural integration into the network – is central to their **interaction and communication possibilities** and contains valuable information for a wide range of applications of innovative business models (Borgatti, Everett, Johnson 2013). For example, identifying particularly well-connected landowners offers insight into the considerations that will be made regarding the acceptance of policy instruments. At the same time, there are influences that other groups of people and institutions have on these landowners. This makes it possible to highlight which factors influence network positions (such as location of properties, annual costs, subsidy volumes, conflicts with the municipality, institutional responsibilities for disaster control etc.). It also shows how large possible target groups can be reached if the policy instruments are accepted. This will be evident in specific connecting points that arise from intersections in this network. A graphical representation of the rough network connections can be illustrated as shown in Figure 12.

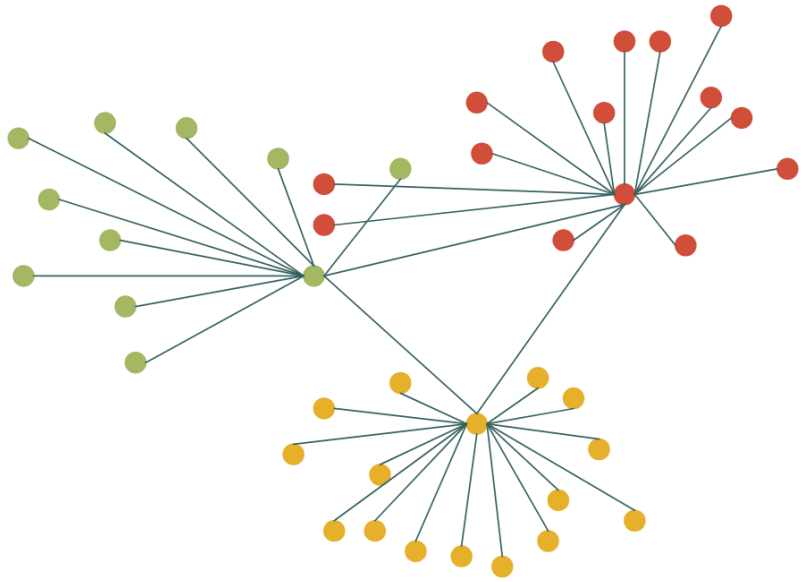

Figure 12: Example of graphical representation of the network connections

5. Demonstration and simulation of the implemented model instruments

5.1 From Simulation to real-world context

The simulation environment of the game provides a structured yet flexible space in which stakeholders can safely explore the functionality and implications of various policy instruments under different environmental and socio-institutional conditions. However, the ultimate aim of the simulation is not the game itself, but the translation of these experiences into the real world, where actual decisions, trade-offs, and negotiations take place.

The transition from simulation to practical application involves several key elements:

1. Ground-testing instrument acceptability

Through gameplay, participants engage with selected innovative policy instruments in specific land-use scenarios. Their decisions and reactions reveal not only the attractiveness or resistance to certain instruments but also how these instruments are perceived under current legal, financial, and institutional constraints. These insights form a basis for identifying which instruments may be promising for real-world adaptation and under what conditions. The use of social network analysis (SNA) provides qualitative insights into the identification of groups and subgroups that are strongly interconnected internally but weakly connected to other groups. By localising relationships between landowners, businesses and local administrations, insights are generated into whether there is a strongly connected centre and a loosely connected periphery, and what attitudes towards legal, financial and institutional constraints become apparent in these network connections.

2. Revealing real-world trade-offs and constraints

While the serious game operates within a simplified environment, players bring with them their real-world knowledge, experiences, and constraints. The simulation thus becomes a lens through which actual trade-offs emerge: concerns over land value, legal ambiguity, transaction costs, or social acceptability. These reflections are not hypothetical they provide a mirror of what would need to be addressed for successful implementation. At the same time, bringing real-world attitudes and knowledge to the 'game-table' is a key prerequisite for willingness to compromise on these criteria. These are not solely attributable to individual factors. Rural and urban landowners, for example, may have diverging concerns about land value. Social acceptability, on the other hand, could be another of a wide divergence between landowners, having for example a family-run farm as landholder on the one side and large property with high relevance for the municipality on the other side. The analysis of hypothetical scenarios in the course of the SNA is intended to reveal the density of these differences and thus show what differences actually exist in the network connections between landowners.

3. Encouraging deliberation

By involving different types of landowners, the game opens a platform for shared reflection and negotiation. This dialogue helps to uncover mismatches between policy design and stakeholder needs, or between theoretical feasibility and practical viability. It supports the co-identification of barriers and enablers. Inwiefern werden Annäherung und Deliberation zwischen den participants angeregt? The SNA therefore reveals the extent to which the network breaks down into clusters/ groups that either facilitate or hinder deliberative negotiation. Mismatches between policy design and stakeholder needs could, for example, prove to be the result of a lack of political participation in the respective stakeholder group, meaning that political actors and landowners would have few points of contact in the network structure.

4. Bridging to policy and planning

Findings from the simulation sessions including stakeholder preferences, acceptance levels, perceived risks, and ideas for refinement are not just collected as research data. They are intended to inform real planning and policy design, both at the local and national level. For example, a frequently preferred instrument in the simulation, such as biodiversity offsetting or land swaps, may be proposed for piloting in a selected municipality or tested under an experimental policy framework. For this purpose, SNA-based relationship and role analysis provides an overview of the key criteria that are relevant for transfer to planning processes. For example, what gatekeepers are needed to bridge the gap between politics and planning? This role has an important and well-connected network position. Are there missing links on the part of planning actors that could strategically fill the policy instruments?

5. Iterative Refinement and Co-Creation

Finally, the simulation process itself is not static. It serves as an iterative loop in which instruments are not only tested but gradually refined in cooperation with stakeholders. This co-creative element ensures that policy designs are not only technically sound but also socially acceptable and practically implementable. The network's approach should therefore be understood as fluid, as connections and nodes are constantly changing, and with them the network itself. Each new simulation process therefore limits and enables the flow of information about the applicability of policy instruments and their acceptance.

5.2 Application of the game in stakeholder constellations

The current version of the serious game has been designed with a specific focus on landowners as the primary decision-making actors. While other relevant stakeholder groups such as municipal authorities, private companies, or state representatives play a crucial role in the real-world application of nature-based solutions (NBS), their positions are represented within the game by the moderator or through predefined roles ("agents"). This structure allows the game to concentrate on the reactions, motivations, and decision-making processes of landowners under varying environmental, institutional, and economic conditions.

The primary goal of this approach is to explore how different types of landowners respond to policy instruments in hypothetical scenarios and, eventually, to evaluate the extent to which these responses might translate into real-world behavior. The game enables the identification of patterns in preferences, hesitations, or resistance across stakeholder typologies (e.g. small vs. large landowners, urban vs. rural contexts, individuals vs. companies) and geographical or thematic contexts (e.g. flood-prone areas vs. drought-exposed regions). The behavior of other agents is so fixed. There are no deviations in behavior on this side, which makes it easier to compare players' decisions.

Through repeated gameplay sessions in diverse locations, the game makes it possible to examine:

- Contextual variability: How do landowners respond differently depending on the type of environmental risk (floods, droughts, wildfires, erosion) or landscape setting (urban, peri-urban, rural)?
- Instrument-specific acceptability: Which policy instruments are perceived as fair, effective, or feasible and under what conditions?
- Motivational differences: What role do financial incentives, social norms, long-term planning, or personal values play in landowner decision-making?
- Implementation barriers: Where do legal, administrative, or communication obstacles limit the usability or credibility of the proposed tools?

By systematically collecting data and observations across stakeholder constellations, the game contributes to a better understanding of what drives or hinders the uptake of NBS-related instruments among private landowners. This understanding is essential for tailoring future interventions, designing targeted policy mixes, and building broader coalitions for implementation not only within the game world, but in the real landscapes where change is needed.

5.3 Inclusion of the feedback during the gameplay

In addition to capturing players' choices and behavior during the game rounds, the design of the game intentionally incorporates real-time feedback to enrich the data collection process and deepen the players' engagement. This feedback loop is crucial not only for understanding what decisions are made, but also why they are made shedding light on motivations, perceptions, and uncertainties that influence behavior.

Throughout the gameplay, participants are regularly invited to reflect on their choices and voice their interpretations of the proposed policy instruments. These reflections may occur spontaneously or be facilitated through structured prompts from the moderator after each round, such as:

- After each round, where players may be asked why they accepted or rejected a particular offer or what considerations (e.g., trust in the agent, long-term benefits, perceived fairness) influenced their decision;
- During group pauses, which enable moderated discussions to explore how the scenario, incentives, or group dynamics affected decision-making;
- At the end of the session, when a debriefing helps capture overall impressions, identify moments of confusion or hesitation, and generate ideas for real-world adaptation.

This embedded feedback is not treated merely as anecdotal or illustrative. On the contrary, it provides qualitative data that complements the structured game outcomes and helps validate or challenge assumptions built into the game design. For example, unexpected reactions to a theoretically “attractive” instrument may signal a communication barrier or a lack of institutional trust. Such insights are crucial for refining both the tool and its implementation strategy.

Moreover, integrating feedback during the gameplay supports an iterative learning process for both players and researchers. Participants begin to understand the broader implications of their decisions, while the moderators gain a deeper grasp of the social and cognitive factors that shape landowner behavior. This dual benefit enhances the realism and relevance of the game and strengthens its utility as a co-creative tool for policy innovation.

5.4 Further development of the game

The feedback gathered during gameplay not only enriches the immediate understanding of participants' choices, but also plays a central role in shaping the future development of the game itself. Insights derived from players’ reactions including moments of confusion, hesitation, enthusiasm, or resistance will be systematically analyzed and used to refine both the design of the game and the way policy instruments are introduced and contextualized.

This iterative development process ensures that the game remains adaptable and relevant across different geographic, cultural, and policy contexts. By integrating user experience and stakeholder input, the game is continuously improved as a research tool for exploring the acceptability and feasibility of nature-based policy instruments, as a practical facilitation tool in real-world negotiations with landowners, and as an educational platform for a broader audience including students, practitioners, and decision-makers.

Ultimately, the feedback collected in each phase of the game serves not only to validate its effectiveness, but also to unlock its full potential as a versatile instrument for supporting climate adaptation and land management strategies in diverse settings.

6. Conclusions

LAND4CLIMATE Deliverable 3.3 examines innovative business models for promoting nature-based solutions on privately owned land with the aim of creating climate-resilient landscapes. A sys-tematic literature review identified 16 relevant policy and market instruments, which were assessed according to their degree of innovation and practical applicability. In a participatory selection process with consortium partners, six instruments were selected for in-depth consideration: subsidies, land exchange, biodiversity offsets, payments for ecosystem services, tradable building rights and nature value offsets. This selection reflects both theoretical potential and practical relevance.

The deliverable describes the transfer of these instruments into a serious game format that serves as a testing and participation tool. In realistic, hypothetical scenarios involving different landscape types and climate risks, landowners are confronted with decision-making and negotiation situations. The aim is to identify preferences, motivational factors and possible barriers to acceptance that often remain hidden in traditional surveys. The game combines economic incentives, narrative elements and visual impact representations to observe behaviour patterns in risk-free but complex decision-making contexts. Supplementary group and focus discussions deepen the analysis by examining the transfer of hypothetical decisions into real-life contexts and reflecting on economic and institutio-nal feasibility.

The results will contribute to the further development and adaptation of the policy instruments examined by providing practical insights into acceptance, incentive effects and implementation barriers. In the long term, this approach can help develop more effective, locally adapted business models for NBS that combine more active role of landowners, ecological effectiveness with economic viability and social acceptance.

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