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P.PORTO

User Manual

Integrative Project LAPR2

MABEC DEVELOPMENT

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Chapter 1

Glossary

Term (EN)	Termo (PT)	Explanation (EN)
Account Balance	Saldo da Conta	Current financial status in the simulation
Acquired Carriages	Carruagens Adquiridas	Carriages purchased and available for train construction
Acquired Locomotives	Locomotivas Adquiridas	Locomotives purchased and available for use
Add Buildings	Adicionar Edifícios	Option to add structures to a station
Add City	Adicionar Cidade	Function to create a new city on the map
Add Industry	Adicionar Indústria	Function to place an industry on the map
Add Station	Adicionar Estação	Function to create a new station
Arrival Station	Estação de Chegada	Destination station for a route
Automatic House Blocks	Blocos Habitacionais Automáticos	System-generated residential areas
Balance Update	Atualização de Saldo	Change in financial status after transactions
Building Type	Tipo de Edifício	Classification of station structures
Buy Carriage	Comprar Carruagem	Action to purchase a carriage
Buy Locomotive	Comprar Locomotiva	Action to purchase a locomotive
Calendar Tracking	Controlo de Calendário	Simulation time management system
Cargo Delivery	Entrega de Carga	Transport of goods to destination
Cargo Generation	Geração de Carga	Production of transportable goods
Cargo Type	Tipo de Carga	Classification of transported goods
Carriage Capacity	Capacidade da Carruagem	Maximum load a carriage can transport
Carriage Related	Relacionado com Carruagens	Menu for managing carriages
City Centre	Centro da Cidade	Central coordinates of a city
City Operations	Operações de Cidade	Menu for city management
Command-line Interface	Interface de Linha de Comandos	Text-based user input system
Compatible Operating Systems	Sistemas Operativos Compatíveis	Supported OS versions
Configuration Resources	Configuração de Recursos	Resource generation settings
Construct Train	Construir Comboio	Process of assembling a train
Continue Program	Continuar Programa	Resume paused simulation
Control Centre	Centro de Controlo	Station type for network management
Create a Map	Criar um Mapa	Generate new railway map
Create a Scenario	Criar um Cenário	Set up new simulation scenario
Create Railway Line	Criar Linha Ferroviária	Establish rail connection
Create Route	Criar Rota	Define train's path

Term (EN)	Termo (PT)	Explanation (EN)
Current Simulation Date	Data Atual da Simulação	Present in-game date
Default Configuration	Configuração Padrão	Predefined resource settings
Delete a Scenario	Eliminar um Cenário	Remove saved scenario
Delete Railway Line	Eliminar Linha Ferroviária	Remove rail connection
Delete Simulation	Eliminar Simulação	Remove saved simulation
Demand	Procura-oferta de um produto	Demands is the logic of supply and demand.
Departure Station	Estação de Partida	Starting station for a route
Direction (Station)	Direção (Estação)	Station orientation (N/S/E/W)
Domain Layer	Camada de Domínio	Core system entities
Domain Model	Modelo de Domínio	System component diagram
Double Track	Via Dupla	Railway line with two parallel tracks
Edit City	Editar Cidade	Modify city properties
Edit Map	Editar Mapa	Modify map properties
Edit Name (Station)	Editar Nome (Estação)	Rename a station
Edit Station	Editar Estação	Modify station properties
Editor Mode	Modo Editor	Map/scenario creation interface
Electrified Line	Linha Eletrificada	Railway line with power supply
End Date	Data Final	Simulation end point
Evolve Station Type	Evoluir Tipo de Estação	Upgrade station capabilities
Export (Industry)	Exportação (Indústria)	Outbound resources from industry
Financial Tracking	Controlo Financeiro	Money management system
Freight Transport	Transporte de Mercadorias	Goods movement system
Fuel Consumption	Consumo de Combustível	Locomotive energy usage rate
Fuel Type	Tipo de Combustível	Energy source classification
Generation Rate (Months)	Taxa de Geração (Meses)	Resource production interval
Graphical Map Display	Visualização Gráfica do Mapa	Visual representation of network
Hardware Requirements	Requisitos de Hardware	Minimum system specifications
House Blocks	Blocos Habitacionais	Residential units in cities
House Blocks Configurations	Configurações de Blocos Habitacionais	Residential area settings
Import (Industry)	Importação (Indústria)	Inbound resources to industry
Industries Configurations	Configurações de Indústrias	Industry production settings
Industry Operations	Operações de Indústria	Industry management menu
Infrastructure Elements	Elementos de Infraestrutura	Railway network components
Initial Money	Dinheiro Inicial	Starting capital for scenario
Installation Procedure	Procedimento de Instalação	Application setup steps
Intended Audience	Público-Alvo	Target user groups
Interface Layer	Camada de Interface	User interaction module
Issue Troubleshooting	Resolução de Problemas	Error fixing guidance
Java Development Kit (JDK)	Kit de Desenvolvimento Java	Required software for development
List Railway Lines	Listar Linhas Ferroviárias	Display all rail connections
Load Capacity	Capacidade de Carga	Maximum transportable weight
Locomotive Power	Potência da Locomotiva	Engine performance metric
Locomotive Related	Relacionado com Locomotivas	Menu for locomotive management
Main Features	Principais Funcionalidades	Key application capabilities
Main Menu	Menu Principal	Primary navigation screen
Maintenance Cost	Custo de Manutenção	Ongoing operational expenses
Manage Routes	Gerir Rotas	Route assignment system
Manual House Blocks	Blocos Habitacionais Manuais	User-placed residential areas
Map Dimensions	Dimensões do Mapa	Width/height of play area

Term (EN)	Termo (PT)	Explanation (EN)
Map Operations	Operações de Mapa	Map management functions
Maximum Speed	Velocidade Máxima	Highest achievable train speed
Maximum Storage (Station)	Armazenamento Máximo (Estação)	Station resource capacity
Mixed Industry	Indústria Mista	Multi-function industrial facility
Modified Configuration	Configuração Modificada	Custom resource settings
Monthly Expenses	Despesas Mensais	Recurring simulation costs
Network Topology	Topologia da Rede	Layout of railway connections
Operating Costs	Custos Operacionais	Daily running expenses
Passenger Demand	Procura de Passageiros	Travel requirement metric
Pause Menu	Menu de Pausa	Simulation interruption options
Player Mode	Modo Jogador	Simulation running interface
Primary Sector Industry	Indústria do Setor Primário	Raw material producer
Product Structure Diagram	Diagrama de Estrutura do Produto	System architecture visualisation
Production Rate	Taxa de Produção	Resources generated per cycle
Quantity Produced (Monthly)	Quantidade Produzida (Mensal)	Monthly resource output
Railway Line Related	Relacionado com Linhas Férreas	Track management menu
Remove City	Remover Cidade	Delete city from map
Remove Industry	Remover Indústria	Delete industry from map
Remove Map	Remover Mapa	Delete saved map
Remove Station	Remover Estação	Delete station from network
Repository Layer	Camada de Repositório	Data storage module
Resource Allocation	Alocação de Recursos	Distribution of materials
Resource Flow	Fluxo de Recursos	Movement of goods between nodes
Resource Management	Gestão de Recursos	Asset control system
Resource Transformation	Transformação de Recursos	Processing raw to finished goods
Resource Type	Tipo de Recurso	Classification of materials
Resources Configurations	Configurações de Recursos	Goods production settings
Route Efficiency	Eficiência da Rota	Delivery performance metric
Route Events	Eventos de Rota	Delivery tracking records
Route Optimization	Otimização de Rotas	Pathfinding improvement process
Route Related	Relacionado com Rotas	Path management menu
Run Simulation	Executar Simulação	Start/continue gameplay
Scenario Duration	Duração do Cenário	Time span of simulation
Single Track	Via Única	Railway line with one track
Speed Adjustment	Ajuste de Velocidade	Change simulation tempo
Start Date	Data de Início	Simulation commencement point
Station Depot	Depósito da Estação	Train storage facility
Station Terminal	Terminal da Estação	Major connection point
Station Type	Tipo de Estação	Classification by function
System Overview	Visão Geral do Sistema	Application purpose and structure
Time Acceleration	Aceleração Temporal	Speed multiplier for simulation
Track Electrification	Eletrificação da Via	Power supply installation
Train Composition	Composição do Comboio	Locomotive + carriages configuration
Train Related	Relacionado com Comboios	Rolling stock management
Transforming Industry	Indústria Transformadora	Material processing facility
Transport Dynamics	Dinâmicas de Transporte	Movement simulation mechanics
Troubleshooting Guide	Guia de Resolução de Problemas	Error correction manual
UI Layer	Camada de Interface do Utilizador	Presentation layer
Upgrade Cost	Custo de Melhoria	Expense for enhancements

Term (EN)	Termo (PT)	Explanation (EN)
Upgrade Railway Line	Melhorar Linha Ferroviária	Enhance track quality
User Credentials	Credenciais de Utilizador	Login email/password
User Manual	Manual do Utilizador	Application instruction guide
View Acquired Carriages	Ver Carruagens Adquiridas	Inspect purchased carriages
View Acquired Locomotives	Ver Locomotivas Adquiridas	Inspect purchased locomotives
View Route	Ver Rota	Examine path details
View Train	Ver Comboio	Inspect train configuration
Warehouse Capacity	Capacidade do Armazém	Storage limit at stations
Waypoint Station	Estação Intermédia	Stop between origin/destination
Annual Revenue	Receita Anual	Yearly income from operations
Asset Depreciation	Depreciação de Ativos	Value reduction over time
Automated Scheduling	Agendamento Automático	Computer-generated timetables
Branch Line	Ramal Ferroviário	Secondary railway route
Cargo Handling	Manuseamento de Carga	Loading/unloading processes
Carriage Weight	Peso da Carruagem	Physical mass of rolling stock
Central Hub	Hub Central	Primary network junction
Coal Consumption	Consumo de Carvão	Fuel usage rate (steam engines)
Connection Fee	Taxa de Ligação	Cost for new rail links
Construction Cost	Custo de Construção	Initial building expenses
Containerization	Contentorização	Standardized cargo units
Crossing Gate	Passagem de Nível	Road-rail intersection barrier
Depot Capacity	Capacidade do Depósito	Maximum train storage
Diesel Locomotive	Locomotiva a Diesel	Combustion engine train
Distance Matrix	Matriz de Distâncias	Network location relationships
Electric Locomotive	Locomotiva Elétrica	Grid-powered train
Emergency Brake	Travão de Emergência	Rapid stopping mechanism
Energy Efficiency	Eficiência Energética	Power consumption metrics
Environmental Impact	Impacto Ambiental	Ecological consequences
Equipment Failure	Avaria de Equipamento	Mechanical breakdowns
Export Tax	Taxa de Exportação	Government trade charges
Freight Yard	Pátio de Cargas	Cargo handling facility
Gradient Profile	Perfil de Inclinação	Track elevation changes
Import Duty	Direito de Importação	Cross-border trade tax
Infrastructure Maintenance	Manutenção de Infraestrutura	Track/station upkeep
Intermodal Transport	Transporte Intermodal	Multi-system logistics
Junction Point	Ponto de Entroncamento	Track intersection node
Labor Costs	Custos Laborais	Workforce expenses
Loading Dock	Cais de Carga	Freight transfer area
Locomotive Fleet	Frota de Locomotivas	Total owned engines
Main Line	Linha Principal	Primary rail artery
Marshalling Yard	Pátio de Manobras	Train sorting facility
Network Expansion	Expansão da Rede	Infrastructure growth
Operational Efficiency	Eficiência Operacional	Performance metrics
Passenger Platform	Cais de Passageiros	Boarding area design
Profit Margin	Margem de Lucro	Financial performance
Rail Gauge	Bitola Ferroviária	Track width measurement
Route Capacity	Capacidade da Rota	Maximum traffic volume
Safety Protocol	Protocolo de Segurança	Accident prevention
Siding Track	Via de Serviço	Auxiliary rail space
Signal System	Sistema de Sinalização	Traffic control network
Steam Locomotive	Locomotiva a Vapor	Coal-fired engine
Stock Inventory	Inventário de Material	Asset tracking
Tare Weight	Tara	Empty vehicle mass
Throughput Rate	Taxa de Processamento	Cargo handling speed

Term (EN)	**Termo (PT)**	**Explanation (EN)**
Track Maintenance	Manutenção de Via	Rail upkeep activities
Train Consist	Formação do Comboio	Vehicle sequence
Transshipment	Transbordo	Cargo transfer process
Turnaround Time	Tempo de Rotação	Operation cycle duration
Usage Statistics	Estatísticas de Utilização	Performance analytics
Vehicle Utilization	Utilização de Veículos	Fleet activity rates
Wagon Load	Carga do Vagão	Per-carriage contents
Yield Management	Gestão de Rendimento	Revenue optimization
Zonal Pricing	Preços Zonais	Geographic fare structure

Chapter 2

Introduction

2.1 Purpose and Scope of the Document

This user guide has been prepared to help users understand and work with the Railway Network Simulation Application. It's purpose is to walk users step by step on how to operate the system including the managing infrastructure elements like maps, stations, railway lines, trains, scenarios, and simulating freight transport and industrial engagements.

2.2 Type of Product Described

The Railway Network Simulation Application is a railway system operation and logistics-based simulation tool developed in Java. It is more focused on the transport dynamics between cities, stations and industries over time, rather than just at one point in time. With the jaw application, users can simulate transport and cargo generation, their transformation, export and movement along railway routes based on available resources, time periods, infrastructure, and other constraints.

2.3 Intended Audience

This user manual is intended for:

- Ordinary users of the application who create maps, stations, and simulations.
- Students and instructors who teach or learn with the application in an academic or training context.
- Developers and testers who need to validate functional workflows during application development have a reference.

Chapter 3

System Overview

3.1 Purpose and Use of the Product

The railway simulation application is a console-based system designed to replicate the essential mechanics of the planning and management of the railway network. It allows users to construct and simulate rail infrastructure by adding cities, stations, and industries, purchasing locomotives and carriages, and assigning them to specific routes. The purpose of the system is to teach and demonstrate key principles of resource management, transport logistics, and the evolution of infrastructure over time. This product serves educational and exploratory purposes, offering users an interactive way to engage with historical and strategic elements of railway development.

3.2 Structure of the Product

The system is modularly organized into several interconnected components. Each component encapsulates a specific responsibility within the simulation, ensuring a clear separation of concerns and enabling easy extensibility. The application is built as a layered structure:

- Domain Layer: Contains core entities such as Map, City, Station, Train, Carriage, Locomotive, and Route.
- Repository Layer: Stores and manages domain data in memory, such as city and train repositories.
- Controller Layer: Handles application logic, coordinating between UI and domain layers.
- UI (User Interface) Layer: Provides command-line interaction, offering options and menus for the user to operate the system.

All modules communicate via clean interfaces, maintaining modularity and testability.

3.3 Reference to the Main Features

The application offers the following key features:

- Creation and customization of railway maps
- Addition of cities, industries, and stations
- Purchasing of historically available locomotives and carriages
- Construction of trains using acquired components
- Creation of railway lines and planning of routes
- Real-time financial and calendar tracking
- Simulated interactions between trains and buildings (e.g., cargo transport)

3.4 Highlight of the Main Modules

The railway simulation and management system is organised into several main modules that work together to offer a complete and interactive experience. The station management module allows you to create and edit stations with different functionalities, such as terminals, control centres or depots. The railway lines module deals with creating and updating lines between stations, including options such as single, double and electrified lines. The train module allows you to build trains with locomotives and carriages, defining properties such as fuel type, capacity and speed. The cargo and resources module simulates the production, transformation and transport of resources, with links to industries, warehouses and consumers. The simulation itself is controlled by a time and events module, which manages the progress of the simulation, pauses and programmed actions. Interaction with the user takes place via a terminal-based module, with menus and messages to guide use. Finally, the system includes a logging and reporting module, which displays relevant information about the operation of the simulation and the behaviour of the elements on the map. These modules, although distinct, are tightly integrated to ensure smooth and coherent operation.

3.5 Product Structure Diagram

The domain diagram represents the main structure of the railway simulation and management system, organised around the central Map object, which defines the spatial arrangement of the elements in the scenario. The State class manages the global state of the simulation, including cities, trains, stations, lines and industries. Each city (City) contains Households that consume resources, while stations (Station) can be depots, terminals or control points, connected by railway lines (RailwayLine) with different characteristics (single, double, electrified). Trains are made up of locomotives and carriages, each with specific properties such as fuel, capacity and speed. Resources (ResourceType) circulate through the network and are produced or transformed by industries (Industry), which follow rules defined in Transformability and Transformation. The system also includes an event engine (Event, HistoricalEvent), feedback messages (Message) and resource flow records (‘ResourceFlow). The whole system is supported by a modular structure, with positions and map elements, allowing for the construction, expansion and simulation of a dynamic and interactive railway scenario.

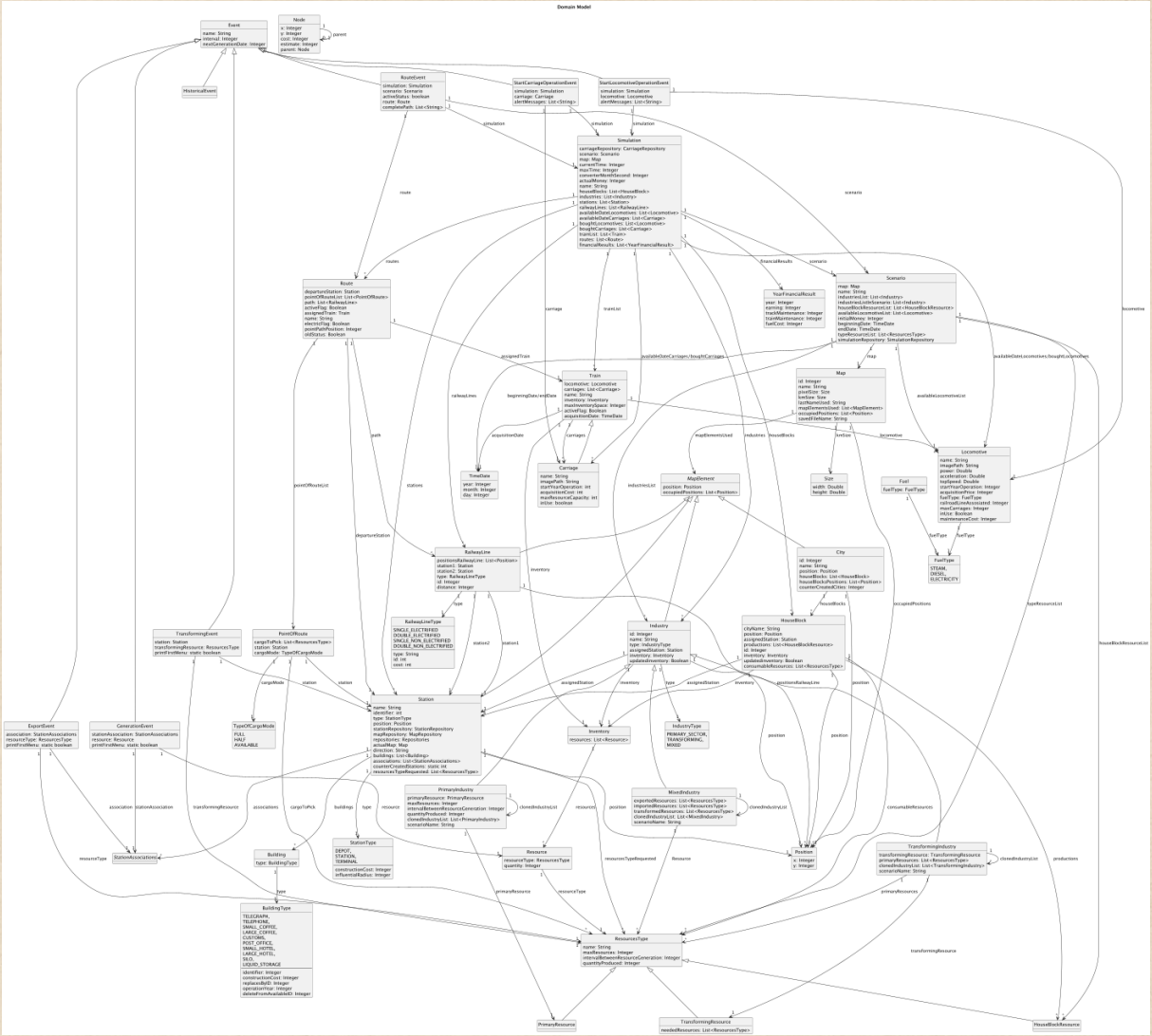

Figure 3.1: Domain Model

Chapter 4

System Requirements

In this part, the system requirements and the steps necessary to set up IntelliJ IDEA are provided. IntelliJ IDEA is a Java-based IDE, but it offers secondary support for many other languages, frameworks, and technologies. Ultimate and Community editions are available, each boasting extensive system compatibility.

4.1 Compatible Operating Systems and Environments

IntelliJ IDEA is compatible with the following environments:

- Windows: Windows 10 or later (64-bit systems only; includes service packs)
- macOS: macOS 11.0 (Big Sur) or later
- Linux: Distributions with glibc 2.17 or later and GTK+ 2.0 or higher (e.g., Ubuntu 20.04+)

Note: A GUI environment is required to use the full IDE features. A terminal/CLI is only used to launch or manage the application.

4.2 Software Dependencies and Plugins

- Java Development Kit (JDK):
  - JDK 17 or later is required for development (JDK 21 recommended for full feature compatibility)
- Required Plugins:
  - Core Java plugin is pre-installed
  - Additional plugins (e.g., Maven, Gradle, Kotlin, Spring) may be required depending on the project
- Bundled Runtime: IntelliJ IDEA includes JetBrains Runtime (based on OpenJDK), no separate Java installation is required to run the IDE itself.

4.3 Hardware Requirements

Component	Minimum Requirement
Processor	Dual-core CPU
RAM	4 GB (8 GB or more recommended)
Disk space	3 GB (for application files) + additional space for projects, caches, and plugins (10 GB recommended)
Display	1024×768 minimum resolution (1920×1080 recommended)
Internet	Required for plugin installation and updates

Table 4.1: Hardware Requirements

4.4 Installation Procedure

4.4.1 Windows

1. Download the .exe installer from the official JetBrains website.
2. Run the installer and follow the setup wizard.
3. Choose whether to add IntelliJ IDEA to the PATH and associate .java files.
4. Launch IntelliJ and install any necessary plugins during the initial setup.

4.4.2 macOS

1. Download the .dmg image.
2. Open the disk image and drag IntelliJ IDEA to the Applications folder.
3. Launch the application and follow the setup wizard.

4.4.3 Linux

1. Download the.tar.gz package from the website.
2. Extract the archive and run the idea.sh script inside the bin folder.
3. Optionally create a desktop entry for easier access.

4.5 Additional Technical Notes

IntelliJ IDEA does not require internet access to run basic projects, but internet is recommended for plugin installation, updates, and license verification (for Ultimate Edition). IntelliJ IDEA supports in-memory compilation and advanced features such as code completion, refactoring, and VCS integration. IntelliJ was tested with:

- IntelliJ IDEA 2023.3.2
- JetBrains Runtime based on OpenJDK 17

Chapter 5

Features

5.1 Main Menu

The Main Menu is the starting point of the application.

- Click **Do Login** to access the system.
- Click **Know Development Team** to view the team members.
- Click **Exit** to close the application.

Figure 5.1: Figure 1 – Main Menu

5.1.1 Login

5.3.1.1.1 Login

The user has two options to access the system:

1. **Create an account using custom credentials:**
   - Choose a user type: **Editor** or **Player**.
   - Enter a valid **email** and **password**
     Note: The password must have seven alphanumeric characters, including three capital letters and two digits.

- Click **Login** to sign in.

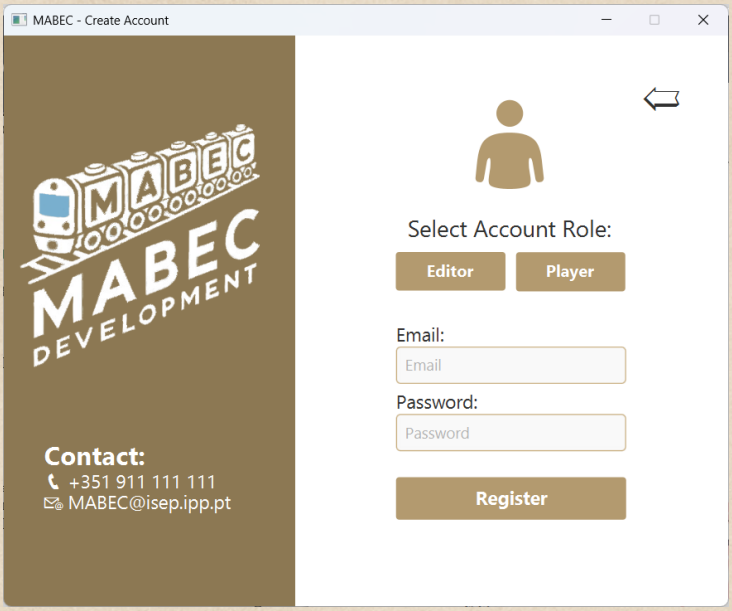

Figure 5.2: Figure 2 – Creat an Account and Login

2. **Use default credentials:**
   - **Editor:**
     - **Email:** editor@this.app
     - **Password:** edt
   - **Player:**
     - **Email:** player@this.app
     - **Password:** ply
3. Click **Login**.
4. If the credentials are valid:
   - The system redirects the user to the corresponding menu based on their role (e.g., **Editor Menu** or **Player Menu**).
5. If the credentials are invalid:
   - An **error message** is shown.
6. Click the **arrow icon** in the top-right corner to return to the Main Menu.

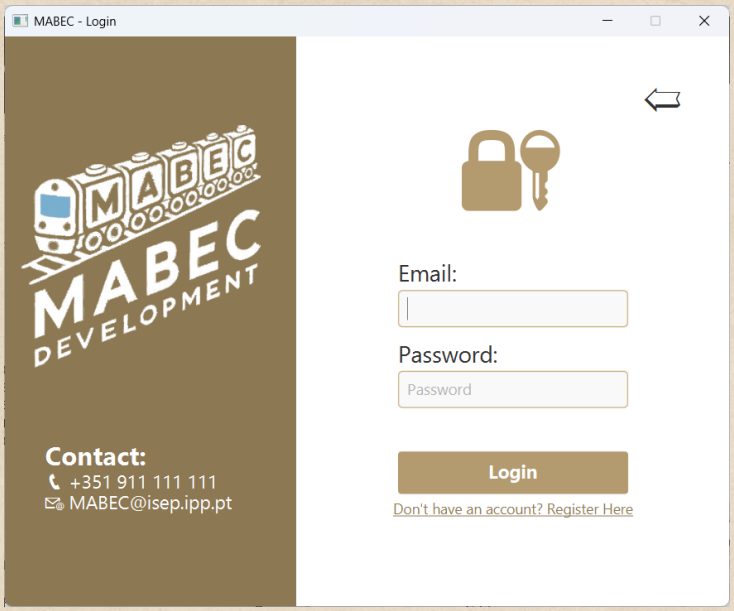

Figure 5.3: Figure 2 – Login

5.1.2 Know the Development Team

- Click **Know Development Team** to access the list of contributors.
- View each team member's **name** and **institutional email**.
- Use this section to learn more about the individuals involved in the application's development.

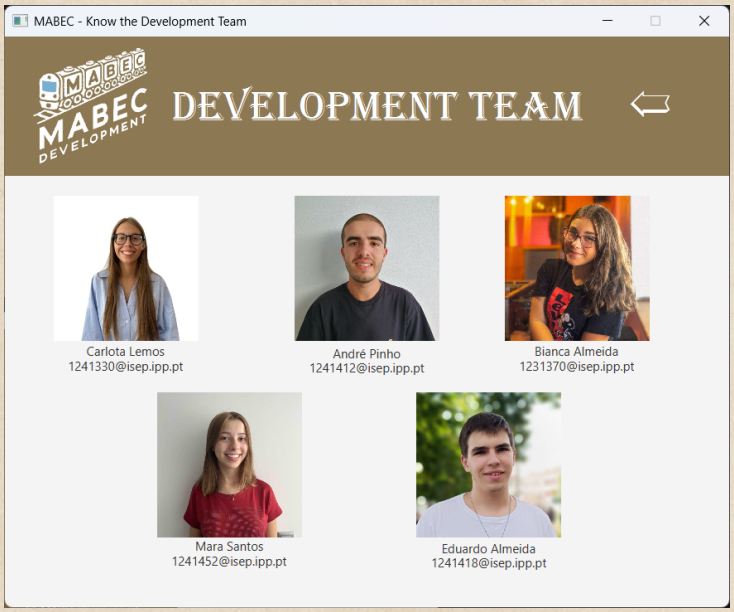

Figure 5.4: Know the Development Team

5.2 Editor Mode

The *Editor Mode* provides access to the application's editing functionalities.

- Click **Map** to manage maps.
- Click **Scenario** to manage simulation scenarios.

- Click **Logout** to return to the previous screen.

This menu provides access to all editor mode functionalities available in the system.

Figure 5.5: Figure 3 – Editor Mode Interface

5.2.1 Map Operations

The *Map Operations* menu provides access to all available actions related to map management.

- Click **Create a Map** to define a new map from scratch.
- Click **Show a Maps** to see the list of existing maps.
- Click **Edit a Map** to change the details of a selected map.
- Click **Delete a Map** to remove an existing map from the system.
- Click **Return** to go back to the Editor Mode menu.

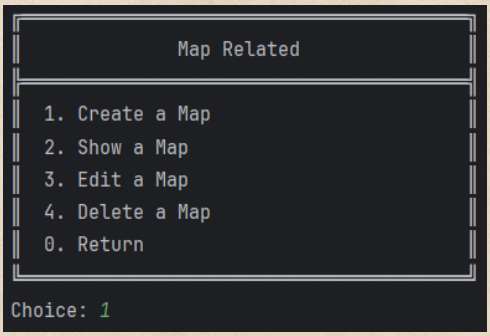

Figure 5.6: Figure 6 – Map Menu Options

5.1.1.1 Creating a Map

To create a new map:

1. Choose a name for the map.
    - You can either enter a custom name or accept the default suggestion (e.g., `map_1`).
    - If the default name already exists, the system automatically increments the suffix (e.g., `map_2`, `map_3`, etc.).

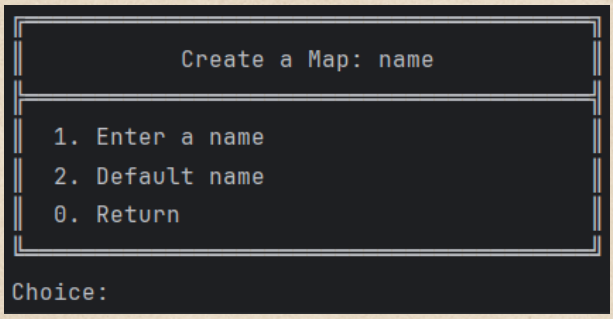

Figure 5.7: Figure 7 – Map Name Default

2. If entering a custom name:
   - Use only **alphanumeric characters** or **underscores**.
   - Do not use spaces, special characters, or accented letters.

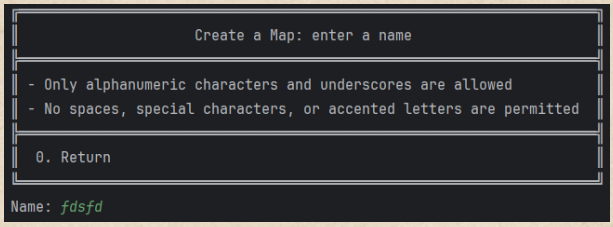

Figure 5.8: Figure 7 – Entering the Map Name

After naming the map, define its dimensions:

1. Enter the **width** of the map as an integer.
2. Enter the **height** of the map as an integer.
3. Confirm both values to proceed.
4. Enter 0 to **Return** at any time to go back to the previous menu.

These values determine the size of the map grid. Only integer values are accepted.

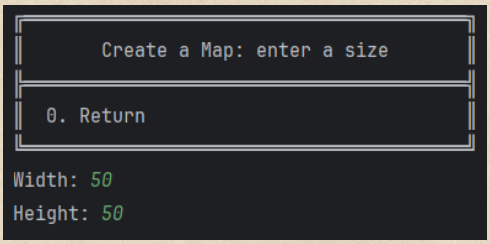

Figure 5.9: Entering Map Dimensions

After defining the map dimensions, confirm whether to save the new map:

1. Click **Yes** to save the map.
2. A confirmation message is displayed upon successful saving.
3. Review the displayed information to verify the map's name and dimensions.

This confirmation step ensures that the map has been created correctly before proceeding.

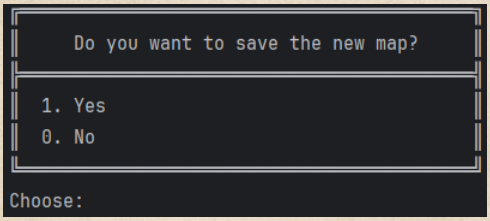

Figure 5.10: Confirmation on saving the map

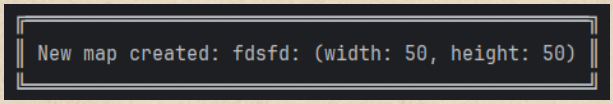

Figure 5.11: Confirmation Message

5.2.1.2. Showing a Map

To view existing maps:

1. Click **Show Map** in the Map Operations menu. (see Figure 5.6)
2. Review the list of available maps displayed by the system.
3. Identify each map by its **name** and **dimensions**.
4. Select a map to visualise its structure.

This feature allows quick access to all saved maps for verification or selection.

Figure 5.12: Select a Map to View

After selecting a map, proceed as follows to analyse its layout:

1. Observe the displayed visual grid representing the complete layout of the selected map.
2. Review the labelled axes, which indicate the map's width and height in kilometres.
3. Note that each pixel in the grid corresponds to one square kilometre.

This visualisation allows the user to clearly analyse the map's structure and spatial dimensions in an organised and intuitive way.

Figure 5.13: Graphical Map Display

5.2.1.3. Editing a Map

To begin editing a map, follow these steps:

1. Select the **Edit a Map** option from the map operations menu. (see Figure 5.6)
2. The system displays a list of all saved maps, each one showing its name and size.
3. Choose the map you want to modify from the list.

This step allows the user to access and prepare the map for further editing actions.

Figure 5.14: Select a Map to Edit

After selecting the desired map, follow the steps below to proceed with editing:

1. The system displays two editing options:
   - **Change Name** – modify the name of the selected map.
   - **Edit Buildings** – access and modify the buildings within the map.
2. Choose the desired editing option according to your needs.
3. If no changes are required, click **0** to return to the previous menu.

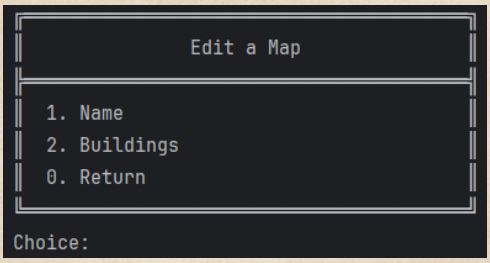

Figure 5.15: Editing Options: Name or Buildings

5.2.1.3.1. Name

To rename a selected map, follow the steps below:

1. Click on the **Name** option from the editing menu.
2. Enter a new name for the map in the input field.
3. Ensure the new name follows these criteria:
   - Use only alphanumeric characters and underscores.
   - Do not include spaces, special characters, or accented letters.
4. Confirm the input to apply the change.
5. If the name is valid, the system updates the map's name and displays a confirmation message showing the change from the previous name to the new one.

This confirmation ensures that the renaming process was successfully completed and provides immediate feedback to the user.

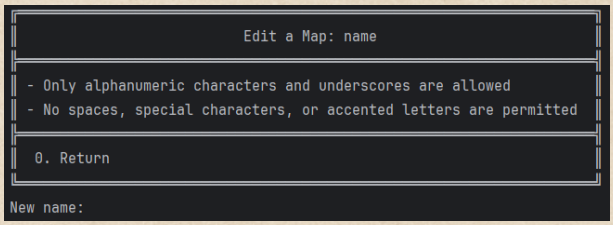

Figure 5.16: Edit Name

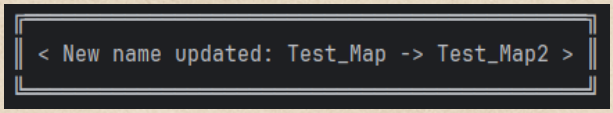

Figure 5.17: Edit Name Message

5.2.1.3.2 Buildings

To edit the buildings within a map, follow these steps:

1. Click on the **Buildings** option from the editing menu. (see the picture 5.15)
2. The system displays two building types:
   - **Industry**
   - **City**
3. Select the type of building you want to manage.

These options allow the user to access and modify the structural components of the map as needed.

Figure 5.18: Menu: Edit Buildings

5.2.1.3.2.1 Industry

To manage industrial buildings within the map:

1. Select the **Industry** option from the building types menu.
2. The system opens the Industry Operations menu with the following actions:
   - **Add Industry** – insert a new industry on the map.
   - **Remove Industry** – delete an existing industry from the map.

Figure 5.19: Menu: Add Industry or Remove Industry

5.2.1.3.2.1.1. Add Industry

To add a new industry to the map, follow these steps:

1. Select the **Add Industry** option from the Industry Operations menu.
2. Choose one of the available industry types:
   - **Primary Sector Industry**
   - **Transforming Industry**
   - **Mixed Industry**
3. Confirm the selection to place the chosen industry on the map.

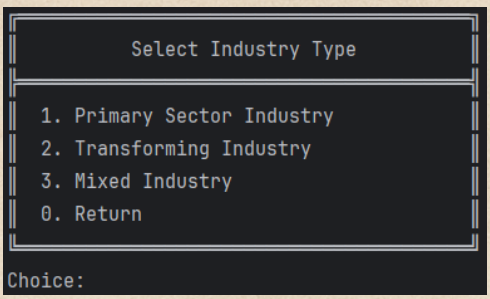

Figure 5.20: Menu: Add Industry - Industry Type

4. After selecting the type of industry, enter the required information:
   - **Name of the industry**
   - **Position on the map**, defined by the X and Y coordinates
5. Confirm the input to complete the addition process.

These inputs ensure that the new industry is correctly identified and positioned on the map.

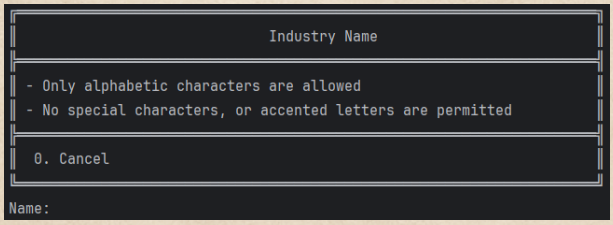

Figure 5.21: Menu: Add Industry - Industry Name

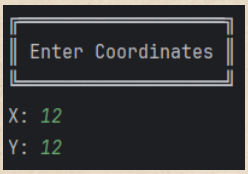

Figure 5.22: Menu: Add Industry - Position

6. A confirmation message is displayed showing all the entered data.
7. The newly added industry is also shown graphically on the map.

This confirmation step ensures that the industry has been successfully created and correctly positioned.

Figure 5.23: Add Industry: Confirmation Message

Figure 5.24: Industry Added to Map

5.2.1.3.2.1.2. Remove Industry

To remove an existing industry from the map, follow these steps:

1. Select the **Remove Industry** option from the Industry Operations menu (see Figure 5.19).
2. The system displays a list of all existing industries.
3. Choose the industry you want to remove from the list.

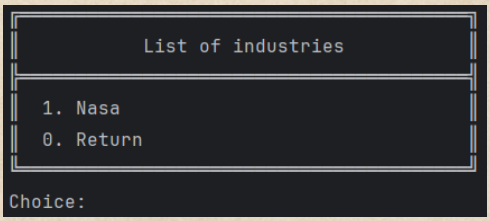

Figure 5.25: List of Industries to Remove

4. After selecting the industry, a confirmation prompt appears asking if you are sure about deleting the selected industry.
5. Click **Yes** to confirm the removal.
6. The system displays a final message indicating that the industry has been successfully removed.

This confirmation process ensures that deletions are intentional and prevents accidental data loss.

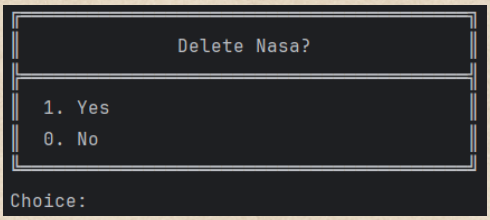

Figure 5.26: Industry Removed from the Map Confirmation

```
< Industry Nasa removed from map >
```

Figure 5.27: Industry Removed from the Map Message

5.2.1.3.2.2. City

Selecting the **City** option opens the **City Operations** menu, which includes the following options:

1. Add City
2. Edit City
3. Remove City

```
City Operations

1. Add City
2. Edit City
3. Remove City
0. Return

Choice:
```

Figure 5.28: Menu: City Operations

5.2.1.3.2.2.1. Add City

To add a new city to the map, follow these steps:

1. Select the **Add City** option from the City Operations menu.
2. Enter the required information:
   - **Name of the city**
   - **Position on the map**, defined by the X and Y coordinates
3. Confirm the input to place the new city on the map.

```
Create a City: name

- Only alphabetic characters are allowed
- No special characters, or accented letters are permitted

0. Cancel

Name:
```

Figure 5.29: Add City: Name

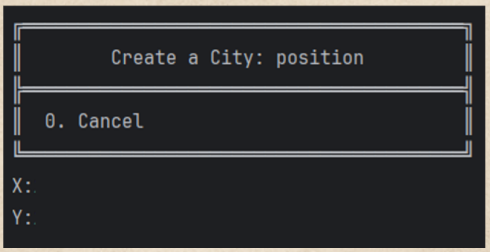

Figure 5.30: Add City: Position

5.2.1.3.2.2.1.1. Automatic House Blocks

To generate houses automatically, follow these steps:

1. Select the option to generate houses automatically.
2. When prompted, enter the number of houses to be created.
3. Confirm the operation.

Once confirmed, the system displays a success message and shows the updated city map with the newly created houses.

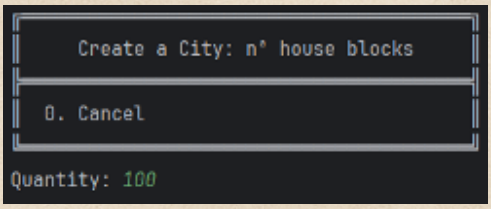

Figure 5.31: Add City: Automatic House Blocks

Figure 5.32: Add City: House Block Automatic - Success Message

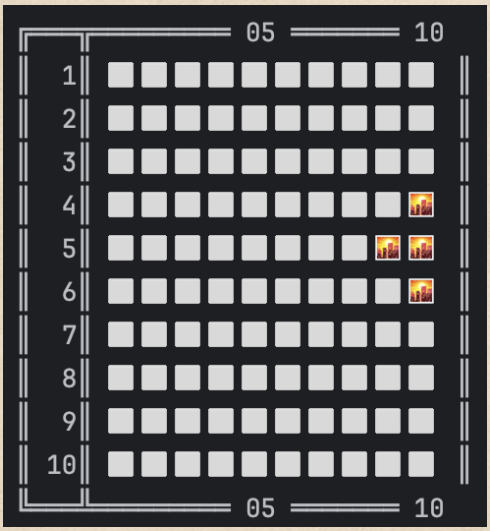

Figure 5.33: Add City: Map

5.2.1.3.2.2.1.2. Manual House Blocks

To place houses manually, follow these steps:

1. Select the manual placement option.
2. Enter the position coordinates for each house.
3. Repeat the process until the value `0` is entered to indicate the end of input.

After the input ends, a confirmation message is displayed confirming the successful creation of the city.

Note: If a house is placed too far from the city centre, a warning message is displayed to alert the user.

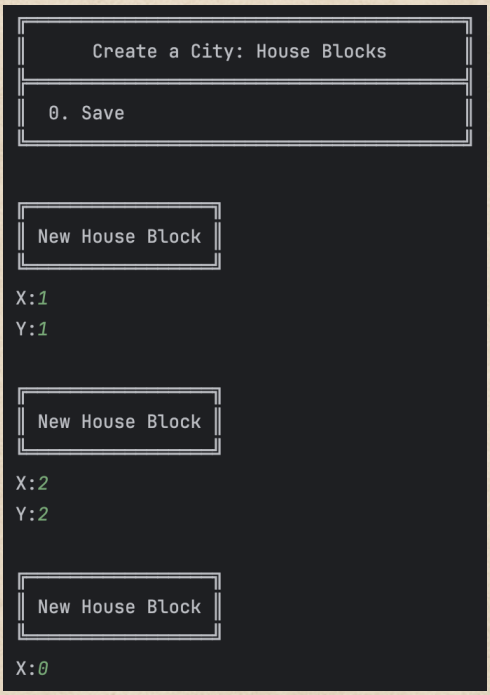

Figure 5.34: Add City: Manual House Blocks

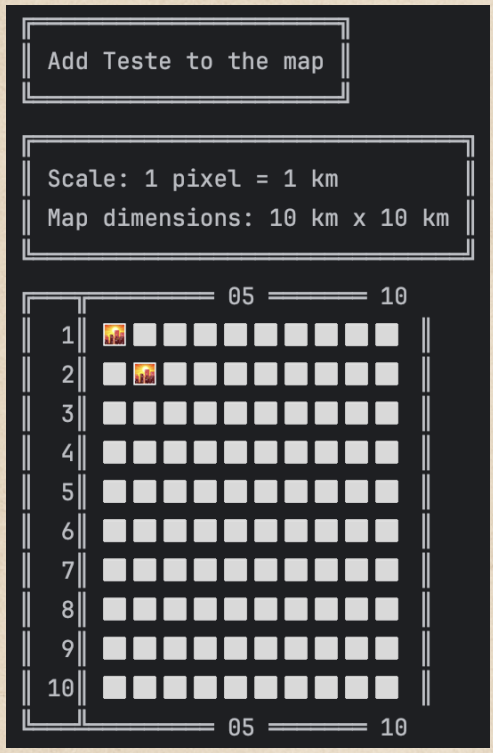

Figure 5.35: Add City: House Block Manual - Success Message

5.2.1.3.2.2.2. List City

To view detailed information about a specific city:

1. Select a city from the list.

The system then displays the following details:

- **City name**
- **Position**
- **Number of houses**

Figure 5.36: List of Created Cities

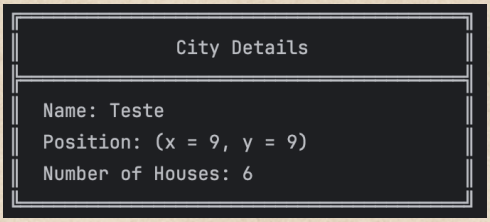

Figure 5.37: Selected City Details

5.2.1.3.2.2.3. Remove City

To remove a city from the map, follow these steps:

1. A list of all available cities is displayed (see Figure 5.38).
2. Select the city you want to remove.
3. A confirmation dialog is shown asking for deletion confirmation (see Figure 5.39).
4. If confirmed, the selected city is removed from the map.
5. A success message is displayed (see Figure 5.40).

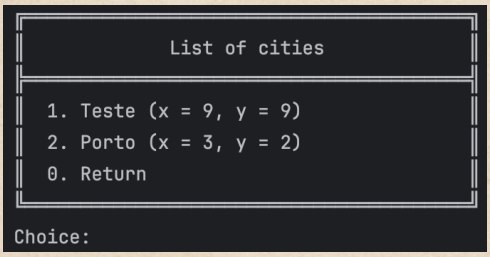

Figure 5.38: List of Cities to Remove

Figure 5.39: Confirmation: Remove City

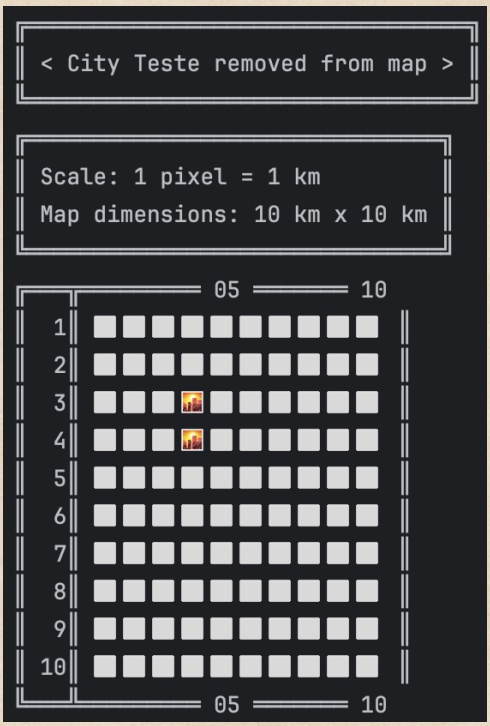

Figure 5.40: Success Message: Remove City

5.2.1.4. Remove Map

To remove a map from the system, follow these steps:

1. A list of all available maps is displayed (see Figure 5.41).
2. Select the map you want to remove.
3. A confirmation prompt is shown asking for deletion confirmation (see Figure 5.42).
4. If confirmed, the selected map is deleted.
5. A success message is displayed to confirm the removal.

```
╔═══════════════════════════════════╗
║                List of maps       ╒
╔═══════════════════════════════════╗
╒  1. Map_1: (width: 10, height: 10) ╒
╒  0. Return                        ╒
╔═══════════════════════════════════╗

Choice:
```

Figure 5.41: List of Maps to Remove

```
╔═══════════════════════════════╗
║     Do you want to delete it?  ╒
╔═══════════════════════════════╗
╒  1. Yes                       ╒
╒  0. No                        ╒
╔═══════════════════════════════╗

Choice: 1
```

Figure 5.42: Confirmation: Remove Map

5.2.2 Scenario

To manage scenarios, follow the steps below:

1. Enter the **Scenario** menu. A list of available maps is displayed (see Figure 5.43).
2. Select a map from the list.
3. After selection, the following options become available:
   - Create a Scenario
   - Show a Scenario
   - Delete a Scenario

```
╔═══════════════════════════════════╗
║                List of maps       ╒
╔═══════════════════════════════════╗
╒  1. Map_1: (width: 20, height: 20) ╒
╒  0. Return                        ╒
╔═══════════════════════════════════╗

Choice: 1
```

Figure 5.43: Scenario: List of Maps

```
╔═══════════════════════════════════╗
║                                   ╒
│          Scenario Related         │
╘                                   ╘
╔═══════════════════════════════════╗
│  1. Create a Scenario             │
│  2. Show a Scenario               │
│  3. Delete a Scenario             │
│  0. Return                        │
╚═══════════════════════════════════╝
Choice: 1
```

Figure 5.44: Scenario Options: Create, Show, or Delete a Scenario

5.2.2.1. Create a Scenario

To create a new scenario, follow these steps:

1. Enter a name for the scenario. The following constraints apply:
   - Only alphanumeric characters and underscores are allowed.
   - Spaces, special characters, and accented letters are not permitted.

   (See Figure 5.45)
2. Define the initial amount of money available in the scenario (See Figure 5.46).
3. Set the simulation period by entering the start and end dates. This period is used by the simulator to define its runtime and filter relevant elements (See Figure 5.47).
4. Select the types of locomotives available in the scenario. A list is displayed, and the user must select at least one locomotive type (See Figures 5.48 and 5.49).

```
╔═══════════════════════════════════╗
║                                   ╒
│   Create a Scenario: enter a name │
╘                                   ╘
╔═══════════════════════════════════╗
│ - Only alphanumeric characters and underscores are allowed
│ - No spaces, special characters, or accented letters are permitted
╘                                   ╘
╔═══════════════════════════════════╗
│  0. Return                        │
╚═══════════════════════════════════╝
Name: Scenario_1
```

Figure 5.45: Scenario: Enter Scenario Name

```
╔═══════════════════════════════╗
║                               ╒
│        Initial money          │
╘                               ╘
╔═══════════════════════════════╗
│  0. Return                    │
╚═══════════════════════════════╝
Initial money: 10000
```

Figure 5.46: Scenario: Set Initial Money

```
╔═══════════════╗
║               ╒
│     Date      │
╘               ╘
╔═══════════════╗
│  0. Return    │
╚═══════════════╝
Beginning Date (DD-MM-YYYY or 0 to cancel): 01-01-1990
Ending Date (DD-MM-YYYY or 0 to cancel): 01-01-2000
```

Figure 5.47: Scenario: Enter Beginning Date and Ending Date

```
Choose locomotive types to make available

1. STEAM
2. DIESEL
3. ELECTRICITY

Choice: 1
```

Figure 5.48: Scenario: Select One Locomotive

```
Choose locomotive types to make available

1. DIESEL
2. ELECTRICITY
0. Save

Choice: 0

< Locomotive types configured successfully >
```

Figure 5.49: Scenario: Select Another Locomotive or Save

5.2.2.1.1. Configurations Resources

The user is presented with a configuration menu, where they can choose between the default settings, a modified configuration, or return to the previous screen. Upon selection, the corresponding action is executed.

```
Configuration Resources

1. Default configuration
2. Modified configuration
0. Return

Choice:
```

Figure 5.50: Configurations Resource: Menu

5.2.2.1.1.1. Default Configuration

Select the type of house block resources to include in the scenario. At least one option must be selected:

- **Passenger**
- **Mail**

```
Choose house block resources to make available

1. Passenger (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
2. Mail (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)

Choice: 1

Choose house block resources to make available

1. Mail (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
0. Save

Choice: 0

< House block resources configured successfully >
```

Figure 5.51: House Blocks Resources Available

5.2.2.1.2.1. Primary Sector Industry

Select the resource to be generated by all primary industries. A confirmation message is shown afterward.

```
Generation in the Nasa industry

1. Coal (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
2. Iron (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
3. Lumber (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
4. Grain (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
5. Cattle (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
6. Oil (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
7. Copper (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
8. Gold (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
9. Silver (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
10. Sulfur (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
11. Lead (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)

Choice:
```

Figure 5.52: Generation in the Primary Industry

```
< Resource Coal configured successfully in the Nasa industry >
```

Figure 5.53: Generation in the Primary Industry: Confirmation Message

5.2.2.1.2.2. Transforming Industry

Select the resource to be processed by transforming industries. A confirmation message is displayed.

```
Transformation in the Audi industry

1. Steel: (Coal + Iron)
2. Lumber Goods: (Lumber)
3. Food: (Cattle)
4. Oil Goods: (Oil)
5. Lead Goods: (Lead)
6. Jewellery: (Gold)
7. Chemical: (Sulfur)
8. Beer: (Grain)
9. Electronic: (Copper + Chemical)
10. Car: (Steel + Electronic)
11. Plastics: (Chemical)
12. Furniture: (Lumber Goods)

Choice: 4
```

Figure 5.54: Generation in the Transforming Industry

```
< Resource Oil Goods configured successfully in the Audi industry >
```

Figure 5.55: Transforming Industry: Confirmation Message

5.2.2.1.2.3. Mixed Industry

Configure the behavior of mixed industries. At least one of the following options must be selected:

- **Import**
- **Export**
- **Transformation**

```
Generation in the Mercadona industry

1. Import
2. Export
3. Transformation

Choice:
```

Figure 5.56: Mixed Industry Configuration

5.2.2.1.2.3.1. Import

View and select all resources available for import.

```
Import in the Mercadona industry

1. Coal (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
2. Iron (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
3. Lumber (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
4. Grain (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
5. Cattle (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
6. Oil (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
7. Copper (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
8. Gold (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
9. Silver (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
10. Sulfur (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
11. Lead (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
12. Steel (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
13. Lumber Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
14. Food (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
15. Oil Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
16. Lead Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
17. Jewellery (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
18. Chemical (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
19. Beer (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
20. Electronic (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
21. Car (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
22. Plastics (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
23. Furniture (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
0. Return

Choice:
```

Figure 5.57: Import in the Mixed Industry

5.2.2.1.2.3.2. Export

View all resources available for export.

```
Export in the Mercadona industry

1. Iron (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
2. Lumber (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
3. Grain (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
4. Cattle (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
5. Oil (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
6. Copper (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
7. Gold (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
8. Silver (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
9. Sulfur (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
10. Lead (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
11. Steel (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
12. Lumber Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
13. Food (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
14. Oil Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
15. Lead Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
16. Jewellery (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
17. Chemical (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
18. Beer (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
19. Electronic (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
20. Car (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
21. Plastics (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
22. Furniture (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
0. Return

Choice: 2
```

Figure 5.58: Export in the Mixed Industry

5.2.2.1.2.3.3. Transformation

View all resources that can be transformed by mixed industries.

```
Transformation in the Mercadona industry

1. Steel (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
2. Lumber Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
3. Food (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
4. Oil Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
5. Lead Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
6. Jewellery (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
7. Chemical (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
8. Beer (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
9. Electronic (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
10. Car (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
11. Plastics (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
12. Furniture (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
0. Return

Choice: 1
```

Figure 5.59: Transformation in the Mixed Industry

After completing the configuration, the system prompts to save the scenario. If confirmed, the scenario is saved and a success message is displayed.

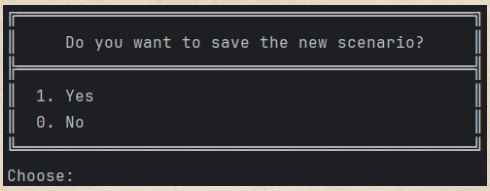

Figure 5.60: Save Scenario Confirmation

Figure 5.61: Scenario Saved Successfully

5.2.2.1.1.2. Modified Configuration

Select this option to modify default scenario parameters such as resource generation behavior. For each resource, the following parameters can be configured:

- Maximum resource storage
- Interval between generations
- Quantity produced per generation

Figure 5.62: Modified Configuration Overview

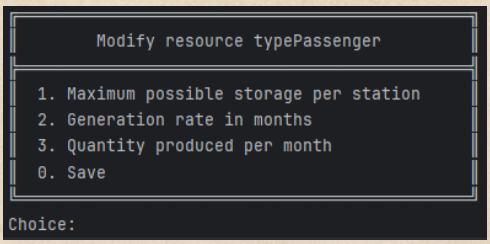

Figure 5.63: Modify Resource Type Configuration

5.2.2.1.1.3. Maximum Possible Storage per Station

Set a new value for the maximum storage per station. A confirmation message follows the update.

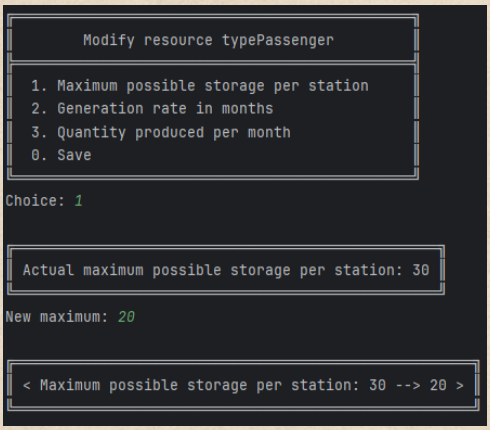

Figure 5.64: Maximum Storage Per Station

5.2.2.1.1.4. Generation Rate in Months

Specify the generation interval (in months). A confirmation is shown after saving.

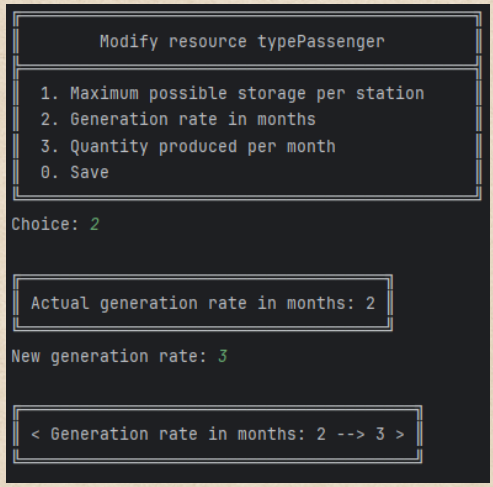

Figure 5.65: Generation Rate in Months

5.2.2.1.1.5. Quantity Produced per Month

Enter the new monthly production quantity. A confirmation message is displayed.

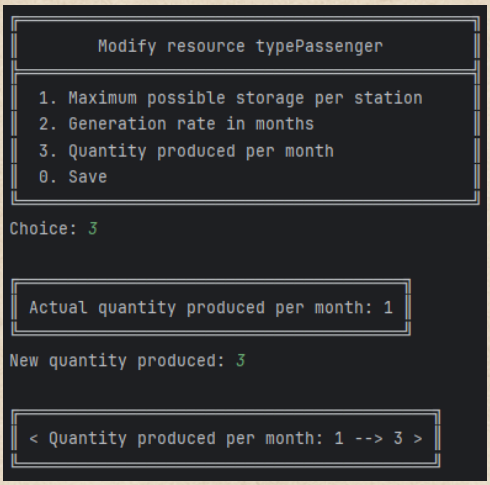

Figure 5.66: Quantity Produced Per Month

5.2.2.2. Show a Scenario

To view the details of a scenario, follow these steps:

1. Enter the "Show Scenario" menu option to display a list of all available maps (see Figure 5.44).

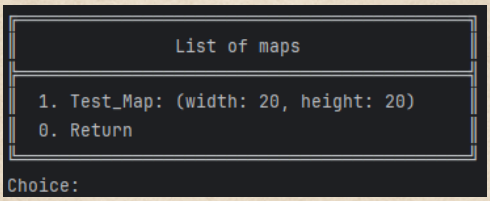

Figure 5.67: List of Maps

2. Select the desired map. The system displays all scenarios created for that map.

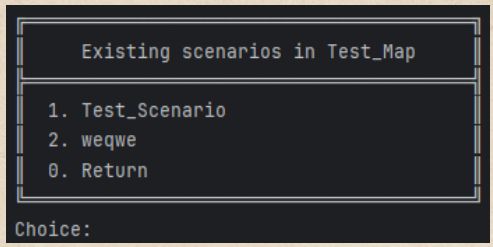

Figure 5.68: List of Created Scenarios

3. Select a scenario. The system shows its initial configuration data.

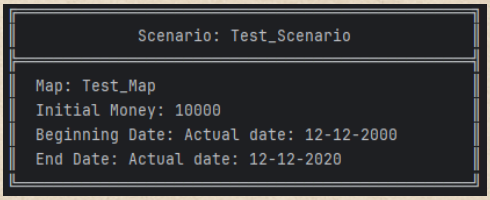

Figure 5.69: Scenario Initial Details

4. To view additional scenario data, access the following configuration options:
   - Resources Configurations
   - House Blocks Configurations
   - Industries Configurations

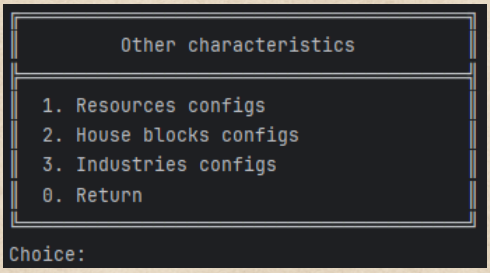

Figure 5.70: Scenario Other Configuration Details

5.2.2.2.1. Resources Configurations

The system provides a standardized configuration for all available resources. Each resource shares the same production behavior and storage constraints.

1. Each resource has a maximum storage capacity of 30 units.
2. Resources are generated at a fixed interval of 2 time units.
3. Each generation cycle produces exactly 1 unit of the corresponding resource.
4. Resources are configured with these parameters (see Figure 5.71).
5. No resource exceeds the defined limits. Resource generation halts once the storage reaches 30 units.

```
Resources configurations

Passenger (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Mail (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Coal (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Iron (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Lumber (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Grain (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Cattle (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Oil (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Copper (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Gold (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Silver (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Sulfur (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Lead (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Steel (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Lumber Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Food (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Oil Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Lead Goods (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Jewellery (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Chemical (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Beer (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Electronic (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Car (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Plastics (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Furniture (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
```

Figure 5.71: Resources Configurations

5.2.2.2.2. House Blocks Configurations

House blocks are configured to produce specific resources at regular intervals. These resources follow a consistent generation pattern and are subject to defined storage limits.

1. Each house block resource has a maximum storage capacity of 30 units.
2. Resources are generated every 2 time units.
3. Each generation cycle produces exactly 1 unit.
4. The resources produced by house blocks are:
   - Passenger
   - Mail
5. Resource generation stops when the storage limit of 30 units is reached.

```
House blocks resources

Passenger (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
Mail (Max resources storage: 30, Interval between resource generation: 2, Quantity produced per generation: 1)
```

Figure 5.72: House Blocks Configurations

5.2.2.2.3. Industries Configurations

Industries are responsible for generating specific resources over time. Each industry follows a predefined production model with fixed parameters.

1. Each industry resource has a maximum storage capacity of 30 units.
2. Resource generation occurs every 2 time units.
3. Each generation cycle produces exactly 1 unit.
4. The industry is configured to generate the following resource:
   - Coal
5. Resource generation pauses once the storage capacity of 30 units is reached.

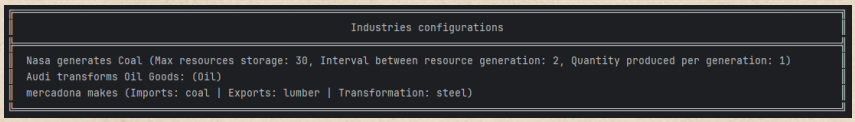

Figure 5.73: Industries Configurations

5.2.2.3. Delete a Scenario

To delete a scenario, follow the steps below:

1. Enter the "Delete Scenario" menu option to view a list of all available maps (see Figure 5.44).

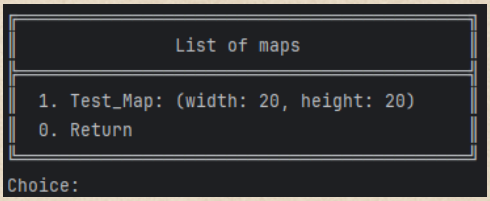

Figure 5.74: List of Maps

2. Select the desired map. The system displays all scenarios associated with that map.

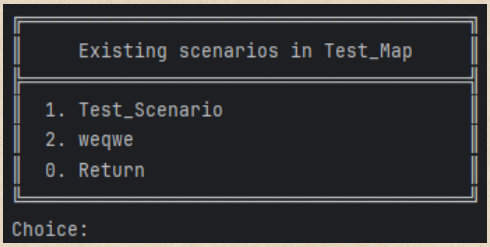

Figure 5.75: List of Created Scenarios

3. Select the scenario you want to delete. A confirmation prompt appears asking if you are sure you want to delete the scenario.
4. The system also informs that deleting the scenario will permanently delete the corresponding simulation.

5. Select "Yes" to confirm. The system deletes the scenario and displays a success message.

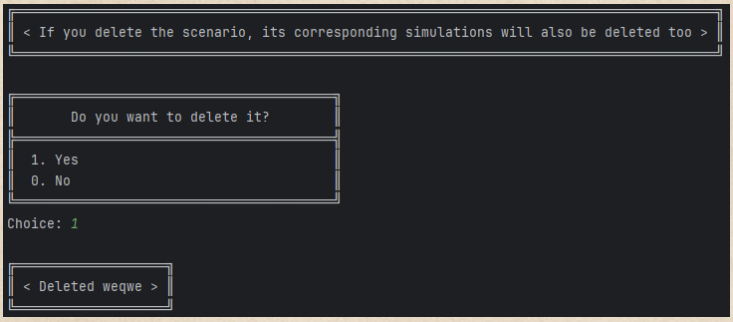

Figure 5.76: Scenario Deletion Confirmation

5.3 Player Mode

When you log in with a **Player** account, you enter **Player Mode**, where you have two options:

- Simulation
- Verify Routes

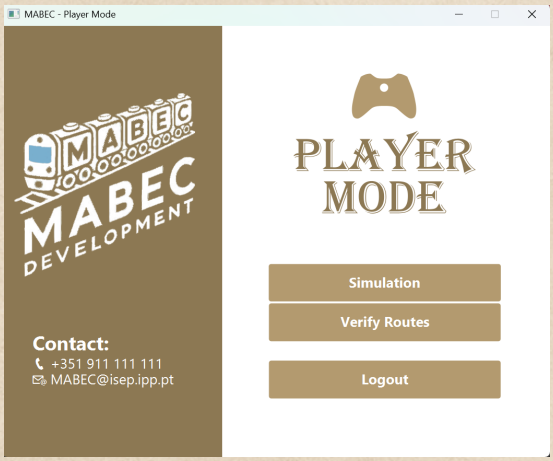

Figure 5.77: Player Mode

5.3.1 Simulation

To start a simulation, follow the steps below:

1. Enter the "Simulation" menu option to display a list of all available maps.

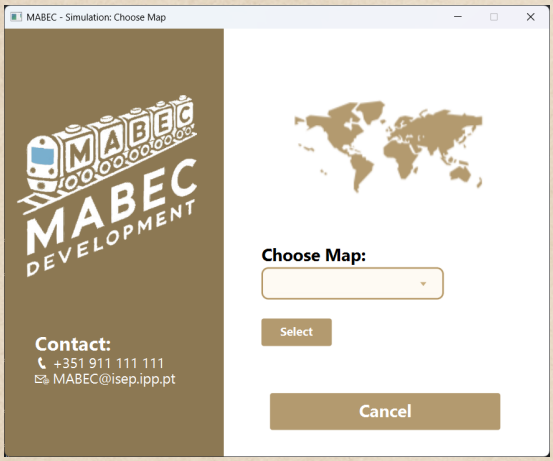

Figure 5.78: List of Maps

2. Select a map. The system shows all scenarios available for the selected map.

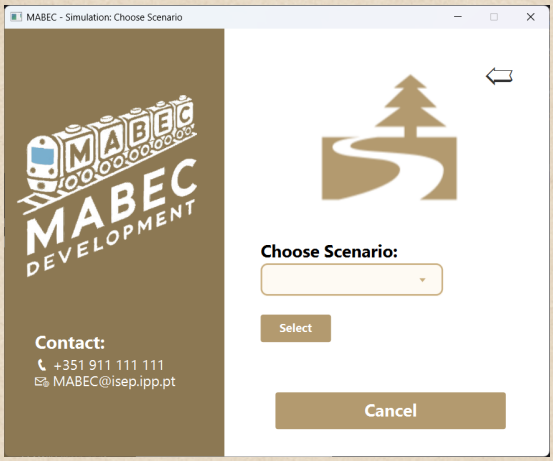

Figure 5.79: List of Scenarios Available in Map

3. After choosing the map and scenario, access the simulation menu. You can create, choose, or delete a simulation.

Figure 5.80: Simulation Menu

5.3.1.1. Create Simulation

To create a new simulation:

1. Select the **Create Simulation** option.
2. Enter a name for the new simulation when prompted.

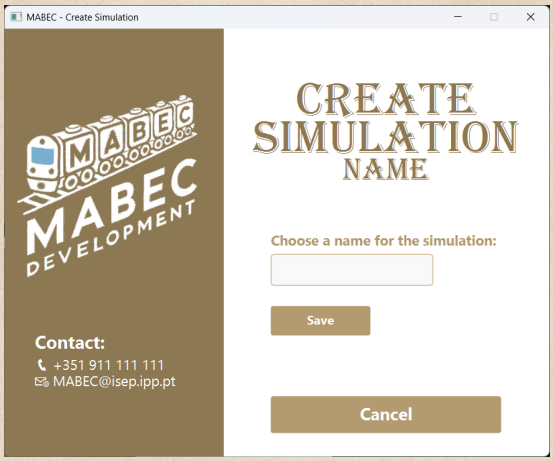

Figure 5.81: Create Simulation

5.3.1.2. Choose Simulation

To choose an existing simulation:

1. Select the **Choose Simulation** option.
2. Select one simulation from the displayed list.

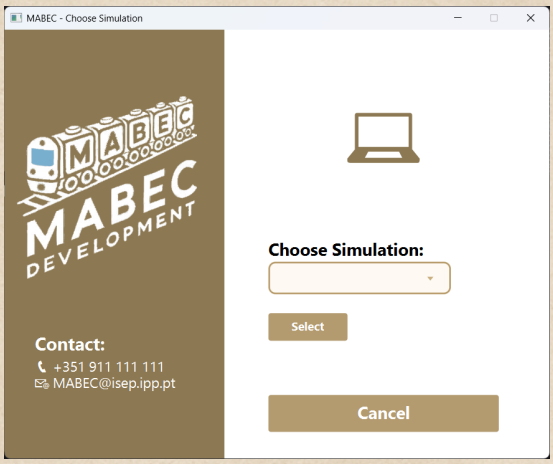

Figure 5.82: Choose Simulation

5.3.1.3. Delete Simulation

To delete a simulation:

1. Select the **Delete Simulation** option.
2. Choose one simulation from the list.
3. Confirm the deletion when prompted. The system warns that this action is irreversible.

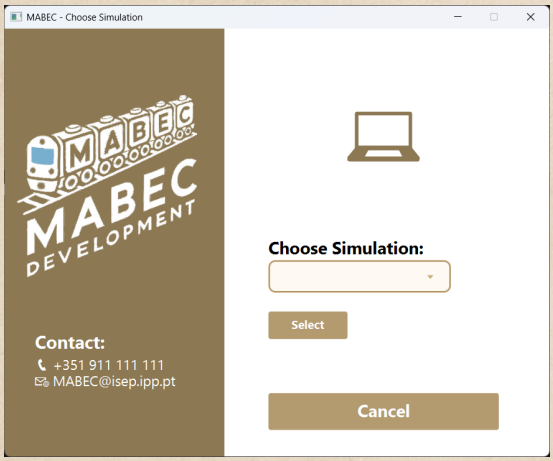

Figure 5.83: Delete Simulation

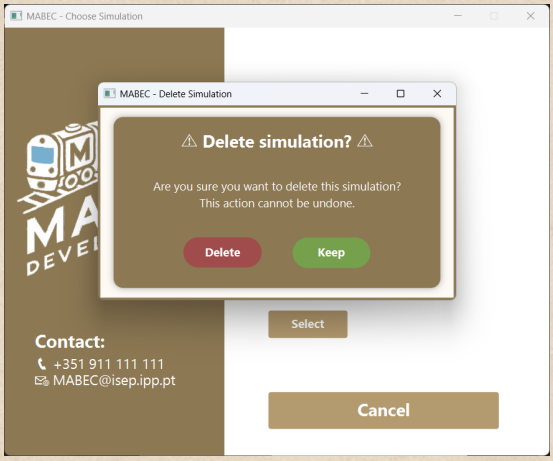

Figure 5.84: Delete Simulation Message

5.3.1.4. Run Simulation

For every 2 seconds in real time, 1 month passes in the simulation.

While the simulation is running, the following activities occur:

- Industries produce resources, which are stored in stations.
- The **Manufacturing** section shows the products processed and stored by industries.
- The **Export** section displays the products exported from industries.
- The **Route Events** section lists delivered resources, their quantity, season of delivery, earned money, and updated account balance.

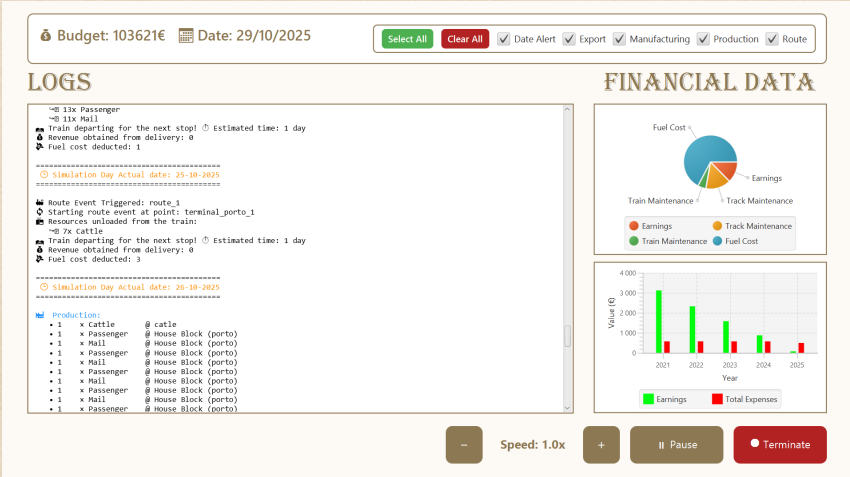

Figure 5.85: Simulation

5.3.1.4.1. Pause Menu

Press **Pause** during the simulation to access the pause menu. The following options are available:

- **Continue Program** – Resumes the simulation from the paused state.
- **Station Related** – Opens a submenu to manage all station-related operations.
- **Train Related** – Opens a submenu to manage all train-related operations.
- **Railway Line Related** – Opens a submenu to manage railway lines: create, remove, upgrade, and list.
- **Route Related** – Opens a submenu to create and manage transport routes.
- **View Financial Historical** – The "View Financial Historical" button opens a screen displaying the yearly financial summary of the simulation. It shows earnings, expenses (track, train, fuel), and net results. Pie and bar charts provide a clear visual analysis and yearly comparison.
- **Show Map** – Displays the full map, showing all stations, routes, and trains.

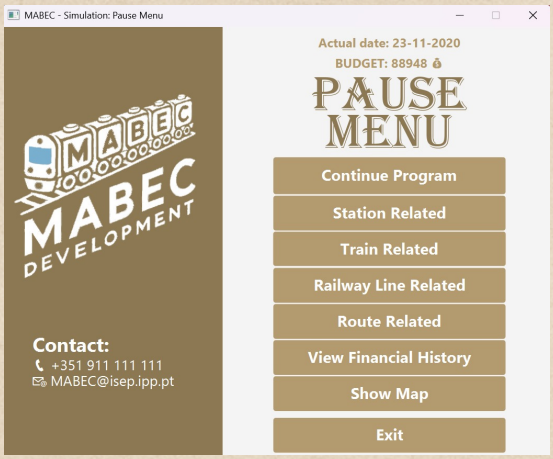

Figure 5.86: Pause - Resume Menu

5.3.1.4.2. Station Related

Select **Station Related** to manage all aspects of stations in the simulation. The following options are available:

- **Add Station** – Add a new station by selecting its type, position, direction, and name.
- **Show Station List** – Display a list of all existing stations, including their type, location, and current stored resources.
- **Remove Station** – Delete an existing station from the simulation. This action is irreversible.
- **Edit Station** – Modify station details, such as name, direction, or resource handling properties.

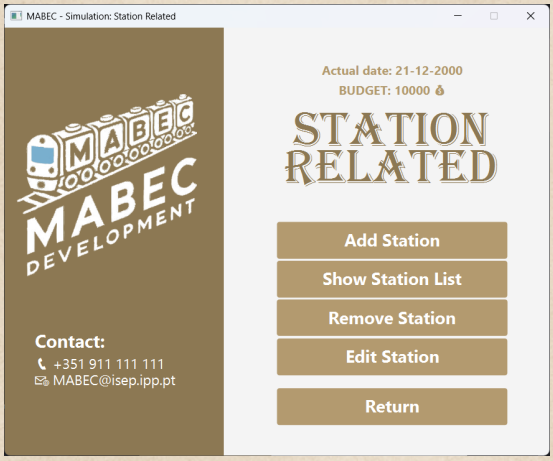

Figure 5.87: Resume Menu - Station Related

5.3.1.4.2.1. Add Station

To add a new station:

1. Select a station type from the list. Each type includes its name and associated cost (see Figure 5.88).
2. Provide the required station information:
   - **Position (x, y)** – Define the exact location for the station on the map (see Figure 5.89).
   - **Direction** – Choose the direction the station faces: North, South, East, or West (see Figure 5.90).
   - **Name** – Use the default suggested name or input a custom name (see Figure 5.91).
3. A confirmation message is shown upon creation.

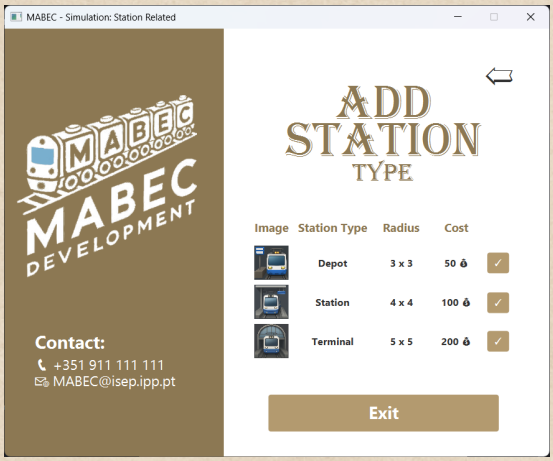

Figure 5.88: Add Station - Select Station Type

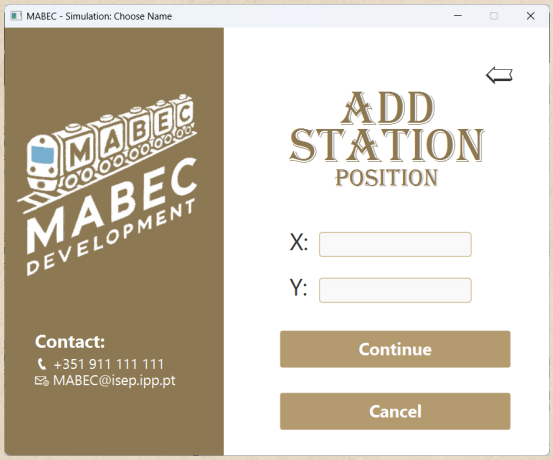

Figure 5.89: Add Station - Enter Positions

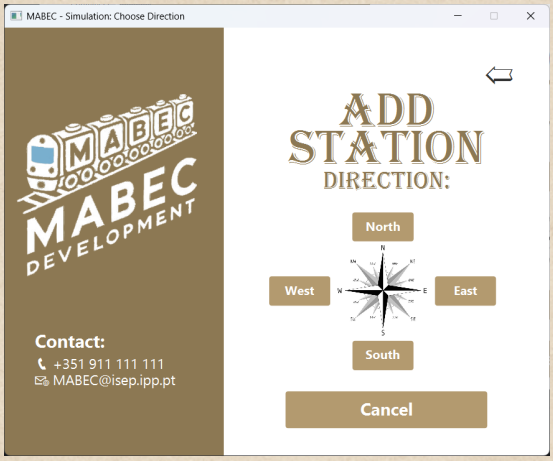

Figure 5.90: Add Station - Select Direction

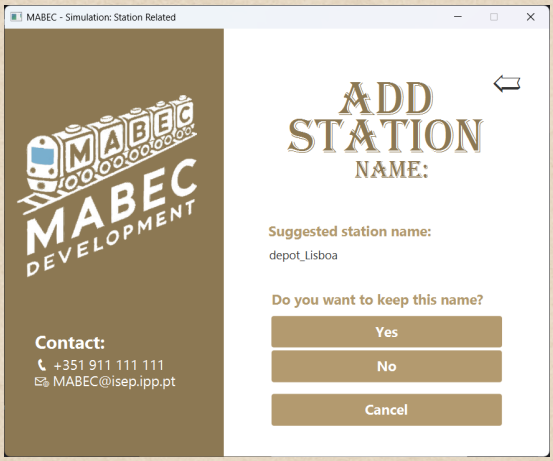

Figure 5.91: Add Station - Choose Station Name

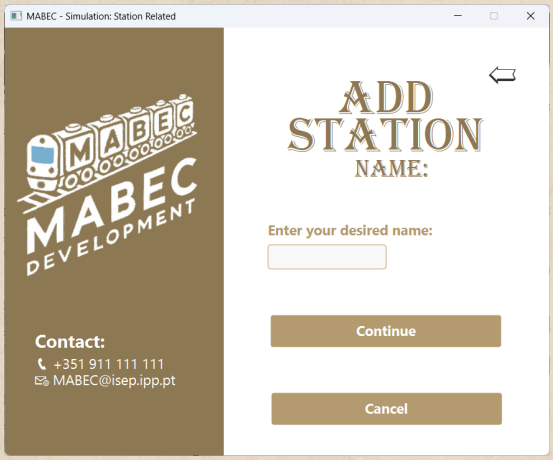

Figure 5.92: Add Station - Choose Station Desired Name

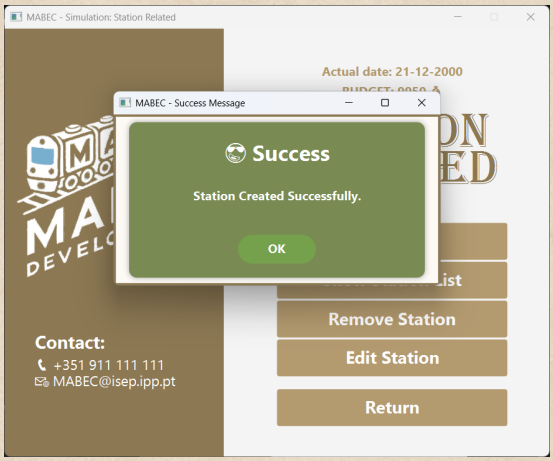

Figure 5.93: Add Station - Success Message

5.3.1.4.2.2. Show Station List

Select **Show Station List** to display all available stations. The list shows each station's name and position on the map.

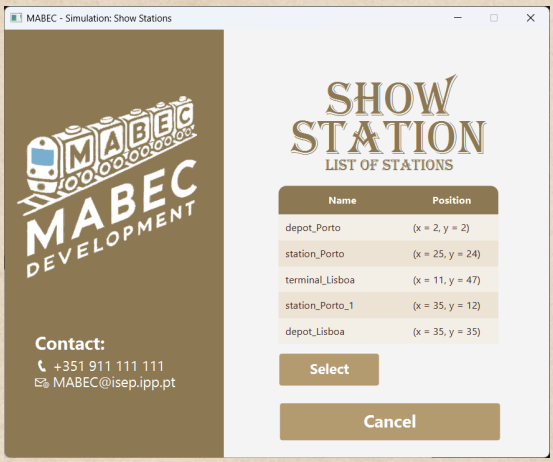

Figure 5.94: Show Available Stations List

After selecting a station from the list, the system displays detailed information about the station, including:

- Name – The station's name.
- Position (x, y) – The station's coordinates on the map.
- Type – The type of station.
- Direction – The station's facing direction.
- Buildings – Buildings associated with the station.
- Cargoes – Types of cargo handled by the station.

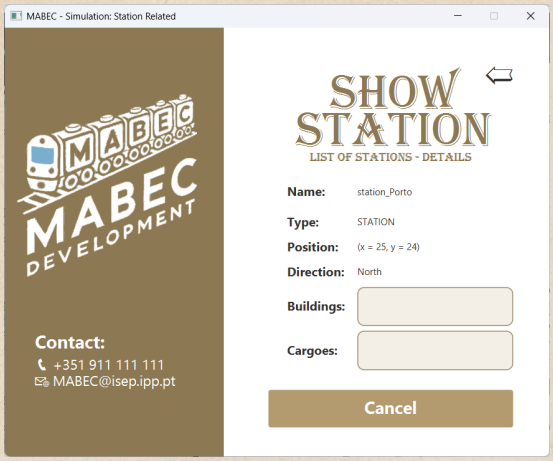

Figure 5.95: Station Details

5.3.1.4.2.3. Remove Station

Select **Remove Station** to display a list of all available stations, showing their name and position on the map.

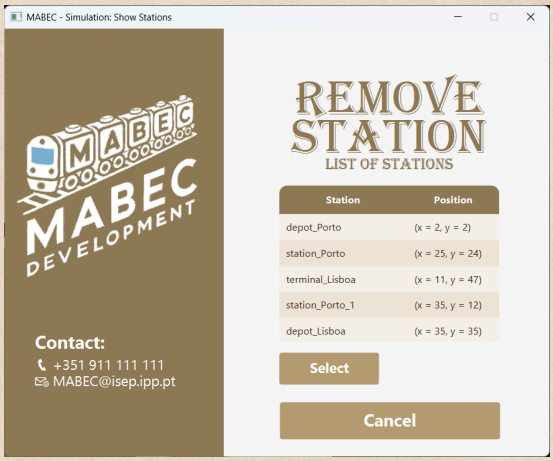

Figure 5.96: Remove Station: Available Stations List

1. Choose the station you want to remove.
2. A confirmation prompt appears asking if you really want to delete the selected station.
3. Select **Yes** to confirm the removal.
4. A success message appears confirming that the station has been deleted.

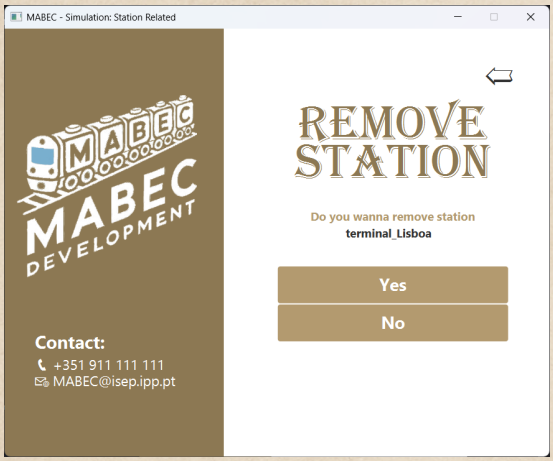

Figure 5.97: Remove Station: Confirmation

5.3.1.4.2.4. Edit Station

Select **Edit Station** to display a list of all available stations, showing their name and position on the map.

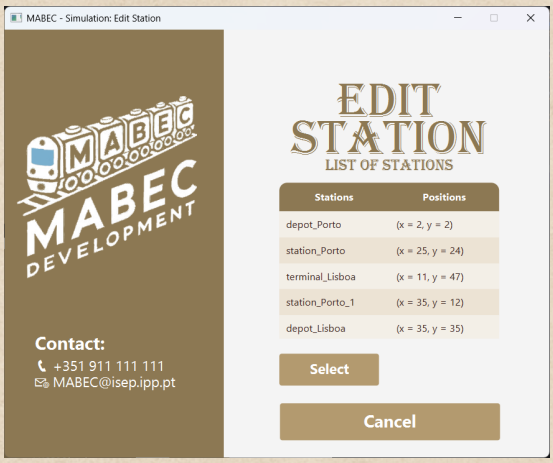

Figure 5.98: Edit Station: Available Stations List

Choose a station to edit. The system provides three editing options:

- **Edit Name** – Change the station's name.
- **Add Buildings** – Add new buildings to the station.
- **Evolve Station Type** – Upgrade the station to a new type.

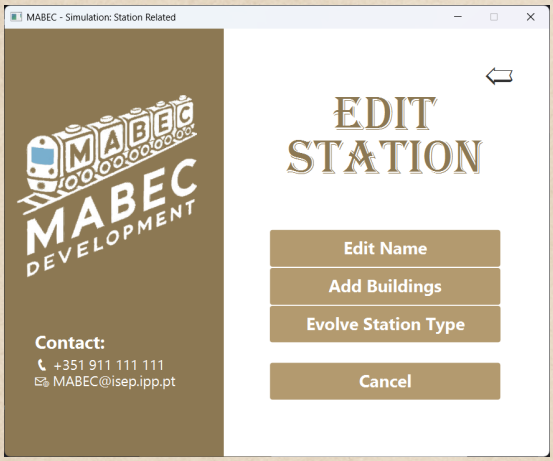

Figure 5.99: Edit Station Menu

5.3.1.2.1.4.1. Edit Name

1. Select **Edit Name** to change the name of the chosen station.
2. Enter the new name.
3. The system confirms that the station name has been updated.

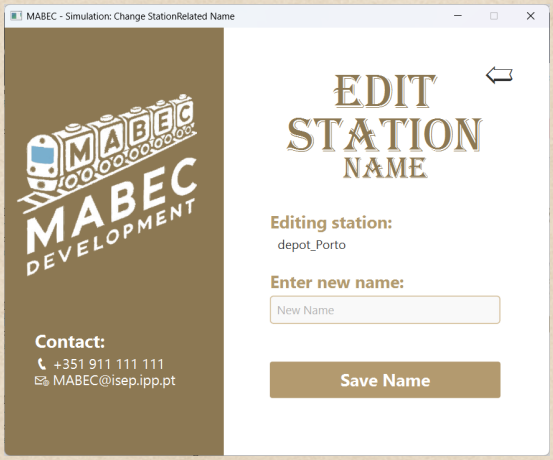

Figure 5.100: Edit Station Name

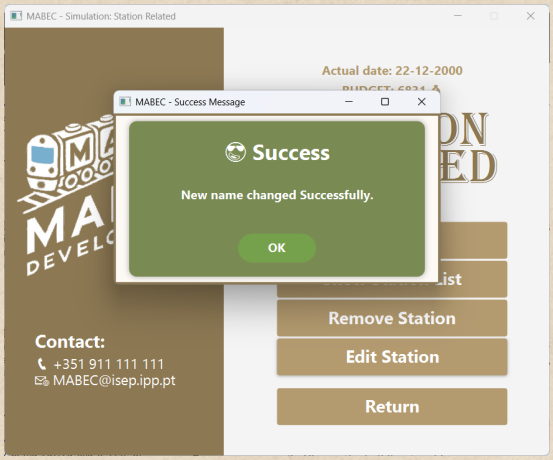

Figure 5.101: Edit Station Name – Success Message

5.3.1.2.1.4.2. Add Buildings

1. Select **Add Buildings** to see the station currently being edited and a list of available buildings with their costs.
2. Choose the building to add.
3. The system confirms that the building has been added to the station.

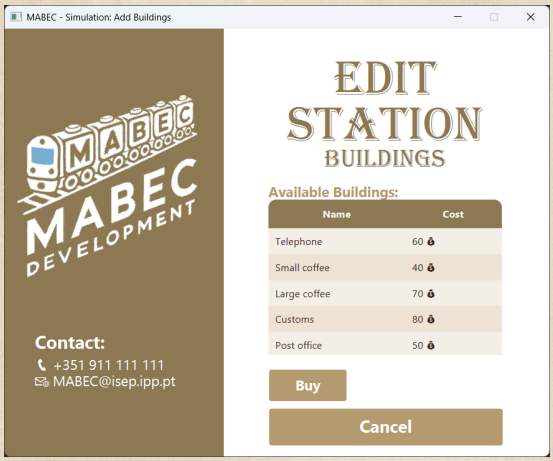

Figure 5.102: Add Buildings: Available Buildings Types

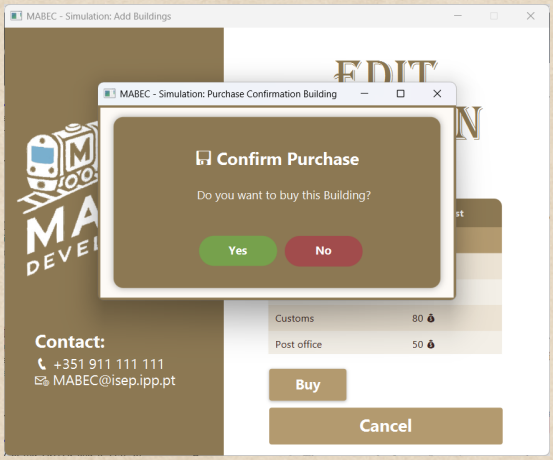

Figure 5.103: Add Buildings: Success Message

5.3.1.2.1.4.3. Evolve Station Type

1. Select **Evolve Station Type** to view the available station types for upgrading and their costs.
2. Choose the station type to upgrade to.
3. The system asks for confirmation to upgrade.
4. After confirming, the system displays a success message indicating that the station has been upgraded.

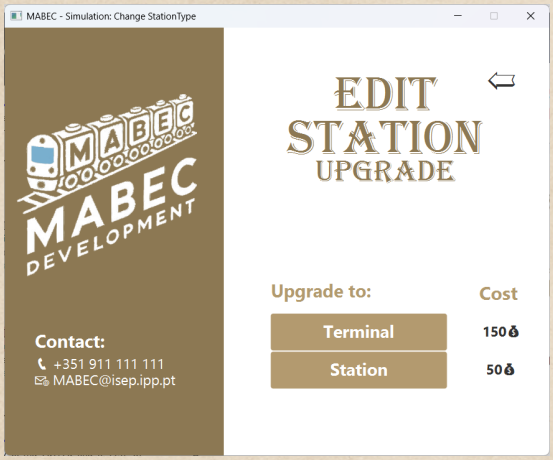

Figure 5.104: Upgrade the Type of Station Available

5.3.1.2.2. Train Related

The **Train Related** menu provides the following options:

- **Locomotives** – Manage locomotives, including buying and viewing owned units.
- **Carriages** – Manage train carriages.
- **Construct Train** – Build a train by assembling locomotives and carriages.

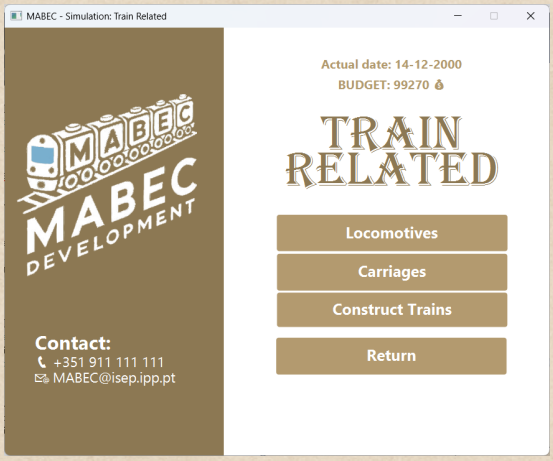

Figure 5.105: Train Related Menu

5.3.1.2.2.1. Locomotive Related

The **Locomotives** menu includes the following options:

- **Buy Locomotive** – Browse and purchase locomotives available in the scenario.
- **View Acquired Locomotives** – View details of locomotives already owned.

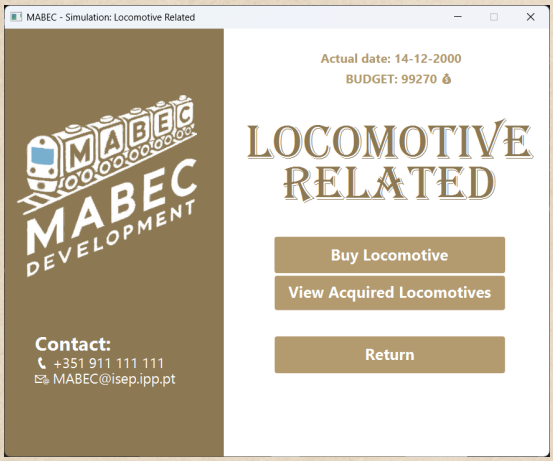

Figure 5.106: Locomotive Related Menu

5.3.1.2.2.1.1. Buy a Locomotive

1. When selecting **Buy Locomotive**, the user sees a list of all locomotives available in the current scenario.
2. Selecting a locomotive displays its details on the right side of the screen.
3. Clicking the **Buy** button triggers a confirmation dialog asking the user to confirm the purchase.
4. Upon confirmation, the locomotive is added to the user's acquired locomotives.

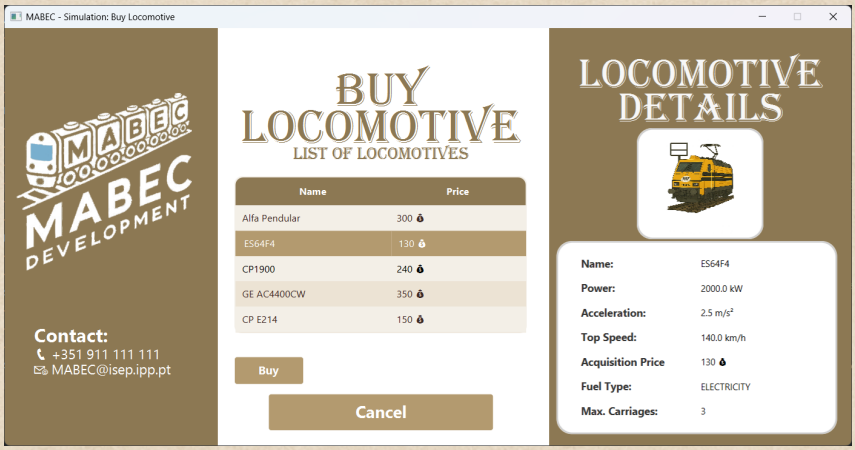

Figure 5.107: Buy Locomotive: Available Locomotives and Details

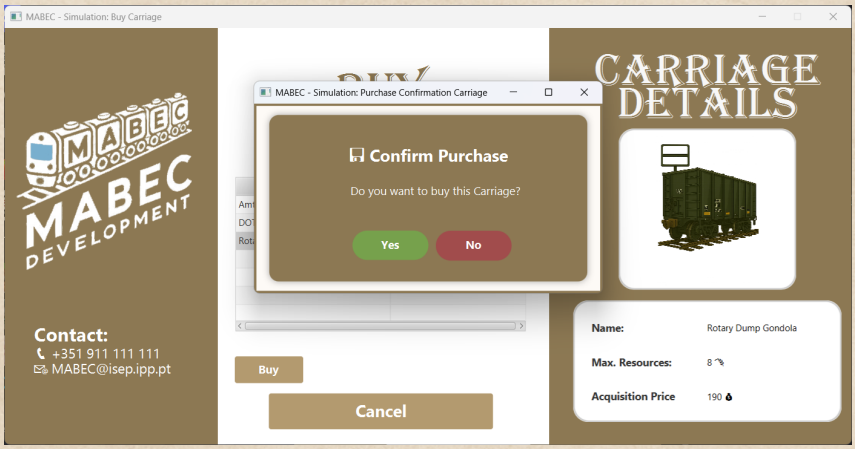

Figure 5.108: Buy Locomotive - Confirmation Message

5.3.1.2.2.1.2 View Acquired Locomotives

On the menu "View Acquired Locomotives" it displays all the acquired locomotives and when one is selected it shows their details.

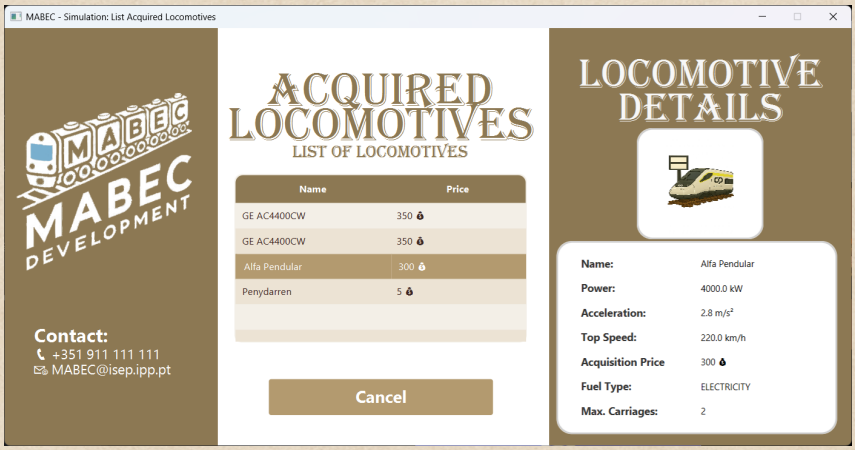

Figure 5.109: List of Acquired Locomotives and their details

5.3.1.2.2.2. Carriage Related

The **Carriages** menu offers the following options:

- **Buy Carriage** – Browse and purchase carriages available in the scenario.
- **View Acquired Carriages** – View details of carriages already purchased.

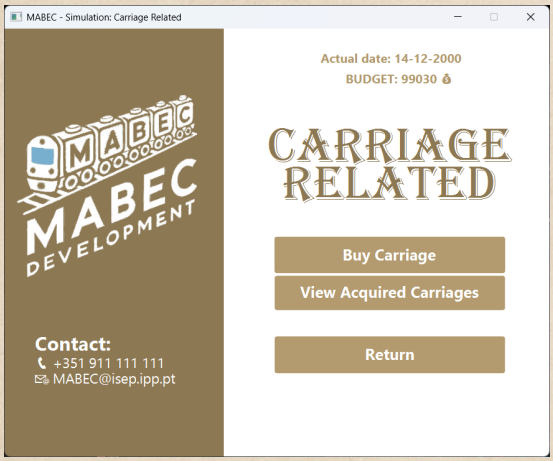

Figure 5.110: Carriage Related Menu

5.3.1.2.2.2 Carriage Related

The **Carriage Related** menu contains the following options:

- **Buy Carriage** – View all carriages available in the current scenario and purchase one.
- **View Acquired Carriages** – Display a list of carriages you have already purchased, with detailed information.

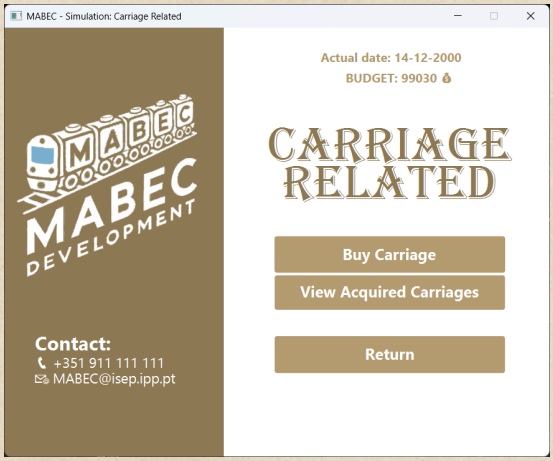

Figure 5.111: Carriage Related Menu

5.3.1.2.2.2.1 Buy a Carriage

Select **Buy Carriage** to display a list of all carriages available in the current scenario.

1. Select a carriage from the list.
2. View the selected carriage's details on the right side of the screen.
3. Click **Buy** to initiate the purchase.
4. Confirm the purchase when prompted with a confirmation message.
5. After confirmation, the system displays a success message.

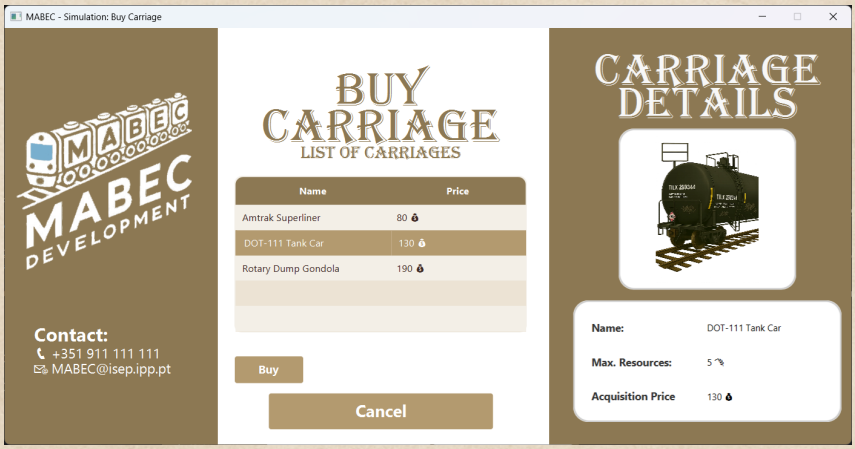

Figure 5.112: Carriage Menu: Buy Carriage

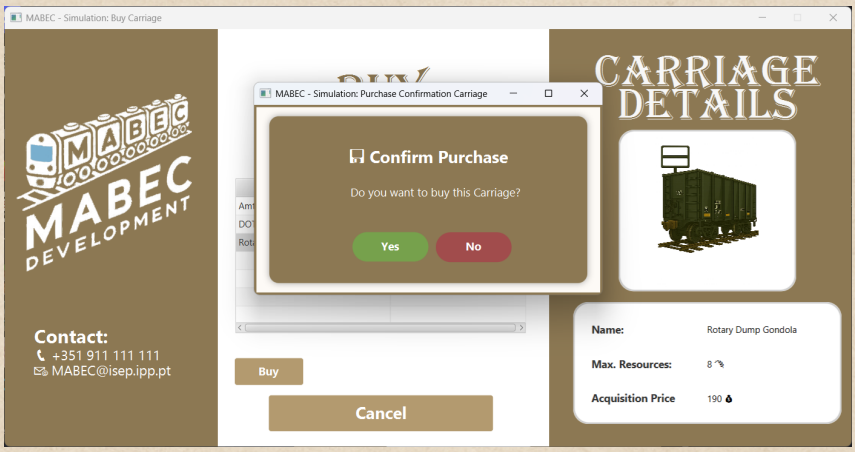

Figure 5.113: Buy Carriage – Confirmation Message

5.3.1.2.2.2.2 View Acquired Carriages

Select **View Acquired Carriages** to access a list of all carriages you have purchased.

1. Browse the list of acquired carriages.
2. Select a carriage to display its detailed information, including:
    - Type
    - Capacity
    - Assigned train (if applicable)
    - Condition or status

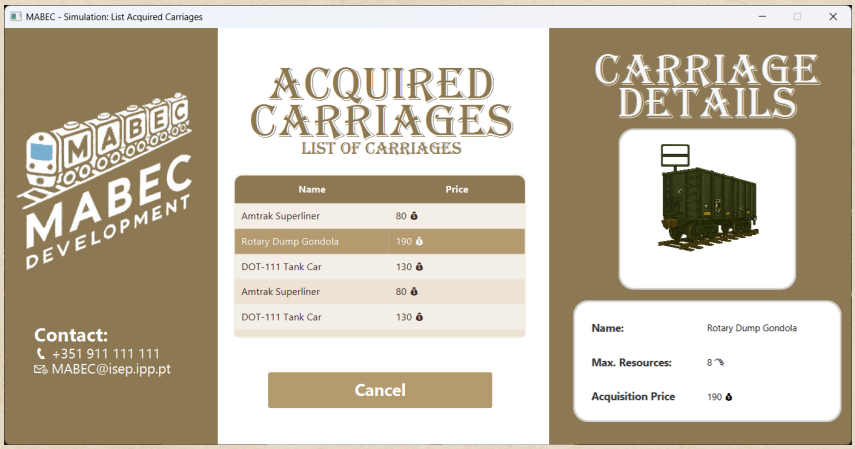

Figure 5.114: List of Acquired Carriages

5.3.1.2.2.3 Construct Train Related

The **Construct Train Related** menu allows you to assemble and manage trains.

- **Construct Train** – Combine one locomotive with one or more carriages to form a complete train.
- **View Train** – View details of previously constructed trains.

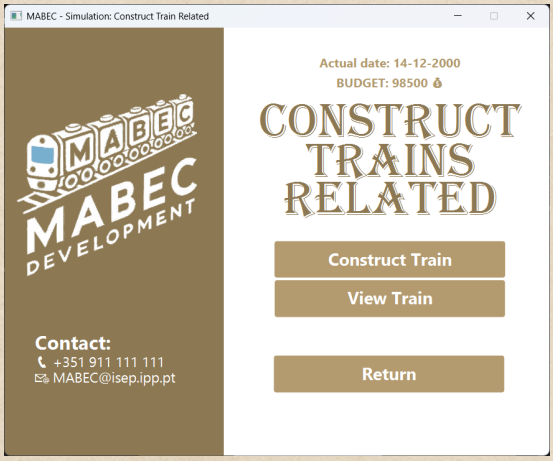

Figure 5.115: Construct Train Related Menu

5.3.1.2.2.3.1 Construct Train

To construct a train:

1. Select **Construct Train**.
2. Choose a locomotive from the list of acquired locomotives.
3. View available carriages.
4. Add carriages one by one, respecting the capacity limit.
5. Confirm the construction of the train when asked.
6. The system displays a success message once the train is built.

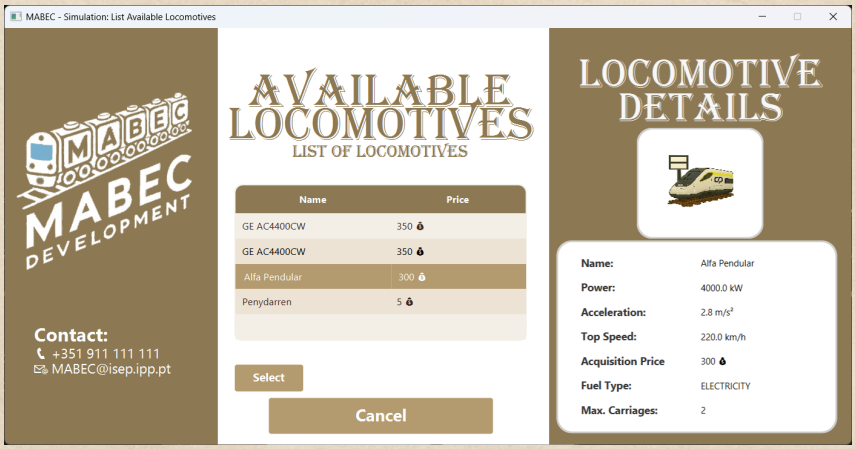

Figure 5.116: Construct Train - Choose Locomotive

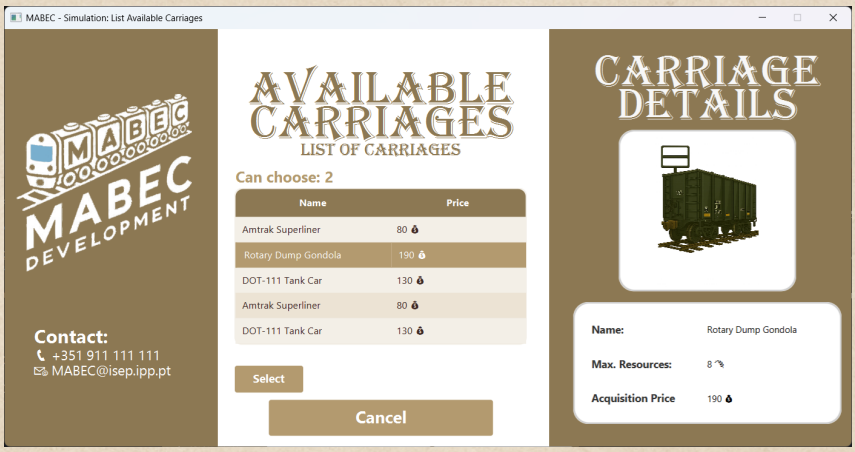

Figure 5.117: Construct Train - Choose Carriages

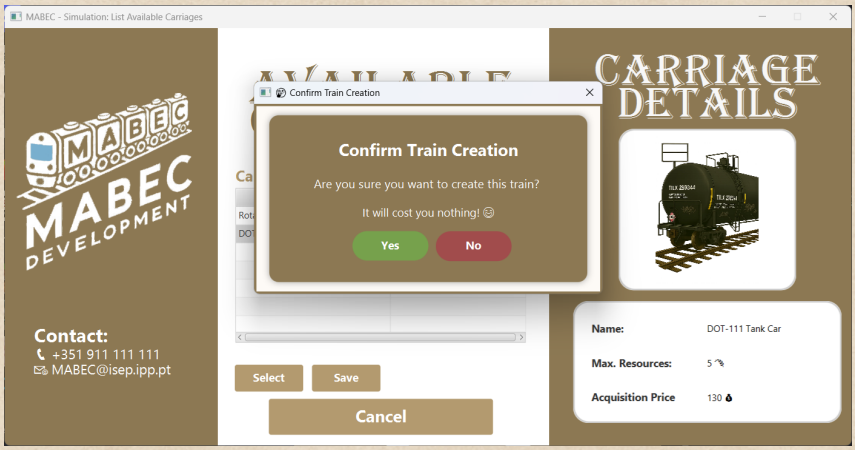

Figure 5.118: Construct Train - Confirmation Message

5.3.1.2.2.6 View Train

Displays all constructed trains and their details.

1. View a list of all trains currently constructed.
2. Select a train to see its detailed composition:

- Locomotive model and specifications
- Attached carriages and their types
- Capacity and configuration

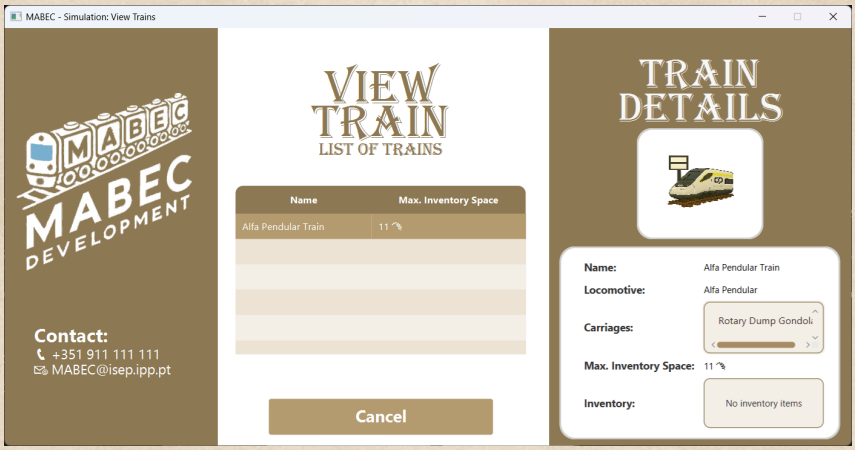

Figure 5.119: View Trains

5.3.1.2.3 Railway Line Related

The **Railway Line Related** menu offers the following options:

- Create Railway Line
- Remove Railway Line
- Upgrade Railway Line
- List Railway Lines

Figure 5.120: Railway Line Related Menu

5.3.1.2.3.1 Create Railway Line

To create a new railway line:

1. Select the departure station.

2. Select the arrival station.

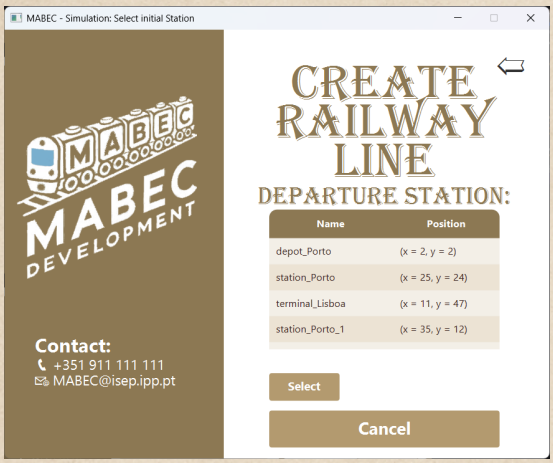

Figure 5.121: Create Railway Line – Choose Departure Station

Figure 5.122: Create Railway Line – Choose Arrival Station

3. Choose the line type:
   - Electrified or non-electrified
   - Single or double track

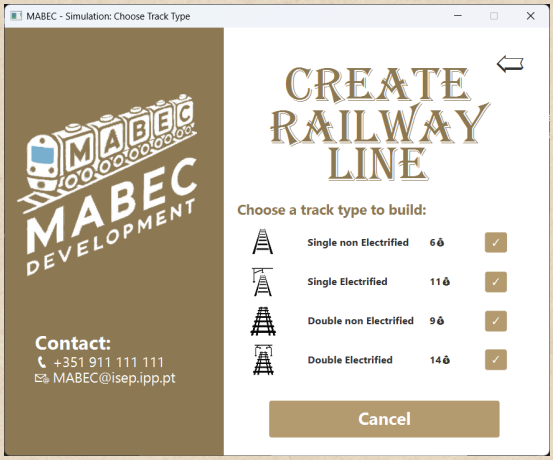

Figure 5.123: Create Railway Line – Select Line Type

4. Review the total cost and confirm creation.

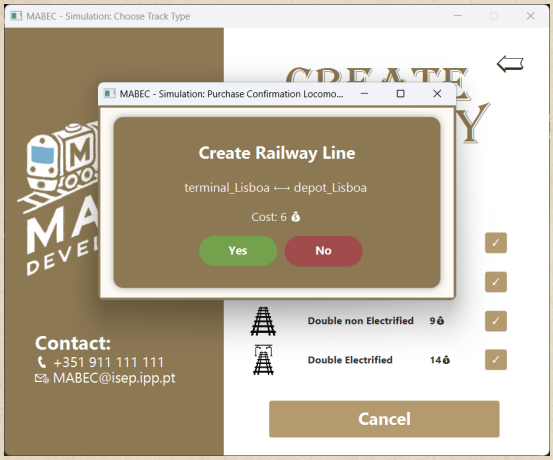

Figure 5.124: Create Railway Line – Confirmation Message

5.3.1.2.3.2 List Railway Lines

Displays a complete list of all existing railway lines with the following information:

- Connected stations
- Line type (electrified/non-electrified, single/double track)

To view details for a specific line:

1. Select the line.
2. View additional information, including:
    - Line map
    - Connected stations
    - Line type

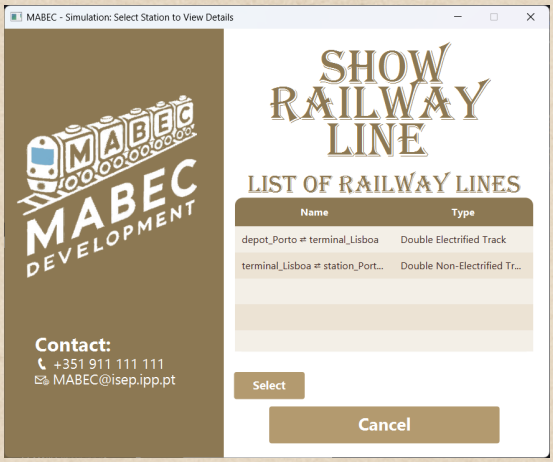

Figure 5.125: List Railway Lines

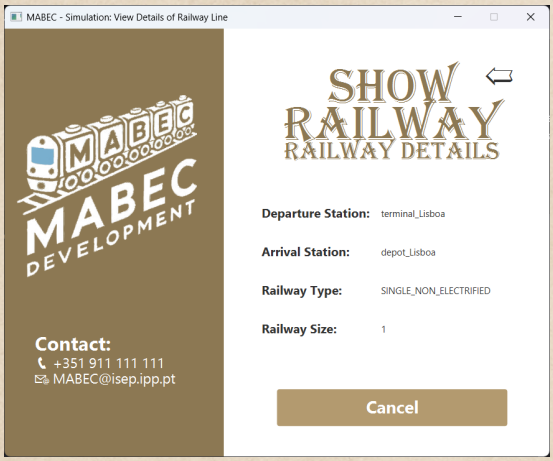

Figure 5.126: List Railway Lines – Details

5.3.1.2.3.3 Delete Railway Line

To delete a railway line:

1. View the list of all railway lines.
2. Select the line to be removed.
3. Confirm deletion when prompted.
4. The system displays a success message once the line is deleted.

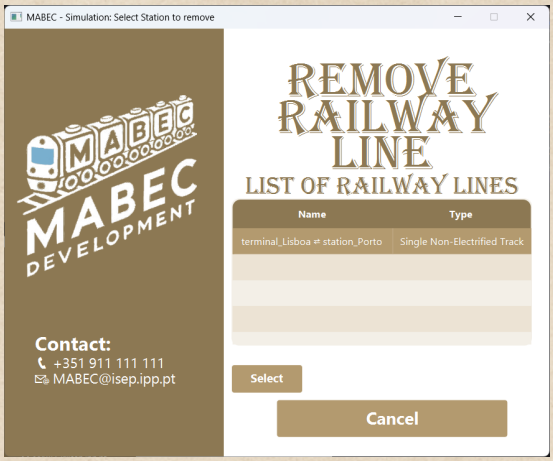

Figure 5.127: Delete Railway Line – List Railway Lines

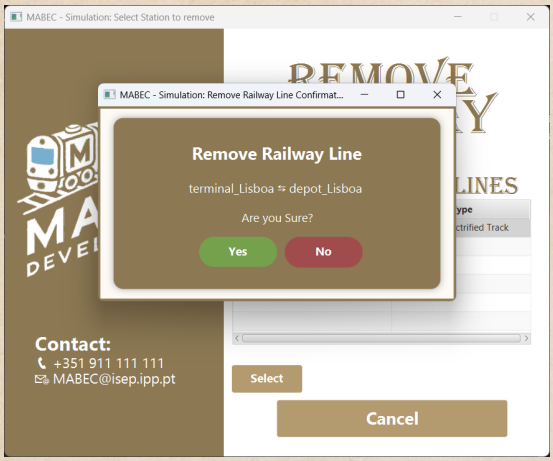

Figure 5.128: Delete Railway Line – Confirmation Message

5.3.1.2.3.4 Upgrade Railway Line

To upgrade a railway line:

1. View the list of all existing lines and their current type.
2. If upgrades are available, select an upgrade option (e.g., single to double, non-electrified to electrified).
3. Confirm the upgrade when prompted.
4. A success message confirms the upgrade.

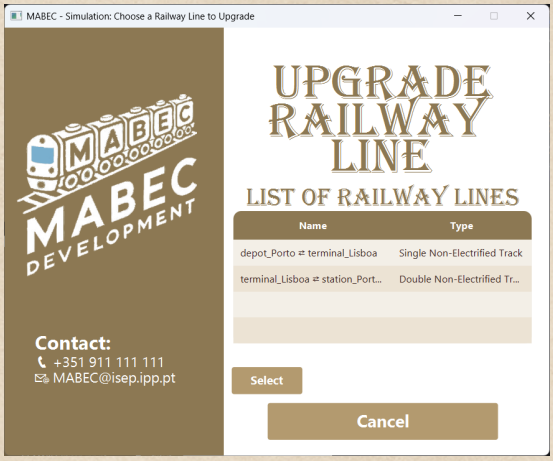

Figure 5.129: Upgrade Railway Line – List Railway Lines

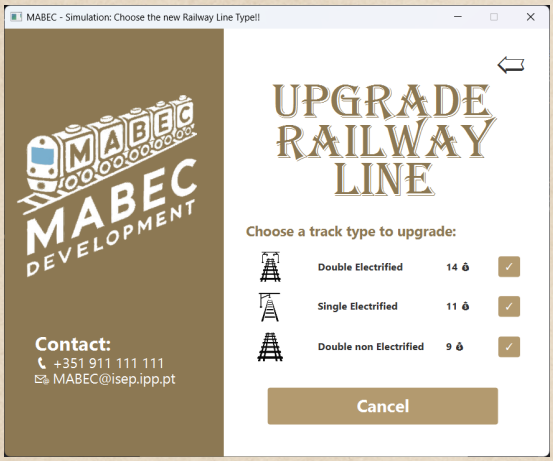

Figure 5.130: Upgrade Railway Line – Choose Upgrade

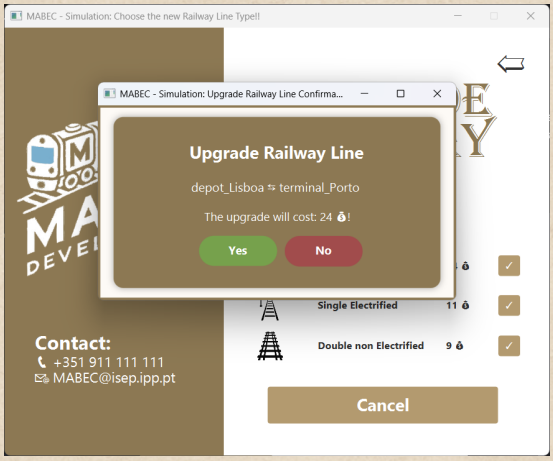

Figure 5.131: Upgrade Railway Line – Confirmation Message

5.3.1.2.4. Route Related

Options:

- Create Route
- View Route

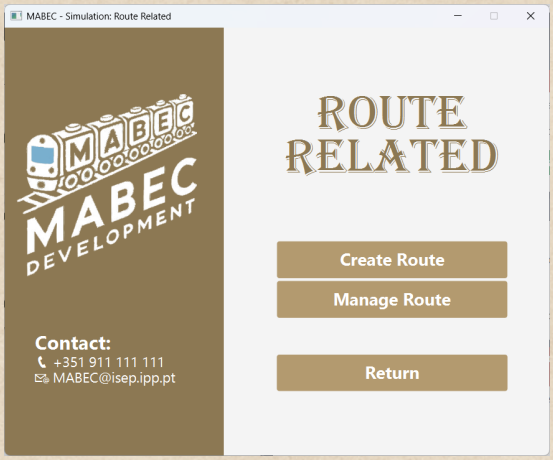

Figure 5.132: Route Related Menu

5.3.1.2.4.1. Create Route

Steps:

1. Choose line type

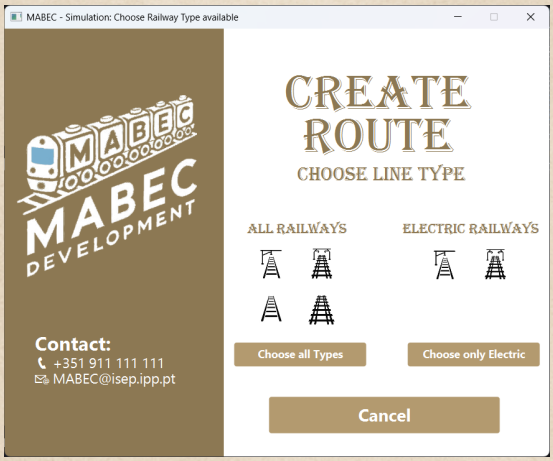

Figure 5.133: Create Route - Choose Line Type

2. Choose Departure Station and the Cargo it going to be delivered

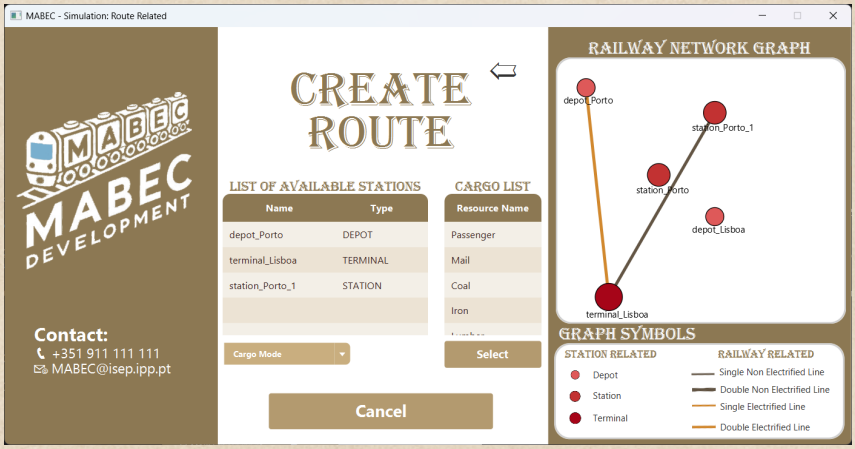

Figure 5.134: Create Route - Choose Departure Station and the Cargo

3. Choose Points of Route and the Cargo its going to be delivered

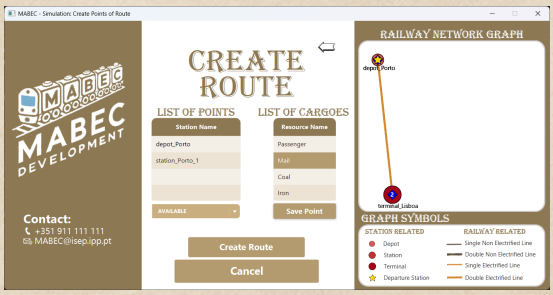

Figure 5.135: Create Route - Choose Points of Routes and the Cargo

4. Confirmation Message

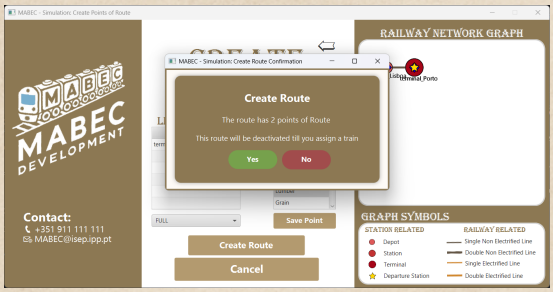

Figure 5.136: Create Route - Confirmation Message

5.3.1.2.4.2 Manage Routes

Displays a list of all existing routes, including:

- Route name
- Current status (active/inactive)

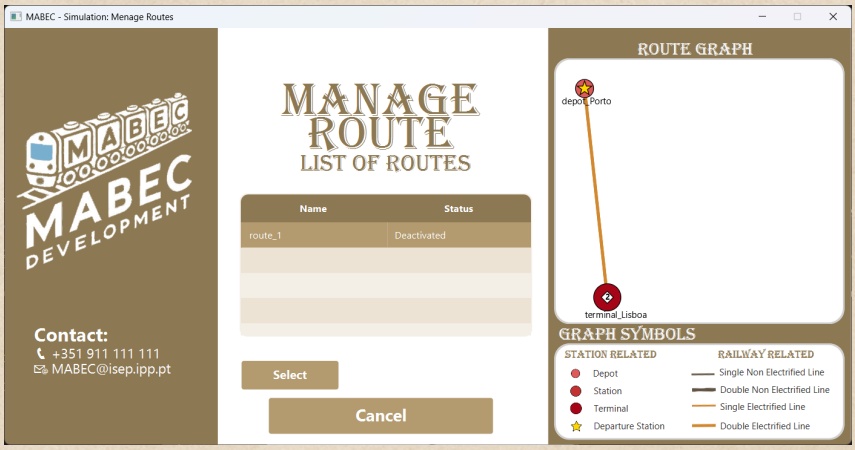

Figure 5.137: Manage Routes – List of Routes

The user can manage the status of routes through the following interactions:

1. Select a route from the list.
2. If the selected route is currently **active**, the system immediately updates its status to **inactive**.
3. If the selected route is currently **inactive**, the system prompts the user to select a train from the list of available trains.
4. Upon selecting a train, its details are displayed in the right panel.
5. Click **Select** to assign the train to the route and activate it.
6. A confirmation message is displayed, indicating that the route is now active.

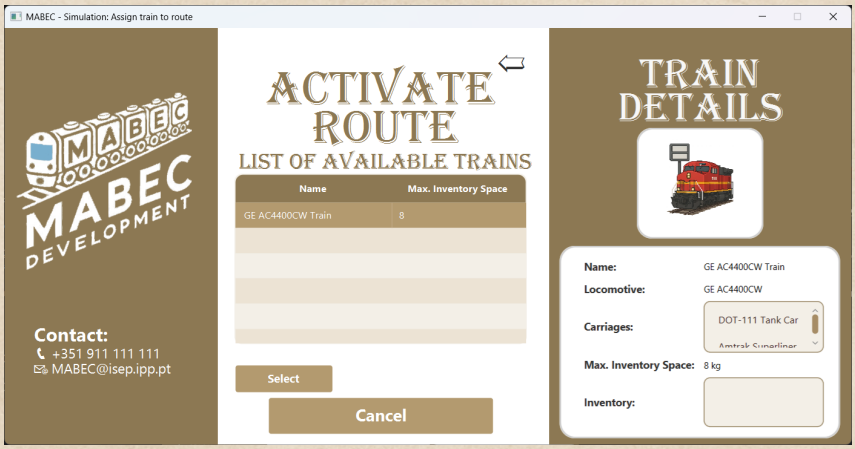

Figure 5.138: Manage Routes – Assign Train to Route

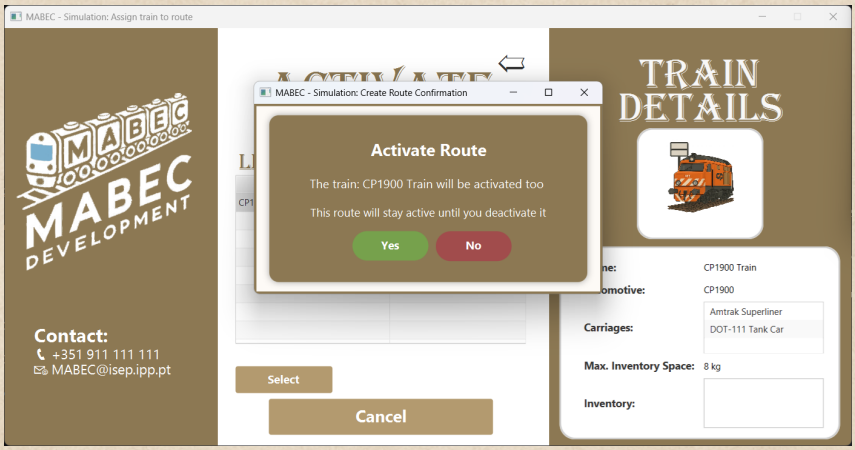

Figure 5.139: Manage Routes – Assignment Confirmation Message

5.3.1.2.5. View Financial History

The View Financial Historical button opens a detailed summary of the simulation's yearly financial performance. This view presents key figures such as earnings, track and train maintenance costs, fuel expenses, and the net result for each year. A pie chart illustrates the distribution of costs and income for the selected year, while a bar chart provides a comparative overview of revenue and expenses across multiple years. This feature supports clear financial analysis and informed decision-making throughout the simulation.

Figure 5.140: Financial Results

5.3.1.2.6. Show Map

This option opens the global map view of the simulation world.

- Each grid cell represents exactly 1 kilometre in real distance.
- When hovering the mouse over a cell, the corresponding position (x, y) is displayed at the top of the screen.
- The map includes a visible horizontal and vertical scale for precise orientation.
- The grid displays various infrastructure elements:
  - Stations (depots, terminals)
  - Industries (primary, transforming, mixed)
  - House blocks (residential areas)
  - Railway lines (track connections between nodes)

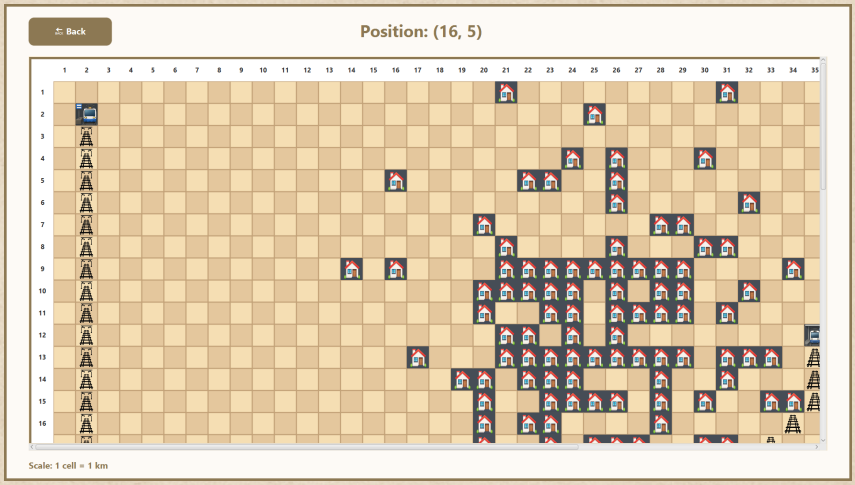

Figure 5.141: Show Map – Grid View with Scale and Position Indicator

5.3.1.2.6.1. View Station, Industry, House Block, and Railway Line Details from the Map

From the global map, the user can click on any visible infrastructure to view detailed information:

1. **Station** Clicking a station opens a panel showing:
   - Name, type, and map coordinates
   - Associated industries and house blocks
   - Requested resources
   - Station demand chart (Demands reduce the value received when transferring certain resources, based on the logic of supply and demand.)

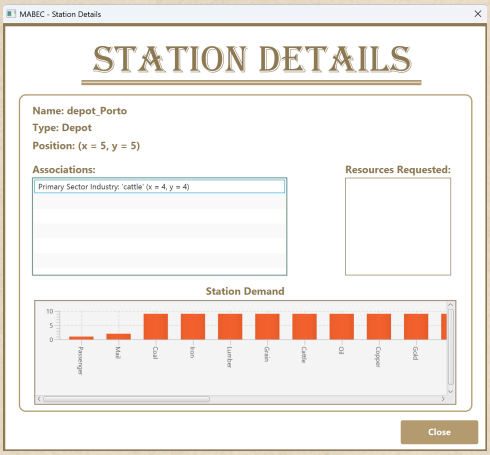

Figure 5.142: Show Map – Viewing Station Details

2. **Primary Industry** Displays detailed data including:
    - Name and map position
    - Assigned station
    - Primary resource type
    - Resource generation rate and capacity
    - Inventory

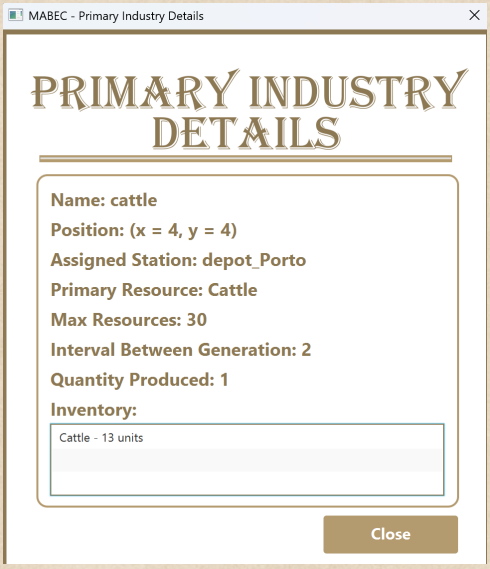

Figure 5.143: Show Map – Viewing Primary Industry Details

3. **Transforming Industry** Shows:
    - Name and position
    - Assigned station
    - Transformed product and raw materials used
    - Current inventory

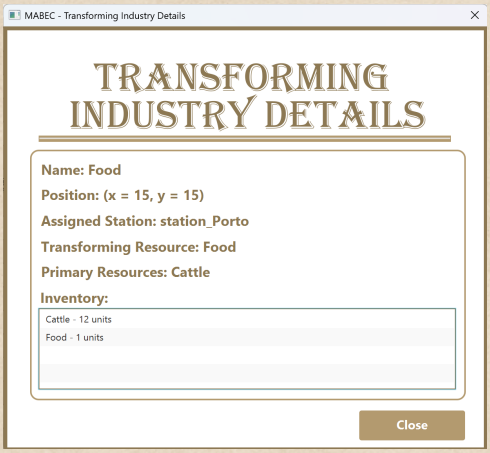

Figure 5.144: Show Map – Viewing Transforming Industry Details

4. **Mixed Industry** Displays:
    - Name and coordinates
    - Assigned station
    - Exported, imported, and transformed resources
    - Inventory (if available)

Figure 5.145: Show Map – Viewing Mixed Industry Details

5. **Railway Line** Presents:
    - Connection endpoints
    - Track type (single/double, electrified/non-electrified)
    - Total distance (in km)
    - Construction date
    - Next maintenance date

Figure 5.146: Show Map – Viewing Railway Line Details

6. **House Block** Opens a panel showing:
   - City name and map position
   - Assigned station (if any)
   - Produced resources (with capacity, interval, and amount)
   - Current inventory levels

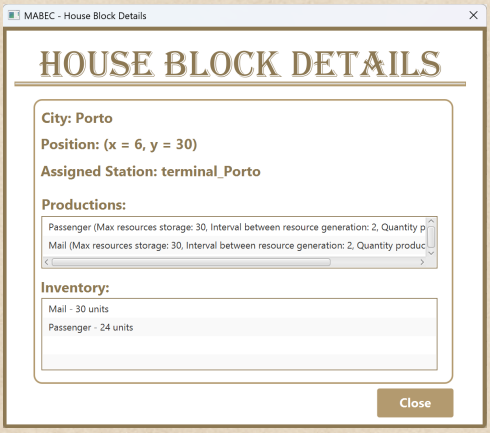

Figure 5.147: Show Map – Viewing House Block Details

This interaction enables the user to retrieve infrastructure and logistics information quickly and efficiently from the map interface.

Chapter 6

Troubleshooting

6.1 Issue 1 - Application does not start

- **Symptom**: Running the application does not open the application.
- **Possible Cause**: Java runtime environment is missing or corrupted.
- **Solution**: Confirm that Java is installed and configured correctly. Try rebooting your system. If the issue remains, reinstall the application and Java.

6.2 Issue 2 – Simulation freezes or stops responding

- **Symptom**: No updates are displayed in the simulation interface, nor will the simulation react to any input.
- **Possible Cause**: High CPU/memory occupancy or infinite loops during event execution.
- **Solution**: Terminate other applications in order to improve system resource availability. Check that the simulation scripts do not contain errors or infinite loops in the simulation scripts. Restart the application.

6.3 Issue 3 – During simulation no resources are being generated

- **Symptom**: The progress in time does not translate to any changes in the inventory of stations.
- **Possible Cause**: Lack of resource generation in the station's area of influence.
- **Solution**: Ensure proper strategic placement of the stations so they can generate resources in their area of influence.

6.4 Issue 4 – Routes cannot be created

- **Symptom**: When attempting to create a new route, an error message appears stating that required elements are missing.
- **Possible Cause**: An error appears indicating that the necessary components have not been included when creating a new route.
- **Solution**:
  - Create at least one station on the map first.
  - Construct multiple railroad tracks that link all the relevant regions.
  - Build a minimum of one train which must include a locomotive and suitable carriages.

  Upon fulfilling these requirements, it will be possible to create a new route without any issues.

Chapter 7

Frequently Asked Questions (FAQs)

Q.1: Is it possible for me to access the Railway Simulation app on my cellphone?

A.1: Unfortunately, the app is only accessible via a desktop system running in a Java-based environment configuring now.

Q.2: What is preventing me from designing a route in the simulation?

A.2: For routes to work properly, there needs to be at least one station, a train, and a railway line. Additionally, the train's line must be suitable for the fuel type used by the train, so make sure these prerequisites are met.

Q.3: Do the stations require geographical proximity to the city and/or industries?

A.3: Yes, in order to generate or consume load, the stations must be located within the range of influence from cities or industries, but if a station is desired only as a complementary stop on a route and not for load generation or consumption, it can be placed far from any city or industry.

Q.4: What do I do if I run out of money in the simulation?

A.4: As a result of having no money, you will be unable to construct any new additions such as; stations, or railway lines. You are faced with the possibility of waiting for further profits or restarting the scenario.

Q.5: Is it possible to upgrade a station with any building at any given time?

A.5: No, there are certain requirements in terms of the current simulation year. Some structures supplant others and cannot coexist.

Q.6: Is the simulation real-time, or is it turn-based?

A.6: The simulation happens in months, which facilitates further subdivision. It can be paused, started, and sped up or slowed down during execution.

Q.7: Where can I access the information for a train's route between two stations?

A.7: From the control panel, make use of the specific train type selection path validation tool (steam, diesel, electric).

Chapter 8

7. References

1. JETBRAINS. *IntelliJ IDEA Installation Guide*. Available in:`https://www.jetbrains.com/help/idea/installation-guide.html#toolbox`. Accessed on: 18 May 2025.