UCCRN_edu Climate-Resilient City Board/Card Game

Project Results' Lead Partner: Aalborg Universitet

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Introduction

Collaborative games, such as the Climate-Resilient City Board Game, foster moments of interaction with institutions, public decision-makers, end-users, and civil society. These interactions reveal the unique demands and needs of each group, as well as the collective needs in the urban regeneration process.

The game serves as a catalyst for discussions with local authorities and communities, fostering knowledge sharing in a multi-partner context and levelling the communication field.

By incorporating gamification methods into collaborative practices for knowledge-sharing in climate-resilient governance, planning, and design, we aim to effectively engage local authorities, stakeholders, and communities, shaping their needs and priorities around concrete mapping and co-design exercises. More into detail, we aim:
- to facilitate discussion and incorporate ideas and suggestions
- to create awareness about climate benefits and social, economic, and environmental co-benefits of climate resilient governance, planning and design measures
- to identify and express local needs in terms of urban regeneration priorities (urban quality and essential services — housing, transportation, social services, etc.)
- to identify synergies between expressed needs and the opportunities to respond to them through climate-resilient strategies
- to facilitate discussion among participants and co-creation of shared outputs
- to break cultural barriers and role hierarchies, foster the creation of a shared mindset for further collaborative work and output implementation

The game is expected to have a significant impact and transferability potential, extending beyond the UCCRN_edu context. It will be a valuable tool for streamlining collaborative processes in the field of urban climate change and resilience, engaging a diverse range of actors in education, capacity building, and community-led initiatives.

The game will contribute to responding to key needs of Intensive Study Programmes and Multiplier Events, where the participants are asked to produce relevant design

outputs (both in terms of policy design and urban design) in a limited time. Here, there is a need to streamline the integration of several elements that characterise implementing possible solutions to tackle climate challenges at city levels, clearly identifying goals, roles and their interaction, feedback, problem-solving, competition, and narrative.

The game's testing within the UCCRN_edu Course will allow us to identify the advantage of innovative learning/knowledge exchange environments, which include "fun" as a pivotal element to increase engagement and sustain motivation.

Gamification sessions will be included in Multiplier Events in 2023 and 2024 to test the game's potential to facilitate discussion among participants and co-create shared outputs.
The game is expected to have a significant impact and transferability potential, not limited to the UCCRN-EDU context, but available to streamline collaborative processes in urban climate change and resilience by various actors in the field of education, capacity building, and community-led initiatives.

The game will be a joint effort developed by all UCCRN_edu Partners, with significant involvement of AAU, UNINA, and UIC. Students from UCCRN_edu Courses will also play a crucial role in the game-design implementation, ensuring a collaborative and inclusive process.

The game will be released as a downloadable package, including the board, cards, rules, and other components needed to replicate the gaming exercise in different contexts. Online tutorials will be produced to facilitate the replication process.

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1.

The UCCRN_edu Game

1.1 Background

Previous experiences within EU and national projects conducted by UCCRN_edu partners (e.g. RAMSETE within H2020 ESPREssO project, coordinated by AMRA-UNINA see www.sciencedirect.com/science/article/pii/S221242092031284X, Broken Cities and Gone With the Wind, developed by KlimaLab at AAU, see www.en.dcea.dk/education-teaching/), as well as game-based exercises developed within UCCRN UDCWs (e.g. CRUD Napoli 2018, see www.uccrn-europe.org/international-workshop-%E2%80%9Cclimate-resilient-urban-design%E2%80%9D-napoli), represent a background for developing the Climate-Resilient City Board Game.

H2020 ESPREssO project serious games have demonstrated how results from panel discussions and breakout group sessions are greatly improved when preceded by a game session since it helps break cultural barriers and role hierarchies, fostering a shared mindset for further collaborative work and output implementation. RAMSETE series was designed to elicit information from stakeholders.

1.1.1 Ramsete Series

The Ramsete series is designed for information elicitation from stakeholders; the process of creating the game is referred to as MDA – Mechanics, Dynamics and Aesthetics, which breaks down the game's development into the mechanics (components of the exercise, rules governing the permissible actions and responses), dynamics (the behaviour of the players in terms of their input and the resulting output), and aesthetics (the sort after the emotional response of the players). Such a process allows the game's design to be considered from the perspective of the designer and the player simultaneously.
In this game series, the focus is on policy development in the fields of disaster risk reduction and climate change adaptation, within negotiations and identifications and comparisons of different policy and technical options in the context of the scenario. The actions also depend on the selection of roles, with actions divided between those associated with, for example, policy leadership, research and development, infrastructure provision, education, welfare, etc.

1.1.2 Broken Cities

The game allows players to make decisions as landlords, competing for the top place among all landlords in a city. Players collaborate on legislation to "fix" their city's environmental problems. This legislation session attempts to simulate situations in which legislation is created, leading to thought-provoking and playful moments of realisation. Players see the direct consequences of their emissions decisions in near real-time.

Figure 1. Ramsete Series and Broken Cities game sessions.

1.2 The UCCRN_edu Game

1.2.1 Identification of Objectives and Needs for Stakeholders' Meetings

The gamification solution is a tool to support knowledge-sharing and co-design practices with local stakeholders and communities. For the UCCRN_edu game, the stakeholders' needs are identified as follows:
- discussions to share ideas and suggestions among participants and co-creation of shared outputs
- knowledge and awareness about climate benefits and social, economic, and environmental co-benefits of climate resilient governance, planning and design measures
- identification of local needs in terms of urban regeneration priorities (urban quality and essential services — housing, transportation, social services, etc.)
- synergies between expressed needs and the opportunities of responding to them through climate-resilient strategies
- to break cultural barriers and role hierarchies, foster a shared mindset for further collaborative work and output implementation

1.2.2 Game Design Principles

This gamification toolkit is focused on the science-policy interface, bringing science into action in the approaches on DRR and CCA to enhance risk management capabilities by bridging the gap between science and legal/policy issues at local and national levels.

It integrates environmental issues related to the urban project, which develops with multidisciplinary, multi-scalar and multi-operational dimensions. It is situated at the articulations of environmental design and governance of the economic and built environment.
The challenge in the design model is to create interactions between elements, allowing various scales of intervention to create a similar experience to the real-life context. Two critical action levels are identified: planning and design measures and governance and policy measures. The gamification toolkit will be developed with a focus on these two aspects.

The game structure allows participants to act on a multi-scale perspective, with the possibility to act at various levels (building, street, neighbourhood, commune) using action cards (Adaptation and mitigation measures Cards, Constructions Cards, Governance cards and Science cards) that will participate in changing the game features (land tiles, land use regulations, buildings, infrastructures) within resilient city visions (15min city and mobility, circular city, bleu/green infrastructures, disaster-resilient city) through installation conditions of the components.

1.2.3 Expected Results

The main expected results are:
- an understanding of the reasons behind the players' choices regarding policy development, policy change, and decision-making
- fostering of discussion, decision-making
- co-production of solutions
- interactions between elements, co-benefits and interests, conflicts of interest

At the end of the game, once the players generate the urban environment, it should be able to be analysed by the UCCRN_edu Toolkit. The technical solutions integrated into the game will be defined according to the criteria of the UCCRN_edu Toolkit database.

1.2.4 Test and Download

The toolkit has been tested in an educational context within the UCCRN_edu Intensive Study Programmes at AAU in Aalborg and in Naples, among others cities.

The components of the game are available in open access at the following link: https://drive.google.com/drive/folders/1aU1PspTZl9aEJrRvhXRfuo6c9BWrNq0I

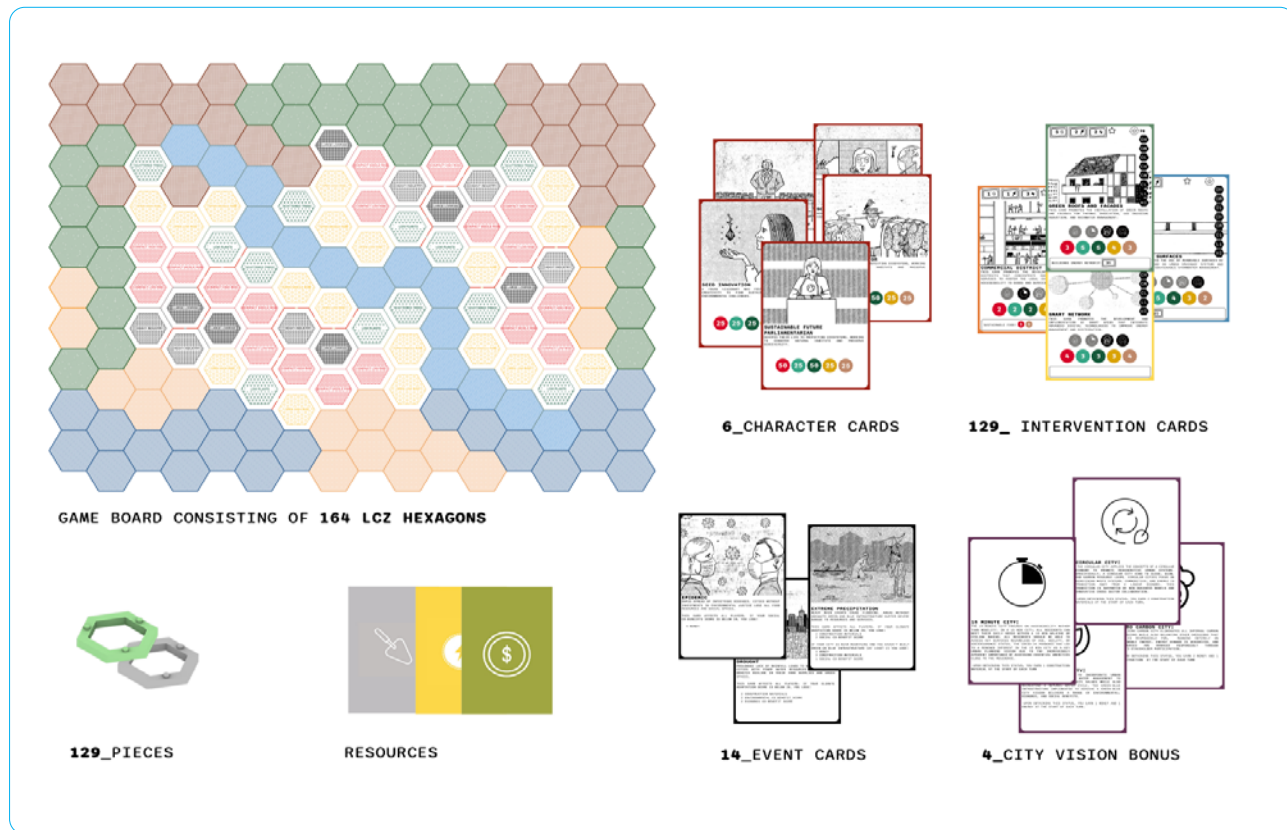Figure 2. Overview game components.

Figure 3. Game session in Naples.

Annex 1. Game Description

A1.2 Introduction

ClimeCraft board/card game has been developed to enhance players' awareness of climate change adaptation and mitigation solutions, aiming to promote understanding and action through an engaging and playful experience. The game's primary mission is to teach players about the balance between climate benefits and the social, economic, and environmental co-benefits associated with climate-resilient governance, planning, and design measures. By employing gamification methods, the game facilitates collaborative practices for knowledge-sharing among local authorities, stakeholders, and communities, helping to identify and express local needs in urban regeneration priorities. These needs often extend beyond climate mitigation and adaptation, encompassing broader improvements in urban quality and essential services such as housing, transportation, and social services.

ClimeCraft corresponds to the R3 of the UCCRN_edu project, an Erasmus+ cooperation partnership that brings together world-leading Higher Education Institutions (HEIs) within the Urban Climate Change Research Network (UCCRN). This international consortium is dedicated to fostering multidisciplinary, knowledge-based, cross-sectoral action on climate change from an urban perspective. The project aims to address existing gaps in education regarding climate-resilient urban planning, design, and governance. By establishing synergies with leading research and teaching institutions, as well as EU and international networks, UCCRN_edu endeavours to streamline climate action in cities and cultivate the next generation of urban climate leaders who can navigate the complexities of interconnected knowledge domains.

The game draws upon valuable lessons from previous EU and national projects conducted by UCCRN-EDU partners, such as the RAMSETE initiative within the H2020 ESPREssO project. Coordinated by AMRA-UNINA, the RAMSETE series has demonstrated how serious games can significantly enhance stakeholder engagement and information elicitation. Utilising the MDA (Mechanics, Dynamics, Aesthetics) framework, the design process considers the player's experience and the game's objectives, facilitating a shared mindset for collaborative work. Furthermore, games like "Broken Cities" developed by KlimaLab at Aalborg University immerse players in the role of competing landlords, where they collaborate to create legislation addressing environmental challenges in their city, experiencing the immediate impacts of their emissions decisions in a thought-provoking and engaging manner.

In addition to these experiences, prior game-based exercises within UCCRN Urban Design Climate Workshops (UDCWs), such as CRUD Napoli 2018, have further shaped the development of the Climate-Resilient City game. These workshops have successfully employed game mechanics to engage participants in collaborative urban design processes, empowering communities to visualise and negotiate climate-resilient strategies.

By building on this rich foundation of experience and knowledge, the ClimeCraft game aspires to create immersive learning environments that raise awareness about climate challenges and promote active participation in developing solutions for sustainable and resilient urban communities.

A1.2 Overview

The game board is composed of hexagonal-shaped areas representing LCZs.

LCZ	Resource	Symbol
Compact High-rise	Construction Material	(bricks)
Compact Middle-rise	Construction Material	(bricks)
Compact Low-rise	Construction Material	(bricks)
Open High-rise	Money	(dollars)

LCZ	Resource	Symbol
Open Middle-rise	Money	(dollars)
Open Low-rise	Money	(dollars)
Large Low-rise	Money	(dollars)
Heavy Industry	Energy	(thunderbolt)
Scattered Trees	Energy	(thunderbolt)
Low Plants	Energy	(thunderbolt)
Dense Tree	Context	
Bush, Scrub	Context	

At the start of the game, each player will randomly be given a character card, five intervention cards, three construction materials, four money, and two energy resources. The intervention cards are used to achieve specific objectives determined by the character card previously received. The first player to accomplish the required score will be declared the winner.

Playing the intervention cards will earn the player points in the following categories: climate neutrality, climate adaptation, environmental co-benefits, social co-benefits, and economic co-benefits.

Each turn begins with the player drawing an intervention card. Playing these cards requires resources. How are resources obtained? Simple! Players collect resources at the beginning of each turn (4 money, 3 energy and 3 building material). Based on the available resources, the player can play an intervention card.

To obtain the necessary combination of resources, players may trade resources with one another. Players can trade three equal cards for one specific card with the gamemaster.

A1.3 Game Rules

The following sections contain all the important information that you need to play! If you need more information during the game, you can look up keywords in the *Glossary*, which follows these rules.

Game components:
- The Game Board is composed of 164 LCZ hexes
- 6 task character cards — each card represents a character with a specific objective
- Intervention cards — a total of 129 cards, divided into two categories:
  - 27 general intervention cards valid for all LCZs
  - 102 intervention cards only valid for the LCZ in which they are placed
- 14 event cards divided as follows:
  - 7 hazard event cards
  - 7 socio-economic cards
- 105 pieces
- 4 bonus city vision cards: special cards that offer advantages to players

Preparation:
The game can be played by 2 to 12 players, with a game master facilitating the game and managing the event cards. Each player receives one character card, five intervention cards and the initial resources.

Turn Overview:
At the beginning of the game, each player receives a character card, five intervention cards and initial resources.
On each turn, players receive the basic resources and those related to the benefits of the cards played.
On their turn, a player draws an intervention card, may play one or more intervention cards paying for neces-

sary resources, and may exchange resources with other players or the bank.
At the end of every turn except the first, the gamemaster draws an event card that affects all players. If there is no gamemaster, a player draws the event card.

Ending the game:
The game ends when a player achieves the final objective, which is determined by a score based on climate benefits and economic, environmental, and social co-benefits. Event cards can modify the victory conditions and may require players to take action to protect the city from various risks.

A1.4 Glossary

This section contains detailed, alphabetical entries and examples for the game.

- **Character Cards**
- **City Vision Bonus**
- **Climate Adaptation**
- **Climate Neutrality**
- **Co-benefits**
- **Ending the Game**
- **Event Cards**
- **Gameplay**
- **Intervention Cards**
- **Local Climate Zone**
- **Resource Cards**
- **Round**
- **Trade**

C

Character Cards
At the start of the game, each player receives a character card. Each character has a unique objective based on climate neutrality, climate adaptation, and environmental, social, and economic co-benefits. These characters represent different perspectives and roles in the context of climate change. Below are the characters with their respective target scores.

1. CORRUPT POLITICIAN
Opposes environmental legislation and prioritises economic interests at the expense of the planet's health and future generations.
- **Score:**
  - Climate neutrality: 25
  - Climate adaptation: 50
  - Environmental co-benefits: 25
  - Social co-benefits: 25
  - Economic co-benefits: 50

2. FOSSIL FUEL INDUSTRY LOBBYIST
Advocates for the fossil fuel industry, hindering the transition to sustainable energy sources.
- **Score:**
  - Climate neutrality: 50
  - Climate adaptation: 25
  - Environmental co-benefits: 25
  - Social co-benefits: 25
  - Economic co-benefits: 50

3. SCIENTIST
Works to raise public awareness about climate change and promotes sustainable solutions.
- **Score:**
  - Climate neutrality: 50
  - Climate adaptation: 50
  - Environmental co-benefits: 25
  - Social co-benefits: 25
  - Economic co-benefits: 25

4. SEED INNOVATION
A young visionary who fosters innovation and creativity to find sustainable solutions to environmental challenges.
- **Score:**
  - Climate neutrality: 25
  - Climate adaptation: 25
  - Environmental co-benefits: 25
  - Social co-benefits: 50
  - Economic co-benefits: 50

5. NATURE PROTECTOR
Devotes their life to protecting ecosystems, working to conserve natural habitats and preserve biodiversity.
- **Score:**
  - Climate neutrality: 25
  - Climate adaptation:50
  - Environmental co-benefits: 50
  - Social co-benefits:25
  - Economic co-benefits:25

6. SUSTAINABLE FUTURE PARLIAMENTARIAN
A parliament member committed to long-term policies that address climate change and protect the environment for future generations.
- **Score:**
  - Climate neutrality: 50
  - Climate adaptation: 25
  - Environmental co-benefits: 50
  - Social co-benefits: 25
  - Economic co-benefits: 25

City Vision Bonus
During the game, players can obtain the City Vision Bonus. Each card specifies a minimum and maximum score needed to receive the Bonus. The first player to reach the minimum score can claim this Bonus, but if another player surpasses their score, they will take over the City Vision Bonus certificate. The player who reaches the maximum score keeps the Bonus permanently.
Example: During her turn, Elisabetta reaches 6 points for the "15-Minute City" and now enjoys the City Vision Bonus, receiving one "energy" resource card at the start of each turn. In the following round, Francesco reaches 7 points for the "15-Minute City," taking the City Vision Bonus from her.

GREEN-BLUE CITY:
The Green-Blue City aims to incorporate urban greening with sustainable water management to provide ecological and amenity values while recreating a natural water cycle. The green-blue infrastructure implemented to achieve a green-blue city vision delivers a range of environmental, economic, and social benefits.
— Upon obtaining this status, you earn 1 money and 1 energy at the start of each turn.

15 MINUTE CITY:

The 15-Minute City focuses on accessibility rather than mobility. In a 15-minute city, all residents can meet their daily needs within a 15-minute walking or cycling radius. All residents should be able to access key services regardless of age, ability, or socioeconomic status. The COVID-19 pandemic has led to a renewed interest in the 15-minute City as a key urban planning vision due to the increasingly apparent importance of accessing essential amenities close to the residence.
— Upon obtaining this status, you earn 1 construction material at the start of each turn

ZERO CARBON CITY:

The zero-carbon City eliminates all internal carbon emissions while balancing other emissions it is responsible for, running entirely on renewable energy, minimising energy demand, and managing resources responsibly through multi-stakeholder participation.
— Upon obtaining this status, you earn 2 money and 1 construction at the start of each turn

CIRCULAR CITY:

The circular City applies circular economy concepts to promote regenerative urban systems. Specifically, it aims to close, slow, and narrow resource loops. Circular cities focus on redefining waste systems, commodities, and energy to transition away from a linear economy. New business models and innovative cross-sector collaboration support this transition.
— Upon obtaining this status, you earn 2 construction materials at the start of each turn.

Climate Adaptation

"In human systems, the adjustment process to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects."

Climate Neutrality

"Climate neutrality refers to the idea of achieving net zero greenhouse gas emissions by balancing those emissions so they are equal to, or less than, the emissions removed, as well as accounting for regional or local biogeophysical effects of human activities, such as changes in surface albedo or local climate. In basic terms, it means we reduce our emissions through climate action to ensure no net effect on the climate system."

Co-benefits

"A policy or measure aimed at one objective has a positive effect on another objective, thereby increasing the total benefit to society or the environment. Co-benefits are also referred to as ancillary benefits."

E

Ending the Game

If you reach all the points on your turn, the game ends, and you win! You can only win during your turn.

Event Cards

The master plays event cards at the end of each round. There are two types of event cards: Hazard and Socioeconomic.

1. HEATWAVE

Prolonged extreme temperatures cause thermal stress. Cities without green and blue infrastructures, such as green roofs and urban parks, suffer significant resource losses.
This card affects all players. If your climate adaptation score is below 15, you lose:
- 2 construction materials
- 2 Environmental co-benefit score
- 2 social co-benefit score

2. EXTREME PRECIPITATION

Heavy rain events cause flooding. Areas without adequate green and blue infrastructure severely damage resources and services.

This card affects all players. If your climate adaptation score is below 20, you lose:

- 2 construction materials
- 2 social co-benefit score

If your City is near mountains and you have not built green or blue infrastructure (at least 2), you lose:

- 3 money
- 3 construction materials
- 1 social co-benefit score

3. COASTAL FLOOD

Storm surges can also cause coastal flooding. Areas without permeable infrastructure or coastal risk management measures suffer significant losses of materials and social spaces.

This card affects cities adjacent to the coast. If you have not built green and blue infrastructure (at least 3), you lose:

- 2 money
- 2 construction materials
- 2 environmental co-benefit score

4. RIVER FLOOD

River overflows are caused by intense rainfall. Cities without green and blue infrastructures or river risk management measures suffer severe damage.

This card affects all the players. If you have not built green infrastructure (at least 4) along the rive banks, you lose:

- 2 money
- 2 construction materials
- 1 economic co-benefits score

5. DROUGHT

Prolonged lack of rainfall leads to water scarcity. Cities with fewer water resources experience a drastic decline in their food supplies and green spaces.

This card affects all players. If your climate adaptation score is below 20, you lose:

- 2 construction materials
- 2 environmental co-benefit score
- 2 economic co-benefit score

6. EPIDEMIC

The rapid spread of infectious diseases. Cities without investments in environmental justice lose all ood resources and social spaces.

This card affects all players. If your social co-benefits score is below 20, you lose:

- 4 money

7. INDUSTRIAL PLANT ACCIDENT

An industrial plant accident causes contamination, which causes adjacent cities to suffer significant losses of economic resources, water, and food.

This card affects all players. If your climate adaptation score is below 15, you lose:

- 4 money
- 2 construction materials

8.INCREASE IN UNEMPLOYMENT

Job losses due to climate change. Damaged economic sectors are unable to recover.

This card affects all players. If your climate adaptation score is below 20, you lose:

- 4 money
- 2 Economic co-benefits score

- 2 Social co-benefits score

9. INCREASE IN FOOD PRICES
A decrease in agricultural production causes food prices to rise. Families face higher food expenses.
This card affects all players. If your climate adaptation score is below 15, you lose:
- 2 money
- 2 Economic co-benefits score
- 2 Social co-benefits score

10. CLIMATE DEBT
An increase in public debt to finance adaptation and mitigation measures for climate change.
This card affects all players. If your climate neutrality score is below 20, you lose:
- 2 Economic co-benefits score
- 2 Social co-benefits score

11. SOCIAL INEQUALITY
Climate impacts exacerbate social inequalities, with vulnerable communities suffering the most significant impacts.
This card affects all players. If your social co-benefits score is below 10, you lose:
- 2 money
- 2 Economic co-benefits score
- 2 Social co-benefits score

12. AIR POLLUTION
An increase in greenhouse gas emissions and fossil fuel usage worsens air quality. This card affects all players. If your climate neutrality score is below 15, you lose:
- 2 Environmental co-benefits score
- 2 Social co-benefits score

13. TECHNOLOGICAL INNOVATION
Technological advancements offer new solutions for adapting to climate change.
This card affects all players. If your climate neutrality score is 20 and your climate adaptation score is 20, you earn:
- 6 money
- 2 construction materials
- 5 Economic co-benefits score
- 2 Social co-benefits score

14. INVESTMENTS IN RENEWABLE ENERGY
Increased investments in renewable energies such as solar, wind, and hydroelectric power.
This card affects all players. If your climate neutrality score is 20, you earn:
- 6 money
- 5 climate neutrality score
- 2 Economic co-benefits score
- 2 Social co-benefits score

Example: The game master draws the "Drought" card. Fabrizio, who has not reached 20 points in climate adaptation, loses 2 money, 2 Environmental Co-benefits score, and 2 Social Co-benefits score. On the other hand, Luz has 25 points in climate adaptation and does not lose anything.

G

Gameplay
Here is a summary of the game sequence; for details, refer to the following key terms:
- Board Setup

- Rounds

The game is played clockwise. During their turn, each player performs the following actions (only the first one is mandatory):
- Resource Production
- Trading
- Playing Intervention Cards

I

Intervention Cards

Intervention cards allow players to take specific actions to adapt to or mitigate the effects of climate change. Some intervention cards can be played in all LCZs, while others must be played in a specific LCZ. The cards are divided into green infrastructure, blue infrastructure, grey infrastructure, sustainable energy infrastructure, and social infrastructure.

Intervention Cards Valid on All LCZs

15. SUSTAINABLE FOOD
The card promotes sustainable agricultural practices, such as organic farming and permaculture, which preserve biodiversity, reduce the use of harmful chemicals, and improve soil health.
- **Cost**: 6 money
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 4
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **Effects on**: COMMUNITY FARMING, COMMERCIAL DISTRICT

16. SOCIAL INNOVATION
The card introduces new social and community solutions to climate change, such as energy cooperatives, shared urban gardens, and community resilience projects.
- **Cost**: 10 money
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 5
  - Environmental co-benefits: 4
  - Social co-benefits: 5
  - Economic co-benefits: 3
- **Effects on**: DISTRIBUTED GENERATION FROM RENEWABLE SOURCES, all PLANT, EQUIPPED PUBLIC SPACES, SOCIAL SERVICES HUB, CULTURAL AND LEISURE HUB

17. BUILDINGS ENERGY RETROFIT
The card promotes energy retrofit actions for buildings, such as thermal insulation and upgrading of heating and cooling systems, which reduce overall energy consumption.
Cost: 6 money
Score:
  - Climate neutrality: 5
  - Climate adaptation: 4
  - Environmental co-benefits: 3
  - Social co-benefits: 4
  - Economic co-benefits: 5
Effects on: GREEN ROOFS AND FACADES, SOCIAL HOUSING, LUXURY HOUSING

18. CLIMATE SHELTERS

The card promotes the creation of climate shelters in cities, which will provide safe and cool spaces during heat waves and help protect vulnerable populations.

- **Cost**: 4 money
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 4
  - Environmental co-benefits: 3
  - Social co-benefits: 5
  - Economic co-benefits: 3

19. INTENSIVE RECYCLING

Promotes increasing the recycling rate of materials, thus reducing the waste sent to landfills.

- **Cost**: 5 money
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 1
  - Environmental co-benefits: 5
  - Social co-benefits: 2
  - Economic co-benefits: 5
- **Effects on**: RECYCLING HUB

20. ECO DESIGN

The card promotes developing and adopting products made from recyclable and reusable materials, contributing to a more sustainable product lifecycle.

- **Cost**: 6 money
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 2
  - Environmental co-benefits: 4
  - Social co-benefits: 2
  - Economic co-benefits: 5
- **Effects on**: GREEN CAR PARKS, CONSTRUCTION MATERIALS HUB

21. PUBLIC TRANSPORT PROMOTION

The card promotes incentives for using public transport, reducing the use of private vehicles and greenhouse gas emissions.

- **Cost**: 7 money
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 3
  - Environmental co-benefits: 4
  - Social co-benefits: 5
  - Economic co-benefits: 4
- **Effects on**: CYCLE AND PEDESTRIAN INFRASTRUCTURE, LTZ2 AND PEDESTRIANIZATION

22. TRANSPORT ELECTRIFICATION

This card promotes the adoption of electric vehicles through tax incentives and the installation of public charging infrastructure.

- **Cost**: 5 money
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 3
  - Environmental co-benefits: 5

- Social co-benefits: 4
- Economic co-benefits: 4
- **Effects on**: SHARED MOBILITY

23. INDUSTRIAL SAFETY
Safe maintenance and operation of industrial plants to reduce environmental risks and improve worker safety.
- **Cost**: 5 money
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation:3
  - Environmental co-benefits: 5
  - Social co-benefits: 5
  - Economic co-benefits: 4

Green Infrastructures

24. GREEN ROOFS AND FACADES
This card promotes the installation of green roofs and facades to improve thermal insulation, reduce CO_2 emissions, and manage rainwater.
- **Cost**: 3 money, 2 construction materials, 2 energy
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **Card Benefits**: If you have played the BUILDINGS ENERGY RETROFIT card, this card will cost 3 money. If you play this card, you will receive 1 energy (every turn benefit)
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY and 1pt ZERO CARBON CITY

25. PARKS AND GREEN CORRIDORS
This card enables the creation of linear parks that offer accessible green spaces to the community, enhance biodiversity, improve air quality and reduce flood risks.
- **Cost**: 2 money, 2 construction materials, 1 energy
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **Card Benefits**: If you play this card, you will receive 1 construction material (every turn benefit)
- **City Vision Bonus**: 1 pt GREEN AND BLUE CITY e 1pt ZERO CARBON CITY

26. GREEN EMBANKMENTS
This card promotes the construction of green embankments along the City's watercourses to prevent flooding and improve water management. It must be placed near a river.
- **Cost**: 2 money, 3 construction materials
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 4
  - Environmental co-benefits: 4
  - Social co-benefits: 3
  - Economic co-benefits: 3
- **Card Benefits**: If you play this card, you will receive 1 construction material (every turn benefit)

- **City Vision Bonus**: 1 pt GREEN AND BLUE CITY

27. URBAN AREAS REFORESTATION
This card promotes the reforestation of urban areas in the City, including planting trees along streets, in parks and public squares.
- **Cost**: 6 money, 2 construction materials
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 5
  - Economic co-benefits: 3
- **Card Benefits**: If you play this card, you will receive 2 construction materials (every turn benefit)
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY, 1pt ZERO CARBON CITY, 1 pt 15 MINUTES CITY

28. GREEN CAR PARKS
The card promotes integrated car parks with vegetation elements and permeable surfaces, which help manage rainwater runoff and reduce urban heat islands.
- **Cost**: 2 money, 2 construction materials
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 5
  - Environmental co-benefits:4
  - Social co-benefits: 4
  - Economic co-benefits: 2
- **Card Benefits**: If you have played the ECO DESIGN card, you pay 2 money.
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY

Blue Infrastructures

29. PERMEABLE SURFACES
This card promotes the use of permeable surfaces by reducing the load on urban drainage systems and contributing to sustainable stormwater management.
- **Cost**: 2 money, 3 construction materials
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 5
  - Environmental co-benefits: 4
  - Social co-benefits: 3
  - Economic co-benefits: 2
- **City Vision Bonus**: 1 pt GREEN AND BLUE CITY

30. BIOSWALES AND RAINGARDENS
This card promotes linear and punctual green elements that filter and treat rainwater, reducing water and soil pollution and contributing to sustainable water management.
- **Cost**: 3 money, 3 construction materials
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY

31. WATER STORAGE AND RECYCLING SYSTEMS

This card supports the optimisation of water tanks, fostering efficient water resource management and ensuring fair distribution of drinking water across the City.

- **Cost**: 2 money, 2 construction materials, 2 energy
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 3
  - Environmental co-benefits: 4
  - Social co-benefits: 4
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 1 money (every turn benefit)
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY e 1pt CIRCULAR CITY

32. ARTIFICIAL WETLANDS

This card promotes the design of wetlands that play a key role in the ecosystem by improving water quality and contributing to climate change mitigation.

- **Cost**: 4 money, 2 construction materials, 1 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 1 construction material (every turn benefit)
- **City Vision Bonus**: 1 pt GREEN AND BLUE CITY e 1pt ZERO CARBON CITY

33. LIVING BREAKWATERS

This card designs Living Breakwaters, a coastal green infrastructure solution that mitigates storm wave damage, reduces erosion, and restores ecosystem health.

- **Cost**: 3 money, 3 construction materials, 1 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 5
  - Environmental co-benefits: 5
  - Social co-benefits: 3
  - Economic co-benefits: 3
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY

34. MARINE ECOSYSTEM RESTORATION

This card focuses on restoring degraded marine ecosystems to boost biodiversity, improve ecosystem productivity, and support local communities and livelihoods. It must be placed near the sea.

- **Cost**: 7 money
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 4
  - Environmental co-benefits: 5
  - Social co-benefits: 4
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 money(every turn benefit)
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY

35. WATER UPCYCLING

This card promotes advanced wastewater treatment systems that recycle and reuse water in different contexts, improving water management and reducing environmental impact.

- **Cost**: 5 money, 2 construction materials, 1 energy
- **Score**:

- Climate neutrality: 4
- Climate adaptation: 4
- Environmental co-benefits: 5
- Social co-benefits: 3
- Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 money and 2 energy (every turn benefit)
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY e 1 pt CIRCULAR CITY

Sustainable Energy Infrastructures

36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
This card promotes the adoption of distributed generation systems using renewable sources, enabling local energy production, reducing transmission losses, and enhancing efficiency.
- **Cost**: 4 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 5
  - Climate adaptation: 3
  - Environmental co-benefits: 4
  - Social co-benefits: 4
  - Economic co-benefits:4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social benefits and economic co-benefits score will be 5 points.
- **City Vision Bonus**: 1pt CIRCULAR CITY , 1pt ZERO CARBON CITY

37. SMART NETWORK
This card promotes the development of smart grids that use advanced digital technologies to optimise energy management, improve efficiency and transfer energy sustainably.
- **Cost**: 2 money, 1 construction material, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (a one-time benefit), 1 money, and 2 energy (a benefit every turn).
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

38. SOLAR POWER PLANT
This card promotes installing solar power plants, which use photovoltaic panels or solar collectors to convert sunlight into electrical or thermal energy.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social benefits score will be 5.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

39. WIND POWER PLANT
This card promotes the installation of wind turbines that harness wind power to generate clean, sus-

tainable energy without harmful emissions.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social co-benefits score will be 5 points.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

40. MARINE POWER PLANT
This card promotes the installation of marine power plants that harness the energy of waves, tides, and sea currents to generate electricity. The plants must be placed near the sea.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social co-benefits score will be 5 points.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

41. GEOTHERMAL POWER PLANT
This card promotes installing geothermal power plants to harness the Earth's natural heat and generate sustainable energy.
- **Cost**: 2 money, 2 materiali da costruzioni, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social co-benefits score will be 5 points.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

42. BIOMASS ENERGY PLANT
This card promotes using biomass power plants to convert organic material, such as agricultural and forestry residues, into clean energy.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 2
  - Social co-benefits: 2
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 energy (one-time benefit), 1 money and 2 energy (every turn benefit). If you have played the SOCIAL INNOVATION card, the Social co-benefits score will

be 5 points.
- **City vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

43. WASTE TO ENERGY
This card promotes the implementation of advanced waste treatment plants, which reduce the amount of waste going to landfills and contribute to the production of clean, renewable energy.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 3
  - Environmental co-benefits: 2
  - Social co-benefits: 2
  - Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 2 energy (a one-time benefit), 1 money, and 2 energy (a benefit every turn). If you have played the INTENSIVE RECYCLING card, you will receive 2 extra money (every turn benefit).
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

44. COMPOSTING CENTER
This card promotes the composting of organic waste for soil fertilisation, reducing waste sent to landfills and decreasing greenhouse gas emissions.
- **Cost**: 2 money, 2 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits: 4
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 1 money and 1 construction material (a benefit every turn). If you have played the SOCIAL INNOVATION card, the Social co-benefits score will be 7 points.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

Grey Infrastructure

45. RECYCLING HUB
This card promotes the establishment of recycling centres to manage material waste efficiently.
- **Cost**: 1 money, 3 construction materials, 3 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits:4
  - Social co-benefits: 3
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 money and 2 construction materials (a benefit every turn). If you have played the INTENSIVE RECYCLING card, the Social co-benefits and economic co-benefits score will be 7.
- **City Vision Bonus**: 1pt CIRCULAR CITY e 1pt ZERO CARBON CITY

46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
This card promotes the design of accessible cycle paths and pavements in urban areas to encourage active mobility and reduce vehicular traffic.
- **Cost**: 2 money, 2 construction materials
- **Score**:
  - Climate neutrality: 4

- Climate adaptation: 3
  - Environmental co-benefits:4
  - Social co-benefits: 4
  - Economic co-benefits: 4
- **Card Benefits**: If you have played the PUBLIC TRANSPORT PROMOTION card, this card will cost 1 money and 1 construction material.
- **City Vision Bonus**: 1pt ZERO CARBON CITY e 1pt 15 MINUTES CITY

47. LTZ AND PEDESTRIANISATION

This card promotes limited traffic zones and the pedestrianisation of central city areas to reduce air pollution and improve the quality of life.
- **Cost**: 2 money, 1 construction material, 1 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3
  - Environmental co-benefits:4
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **Card Benefits**: If you have played the PUBLIC TRANSPORT PROMOTION, this card will cost 1 money
- **City Vision Bonus**: Ottieni 1pt ZERO CARBON CITY e 1pt 15 MINUTES CITY

48. LUXURY HOUSING

This card promotes the development of luxury housing characterised by high comfort standards, innovative design, and exclusive services.
- **Cost**: 7 money, 4 construction materials, 1 energy
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 2
  - Environmental co-benefits:2
  - Social co-benefits: 2
  - Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 5 money (income at every turn). If you have played the BUILDINGS ENERGY RETROFIT, the Climate neutrality and Climate adaptation score will be 7.

49. MIXED USE NEIGHBOURHOOD

This card promotes mixed-use neighbourhoods that combine residences, businesses, public services, and green spaces. These neighbourhoods foster dynamic urban life, reduce commutes, and create more connected communities.
- **Cost**: 4 money, 2 construction materials, 2 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 4
  - Environmental co-benefits: 4
  - Social co-benefits: 5
  - Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 4 money (income at every turn).
- **City Vision Bonus**: 1pt 15 MINUTE CITY

50. CONSTRUCTION MATERIALS HUB

This card promotes the creation of building material hubs that centralise the production, distribution and recycling of sustainable building materials.
- **Cost**: 5 money, 2 construction materials, 2 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 3

- Environmental co-benefits: 4
- Social co-benefits: 5
- Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 2 construction materials (every turn benefit). If you have played the ECO DESIGN card, it will cost 3 money.
- **City Vision Bonus**: 1pt 15 CIRCULAR CITY

Social Infrastructure

51. COMMUNITY FARMING
This card promotes sustainable agriculture by providing healthy, locally sourced food, encouraging community collaboration, reducing the ecological footprint of food transportation, and enhancing food security.
- **Cost**: 3 money, 2 construction materials
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 4
  - Environmental co-benefits: 4
  - Social co-benefits: 5
  - Economic co-benefits: 3
- **Card Benefits**: If you have played a SOCIAL INNOVATION or SUSTAINABLE FOOD card, the Social benefits Economic co-benefits score will be 6
- **City Vision Bonus**: 1pt GREEN AND BLUE CITY e 1 pt CIRCULAR CITY

52. SHARED MOBILITY
This card promotes car-sharing, bike-sharing, and ride-sharing services to reduce the number of vehicles on the road.
- **Cost**: 1 money, 1 construction material, 2 energy
- **Score**:
  - Climate neutrality: 4
  - Climate adaptation: 2
  - Environmental co-benefits:4
  - Social co-benefits: 4
  - Economic co-benefits: 3
- **Card Benefits**: If you have played the TRANSPORT ELECTRIFICATION card, this card will cost 1 energy
- **City Vision Bonus**: 1pt ZERO CARBON CITY e 1pt 15 MINUTES CITY

53. SOCIAL HOUSING
This card promotes social housing construction to provide affordable housing for low-income families.
- **Cost**: 4 money, 3 construction materials, 1 energy
- **Score**:
  - Climate neutrality: 3
  - Climate adaptation: 3
  - Environmental co-benefits:3
  - Social co-benefits: 5
  - Economic co-benefits: 4
- **Card Benefits**: If you play this card, you will receive 2 money (income at every turn). If you have played the BUILDINGS ENERGY RETROFIT card, the Climate neutrality and Climate adaptation score will be 5

54. EQUIPPED PUBLIC SPACES
This card promotes the design and implementation of well-equipped public spaces, such as parks, squares and recreational areas, to improve the quality of urban life.
- **Cost**: 2 money, 1 construction materials

- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 4
  - Environmental co-benefits: 3
  - Social co-benefits: 5
  - Economic co-benefits: 2
- **Card Benefits**: If you have played the SOCIAL INNOVATION card, the Social benefits score will be 7

55. COMMERCIAL DISTRICT

This card promotes the development of business districts concentrating on shops, offices, and services to foster the local economy and improve accessibility to goods and services.
- **Cost**: 3 money, 1 materiali da costruzione, 3 energia
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 2
  - Environmental co-benefits: 2
  - Social co-benefits: 4
  - Economic co-benefits: 5
- **Card Benefits**: If you play this card, you will receive 2 money (one-time benefit) and 1 money (income at every turn). If you have played the SUSTAINABLE FOOD card, the climate neutrality and Enviro mental co-benefits score will be 5
- **City Vision Bonus**: 1pt 15 MINUTE CITY

56. SOCIAL SERVICES HUB

This card promotes social services hubs that provide access to healthcare, education, and support, enhancing interaction and improving the quality of life for vulnerable community members.
- **Cost**: 3 money, 1 construction material, 1 energy
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 3
  - Environmental co-benefits: 2
  - Social co-benefits: 5
  - Economic co-benefits: 4
- **Card Benefits**: If you have played the SOCIAL INNOVATION card, the Social benefits sarà score will be 7
- **City Vision Bonus**: 1pt 15 MINUTE CITY

57. CULTURAL AND LEISURE HUB

This card promotes the design and implementation of cultural and leisure hubs that enrich urban life with artistic, cultural, and recreational activities.
- **Cost**: 3 money, 1 construction material, 1 energy
- **Score**:
  - Climate neutrality: 2
  - Climate adaptation: 3
  - Environmental co-benefits: 3
  - Social co-benefits: 5
  - Economic co-benefits: 4
- **Card Benefits**: If you have played the SOCIAL INNOVATION card, the Social benefits sarà score will be 7
- **City Vision Bonus**: 1pt 15 MINUTE CITY

L

Local Climate Zone

"We formally define local climate zones as regions of uniform surface cover, structure, material, and human activity that span hundreds of meters to several kilometres on a horizontal scale. Each LCZ has a characteristic

screen-height temperature regime most apparent over dry surfaces, on calm, clear nights, and in areas of simple relief. These temperature regimes persist year-round and are associated with the homogeneous environments or ecosystems of cities (e.g., parks, commercial cores), natural biomes (e.g., forests, deserts), and agricultural lands (e.g., orchards, cropped fields). Each LCZ is individually named and ordered by one (or more) distinguishing surface properties, which in most cases is the height/packing of rough objects or the dominant land cover. The physical properties of all zones are measurable and nonspecific as to place or time."

Compact High-rise
It is a dense mix of towering buildings, some tens of stories high. There are few to no trees. The land cover is mainly paved and characterised by concrete, steel, stone, and glass construction materials.
- **Resources It Produces**: Construction material
- **Possible Actions**:
    24. GREEN ROOFS AND FACADES
    25. PARKS AND GREEN CORRIDORS
    27. URBAN AREAS REFORESTATION
    28. GREEN CAR PARKS
    29. PERMEABLE SURFACES
    30. BIOSWALE AND RAINGARDEN
    31. WATER STORAGE AND RECYCLING SYSTEMS
    35. WATER UPCYCLING
    36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
    37. SMART NETWORK
    44. COMPOSTING CENTER
    46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
    47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
    48. LUXURY HOUSING
    49. MIXED USE NEIGHBOURHOOD
    51. COMMUNITY FARMING
    52. SHARED MOBILITY
    54. EQUIPPED PUBLIC SPACES
    55. COMMERCIAL DISTRICT
    56. SOCIAL SERVICES HUB
    57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 6

Compact Mid-rise
Attached or closely spaced buildings 3–9 stories tall. Narrow streets and inner courtyards separate buildings and are uniform in height. The sky view from street level was significantly reduced. Heavy building materials (stone, concrete, brick, tile) are used, and buildings have thick roofs and walls.
- **Resources It Produces**: Construction material
- **Possible Actions**:
    24. GREEN ROOFS AND FACADES
    25. PARKS AND GREEN CORRIDORS
    27. URBAN AREAS REFORESTATION
    28. GREEN CAR PARKS
    29. PERMEABLE SURFACES
    30. BIOSWALE AND RAINGARDEN
    31. WATER STORAGE AND RECYCLING SYSTEMS
    35. WATER UPCYCLING
    36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
    37. SMART NETWORK
    44. COMPOSTING CENTER
    46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
    47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
    49. MIXED USE NEIGHBOURHOOD

51. COMMUNITY FARMING
52. SHARED MOBILITY
53. SOCIAL HOUSING
54. EQUIPPED PUBLIC SPACES
55. COMMERCIAL DISTRICT
56. SOCIAL SERVICES HUB
57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 6

Compact Low-rise

Attached or closely spaced buildings 1–3 stories tall. Buildings are small and tightly packed along narrow streets, often without discernible alignment. Sky view from the street level was significantly reduced. Heavy building materials (stone, concrete, brick, tile) and thick roofs and walls. Land cover is mainly paved; there are few or no trees.
- **Resources It Produces**: Construction material
- **Possible Actions**:
    24. GREEN ROOFS AND FACADES
    25. PARKS AND GREEN CORRIDORS
    27. URBAN AREAS REFORESTATION
    28. GREEN CAR PARKS
    29. PERMEABLE SURFACES
    30. BIOSWALE AND RAINGARDEN
    31. WATER STORAGE AND RECYCLING SYSTEMS
    35. WATER UPCYCLING
    36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
    37. SMART NETWORK
    44. COMPOSTING CENTER
    46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
    47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
    49. MIXED USE NEIGHBOURHOOD
    51. COMMUNITY FARMING
    52. SHARED MOBILITY
    53. SOCIAL HOUSING
    54. EQUIPPED PUBLIC SPACES
    55. COMMERCIAL DISTRICT
    56. SOCIAL SERVICES HUB
    57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 6

Open High-rise

Buildings of 10 stories are set in an open, geometrically defined arrangement. They are of uniform height, width, and spacing. The sky view from ground level is significantly reduced. Heavy building materials (concrete, steel, stone, glass) and thick roofs and walls. Roofs are typically flat. Scattered trees and abundant plant cover.
- **Resources It Produces**: Money
- **Possible Actions**:
    24. GREEN ROOFS AND FACADES
    25. PARKS AND GREEN CORRIDORS
    27. URBAN AREAS REFORESTATION
    28. GREEN CAR PARKS
    29. PERMEABLE SURFACES
    30. BIOSWALE AND RAINGARDEN
    31. WATER STORAGE AND RECYCLING SYSTEMS
    35. WATER UPCYCLING
    36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
    37. SMART NETWORK

44. COMPOSTING CENTER
45. RECYCLING HUB
46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
48. LUXURY HOUSING
49. MIXED USE NEIGHBOURHOOD
50, CONSTRUCTION MATERIALS HUB
51. COMMUNITY FARMING
52. SHARED MOBILITY
54. EQUIPPED PUBLIC SPACES
55. COMMERCIAL DISTRICT
56. SOCIAL SERVICES HUB
57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 10

Open Mid-rise

Open arrangement of buildings of 3–9 stories. The sky view from street level is slightly reduced. Heavy building materials (concrete, steel, stone, glass) are used, and buildings have thick roofs and walls. There are some scattered trees and abundant plant cover.
- **Resources It Produces**: Money
- **Possible Actions**:
  24. GREEN ROOFS AND FACADES
  25. PARKS AND GREEN CORRIDORS
  27. URBAN AREAS REFORESTATION
  28. GREEN CAR PARKS
  29. PERMEABLE SURFACES
  30. BIOSWALE AND RAINGARDEN
  31. WATER STORAGE AND RECYCLING SYSTEMS
  35. WATER UPCYCLING
  36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
  37. SMART NETWORK
  44. COMPOSTING CENTER
  45. RECYCLING HUB
  46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
  47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
  49. MIXED USE NEIGHBOURHOOD
  50. CONSTRUCTION MATERIALS HUB
  51. COMMUNITY FARMING
  52. SHARED MOBILITY
  53. SOCIAL HOUSING
  54. EQUIPPED PUBLIC SPACES
  55. COMMERCIAL DISTRICT
  56. SOCIAL SERVICES HUB
  57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 10

Open Low-rise

Small buildings of 1 to 3 stories, detached or attached in rows, often in a grid pattern. Sky view from street level is slightly reduced. Building materials vary (wood, brick, stone, tile). There are some scattered trees and abundant plant cover.
- **Resources It Produces**: Money
- **Possible Actions**:
  24. GREEN ROOFS AND FACADES
  25. PARKS AND GREEN CORRIDORS
  27. URBAN AREAS REFORESTATION

28. GREEN CAR PARK
29. PERMEABLE SURFACES
30. BIOSWALE AND RAINGARDEN
31. WATER STORAGE AND RECYCLING SYSTEMS
35. WATER UPCYCLING
36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
37. SMART NETWORK
44. COMPOSTING CENTER
45. RECYCLING HUB
46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
47. RESTRICTED TRAFFIC ZONE AND PEDESTRIANISATION
49. MIXED USE NEIGHBORHOOD
50. CONSTRUCTION MATERIALS HUB
51. COMMUNITY FARMING
52. SHARED MOBILITY
53. SOCIAL HOUSING
54. EQUIPPED PUBLIC SPACES
55. COMMERCIAL DISTRICT
56. SOCIAL SERVICES HUB
57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 10

Large Low-rise

Large, low buildings of 1 to 3 stories are separated by extensive paved surfaces. Buildings extend outward and not upward, and roofs are flat. The sky view from ground level is slightly reduced. Building materials vary (steel, concrete, metal), and there are few to no trees; the surface is mostly paved.
- **Resources It Produces**: Money
- **Possible Actions**:
    24. GREEN ROOFS AND FACADES
    25. PARKS AND GREEN CORRIDORS
    28. GREEN CAR PARKS
    29. PERMEABLE SURFACES
    30. BIOSWALE AND RAINGARDEN
    31. WATER STORAGE AND RECYCLING SYSTEMS
    35. WATER UPCYCLING
    36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
    37. SMART NETWORK
    38. SOLAR POWER PLANT
    39. WIND POWER PLANT
    40. MARINE POWER PLANT
    41. GEOTHERMAL POWER PLANT
    42. BIOMASS ENERGY PLANT
    43. WASTE TO ENERGY
    44. COMPOSTING CENTER
    45. RECYCLING HUB
    46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
    50. CONSTRUCTION MATERIALS HUB
    51. COMMUNITY FARMING
    52. SHARED MOBILITY
    54. EQUIPPED PUBLIC SPACES
    55. COMMERCIAL DISTRICT
    56. SOCIAL SERVICES HUB
    57. CULTURAL AND LEISURE HUB
- **Maximum Number of Actions**: 7

Low Plants

Featureless landscape of pervious ground, predominantly low plant cover. There are few or no trees, roads, or buildings. The whole sky view from ground level.

- **Resources It Produces**: Money
- **Possible Actions**:
  - 25. PARKS AND GREEN CORRIDORS
  - 31. WATER STORAGE AND RECYCLING SYSTEMS
  - 32. ARTIFICIAL WETLAND\
  - 35. WATER UPCYCLING
  - 38. SOLAR POWER PLANT
  - 39. WIND POWER PLANT
  - 41. GEOTHERMAL POWER PLANT
  - 42. BIOMASS ENERGY PLANT
  - 43. WASTE TO ENERGY
  - 44. COMPOSTING CENTER
  - 46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
  - 51. COMMUNITY FARMING
  - 54. EQUIPPED PUBLIC SPACES
- **Maximum Number of Actions**: 5

Heavy Industry

A highly irregular mix of low and mid-rise industrial structures (tanks, towers, stacks). Structures are openly spaced on hard-packed surfaces. The sky view from ground level is slightly reduced. Building materials vary (steel, concrete, metal), and no trees exist.

- **Resources It Produces**: Money
- **Possible Actions**:
  - 24. GREEN ROOFS AND FACADES
  - 28. GREEN CAR PARKS
  - 29. PERMEABLE SURFACES
  - 30. BIOSWALE AND RAINGARDEN
  - 31. WATER STORAGE AND RECYCLING SYSTEMS
  - 35. WATER UPCYCLING
  - 36. DISTRIBUTED GENERATION FROM RENEWABLE SOURCES
  - 37. SMART NETWORK
  - 38. SOLAR POWER PLANT
  - 39. WIND POWER PLANT
  - 40. MARINE POWER PLANT
  - 41. GEOTHERMAL POWER PLANT
  - 42. BIOMASS ENERGY PLANT
  - 43. WASTE TO ENERGY
  - 44. COMPOSTING CENTER
  - 45. RECYCLING HUB
  - 50, CONSTRUCTION MATERIALS HUB
  - 52. SHARED MOBILITY
- **Maximum Number of Actions**: 5

Scattered Trees

Lightly wooded landscape of deciduous and/or evergreen trees. Trees are scattered across the previous ground (low plants). The sky view from ground level is slightly reduced. Few or no roads or buildings.

- **Resources It Produces**: energy
- **Possible Actions**:
  - 25. PARKS AND GREEN CORRIDORS
  - 27. URBAN AREAS REFORESTATION
  - 30,BIOSWALE AND RAINGARDEN
  - 31. WATER STORAGE AND RECYCLING SYSTEMS

32. ARTIFICIAL WETLAND
35. WATER UPCYCLING
38. SOLAR POWER PLANT
39. WIND POWER PLANT
42. BIOMASS ENERGY PLANT
43. WASTE TO ENERGY
44. COMPOSTING CENTER
46. CYCLE AND PEDESTRIAN INFRASTRUCTURE
51. COMMUNITY FARMING
54. EQUIPPED PUBLIC SPACES

- **Maximum Number of Actions**: 5

R

Resource Cards

There are three resources: money, energy and materials. These cards represent each player's production. Resource production is determined at the start of the turn. You can also get resource cards by playing Intervention cards.

Example: Antonio plays the Intervention card 'Green Roof and Green Facade' and receives an Energy resource card each turn.

Round

A round comprises several phases during which players perform specific actions. The main phases of a round are:

- **Resource Collection Phase**
  At the beginning of each turn, all players collect resources based on their LCZs or the cards played.
  Intervention Card Drawing Phase
  Each player draws a new card from the intervention deck in this phase. The cards represent technological solutions that players can implement in turn. At the end of the turn, the player must draw or discard enough intervention cards to have 5 cards.
- **Trading Phase**
  During their turn, players can negotiate and trade resources with each other to get what they need. Trading is an important part of the game, as it helps players overcome resource shortages. Resources can also be traded with the bank. To do so, players must present 3 equal cards for the bank to give them one specific resource card.
- **Action Phase**
  In this phase, each player can play one or more cards from their hand, paying the required resources for implementation. Intervention cards can have immediate or long-term effects on the LCZs or the entire City.
  At the end of their turn—and only at the end of your turn—you can add up to 5 cards to your hand.
- **Event Phase**
  At the end of each player's turn, the game master (or a designated player in their absence) draws an event card from the event deck. Events can be either positive or negative and affect all players. Events can include:
  - **Hazard Events**: Natural disasters such as floods, droughts, or storms that reduce resources or damage LCZs.
  - **Socioeconomic Events**: Changes in social or economic dynamics that alter available resources or the cost of interventions.
    Players must adapt to these events by adjusting their strategies and using resources and available cards to minimise negative impacts or maximise positive ones.
- **End of Round Phase**
  At the end of each round, players update their scores based on their interventions and the resources they have collected. A check is made to verify if anyone has reached the final goal to win the game. If no one has won, the game continues with a new round, repeating the phases described above.

T

Trade

The player, in turn, may trade with other players. They can exchange any resources they produce, and the conditions of each exchange (how much and in exchange for which resources) depend on the players' negotiation skills. The player whose turn it is may also trade resources with the bank at a ratio of 3:1. By placing three equal resource cards in reserve; the player can take one resource of their choice in return.

Example: Andrés deposits three dollars in the bank and takes the building materials in return.

Annex 2. Cities Description

A2.1 Posidoniaville

Posidoniaville stretches along the shores of Turtle Bay, a place known for its crystal clear waters and the presence of the loggerhead turtle (Caretta caretta), a marine species classified as vulnerable due to climate change and habitat loss. The Tipha River, a watercourse rich in biodiversity, borders the town. Posidoniaville neighbours Dendropolis to the north and Owl's Grove to the east, a natural area teeming with wildlife and majestic trees contributing to regional biodiversity. Within its boundaries, the city boasts a variety of zones, ranging from dynamic and densely populated urban areas to industrial districts and residential neighbourhoods enriched by green spaces.

Posidonia's proximity to the river and the coast makes it increasingly vulnerable to extreme climate events such as coastal and river flooding. To address these challenges, the development of green and blue infrastructure along the Tipha River and the coastline is essential. These measures not only increase the city's resilience but also provide green spaces that improve the quality of life for citizens.

The city's name pays homage to Posidonia oceanica, a type of seagrass endemic to the Mediterranean crucial to preserving marine ecosystems. Posidonia meadows protect the coastline from erosion, absorb CO₂, and provide habitat for numerous marine species, affirming the city's key role in protecting these environments.

A2.2 Mangrove Town

Mangrove Town is located near the Scirocco Dunes, a desert-like landscape characterised by wind-sculpted sand formations, and a short stretch of the Kelp Sea, a marine area rich in kelp forests that harbours extraordinary marine biodiversity. Mangrove Town is located along the Tipha River, which brings life and biodiversity to the surrounding areas and borders Corallia.

The city comprises different zones, from densely populated urban centers serving as economic and cultural centers, to industrial and residential areas enriched by green spaces. Its proximity to the river and the coast exposes Mangrove Town to increased risks from extreme climate events such as storm surges and coastal and river flooding. To address these threats, the city is focusing on implementing green and blue infrastructure that increases its resilience and provides green spaces to improve the quality of life for residents.

The city owes its name to mangroves, a unique ecosystem that resists erosion, absorbs carbon dioxide, and provides essential habitat for many species. Mangroves act as a natural barrier against storms and flooding while supporting a wide variety of life, including fish, crustaceans and birds.

A2.3 Corallia

Corallia is located on the shores of the Kelp Sea, a marine area rich in coral reefs and home to a remarkable biodiversity. The city is bordered to the north by the Tipha River, which brings fertility and life to the region, and is located between Mangrove Town and Phytopolis. Its strategic location near marine and riverine ecosystems makes Corallia an important site for biodiversity conservation.

Internally, Corallia blends urban and natural zones, with residential neighbourhoods seamlessly integrated into the surrounding environment. However, its proximity to the sea and river exposes the city to risks from extreme climate events such as storm surges and flooding. To mitigate these risks, Corallia needs a green and blue infrastructure network to protect urban areas and increase community resilience.

The city's name is a tribute to the coral reefs along its coast, vital ecosystems that protect the coastline from erosion and contribute to the marine carbon cycle. Coral reefs are a natural treasure that provides shelter for

many marine species and plays a central role in combating climate change.

A2.4 Bumbleville

Bumbleville is located between Oakwood Farnia and the banks of the Tipha River, a location that connects it to both the river and the surrounding hills—the city neighbours Dendropolis and the Juniperus Hills. This mountainous area shapes its layout.

Bumbleville comprises various zones, from densely populated urban centers and cultural and economic hubs to residential and industrial areas and green spaces that blend harmoniously into the natural environment. The city's proximity to the Tipha River makes it vulnerable to flooding during high water periods, while the Juniperus Hills, with their rugged terrain, pose a risk of landslides, especially during heavy rains. Bumbleville needs to develop green and blue infrastructure systems to address these challenges. These systems are essential to protecting the city from climate-related risks and ensuring the safety and well-being of its residents.

The city's name honours bumblebees, pollinating insects that provide an invaluable ecosystem service to humanity. Pollination underpins species ecology and ecosystem functioning, supports habitat conservation, and provides a wide range of vital human services and benefits.

A2.5 Dendropolis

Dendropolis lies at the foot of the Eagle Peaks, majestic mountains that dominate the landscape and stretch to the banks of the Tipha River. Posidoniaville and Bumbleville border the city.

Dendropolis is a mix of urban, industrial and residential areas within its boundaries, with neighbourhoods integrated into the mountain and river landscapes. The Tipha River, which flows close to the city, makes Dendropolis particularly vulnerable to river flooding. Green infrastructures are crucial to reducing this risk and increasing the city's resilience. With their towering peaks and steep slopes, the Eagle Peaks are a vital resource for Dendropolis, but also a challenge, as the city faces the risk of flooding, landslides, and river flooding caused by heavy rainfall.

Dendropolis takes its name from the abundance of trees surrounding and within the city. Trees are essential for land protection and stabilising soil to prevent landslides. Their roots act as a network that retains water and promotes drainage, reducing the risk of flooding. In addition, trees absorb carbon dioxide, improving air quality and mitigating climate change.

A2.6 Phytopolis

Phytopolis is located between the banks of the Tipha River and the boundaries of the Mistral Grove, an area known for the strong winds that sweep through its forested expanses. Corallia and the Juniperus Hills border it.

The town occupies a strategic position where the interplay of river and wind shapes its landscape and climatic characteristics. Phytopolis has different zones within its borders, ranging from dynamic and densely populated urban areas to industrial districts and residential neighbourhoods enriched by green spaces. While Phytopolis benefits from its proximity to the river and the Mistral Grove, it is also vulnerable to environmental risks. The proximity to the river and the hilly terrain expose Phytopolis to flooding and landslides. Green and blue infrastructures are key to protecting against flooding and landslides and mitigating extreme climate events' effects.
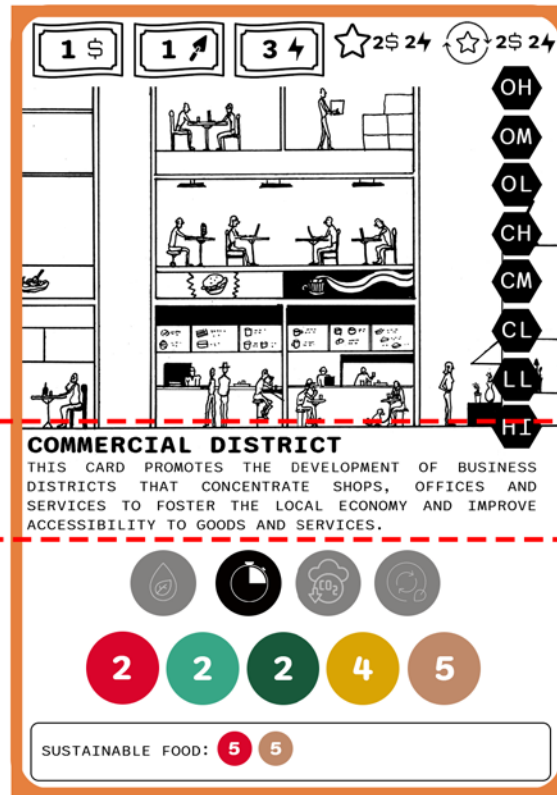
The name Phytopolis honours phytoremediation, a natural process in which plants play a key role in water purification. Through their roots and biological mechanisms, plants can absorb and filter contaminants such as heavy metals, excess nutrients and organic matter in water.

Annex 3. Game Components

Game Components	Description
Role Players	• Scientific community (CCA and DDR) • Minister (national government) • Decision maker (local government) • Investor (industry, building) • Municipality's technic services • Cultural services
Game Board	• A game board that allows intervention at several scales (city, district, buildings) • Transformable tiles to represent the evolutionary environment of the game to condition the installation of the infrastructures
Tokens	• Infrastructures • Constructions • Technical solutions • Resources • Residents
Event Card	• Infrastructures climate change card • Hazard event card (flood, drought, hurricane strikes, heavy rain, biodiversity loss, new forecast)
Action Cards	• Adaptation and mitigation measures cards • Constructions cards (buildings, industry)
Counting Annual Trackers	• Community well-being • City visions • Emission • Resources and currency trackers • Financial gain

Annex 4. Card Game Description

CARD

Title & Description

COMMERCIAL DISTRICT
THIS CARD PROMOTES THE DEVELOPMENT OF BUSINESS DISTRICTS THAT CONCENTRATE SHOPS, OFFICES AND SERVICES TO FOSTER THE LOCAL ECONOMY AND IMPROVE ACCESSIBILITY TO GOODS AND SERVICES.

SUSTAINABLE FOOD: 5 5

COST:

1 $ Money
1 ↗ Construction material
3 ⚡ Energy

SCORE:

2 Climate neutrality
2 Climate adaptation
2 Environmental co-benefits
4 Social co-benefits
5 Economic co-benefits

The colour suggests, the score to which category it belongs.

CITY VISION:

Green and blue
15 Minute
Zero Carbon
Circular

Switched-off icons are not active on your card

BENEFITS:

☆ Benefit one-shot
⟨☆⟩ Benefit each turn

Switched-off icons are not active on your card

CARDS EFFECT:

SUSTAINABLE FOOD: 5 5

If you have played the indicated card, you have a score increase in some items.

LCZs:

OH Open High rise
OM Open Middle rise
OL Open Low rise
CH Compact High rise
CM Compact Middle rise
CL Compact Low rise
LL Large Low rise
HI Heavy industry
ST Scattered trees
LP Low plants

The LCZ shown on your map is where you can place this action

BORDER:

Social | Blue
Grey | Enegy
Green | All

indicate Infrastructure

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