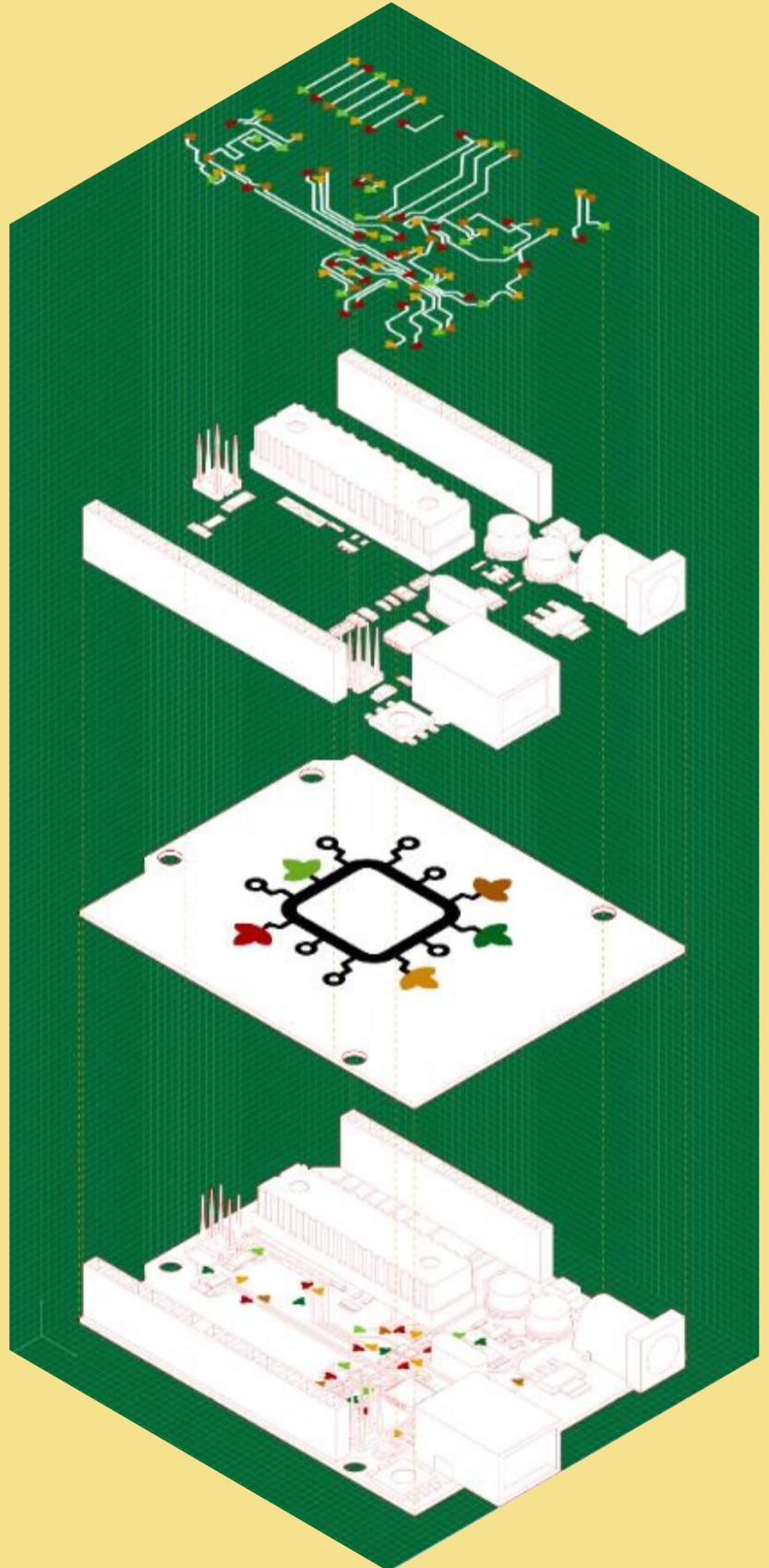


Green  
**STEAM**  
Incubator

The "Green  
STEAM  
Incubator"  
**GAME  
MANUAL**



# TABLE OF CONTENT

TABLE OF CONTENT .....	1
TABLE OF FIGURES .....	1
INTRODUCTION .....	2
1. CONTEXT OF THE PROJECT GREEN STEAM INCUBATOR .....	3
A. AIM OF THE INVOLVEMENT OF PLAY ACTIVITIES IN STEM EDUCATION WITH LINK AGRICULTURE .....	3
B. ABOUT THE AUDIENCE AND TARGET GROUP OF THESE ACTIVITIES .....	4
A. WHY THEM? .....	5
B. WHY ADOPT A GAME-BASED LEARNING (GBL) APPROACH, AND WHAT ARE THE ADVANTAGES OF TRAINING THE YOUTH FROM 18 TO 35 YEARS OLD? .....	6
2. THE METHODOLOGY FOLLOWED TO DEVELOP THE BOARD GAME AND THE ACTIVITIES .....	8
A. METHODOLOGY FOR DEVELOPING THE BOARD GAME .....	9
B. METHODOLOGY FOR DEVELOPING THE 8 TREASURE HUNTS .....	11
3. DESCRIPTION AND INSTRUCTIONS OF THE BOARD GAME AND THE TREASURE HUNTS.....	17
A. THE BOARD GAME .....	17
B. TREASURE HUNTS.....	28
4. CONCLUSION.....	37
REFERENCES .....	38

# TABLE OF FIGURES

FIGURE 1 – THE LEARNING PYRAMID OR CONE OF LEARNING .....	7
FIGURE 2 - THE FOUR FREEDOMS OF PLAY CREATED ON <a href="https://www.plushnuggets.com/2019/02/19/the-4-freedoms-of-plays/">HTTPS://WWW.PLUSHNUGGETS.COM/2019/02/19/THE-4-FREEDOMS-OF-PLAYS/</a> .....	8
FIGURE 3 CARDS OF THE GREEN STEAM GAME .....	10
FIGURE 4 A DESIGN THINKING MODEL .....	12
FIGURE 5 EXAMPLE OF A CLU4 FROM TREASURE HUNTS ACTIVITIES .....	15
FIGURE 6 EXAMPLES OF COUNTRIES CARDS .....	19
FIGURE 7 EXAMPLES OF ANIMAL CARDS .....	19
FIGURE 8 EXAMPLES OF VEGETABLE CARDS .....	20
FIGURE 9 EXAMPLES OF FRUIT CARDS .....	20
FIGURE 10 EXAMPLES OF CEREALS CARDS .....	21
FIGURE 11 EXAMPLES OF STEM CARDS .....	21
FIGURE 12 EXAMPLES OF MACHINE CARDS .....	22
FIGURE 13 EXAMPLES OF TRANSFORMATIVE PRODUCT CARDS.....	22
FIGURE 14 EXAMPLE OF PLAYER POINT SHEET .....	23



## INTRODUCTION

In the framework of the Green STEAM Incubator project, funded by the Erasmus + program, 4 partners - CEPROF (based in Portugal), CIP and CSI (based in Cyprus), and Logopsycom (based in Belgium) - wished to develop an innovative and inspiring educational approach that creates a bridge between the so-called STEM subjects, organic permaculture/bio agriculture and the entrepreneurial spirit. This method aims to enable learners to conceptualize STEM subjects and apply them in an environmental education framework. With this approach, the project tends to help youth explore environmental issues pedagogically and playfully. By raising their awareness through play, it encourages them to develop their critical thinking, collaborative, and interpersonal skills and encourages them to take ownership of certain tools, reasoning or habits that can impact the environment around them.

In order to offer a qualitative and educational content related to the above-mentioned themes, the partners have developed a board game and 8 activities (treasure hunts) that focus on the project's pedagogical objective. In this manual, we would like to outline the methods and approaches developed to cover these subjects to be familiarized with such tools and methods and implement them at different levels according to their needs. What should always be kept in mind is that this approach aims to propose fun, informative, and easily implemented instructions/rules for setting up the games and activities.

This manual will first present the context of this project and approach applied. Secondly, the manual will present the instructions to play the board game and the 8 activities developed. Finally, the manual will focus on the methodology used to develop and implement the board game as well as the activities.



# 1. CONTEXT OF THE PROJECT GREEN STEAM INCUBATOR

## A. Aim of the involvement of play activities in STEM education with link agriculture

Over the last ten years or so, the rate of agricultural employment in Europe has been falling. In the Europe of 24, it represented 3.9% in 2017 (against 4.7% in 2008). Agriculture is more and more becoming a concern of professionals in the countryside, and the farming sector is tending to take a back seat to some city dwellers. There is a kind of disconnection between those who work on farms and produce or raise food and those who consume it.

Similarly, at school, learners have been increasingly losing interest in STEM subjects, which they consider abstract, useless, or elitist. Indeed, it is common to hear some pupils wondering about the need for this or that method, theorem, or lesson when it is simpler and quicker to ask Google for the solution.

As a result, there is a decline in science subjects' overall level and a significant disengagement of students from mathematics, science, and engineering subjects. (Pinxten et al., 2015)

Having made these two observations, "Science education for responsible citizenship" (European Commission, 2015) stresses that it is becoming necessary to build bridges to strengthen collaboration between formal, non-formal, and informal education providers, business, industry, and civil society. The aim is then to reconnect learners and give meaning to their learning. According to the report, the best way to avoid this disconnection would be to put in place a collaborative framework that would allow for relevant and meaningful engagement of the different actors in society with science in general and thus encourage individuals to pursue more scientific studies and careers. Ultimately, this would improve the employability and competitiveness of individuals.

Indeed, the group of experts behind the report points out the inequality and lack of basic scientific knowledge in Europe, which is necessary to ensure a comprehensive understanding of our societies and is proving to be indispensable in encouraging



decision-making, particularly in areas such as health, the environment, food, energy, and consumption.

To improve the situation and propose a concrete and functional framework, the Green Steam Incubator (GSI) project has developed a methodology using games and activities that can be set up within the framework of collaboration between actors in the agricultural sector (agro-entrepreneurship sector) and youth centres. These activities and games help create a beneficial framework to interlink lessons and illustrate the synergies between scientific subjects, agriculture, and entrepreneurial skills.

To best meet everyone's needs and offer an accessible formula that can be adapted and easily implemented, the project partners have developed two support types.

The first one is a classic board game that helps players gain a better understanding of eco-friendly products and how those are being positioned in a broader eco-friendly circular system.

The second one is more activity-oriented since it consists of a series of 8 treasure hunts that can be set up in different places (on the premises of a bio-farm/ permaculture farm / an organic shop) and different needs. Each treasure hunt covers/addresses a precise pedagogical objective linked to permaculture, STEM, and entrepreneurship.

These two games and activities aim to help participants understand how their own eating and consumption behaviour and habits can relate to the ecosystem's wider problems. The treasure hunts' themes are multiple: habitat conservation, awareness of rare resources, learning about soils, waste management, the impact of pollution (marine, terrestrial, air...) and can be extended to many other issues as well.

## **B. About the audience and target group of these activities**

As part of the project, activities and a board game have been developed to meet youth organizations and youth centres' expectations regarding training for the 18 - 35 years old learners. By using game-based activities with the scope of agriculture, STEM and entrepreneurship, youth organizations can support young people in developing



transversal skills and knowledge that can informally help them increase their interest, fulfilment, and employability.

These gamified methodologies can be set up under the context of actions and educational workshops offered by Youth Organizations. Therefore, this manual is intended for a variety of audiences.

Firstly, it is aimed at instructors, facilitators, trainers, and supervisors of youth centres or training centres who wish to set up games and activities that enable them to cover environmental and agricultural awareness topics and a STEM-oriented prism. The manual also provides the methodology for instructors to develop their own activities and games and expand the content or choose their own agro-scientific themes.

In a second step, this manual can also be addressed to agro-entrepreneurs, farms, cooperatives, organic shops, and farms willing to give more visibility to their work and projects. In fact, this manual proposes turnkey activities that can be easily implemented and address the themes sought by this type of organization. Indeed, there are many farms, agro-entrepreneurs and agro-organizations willing to develop their activity in the field of training and raising public awareness about agriculture and the environment. With this manual, the activities and the board game enable them to organize visits or training sessions and workshops with free and already adapted content designed for their needs. This makes it easier for them to focus on the awareness-raising aspect, and they are then able to guide a public wishing to grasp environmental and agricultural issues.

Finally, this manual is also aimed at learners, parents or players of all kinds who wish to develop their skills and learn about bio-agriculture and STEM while having fun.

### a. Why them?

The activities are developed to address current, down-to-earth themes that concern us all. The overall goal is to succeed in arousing young people's interest by stimulating them with challenges that require their critical thinking and scientific knowledge and a certain ability to collaborate, cooperate, and develop team spirit to reach the treasure before the opposing team.



## b. Why adopt a Game-Based Learning (GBL) approach, and what are the advantages of training the youth from 18 to 35 years old?

When we talk about education, we are talking about transmission and sometimes passion. How can one succeed in transmitting knowledge, know-how or simply an interest in a subject when teaching it is boring, theoretical, and highly conceptual?

To bypass the so-called classical and conventional teaching method, many studies have proven that learning through play and experience can have a much greater impact on learners (Naik, N. 2017).

In fact, the approach through play and, therefore, through experience makes it possible to break the routine of conventional teaching and place the learner at the heart of the learning process.

This approach allows the learner to be integrated and engaged and develop complementary skills and abilities to reinforce the theoretical aspect with a more positive experience.

The learning pyramid is a representation that relates various degrees of retention resulting from different types of learning. It demonstrates that active learning methods enable the learner to acquire more sustainable and solid knowledge and skills. At the base of the pyramid is experiential learning and teaching others. In games, it is very often the case that participants have to explain to each other what they understand and share their knowledge so that the game can continue under good conditions for all.



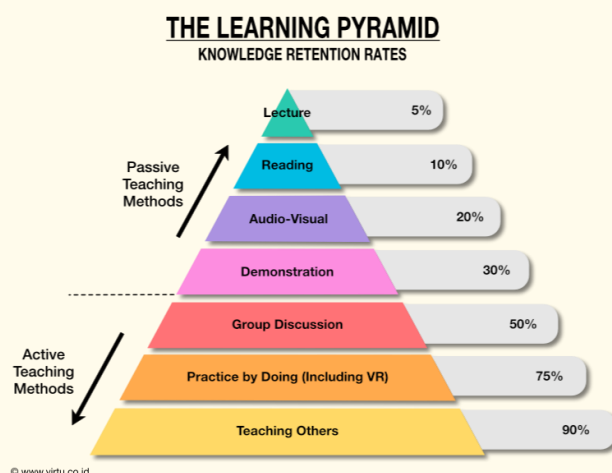


Figure 1 – The Learning Pyramid or Cone of Learning

Source: <https://www.virtu.co.id/education/>

Choosing to approach scientific subjects and agri-business with a board game and treasure hunts ensures that learners are immersed in the subject and understand the vocabulary and issues involved. This enables subjects to be experienced and approached informally even though the subjects may be perceived as boring. Learners can, therefore, more easily integrate reasoning and theoretical concepts through play without necessarily feeling that they are actually learning. As a bonus, the stimulation towards each other, whether they are working together or playing against an opposing team, reinforces their commitment and interest. Finally, as far as treasure hunts are concerned, the treasure aspect is an element that motivates and involves the players all the more!



## 2. THE METHODOLOGY FOLLOWED TO DEVELOP THE BOARD GAME AND THE ACTIVITIES

Before looking at the methodology used to develop board games and treasure hunts, it is useful to look at what Scot Osterweil, President of the Learning Games Network and Creative Director of the MIT Education Arcade, has called the 4 freedoms of play, which allow a range of skills and abilities to be developed through play.

It is important to keep these 4 freedoms in mind so that the game developed (board game or treasure hunt) can fulfil both the pedagogical objectives and the objectives of what is expected of a game, i.e., pleasant, enjoyable and fun.

**These 4 freedoms are:**



Figure 2 - The four freedoms of play created on <https://www.plushnuggets.com/2019/02/19/the-4-freedoms-of-plays/>

Freedom to fail since failing in a game is not like failing in a test. This freedom encourages players to re-mobilize, to understand their mistakes, and not get stuck in any situation.

Freedom to embody different identities allows players to step back from the situation and develop both empathy and open-mindedness.

Freedom to Experiment encourages motivation and involvement. Implicitly it stimulates curiosity, enthusiasm, and the ability to spark new ideas and create connections to solve a problem.

Freedom of Effort: when players are involved in a challenge and succeed/win (when they find the treasure, for example), it brings many rewards and shows that the effort pays off.

## A. Methodology for developing the board game

Although the pedagogical aspect was paramount, it was necessary to find and create a fun and dynamic game. In other words, the partners sought to develop a game that could integrate both a board dynamic with participants building their game, interacting and developing a strategy, and generating a certain knowledge, satisfaction, and pleasure for the participants.

The process of developing this type of game involves several stages:

1. The first phase of **research on the subjects** to be addressed by the game.

What is the game's purpose in terms of skill development, acquisition of competencies, the concepts, and the knowledge presented? In what format? What is the pedagogical objective of the game? What content should be used and developed to reach the pedagogical aim of the game?

This first phase is necessarily very strongly interwoven with the second phase, consisting of materializing the research into a concrete game.

Research about the content: since the game is about permaculture /organic farming and environmental education, most of the study is focused on the products and biodiversity that can be found in European derivatives and practical information about them: where they can be found, how to grow/raise, their needs and about the synergies that exist between all the elements and that will be used in the content of the game.

2. This second phase corresponds to what could be described as game mechanics research that must meet the expectations and playful and pedagogical objectives established in stage 1. It is necessary to have a clear idea of the subjects to be addressed by the game and the skills we aim to be developed.

For this stage, there are two possibilities: option 1, inventing a new game from scratch; option 2, taking inspiration from an existing game or mechanism and adapting it to the needs of the project.

At this stage, a draft of the game's rules and mechanisms should be defined to align with the fun and pedagogical objectives of the game. Here, the partners



have chosen to adopt an already existing game and inspire themselves based on the 7 Wonders Game.

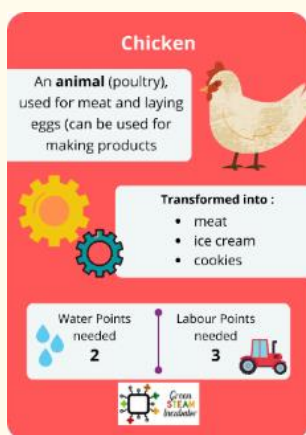
### 3. Third step: **adapt the existing game**: developing the content

The work consists of finding out what and how to adapt the game, the rules and its functioning with the project's objectives, i.e., the game must allow a global understanding of the different varieties of plants, animals, and vegetation that make up our food and way of life. Therefore, it is necessary to transpose what already exists on the game to be adapted with the new game's content and data to be adjusted. For example, to see how the game board looks and how to modify it to align with the new game's objectives. If new maps, slightly different rules, or additional challenges need to be integrated? This step is essential for the new game to be coherent, well-constructed, and therefore pleasant and effective.

### 4. Fourth step: **adapt the design of the graphical elements**

Considering step 3, the partners had to develop the appropriate maps with the required pedagogical information. Also, the whole new adapted design of the game had to be created and defined. This step is a coherent continuation of the previous steps: the research findings are shaped graphically, and according to the game's mechanism requirements.

#### PROTOTYPE:



#### FINAL VERSION:

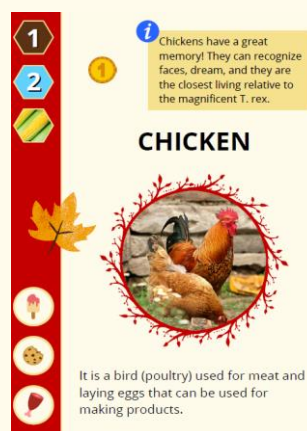


Figure 3 Cards of the Green STEAM Game

Source: Green STEAM project

5. Fifth step: **test the game with real players**. This step is crucial; it consists of entirely reviewing the game. Ideally, the game should be played by testers that fit with the targeted audience to ensure that the rules, mechanisms, objectives, and content are coherent, relevant, fun, accessible to this specific audience. Indeed, it is highly recommended to have real and neutral players, so it is possible to collect relevant and valuable feedback from them.
6. Sixth step: **improving the game**. Given the feedback and comments from the previous step, it is possible to improve the game's quality in terms of content, design, graphism and modify some rules or functioning if needed.
7. Last step: **create the kit containing the game and the instructions**. It is also highly recommended to have people outside of the project reading the instructions and testing the game so it is possible to check if the game runs smoothly in any situation and reach the participants' expectations.

## B. Methodology for developing the 8 treasure hunts

The treasure hunt principle involves confronting the participants with a succession of steps and tests/enigmas linked to each other. Each stage's solution allows us to reach the next step and so on until arriving at the treasure. On the other hand, it is possible that the teaching materials can be more developed in a treasure hunt than in a board game.

To develop a pedagogical treasure hunt, the mechanism and process remain the same except that the instructional approach must be included, and a link must be made between the purely functional aspect of the game and the skills and abilities that the participants are expected to acquire throughout the game.

To develop these 8 treasure hunts, the project partners were inspired by the Google Design Sprints (II) Model.



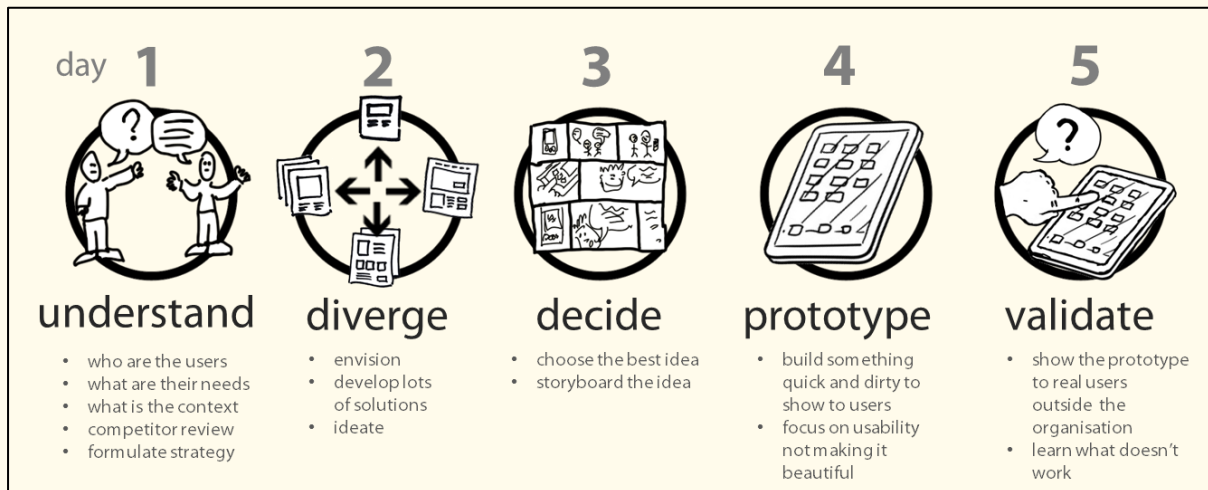


Figure 4 A Design Thinking Model

Source: <https://medium.com/@elizabeth7hoffman/10-models-for-design-thinking-f6943e4ee068>

### UNDERSTAND:

Before starting to develop, it is important to understand and define some key elements, such as:

1. Understand and identify the **target group**. This phase is important to apprehend **the target group's** learning needs and shape the teaching accordingly. A treasure hunt for youth from 18–35-year-olds will completely differ from a treasure hunt for youth from 11 to 18-year-olds.

2. Define the **subject**, the topic to be approached according to the target group: In the project framework, the treasure hunts aim to understand our human behaviour and the relationships between nature and the environment. With this scope, many subjects can be tackled: energy, water, seasons, soil.

3. Within the given subject and topic, Identify the **knowledge** to be developed and the **skills** or **aptitudes** to be encouraged: collaboration, agility, memory, organization, presentation.

Firstly, there are theoretical skills such as knowing definitions, understanding figures,

literacy, so-called thinking, analysis, communication, critical thinking skills, and skills such as observation, collaboration, organization, speed, and team spirit...

4. **Elaborate a plan** and/or a roadmap of the different steps and phases to be covered for the treasure hunt's development process. In this project, partners have a template to fill with all the needed section (topic, requirement, methodology, treasure...)

5. A **research** phase to find inspiration, relevant material, and an instructive approach is necessary to ensure that the overall project is on track and with solid foundations. Study the educational content and the supports/materials that will be used and presented during the treasure hunt: videos, presentations, articles. The research must be focused on the subject, the topics, the game structure, and the kind of game mechanisms that can be implemented.

### DIVERGE:



Once the "understanding" phase is over, it is time to propose and develop as many ideas, possibilities, and mechanisms as possible.

To develop this phase, it is really useful to search for a lot of **online and offline inspiration**

### IDEATE:

1. Explore the subject and identify the different steps and milestones you want to reach about the theme. List all the topics you want to tackle during the game; is it about the definition, about self-reflection, understanding the consequences.

2. Think about all different possible riddles that could fit with pedagogical and interpersonal skills development. Develop as many types as you can imagine. The idea is to have a huge list of possible riddles, enigmas, activities, and challenges that work and that you can, later on, be adapted to your pedagogical needs.

In our case, all the clues are either given in an envelope to the participants, or the envelopes must be found thanks to the clues and hints received in the previous station.

**Examples of activities/riddles:** finding clues, ordering letters to find a word, decoding a message, crosswords, flashing a QR code to obtain information, finding the solution to a question, matching elements, use technology or social media.

Identify which activity can be played outdoor/indoor and the kind of resources required to set up these activities.

3. Consider different **game mechanisms**: game based on speed, on the right answers, with several teams, who compete simultaneously or in a delayed manner. Search for a way to distribute points or other gamification methods.

*In the treasure hunt RENEWABLE ENERGY, every time participants find an object, they must take a selfie/picture of them, along with the item, and share it on the social media account. Instead of having a task sheet, the instructor can follow all the teams by checking the game's social media account.*

4. Propose several **roadmaps** with possible options and scenarios. Articulate them so you can find a fun and logical succession of steps that fit in with the lesson and the chosen theme. Overall, you need to elaborate on many activities/riddles for this phase and match them with the pedagogical objective.

*For example, for the RENEWABLE ENERGY treasure hunt, participants need to understand the link with some objects and identify what energy it represents.*

**1<sup>st</sup> Clue:** “I am a solid fossil fuel, mined from the ground, used by power plants to produce electricity. What am I?”

**Hints:** “I have moved around the country by train”

**Item:** train toy

The teams should recognize that the energy source described is the coal. The participants should search for the train toy that is placed somewhere in the farm; next to it, they will find an envelope, enclosing the printed poster card with the coal. A similar procedure applies for all the clues that follow.

*Figure 5 Example of a clue from Treasure Hunts activities*

*Source: Green STEAM Incubator project*

5. Propose a **selection of rewards/treasures** that would make sense with the topic and be easily hidden or given to participants.

For this diverge phase, creativity, imagination, and brainstorming will be your best allies!

### **DECIDE:**

1. After UNDERSTAND and DIVERGE, you need to select and identify the clues, activities, and roadmaps that will make sense to your game and which will be consistent with the pedagogical objectives and the participants' expectations. Keep in mind that the clues and overall game should be challenging, fun, and instructive at the same time. Choose a reward that will motivate the participants, making a bridge between the topic and the game.

2. At this stage, you should have the first draft of the full roadmap of the game and have all you need to move to the next step:

### **PROTOTYPE:**

1. The template: thanks to the previous steps, you should have all the needed elements to develop a clear structure of the game, and you should be able to fill the template described.

2. In the 8 treasure hunts proposed in the project, each game consists of 5 to 7 stages with an introductory phase and a concluding stage.



3. The material: develop the annexes and needed material and resources for the clues, riddles, and activities. It is important to list the resources in the corresponding sections of the template.

This phase will allow you to check the proper functioning and coherence of all stages.

### VALIDATE:

Once the template is filled, all the elements are described correctly, and all the material ready, it is time to check and validate that the game can be played and serves the pedagogical objective explained.

Don't forget to check if rules, points, clues, feasibility, time... are well explained, logical, fun, relevant, and instructive. If certain elements or material pose problems or are too complicated to understand, it is preferable to change or adapt them so that participants and instructors are not misled.

Testing the game will also help you give the instructor more help and content for the 2 most important game steps: the introduction and conclusion (briefing and debriefing). These two phases are mandatory and essential to collect participants' feedback and questions and allow the trainer to improve the game according to the participants' needs and comments.

### IMPORTANT STEPS

Preparation of the game: The introduction stage enables the treasure hunt's pedagogical framework to be defined so that the participants are quickly introduced to the spirit of the game and that they grasp the stakes involved and understand how to win/find the treasure.

The **conclusion** helps to validate learning and ensure that the various points addressed are integrated and understood. This is a final phase essential to open up or involve participants in sharing their ideas and concepts.

**About the treasure/the reward:** Instructors must find a treasure or, in other words, a reward that participants feel motivated about. Learning and experience will be all the more positive if participants gain something that motivates them. It is also



recommended that they gain something with which they can extend the activity, as it constitutes positive reinforcement of the activity and learning.

For example, for the treasure hunt, Conscious consumerism, each participant is encouraged to plant at home, the vegetable seeds they have gained during the game. This "treasure" reward makes it possible to reinforce the pedagogy even more and make learning fun, practical and concrete.

### 3. DESCRIPTION AND INSTRUCTIONS OF THE BOARD GAME AND THE TREASURE HUNTS

#### A. The board game

The board game will recall several soft skills such as management, self-organization, and time-management, but also the game will also help develop observation and reasoning skills in mathematical logic, analytical and critical skills on behalf of the players.

To allow the development of these skills, the game consists of 84 cards of different categories of animals, plants, cereals, fruits, vegetables, and function cards that illustrate the usage of STEM-interrelated concepts with the scope of permaculture and environment education.

The aim is to find cards that match each other, see the beneficial associations in permaculture, and understand the links between different categories of plants/animals/cereals...The principles of permaculture being developed throughout the game participants can acquire a systemic vision of the earth, permaculture, consumption, farming.



## THE GREEN STEAM BOARD GAME

### The goal of the game:

The player with the most points and coins wins. The players must elaborate the appropriate strategy for their country to gain points: to say associate as many and relevant cards compatible with their land to create/obtain finish products.

### The pedagogical objective of the game:

This game proposes to tackle the diversity in terms of agriculture and natural resources available and present in 6 countries of the European Union.

The game's educational objective is to familiarise participants with the agricultural resources and different agricultural techniques present in Europe and encourage them to combine several products or processes to obtain finished products for consumption. This game also allows apprehending concepts such as human intervention for crops and the indispensable need for water.

The participants have to associate a series of natural-resource type cards with obtaining a final product, obtained through a precise combination of water and human work with other cards like STEM cards or Machine cards.

The game proposes a systemic approach that shows that many elements are linked to each other and encourage players to understand what kind of decisions can minimize waste, human labour, and energy inputs. Each player starts with 20 water and 20 labour points that they need to manage sustainably to obtain certain cards and points to win the game. Each resource card indicates in the top left corner what is required to maintain a resource card and accumulate each cards coins.

### **Examples:**

1. To maintain a grape card, the player needs to use 1 labour point and 2 water points at the end of each round to win the 4 coins given by this card. The grape card allows the player to create juice, wine, or jam product. To transform grape in those products, a MACHINE card is needed.
2. To maintain a sheep, the player needs to have the maize card and also to use 2 labour points and 2 water points at the end of each round to win the 2 coins



given by this card. The sheep allows the player to produce cheese and meat if they own a processing machine card.

The game contains:

- 1. Board of countries:** 6 countries (Portugal, Belgium, Cyprus, Hungary, Estonia, Sweden)

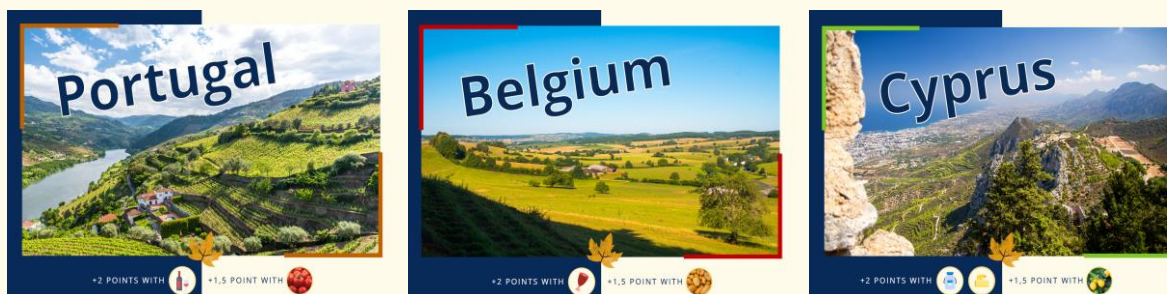


Figure 6 Examples of countries cards

Source: Green STEAM Incubator project

- 2. Cards:** 85 cards in total

### a. RESOURCES CARDS

#### 10 ANIMAL CARDS

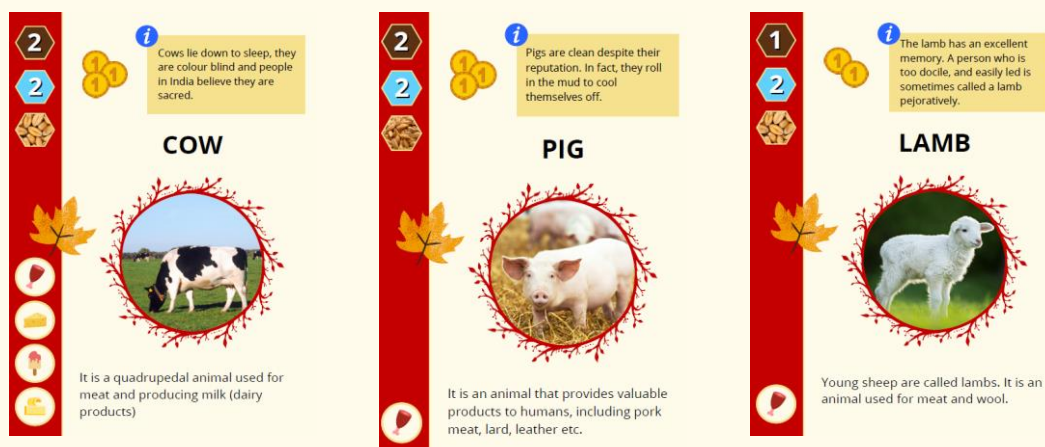


Figure 7 Examples of animal cards

Source: Green STEAM Incubator project

## 10 VEGETABLE CARDS

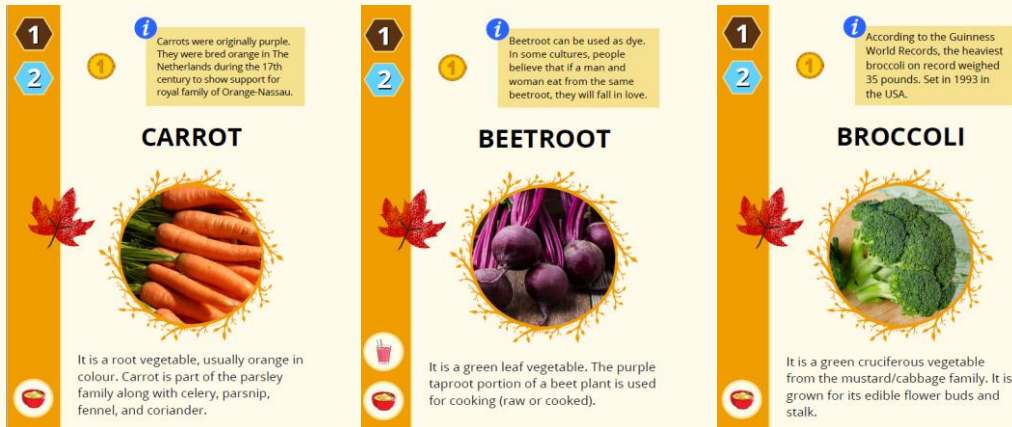


Figure 8 Examples of vegetable cards

Source: Green STEAM Incubator project

## 10 FRUITS CARDS

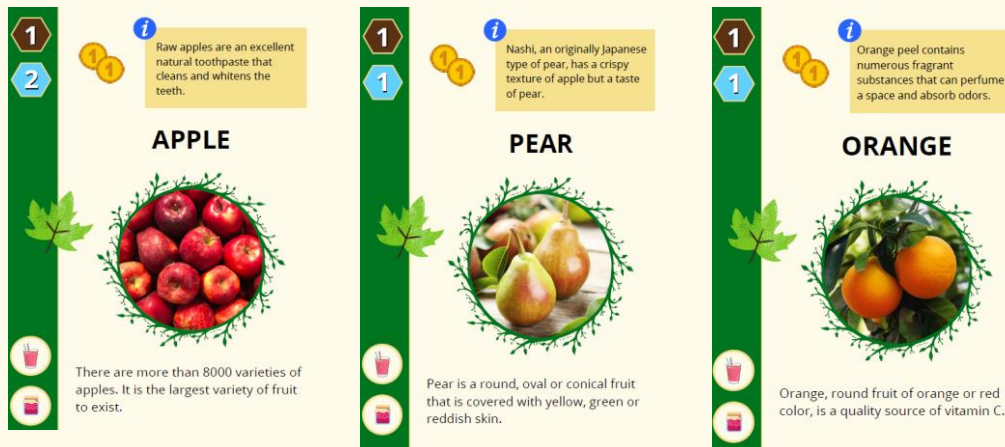


Figure 9 Examples of fruit cards

Source: Green STEAM Incubator project

## 20 CEREAL CARDS

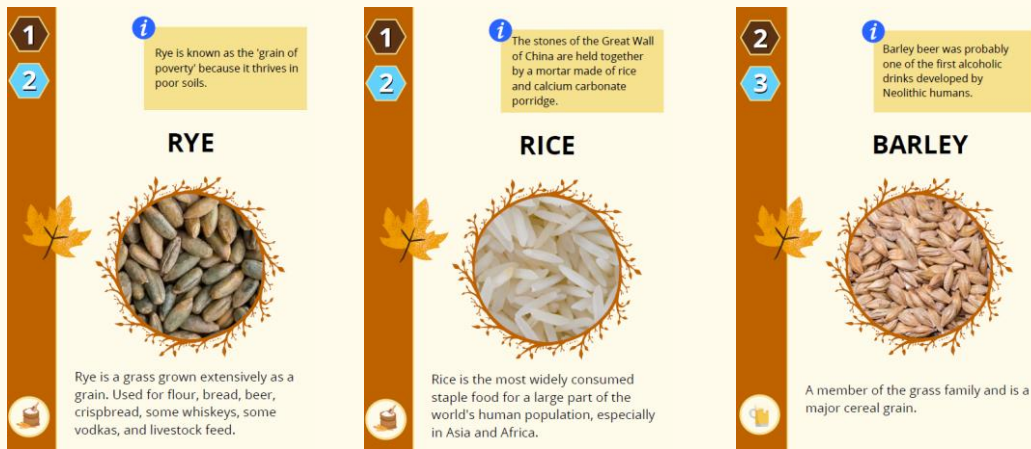


Figure 10 Examples of cereals cards

Source: Green STEAM Incubator project

## b. STEM CARDS

### 10 STEM CARDS (5x2)



Figure 11 Examples of STEM cards

Source: Green STEAM Incubator project

### 8 MACHINE CARDS (4x2)

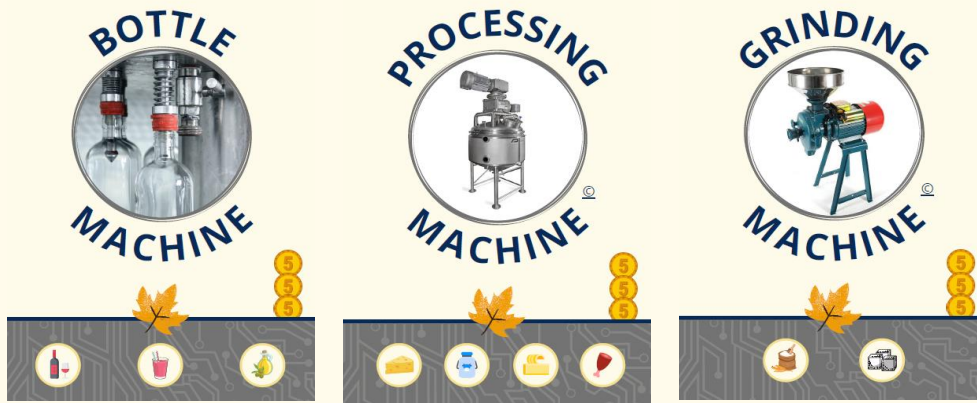


Figure 12 Examples of machine cards

Source: Green STEAM Incubator project

### 17 TRANSFORMATIVE PRODUCTS

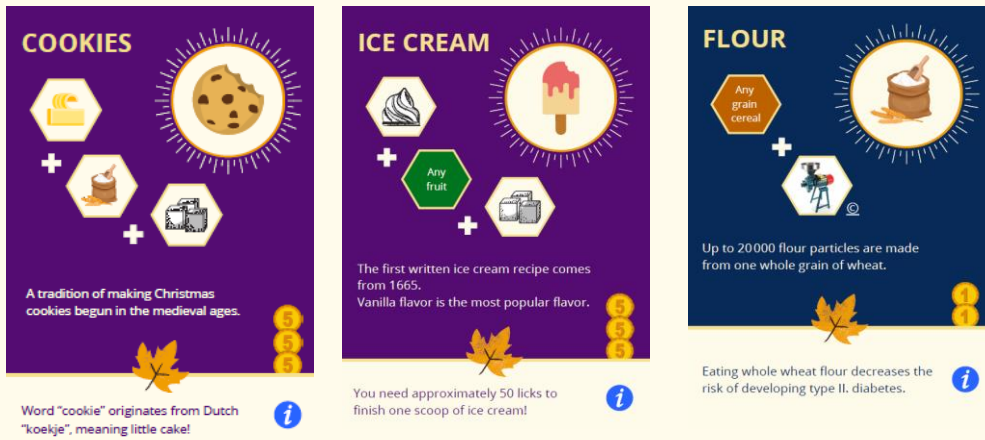


Figure 13 Examples of transformative product cards

Source: Green STEAM Incubator project

- c. Sheet point to keep track of the points spend and accumulated during the rounds.

**SAMPLE  
PLAYER POINTS SHEET**

	1	LABOUR BANK	SPENT (-)	EARNED (+)	LABOUR BALANCE*	WATER BANK	SPENT (-)	EARNED (+)	WATER BALANCE**	WINE	TOMATOES	ROUND TOTAL
INITIATION												
ROUND 1												
ROUND 2												
ROUND 3												
ROUND 4												
ROUND 5												
ROUND 6												

\*LABOUR BALANCE= LABOUR BANK-USED+GAINED  
\*\*WATER BALANCE=WATER BANK-USED+GAINED

Figure 14 Example of Player Point Sheet

Source: Green STEAM Incubator project

## GAME MECHANICS

1. The game is designed for 2-5 players aged 16-35.
2. To decide who plays first, the players roll a dice. The player with the higher number begins first.
3. Each player starts with 20 water and 20 labour points, which they spend during the game to maintain their resources, starting from the end of the first round.
4. Each player chooses their country card at the beginning of the game. There are points indicated for the country's product and its resource in each country card. The product's points are added to the player's final score if the player manages to produce it by the end of the game. The resource points indicated on the country's card are added to each round's score in which the player manages to obtain this resource card. If the player does not have the specific resource card in one of the rounds, then these points are not added to that round score.



5. The first player selects one card until all players choose their card. Once all players select their first card, the first player picks a second card and so on until all players have 4 cards.
6. The game has 6 rounds.
7. Each round is the same: there are 20 cards displayed in front of the players, and they can only choose 4 for their farm.
8. In the initiation round, only 20 resources cards are displayed **reversed** in front of the players. The players cannot see which cards they have picked until all players have their 4 cards selected.

**Note:** The cards are reversed only in the first round.

9. In the first round, the STEM and MACHINE cards are added, and the players need to choose their STEM strategy. They can select from "STEM cards" and "machine cards," and each player can have only 2 (1 STEM card and 1 MACHINE card).
10. In the second round, the product cards are also available for the players.
11. Each card has water points and labour points, which are needed to maintain it. The cards also indicate the number of coins that the players can accumulate if they have what is required to maintain the card. The points (coins + labour points + water points) are accumulated each round of the game. Players can keep track of points on each country's points sheet.

**Note:** On the player's point sheet, the labour and water points used in each round to maintain the resources cards must be marked with a negative sign so that they are deducted from the final score.

12. Transformative cards can be unlocked after collecting the necessary parts. Example: to unlock points from the "Flour transformative card," the player needs to have a "grain card" and "grinding machine card."
13. At the end of the third round, the players can exchange some of their cards (max 5 exchanges per player).

14. The player who accumulates the most points at the end of the game wins.

**Note:** The score is calculated as follows:

LABOUR BALANCE = LABOUR BANK - SPENT POINTS + EARNED POINTS

WATER BALANCE = WATER BANK - SPENT POINTS + EARNED POINTS

The player who accumulates the most points at the last round wins.



## Important notes about product cards:

- Using a product card blocks the resources (the player can not gain any coins from the resources card used to produce a product, and they do not spend any labour and water points to maintain those resources).
- Each card has a certain number of points and requires some "STEM" or other cards to be unlocked.
- Some cards combined can increase the number of points by allowing to unlock the transformative product card ex. chicken + oat = eggs.

## GAME RULES:

### PLAYERS

This strategy game of 6 rounds is designed for 2-5 players aged 16-35.

### GOAL

Earn the highest score (only the final round score matters) and win. By using technology (MACHINES) your aim is to support your animal- and/or agriculture (RESOURCES), make PRODUCTS and increase your final score. The most profitable product for each player is the local product designated in the Country Card (e.g. wine for Portugal). However, each player is free to choose their own strategy to earn more points.

### LEARNING OBJECTIVE

Learn how technology in agriculture can produce financial benefits for the farmers and benefits for the environment.

### PRINTING THE GAME

The game includes 84 cards (Resource, MACHINE, STEM and Product Cards), 6 Country boards with their point sheets. They need to be printed before the beginning of the game.



To print all cards the following printer settings are needed:

- Pages per sheet: 4
- Page order: Vertical
- Print on both sides of paper
- Flip on short edge
- Orientation: Landscape

### SCORING

- Each player starts with 20 Water Points and 20 Labour Points.
- Labour and Water Points are earned through STEM and Machine Cards.
- Labour and Water Points are spent to maintain the Resource cards in each round.
- During the game the score is calculated as follows:

+ COINS  
+ LABOUR BALANCE  
+ WATER BALANCE  
+ PRODUCTS

LABOUR BALANCE = LABOUR BANK - SPENT POINTS + EARNED POINTS

WATER BALANCE = WATER BANK - SPENT POINTS + EARNED POINTS

- The Labour and Water Balance are carried over in the Labour and Water Bank of the next round, respectively and so on.
- The coins from the previous round are carried over in the next round and so on.
- The Points earned from the Products you built are carried over and added in the next round and so on.
- The player who accumulates the most points at the last round wins.

### SETUP - INITIATION

- Choose your Country Card and the corresponding Point Sheet. Each Country card has its own Point Sheet.

Example: If you hold the Portugal board you earn 1.5 points per round if you hold the Tomato Resource card. You can win 2 extra points at the end of the game if you manage to



produce wine by the fourth and final round of the game.

- Roll the dice with your team players. The player who scores the highest number plays first, followed by the other players in a clockwise order.
- Resource Cards are reversed in front of the players, so their selection is random. (Note: this is the only time cards are reversed)
- Each player chooses one Resource Card starting from the first player, until all players have 4 cards each.
- The STEM and MACHINE cards are added in the First Round. Players choose one of each Card (1 STEM card and 1 MACHINE card).
- Product Cards are added in the Second Round.
- Collect the relevant MACHINE, STEM and Resources to build a Product. Once a Product is built you can collect the Product Card and earn the coins and points on it.

Example: To unlock the 2 coins from the "Flour product card," the player needs to have a "grain" Card and a "grinding machine" Card.

**RULES**

- One game has 6 rounds.
- Each player starts with 20 water points and 20 labour points, which can be spent during the game to maintain their resources.
- Coins and Points are earned in each round. Look for the coin and other symbols in all Cards.
- All Cards are displayed in front of the players, except in the first round when Resource Cards are hidden and picked randomly.
- All Cards become available from the Second Round and players continue building their STEM strategy to reach their Goal.
- Players can exchange up to max 5 Cards between players (or from the displayed cards that were not chosen) during one game. It is advisable to start exchanging cards after the second round, when all cards become available.

- When you spent labour and water points, remove them from your bank.
- Collect the relevant MACHINE, STEM and Resource to build a Product. Once a Product is built you can collect the Product Card and earn the coins and points on it.

Example: To unlock the 2 coins from the "Flour product card," the player needs to have a "grain" Card and a "grinding machine" Card

- In each round, a resource card can only be used for the production of one product!
- When a player produces a product, the player holds the product card only for one round. In the next round, the product card becomes again available for all players.

**RESOURCE CARDS**



- Water and Labour points found on the left top corner of the Resource cards need to be spent to keep the resources alive in each round. In the case of animal cards, a grain, vegetable or fruit card is also needed for maintaining the animal.

- Each card has water points and labour points that the player needs to give in each round to maintain their resources.
- The coins on the resource cards can be earned in each round, only if you can keep resources alive every time in each time.
- The cards also indicate the number of coins that the players can accumulate if they have what is required to maintain the card.
- The points are accumulated each round.
- Players can keep track of points on the country's points sheet that they have chosen at the beginning of the game.

Points need to spent to keep resources alive.

Coins that can be earned



**PRODUCT CARDS**

- Using a product card blocks the resources (the player does not earn any coins from the resources card used to produce a product, and they do not spend any labour and water points to maintain those resources).
- Each card has a certain number of points and requires some "STEM" or other cards to be unlocked.



Example: To unlock the "FLOUR" card, you need the Grain Resource card and the Grinding Machine card. Pick the card up and earn the 2 coins as a reward.

### HOW TO KEEP SCORE

- See the Scoring Section and the Example Point Sheet for more information on the formulas.
- An example of Player's Point Sheet can be seen below, with the arrows showing how you carry over the balance from the previous round.
- On the Point Sheet, the labour and water points spent in each round to maintain the Resource Cards are marked in the corresponding "SPENT" column so that they are deducted from the final balance.
- Only the final balance that is accumulated shows the winner of the game. The player with the highest score wins.

This game is an original production of the Green STEAM Incubator partnership, and it requires several testing sessions until it is perfect. If you have suggestions on improving the game, please contact us through the project.

Facebook page  
<https://www.facebook.com/greenSTEAMincubator>

Project Webpage  
<https://steam-incubator.org/>

The European Commission support for the production of this document does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.  
 Project Number: 2019-3-CY02-KA205-001692

Co-funded by the Erasmus+ Programme of the European Union



### PLAYER POINTS SHEET SAMPLE FOR POINTS

	1	LABOUR BANK	SPENT (-)	EARNED (+)	LABOUR BALANCE*	WATER BANK	SPENT (-)	EARNED (+)	WATER BALANCE**	WINE	TOMATOES	ROUND TOTAL
INITIATION												
ROUND 1												
ROUND 2												
ROUND 3												
ROUND 4												
ROUND 5												
ROUND 6												

### PRODUCTS TABLE

WINE=GRAPES+BOTTLE MACHINE



OLIVE OIL=OLIVES+BOTTLE MACHINE



BEER=BARLEY+BOTTLE MACHINE



JUICE=ANY FRUIT+BOTTLE MACHINE



HONEY=BEE+JAR MACHINE



CREAM=GOAT/SHEEP/COW+PROCESSING MACHINE



SOUP=ANY VEGETABLE+JAR MACHINE



MILK=GOAT/SHEEP/COW+PROCESSING MACHINE



BUTTER=GOAT/SHEEP/COW+ PROCESSING MACHINE



CHEESE=GOAT/SHEEP/COW+ PROCESSING MACHINE



MEAT=ANY ANIMAL+ PROCESSING MACHINE



FLOUR=ANY GRAIN CEREAL+ GRINDING MACHINE



SUGAR=SUGAR BEET + GRINDING MACHINE



TOMATO PASTE = TOMATOS + JAR MACHINE



JAM=ANY FRUIT+ SUGAR+JAR MACHINE



ICE CREAM=CREAM+ANY FRUIT+ SUGAR



COOKIES=BUTTER+FLOUR+ SUGAR



The European Commission support for the production of this document does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



**NOTE: The game is an original production of the Green STEAM Incubator partnership, and it requires several testing sessions until it is perfect. If you have suggestions on improving the game, please contact us through the project [Facebook page](#).**

## B. Treasure hunts

The treasure hunts are more focused on encouraging positive behavioural change of youth by raising their awareness on environmental challenges and what can be done at their level. Thanks to a treasure hunt, it is possible to approach some concepts like water shortage, water, air pollution, improper disposal of waste, land, and soil degradations playfully and engage them to become responsible citizens of the earth.

As its name suggests, a treasure hunt consists of a quest with a starting point and then a succession of clues and steps that should lead to a treasure.

In the case of the 8 treasure hunts developed by the partners, each one addresses a theme related to the environment, preserving resources, permaculture, or our modes of consumption.

These 8 treasure hunts are designed to be played in different locations: outdoor, indoor, nature, or city.

Each treasure hunt is presented and described to facilitate these treasure hunts' implementation for instructors and agro-businesses.

Each treasure hunt's explanatory carefully describes the educational objectives, the resources used, the clues, the material, and the processes to set up the activity, foster the participants, and monitor the games.

All treasure hunts are presented as follows:

### **Topic:**

The topics are related to responsible citizenship and conscious behaviour to raise awareness about water, energy, and biodiversity, so participants can acquire environmental protection knowledge.



The 8 topics developed are listed below:

Bees protection	Ways of habitat conservation for animals in cities
Conscious Consumerism	Ethical Investment
Elements of permaculture in the world around us	Methods of urban agriculture
Environmental conservation and sustainability - Food supply chain with an emphasis on sustainable/local food systems.	Renewable energy resources

### **Pedagogical objective:**

This section describes exactly what the participants will learn and acquire in soft and hard skills.

As an example, in the TH - *THE BEES PROTECTION*

<p><b>PEDAGOGICAL OBJECTIVE:</b></p> <p style="text-align: center;"><b>General objective</b></p> <ul style="list-style-type: none"> <li>- Understanding the importance of bee protection for the ecosystem</li> </ul> <p style="text-align: center;"><b>Specific objectives</b></p> <ul style="list-style-type: none"> <li>- Understand the importance of bees for life on the planet.</li> <li>- Identify the causes of the disappearance and death of bees.</li> <li>- Identify the measures that can be taken for the protection of bees.</li> <li>- Know bee protection programs.</li> </ul>
--

### **A short introduction to the topic:**

Here all the pedagogical resources used to develop, illustrate or approach the topic are listed. These resources can be consulted by the instructor for him/her to gain knowledge about the subject and share it with the participants so they have a first glimpse/understanding of what the theme of the TH will be.

The section can propose definitions, videos, articles, schemas, etc. Here is an example of the Treasure Hunt - *RENEWABLE ENERGY RESOURCES*:

### SHORT INTRODUCTION TO THE TOPIC:

#### Terms to know and familiarize with:

- **biomass:** Any organic (plant or animal) material which is renewable, including agricultural crops, wastes, and residues; wood, animal, and municipal wastes; and aquatic plants.
- **carbon dioxide:** a colourless, odourless gas that is present in the atmosphere.
- **energy:** the ability to do work or the ability to move an object.
- **potential energy:** stored energy, or the energy of position.
- **kinetic energy:** the energy of motion.
- **power:** the rate at which energy is transferred.
- **watt:** a metric unit of power, usually used in electric measurements, which gives the rate at which work is done or energy used.
- **renewable energy sources:** fuels that can be easily made or renewed in our lifetime, such as water, solar, wind, geothermal, and biomass.
- **non-renewable energy sources:** fuels that cannot be easily made or renewed, such as oil, natural gas, and coal.

### Methodology:

The methodology will help instructors develop and set up the treasure hunt on their own.

It describes all the steps needed to develop the activity before the game takes place. For example, take 7 colourful envelopes, print the clues, design a specific puzzle, display a clue, cut or fold or paste a piece of paper, hide the treasure, and all the steps beforehand to prepare the game and develop the clues. This section is mandatory because it gives all the riddles' guidelines, clues that instructors need to print, hide or cut.

It also focuses on after the game: the debriefing phase, with the conclusion, open to new discussions, and how to collect feedback from participants.

Here is an example of the Treasure Hunt - *THE WORLD AROUND US*



**METHODOLOGY:****Before:**

- Prepare 7 envelopes.
- Print the 6 cards (+ Tea instruction card for treasure).
- Prepare 7 clue cards (how to get to the next station).
- Prepare a treasure: Make sure to either have a berry bush/apple tree/etc. where the participants can pick some fruit OR buy seeds for tea herbs to plant at home (including instructions on how to plant, harvest, dry and use them)
- Explain the basic principles and ethics of permaculture and talk with the participants about why it is important to have a sustainable lifestyle

**After:**

- Go through the answers the participants have given and reflect on them together.
- Reflect on the mindfulness exercises and how they could be integrated into everyday life.

**Description of the reward:**

As far as possible, the activity's treasures, i.e., the rewards, should be related to the activity's theme. All the treasure hunts grant different rewards. Some offer real reward material lots such as organic fruits and vegetables or grains/seeds. Other reward experiences, such as the treasure hunt about renewable energy resources, partners propose to offer invitation tickets to a photovoltaic park (or another similar venue linked to renewable energy sources). In some activities, the treasure is a final pedagogical material that participants must find; it can be an article or a video giving more information about the theme—for example, the video about how to protect the hives in the activity about BEES PROTECTION.

The treasure needs to be placed, hidden where the section Methodology indicates. Depending on the game mechanism, the treasure can be found either by the winning team or it can be given by the instructor to the winning team.

Some treasure hunt also grants all the participants a reward, while other treasure hunts are designed to award only the fastest or the best team.

**WHAT IS THE TREASURE:**

an invitation ticket to a photovoltaic park (or another similar venue, linked to renewable energy sources).

**Requirements:**

In the requirement section, the instructors can find more specific information about the game in itself, that is to say, the level of participants, the kind of material needed to be





able to develop and design the clues (stationary, paper, glue...) the recommended space (outdoor or indoor) as well as the estimated time for the game.

Each treasure hunt proposes a different way of developing the activity with participants.

Some activities are itinerant speed-based quizzes, others are based on quizzes and observation, some are only based on time competition between two teams, while others focus on collaboration or memory.

For example, the Treasure Hunt – *CONSCIOUS CONSUMERISM*

**REQUIREMENTS:**

- Level of learners: Basic
- Material: paper, envelope, boxes, seeds, water, pens, gardening tools, leather bag, bucket, water, seeds in individual eco-friendly packaging
- Space: Outdoor
- 75 - 90 minutes

### **Description of the activities:**

This section describes the path of the treasure hunt:

Introduction of the activity

- a. The instructions are given to the facilitator to launch the treasure hunt.
- b. The details of the clues are enclosed: what it contains, the riddle, and where the envelope should be hidden/placed.
- c. The conclusion of the activity.

This section really gathers and explains all the successive riddles, clues, and different steps that participants have to go through to reach the treasure.

It presents the different stations and places where participants will stop and what they will have to do to find, learn or develop to solve the riddle and move to the next station, and so on for all the stations until they reach the treasure.

All the treasure hunts include a minimum of 7 clues and steps before reaching the treasure.

Most of the time, clues are given by the instructor or hidden at the different stations. Most of the clues are designed to be kept in envelopes. In this section, all the content



and the position of the 7 envelop will be explained. Each treasure hunt includes the riddle or challenges that they recall on. A journey plan can also be included for the teams to keep track of their answers, the different stations they have already passed, and the other team. In addition, the task sheet can be used for debriefing and can fuel the final discussion.

Most of the time, participants get to know the topics and the treasure hunt theme during the introduction phase. Then participants are divided into 2 teams, and the game starts when the two teams have understood the challenge and the rules of the game. Depending on the game structure, teams can start at the different stations or play the game after each other. However, most of the time, the teams receive the instructions, they are often given an instructor's envelope, and they start playing.

The clues, riddles, and missions can vary a lot from one game to another. Some treasure hunts are based on quizzes, other on observation riddles or memory and reflection.

Examples of some clues:

#### Description of the activity in *WAYS OF HABITAT CONSERVATION FOR ANIMALS IN CITIES*

**DESCRIPTION OF THE ACTIVITY INCLUDING CLUES** (at least 5 clues per activity)

The activity consists of solving a puzzle of questions and answers. There will be 12 red and 12 blue pieces containing the questions, which will be hidden in 24 specific places, chosen by the facilitator (to be designated on site). The participants from each team will have to find the 12 pieces with the questions and each time they find one, they will go to the facilitator, who will present them the 4 answer options. If they answer correctly, the facilitator will give them 15 points and another piece with the corresponding answer to the question (same colour as the question). If the participants fail to answer the question, they will still receive the other piece (so that they will all end up with 12 pieces), but the number of points will be proportionate to the number of tries (1 try – 15 points, 2 tries – 10 points, 3 tries – 5 points).

Question: **Why is it important to maintain biodiversity?**  
 Answer (in bold is the correct one):

- Biodiversity contributes to the degradation of the environment.
- Because living beings are not important.
- Biodiversity contributes to the preservation of the environment, but is dangerous to human life.
- Biodiversity contributes to the preservation of the quality of life and the well-being of humans.**

Clue (participants can ask for a clue for each question): Quality of life is important.

Question: **What factors contribute to the loss of biodiversity?**  
 Answer:

- Environmental protection, reduced water consumption and organic farming.
- Habitat destruction due to urbanisation, climate change and pollution.**
- Use of pesticides, organic farming and recycling.
- Pollution, creation of nature reserves and hunting/fishing.

Clue: Pollution is very present in our days.

#### Example of step 7 in *the FOOD SUPPLY CHAIN*



**Station 7: This is where the {name} Farm brings produce after harvest to prepare it for market with washing and packaging.**

1. How do you think the {name} Farm sells its produce? Is it locally sold, nationally sold, or globally sold?
2. If a cucumber is sold for 1 euro, how much of that euro do you think goes directly back to the {name} Farm? How much do you think goes to other companies for processing, packaging, transportation, and wholesale?
3. Below is an image of how a 10-euro banknote is distributed in the industrial/global food system. How much goes back to the farmer in this food system type?



The industry group euro demonstrates that the cost of food equals the sum of value added by all supply chain establishments. Supply chain establishments are categorised into 12 industry groups. Other includes agribusiness, legal and accounting.

How has the value added (costs) to the food euro by each industry groups changed over time?

**Clue to Next Station:** I am a wooden home where billions of invisible organisms divide and transform past lives into parts to build new lives upon the year's renewal.

An example of a step in the treasure hunt *THE WORLD AROUND US*



## OBSERVE & INTERACT

Taking time to observe nature and understand its different processes is important to enable us to react in the best way possible. On a permaculture farm this might mean to observe your garden throughout the day to see where the sunny spots are before planting tomatoes (which need a lot of sun to thrive).

On a personal level, this might mean to observe a certain situation and try to understand the big picture before responding. When being observant and attentive, we can learn a lot from nature and our peers – also how to lead a more sustainable way of life.

### BE MINDFUL

Wander around the farm for a bit and **observe the different plants** carefully. What colour and size are they? How do they feel and smell? Do you recognise any of them?

### REFLECT

Try to **find three kinds** of vegetables, fruit, herbs, nuts or cereals you know and **note their names** on a paper. Can you find carrots? Apples? Basil? Hazelnuts? Barley? Then, brainstorm what kind of **dishes** you could make with them and **note one** of them!



**Specific rules:** steps, rewards, point system



The European Commission support for the production of this document does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



This section goes deeper into details about all the guidelines and instructions addressed to the instructor so he/she can supervise and monitor the game correctly with a playful scope and mindset. The treasure hunt methodology corresponds entirely to a game-based learning approach because it turns the lesson into a real game. The lesson becomes the game, and the game is the lesson instead of simply putting in place a few gaming levers that help motivate and engage learners.

This section also provides the rules, some tips and gives the trainers a big picture about whether participants can use their smartphone or not, how the teams should be divided if the game is based on speed or score. It is a kind of overview of the entire game, precisising how many steps/stations are needed, how points should be calculated, and the reward.

#### Example of the Gamification element of *ETHICAL INVESTMENT*:

##### GAMIFICATION ELEMENTS:

- Specific rules: access to phones and internet Point system: one point for each correct answer, point reduction for wrong answers for clue 1
- Rewards: box of organic products

#### Sources:

This last section shares all the resources used to develop and design the treasure hunt activity. This section can be consulted by the instructor to create their skills and pass them on to the participants.

The instructor can also select from these references the resources that he/she would like to develop or discuss deeper into details with the participants during the debriefing phase. Hence, these references can be used to go further, open a discussion with the participants, or provide additional information on what was learned during the game.

Finally, these references can serve as a source of inspiration for the instructors if he/she wishes to develop treasure hunts or educational games on the proposed themes.

Example: Treasure hunt for *ETHICAL INVESTMENT*

**SOURCES:**

Classy. "6 Socially Responsible Companies to Applaud," May 11, 2018.

<https://www.classy.org/blog/6-socially-responsible-companies-applaud/>

Lexico|Dictionaries | English. "Ethics | Definition of Ethics by Oxford Dictionary on Lexico.Com Also Meaning of Ethics." Accessed September 4, 2020.

<https://www.lexico.com/definition/ethics>

Ethical Consumer. "Five Unethical Companies," May 18, 2018.

<https://www.ethicalconsumer.org/retailers/five-unethical-companies>

Kenton, Will. "Ethical Investing." Investopedia, 2020.

<https://www.investopedia.com/terms/e/ethical-investing.asp>

**The role of the instructor:**

The instructor's role is essential to guarantee the smooth running of the game and the participants' supervision.

Indeed, the instructor has several roles to play:

- He or she has a preparatory role upstream: preparing and installing the game (printing, hiding, installing) and testing that everything is functional.
- A coordinating and mediating role: introducing the topic, raising awareness of the participants, giving them the rules and objectives. Then, throughout the game, supervise them, ensure that the steps/enigmas are well understood and solved, give hints if necessary, engage, encourage and motivate participants.

Monitor the time and count the points.

- Debriefing role: make sure the game has gone well, check the answers and debrief on the strengths/weaknesses, explain or resolve blockages, questions. But also open the debate, introduce new ideas to go further, and stimulate the participants' curiosity.

## 4. CONCLUSION

This guide's aim was threefold, firstly to illustrate why using STEM, Entrepreneurship, and Permaculture games in education can be beneficial to learners in terms of personal development, learning to collaborate, acquiring knowledge that is useful for themselves and the planet. The guide also aims at showing that there are bridges between these subjects and that understanding them can help develop employability and critical thinking skills. Besides, we wanted to share the methodology for creating games or treasure hunts by ourselves. By sharing certain good practices and placing the instructor as the central element for the smooth running of the game and a good understanding of its stakes, this aims to demonstrate that developing games to tackle the subjects in question is feasible and certainly easier than one might think.

Finally, to illustrate the methodology, we have presented the game's rules and the various treasure hunts developed. On the one hand, this aims to give the keys and tools to set up this game and these activities, but, on the other hand, it seeks to inspire and "democratize" the GBL.

In conclusion, we hope that the readers of this guide will, in turn, be able to develop their own game and their own pedagogical approaches through play; and to this end, we propose some ideas for topics that could be addressed and developed to continue to train young people to develop their thinking and their capacity to understand their environment. We strongly believe in the importance of using our imagination and creativity and encourage learners to acquire assertiveness and useful knowledge on important subjects such as global warming and water scarcity (pumping system).



## REFERENCES

Pinxten, M., De Laet, T., Van Soom, C., & Langie, G. (2015). Fighting increasing dropout rates in the STEM field: The European ready STEMgo Project. In Proceedings of the 43rd Annual SEFI Conference (pp. 1-8). SEFI.

Naik, N. (2017). The use of GBL to teach mathematics in higher education. *Innovations in Education and Teaching International*, 54(3), 238-246.

Osterweil, S. (2007). The four freedoms of play. Retrieved February 23, 2016.



The European Commission support for the production of this document does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

