

Futurescapes Navigator

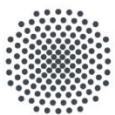
A scenario game for exploring futures*

* Based on Cross-Impact Balance analysis CIB (Weimer-Jehle 2006, 2023)

I. For players



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Futurescapes Navigator Game Instructions - Water Demo Matrix

Guide for Players

Access to the web application:

<https://scenariowizard.org/FuturescapesNavigator/login/FN.php>

Background information:

www.zuwako.de

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Summary

The Futurescapes Navigator is a simulation game (serious game) that is accessible as an online application via a web link. You take on the role of actors who can choose between different decision alternatives in order to achieve their goals. The game then shows you the interactions between the measures you have selected and those selected by your fellow players. It also shows the effects of combinations of measures on the overall system¹. The aim is not to win against other players, but to identify robust and effective bundles of measures with high synergy that improve the state of the system. This guide takes you through the game step by step.

Aim of the Game

Goal 1 (Content): One aim of the game is to make it possible to experience the consequences of your own measures and those of other actors under different future contexts, and to test possible joint and robust combinations of measures (known as "policy mixes"). This helps to reveal system interdependencies in uncertain, complex and potentially conflict-prone decision-making situations with long-term consequences.

Goal 2 (Process): Another aim is to promote collaboration across sectors and disciplines; to bring actors to the same table and into communication; and to make alternative courses of action and their interactions transparent. Advanced users can also use the web application to adapt the demo games and even to develop their own games (see the Guide for Facilitators). ➔

Procedure

At the start of the game, the facilitator will give you a link to a web application. Please open the link on a tablet, laptop, or PC. **Please use the Firefox web browser** (<https://www.firefox.com/>). **Using other browsers may result in gameplay errors.**

The link takes you to your assigned game role.

¹ In the background of the game is a so-called Cross-Impact Matrix, which was created using the method of the same name, Cross-Impact Balance Analysis "CIB" (Weimer-Jehle 2006). Advanced users can create their own games with the web application. Guidance can be found in "Guide II for Facilitators." From the ZuWaKo research project (www.zuwako.de), we provide three ready-made games in the field of water as well as a simplified demonstration game. Guidance on the three games can be found in Guide III. All materials are available at: <https://www.zuwako.de/planspiel/>

The link takes you to your game role.

- ⇒ In the demo game, the following five roles are available: paper mill (Descriptor A), household (Descriptor B), agriculture (Descriptor C), nature conservation (Descriptor D), and water administration (Descriptor E).

Futurescapes Navigator

Spielkonzept Spiel Matrix Hilfe

Continuous

Game page: Game role 1

Round: 1

Context:

- K1 Changes in precipitation: K1.1 Decrease
- K2 Water awareness in society: K2.1 High

Results:

Your decision task(s):

A What measure do you take as a paper mill?

☒ A1 Expansion of production with increasing water consumption

☐ A2 Investment in water efficiency

☐ A3 Production and water consumption unchanged

Submit

For each decision task select an option and click 'Submit'.

Figure 1: Home page for game role 1 (paper mill)

The assignment of players to roles is carried out by the facilitator (see the Guide for Facilitators). The role, its goals and action alternatives can be found on the respective game page; background information on contexts, goals and alternatives for the role, as well as information on the indicators, can be accessed from there.

When the game starts, carry out the actions described below:

1. Read the Context

By clicking on the contexts listed under **Framework Conditions**, you can view a description of the respective contexts and their variants under which the game roles you represent make decisions. Please pay particular attention to the part of the description that is selected as the variant on the player page.

Futurescapes Navigator

Spielkonzept
Spiel
Matrix
Hilfe

Continuous

Game page: Game role 1

Round: 1

Context:

- K1 Changes in precipitation: K1.1 Decrease
- K2 Water awareness in society: K2.1 High

Your decision task(s):

A What measure do you take as a paper mill?

☒ A1 Expansion of production with increasing water consumption
☐ A2 Investment in water efficiency
☐ A3 Production and water consumption unchanged

[Submit](#)

For each decision task select an option and click 'Submit'.

Results:

Figure 2: Home page, round 1, framework conditions

Definitions

Close the tab to return to the game page

Definition
K1 Changes in precipitation

Essay:

In this context, the possible future change in precipitation in Germany up to 2050 is described. Due to ongoing climate change, the weather system and therefore overall precipitation patterns have changed and will continue to change in the future. Dry months or even dry years may become noticeable through a decline in the supply of water in groundwater and flowing waters. Shifts in precipitation patterns may also occur within a single year.

Variant 1: Decline in average annual precipitation (decrease)
As a result of climate change, Germany experiences increasing numbers of dry months or even dry years. The least favourable of the possible projected decreases in precipitation occur (0% in winter and up to -60% in summer, DWD).

Variant 2: Shift of precipitation to the colder seasons (shift to winter)
As a consequence of climate change, precipitation will not decrease overall, but will shift to the colder seasons (RCP 8.5 - DWD). This means a water surplus in winter which, under some circumstances, cannot be sufficiently stored or used either by nature (cold and therefore partly sealed soils) or by humans (e.g. limited reservoir capacities) (Hyman-Rabeleer, 2021). On the other hand, the hot summers suffer even more from low precipitation.

Variant 3: Precipitation extremes alternate between years (alternating years)
Precipitation volumes fluctuate strongly from year to year. Very wet years are followed by dry years. In addition to the risk of floods and high water levels, the surplus water cannot be stored because the soils cannot fully absorb the volumes of water. As a result, groundwater recharge can decrease despite unchanged or even increasing precipitation.

Figure 3: Definition texts open in a new tab.

2. Read Your Role and Your Decisions

Each game role has one or more decision tasks that correspond to the goals of that role. By clicking on a measure listed under **Your decision task(s)**, a new tab opens in which the

decision situation of your game role and your action alternatives are defined.

Futurescapes Navigator

Spielkonzept Spiel Matrix Hilfe

Continuous

Game page: Game role 1

Round: 1

Context:

- K1 Changes in precipitation: K1.1 Decrease
- K2 Water awareness in society: K2.1 High

Results:

Your decision task(s):

A What measure do you take as a paper mill?

☒ A1 Expansion of production with increasing water consumption
☐ A2 Investment in water efficiency
☐ A3 Production and water consumption unchanged

For each decision task select an option and click 'Submit'.

Figure 4: Game page round 1, decision tasks

Definitionen

Schließen Sie den Tab, um zur Spielseite zurückzukehren

Definition von

A What measure do you take as a paper mill?

Essay:

This descriptor describes the possible behaviour of a large paper mill in relation to water. The paper mill, which has been run in the local area for generations, faces important decisions in view of the changing future in order to maintain its economic success (objective).

Variant 1: Expansion of production with increasing water consumption
 The paper mill's decision to expand its production is motivated by the objective of increasing profits. As a result, water abstraction from rivers and groundwater is intensified and the water is used as process water.

Variant 2: Costly investment in water efficiency
 The paper mill wants to maintain its high level of production while also making its processes more efficient. The focus is on measures to optimise water use, whether through water-saving processes or through opportunities for multiple use of water. In both cases, the result is a lower level of intervention in water bodies, but initially high costs for the company.

Variant 3: No production adjustments and unchanged water consumption
 The paper mill continues to operate as before and uses a constant amount of water. It is therefore dependent on there being no serious changes in its environment that could influence this behaviour.

Figure 5: Definition texts open in a new tab.

Please select one measure for each decision task that you would mainly use in the scenario defined under "Framework Conditions" in order to achieve your goal.

In the demo game, three alternative measures are available to the paper mill game role:

- Variant 1: Expansion of production with increasing water consumption
- Variant 2: Costly investments in water efficiency
- Variant 3: No production adjustments, with water consumption remaining unchanged

3. Submit Decision

Once you have selected a measure for your decision tasks, you can click **Submit**. Please click only once, as otherwise you will automatically move on to the next round.

4. Understand the Results

Depending on the game mode, the results are displayed on the right-hand side either immediately or as soon as all players have made their decisions. Take some time to **understand the results**. The following tips can help you:

4.1 Indicators and Synergy

Here you can see how the combination of the measures selected by all players affects the overall system.

Results Round 3:

Take a look at the results. Would you like to change your choice in the next round, perhaps to improve your situation?

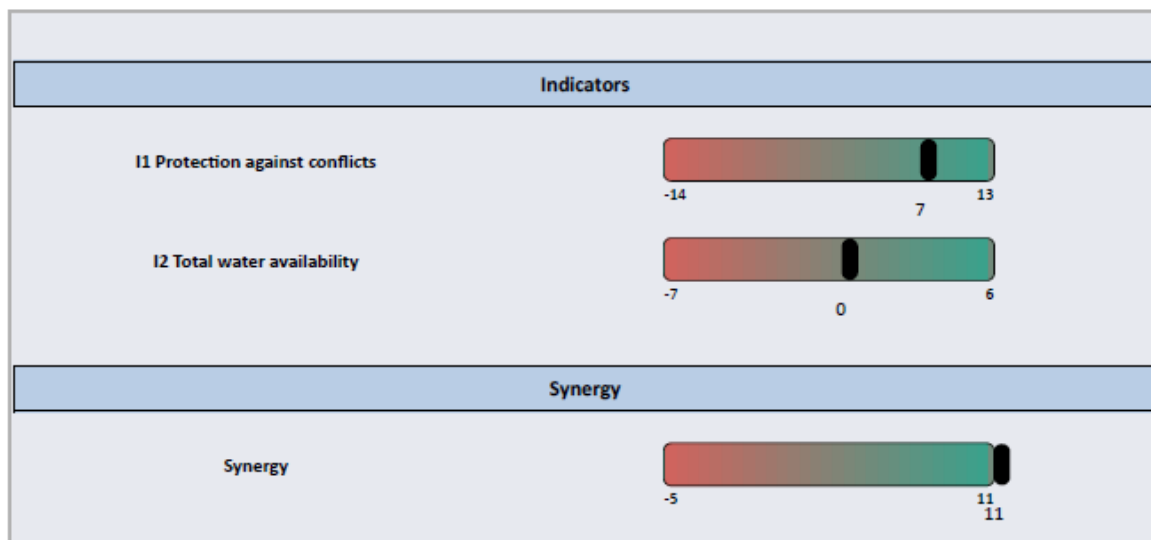


Figure 6: Example of system indicators. How does the combination of the measures selected by all players affect the overall system?

The **Indicators** are defined differently in each game and may describe possible outcomes or consequences for the overall system, for example. The gauge display shows how well the selected mix of measures performs. The numbers to the left and right of the bar indicate the range from poor (red) to good (green) in which the indicator values can ideally or maximally lie (depending on the default setting or the information provided by the facilitator).

- ⇒ In the demo game, these are "I1 Protection against conflicts" and "I2 Water availability". A window with more detailed definitions of these indicators opens when you click the respective

indicator name. Clicking the corresponding scale opens a window showing all active influences on the indicator.¹

Synergy measures the sum of inhibiting and promoting influences between the selected measures. It is calculated according to the logic of the Total Impact Score (TIS); however, only the interactions between the selected measures are used here (the so-called Policy TIS). It provides information on how much the measures in the selected combination overall interfere with or support one another in their effectiveness. The higher the synergy, the stronger the internal logic. However, synergy says nothing about the probability of a combination of measures.

- ⇒ In the demo game, **protection against conflicts** and **water availability** should be increased as much as possible (both in the green range).

4.2 All Decisions

All decisions	
A What measure do you take as a paper mill? (Game role 1)	A2 Investment in water efficiency
B How do you behave as a household? (Game role 2)	B1 Increasing water consumption (e.g. swimming pools)
C How do you decide as an agricultural business? (Auto)	C2 Change or reduction of cultivation
D How do you act as a nature conservation organisation? (Auto)	D2 Raising public awareness (education and public relations)
E How do you decide as the water authority? (Auto)	E2 Ban on garden irrigation and private pools

Figure 7: Simple overview of all decisions made

Below the scale displays for indicators and synergy, a simple overview appears of the decisions made by all players. The decision tasks of the game roles are shown on the left, and the alternatives they selected are shown on the right. Clicking on the respective decision opens the associated definition. Decisions made by co-players that have changed compared with the previous round are shown in red.

4.3 Details on the Interactions of Your Decision Task

Below the simple overview, a detailed table is shown for your decision task in which you can find information on the interactions of your decision. If you had more than one decision task, the tables appear one below the other.

In the upper center of the graphic, you can see your current selection (ochre, bold and outlined) and, to the right of it, your possible alternatives (ochre).

In the two left-hand columns, you can see the decision tasks of the other players (dark blue) and their selected options (ochre). The green and red fields to the right show what influence the decisions of the other players have on your selected measure.

¹ For use in the Futurescapes Navigator, the original indicator "conflict potential" was reversed and renamed "protection against conflicts" so that all indicators point in the same direction: a high value indicates a more desirable system state.

In the right-hand columns, you can see what influence the measures of others would have had on your alternative options. Positive values in green fields indicate a promoting effect of the other decision on your own; negative values in reddish fields indicate an inhibiting influence. Empty fields mean "no influence" (see also Figure 8).

At the end of the columns, in black boxes, you can see the **balances** for your measures. Here you can see whether your choice is promoted or inhibited overall by the measures of others - and whether an alternative measure might be promoted more strongly by the decisions of others.

Your decision task: A What measure do you take as a paper mill?				
Decision tasks of other players	Other players' choices	The impact of co-player policies on ...		
		your chosen policy A2 Investment in water efficiency	your alternative policies	
			A1 Expansion of production with increasing water consumption	A3 Production and water consumption unchanged
B How do you behave as a household?	B1 Increasing water consumption (e.g. swimming pools)	(+1)	(-2)	(-1)
C How do you decide as an agricultural business?	C2 Change or reduction of cultivation	(-1)	(+1)	(+2)
D How do you act as a nature conservation organisation?	D2 Raising public awareness (education and public relations)	(+1)	(-1)	
E How do you decide as the water authority?	E2 Ban on garden irrigation and private pools			
I1 Protection against conflicts:	7			
I2 Total water availability:	0			
K1 Changes in precipitation:	K1.1 Decrease	(+2)	(-2)	(-2)
K2 Water awareness in society:	K2.1 High	(+2)	(-2)	(-1)
		↓	↓	↓
		Balance: +5	Balance: -6	Balance: -2

Empty fields indicate an impact of 0

Empty rows
☒ show
☐ hide

Figure 8: Interactions of your decision in detail.

Clicking on the text in the fields gives you further information on the interactions. Each opens in a new tab.

- **Dark blue field:** effects of your decision task on that of the other player
- **Ochre-colored, green or reddish field:** effects of the co-player's decision task on your measure

In the new window (Figure 10), you can see the qualitative assessment, i.e. the substantive justification of the influences. In addition, the corresponding matrix field of the quantitative assessment is shown, where you can see the direction and strength of the influence. The currently selected alternatives are highlighted in light gray, and the active influence is shown with a white background.

-3	-2	-1	Empty Field	1	2	3
Strongly inhibiting	Inhibiting	Slightly inhibiting	No influence	Slightly promoting	Promoting	Strongly promoting

Figure 9: Strength and direction of the influences

- Direction of influence: promoting (positive) vs. inhibiting (negative)
- Strength of influence: +/-1 (slight), +/-2 (medium), +/-3 (strong)
- **Reading direction:** from the measure in the row (influencing factor) to the measure in the column (target factor)

Qualitative assessment:

Only direct interventions in industry affect its behaviour. They prevent growth-oriented strategies, promote efficiency measures and relocation. Interventions in other sectors have hardly any influence on industry.

Quantitative assessment:

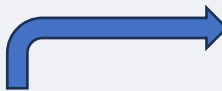
				A What measure do you take as a paper mill?		
				A1 Expansion of production with increasing water consumption		
				A2 Investment in water efficiency		
				A3 Production and water consumption unchanged		
E How do you decide as the water authority?						
E1 Restrictions on agricultural abstraction	0	0	0			
E2 Ban on garden irrigation and private pools	0	0	0			
E3 Restrictions on industrial abstraction	-3	2	-1			

Figure 10: Qualitative and quantitative justification of the influence assessment in the new window. The blue arrow indicates the reading direction.

In larger matrices, there are often several rows that do not exert any influence on your own measure. The Cross-Impact Matrix often also provides a justification for this; to make this visible, rows without influences are listed by default. These can be hidden by selecting the "Hide empty rows" field below the interaction table and then clicking "Confirm selection".

I2 Total water availability:	0			
K1 Changes in precipitation:	K1.1 Decrease	(+2)	(-2)	(-2)
K2 Water awareness in society:	K2.1 High	(+2)	(-2)	(-1)
		↓	↓	↓
		Balance: +5	Balance: -6	Balance: -2
Empty fields indicate an impact of 0				
Empty rows				
☒ show				
☐ hide				
Confirm choice				

Figure 11: Hiding empty rows in the interaction table

4.4 Overview of the Balances of All Players

Below the detailed information on the interactions, you will find the **balances of all players**. The selected alternative is shown in bold; for quantitative indicators, the current value is shown.

Balances of all players	
A What measure do you take as a paper mill? (Game role 1)	
A1 Expansion of production with increasing water consumption	-6
A2 Investment in water efficiency	+5
A3 Production and water consumption unchanged	-2
B How do you behave as a household? (Game role 2)	
B1 Increasing water consumption (e.g. swimming pools)	-6
B2 Saving water (behaviour and/or technology)	+7
B3 Water consumption unchanged	-1
C How do you decide as an agricultural business? (Auto)	
C1 Expansion of irrigation	-1
C2 Change or reduction of cultivation	+6
C3 No artificial irrigation (rain only)	0
D How do you act as a nature conservation organisation? (Auto)	
D1 Pressure on industry or agriculture (lobbying and lawsuits)	+2
D2 Raising public awareness (education and public relations)	+6
E How do you decide as the water authority? (Auto)	
E1 Restrictions on agricultural abstraction	+2
E2 Ban on garden irrigation and private pools	+10
E3 Restrictions on industrial abstraction	+2

Figure 12: Overview of the balances of all players

Directly below the balances of all players, several key figures for the current scenario are shown:

Overall synergy balance: The Total Impact Score (TIS) is shown here. It adds up all active interactions in the current scenario (including between context and indicators, measures and indicators, and measures and context).

Synergy of the current policy mix: The Policy TIS is shown here; this is the same value shown as a gauge at the beginning of the game page and sums only the interactions between the measures.

Weighted adjustment need of the current policy mix: The adjustment need refers to the consistency values of the selected measure variants and indicates how well they fit with the rest of the scenario (other measures, contexts, and, where applicable, indicators). For this purpose, any inconsistency values (the distance to the best variant) of the individual measures are added up and divided by the number of measures.

⇒ The lower the value of the adjustment need, the better the policy mix fits the framework assumptions.

Averaged need for adjustment over all possible contexts (9): The weighted need for adjustment is calculated for all possible combinations of context variants and divided by the number of possible combinations (the number of possible combinations is shown in brackets).

Number of contexts without need for adjustment: The number of contexts in which there is zero need for adjustment is displayed here. The current policy mix fits perfectly in these contexts.

Overall Synergy:	31
Synergy of the current policy-mix:	11
Need for adjustment of the current policy mix (weighted):	2.6
Averaged need for adjustment across all possible contexts (9):	1.8
Number of contexts without need for adjustment:	0

Figure 13: Key figures for the current scenario

4.5 Interpret Your Results

Possible questions you can ask yourself:

- Are you satisfied with your selection of the measure(s)?
- Does your selected option work in combination with the decisions of others?
- Which measures of other players promote or inhibit your measure?
- How do you assess the impact of the overall policy mix on the indicators?
- Would you like to talk to another player before the next round?
- Would you like to change your decision in the next round?

4.6 Menus

In the menu bar, players can select the following menu items, which open in a new tab:

Game Concept

Opens a link explaining the concept of the simulation game.

Game

Opens a link to a description text of the current game uploaded by the facilitator.

Matrix

Opens a link where the currently used Cross-Impact Matrix and the explanatory texts can be viewed.

Help

Opens a link to this guide.

5. Next Round(s)

Start the next round or rounds together. Try to find a policy mix that is satisfactory for all players, both with regard to the individual goals of the game role and with regard to the overall system (indicator values).

6. End of the Game

Continue the game until you no longer achieve any improvement. Consider the jointly developed policy mix and discuss its possibilities (implementability, obstacles, etc.).

7. Game Variants

Your facilitator can now invite you to play further variants:

7.1 Role Change (Change of Perspective)

The game restarts and you take on a different game role to change perspective.

7.2 Change of Framework Conditions (Robustness Test)

The facilitator changes the framework conditions, either during the current game or by starting a new game. Together with the other players, you can examine whether the jointly developed combination of measures would also work under other contexts or scenarios (and thus test the robustness of a policy mix).

7.3 Continuous vs. Round-Based Game Mode

The facilitator can change the game mode before and during the game. In continuous mode (from the second round onward), the interactions are updated immediately for everyone after any player makes a decision. In round-based mode, the update only takes place after all players have made a choice; the other players therefore do not see which choices the others have made before making their own decision, and the interactions are calculated only at the end of the round.

Glossary

CIB

Cross-Impact Balance Analysis: Weimer-Jehle 2006³ and 2023⁴.

Total Impact Score (TIS)

The Total Impact Score (TIS for short) is the sum of the interactions of all active descriptor variants in a Cross-Impact Matrix. It is a measure of the overall internal strength of the scenario logic, whereas the consistency value measures the logical strength of the scenario at its weakest point.

Policy Mix

A policy mix is the combination of all measures selected by the players. It represents the joint package of actions that actors in the game would implement together.

Indicators

Indicators are metrics that show how the policy mix affects the overall system. They make complex system effects visible and comparable.

Robustness

Robustness refers to the stability of a policy mix across different future scenarios. A robust mix therefore works well not only in one possible future context, but in several.

Qualitative Justification / Quantitative Assessment

The qualitative assessment explains substantively and argumentatively why and how one measure influences another. The quantitative assessment uses a numerical value to show how strongly and in which direction the influence acts.

Inconsistency Values

Inconsistency values measure how contradictory a combination of measures is. High values indicate that decisions strongly hinder one another or do not fit together from a system-logic perspective.

Context

In this case, a context describes the external framework conditions under which decisions are made (e.g. economic situation, climate conditions).

¹ [doi:10.1016/j.techfore.2005.06.005](https://doi.org/10.1016/j.techfore.2005.06.005) - Cross-Impact

¹ [doi:10.1007/978-3-658-41497-9](https://doi.org/10.1007/978-3-658-41497-9)