New tools for citizen engagement

Serious Games and their potential

Maurice Jansen
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PORT CITY FUTURES
Leiden Delft Erasmus

UPT *Erasmus*
Erasmus Centre for
Urban, Port and Transport Economics

for

ai∿P
INSPIRING PEOPLE OF PORT CITIES

Outline for today – 22 June 2023 15:15 – 16:45

- Port City ecosystems, what's at stake?

- Why serious gaming?

- Serious game **Port Constructor**
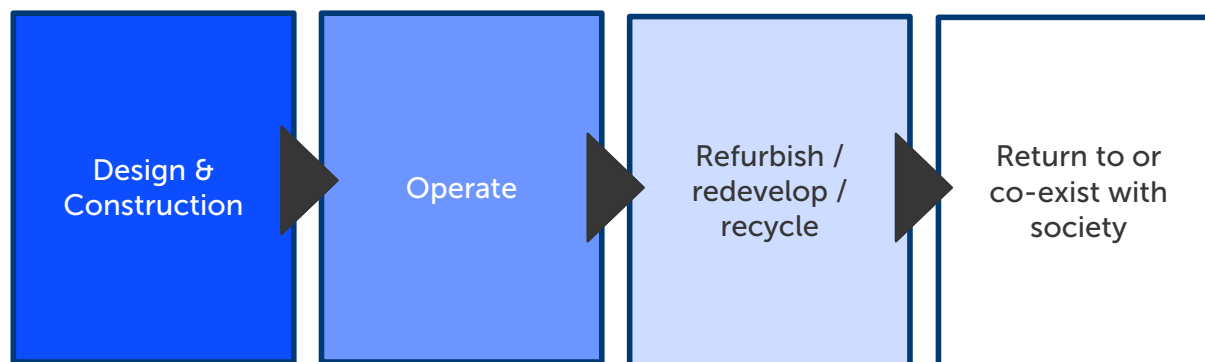
- Demonstration: Playing the game

- Discussion

Ecosystems at the core of SDG implementation, particularly for ports and port cities
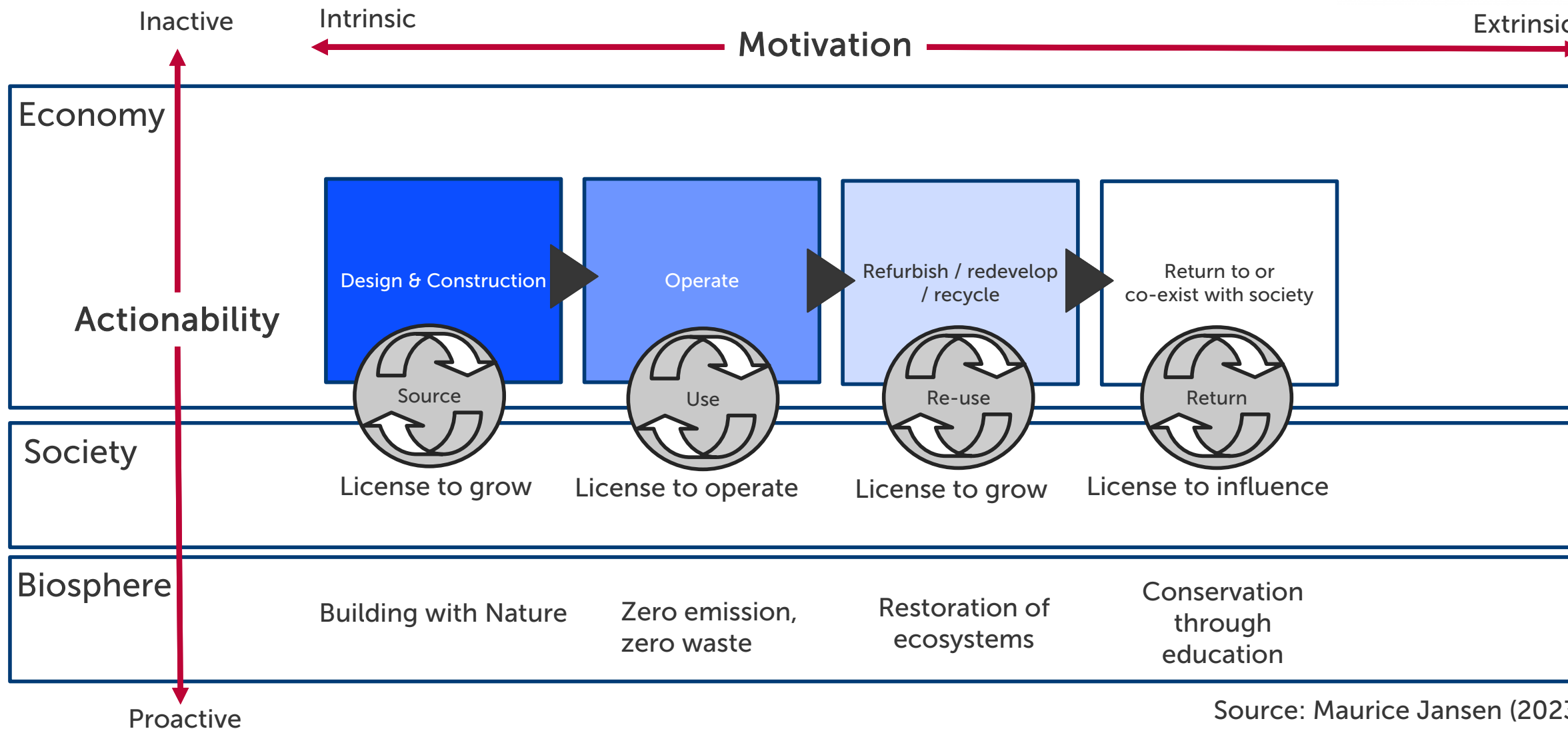

Photo: Maurice Jansen, Hook of Holland, with Maasvlakte, Rotterdam, 2020

Port development life cycle

| Design & Construction | → | Operate | → | Refurbish / redevelop / recycle | → | Return to or co-exist with society |

- The port-city ecosystem lives by the well-being of its inhabitants and is based on the premise that **prosperity flows from the stocks of tangible and intangible capital which the ecosystem provides**: natural capital, industrial (working) capital, human capital, social capital, cultural capital and creative capital (Jansen, 2023).

- The **invisibility of ecosystems** as global public goods – oceans, air, land, forests – has led to ecosystem degradation, biodiversity loss, and negative impacts on human liveability.

- It is for this reason why **ecosystems must be at the core of any approach** to achieve the ambitions of the Sustainable Development Goals. (TEEB, 2010).

Why community engagement is so important

Inactive   Intrinsic ← Motivation → Extrinsic

Economy

Actionability

| Design & Construction → | Operate → | Refurbish / redevelop / recycle → | Return to or co-exist with society |

Source · Use · Re-use · Return

Society

License to grow   License to operate   License to grow   License to influence

Biosphere

Building with Nature | Zero emission, zero waste | Restoration of ecosystems | Conservation through education

Proactive

Source: Maurice Jansen (2023)

Space for growth?

Nitrogen space

Noise space

Infrastructure

Spatial Puzzle

Space for housing

Transition Space

Storage space (XXL DC)
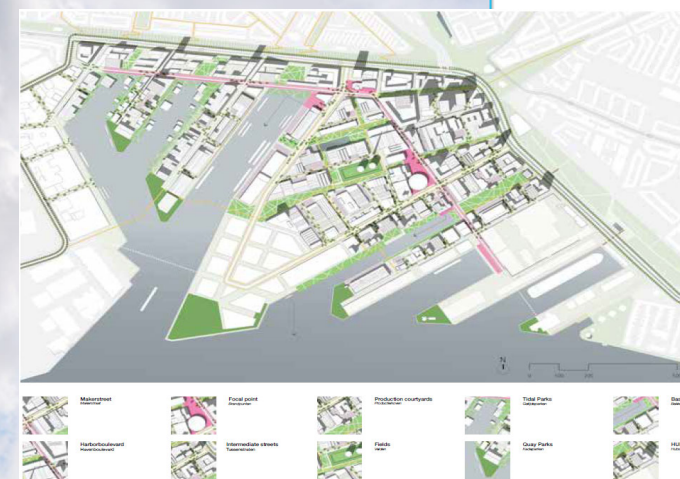
NOVEX-gebied 'Transitie Rotterdamse haven'
t.b.v. de NOVEX-gebieden op 25 april 2023

Source: Gemeente Rotterdam

Implementing the SDGs requires stakeholders to collaborate rather than compete for the resources of the ecosystem

Partnering space takes an issue-driven approach towards SDG implementation

Void

Government

A   B

D

C

Void   Market   Civil society   Void
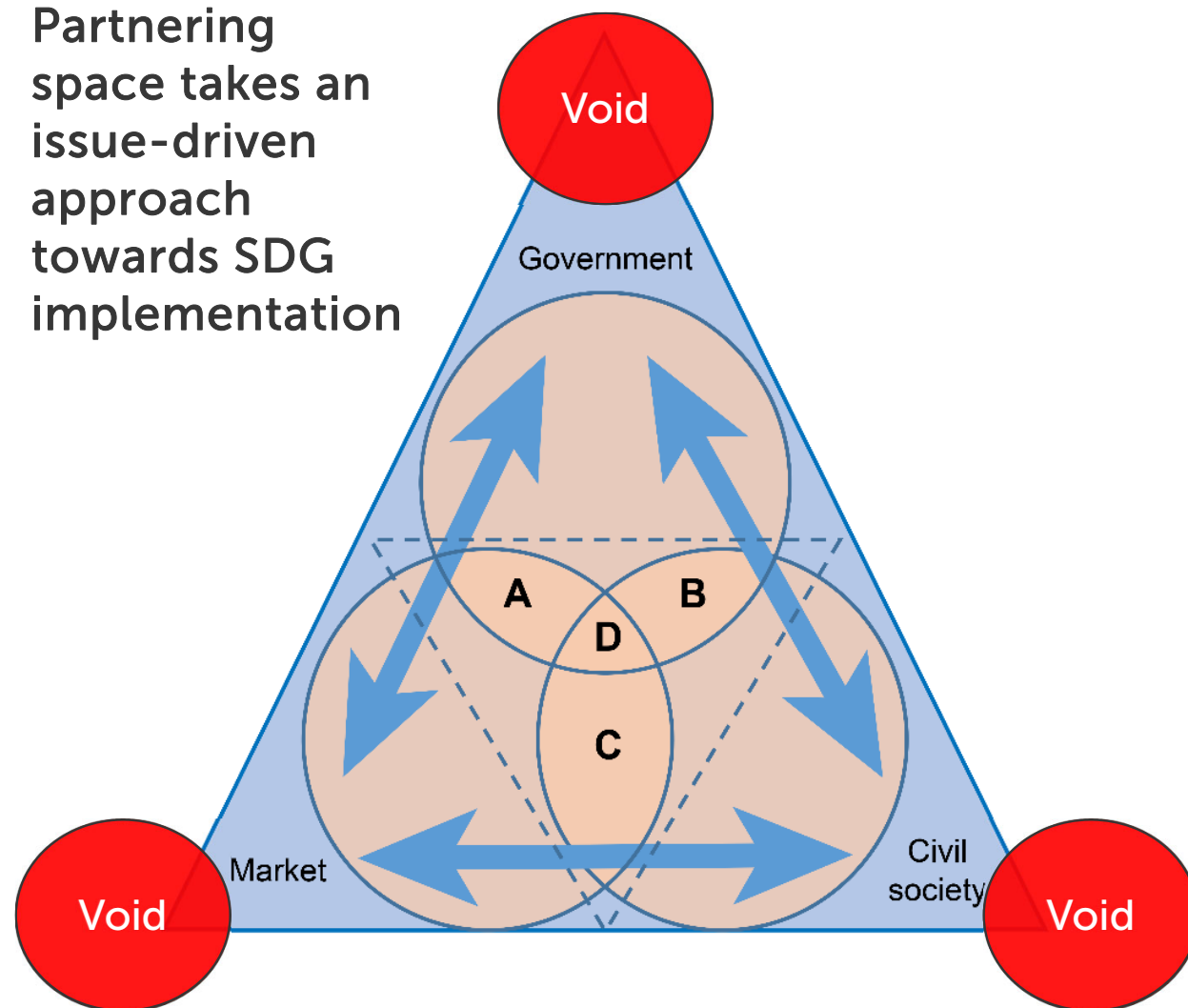
Source: Pfisterer & Van Tulder, 2012

Many issues in the port ecosystem seem to disappear in the **institutional void.**

The **partnering space** brings forward the understanding for new **collaborative governance constellations** towards addressing the issues and thereby resolving the SDGs

Inclusiveness port development **places port authorities in the centre** in between governments, business and society, as important actors to **facilitate, stimulate and co-create** to resolve the issues in the port ecosystem

Serious games to better understand how to deal with complexities

JOIN FORCES AND MAKE THE SHIFT TO SMART AND GREEN CORRIDORS!!

NEW!!

Oslo

Glasgow

Malmö

CO₂NGESTION
TOGETHER EXCEL ON FRESH CORRIDO

Milan

Toulouse

Barcelona

Valencia

There is a sense of urgency

Congestion across supply chain

Climate adaptation (Paris agreement)

demand eco-friendly logistics

Pragmatic

Planet

People

These issues necessitate supply chain partners to collab
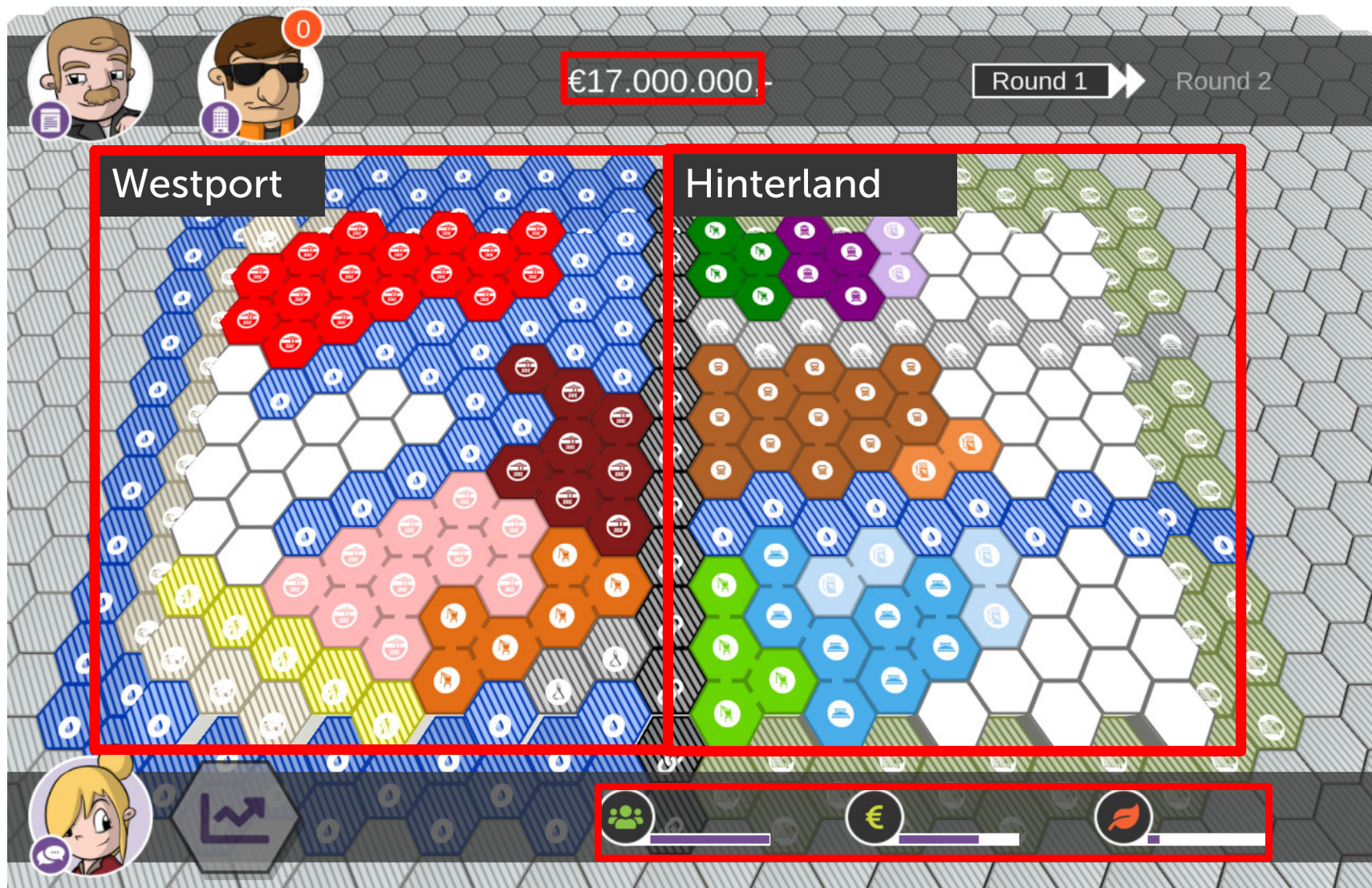more intensively, both horizontally as well as

Copyright © 2019 by Rotterdam School of Management, Erasmus University

For this purpose we design and use serious games!!

Port Constructor Hinterland mission – Make the supply chain more sustainable, while growing!

Timeline
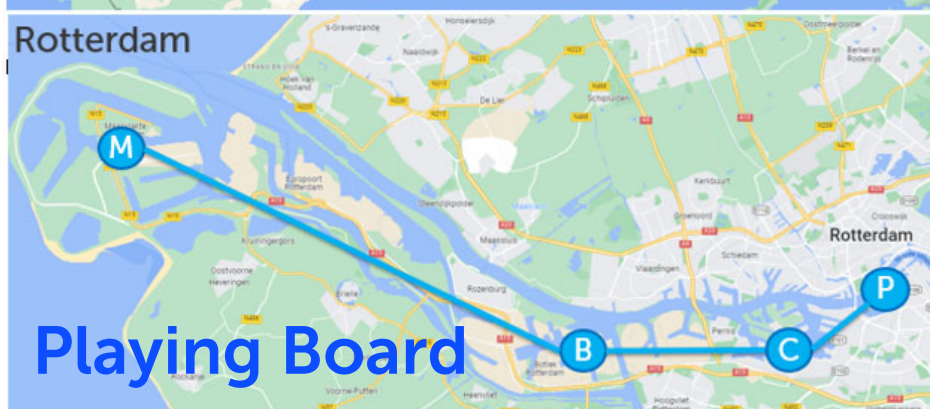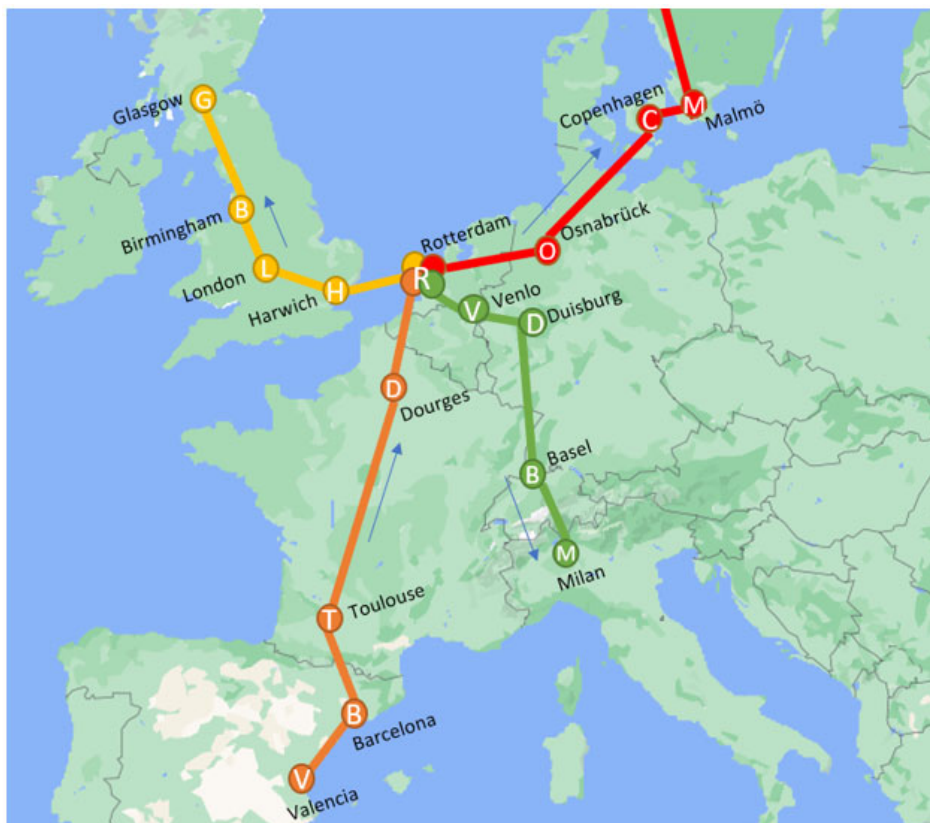2020-2030
Starting point: 2020
5 rounds
1 round = 2 years

PPP
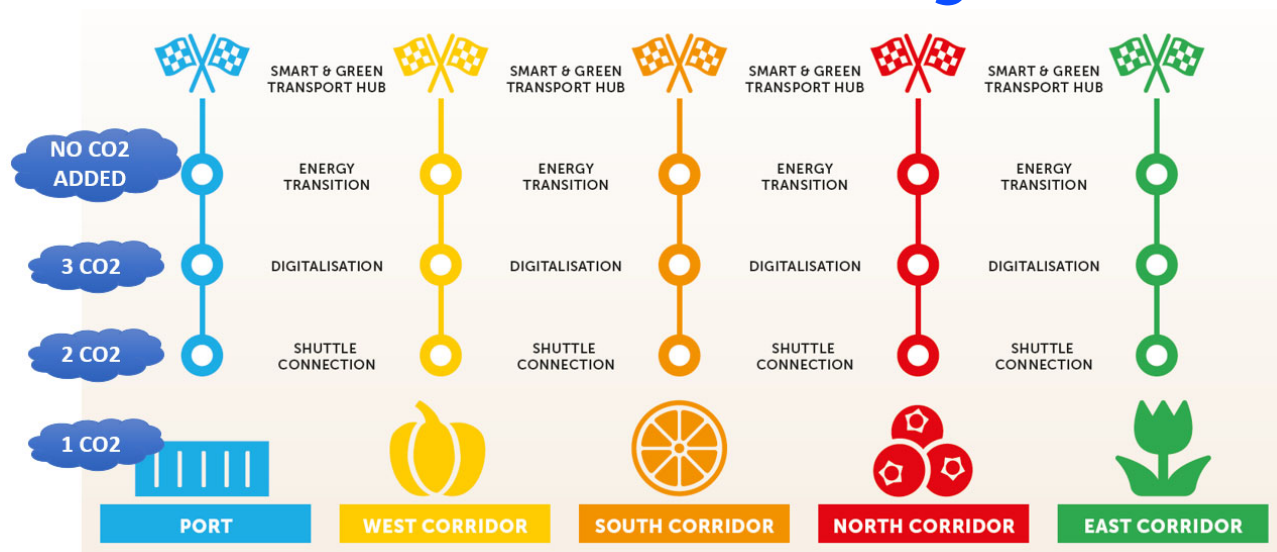**People:** Starting point is an efficient system.
Profit: Profits are quite good already. Profits can become larger while growing.
Planet: Planet has to become better for a higher score

Solutions dashboard (long-term)

	PORT	WEST CORRIDOR	SOUTH CORRIDOR	NORTH CORRIDOR	EAST CORRIDOR
	SMART & GREEN TRANSPORT HUB	SMART & GREEN TRANSPORT HUB	SMART & GREEN TRANSPORT HUB	SMART & GREEN TRANSPORT HUB	SMART & GREEN TRANSPORT HUB
NO CO2 ADDED	ENERGY TRANSITION	ENERGY TRANSITION	ENERGY TRANSITION	ENERGY TRANSITION	ENERGY TRANSITION
3 CO2	DIGITALISATION	DIGITALISATION	DIGITALISATION	DIGITALISATION	DIGITALISATION
2 CO2	SHUTTLE CONNECTION	SHUTTLE CONNECTION	SHUTTLE CONNECTION	SHUTTLE CONNECTION	SHUTTLE CONNECTION
1 CO2					

Breng de corridors bij elkaar om oplossingen te bouwen!

DOURGES: VALENCIA, BARCELONA, TOULOUSE, DOURGES

TOULOUSE: VALENCIA, BARCELONA, TOULOUSE, DOURGES

BARCELONA: VALENCIA, BARCELONA, TOULOUSE, DOURGES

VALENCIA: VALENCIA, BARCELONA, TOULOUSE, DOURGES

Congestion! (short-term)

CONGESTION VALENCIA: CO2 VALENCIA, BARCELONA, TOULOUSE, DOURGES

CONGESTION BARCELONA: VALENCIA, CO2 BARCELONA, TOULOUSE, DOURGES

Daily logistics business continues which causes congestion in the transport chain! Necessary to get rid of the bottlenecks while working on long term improvements

Playing Board

Water Values Game

Together with your team, you will experience what it's like to create a landscape over a period of 100 years. Representing economic, cultural and technological values, each team tries to safeguard both the interest of the common good *and* their own values and interests.

PORT
CITY
FUTURES
Leiden Delft Erasmus

T̃U Delft

Port Constructor

What is Port Constructor?

- Port constructor is a Serious Game consisting of micro games. These games are about the design of the port and provide insights about managing a port and spatial planning.

- Developed by TUDelft, EUR UPT, Port of Rotterdam, STC and InThere

Learning aims Port Constructor

- Understanding the **roles of specific stakeholders** in the port
- Understanding the **technical complexity** of port development
- Gaining insights about **strategic decisions** regarding port development
- Analyzing the different strategic **dilemmas** regarding the **transitions** within a port

Thialf Heerema in Calandkanaal
© Kees Torn

The energy transition

POR HAS A VERY AMBITIOUS ENERGY TRANSITION PLAN

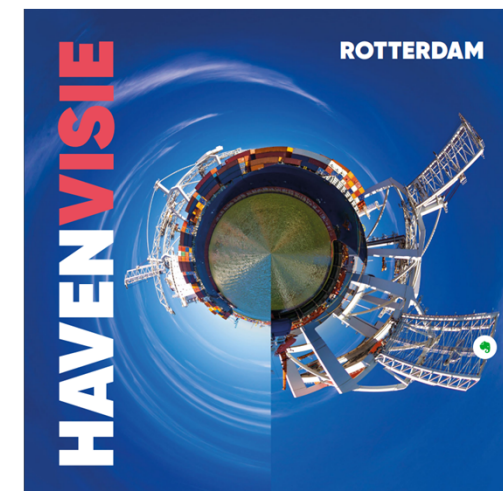Committed to the Paris Agreement and Dutch climate law:

- 2030: 49% reduction of CO2
- 2050: Climate neutral

<u>Three steps towards a sustainable industry cluster</u> (2018)

- The new energy system will be based on green power and Hydrogen

- But also other transitions are needed: CCS, renewables, electrification, alternative fuels, biobased products, circular economy, etc.

	STEP 1 NOW~2025 EFFICIENCY; INFRA FOR HEAT, STEAM, CCUS; INNOVATION FOR STEP 2&3	STEP 2 2020~2030 TOWARDS A NEW ENERGY SYSTEM	STEP 3 2030~2050 TOWARDS A NEW SYTEM FOR RAW MATERIALS AND FUELS	THE GOAL 2050 LIMIT GLOBAL WARMING TO 1.5°C to 2°C
NOW	• EFFICIENCY AT PLANTS • HEAT NETWORK • STEAM NETWORK BOTLEK • CONNECTION WINDFARMS NORTH SEA • PORTHOS (CCUS) • COLD IRONING • EFFICIENCY SHIPPING INDUSTRY	• PRODUCTION WIND TURBINES • WINDFARMS ONSHORE • NORTH SEA WIND POWER HUB • SOLAR PANELS • BLUE HYDROGEN	• WASTE-TO-CHEMICALS • PILOTS CIRCULAR ECONOMY • BIO-KEROSENE • ZERO EMISSION INLAND SHIPPING (ELECTRIC, HYDROGEN)	
COMING SOON	• CCU: MINERALIZATION, GREEN HOUSES	• ENLARGING ELECTRICITY NETWORK • WINDFARMS OFFSHORE • POWER TO HEAT • POWER TO HYDROGEN • HYDROGEN NETWORK • GEOTHERMICS • ENERGY STORAGE	• WASTE • BIO • E → HYDROGEN } • FUELS • CHEMICALS	
FEB. 2019				

Three steps towards a sustainable industry cluster

Port of Rotterdam

HAVEN**VISIE** ROTTERDAM

SUSTAINABLE DEVELOPMENT GOALS

From
'talking the walk'
to
'walking the talk'

The Mission – AnyPort

Aerial photo Maasvlakte 2 June 2020
© Danny Cornelissen

The Mission – AnyPort

How will Rotterdam look like in 2050?

- The port of Rotterdam consists of approximately 8,000 hectares of port area.

- 500 hectares still available for allotment across the port

- This 500 hectares (or 1000 football fields) seems like a lot of space but has an important function to grow current companies and as a sliding space for companies to work well together to connect.

- Now, the Port of Rotterdam Authority is no longer able to meet all the requests that are made are for land in the port of Rotterdam. This is not a problem, but it does require sharp choices...

The most important conclusion (TNO,2021) is that when we do not work together and the cluster will not integrate, we need a lot more space!

The Mission - AnyPort
Demand for space and the energy transition

- Infrastructure is not planned and built on the same day (20-30 years). The future is now, and the strategic decisions have to be made now.

- Not working together coherently will lead to **lack of space**: In the most extreme scenario, you need all the post-war port expansions one more to get a to become a sustainable fuel cluster. That is 42 kilometers of extra port.

- On the other hand: if it gets **good coordinated and integrated**, we can come a long way with a small expansion of Maasvlakte 2.

Eerste generatie industrie

Container terminals

Anydorp

Achterland verbindingen
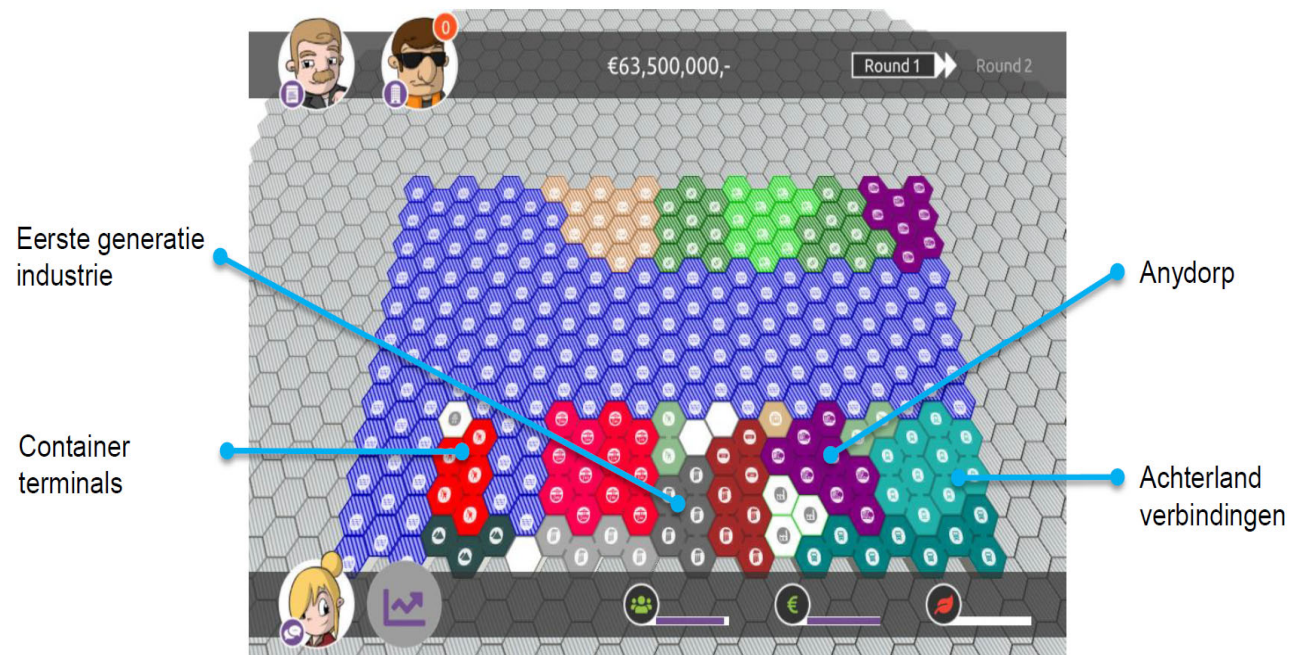
The Mission - Anyport

AnyPort is a growing port! Current activities in the port:

- First generation industry

  - Coal power plants

  - Gas refineries

- Container terminals

  - Deepsea container terminals

  - Hinterland connection

But! Companies keep applying for space in the port:

- New contracts can be concluded with new customers

- E.g., a landing point for offshore wind energy

- Where is the space?

Shore power signal board and wind turbine
© Danny Cornelissen - Source: Port of Rotterdam

The Mission - AnyPort

- **Goal:** Make AnyPort future proof by working together on the space issue with keeping in mind the following:

  People   Can the customer function optimally in AnyPort

  Profit   Income of the port

  Planet CO_2 emissions of the port area

- **What is your role?**
  - AnyPort's strategic port designer. As a strategic port designer look at the future vision from AnyPort port authority perspective

- **Wat is your port development vision for 2030/2040/2050?**
  - Long-term development of the AnyPort
  - What type of companies and activities?
  - Reserve space for infrastructure

The Mission - AnyPort
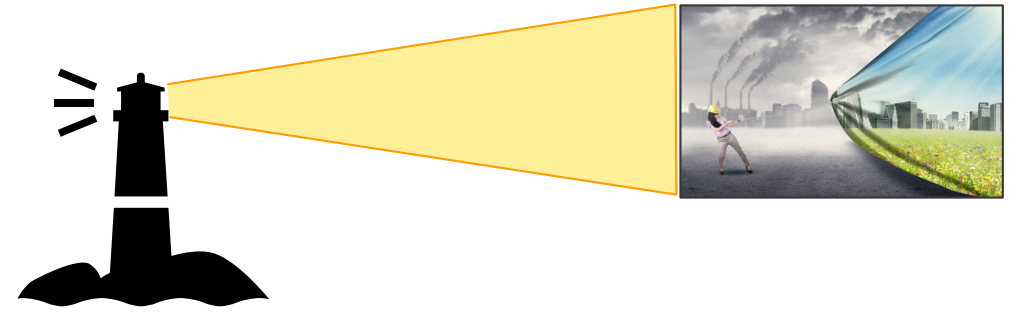
We are going to prepare AnyPort for the future by forming 3x times a vision for the years 2030/2040/2050.

- **Vision for 2030**   **Expanding or restructuring?**

- **Vision for 2040**   **What will be the important cluster activity of the AnyPort?**

- **Vision for 2050**   **Diversifying or upgrading?**

Workflow of AnyPort

You are going to work as follows to make decisions for the different visions.

1. Discuss as duo the options. What are you going to choose as a group? **(10 min)**
2. Fill in your decision in the Mentimeter and pitch your decision **(30 sec per pitch)**
3. After the discussion fill in your definite choice in the Mentimeter **(1 min)**

Forming groups

Group 1: NGO   *Cares about the CO_2 reduction* GREENPEACE

Group 2: Logistics organization   *Cares about the (container) logistics activities* DHL

Group 3: Industrial organization   *Cares about the industrial activities already there* Shell

Group 4: Residents   *Cares about the village*

Group 5: New entrants   *Cares about new zero emission business models* PLATFORM ZERO

We are now in 2023
Vision 2030 – AnyPort

The port is almost full!

Aerial photo Maasvlakte 2 June 2020
© Danny Cornelissen

Challenges AnyPort: Space and CO2 emission

Lack of space

- The last free space has already a new destination
- New customers keep knocking at the door of AnyPort

Space for the (energy) transition

- AnyPort has a high CO_2 emission
- Increasing costs for CO_2 emissions
- Transition towards a sustainable port is needed

Aerial photo Theemswegtrace
© Danny Cornelissen

Overview current customers in AnyPort in 2022

	Satisfaction	Revenues for the Port Authority	CO2 emission	Removal costs (x 1.000.000)
Container terminal 1	Satisfied	High	Limited	6
Coal storage	Very satisfied	Low	No emission	5
Coal power station 1	Very satisfied	Low	Limited	10
Container terminal 2	Satisfied	High	Limited	6,5
Container terminal 3	Satisfied	High	Limited	6
Inland shipping center	Very satisfied	Maintenance costs	No emission	6
Coal power station 2	Very satisfied	Low	High	8
Gas terminal	Very satisfied	Low	No emission	12
Oil refinery	Very satisfied	Low	Limited	20
Cruise terminal	Very satisfied	Barely	No emission	0,5
Truck capacity	Very satisfied	Maintenance costs	No emission	1
Rail capacity	Very satisfied	Maintenace costs	No emission	6

Vision for 2030: how does the future industrial cluster look like?

2030

Zero…

Waste   Delays   Errors

Emissions   CO$_2$

Inventory   Maintenance

Accidents
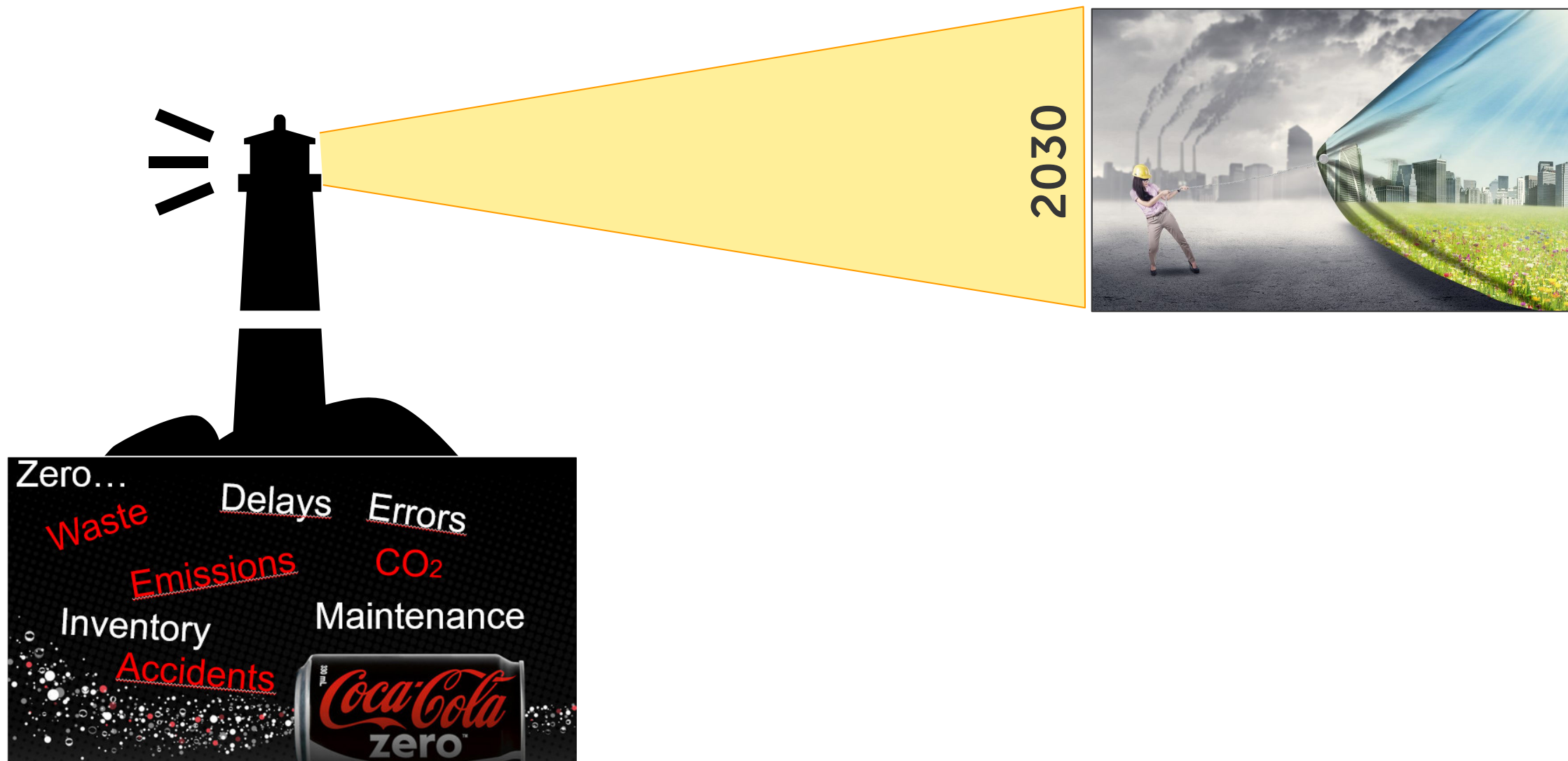
Vision for 2030: Expanding or restructuring?

Expanding the Port

Restructuring and limited expansion the Port

Restructuring the port
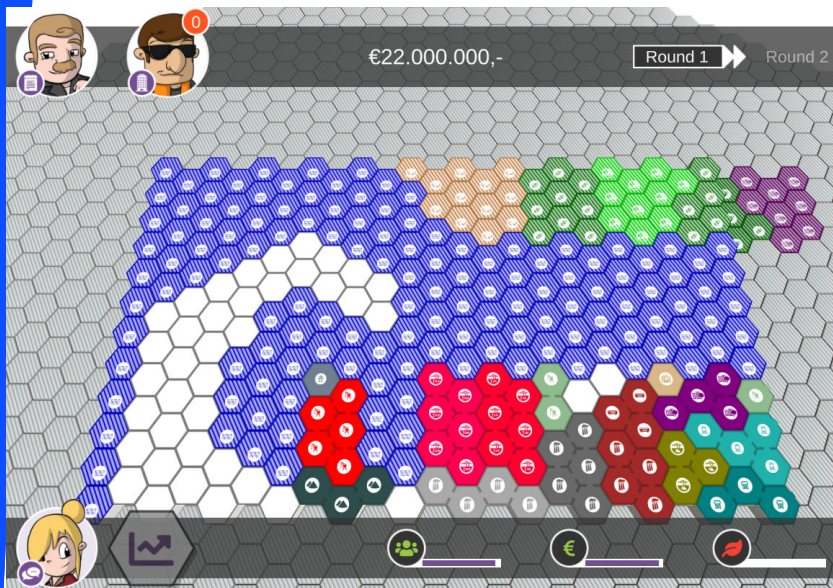
#yKKKx9
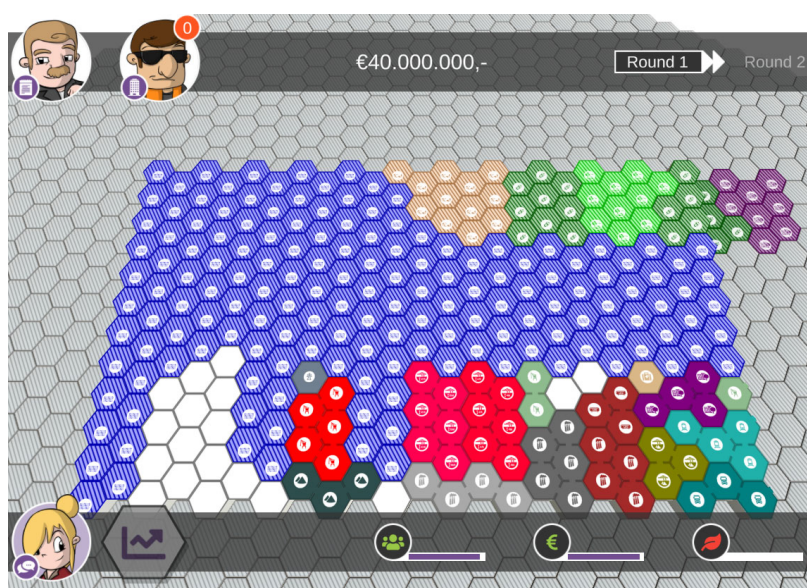
#VGWTXG
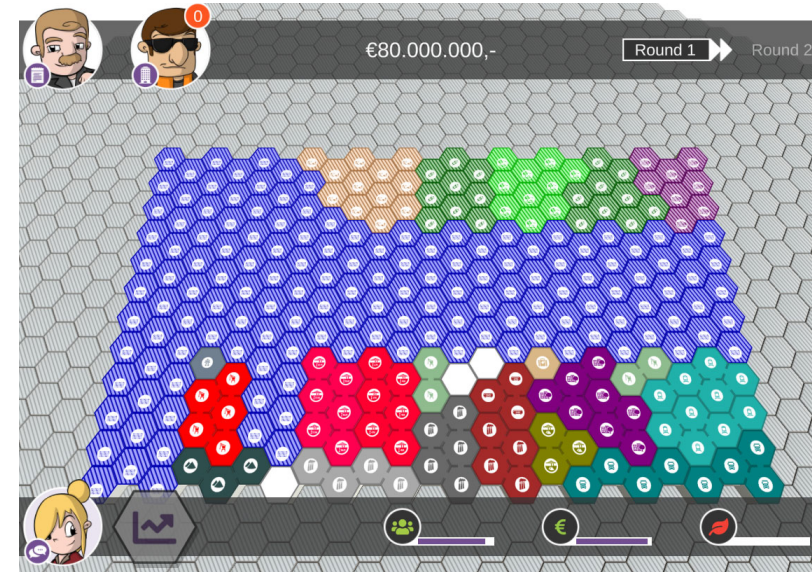

#5pGFt3

We are now in 2030
Vision 2040 – AnyPort

The port is further developed

Welcome to 2030

- The port is further developed based on your previous decision in 2022

- Sustainability has become even more important in 2030 and is a very important aspect while making strategic decisions.

- AnyPort is still very popular and diverse customers have contacted the port!

What are you going to decide?

Vision for 2040: how does the future industrial cluster look like?

2040

Zero…
Waste Delays Errors
Emissions CO₂
Inventory Maintenance
Accidents
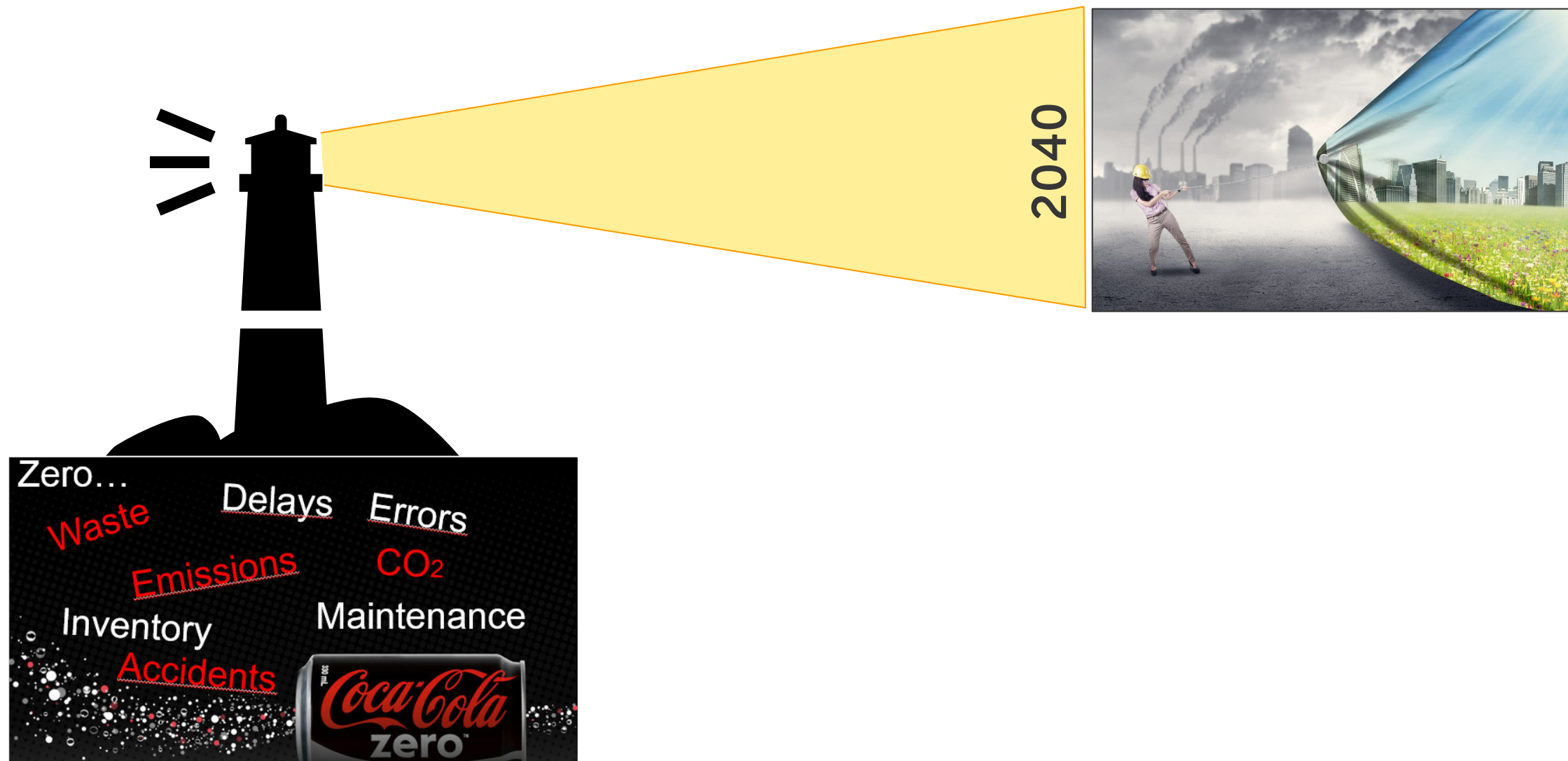
Vision for 2040: What will be the important industrial cluster activity of the AnyPort?

Synthetic cluster
(H2 backbone + Electrolysis)

Opportunities:
- Building on the state-of-the-art cluster
- Reforming to a sustainable environment

Sidenote
- Needs a lot of space for CO2 storage and utilization
- High demand for green electricity

Biocluster
(Gasification plant + Biomass storage)

Opportunities:
- More sustainable than fossil fuels
- Renewable process based on natural processes

Sidenote
- Relatively expensive
- Needs some space

Circular cluster
(Waste plant + waste storage)

Opportunities:
- Focusing on recycling waste
- Upcycling: Convert worthless materials into valuable fuels

Sidenote
- Expensive, because the demanded separation methods
- A lot of waste is needed

Transition maps in Port of Rotterdam

Energy transition project ✕

Status of projects

- 🟢 Operational
- 🔵 In progress
- 🔵 In preparation
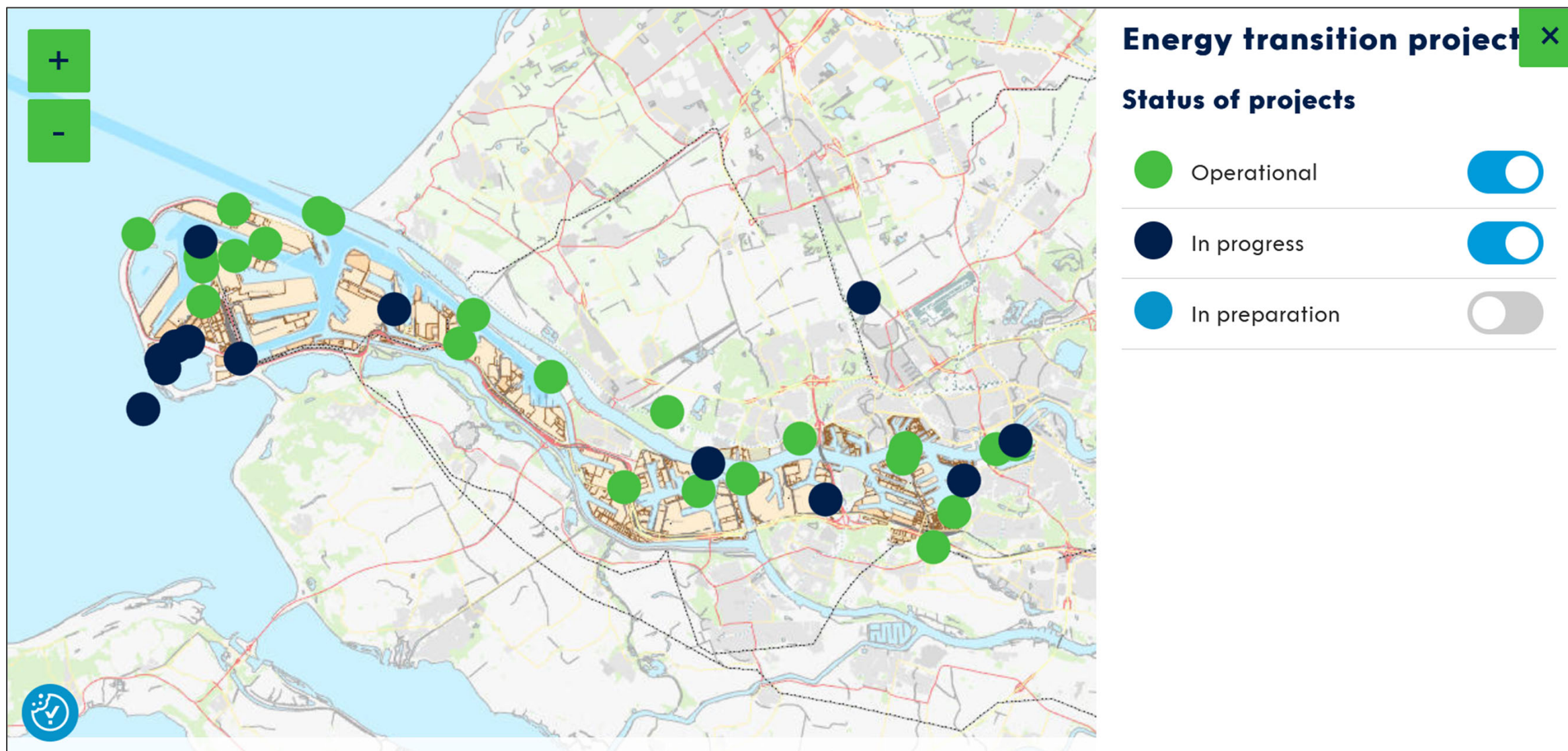
Source: Port of Rotterdam, 2023

We are now in 2040
Vision 2050 – AnyPort

AnyPort is in transition

Aerial photo Maasvlakte 2 June 2020
© Danny Cornelissen

Vision for 2050: Upgrading or Diversifying

Upgrading

Provide an upgrade to the current industrial cluster
Strengthening of synergy in the port and the business climate
Distinguish yourself as a particular cluster

Upgrade Synthetic cluster
(H2-Import terminal)

Upgrade Biocluster
(Gasification plant + biomass storage)

Upgrade Circular cluster
(waste plant + waste storage)

Diversifying

Diversify your business activities
Not reliable on one particular activity

Logistics hub

Carbon capture

Vision for 2050: Diversifying or upgrading?

Upgrade Synthetic cluster
(H2-Import terminal)

Opportunities:
- The opportunity to distinguish yourself as Hydrogen cluster
- Strengthening of synergy in the port and the business climate

Sidenote
- Capturing CO2 asks for a lot of space

Future automatic terminal hub
(Hyperloop)

Opportunities:
- Competitive port logistically
- Extremely efficient
- Sustainable
- Diversifying

Sidenote
- Pressure on the hinterland

Carbon capture from the sea
(CO2 infra)

Opportunities:
- CO2 hub, including selling CO2
- Technological frontrunner
- Sustainable
- Strengthening the CO2 part of the e-fuel cluster

Sidenote
- Proved technology
- Impact on nature/water

Vision for 2050: Diversifying or upgrading?

Upgrade Circular cluster
(waste plant + waste storage)

Future automatic terminal hub
(Hyperloop)

Carbon capture from the sea
(CO_2 infra)

Opportunities:
- Building on existing technology/UPS
- Strengthening of synergy in the port and the business climate

Sidenote
- Depending on limited materials

Opportunities:
- Competitive port logistically
- Extremely efficient
- Sustainable
- Diversifying

Sidenote
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Opportunities:
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Vision for 2050: Diversifying or upgrading?

Upgrade
Circular cluster
(waste plant + waste storage)

Future automatic terminal hub
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2050 AnyPort = Future Port

Aerial photo Maasvlakte 2 June 2020
© Danny Cornelissen

Learning experiences with students and professionals

Table 1: Results survey experiences with Port Constructor

Question	Score
To what extend did you **learn** something by playing the game?	4.3
How much did the game **activate** you in learning the other course contents?	4.3
To what extent did the game require you to **work together** with other?	4.5
To what extent were you **motivated** to learn?	4.1
To what extent were you **engaged** with the game?	4.0
To what extent were you **challenged** to develop your capabilities?	4.1

Score scale 1-5, N=68

What did you like the most about the game?

*"The game helped me to **trade off** people, planet, and profit."*

*"The concept of teaching port development via a strategy game. This is way too **fascinating and entertaining**."*

*"**Interaction** between the groups."*

*"The game caught my **attention** due to the need to improve my high score."*

*"Game being **addictive** and **informative** at the same time."*

*"**Complexity** of the game."*
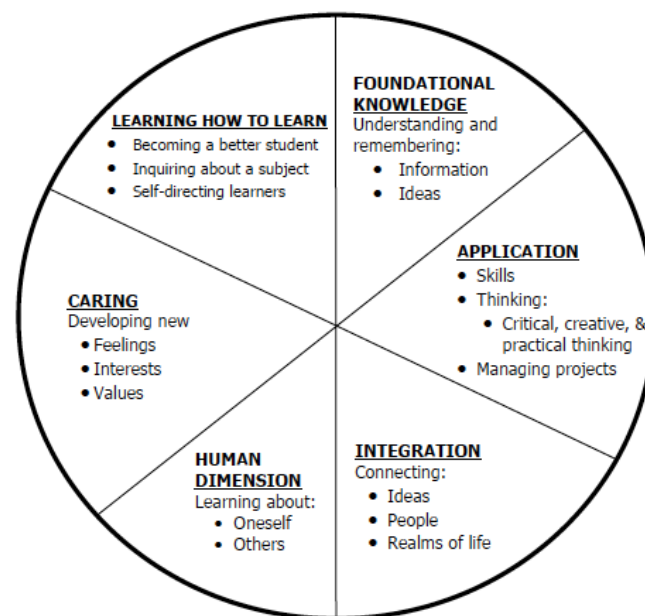
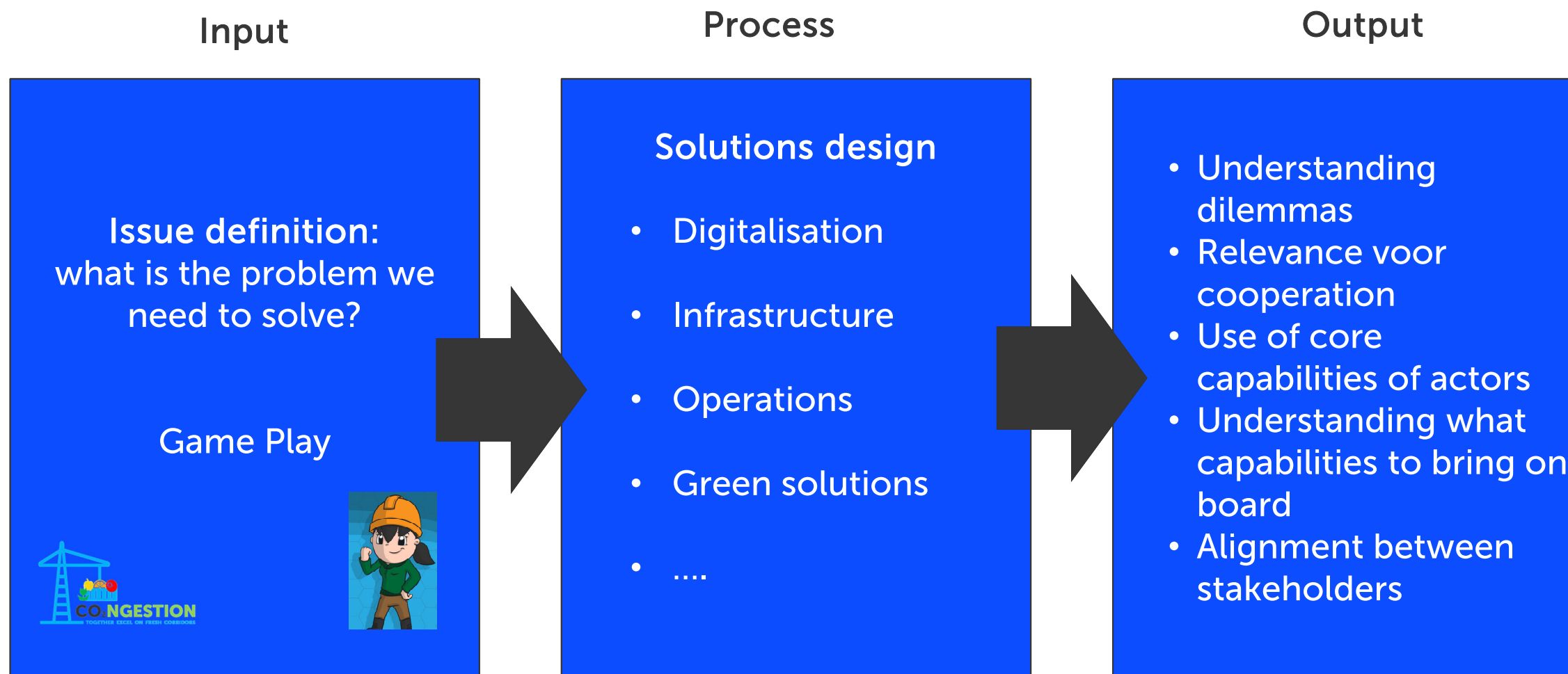# Creating significant learning activities

Serious Games support in creating significant learning experiences for students, achieve better engagement and allow for better comprehension of multi-stakeholder, multi-issue problems
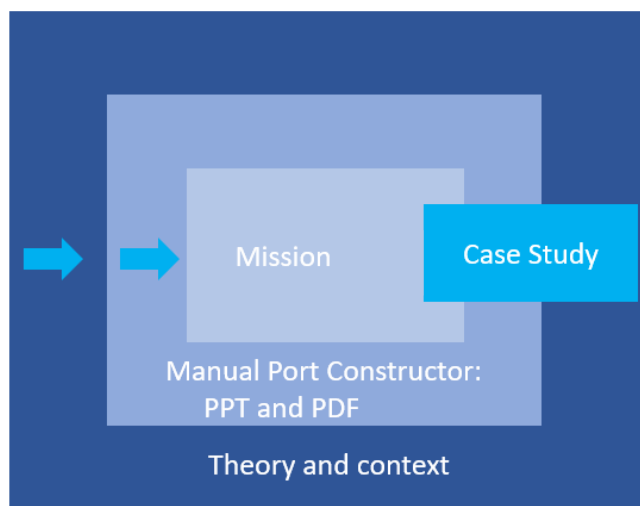
A TAXONOMY OF SIGNIFICANT LEARNING

LEARNING HOW TO LEARN
- Becoming a better student
- Inquiring about a subject
- Self-directing learners

FOUNDATIONAL KNOWLEDGE
Understanding and remembering:
- Information
- Ideas

CARING
Developing new
- Feelings
- Interests
- Values

APPLICATION
- Skills
- Thinking:
  - Critical, creative, & practical thinking
- Managing projects

HUMAN DIMENSION
Learning about:
- Oneself
- Others

INTEGRATION
Connecting:
- Ideas
- People
- Realms of life

Mission — Case Study

Manual Port Constructor: PPT and PDF

Theory and context

REVISED AND UPDATED

CREATING SIGNIFICANT LEARNING EXPERIENCES

An Integrated Approach to Designing College Courses

L. DEE FINK

JOSSEY-BASS
A Wiley Brand

How to move from here?

Input

Issue definition:
what is the problem we need to solve?

Game Play

Process

Solutions design

- Digitalisation
- Infrastructure
- Operations
- Green solutions
- ....

Output

- Understanding dilemmas
- Relevance voor cooperation
- Use of core capabilities of actors
- Understanding what capabilities to bring on board
- Alignment between stakeholders

Further reading

Maurice Jansen (2023) An ecosystems approach to port development in International Business and Sustainable Development Goals, Progress in International Business Research, Volume 17, 263–283, ISSN: 1745-8862/doi:10.1108/S1745-886220230000017014

Jansen, M., Hein, C. Port city symbiosis: introduction to the special issue. Marit Econ Logist (2023). https://doi.org/10.1057/s41278-023-00257-x

Maurice Jansen & Amanda Brandellero & Rosanne van Houwelingen, (2021). "Port-City Transition: Past and Emerging Socio-Spatial Imaginaries and Uses in Rotterdam's Makers District," Urban Planning, Cogitatio Press, vol. 6(3), pages 166-180.
DOI: https://doi.org/10.17645/up.v6i3.4253

Maurice Jansen, Rob van Tulder & Rikky Afrianto (2018) Exploring the conditions for inclusive port development: the case of Indonesia, Maritime Policy & Management, 45:7, 924-943, DOI: 10.1080/03088839.2018.1472824

Learning about port planning in a complex environment; a study on the use of Port Constructor 2.0, ISAGA Conference 4-7 July 2023.

Exploring the conditions
case

Maurice

CHAPTER 14
PORTS AND THE SUSTAINABLE DEVELOPMENT GOALS:

COGITATIO

Article

Port-City Transition: Past and Emerging Socio-Spatial Imaginaries and Uses in Rotterdam's Makers District

Learning about port planning in a complex environment: a study to the use of PortConstructor 2.0

Maurice Jansen[1], Geertje Bekebrede[2] and Rosanne Madelijn van Houwelingen[1]

[1] Erasmus University Rotterdam, Erasmus UPT. Rotterdam, the Netherlands
[2] Technical University Delft, Faculty of Technology, Policy, and Management. Delft, the Netherlands

Keywords: Gaming, Port, Transition, Simulation, Learning, Sustainability, Social dilemma

Abstract

The environment in which port professionals make decisions have become increasingly complex due to advancements in technology, more intense rivalry among ports, increasingly urgent demands from governments and civil rights groups to re-establish balance of the ecosystem. Advanced understanding of port and city or region – its functioning and increased collaboration among stakeholders - holds important potential for bringing together diverse stakeholders in the much-needed transition of port city regions in the field of energy, digitisation, or socio-cultural development. In most port regions, port development companies (PDCs) are taking a leading role in port planning and development. In recent years, PDCs are taking initiatives to develop games, often with local stakeholders, schools, and universities to educate children and citizens or to help professionals to get a better understanding of long-term effects of their decision making. The focus of port games is shifting to include strategies which aim to tackle global issues. Furthermore, more recent simulation games are more centered around collaboration rather than competition. Reaching shared objectives and developing a shared set of values seem to be the new goal. Evaluation of simulation games specifically used as an educational tool in a multi-problem, multi-stakeholder context, have not been done so far. Using a dataset of 137 respondents, the added value of our study is to assess how different ways of embedding games 1) impact knowledge development, and 2) influence motivation, activation, and engagement.

Port Constructor can also be played on mobile (only with access code)

Thank you

Game design

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