Can you turn our Community into a Green Community PULCHRA ?

Agiou Ioanni Lyceum

School Year: 2020-2021

Pulchra - Science in the City

The Science in the City: Building Participatory Urban Learning Community Hubs through Research and Activation- The PULCHRA project

ΛΥΚΕΙΟ ΑΓΙΟΥ ΙΩΑΝΝΗ ΛΕΜΕΣΟΥ

PULCHRA
Participatory Urban Learning Community Hubs through Research and Activation

ΑΝΟΙΚΤΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΥΠΡΟΥ
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Can you turn our Community into a Green Community PULCHRA ?

Non-formal education role play game for the environment and circular economy where can be implemented with teams by students, young of 4-5 people (for the best implemented of the game it is good to be at least 5 teams ate the simulation of the game to create a healthy competition between the teams). Before you start with the simulation of the game the best is to read very careful the instruction and to make sure each team has all the following:

- Game card of the Community PULCHRA
- Rubbish quantities that must be according to the instruction
- First economic budget that you must have
- Recycle card for the wastes (6 cards)
- Renovation cards of community spaces with Parks(4 cards)
- Strategic Planning Plan
- Plan of agreement (in several copies) between teams

Team that created the game

The game was created by a group of students and teachers of Agiou Ioanni Lyceum under the coordinator Mr. Nichola Nikolaou (physics professor) based on the planning that has been done for environmental program PULCHRA during the school year 2020-2021 under the useful comments of the coordinator of the program Georgia Chatziparaskeva for Cyprus. Important comments about the game were also given by our environmentalist Stella Komodromou partner from the organization ACPELIA.

Teachers' team of the program :

- Nikolas Nikolaou (Physics coordinator)
- Maria Hadjimichael Pouliaou (Philologist)
- Maria Christoforou (Chemist)
- Spyros Onisilou (IT)

Students' team of the program (with alphabetical order) :

1. Antoniou Chara
2. Kallinaki Martha
3. Kontogiorgi Giorgos
4. Kyriakou Aggelina
5. Constantinou Narina
6. Mama Evripidis
7. Nikolaou Eleni
8. Nikolaou Mixalis
9. Papadopoulou Eleni
10. Perdiou Antreas
11. Solomou Xaris
12. Hadjikyriakou Nikolas

Preface-Introduction

The game is an organized non – formal education game with specific environmental goals in waste management and circular economy. It is a strategy game with very different results depending on the strategy that each team will follow. We begin with the definitions of formal and non-formal education, the initial scenario and the rules of the game are listed below.

In the game there will be a virtual-time simulation with real-time matching to enable stakeholders to perceive the results of their strategy in relation to environmental policy and circular economy. The aim is for participants to understand the role of their own decisions in relation to the environment, to become environmentally aware and to understand the problem of waste management with the ultimate goal of environmental awareness in the issue of waste.

One of the indirect goals is to involve scientific teams in the decision-making process, using their own critical thinking in a long-term strategy. One of the main objectives of the European Union is to involve and involve young people in decision-making centers in order to gain a sense of volunteering and environmental awareness. Through their involvement in this game, scientific teams acquire skills in terms of cooperation (cooperation between teams is essential for the strategy plan to work), acquire roles, increase critical thinking, and acquire skills in decision-making under pressure.

Formal, non-formal and informal education:
In order to be able to understand the character of the game, we simply refer at the beginning to the definitions of formal, non-formal and informal education so that in the end we can understand the objectives of the game within the context of the non-formal education that is part of this game.

Formal learning-formal education is defined as the hierarchical, structured and organized educational system of each country, from primary education to university, which includes both general academic studies and specialized programs and institutions of integrated vocational and technical education (Jeffs & Smith, 1999). In our country we have the following levels of Education: kindergarten, elementary, high school, high school, Technical Education, College, Post-Secondary Studies, University. In other words, to summarize, we can say that formal education is the pre-defined training that takes place in the educational series of schools based on the prepared timetable programs by the Central Educational Service of each country.

Non-formal learning-non-formal education is defined as any organized educational activity outside the formal education system that is addressed to specific learners and has specific educational objectives. Various educational programs mainly for teachers of all grades are part of non – standard education in our country. In particular, one of the best examples of non-formal education is the Erasmus European program, which deal with a subject similar to the subject of the program and, through the involvement of pupils and teachers or young people if it is youth programs, achieve specific educational objectives defined by each program through the writing and approval of this program. Another example of non-formal

education is environmental education, which is the process that aims to develop, in various sectors of society, environmental concepts, skills, attitudes and environmental ethos, which in our country is carried out by various institutions, environmental centers, secondary schools, gymnasiums and lyceums, and universities (Frangoulis and Karagiannis 1997). Non-formal education depends to a large extent also on the context in which it is provided, and for this the problem of the validity of the acquired knowledge is particularly acute.

Finally, informal education is considered, according to Jeffs & Smith (1990), the process by which each person, throughout his life, learns and acquires attitudes, values, abilities – skills and knowledge, from everyday experience and the effects he receives from the environment (work, family, neighborhood, free occupations, libraries, media etc.). It is the learning that results from activities in everyday life that are related to work, family or leisure and is not structured in terms of learning goals, learning time or teaching support, so it typically does not lead to formal certification.

By referring to the definitions we tried to clarify the context in which this game belongs and as it is defined with times and support, the game is part of the non-formal education in order to be able through the process of the game to acquire educational skills in Environmental Education, circular economy and decision making in relation to environmental policy. A structured non-formal education game with didactic goals in renewable energy can be found at Link:

https://www.nikolas-nikolaou.net/διαθεματικές-εργασίες-/mi-typiki-ekpaideysi/

It is a game set up by the head of the creation of this game some years ago at the in St. John's high school Limassol.

Then follows the script the description and everything that the teams that will be involved with the game process should know.

The game

Initial Description of the prevailing situation in the Community PULCHRA

The hypothetical scenario you will have in the game refers to a hypothetical village somewhere in the near future with conditions not far from reality. Our goal through the whole process is the players involved of the game to enter into a strategy process to bring better conditions in the PULCHRA Community.

The PULCHRA community, today in 2040 AD is in a bad environmental situation as it has become the garbage dump of the two neighbor cities of the Community, the cities of RABISHKA and SHITKA, each of which has a population of over 300,000inhabitants. The Municipal authorities of the two of these cities defined the landfills of cities without at all environmental awareness at the Community territorial boundaries of the PULCHRA Community because until today there has been no reaction from the Community authorities in their decisions regarding landfills. Seeing all this environmental burden borne by their beloved Community the new PULCHRA Community Council, under the coordination of its President Community decided to act and call Scientific Environment Teams to be able to

achieve the best solutions for a proper environment for the inhabitants of the Community and in addition to be able to take advantage of garbage and utilize them through the circular economy for the environment.

Before assigning any views from the Scientific Environmental Groups, the Community Council made a statistical record of waste that exists but also occurs every year in landfills that flood the territorial boundaries of their Community. Assign this entry to a waste management company so they can know what exists in garbage in their Community. When this recording was made proceeded to the installation of a garbage sorting unit in the landfill and so they could distinguished the rubbish streams they received in their community every year. So that they can now manage properly waste in recyclable or non-recyclable materials and proceed to reduce them waste decided to invite scientific teams to propose them what they will do and give the best proposal the opportunity to manage them their garbage.

The Scientific Environmental Teams (role playing by them involved in the game) suggest solutions based on what is initially available capital provided by the Community Council of the PULCHRA community, so as to make the best environmental steps in the long run planning their strategy so that they can finally offer them best solutions for the Community and the rehabilitation of landfills in parks which will help the Community to avoid a number of environmental fines and have a healthy environment with activities and environmental parks which will be able to offer a better quality of life for residents of the community.

Statistical Analysis of Garbage in the Landfills of the community

Pre-existing situation of landfills in the Community

In the landfills of the Community based on the statistical analysis made by the company waste management there are huge quantities of recyclable materials.

This is because there was no environmental policy in either neighboring cities and the PULCHRA Community was the rubbish dump of the two cities RUBBISHKA and SHITKA for the last 40 years. So in the landfills there are below quantities of garbage that have accumulated after several years inaction in relation to the Community environment:

• 120,000 tons of organic waste

• 20,000 tons of plastic waste

• 20,000 tons of waste from various types of paper: cardboard, paper and general paper products.

• 10,000 tons of glass

• 5,000 tons of metals, of which 30% are aluminum.

Also on the borders of the community there are huge sewage lakes that the their quantity may exceed 20,000,000 urban wastewater which are large foci of insect attraction and degrade its quality atmospheric air, soil and groundwater in the area.

Annual waste charge in the PULCHRA Community

As we have mentioned in the Community there are the landfills of the two neighbors cities and thus in addition to the quantities collected in the Community that each time the environment of the Community through landfills is burdened with quantities of waste below:

- 12,000 tons of organic waste
- 2,000 tons of plastic waste
- 2,000 tons of waste from various types of paper: cardboard, glue, paper

and general paper products.

- 1,000 tons of glass
- 1,000 tons of metals, 30% of which are aluminum

Also the sewage ponds whose quantity may exceed 20,000,000 of urban wastewater is charged with another 2,000,000 tons municipal wastewater each year.

Game Rules

The game is competitive, and for proper and healthy competition it is good to play with at least 5 teams. In order to properly organize the non-formal education game, the scientific teams (role-playing of groups playing the game) should be informed first of all about the Community and waste water, explain to them the role of the scientific teams and the process of implementation of the game simulation by the game coordinator. In addition to the coordinator, a further person is also needed for the proper implementation, who will be the banker and another person who will be responsible for the disposal of the game's solid and liquid waste.

Once the game has been updated in fifteen minutes, the teams will have 45 minutes to develop their strategy according to the rules of the game and for the best results according to the scientific team.

The game simulation will then begin to represent the actual status of their strategy over time. The simulation will be played for two hours (120 minutes) and every 5 minutes will reflect the results for one year of operation of all the affected situations in the PUCHRA Community, so that at the end of the game we will have the results of each team's strategy for a period of 24 years. During the simulation there may be dumping, factory sales and generally anything that may come to an agreement is enough to be brought to the

knowledge of the banker and the game coordinator in general. Any agreement between the groups should be recorded by the banker and the waste manager at the time of agreement between the groups.

After the end of the simulation each team will have 30 minutes to track us down the course of their own strategy so that they can ultimately be rated according to the selection criteria of the winning team.

Time of play

20 minutes for the initial update by the game coordinator and presentation of the other parties involved.

90 minutes to inform and meet scientific groups and to develop a strategic work plan.

30 minutes for an initial paradigm simulation to let all teams understand how to perform the game according to the normal simulation.

2 hours and twenty minutes simulated game play with long-term strategic plan results.

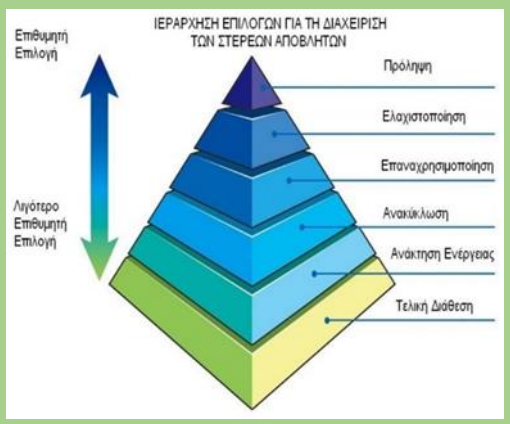
45 minutes to record the results of each group's strategy from the scientific teams.

10 minutes for each group to present and rate their work according to the scoring rules.

In total for 5 groups it will take about 6 hours and if the teams are ten we can get 7 hours. The game can be played with at least 5 teams and a maximum of twelve teams (the scientific teams can consist of 4 to 8 people depending on the interested persons).

Scientific groups

The scientific groups should propose ways of resolving this phenomenon and add additional value to the PUCHRA Community by trying to reduce the volume of waste in different ways to reflect both on the Community interest and on the environmental benefit derived from it the hierarchy of options for solid waste management found in the waste management tabs according to the type of waste.



Important remark: Always consider prioritizing options to get better management and results in designing your strategy. We should mention that in addition to hierarchy management, there should always be environmental regeneration of rubbish areas in the back of your mind.

Initial information and strategy of the scientific teams.

The science teams will have 45 minutes before the start of the game simulation to design their own strategy for the best economic and environmental results at the end of the simulation, so they can catch the bid as the winning team from the PULCHRA Community Council. For the best planning of the strategy it would be good for the scientific team to consult the waste cards, the economic analysis and to make a plan how it will try through the initial capital of 1,000,000 euros that will have the best environmental results and to move in a circle in relation to the results that will bring each passing year. The original design of the game has been done so that the simulation corresponds to 24 years. If the game excites and the teams that will be the scientific teams have previous experience, the difficulty of strategic planning can be easily increased, in the 30 and 40 years of the simulation. Mention that in order to move on to more difficult strategies it is good to be experienced and the trainer and the teams that will play the game.

Designing a smart strategy is one that will predict in the long run what will happen. It should be noted that the European Union, depending on its environmental policy, will each year announce targets and aspirations for the coming years that, if not achieved, will result in an environmental fine, so teams will have to watch live announcements during the game simulation. European Union for the short-term objectives to be announced through the program coordinator.

Game Simulation

The game starts at the same time for all groups and lasts 140 minutes. In the game's original programming, simulation was planned for 20 years. Every 7 minutes of the game will be a real year, with revenues, costs, waste and benefits coming for one year. If the scientific teams are made up of experienced scientists (people who had prior knowledge of the game), then the game could be made more difficult with a 5 minute match per year (strategic environmental planning for 28 years) or even more difficult with a 4-minute match per year (strategic environmental planning for 35 years).

The game will be alive during the simulation and there may be agreements between the groups to buy waste if needed or to buy factories if the factory is not needed in a group. The agreements will be made by the negotiators from each scientific group. When there is agreement between two groups on everything the game's central banker should be informed.

There will be announcements of short-term goals during the game's flow, and for long-term objectives which the scientific groups should incorporate into their strategy in order to achieve the best possible results, so that they can ultimately formulate the best environmental policy for a clean environment in the PUCHRA Community. Nobody can know the outcome in advance because the long-term objectives can change the plans and put them at a dilemma about what they will do to achieve them and how they will change their strategy.

Industrial Coexistence between scientific teams during the game

It is defined as the sharing of services and benefits as well as the utilization of by-products and waste as resources between industries in order to create new values, to reduce production costs while improving the environment. Is essentially an organized system where the waste of one industry (business or industry) can be a useful raw material for another industry. Thus, according to the Industrial Coexistence, the teams can make individual agreements with each other either for the sale of garbage, or for the sale of used factories that no longer need them. Agreements can be made individually between the teams during the implementation of the simulation and judging according to the strategy of each group. When the agreements between the teams are closed, they should refer to the game coordinators for their security in relation to the financial management of the game.

Obstacles and rewards during the game simulation.

Through the live simulation come some instructions from the State and European institutions regarding the waste in order to make the Earth sustainable for future generations. These decisions can be changed depending on the situation in each game simulation. Announcements will be made by the program coordinator depending on the situation prevailing during the simulation. It should be noted that the announcements will be random and will be either a reward, either sponsorship in relation to the actions taken, or a fine if the necessary actions were not taken in relation to waste management. The following are some sample announcements that could be made during the simulation:

1. The European Commission, through Directives 2030/53/EC, 2036/66/EC, 2032/19/ EU of the European Parliament, has decided to impose a fine of EUR 30,000 on all communities that fail to reduce plastics by 50% and their glass waste.

2. Based on the agreement signed by the mayors of the cities (Rubbiska + Shitka) with the Community Council of the PULCHRA Community, 1000 more tons of plastic waste will be sent for the next 5 years to be managed.

3. Under the EU obligation, Member States should include communication and training actions to raise awareness of waste prevention. For this reason, a monetary amount of reward is paid to those who have invested in educational activities. So in case you made any environmental prevention policy you will receive the amount of € 50,000 as a grant for the environmental policy that you followed through our strategic planning.

4. A cash reward of € 20,000 will be awarded to those who provided incentives for the collection of unsold food or to charities, provided that all EU Member States must provide incentives.

5. Due to delays in the implementation of the Union Waste Legislation, those who have not reduced your organic waste to 50% by 2050, are obliged to pay a lump sum of € 100,000.

6. The European Commission has decided to refer you to the Court of Justice for failing to protect your citizens from poor air quality, with regard to sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) limit values from waste, because you proceeded to incineration without energy production and landfilling of your waste, which is not required by the latest directives of the European Union. A court decision fined you € 50,000.

7. There have been systematic omissions regarding the recording and monitoring of pollution from organic waste, so those of you who have not managed 70% of the waste are required to pay the x amount.

8. Some did not ensure proper urban waste water treatment in certain settlements as required by Community law (Council Directive 91/271/ EEC) and untreated wastewater can pose a risk to public health. Those who have not pursued an environmental policy for wastewater treatment will pay a fine of € 100,000.

9. Warning: You risk not achieving the 2045 target for the preparation of municipal waste for reuse and recycling by at least 55% by weight.

10. Those who have not succeeded in collecting their waste separately and recovering raw materials will be fined € 20,000.

11. The Commission has set a recycling rate of 60% for aluminum by 2050. Those who have not succeeded will pay a fine of € 100,000.

12. The Commission has set a recycling rate of 85% for paper-board by 2050. You risk not succeeding. If you do not succeed you will have to pay a fine of € 40,000 each year.

13. Based on your implementation report to the EU, you have not proven to be an effective tool for controlling congestion or ensuring proper implementation, resulting in unnecessary administrative burdens.

14. As of 31 December 2043, the Commission is examining the data on food waste in accordance with Article 37 with a view to reducing waste, and it has been observed that some have not implemented a strategy for reducing food waste and a fine is imposed.

15. The Commission decides to close the landfill. Please review your strategy if it includes part of the above decision.

16. You have not created an electronic register or coordinated registers to record the quantities and streams of waste so that you know whether the objectives of the legislative acts are achieved in the years 2045, 2050 and 2055.

17. UNO (United Nations Organization) objective 6, aims to reduce pollution, eliminate discharges and halve the percentage of untreated wastewater, and to increase recycling and safe water reuse by 2060. Keep this in mind when planning to avoid fines.

The above announcements can be enriched with others depending on your strategic planning in order to show you obstacles in wrong plans but also reward in correct plans in relation to the overall organization of the game.

PULCHRA Community Game Card

All groups will have the Community tab in the following format. The tab is divided into 4 sections and will be used by environmental groups during the simulation to organize all their shots. In the Exploitation of Materials will enter any factories, crafts and other enterprises that will be set up for the recycling and treatment of waste. In Financial Management it will be the money you have at any given time and in the trash will be the municipal waste that exists in your community at any given time. In landscaping projects are any projects you decide as a group to create in the PULCHRA community.

In the Appendix you will find out what you need as a team before you can create your own strategic plan over time and act as a research team.

Final Score and nomination of the winning scientific team

At the end of the simulation the scientific teams will have 30 minutes in which they will take stock of what they have achieved through their strategy. After consulting and studying their final course through the whole conduct of the game they should record the following quantities and projects accordingly. I suggest that as in the final score of the units we count points according to what each team has achieved. The garbage left in the community according to their design at the end of 24 (30 or 40) years should be recorded. Your team will be rated according to the rules below.

Rating for your team's financial management

For every thousand euros you have at the checkout you will have two points in the final score.

Rating for landscaping works carried out in the Community

For each project carried out in the Community you will get the corresponding score and indicate below.

Solar Parks

For each Solar Park grant you have given and built in your Community you will get the following units:

Solar power park 150kw on arable land: **120 points**

Solar power park 100kw on arable land: **80 points**

Solar power park 50kw on arable land: **40 point**

Solar park power 150kw in buildings (on urban land): **240 points**

Solar park power 100kw in buildings (on urban land): **160 points**

Solar park power 50kw in buildings (on urban land): **80 points**

Wind turbines

Small wind turbine 5kw in house: **20 points**

Large Wind Turbine 300kw: **200 points**

Zoo

Creation of a zoo with wildlife protection: **2500 points**

Creation of a zoo with captivity status: **300 points**

Theme Parks

Plant Theme Park: **500 points**

Tourist Theme Park Games: **200 points**

Geological Theme Park: **400 points**

Archaeological Theme Park: **400 points**

Architectural Theme Park: **200 points**

Children's Toy Theme Park: **200 points**

Technological Theme Park: **300 points**

Wildlife Theme Park: **400 points**

Ethnographic Park: **200 points**

Botanical Garden: **400 points**

Recycled materials theme park: **600 points**

Rating for the remaining solid waste of the group

Organic waste

You should divide the quantities you have left into the following:

Animal waste: for every ton you have left you will remove 3 points.

Cooked Food: for every ton you have left you will remove 2 points.

Green organic waste: for every ton you have left you will remove 1 point.

Plastic waste

Plastics that can be recycled: for every ton you have left you will remove 2 points.

Plastics that cannot be recycled: for every ton you have left you will remove 1 point.

Paper Waste

For every ton you have left you will remove 1 point.

Glass Waste

For every ton you have left you will remove 1 degree.

Metal waste

Rusted metal waste: for every ton you have left you will remove 1 point.

Aluminum waste: for every ton you have left you will remove 2 points.

Liquid urban waste: for every thousand tons you have left you will remove 2 points.

Annex

All teams should have the following:

1. Pulchra community game card
2. Quantities of rubbish you should have according to the instructions
3. Initial financial budget that you should have

The above are in the instructions you are currently holding in your hands so you should read all the instructions carefully. You should also have the following forms:

4. Strategic planning plan
5. Agreement plan (in several copies) between the groups

The above is to make the right deals and the right planning according to your decisions. Along with all this you will have with you the recycling tabs and

regeneration tabs which are more information tabs and you should also read them very carefully to know how to proceed with the right design. The recycling tabs are listed below and in photos.

6. Waste recycling cards (6 cards)
7. Regeneration cards of community spaces with parks (4 cards)

Just to mention that, in case of buying factories or other projects in the community you will get cards or constructions respectively.

Strategic planning plan

	ΠΟΣΟΤΗΤΕΣ ΑΠΟΒΛΗΤΩΝ (σε τόνους)											
	ΠΛΑΣΤΙΚΑ		ΟΡΓΑΝΙΚΑ ΣΤΕΡΕΑ		ΠΡΟΙΟΝΤΑ ΧΑΡΤΙΟΥ		ΥΓΡΑ ΑΠΟΒΛΗΤΑ-ΛΥΜΑΤΑ		ΓΥΑΛΙ		ΜΕΤΑΛΛΑ/ΑΛΟΥΜΙΝΙΟ	
Αρχική συσσωρευμένη	20,000		120,000		20,000		20,000,000		10,000		5,000	
Ετήσια συσσώρευση	2,000		12,000		2,000		2,000,000		1,000		1,000	
Έτος	Επεξεργασμένη	Υπολοιπόμενη	Επεξεργασμένη	Υπολοιπόμενη	Επεξεργασμένη	Υπολοιπόμενη	Επεξεργασμένη	Υπολοιπόμενη	Επεξεργασμένη	Υπολοιπόμενη	Επεξεργασμένη	Υπολοιπόμενη
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Plan of agreement between the groups (Industrial Coexistence)

Science in the City. Building Participatory Urban Learning Community Hubs through Research and Activation

Can you turn our community into a PULCHRA green community ?

Industrial Coexistence between scientific teams during the game

Agreement between group A (_____) with

group B (_____)

Today the following agreement was decided between the leaders of the above scientific groups A and B for the following:

Year: 20……..

Group A will sell the following to Group B.

……
……
……
……

For the amount of …….

Signature

Team Leader A: ……..

Team Leader B: ……..

Waste Recycling Cards

Front Side

PLASTIC WASTE (PMD)

Subcategories: PET, HDPE, PVC, LDPE, PS, PP
Quantity of waste accumulated: 20,000 Tonne
Quantity produced every year: 2000 Tonne
Proportion of plastic waste: 50% of plastic waste cannot be recycled

WAYS TO MANAGE PLASTIC WASTE:

1. Plastic recycling factory:

It recycles 2000 tonne per year and generates a profit of €150/tonne
Cost of Proprietary construction: €1,000,000
Cost of Renting Recycling Factory: €200,000/year

2. Plastic waste reduction policy

(a) Three-axis information policy

First Axis: Promote and inform citizens about the very good quality drinking water provided at a very low price by their city's water supply system. So that they consume water from their tap (in homes, schools, offices, workplaces, public places, hotels) as a result they can reduce the use of plastic bottles by 730 bottles 1L/person.
Second Axis: Lectures in schools on the dangers of the reckless use of plastic bottles.
Third Axis: Investment to support measures to reduce plastic waste, such that a ban on the design of specific disposable plastics in the Community (e.g., plastic bottle ban 0.5L)
Result: Reduction of 100 tonnes of plastic waste per year
Information campaign cost: €5000/year

(b) **Factory Construction Grant Policy**

A grant to companies for the construction of factories producing biodegradable plant material for plastics used daily. In this way bioplastics replace large quantities of plastics produced by the petrochemical sector.
Result: Reduction of 300 tonnes of plastic waste per year
Factory Grant Policy Cost: €20,000/year

3. Plastic Recycling Policy

- Installation of recycling bins in every neighbourhood, in all public buildings, etc. recycling plastics in order to avoid discarding plastics in common bins.
- Installation of compressors or guarantee machines in public places, supermarkets, hotel units to encourage citizens to recycle plastic bottles.

Result: for each year of encouraging recycling policy, you are changing the proportion of recyclable waste by 5% (i.e., for the first year recyclable plastics are increased to 55% and non-recyclable plastics 45%)
Recycling Policy Cost: €10,000/year

4. Sanitary Burning of Plastics - Energy Recovery

Power plant production through the collection of gases that will be used for heating as well as for fuel in vehicles so that they do not end up in landfills more than 25 million tons of plastic that cannot be recycled.
Result: The factory can process up to 1,000 tons of non-recyclable plastic/year and can yield a profit of €100/tonne.
Construction cost: €500,000 because of the necessary filters that are needed to avoid environmental pollution.
Rental cost: €100,000/year

5. Sanitary Burial of Plastics

For the sanitary burial of plastic waste, they will have to pay €20 per tonne before they can get rid of plastic waste.

Back Side

Definition: The term plastic describes a wide variety of synthetic or semi-synthetic organic solid materials that have as their main component a natural or artificial resin (polymer) and that can be formed under appropriate pressure and temperature conditions.

Disadvantages

- Plastics are destructive to the environment for the reason that they are one of the main pollution components of the natural environment.
- Huge amounts of rubbish accumulate in no time.
- Contamination of the air, the soil and water.

Advantages

- We save non-renewable fossil fuels and energy.
- Reduces the amount of solid residues that end up in landfills.
- Emissions of carbon dioxide (CO_2), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) are reduced.

Historical Data

The evolution of plastic took place in the 1860s. The father of the plastic is the Belgian scientist Leo Baekeland who gives the world the Bakelite. Other inventions followed, such as cellophane (1925), duct tape (1927), nylon (1934), tapper (1942), the first vinyl record (1948).

Front Side

ORGANIC SOLID WASTE

Quantity of waste accumulated: 120,000 tonnes
Quantity produced every year: 12,000 tonnes
Proportion of solid organic waste: 30% of all organic waste is livestock and other waste that cannot be composted without pasteurization, 30% is cooked food thrown out of the household (not suitable for composting without pasteurization) and the remaining 40% are green leaves and other waste that can be composted without pasteurization.

Ways to manage organic waste

1. Composting Factory

It uses only organic solid waste that can be composted without pasteurization and produces organic soil which is marketed for reuse as organic fertilizer.
Result: It recycles 5,000 tonnes a year of organic compostable waste and generates profits of €50/tonne
Cost of Proprietary Construction: €500,000
Rental Cost: €100,000/year

2. Organic Waste Reduction Policy - Prevention

The organic waste reduction policy focuses on three axes as follows:

- Establishment of a food bank from restaurants, preparation plants, food production industries. Make free concessions of food that has not been consumed in soup kitchens and charities.
- Promote and inform citizens about the creation of new recipes from leftovers (e.g., reducing food waste by making recipes from leftover food from buffets to every meal in hotel units).
- Campaign to inform citizens about composting some cooked food.

Result: The policy of reducing organic waste results in a reduction of 700 tonnes per year from organic waste which is not for composting.
Cost of reduction policy: €25,000/year

3. Pastreurization and anaerobic digestion unit of organics in need of pasteurization

Generally all organic waste can be treated for the production of biogas, liquid and solid digest (depending on their quality characteristics, liquid digest can be used as fertilizer and solid as a conditioner). Part of them however, due to the presence of pathogenic microorganisms, must first pass through pasteurization.
Result: It can handle up to 5,000 tons of solid organic waste/year and can yield a profit of €150/tonne. In order for the plant to work, an additional 500,000 tonnes of urban waste water/year is needed, which will also yield a profit of 50cents/tonnes.
Cost of Proprietary Construction: €1,500,000
Rental Costs: €500,000/year

4. Organic Waste Reuse Policy

Establishment of a factory for the manufacture of feed from food residues. In the factory all organic waste of all categories can be used and at whatever proportion they need depending on the residues.
Result: It can process up to 2,000 tonnes of organic waste/year and can yield a profit of €30/tonne
Cost of Proprietary Construction: €200,000
Rental Costs: €50,000/year

Back Side

Definition: That is, all the waste that is edible. Based on 185/11 as organic waste are: biodegradable garden and park waste, food and kitchen waste from houses, restaurants, mass caterers and retail outlets and related waste from food processing plants.

Disadvantages

- The **recycling** of organic waste is a slow process where it takes a long time to achieve.
- Human intervention in order to influence the process is very difficult.
- They cause large quantities of greenhouse gas emissions during sanitary burial as they are one of the main sources.

Advantages

- By recycling organic waste we succeed in protecting the environment and reducing organic waste
- It can be used to produce electricity and thermal energy with almost zero rigs.
- Proper management of food waste can reduce the number of people who are malnourished.

Front Side

PAPER PRODUCTS

Subcategories: Print and write paper. Toilet paper containing tissues and napkins, cardboard of all kinds.

Quantity of waste accumulated: 20,000 tonnes
Quantity produced every year: 2000 tonnes
Proportion of paper waste: All paper waste can be recycled depending on its category.

Ways of Managing Paper Waste

1. Paper Waste Reduction Policy

The Paper Waste Reduction Policy focuses on two axes as follows:

- Campaign to Promote the use of e-mail format, in Public Services, e-mail, record keeping in electronic format, use of USB
- Reduction policy, on the long-term reduction of paper. Promote the use and reuse of paper in other different ways as in books.

Result: By using the paper waste reduction policy, they can achieve a reduction in paper waste by 100 tonnes of paper of each year that the reduction policy is imposed. The reduction is permanent.
Reduction Policy Cost: €5000/year

2. Paper Waste Recycling Policy

The use of paper has increased rapidly in modern society and has even multiplied 40 times since the beginning of the 20th century to the present day. Given that annual consumption now exceeds 200 million tonnes per year, there is an urgent need to recycling it. Its recycling, if properly managed, is cost-effective and produces good quality recycled paper.
Construction of a paper waste recycling plant with good quality paper waste production.
Result: It can process up to 4,000 tonnes of paper waste/year and can yield a profit of €5/tonne.
Cost of Proprietary Construction: €100,000
Rental Costs: €20,000/year

3. Energy recovery policy from the recycling plant

Liquid infectious waste for the environment is produced in the paper mills. Create a unit to collect this liquid which is the preferred alternative "green fuel". In Sweden they have developed integrated management from paper factories to truck supply, which is used exclusively for their movement. In order to create this plant, it is necessary to have the recycling plant for paper packaging.
Result: From the creation of the plant are saved money for fuel yielding a profit of €3,000/year
Unit Creation Cost: €20,000

Back Side

Definition: Paper is a material consisting mainly of fiber parts of fiber selected or compressed into a coherent single whole.

Disadvantages

- The price of the special paper is relatively high.
- Can only be used in high-end printing.
- It has a low rate of use in daily work and life.

Advantages

- Protection of the environment.
- Economic benefits for the organization organizing paper recycling programs.
- Job creation.

Historical Data

Traditionally, the Chinese date the invention of the paper to 105 AD, when Chai Lun, a great court official, expressed his inspiration to Emperor Ho – What of the Han dynasty and then made paper from materials such as tree bark, hemp fibers, old rags and pieces of silk, which mashed them by pounding them into the water, then poured the pulp onto a plate and the leaf that was made so let it dry in the sun.

Front Side

Liquid Waste – Urban Waste

Subcategories: Toilet liquid, bath, food preparation, liquids of pig farms and other livestock units.

Quantity of Liquid Waste accumulated: 20,000,000 tonnes
Quantity produced every year: 2,000,000 tonnes

1. Liquid Wastewater Treatment Plant

The treatment of the urban type of sewage is usually carried out in biological plants (e.g. SALA in Limassol) for the removal of organic load, nitrogen, phosphorus, particles, fats and oils, pathogenic microorganisms, etc. Sewage is transported to the purification facilities through sewers, sometimes using special tankers; through the treatment of wastewater you can offer cheap water to agriculture and develop green development within the community and the widerregion.
Results: Through the plant, the wastewater treatment plant can clean up to 5 million tonnes per year and offer them for green spaces, parks, agriculture and the gardens of houses with a profit of €0.30 per tonne of treated water.

- **Cost of Proprietary Construction:** €5,000,000
- **Cost of Rental Services for the treatment of the same amount of waste water:** €800,000/year

2. Policy to reduce waste water

Citizens are informed and subsidised to reduce their waste water and reuse the water from the sinks and kitchen sink. In particular, households that want to set up a system for the reuse of grey waters are subsidised.
Results: Through the subsidy given, these water reuse systems place 500 households a year resulting in a permanent reduction of 50,000 tonnes of waste water per year implemented by the policy to reduce wastewater.
Cost of information and subsidy for the reduction of wastewater: €50,000/year

Back Side

Definition: The term sewage refers to waste water from dwellings (domestic waste water) and liquid waste from the normal activities of a city (urban waste water). When a city's liquid waste also contains significant amounts of industrial waste, it is called liquid waste.
Urban Sewage is the mixture of wastewater from residential areas, industries and/or rainwater produced within a settlement. **(Directive91/271/EEC on the Treatment of Urban Waste Water)**

Disadvantages

As disadvantages of waste water we could say the smell to the environment and the nitrate pollution for which there is also a directive on nitrate pollution of groundwater, inter alia, due to discharges of waste water/forage waste into the soil. Also one of the major disadvantages of non-recycling and reuse of wastewater is the lack of water observed in many parts of the world.

1. Influence on the amenities of the environment and public health.
2. Mosquito hatching, resulting in the transmission of diseases.

Advantages

Through the treatment of wastewater we can have:

- Cheap water for agriculture and parks.
- Reuse of water after treatment of waste water.
- Partial treatment of the problem of water scarcity.

Front Side

Glass

Subcategories: common glass, boron glass – (Pyrex), single (unbreakable) glass, bulletproof glass, thermal strength glass (Subcategories: green, brown, transparent)

Quantity of waste accumulated: 10,000 tonnes
Quantity produced every year: 1000 tonnes
Proportion of glass waste: 40% consists of packaging materials that can be recycled as such and 60% from broken glass.

Glass Recycling Policy

Glass Recycling Factory

Creation of a recycling plant so that it can recycle 2000 tonnes a year and generate profits of €5/tonne
Cost of Proprietary Construction: €100,000
Renting Costs: €10,000/year
Concession of recycling glass to a company with an annual grant of €1,000 for transport

Glass Reuse Policy

Glass Breakage Factory

Creation of a glass breaking plant and crushing it to produce sand, which will be added to earthing materials. In this way the glass is transformed back into a resource and re-integrated into the cycle resulting in savings of resources, energy and money.
Result: The factory can break 2000 tonnes a year of non-recyclable glass and yield profits of €3 a tonne.
Cost of Proprietary Construction: €30,000
Renting Costs: €5,000/year

Glass Waste Reduction Policy

The policy of reducing glass waste takes place in two axes as follows:
First Axis: Campaign for the return of glass bottles to points of sale and reimbursement of the surcharge (€) on the purchase price.
Second Axis: Policy for the use of recyclable bins by the recycling campaign.
Result: The campaign finally yields a reduction of 50 tons a year for as many years as the campaign lasts.
Campaign Cost: For as long as the campaign lasts, it will cost €2000/year

Back Side

Definition: Glass is solid and amorphous material, i.e., it does not have a crystalline structure.

Disadvantages

- It's a difficult case to separate the glass for recycling.
- It is sorted according to its color.

Advantages

- It's 100% clean. It is made of three natural, non-toxic elements: sand, sodium carbonate and limestone.
- It is one of the very few 100% recyclable materials.

Historical Data

- The glass was discovered around 3000 BC by the Syrians.
- The prevailing theory of its discovery is that which refers to a random event.

Front Side

Used Metals and Aluminum

Subcategories: construction metals, metals from household appliances, aluminium boxes, construction aluminium, aluminium or aluminium alloys for use in foundries, aluminium or aluminium alloys for mechanical processing.

Quantity of accumulated metals: 5,000 tonnes
Quantity of metals produced every year: 1000 tonnes
Metal waste ratio: 30% of metal waste is aluminum and the rest is metal or metal alloys.

Ways of Managing Metals and Aluminum

1. Metal reuse policy

The policy is divided into two axes as follows:

- **Construction of handicrafts made of reused metals.**

In the craft industry, the rust of metals is processed and cleaned and various constructions are made from used metals which are sold on the market. Metal constructions of small houses are also made to order in the craft industry. The biggest cost of running the craft industry lies in the staff it employs.
Result: Through the operation of the craft industry can be reused up to 1500 tonnes of metals per year yielding revenues of €500/tonne
Initial cost of buying craft machinery: €300,000
Cost of operation of the craft industry: €400,000

- **Campaign for the reuse of metals**

There is a campaign to inform the world and subsidise small businesses to reuse metals. On the long-term reduction of metals you inform the population of the two cities to reduce the use and reuse of metal.
Results: Through the campaign comes a reduction of 100 tonnes of metal waste (not aluminum) from the two cities for each year the campaign takes place.
Educational Campaign's Cost: €30,000/year

2. Aluminium Recycling Plant:

Aluminium can be recycled indefinitely and used for food containers. Construction of an aluminium recycling plant and construction of aluminium rods according to market demand.
Results: The factory can manage and recycle 500 tonnes of aluminum per year and generates a profit of €1500/tonne.
Cost of Proprietary Construction: €2,000,000
Renting Costs: €400,000/year

Back Side

Definition: Metalwork is the art of creating objects from metal materials (pure metals or alloys).

Disadvantages:

Due to the significant diversification of waste, the separation process is quite complex, and extensive and continuous public information is required, as well as significant investments in sorting plants.
It is not easy for industry to accept recycling materials due to altered quality. Collection and classification is intensive work.

Advantages:

- Limitation of soil-decomposing materials and effective separation of hazardous waste.
- Aluminium can be recycled indefinitely and used for food containers.

Historical Data:

Aluminum does not exist in nature in simple chemical compounds, so the isolation of this metal was particularly delayed. Its discovery and production, when electricity and chemistry were discovered and used to a large extent, was separated from the ghost of alchemy.

Industrial Coexistence Cards