Hera Software Manual v1.1n

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HERA SOFTWARE MANUAL

TABLE OF CONTENTS

Introduction 3

Contact 6

ACKNOWLEDGEMENT 6

First steps in the game 7

Setting things up 7

Main Menu 7

The Teacher Experience 13

The Student Experience 23

The Game Interface 26

The left hand buttons 27

The bottom bar 32

The Hera integrated Tools 38

Table of figures 46

Annex: The novelty and innovation of the HERA game 49

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INTRODUCTION

HERA aims to develop high order problem solving skills among engineering and economics higher education students, building their capacity to address emerging 21st century societal and industry challenges. HERA introduces active learning design to expose students to complex challenges inspired by real life, the solution to which requires the integration of interdisciplinary knowledge, emulating industry problem solving processes. HERA deploys digital serious games to enrich classroom engagement and interaction, promoting experimentation, collaboration, independent learning, communication, and presentation skills desirable.

In order to achieve those goals, the HERA project deploys a Unity-based city builder type serious game (that we will refer to as the Hera Software or Hera from now on) showcasing to groups of students concrete city-sized issues that need to be tackled on by different experts with different point of view and different objectives. They will need to communicate, synchronize and collaborate in order to achieve and their goals and the goals of everyone else in the team with the limited resources available. Each of the specific point of view and expertise defined in a scenario is called a **role**.

Both the teacher and the student experience happen entirely inside the Hera software, which contains the city builder, a learning management system for the teachers to create and manage their courses and a collaborative work environment for students offering a host of communication, organization and coordination tools such as a chat, a Kanban-style list making system, a virtual sticker board and others.

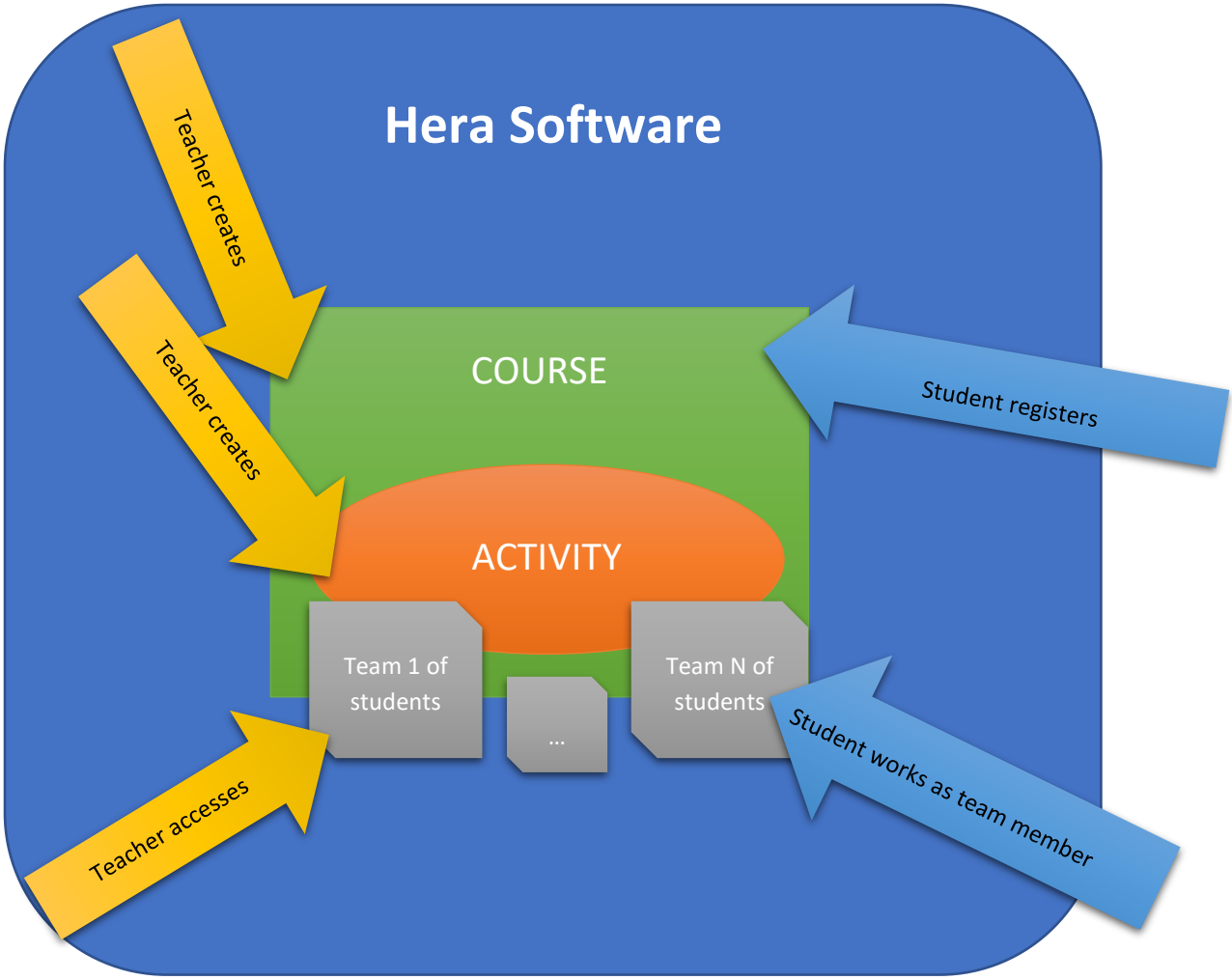

Figure 1: Students and Teachers actions in the Hera software

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The atomic element in the course structure is called a **scenario**. A scenario contains a map of a certain city and a definition of a related challenge to be tackled by a team of players. Each team can consist of 1 to 4 students, each of them playing a different a distinct role. Each of the roles has a distinct set of objectives to reach. Each of the defined roles can access to specific tools, which might or might not be available to the other roles. For example, a student playing the role of a city's public work manager might be able to construct some roads, a capacity a student playing the city's treasurer might not have.

Figure 2: The teacher's workflow

Scenarios are created by teachers and can be made public to offer fellow teachers examples of interesting courses. Any public course can be duplicated and then customized and used by any teacher who desires to do so, fostering the development of a community of content creators around Hera. Once a scenario has been created or duplicated by a teacher, it is available in their private scenario folder. Teacher can then create a course (with a starting and an ending date) and slot inside the course any scenario they see fit. Only one scenario can be studied in a certain course, working with several scenarios requires to create several courses. The teacher will associate a unique code (auto-generated for them by the system) to their course and will distribute this code to the students they want to see working on that course. The choice of letting the students create their own group is left to the teachers, who can for example create one course for 50 students (up to the students to organize and populate the teams) or constrain students to work in teams they designed themselves (in that case one course will be created for each of the teams).

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Figure 3: The student's workflow

Once a student starts Hera, they can check their existing course or enroll into a new by entering a new code. Selecting a certain course, they can see what the activity is about, select a role, communicate with their teammates through all the organizational tools and of course play the game itself.

The current manual aims to explain how to use Hera whether you are a teacher or a student and will show and explain all the facets of the software.

From now on, students will be referred to as students or players and teachers as teachers and content creators. The term user will be employed if the experience is the same for both students and teachers.

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CONTACT

If you have any question, please feel free to send an email to the lead developer at this email address, he will answer you promptly: olivier.heidmann@gmail.com.

ACKNOWLEDGEMENT

HERA is partly based on the eCity game from the eCity project, please see the Annex for more details.

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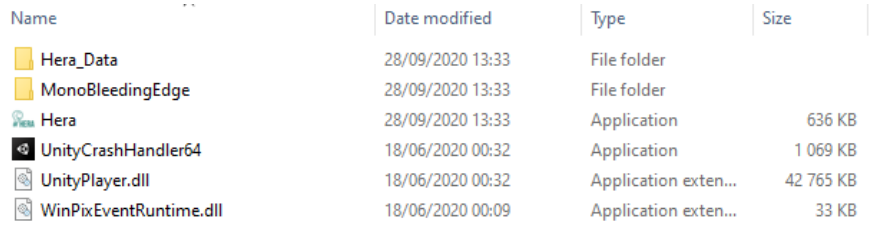
FIRST STEPS IN THE GAME

SETTING THINGS UP

The game is available at this URL: http://heraproject.eu/index.php/results/

The Hera software is compiled to run on computer using the Windows operating system in a 64b edition. The file downloaded at the above URL is an archive containing all the files necessary to play the game.



Name	Date modified	Type	Size
Hera_Data	28/09/2020 13:33	File folder	
MonoBleedingEdge	28/09/2020 13:33	File folder	
Hera	28/09/2020 13:33	Application	636 KB
UnityCrashHandler64	18/06/2020 00:32	Application	1 069 KB
UnityPlayer.dll	18/06/2020 00:32	Application exten...	42 765 KB
WinPixEventRuntime.dll	18/06/2020 00:09	Application exten...	33 KB

Figure 4: Hera archive content

Once the archive is downloaded, extract all the files and double click on the ***Hera.exe*** file to start the game.

MAIN MENU

You will be greeted with an animated main menu broadcasting an animation of a roundabout bird's eye tour in a city. Three actions are available at startup:

- select the game language by clicking
- open the authentication window to log in or register by clicking

- open the option menu. by clicking

Figure 5: Hera Main Menu

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By clicking on the flag, a ribbon of all the available languages will appear. Click on the flag related to the desired language to make the interface switch languages. This choice will be valid throughout the game.

Figure 6: The language ribbon

Figure 7: The authenticate button in Greek

Clicking on the three parallel lines on the bottom right side triggers the opening of the option menu.

Once the option menu is open, the three lines have transformed into a cross that you can click to close the menu.

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The option menu is available throughout the entire Hera software experience and dynamically displays content adapted to the screen currently displayed.

Figure 8: The option menu

The option menu offers a host of parameters to modify, as described in details below.

ACTION BUTTONS

Those buttons allow the user to perform a decisive in-game action, such as leaving the game or saving. Which button exactly is displayed depends on which screen the user is seeing.

- Log Out allows the user to log out from the account they have logged in with

- Exit game closes the game altogether

- Tools allows the user to display the communication and organizational tools

- Save scenarios allows the user to save the scenario they are currently working on

- Save and exit saves the scenario and exits

- Exit editor closes the scenario editor and goes back to the main menu

SOUND MANAGEMENT

Three radial sliders are available for the user to customize their sound experience in the game.

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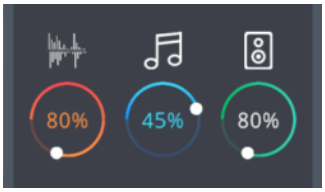
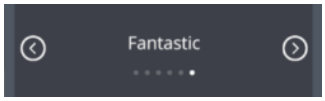


Figure 9: Sound management

The first slider manages all the sound effects volume, the second one the music volume, and the last one the overall sound volume. The sound volume can be set anywhere between 0 and 100%.

GRAPHICAL QUALITY MANAGEMENT

The user can influence the overall quality of the game graphics by interacting with the following selector:



Six different values are available for the graphical quality, ranging from Very Low to Fantastic. If you have issues with the game playing slowly, try to lower the overall graphical quality.

In order to help the user check how well the game is running, a FPS (frame per seconds) counter can be displayed by clicking on the

button. If the FPS counter is displayed, it will appear as three numbers on top of each other on the top right corner of the screen.

The top number indicates the highest number of FPS displayed. This number is capped at 100 maximum no matter what, in order not to tax too much computers. The middle number indicates the average number of FPS, and the bottom one indicates the lowest amount of FPS displayed. All numbers are colored according to their value, following this convention:

- Green indicates FPS above 60
- Blue indicates FPS between 45 and 60
- Yellow indicates FPS between 30 and 45
- Orange indicates FPS between 15 and 30
- Red indicates FPS below 15

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CREDITS

The Credit button Credits displays the Erasmus+ disclaimer, the partners involved in the project and of all the participating individuals.

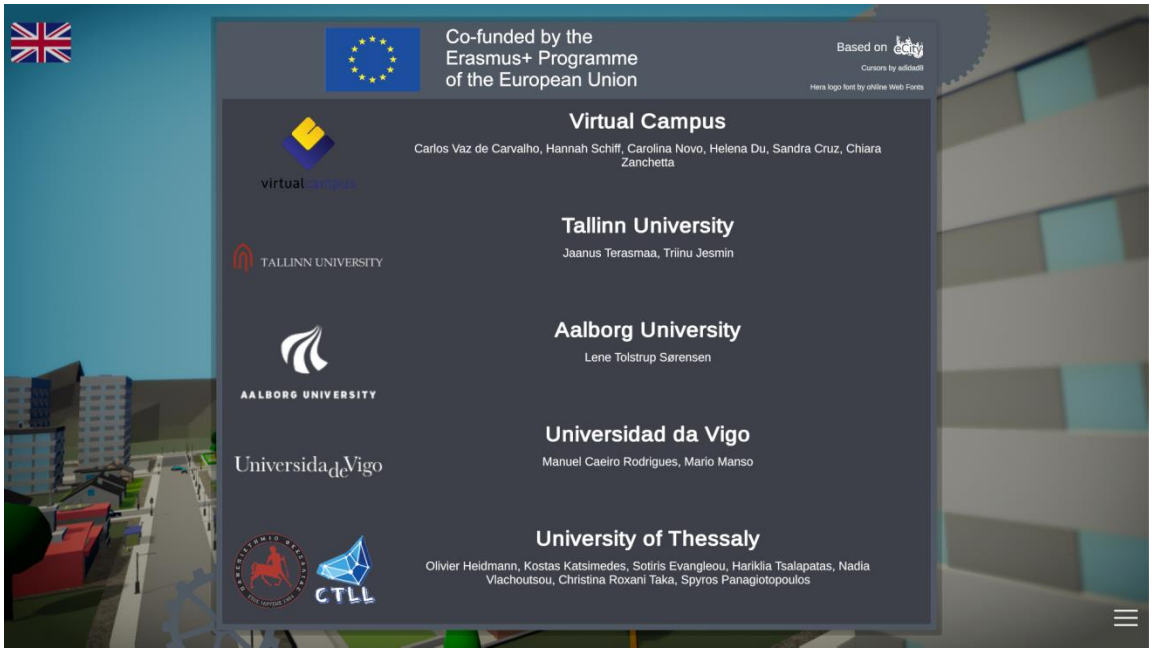

Figure 10: Hera credits screen

LOGGING IN

Clicking on the Authenticate button brings up the Authentication window.

If the user already has a username and password, they will enter them and click on the sign in button to be authentified.

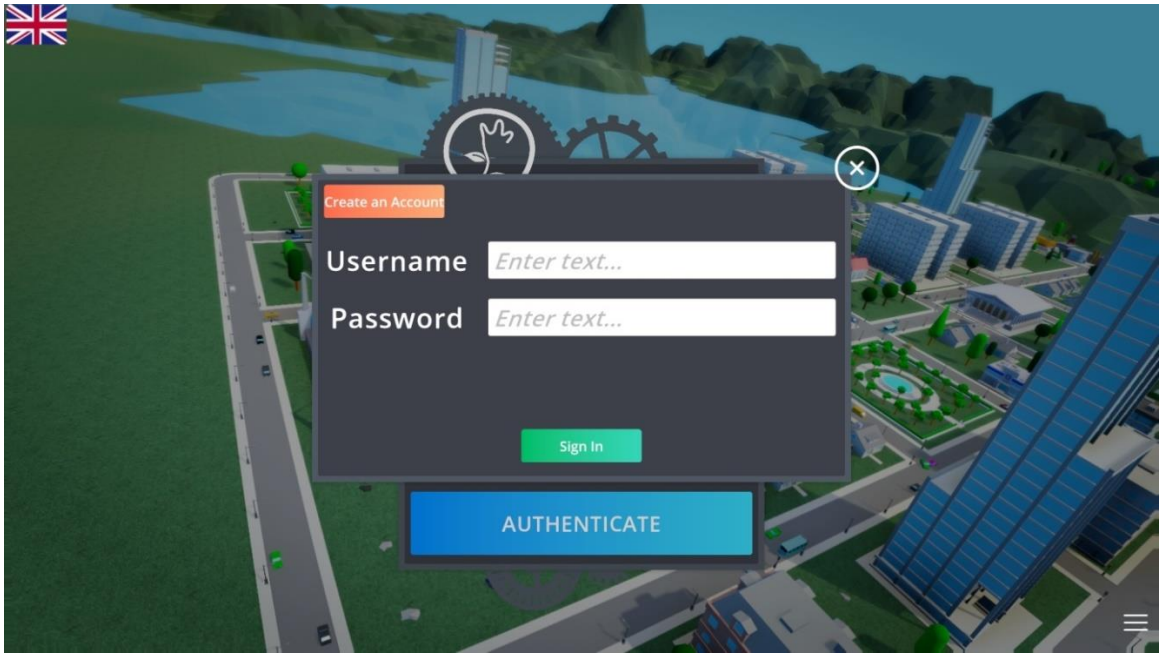

Figure 11: Authentication window

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If it's the first time the user is using the Hera software, they need to create an account.

Figure 12: Account creation

When creating an account, the user needs to enter a Username, a Password and their First and Last Name. No email address will be asked in order to minimize (down to zero) the number of personal data kept on our servers. If the user is a teacher, they can enter a special code to get access to the teacher side of the Hera platform. Contact us to get the teacher code.

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THE TEACHER EXPERIENCE

Once you are connected as a teacher a new window appears showing you the current courses you have in your name.

Three tabs are displayed in the course window:

- Courses
- Scenarios
- Public scenarios

COURSES

Each of the boxes displayed in the course tab corresponds to one of your courses. You can see at a glance the name of the course, a description, the language of the course and some meta-tags.

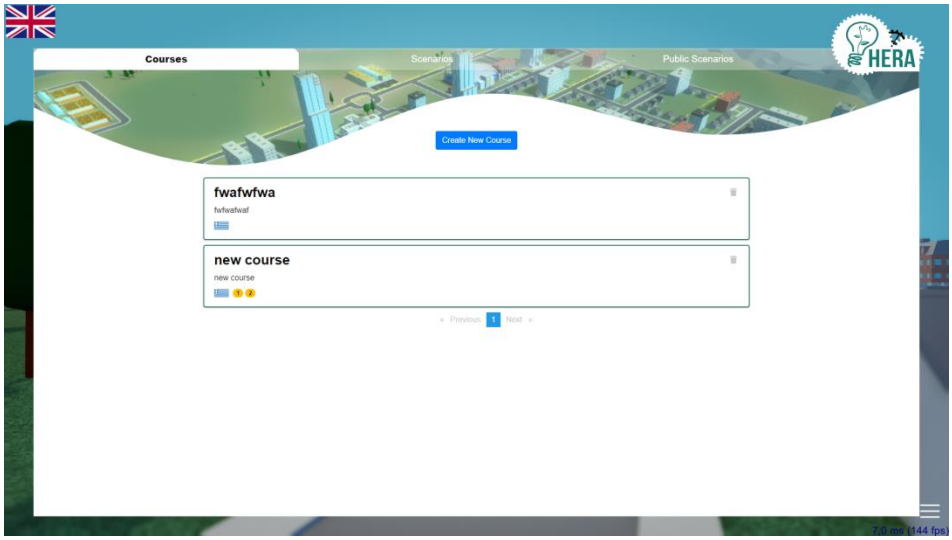

Figure 13: The Course tab

To enter into a course and see it in details, you need to click on the course box.

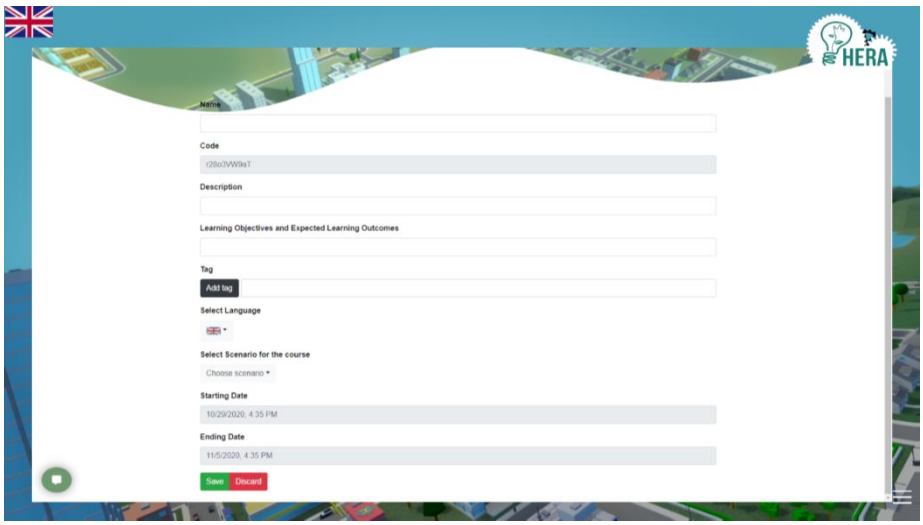

Figure 14: Creating a course

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When you click on the blue button Create a New Course, a new window appears where you need to insert some information about this new course. First you need to give a name and a description, along with the learning objectives and expected pedagogic outcomes. A code for the course is automatically and randomly generated. Afterwards you can insert some meta-tags and select the course's language. You need to select the name of the scenario you want to slot in this course from a selection box. All the scenarios that appear in the scenario tab will appear in this box. You finally need to select a start and an ending date for your course.

Be advised that the city game described in the scenario will start at the starting date and stop at the ending date. So if your course lasts for 10 days and the scenario on which it is based is described as being 240 days long, the students will experience the passing of 24 game days for each day in real life, one game day per real life hour. The game calculates everything automatically based on your course's starting and ending dates and the duration of the scenario. The time in the game will continue to flow whether the students are playing it or not. This means that if we take the preceding example, a team of student playing the game for the first time on the very last day of the course will start the scenario at day 216 (on 240) already.

SCENARIOS

The scenario tab shows you all of the scenarios that are in your name. Any scenario displayed here can be immediately slotted into a new course that you would want to create. Scenarios can be edited, cloned or deleted.

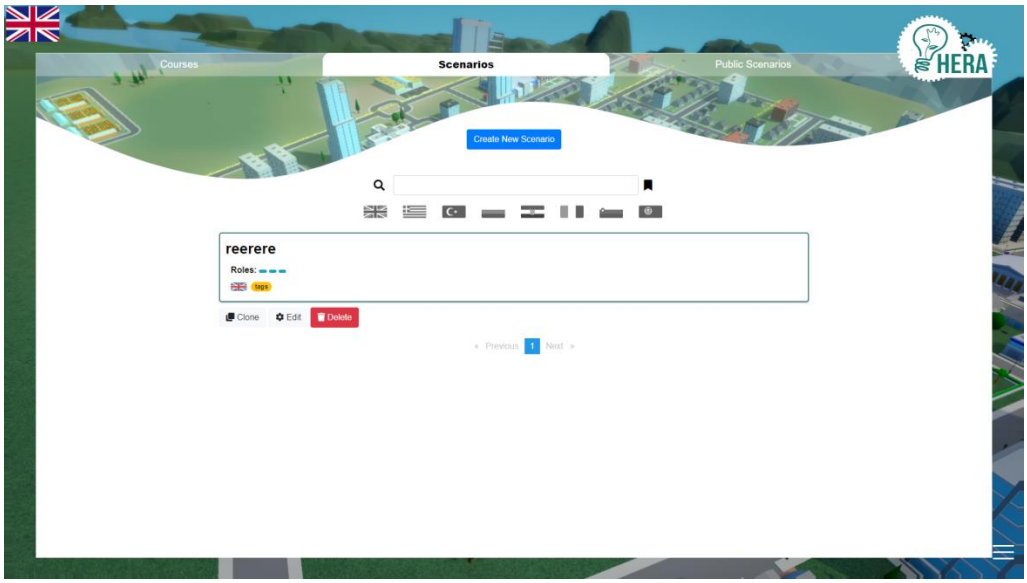

Figure 15: The Scenario tab

You can see at a glance the name of the scenario, a description, the number of roles available, the language and some meta-tags.

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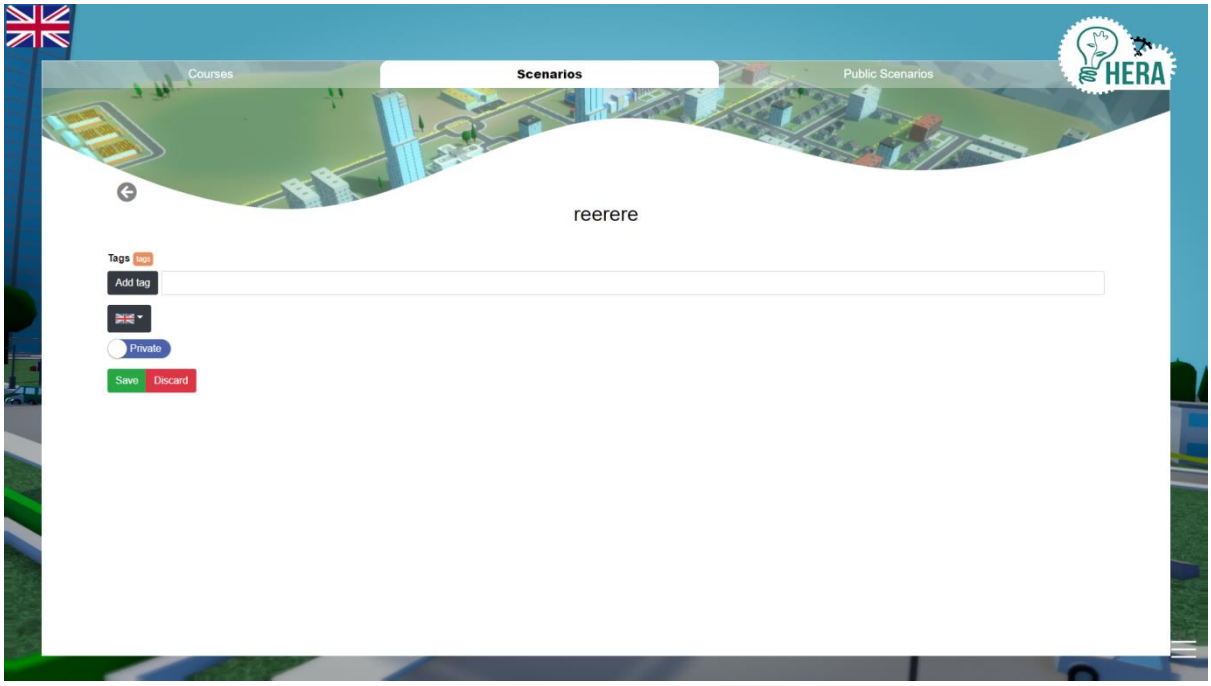

Figure 16: Editing a scenario

When editing a scenario, you can add meta-tags, change the scenario language and select if it's a scenario that will appear only to you (private) or be shared with all users (public). All the other changes to a scenario (name, description, map, roles, etc…) can be done by clicking on the scenario box in the scenario tab. This will start the game in scenario mode.

PUBLIC SCENARIOS

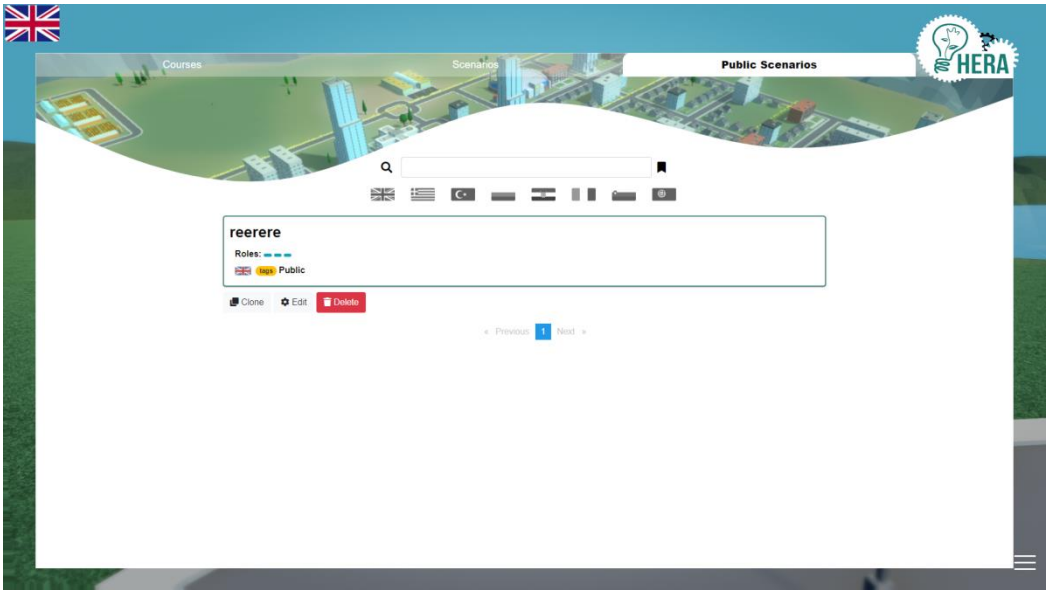

Figure 17: The Public Scenarios tab

The public scenario tab shows you all of the scenarios that are available to all the teachers and content creators of the Hera platform. Any scenario displayed needs to be duplicated (Clone button) before you can be able to slot it into a new course that you would want to create. Scenarios can be edited or deleted only if you are the scenario author. Any public scenario that has been cloned will appear in the Scenario tab.

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You can see at a glance the name of the scenario, a description, the number of roles available, the language and some meta-tags.

INSIDE A COURSE

When clicking on a course, you enter in a new window showing the details of the course.

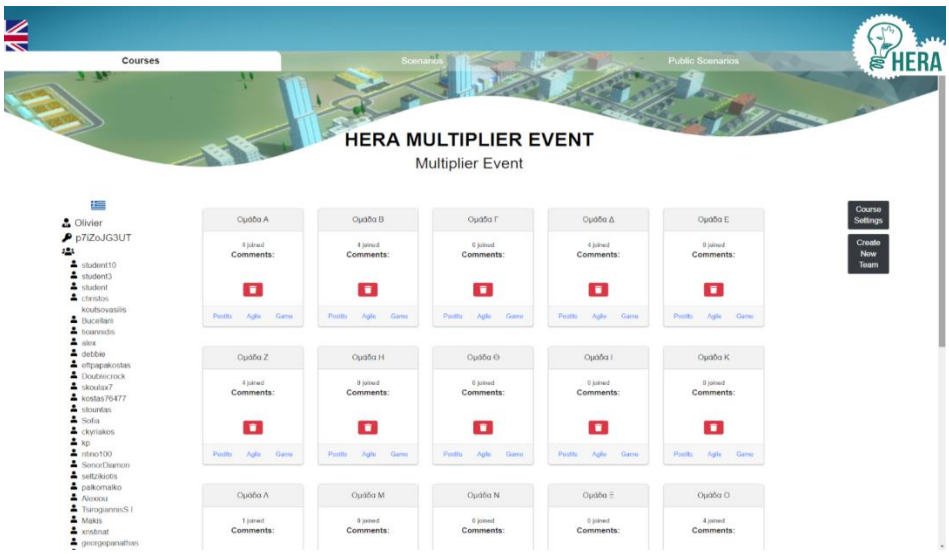
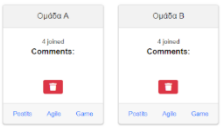


Figure 18: Course details

The left hand side of the screen shows the language of the course and the associated meta-tags. The name of the teacher sevangelou appears, along with the course code SotCourse . Finally at the bottom a list of students having enrolled in the course is displayed .



Each of the grey boxes on the screen corresponds to one team of players. You as a teacher are responsible for creating those Teams. The students will first enroll to the course using the course code that you are giving them and will then enroll into any of the available teams, at their liking.

This system allows both for the students and for the teacher to select their teams. If the teacher wants to keep total control and name specific people to specific teams, they simply have to create as many courses as there are team, but with only one team per course. They then give to each of the members of the teams that they selected one of the course codes. On the contrary, if a teacher wants to let the students completely free of choosing their teams, they simply have to create one single course with as many teams as needed inside. Then they give the course code to the students who will populate the teams at their liking.

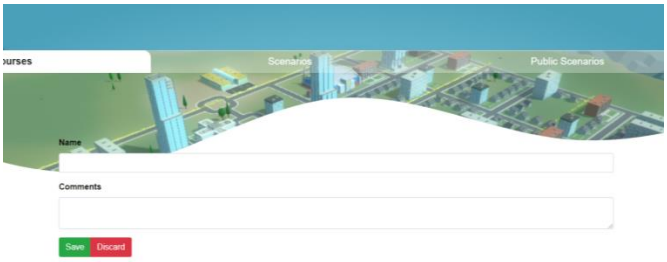


Figure 19: Creating a team

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The Postits, Agile buttons in the grey boxes allow the teacher to access to the communication and organization tools available to that particular team of students. We detail those tools in the annex of this manual. The Game button allows the teacher to enter into the game and see what their students are doing. The red and white trashcan icon allows the teacher to delete a created team.

The black buttons on the right hand side allow to check the course settings and to create new teams. Checking the course settings allows seeing the name, description, learning objectives, scenario used, meta-tags and language of the course.

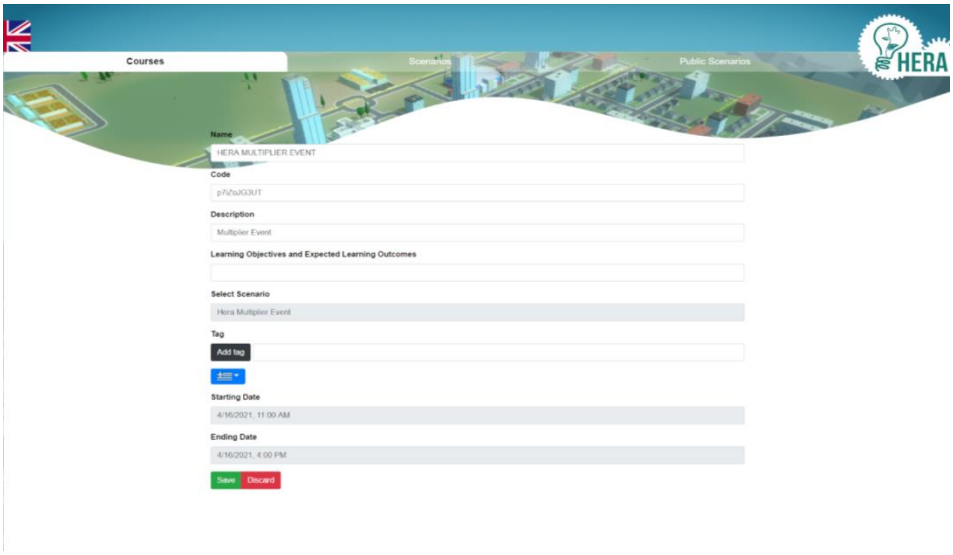

Figure 20: Course edition

Best practice: Once you have created a course as a teacher, your first move should be to create as many teams as you see fit. It's only afterwards that your course will be ready to use for your students.

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CREATING A SCENARIO

When as a teacher you click on the scenario box of a scenario, you access to the scenario settings inside the game. If you create a new scenario you'll first be prompted with a screen asking you to define the size of the map used in the scenario. Three size are available,: medium, large, huge.

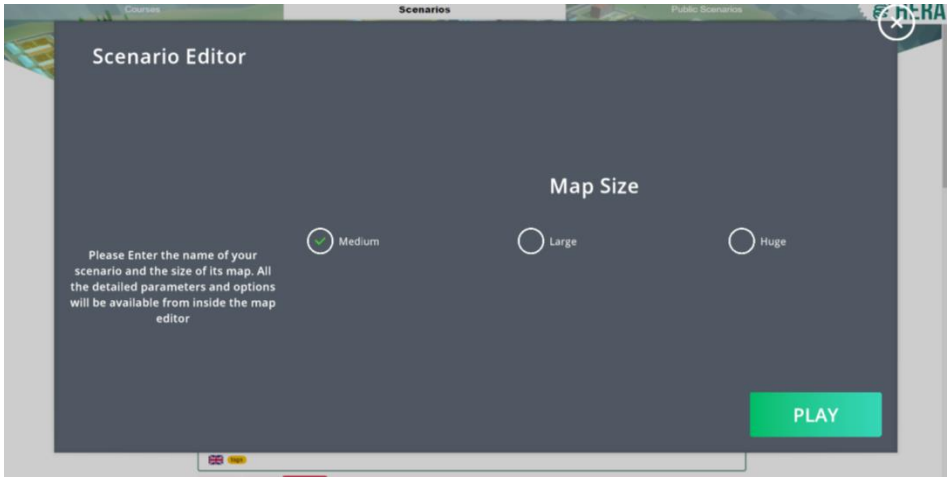

Figure 21: Selecting the size of the map

The interface of the game is the shown below and will be described later in this manual.

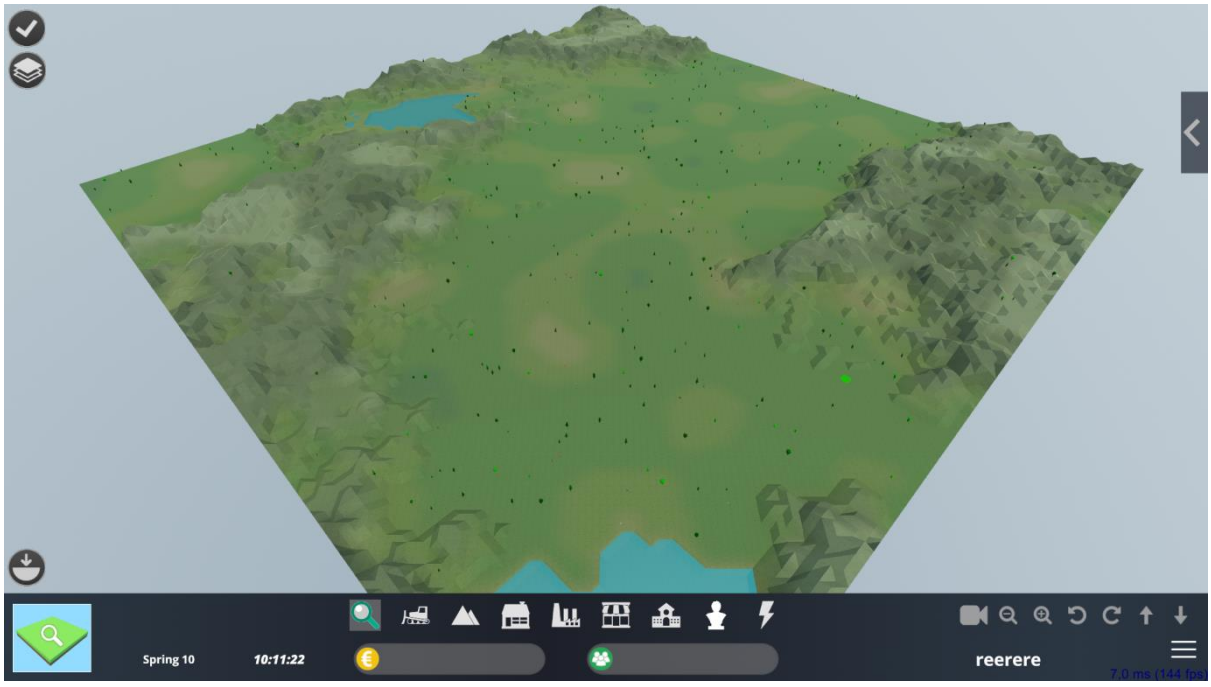

Figure 22: Game interface

Clicking on the arrow button on the right makes the scenario editor window pop open. Clicking on the same button will make it disappear.

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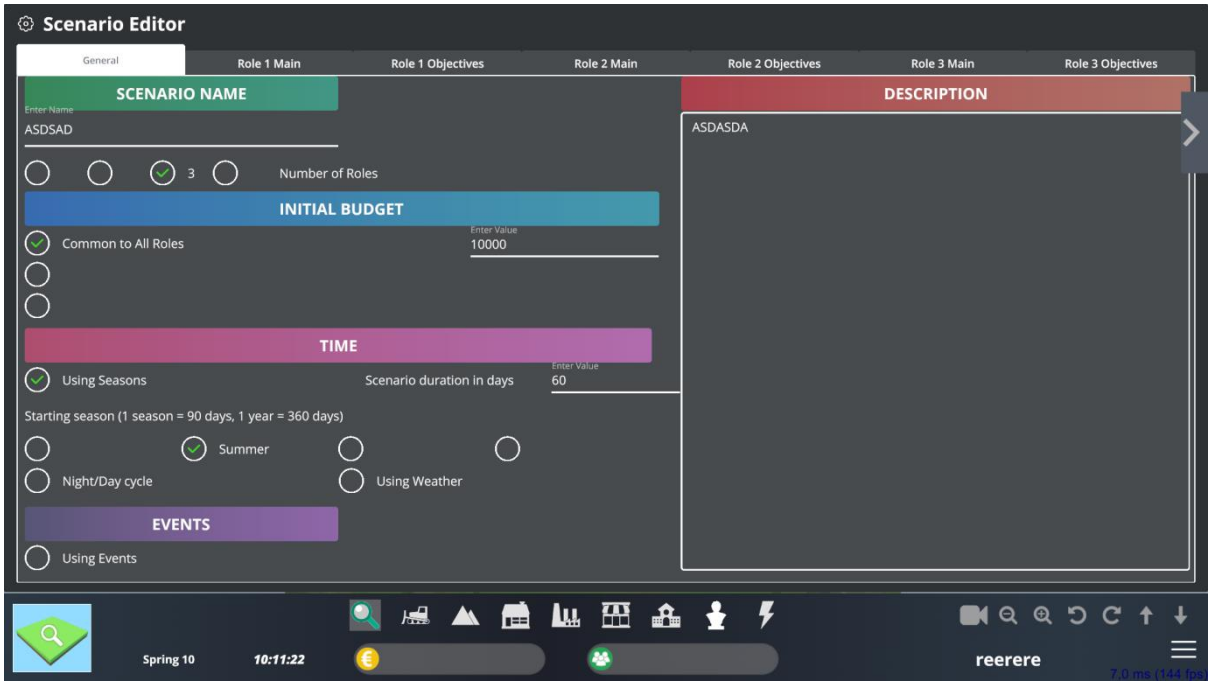

Figure 23: Scenario Editor

The scenario editor is divided into several tabs, each containing:

- The general information about the scenario
- The general information about a role (from 1 up to 4)
- The specific objectives information about a role (form 1 up to 4)

Given there can be anywhere between 1 and 4 roles in a given scenario, this mean there will be between 3 (1+1x2) and 9 (1+4x2) tabs in the scenario editor window.

The general window allows the teacher or content creator to insert the following information about the scenario:

- The scenario name
- The scenario description
- How many roles does the scenario have
- How is the city budget managed in this scenario? It can either be common to all (and its value need to be specified here) or it can be specific per role but then it can either be the same amount for all (and its value need to be specified here) or a different amount of each (and its value need to be specified in the role tab).
- How long in game days is the scenario lasting? According to the subject at hand, the scenario duration can vary between 1 day and as many as needed.
- Is the game using a season system or are all days exactly the same? If a season system is used, then which season are we starting from? Each month of the in game year will last 30 in game days exactly. This means there's only 360 days in a year in game.
- Is the game using a day and night cycle? If not, the days are always lit by the sun no matter the time, and if the night/day system is in use, the sun will rise and fall during the days, casting shadows and leaving the night dark, lit only by the moon and stars. The city will react accordingly, with the lights being turned on at night for houses, streets and cars.

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- Is the game using the weather system? If not, all days will be always bright and sunny. If not, a complex weather system with rain, storm, thunder, snow, will be set in game. The weather will vary according to the season.
- Is the game using events? Events are incidents that can happen to the city in game. It could be a flood, an incident at the nuclear power plant or others.

Once the general information has been filled by the teacher or content creator, each of the roles need to be defined and explained.

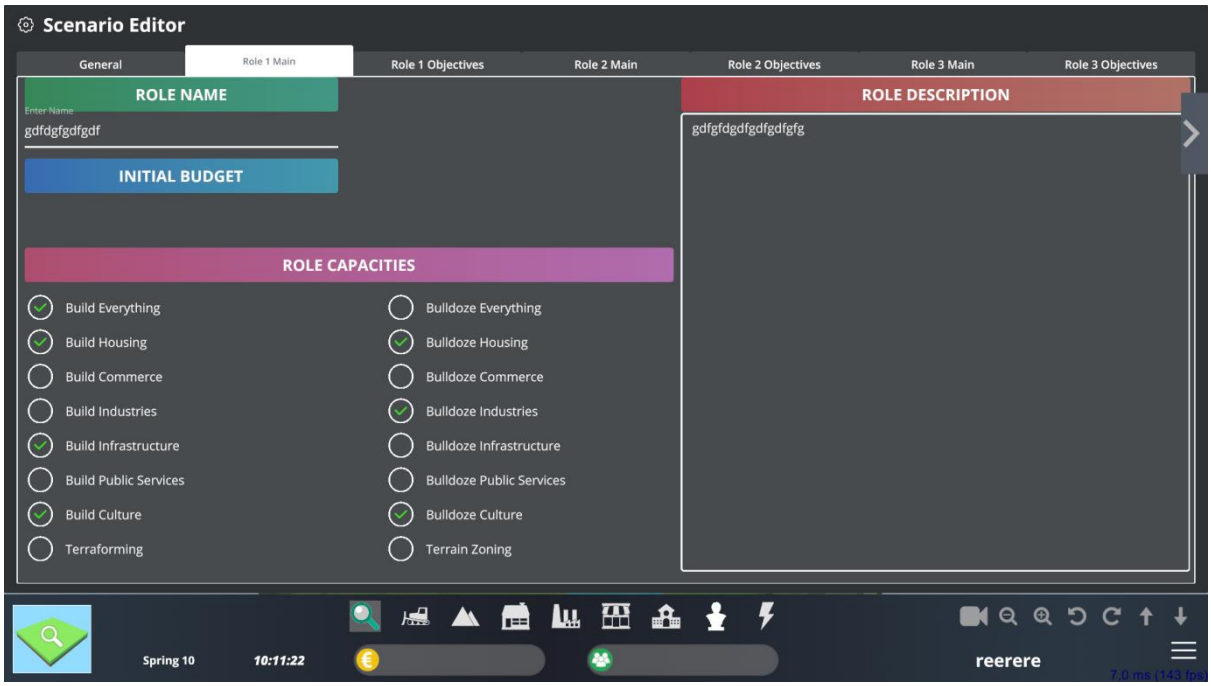

Figure 24: Scenario Editor Role details

The first tab of a role contains the following information:

- The role name
- The role description
- The specific role budget if it was not defined as common to all
- The capacities the student playing the role can have. Typically in a city builder game the player is omnipotent and can do everything. We wanted to introduce limitations to the capacities of players so they would need to collaborate to succeed.

The capacities of a role are the following:

- Being able to build all the available buildings in game
- Being able to destroy any of the buildings on the map
- Being able to build housing buildings
- Being able to destroy housing buildings
- Being able to build commercial buildings
- Being able to destroy commercial buildings
- Being able to build industrial buildings
- Being able to destroy industrial buildings
- Being able to build public services buildings
- Being able to destroy public services buildings

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- Being able to build cultural buildings
- Being able to destroy cultural buildings
- Being able to do terraforming of the map, leveling mountains or creating them
- Being able to define specific zones on the map, especially useful for terraforming

Finally, the teacher/content creator will need to define the objectives for the role to fulfill at the end of the scenario. Typically, the success of each player and of the global team can be evaluated through how many pre-defined objectives they managed to reach. If a player reached all its goal but at the detriments of all the other in the team, they will have failed in the global framework of the teamwork.

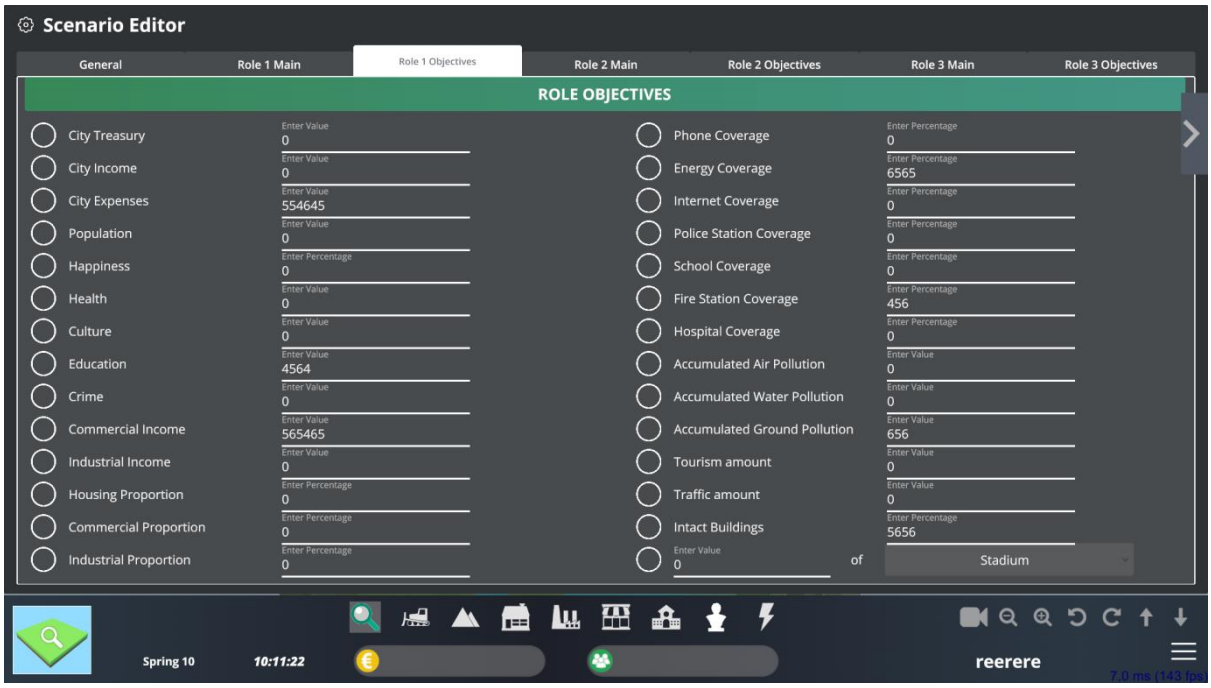

Figure 25: Scenario Editor Role objectives

The objectives that can be defined for the players' role are the following:

- Make sure the city treasury contains a certain amount of money
- Make sure the city gets a certain amount of income by taxes
- Make sure the city expenses are below a certain threshold
- Make sure the population of the city reaches a certain number
- Make sure the population's happiness rises to a certain percentage
- Make sure the overall health of the population reaches a certain number
- Make sure the cultural level of the population reaches a certain number
- Make sure the education level of the population reaches a certain number
- Make sure the crime level stays below a certain threshold
- Make sure the city tax income from commerce reaches a certain amount
- Make sure the city tax income from industries reaches a certain amount
- Make sure the number of houses reaches a certain target percentage compared to the total buildings in the city
- Make sure the amount of commerce reaches a certain target percentage compared to the total buildings in the city
- Make sure the number of industries reaches a certain target percentage compared to the total buildings in the city

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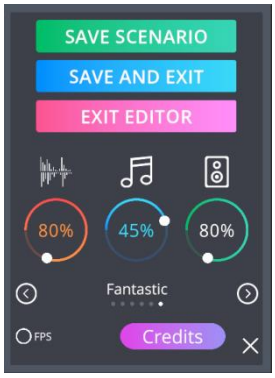
- Make sure a certain target percentage of the city has access to phone
- Make sure a certain target percentage of the city has access to energy
- Make sure a certain target percentage of the city has access to Internet
- Make sure a certain target percentage of the city is covered by the reach of police stations
- Make sure a certain target percentage of the city is covered by the reach of schools
- Make sure a certain target percentage of the city is covered by the reach of fire stations
- Make sure a certain target percentage of the city is covered by the reach of hospitals
- Make sure air pollution is not soaring above a certain target threshold
- Make sure ground pollution is not soaring above a certain target threshold
- Make sure water pollution is not soaring above a certain target threshold
- Make sure there is a certain target amount of tourism in town
- Make sure there is no more than a certain threshold value of traffic anywhere in town
- Make sure a certain target percentage of buildings are still intact
- Make sure there is a certain amount of a specific building that is present in the city

Once all those information have been set by the teacher/content creator, they can begin building the town in the game interface to perfectly suit the scenario.



Once both the town and all the data are ready, the teacher/content creator can save the scenario and exit the game creation tool by using the main menu.

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THE STUDENT EXPERIENCE

Students will start the game and log in the same way teachers do and as it was described above.

Once a student is connected, they can access the courses they are registered to. Adding a new course code in the box at the top of the screen and clicking the Join button allows for joining additional courses.

At a glance, the students can see for each course their name, language and description. They can unsubscribe to any course they want at any time by clicking the button in the corresponding course box.

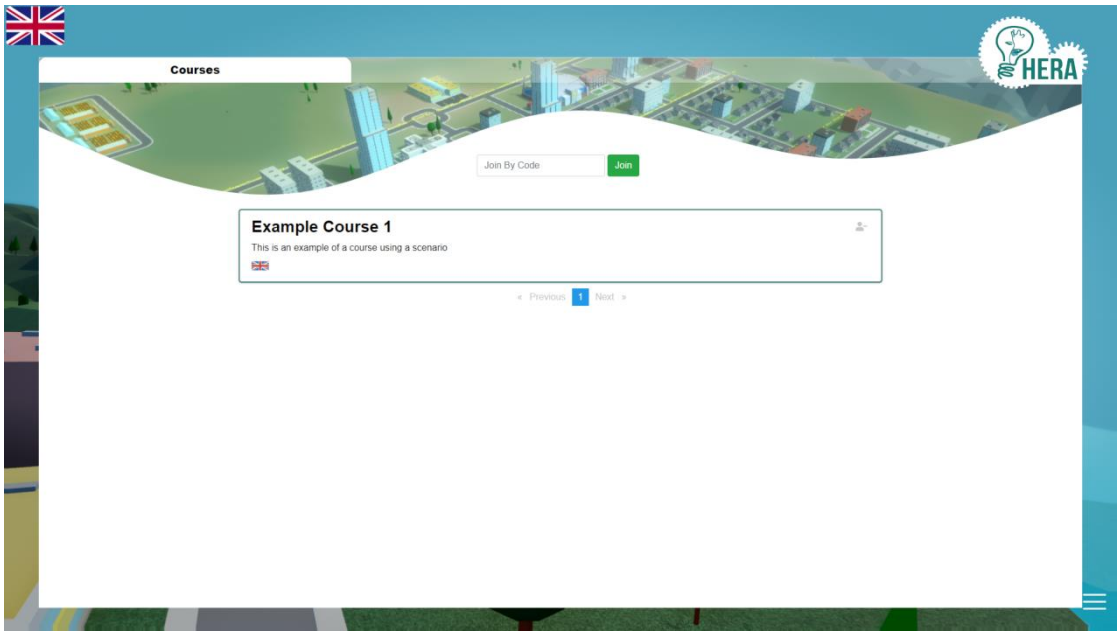

Figure 26: The students' course list

Once a student has a entered a course, they are greeted by the screen shown in Figure 26.

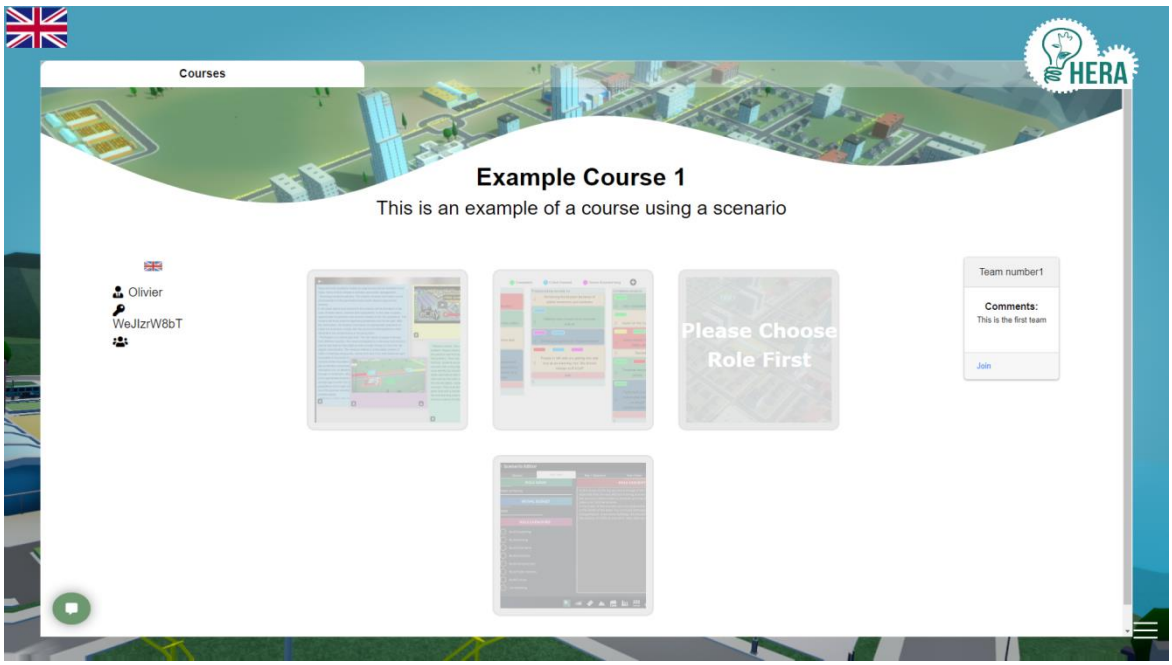

Figure 27: Inside a course

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This screen has been partly described above in the teacher's interface, so let's focus on the differences, namely the images/icons in the middle and the team list on the right hand side.

The button on the bottom right allows the player to display the chat box, in which they can have a live dialog with their teammates.

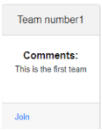
There are 4 images in the middle, each corresponding to one action.

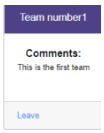
Clicking on starts the whiteboard interface (described in the annex) where students can communicate together by posting post-it notes on a virtual board. The notes can contain text, photos or videos.

Clicking on starts the agile tool (described in the annex) where students can plan and organize their work together.

Clicking on starts the city management game.

Clicking on allows the student to choose their role in the team, as per described in the scenario. The player cannot start the game or access any organization tool before having chosen a role.





The boxes on the right of the screen represent the teams created by the teacher. The player can join a team by clicking the Join button on any team and leave them by clicking the Leave button that replaces the Join button once a team is joined.

If the player wants to go back to the list of courses, they simply have to click on the course tab on top of the screen.

The interface for choosing a role is displayed in Figure 28. The different available roles are shown on the screen and the player can pick one they like. Naturally they can only pick a role which is still available. They can also change role at any point in time, by selecting another free role (or by selecting the No Role option) first and then picking their favorite role.

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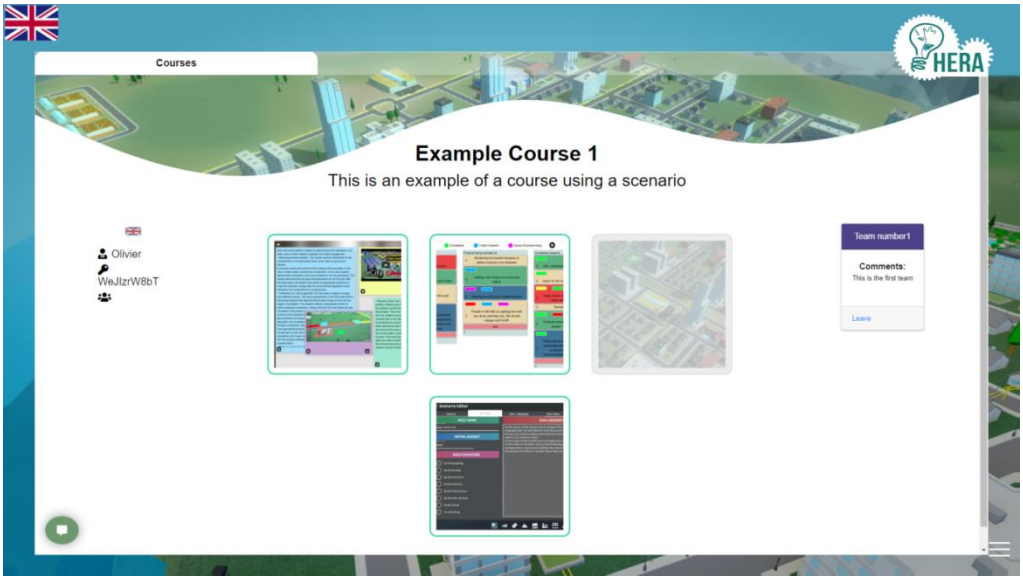

Figure 28: The player has joined the team

When picking a role, the player can select any of the displayed roles. If the button Choose this role is greyed out, this means the role has already been taken and you cannot choose it. If you want to switch role with another member of your team, please first select No Role, let your team mate pick up the role you just abandoned and then select the role you wish.

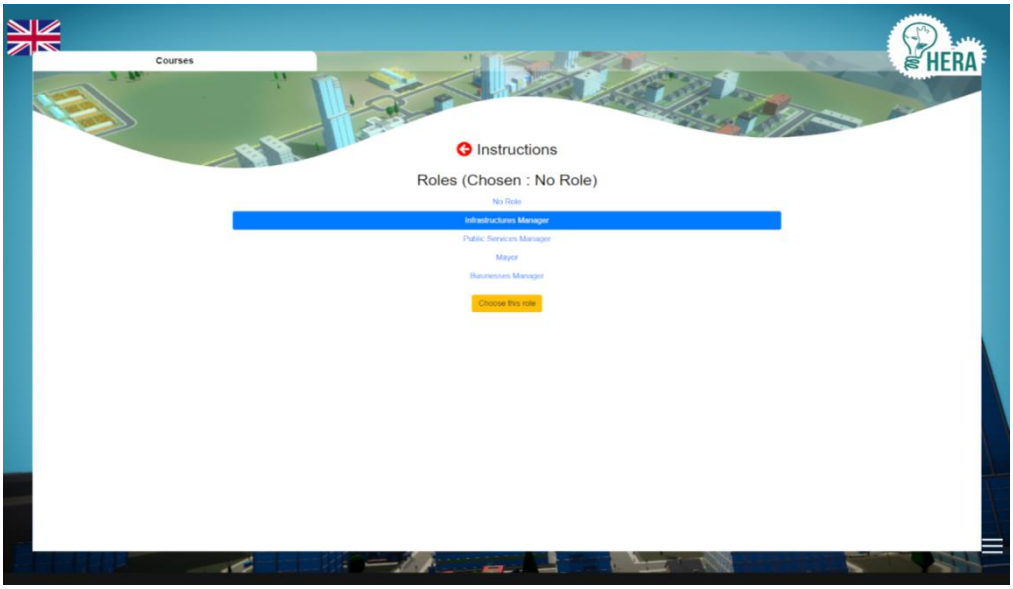

Figure 29: The player has chosen a role

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THE GAME INTERFACE

The in game interface (shown figure below) allows the player to get many details about the city and its environment and interact with it.

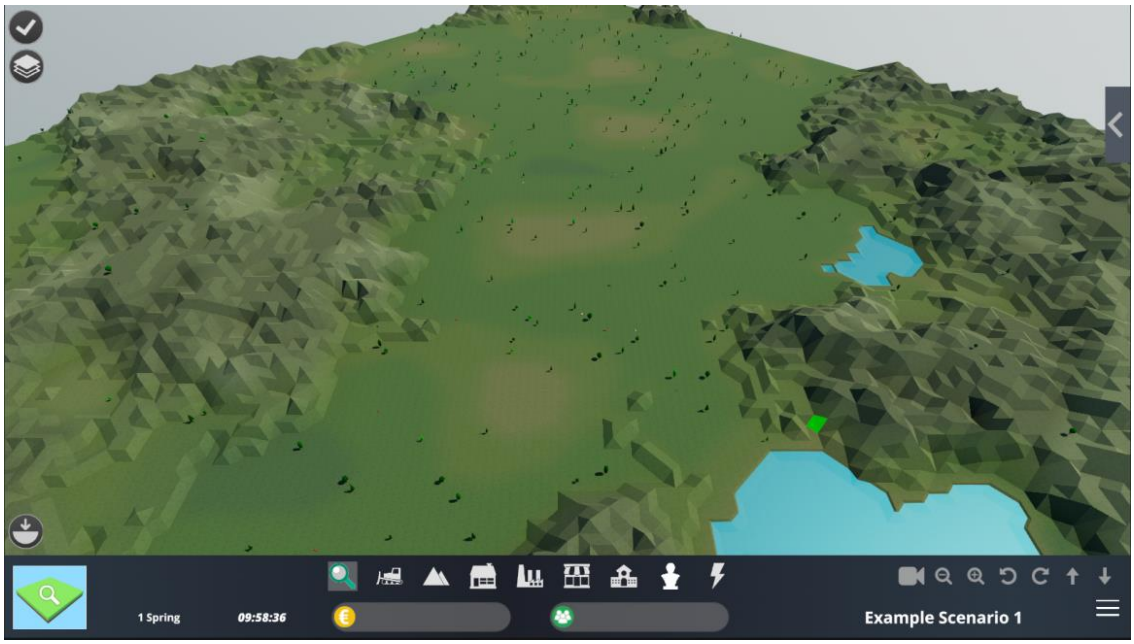

Figure 30: In game interface

The interface is divided in two main zones: the bottom bar and the left-hand buttons.

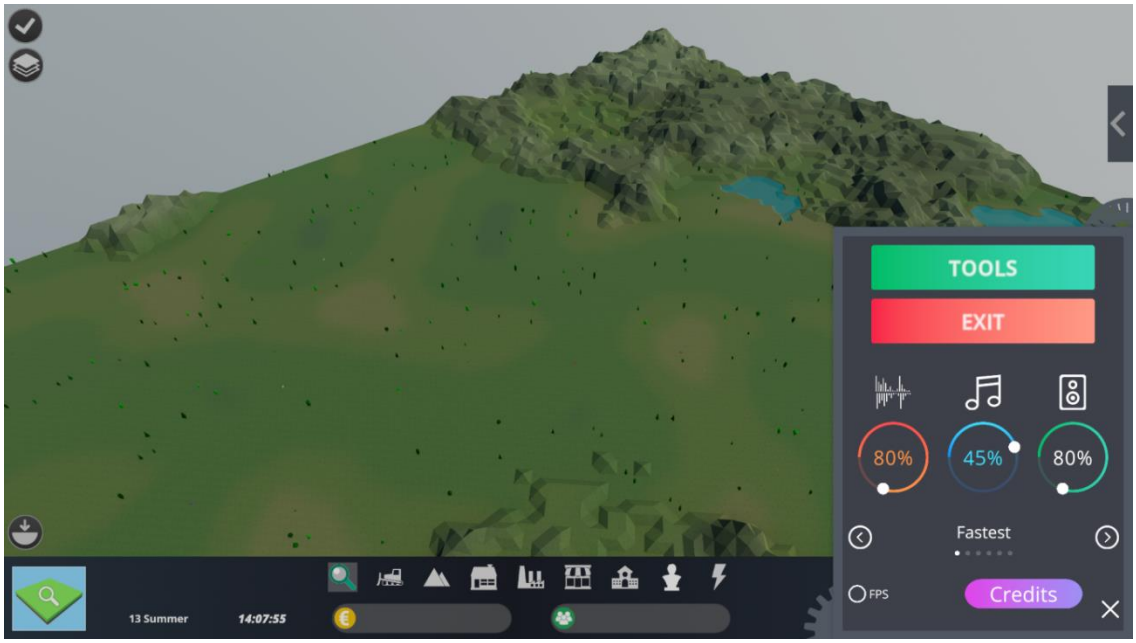

Figure 31: Option menu

At any moment the player can leave the game and go back to the Amin menu by clicking on the exit button. The Tools button will make the browser appear, where they are able to access the organization tools.

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The entire game interface is using tooltips, so the players should let their mouse hover objects for a second to get additional information about that object's role.

THE LEFT HAND BUTTONS

There are 3 buttons available to the players:

Displays the different information layers available to the players.

Displays the underground of the map.

Displays the objectives for all the roles and how close they are from completion.

INFORMATION LAYERS

The information layers display the map by showcasing a special type of information, shown as a layer on top of the current map. This helps the user to better understand the situation quickly by displaying data which might not be easily available otherwise.

To illustrate the different color codes used by the layer system, an explanative legend is displayed on the bottom right of the screen.

Figure 32 shows a city displaying its energy layer. The player can immediately see what zones are using low voltage energy (yellow on the map), what zones are using medium voltage energy (orange on the map) and where the power factory is (red on the map corresponding to high voltage energy).

Figure 32: Showing the energy layer

Figure 33 shows the same city seen through the pollution layer, and the player can immediately see that some industries and power plants are causing pollution issues in the town.

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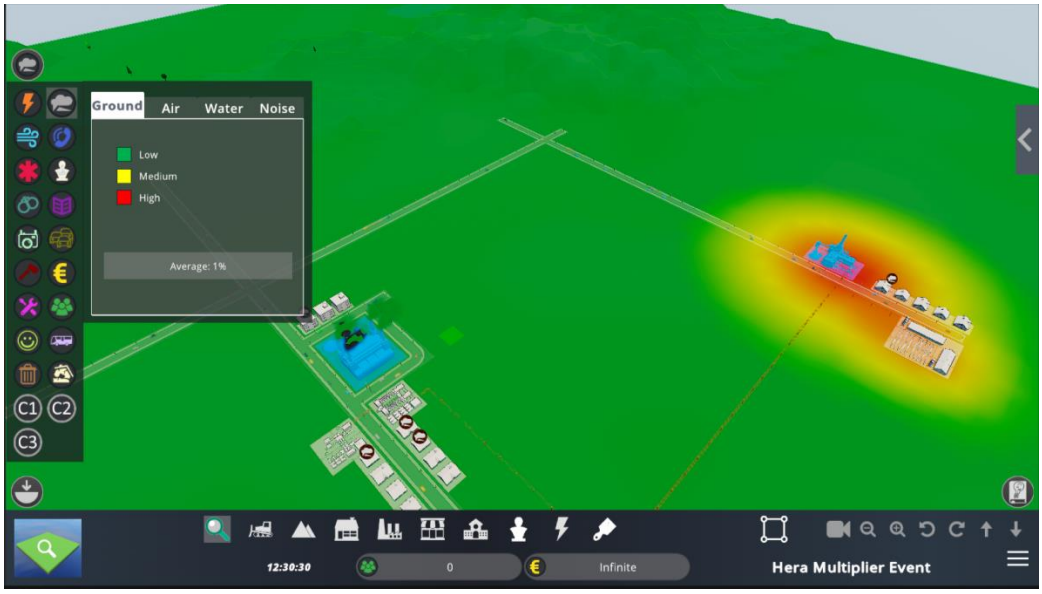

Figure 33: Showing the pollution layer

There are a total of 18 + 3 different layers available to the player by clicking on the button.

- displays the revenue levels in the city
- displays the levels of culture in the city
- displays the level of tourism in the city
- displays the wind levels on the map
- displays the telecommunication services coverage on the map
- displays the police coverage and crime prevalence on the map
- displays the different types of pollutions on the map
- displays the level of education on the map
- displays maintenance costs on the map
- displays all information related to energy
- display the fire fighters coverage on the map
- displays the happiness levels of the population
- displays the health level on the map
- displays the public transportations coverage on the map
- displays the traffic levels on the map
- displays the garbage collection information on the map
- displays the level of integrity of all buildings on the map
- displays the population information on the map
- displays the first custom layer information on the map

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- C2 displays the second custom layer information on the map
- C3 displays the third custom layer information on the map

Most of the layers include sub-layers related to the theme of the layer. Each sub layer contains a legend explaining the color coding on the map. Figure 34 shows the crime layer, which also contains the police coverage and the resulting public safety level.

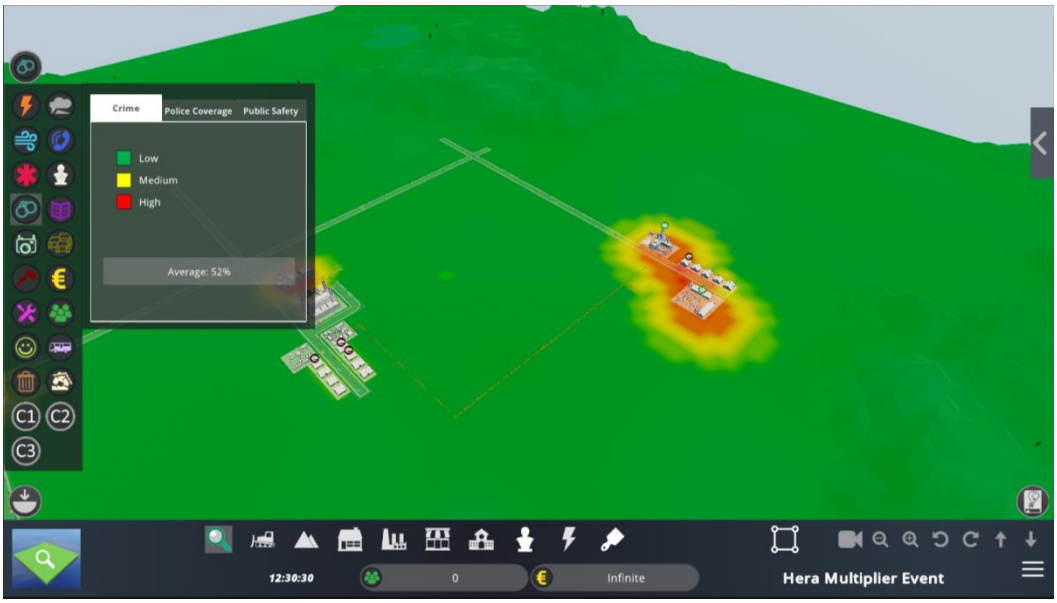

Figure 34: All the layers related to police and crime

When a zone is selected by clicking on its icon and can be de-selected by clicking again on its icon.

UNDERGROUND

Clicking on the button simply displays what is underneath the map, at the underground level.

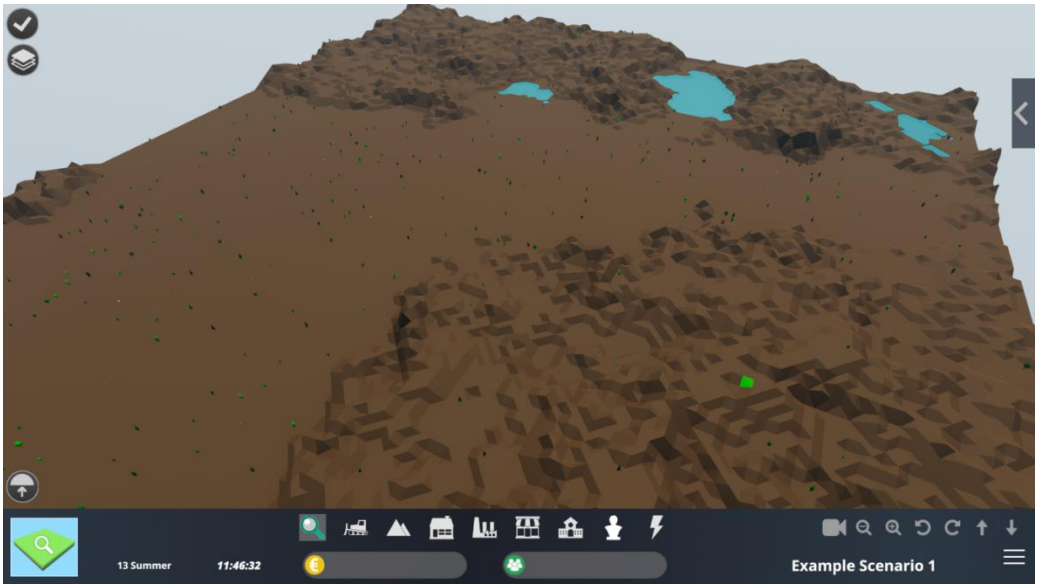

Figure 35: Underground

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CUSTOM LAYERS

When preparing their scenario the teacher or content creator can specify a certain amount of customized layers which will have various effects in the game. In order to do so, the teacher needs to click on the in the toolbar at the bottom of the screen. This prompts the display of the layer editor.

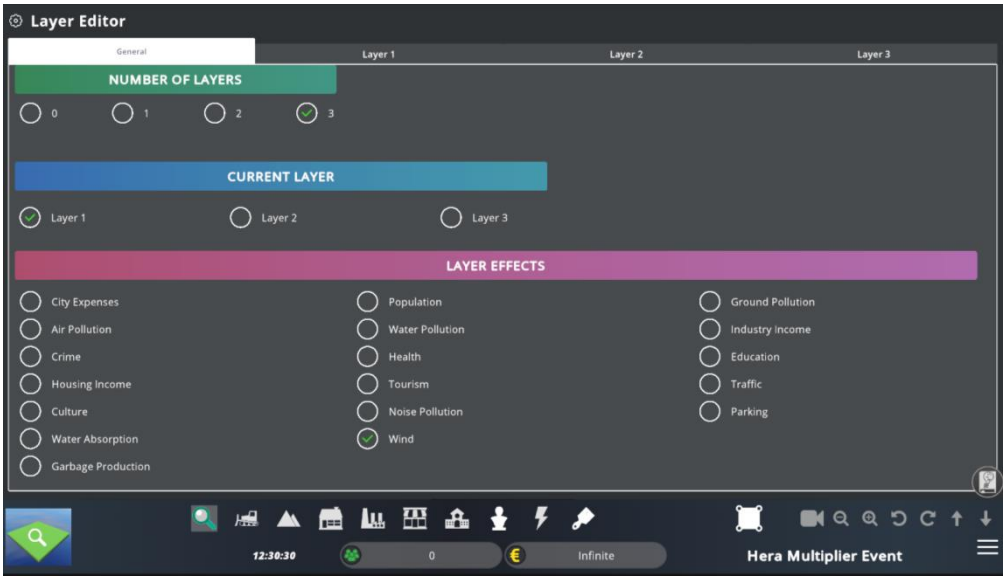

Figure 36: The Layer Editor

Up to 3 custom layers can be defined. Each of the layers is focusing on one only of the following effects:

- City Expenses
- Air Pollution
- Crime
- Housing Income
- Culture
- Water Absorption
- Garbage Production
- Population
- Water Pollution
- Health
- Tourism
- Noise Pollution
- Wind
- Ground Pollution
- Industry Income
- Education
- Traffic
- Parking

Inside a custom layer, up to 6 individual zones can be defined, each affecting the layer effect in a positive or negative way. Each zone can be named independently. Figure 37 shows that two different zones have been defined inside the third custom layer, affecting Commercial income. The first zone, named “Less Commercial revenue” will inflict a net -15 penalty for commercial revenue to each and every building built inside the zone. The second one, named “More Commercial Revenue” adds a bonus of +15 to each of the buildings in that

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zone. Each zone can be assigned any of the 6 predefined colors (blue, green, yellow, magenta, red, and turquoise).

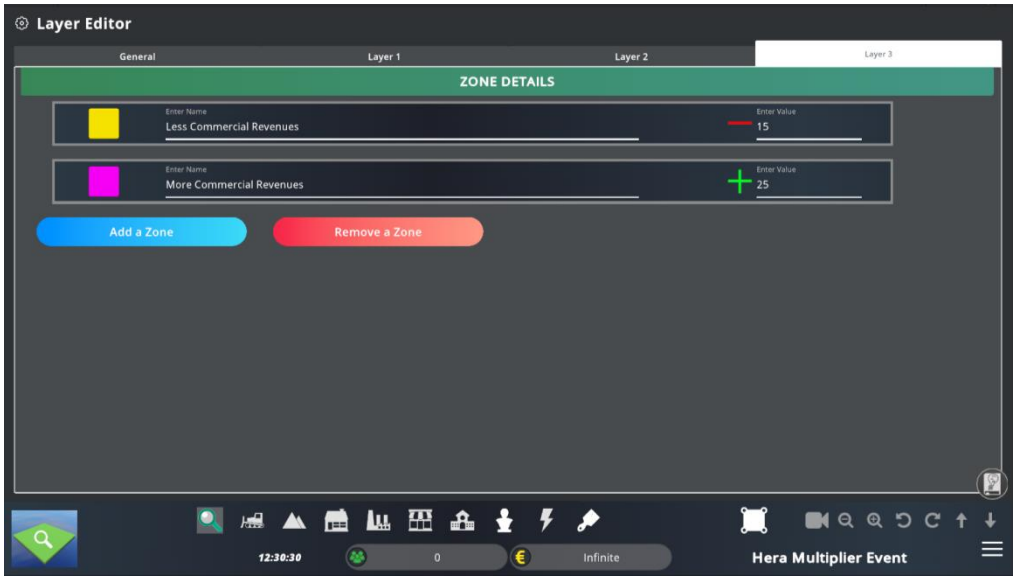

Figure 37: Zones defined inside a custom layer

The custom layer system is an extremely useful tool for content creators and teachers to simulate anything they wish in an easy fashion. For example, in order to simulate a very windy plain, the content creator only needs to define a custom layer affecting wind value, create a zone with a big bonus and then paint in on the map at the right place.

Click again on the Custom Layer's icon to close the Editor.

In order to paint the zones created, the teacher needs to click on the icon to reveal all the created layers and their zones. Click on one of the zone paint brushes to paint on the map in the right color

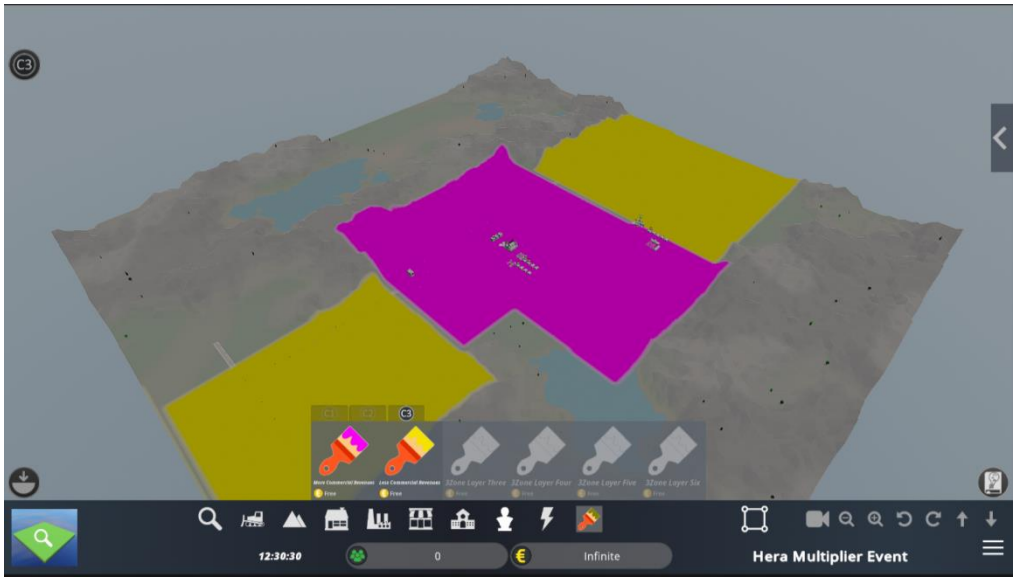

Figure 38: Painting custom zones on the map

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OBJECTIVES

By clicking on the objectives button, a player can see what objectives are assigned to each of the defined role and how close they are from being complete.

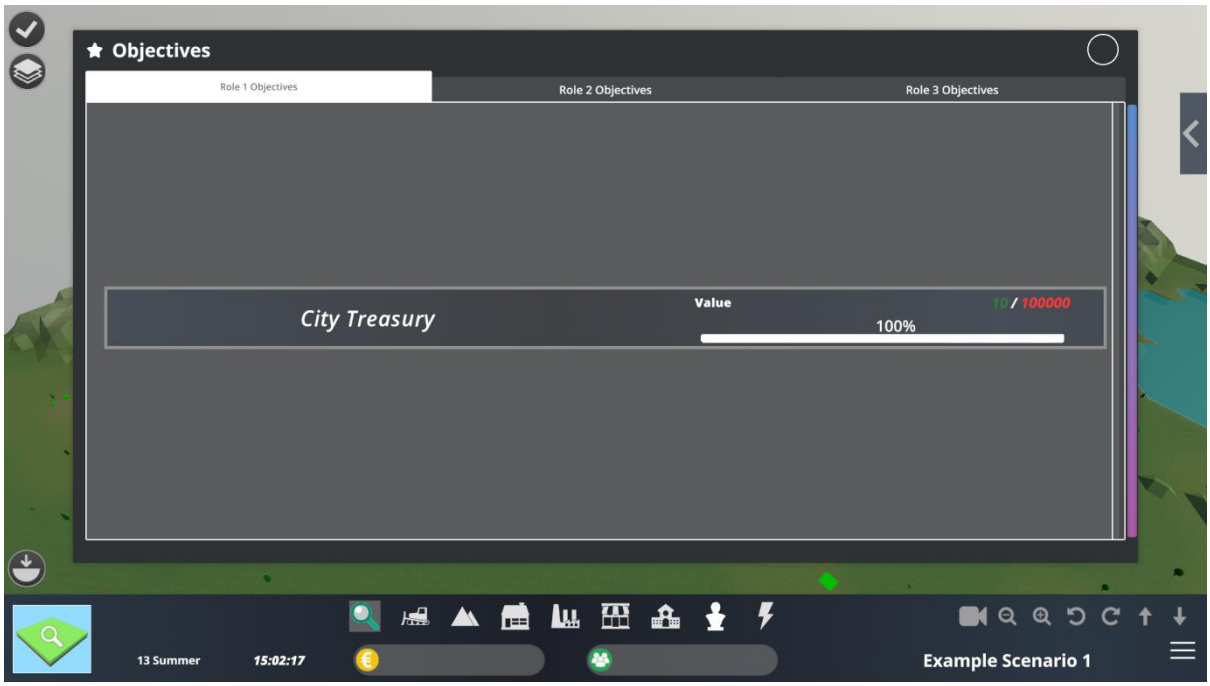
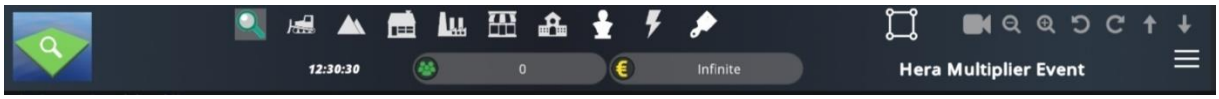


Figure 39: Objective screen

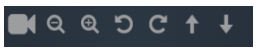
In the example figure 33, the student who is playing role 1 will need to make sure that the city treasury contains 100000 before the end of the scenario, and they have only 10 in bank for the moment.

THE BOTTOM BAR

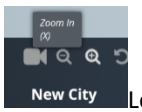
The bottom bar can be divided in several functional parts.



THE CAMERA TOOLS



The camera tool bar allows the player to manipulate the in game camera as they see fit. There are buttons to make it go up, down, rotate left, right, zoom in and zoom out.



Leaving the mouse hovering over a button shows a tooltip explaining the button function and also showing the keyboard key that can be pressed for the same result. Here we see we can zoom in by pressing the x key.

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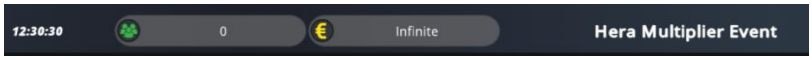
CITY GENERAL INFORMATION



The lower part of the bottom bar displays the in game date and time, along with the city's treasury and population and the name of the current scenario.

THE CONSTRUCTION TOOL BAR

This toolbar allows the player to build and destroy anything on the map, up to and including its terrain. Some category might not appear for some players, as certain roles will carry limitations in what the players are able to build and destroy on the map.

The magnifying glass allows the user to click on a building on the map and see more information about it. Figure 36 shows the information panel of a paper mill

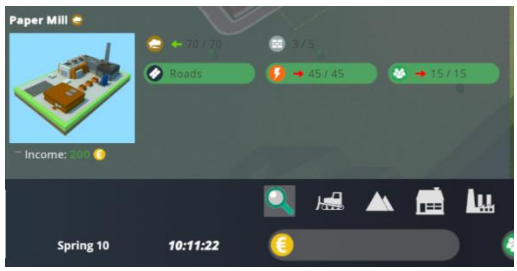


Figure 40: Close up of a paper mill

The Bulldozer tool allows the user to destroy any building they want, within the limits of what is allowed by their role.

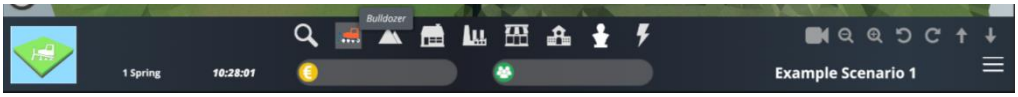


Figure 41: Bulldozer tool

The terraforming tools allow the user to modify the terrain. Modify terrain will raise or lower the terrain according to the player clicking with their left or right mouse button and level terrain will set a portion of terrain to the same height.

Figure 42: The terraforming tools

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The house tools allow you to build any available dwelling in town. Four different tabs are available, one per size of the house: small, medium, large and skyscrapers.

Figure 43: Building houses

The industry tools allow you to build any available industry in town. Three different tabs are available: farms, industries and anti-pollution buildings

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Figure 44: Building industries

The commerce tools allow you to build any available commercial building in town. Three different tabs are available: big markets, small shops and office buildings.

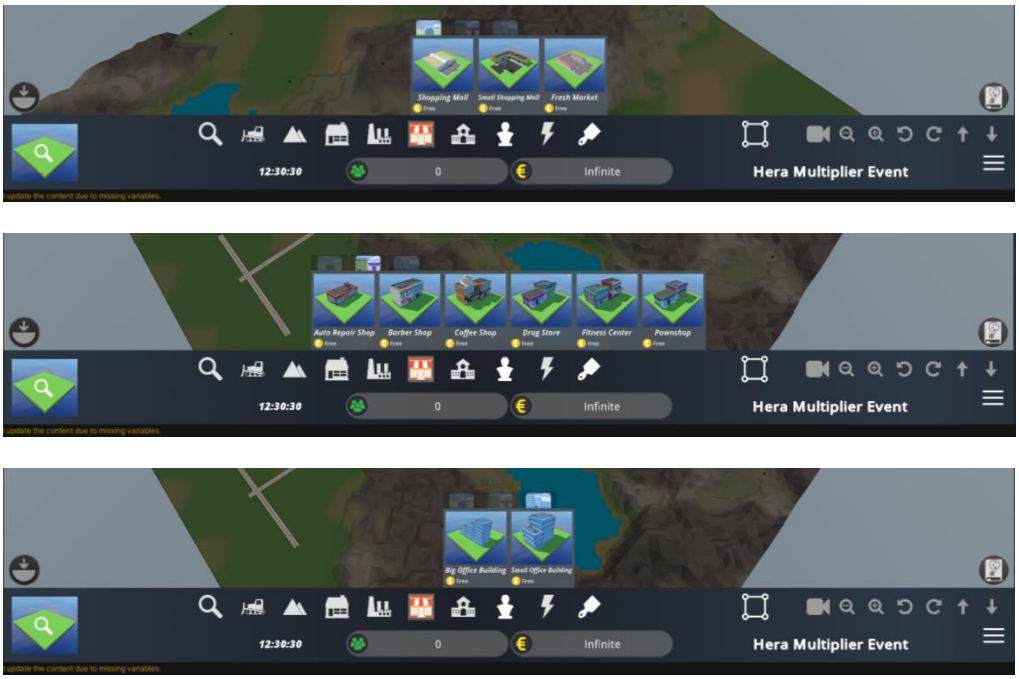

Figure 45: Building commercial

The public services tools allow you to build any of the available public services in town. Four different tabs are available: public services, public transports, parks and garbage disposal.

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Figure 46: Building public services

The culture tools allow you to build any cultural building in town.

Figure 47: Building culture structures

The infrastructure tools allow you to build all the electrical and energy-related infrastructures, but also everything pertaining to Internet and phones. Four different tabs are available: roads, energy, internet and phone.

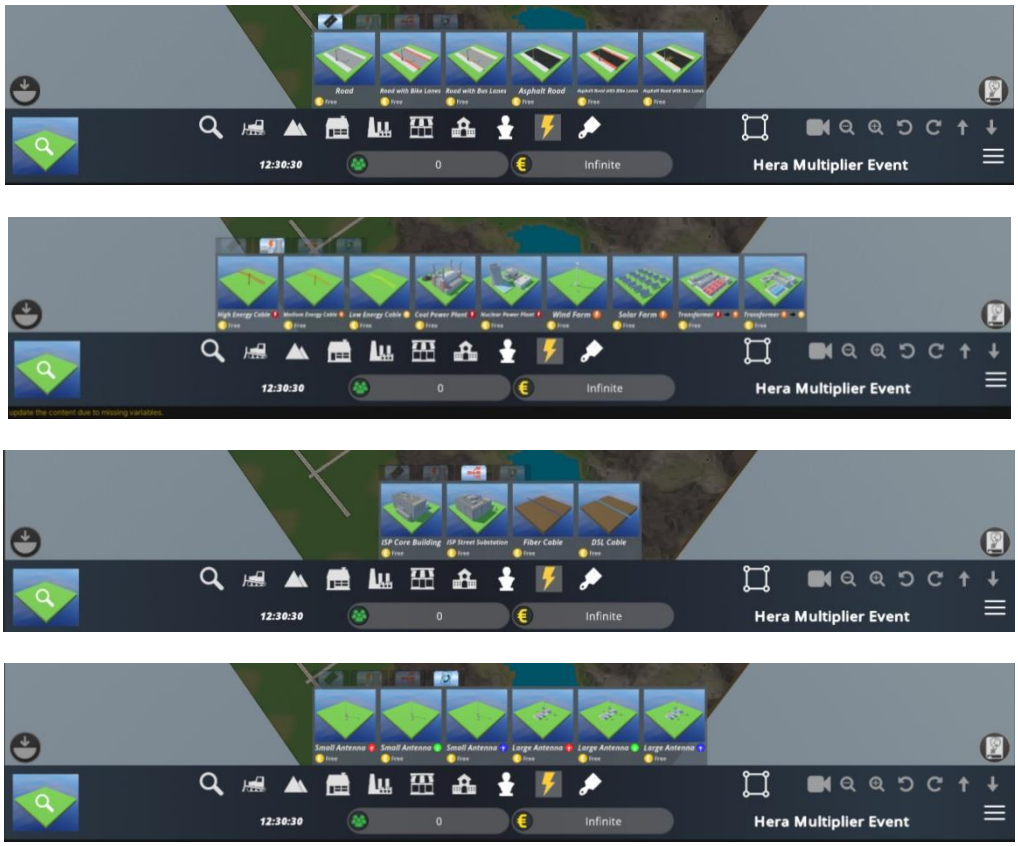

Figure 48: Building infrastructures

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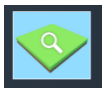
The paintbrush icon is related to custom layers, appears only for the teachers and content creator in editor mode and has been explained in details above.

THE CONTEXTUAL INFO BOX


The contextual info box allows you to always know what building is selected while you are using building tools. Figure 49 shows that the currently selected building is a Classic Medium House and of them will be built if the players click on the map.

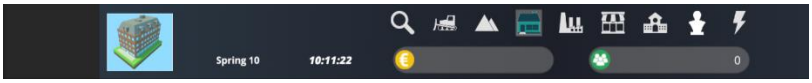


Figure 49: Contextual info box

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THE HERA INTEGRATED TOOLS

THE AGILE TOOL

The Agile tool allows the students to coordinate by drawing up fully fledged action plans, complete with custom annotations and legends.

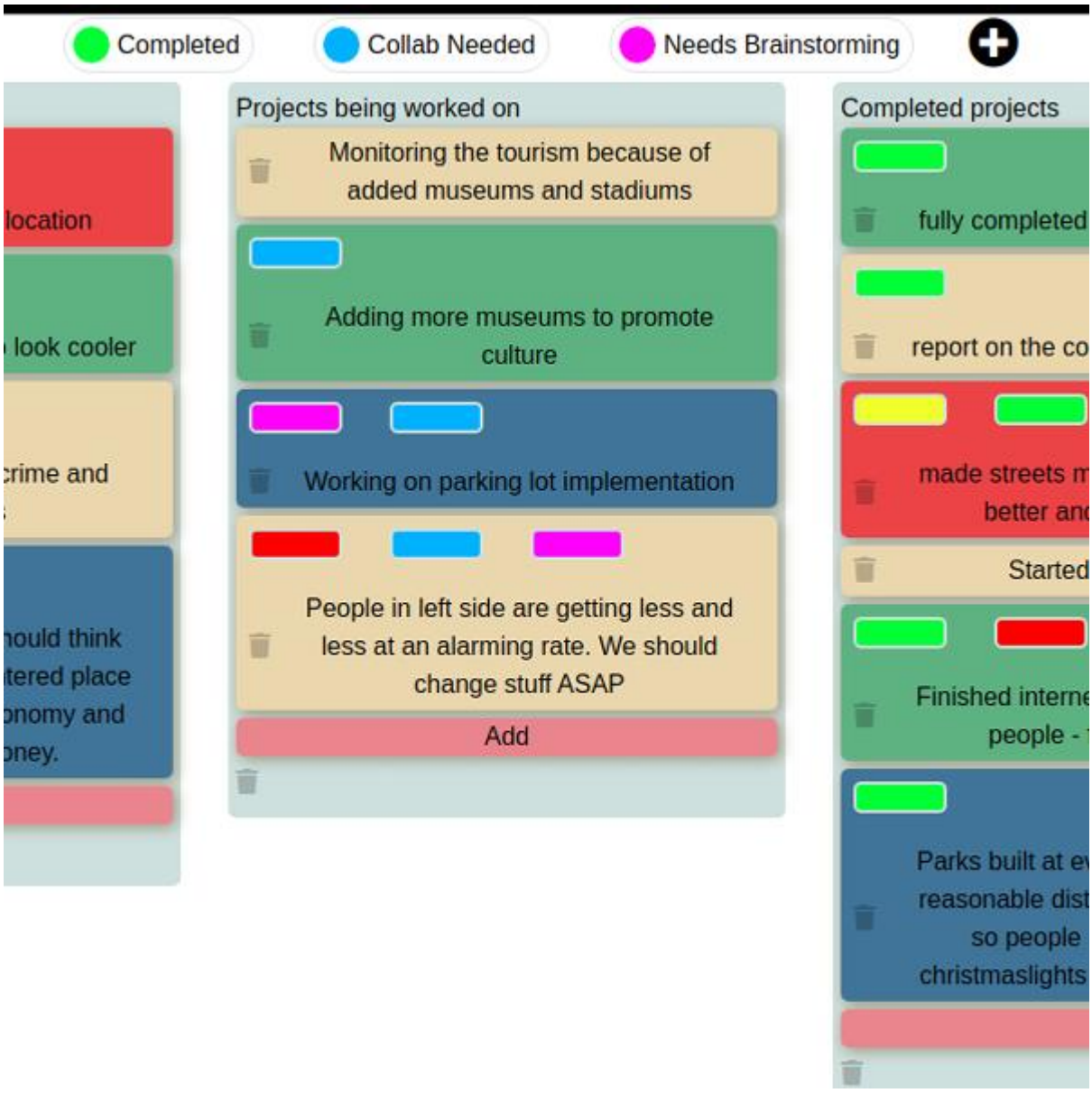

Figure 50: The Agile tool in use

Tasks, represented by color-coded boxes can be put in columns according to their advancement and can be adorned with colored tag in order to better represent their state of advancement.

This way of representing tasks to be done in an overall project, with columns, color codes and tags is consistent with the industry standard of task management software.

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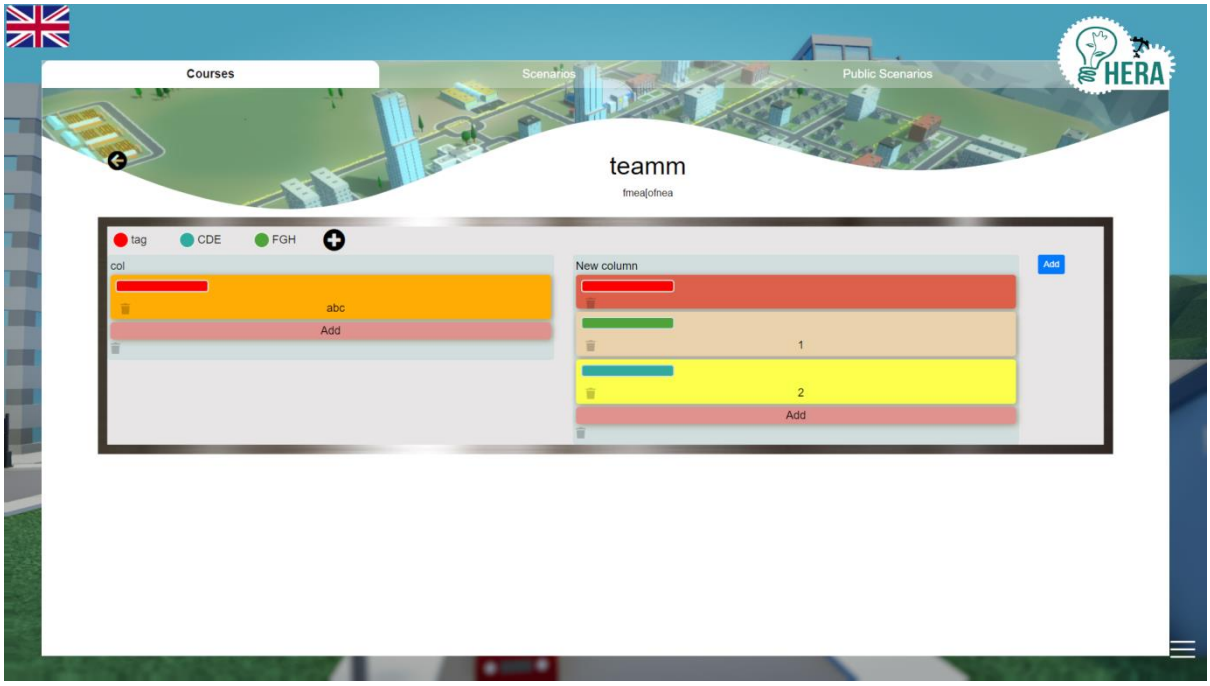

Figure 51: Creating new columns

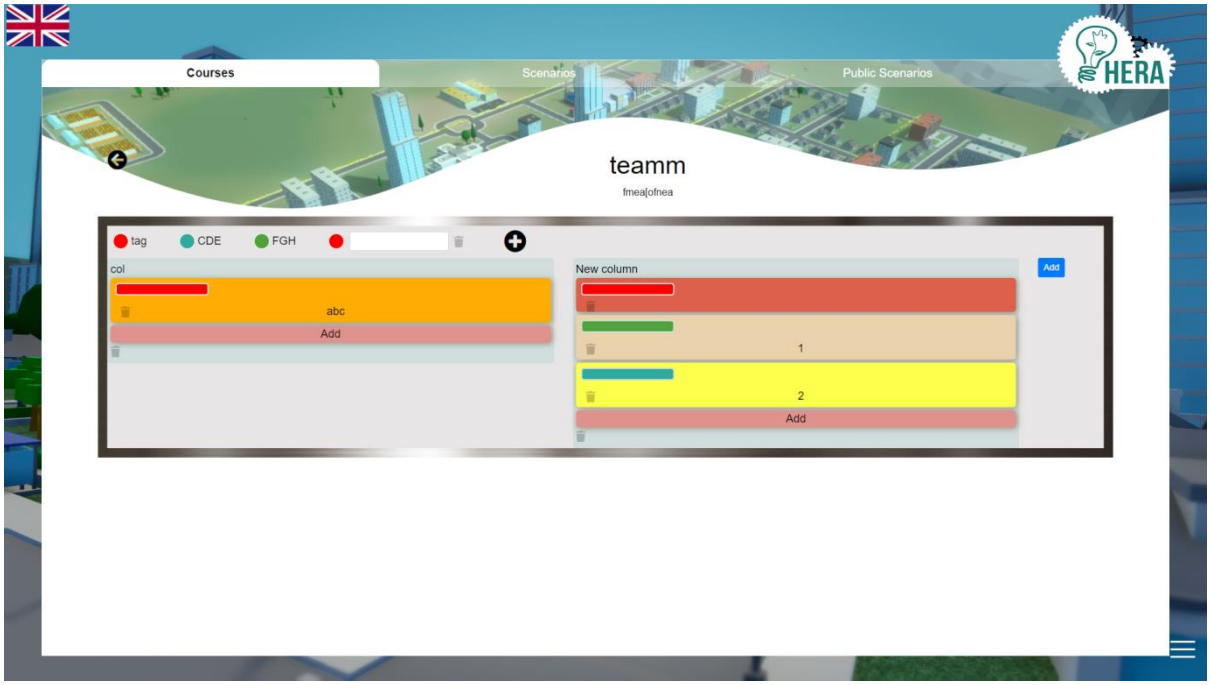

Figure 52: Inserting a new tag

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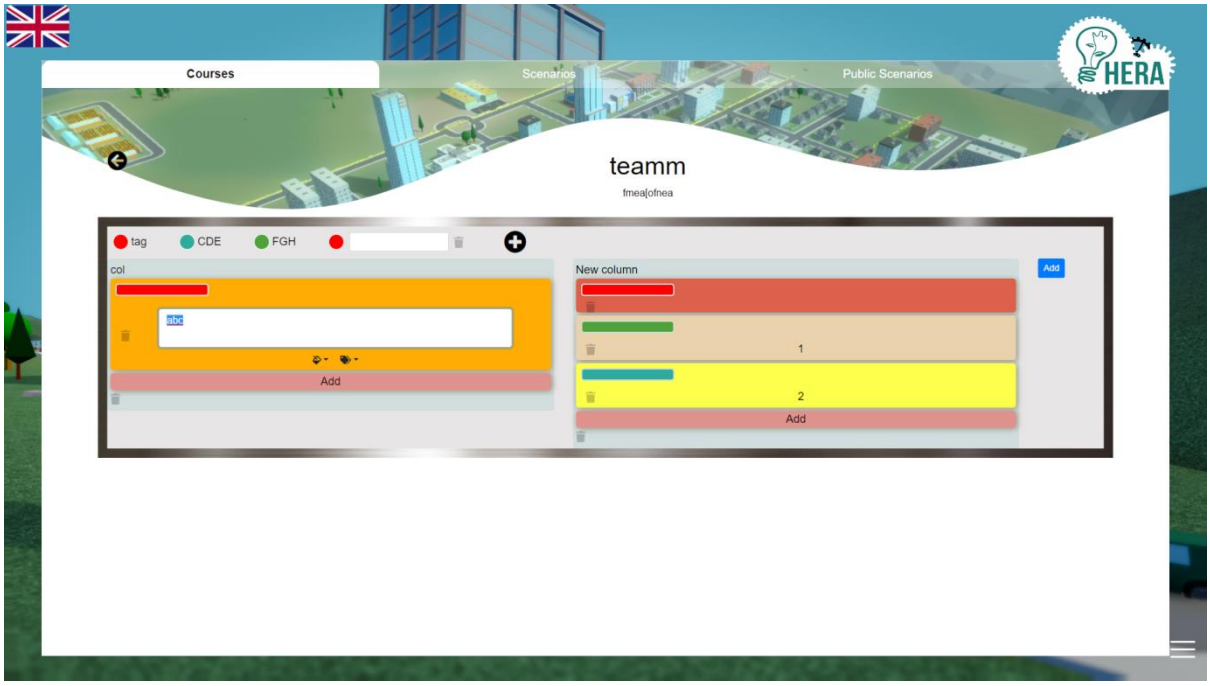

Figure 53: Filling a label for a task

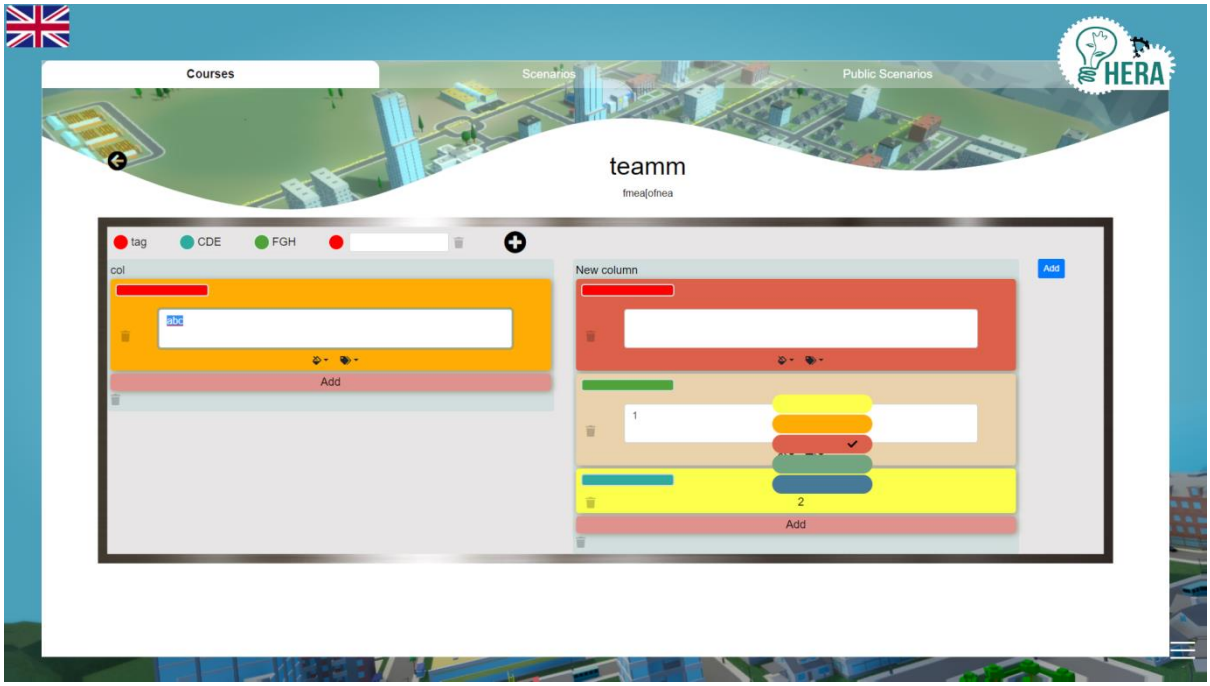

Figure 54: Color-coding a task

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POST-IT WHITEBOARD

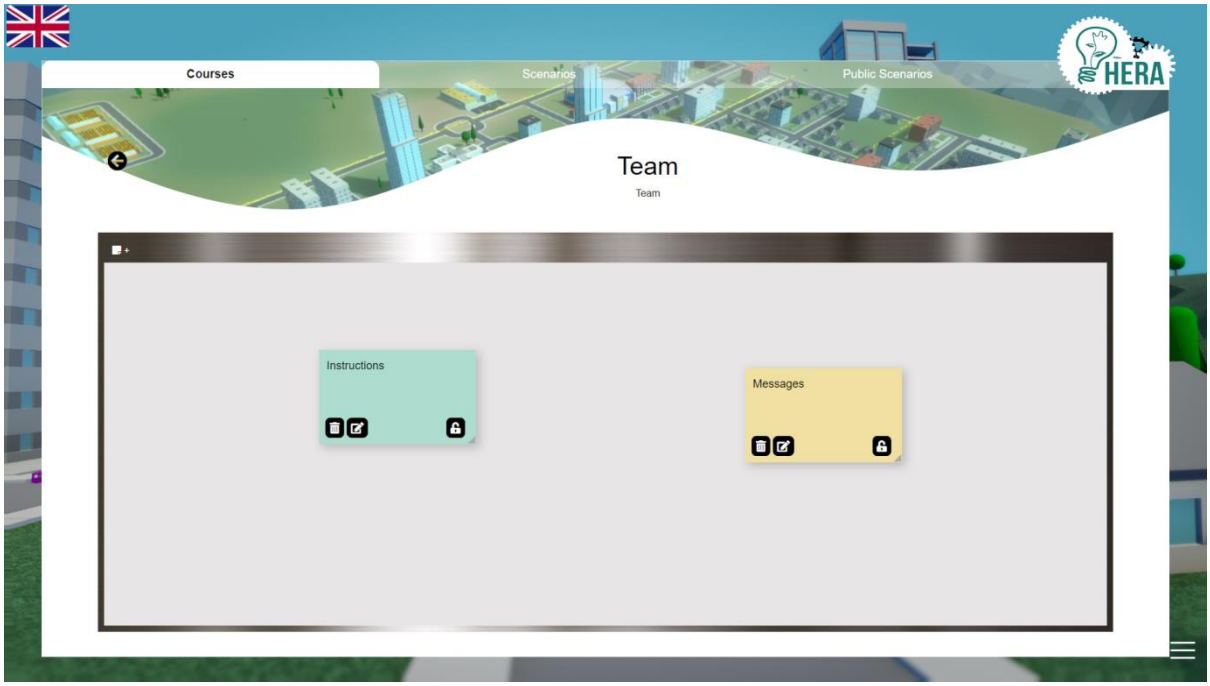

Figure 55: The Post it whiteboard

By default the default post-it note is only text, with the message “Edit me Double Click me” displayed. “Edit me” is in italic and “Double click me” is in bold, showcasing from the get-go the formatting capacities of the post-it text engine.

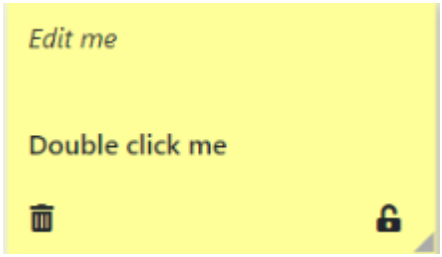

Figure 56: The default post-it

In order to avoid issues with users concurrently working on the same canvas, when a user adds a new note, the note won’t appear directly on the canvas but it will open a pop-up instead. There, the post-it can be modified as it was directly on canvas and by clicking save it will show up to all the other users too.

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Figure 57: Add new note pop-up

To change this text the user has to double click on the post-it (double tap on mobile) on the pen icon on the bottom left and to destroy the post-it the user has to click on the trashcan icon on the bottom right. In order to confirm deletion, the button has to stay pressed for a certain amount of time before the note is deleted. Once the blue bar on top of the screen is full, the post-it is deleted. This mechanism has been introduced to avoid any possible accidental deletion.

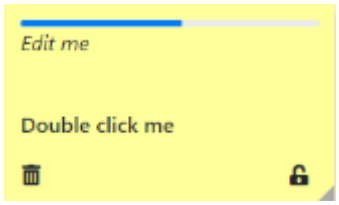

Figure 58: Post-it getting deleted

When clicking on the text editing button, new icons appear on the bottom of the text, one for adding a photo and one for adding a video. By clicking on the floppy disk icon the user will change any modifications that been done. Clicking on the color disk at the bottom will change accordingly the post-it color.

Figure 59: Editing the text

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All the changes done to a post-it are immediately shown to all the other members of the team if they are consulting the brainstorm canvas at the same time.

When the user wants to add a photo, they are prompted with a button asking them to select a file from their hard drive. The said file will be automatically and transparently be displayed on the screen, being uploaded to our servers for them to handle it.

Figure 60: Inserting a photo

The icon at the right of the camera icon is a text icon, in case the user wants to go back to a text only post.

Figure 61: a photo embedded in a post-it

If the user wants to insert a video, they are prompted with a message asking them to copy here the URL of the video. Youtube, Vimeo and Dailymotion are supported at the moment.

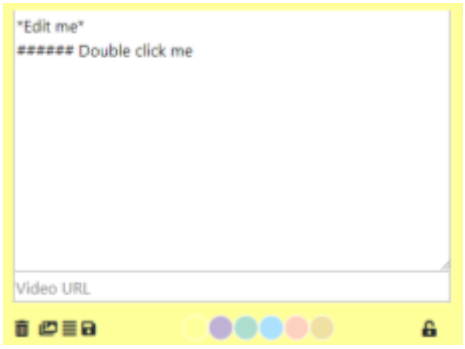

Figure 62: Inserting a video

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Figure 63: A video embedded in a post-it

At the bottom right of the post-it we can see a padlock icon. It is open when the post-it is editable or locked when the post-it cannot be edited. Only teachers have the possibility of locking and unlocking post-its, students can only know if a post is locked or not without being able to act on it.

Grabbing the little triangle symbol at the bottom left of a post-it allows to resize the post it to the desired size. This is especially useful if the post-it contains a huge photo or a long text, as otherwise the content will just overflow the post-it.

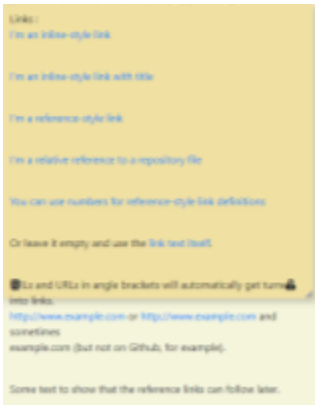

Figure 64: Example of content overflowing

To avoid such overflow, please re-dimension your post-it accordingly.

POST-ITS ENRICHED TEXT RULES

The complete reference for the enrich text rule is available at this URL: https://github.com/adam-p/markdown-here/wiki/Markdown-Cheatsheet.

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Headers can be defined by using # symbols (the more # there are, the smaller the header's text) or alternatively by underlining the text with the = symbol.

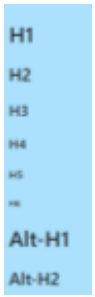

Figure 65: Post-it containing various headers

Emphasis (italic, bold, bold and italics or strike through) can be obtained by placing the text between * and _. If we write *italics* or _italics_ the post-it will display *italics*, **strong** or __strong__ are displayed as **strong**, and **_italics strong_** are displayed as ***italics strong***. Finally ~~strike~~ is displayed as ~~strike~~.

Figure 66: Post-it containing emphasis

The system also supports bullet point lists, numbered lists and hypertext links (see the linked URL above for more details).

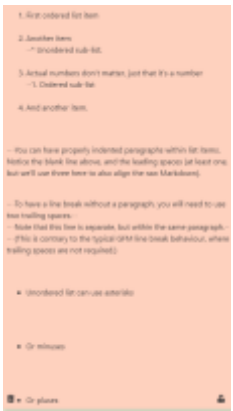

Figure 67: A post-it containing lists

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TABLE OF FIGURES

Figure 1: Students and Teachers actions in the Hera software 3
Figure 2: The teacher's workflow 4
Figure 3: The student's workflow 5
Figure 4: Hera archive content 7
Figure 5: Hera Main Menu 7
Figure 6: The language ribbon 8
Figure 7: The authenticate button in Greek 8
Figure 8: The option menu 9
Figure 9: Sound management 10
Figure 10: Hera credits screen 11
Figure 11: Authentication window 11
Figure 12: Account creation 12
Figure 13: The Course tab 13
Figure 14: Creating a course 13
Figure 15: The Scenario tab 14
Figure 16: Editing a scenario 15
Figure 17: The Public Scenarios tab 15
Figure 18: Course details 16
Figure 19: Creating a team 16
Figure 20: Course edition 17
Figure 21: Selecting the size of the map 18
Figure 22: Game interface 18
Figure 23: Scenario Editor 19
Figure 24: Scenario Editor Role details 20
Figure 25: Scenario Editor Role objectives 21
Figure 26: The students' course list 23
Figure 27: Inside a course 23
Figure 28: The player has joined the team 25

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Figure 29: The player has chosen a role 25
Figure 30: In game interface 26
Figure 31: Option menu 26
Figure 32: Showing the energy layer 27
Figure 33: Showing the pollution layer 28
Figure 34: All the layers related to police and crime 29
Figure 35: Underground 29
Figure 36: The Layer Editor 30
Figure 37: Zones defined inside a custom layer 31
Figure 38: Painting custom zones on the map 31
Figure 39: Objective screen 32
Figure 40: Close up of a paper mill 33
Figure 41: Bulldozer tool 33
Figure 42: The terraforming tools 33
Figure 43: Building houses 34
Figure 44: Building industries 35
Figure 45: Building commercial 35
Figure 46: Building public services 36
Figure 47: Building culture structures 36
Figure 48: Building infrastructures 36
Figure 49: Contextual info box 37
Figure 50: The Agile tool in use 38
Figure 51: Creating new columns 39
Figure 52: Inserting a new tag 39
Figure 53: Filling a label for a task 40
Figure 54: Color-coding a task 40
Figure 55: The Post it whiteboard 41
Figure 56: The default post-it 41
Figure 57: Add new note pop-up 42

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Figure 58: Post-it getting deleted 42

Figure 59: Editing the text 42

Figure 60: Inserting a photo 43

Figure 61: a photo embedded in a post-it 43

Figure 62: Inserting a video 43

Figure 63: A video embedded in a post-it. 44

Figure 64: Example of content overflowing 44

Figure 65: Post-it containing various headers 45

Figure 66: Post-it containing emphasis 45

Figure 67: A post-it containing lists 45

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ANNEX: THE NOVELTY AND INNOVATION OF THE HERA GAME

This text describes in brief the new functionalities implemented in the HERA game, which are unique and developed for the purposes of the HERA project. This text aims to provide insight on the software development that took place during the project implementation period.

EXTENSION OF CORE CITY BUILDER FUNCTIONALITIES

Project eCity developed a serious game designed to be played by a single user by being installed as a standalone application on a PC. The game included 8 specific scenarios.

In the HERA project, inspiration was taken from eCity, but from the actual game only the basic code regarding the city builder aspect was re-used. Most of the re-used code was rewritten and refactored to satisfy the specific needs of the HERA project. The rest of the implementation is specific to HERA.

1.1 REWRITING OF THE CORE ENGINE

As eCity was designed in a much older version of Unity, a lot of rewriting and refactoring or brand new introduction of code had to happen to upgrade the base functionalities to function correctly in Unity 2017 and to reflect new coding paradigms and state-of-the-art way of tackling functionalities. For example, the localization system that allows the software to be available in all the consortium's languages has been specifically developed for HERA.

1.2 TOTAL REDESIGN OF THE GUI

The Graphical User Interface has been totally rewritten and is using new proprietary assets. All the themes, fonts and overall look of the interface are brand new. From the original texts present in multiple languages in eCity only around 10% of them are still present in HERA and they concern the most basic actions only, such as "Play" or "Exit". Everything else has been written (and had to be translated) specifically for HERA.

1.3 EXTENSION OF AVAILABLE CITY STRUCTURES

The set of available city structures was extended to include a significant number of new buildings and structures to ensure that learning scenarios are rich and address the needs of higher education students. For each and every new type of building, new simulation algorithms and code had to be introduced to manage those brand-new features. Existing management code has also been completely rewritten. Indicatively, the following management structures and supporting were introduced in HERA: culture, crime, garbage management, parking, the building affection system (buildings can now have direct effect on each other if they are placed in a certain radius of each other), the building integrity system. The total number of structures supported in HERA as a result of this extension is 100. All the existing structures were also refactored with better quality graphics.

1.4 DAY AND NIGHT CYCLE

To make scenarios more realistic, the HERA city supports day and hight cycles. Each and every single building of the game exists now in a night and a day version, with specific code and specific graphics which had to be created from scratch.

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1.5 DIVERSE WEATHER CONDITIONS

To make scenarios more interesting and realistic, the HERA game support diverse weather conditions and simulates seasons. Rain, thunderstorms, all can happen in the game thanks to the brand new weather system.

1.6 DEFINITION OF CITY CHARACTERISTICS THROUGH LAYERS

Another interesting element implemented in the HERA game is providing the opportunity to scenario creators to define layers on a city. Each layer corresponds to specific characteristics. For example, a creator may create a layer to define that some parts of the city are more expensive than others. Or, to identify that some parts of the city may suffer increased crime in comparison to others. This helps make scenarios realistic and provides a new element of flexibility in city design. A creator may review all available layers and modify them accordingly.

MULTI-USER ARCHITECTURE

eCity is a single player game. On the other hand, HERA is a multiplayer game. The multiplayer nature of the application is important for demonstrating to higher education students the importance of collaboration with professionals that have complementary knowledge towards solving modern challenges. In other words, HERA does not only promote role playing; it further promotes role playing in groups. It is a central design choice, that has led to the design and implementation of a completely new architecture that supports the collaboration of teams of up to 4 individuals.

The HERA application architecture is based on the client-server distributed computing model. The server side of the application aims at supporting distributed, concurrent collaboration of students in real-time. To achieve this, the architecture ensures that all 4 team members can edit the city canvas concurrently at the same time, maintains an image of the game state, namely the changes performed by each of the 4 team players, and ensures that there are no conflicts, namely students trying to modify the same space at the same time.

The client side of the application can be downloaded by each student on his/her computer and used to collaborate with team members in introducing enhancements in city design for addressing the goals of a specific learning scenario.

The client-server architecture is the reason why a user needs internet access to play the game, applying good practices used in other modern games.

The implementation is sophisticated, and it is one of the big achievements of the project introducing a completely new and engaging game engine suitable for higher education.

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FUNCTIONALITY IMPLEMENTED IN THE HERA GAME

The following new functionality was developed in the HERA game.

3.1 SCENARIO EDITOR

The scenario editor allows educators and other stakeholders to design new learning scenarios in the HERA game. It is a complete service which guides creators to define a general description of the scenario and the related learning objectives, descriptions of the foreseen student roles, and the individual objectives of each role. In addition, the educator can associate with the scenario a new city canvas/plan that he/she may create or copy and adapt from existing other scenarios. The editor allows the effective creation of any number of scenarios, which is a big achievement of the project as it makes educators co-creators rather than simple consumers of existing, pre-defined scenarios. The scenario editor is a complete service.

3.2 PUBLIC AND PRIVATE SCENARIOS

Scenarios created by an educator are available in his/her own HERA personal working space. The educator has the option of making a well-designed scenario public, allowing peers to benefit from their work. Scenarios made public by their creators are accessible by all educators that use the HERA game through a «public» space. An educator may clone a public scenario in his/her private working space and modify it to address specific class needs.

This functionality allows educators to be inspired by the work of their peers. It further allows them to start designing from a completed scenario, which may be useful during the early exposure to the HERA game when educator experience is relatively low.

3.3 COURSE EDITOR

In the context of HERA a course is an activity that takes place over a specific period of time. The educator can provide students with general directions and associate with the course a specific scenario created through the scenario editor. Students connect to a course by using a code, similarly to popular modern applications. The code differentiates the working space of an individual course. The course is accessible to students for the duration of time specified by the educator. The educator is supported to create team working spaces for supporting group collaboration. The educator may create a separate space for each team in the class. The course editor is a complete service.

3.4 STUDENT WORKING SPACES

Upon connecting to a course by using the pre-defined course code, students gain access to their team's working space. In this working space students may brainstorm and collaborate towards introducing interventions in their city for addressing the given challenge.

3.5 BRAINSTORMING TOOL

Through their team working space students have access to a brainstorming tool. The brainstorming tool is a shared workspace that can be edited concurrently by team members, who may add posts with ideas that the rest of the team sees in real time, similarly to using a board. Students can continue to post ideas, building on each other's suggestions before focusing on modifying their city to solve a given problem.

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3.6 CHAT FACILITY

Through the group working space team members may communicate through a chat facility that allows them more direct communication.

3.7 TASK PRIORITIZATION TOOL

Through their team working space students have access to a task management tool, through which they can identify and prioritize tasks the need to execute for solving the given problem. This tool is inspired by agile industry practices deployed in engineering, in which engineers perform similar activities for designing software and other solutions that best address user needs.

SCENARIOS

A total of 12 scenarios have been created in the game by using the scenario editor. This goes beyond the 3 foreseen scenarios described in the project proposal.

CONCLUSIONS

The above discussion aims to demonstrate the significant work implemented in the context of and for the purposes of the HERA project, the results of which are available on the project portal for all interested parties.

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