

# Test case scenarios

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## UC1: Calculate Scope 1 emissions

Test case ID	UC1_TC1
Description	Verify that the system can successfully calculate GLEC Framework Scope 1 Emissions when all general information is provided
Test Steps	<ol style="list-style-type: none"><li>1. User requests Scope 1 emission calculation providing the following information during a Well-to-Wheel road transportation activity:<ul style="list-style-type: none"><li>◦ Gasoline Van using Gasoline/Ethanol 95/5 Blend and consuming <b>85,364l</b></li><li>◦ 7.5 t Diesel Truck using Diesel/Biodiesel Blend 95/5 and consuming <b>127,257l</b></li><li>◦ 40 t/Class 8 Truck using Diesel/Biodiesel Blend 95/5 and consuming <b>7,486l</b></li></ul></li><li>2. User sends the request to the application</li><li>3. System accepts the request</li><li>4. System performs calculation</li><li>5. System responds with the following information:<ul style="list-style-type: none"><li>◦ Total of 666153 <b>kg of CO2-equivalent</b> emissions</li><li>◦ Gasoline Van total of <b>239,019kg of CO2-equivalent</b> emissions</li><li>◦ 7.5 t Diesel Truck total of <b>403,404kg of CO2-equivalent</b> emissions</li><li>◦ 40 t/Class 8 Truck total of <b>23,730kg of CO2-equivalent</b> emissions</li></ul></li></ol>
Expected Result	The <b>kg of CO2-equivalent</b> produced by the fuel consumption given by the User

Test case ID	UC1_TC2
Description	Verify that the system can successfully calculate more detailed GLEC Framework Scope 1 Emissions when all detailed information is provided
Test Steps	<ol style="list-style-type: none"><li>1. User requests Scope 1 emission calculation providing a consumption of <b>374,285l</b> of diesel-biodiesel blend 95/5 during a a Tank-to-Wheel activity</li><li>2. User sends the request to the application</li><li>3. System detects that transportation type is missing</li><li>4. System responds with a missing transportation type</li></ol>

<b>Test case ID</b>	<b>UC1_TC2</b>
Expected Result	The <b>kg of CO2-equivalent</b> produced by the fuel consumption by each of the vehicles given by the User

<b>Test case ID</b>	<b>UC1_TC3</b>
Description	Verify that System returns an error when any of the required information fields are missing, which are: - The type of transport (Transport mode) - The fuel in <b>kg</b> or <b>l</b> used during transport - The type of fuel used during transport - Emission type (Well-to-Tank, Tank-to-Wheel, Well-to-Wheel)
Test Steps	<ol style="list-style-type: none"> <li>1. User requests Scope 1 emission calculation missing one or more of the required information</li> <li>2. User sends the request to the application</li> <li>3. System detects that information is missing</li> <li>4. System responds with a data missing error</li> </ol>
Expected Result	System error informing of missing data during the calculation

<b>Test case ID</b>	<b>UC1_TC4</b>
Description	Verify that System returns an error when calculation can't be performed
Test Steps	<ol style="list-style-type: none"> <li>1. User requests Scope 1 emission calculation providing a consumption of <b>374,285l</b> of orange juice blend 95/5 during a Tank-to-Wheel road transportation activity</li> <li>2. User sends the request to the application</li> <li>3. System accepts the request</li> <li>4. System tries to perform such calculation but provided data is not correct</li> <li>5. System responds with a calculation not possible error</li> </ol>
Expected Result	System error informing of not possible to perform such calculation

## UC2: Calculate Scope 2 emissions

Test case ID	UC2_TC1
Description	Verify that the system can successfully calculate Scope 2 Emissions when all necessary information is provided.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a regular user.</li><li>2. Enter valid basic information required for Scope 2 Emissions calculation.</li><li>3. Send the request to the application.</li><li>4. Verify that the system processes the request without errors.</li><li>5. Check if the system sends the correct result back to the user.</li></ol>
Expected Result	The system should calculate and return the correct Scope 2 Emissions value.

Test case ID	UC2_TC2
Description	Verify that the system handles a scenario where the user does not provide all the necessary information.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a regular user.</li><li>2. Enter incomplete or missing basic information required for Scope 2 Emissions calculation.</li><li>3. Send the request to the application.</li><li>4. Verify that the system detects the missing information.</li><li>5. Check if the system provides an appropriate error message to the user.</li></ol>
Expected Result	The system should detect the missing information and provide a clear error message to the user.

Test case ID	UC2_TC3
Description	Verify that the system restricts unauthorized users from accessing the Scope 2 Emissions calculation.
Test Steps	<ol style="list-style-type: none"><li>1. Attempt to access the Scope 2 Emissions calculation without authentication.</li><li>2. Enter valid basic information.</li><li>3. Send the request to the application.</li><li>4. Verify that the system denies access and returns an unauthorized error message.</li></ol>
Expected Result	The system should deny access to unauthorized users and return an appropriate error message.

## UC3: Calculate Scope 3 emissions

Test case ID	UC3_TC1
Description	Verify that the system can successfully calculate GLEC Framework Scope 3 Emissions when all general information is provided
Test Steps	<ol style="list-style-type: none"><li>1. User requests Scope 3 emission calculation using the following information from a road transport:<ul style="list-style-type: none"><li>◦ Vehicles using a Diesel/Biodiesel Blend consumed 374,2851 of fuel</li><li>◦ Vehicles using a Gasoline/Ethanol Blend consumed 85,3641 of fuel</li></ul></li><li>2. User sends the request to the application</li><li>3. System accepts the request</li><li>4. System performs calculation</li><li>5. System responds with the following information:<ul style="list-style-type: none"><li>◦ Emissions by first vehicle type 235,800 kg of CO2-equivalent</li><li>◦ Emissions by second vehicle type 42,682 kg of CO2-equivalent</li><li>◦ Total of 278,482 kg of CO2-equivalent emissions</li></ul></li></ol>
Expected Result	The kg of CO2-equivalent produced by the fuel consumption given by the User

Test case ID	UC3_TC2
Description	Verify that the system can handle missing information when any of the required information fields are missing, which are: <ul style="list-style-type: none"><li>• The type of transport (Transport mode)</li><li>• The fuel in kg or l used during transport</li><li>• The type of fuel used during transport</li><li>• Emission type (Well-to-Tank, Tank-to-Wheel, Well-to-Wheel)</li></ul>
Test Steps	<ol style="list-style-type: none"><li>1. User requests Scope 3 emission calculation using the following information from a road transport:<ul style="list-style-type: none"><li>◦ Vehicles consumed 187,0001 of fuel</li></ul></li><li>2. User sends the request to the application</li><li>3. System detects that fuel type is missing</li><li>4. System responds with an error message indicating that fuel type is missing</li></ol>
Expected Result	An error informing the user what information is missing

Test case ID	UC3_TC3
Description	Verify that System returns an error when there is no corresponding emission factor for the provided information
Test Steps	<ol style="list-style-type: none"> <li>1. User requests Scope 3 emission calculation providing a consumption of 374285 l of rainbow blend 95/5 during a Tank-to-Wheel road transportation activity</li> <li>2. User sends the request to the application</li> <li>3. System detects that there is no emission factor for the provided fuel type</li> <li>4. System responds with an error message indicating that there is no emission factor for the provided fuel type</li> </ol>
Expected Result	System error informing of missing emission factor for the provided fuel type

Test case ID	UC3_TC4
Description	Verify that System can perform calculations using other possible input data
Test Steps	<ol style="list-style-type: none"> <li>1. User requests Scope 3 emission calculation using the following information from an air transport activity: <ul style="list-style-type: none"> <li>◦ Plane using Jet Fuel A assuming a standard emission intensity of 0.702 kg CO<sub>2</sub>e/tkm</li> <li>◦ The total tonne-kilometers of the transport is 1,301 tkm</li> </ul> </li> <li>2. User sends the request to the application</li> <li>3. System accepts the request</li> <li>4. System performs calculation</li> <li>5. System responds with the following information: <ul style="list-style-type: none"> <li>◦ Total emissions of that transport activity 913 kg of CO<sub>2</sub>-equivalent</li> </ul> </li> </ol>
Expected Result	The kg of CO <sub>2</sub> -equivalent produced by the fuel consumption given by the User

## UC4: Edit emission factors

<b>Test case ID</b>	<b>UC4_TC1</b>
Description	Verify that the Administrator can successfully edit an emission factor to the database.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to edit an emission factor with the new value</li><li>3. Verify that the system processes the request</li><li>4. Check if the system edits the emission factor</li><li>5. Confirm that the Administrator receives a success message</li></ol>
Expected Result	The emission factor should be edited in the application, and the Administrator should receive a success message

<b>Test case ID</b>	<b>UC4_TC2</b>
Description	Verify that the system handles a scenario where the emission factor being edited already has the same value
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to edit an emission factor with the new value</li><li>3. Verify that the system detects that the new emission factor provided is the same as the old one</li><li>4. Check if the system provides an appropriate error message to the Administrator</li></ol>
Expected Result	The system should notify the user that the new emission factor is the same as the old one

<b>Test case ID</b>	<b>UC4_TC3</b>
Description	Verify that the system handles a scenario where the Administrator inserts an invalid value for the emission factor
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to change the emission factor to an invalid value</li><li>3. Verify that the system detects the invalid value</li><li>4. Check if the system provides an appropriate error message to the Administrator</li></ol>
Expected Result	The system should detect the invalid value and provide an error message to the Administrator

## UC5: Add emission factors

<b>Test case ID</b>	<b>UC5_TC1</b>
Description	Verify that the Administrator can successfully add an emission factor to the database.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to add a valid emission factor.</li><li>3. Verify that the system processes the request.</li><li>4. Check if the system adds the emission factor.</li><li>5. Confirm that the Administrator receives a success message.</li></ol>
Expected Result	The emission factor should be added to the application, and the Administrator should receive a success message.

<b>Test case ID</b>	<b>UC5_TC2</b>
Description	Verify that the system handles a scenario where the emission factor being added already exists in the database.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to add an emission factor that already exists in the database.</li><li>3. Verify that the system detects the existing emission factor.</li><li>4. Check if the system provides an appropriate error message to the Administrator.</li></ol>
Expected Result	The system should detect the existing emission factor and provide an error message to the Administrator.

<b>Test case ID</b>	<b>UC5_TC3</b>
Description	Verify that the system handles a scenario where the Administrator inserts an invalid value for the emission factor.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as an Administrator</li><li>2. Send a request to add an invalid emission factor.</li><li>3. Verify that the system detects the invalid value.</li><li>4. Check if the system provides an appropriate error message to the Administrator.</li></ol>
Expected Result	The system should detect the invalid value and provide an error message to the Administrator.

## UC6: Remove emission factors

Test case ID	UC6_TC1
Description	Verify that the system can successfully remove emission factors
Test Steps	<ol style="list-style-type: none"><li>1. User requests to remove a certain emission factor by providing valid indormation such as the ID</li><li>2. System find the emission factor the User refers to</li><li>3. System removes the emission factor</li><li>4. System responds with a operation successful message</li></ol>
Expected Result	The emission factor is not longer available in the system

Test case ID	UC6_TC2
Description	Verify that System returns an error when trying to delete a non existing emission factor
Test Steps	<ol style="list-style-type: none"><li>1. User requests to remove a certain emission factor by providing valid indormation such as the ID</li><li>2. System can't find the emission factor the User refers to</li><li>3. System responds with a cannot find the given emission factor error or not possible to delete such emission factor error</li></ol>
Expected Result	System returns an error when is not possible to remove an emission factor



## UC7: Read emission factors

Test case ID	UC7_TC1
Description	Verify that the system can successfully return emission factors
Test Steps	<ol style="list-style-type: none"><li>1. User requests to read all emission factors</li><li>2. System finds all emission factors</li><li>3. System returns all emission factors</li></ol>
Expected Result	The system returns all emission factors

Test case ID	UC7_TC2
Description	Verify that System can return filtered emission factors
Test Steps	<ol style="list-style-type: none"><li>1. User requests to read emission factors for a specific transport mode</li><li>2. System finds emission factors for the specific transport mode</li><li>3. System returns emission factors for the specific transport mode</li></ol>
Expected Result	System returns emission factors for a specified set of filters like transport mode, fuel type, emission type

## UC8: User authentication

Test case ID	UC8_TC1
Description	Verify that the User provided valid authentication credentials
Test Steps	<ol style="list-style-type: none"><li>1. Send the credentials to be verified</li><li>2. Verify that the system responded with a success message</li></ol>
Expected Result	The user has been authenticated

Test case ID	UC8_TC2
Description	Verify that the User provided invalid credentials
Test Steps	<ol style="list-style-type: none"><li>1. Send the credentials to be verified</li><li>2. Verify that the system responded with an error message</li></ol>
Expected Result	The system should detect the the invalid credentials and respond with an error message

## UC9: Store emission calculation results

Test case ID	UC9_TC1
Description	Verify that the User can successfully store the result of their calculation for later use and/or review.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a User.</li><li>2. Complete an emission calculation.</li><li>3. See the result of the calculation.</li><li>4. Send a request to the system to save the calculation.</li><li>5. Verify that the system processes the request.</li><li>6. Check if the system stores the calculation result.</li><li>7. Confirm that the system returns a success message to the User.</li></ol>
Expected Result	The calculation result should be successfully stored within the application, and the User should receive a success message.

Test case ID	UC9_TC2
Description	Verify that the system handles a scenario where the calculation fails, and the User attempts to store the result.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a User.</li><li>2. Start an emission calculation that fails</li><li>3. Attempt to save the result of the failed calculation.</li><li>4. Verify that the system detects the calculation failure.</li><li>5. Check if the system provides an appropriate error message to the User.</li></ol>
Expected Result	The system should detect the calculation failure and provide an error message to the User.

Test case ID	UC9_TC3
Description	Verify that the system handles a scenario where communication to the database fails when the User attempts to store a calculation result.
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a User.</li><li>2. Complete an emission calculation successfully.</li><li>3. See the result of the calculation.</li><li>4. Send a request to the system to save the calculation.</li><li>5. Simulate a database communication failure during the storage process.</li><li>6. Verify that the system appropriately handles the database communication failure.</li></ol>

Test case ID	UC9_TC3
Expected Result	The system should handle the database communication failure gracefully and provide an error message or notification to the User indicating the failure to store the calculation result.

## UC10: Check for past GHG emissions calculations

<b>Test case ID</b>	<b>UC10_TC1</b>
Description	Verify that the system can successfully provide all the past emissions calculations belonging to a certain user
Test Steps	<ol style="list-style-type: none"><li>1. User requests to view past emissions calculations</li><li>2. System finds past emissions calculations belonging to the User</li><li>3. System returns all the past emissions calculations that has found</li></ol>
Expected Result	All the past emissions calculations belonging to the User

<b>Test case ID</b>	<b>UC10_TC2</b>
Description	Verify that the system returns empty list when no past emissions calculations exist for a certain user
Test Steps	<ol style="list-style-type: none"><li>1. User requests to view past emissions calculations with or without providing filter options</li><li>2. System can't find past emissions calculations belonging to the User</li><li>3. System returns an empty list</li></ol>
Expected Result	Empty list

<b>Test case ID</b>	<b>UC10_TC3</b>
Description	Verify that the system returns past emissions calculations, matching certain filter conditions, belonging to a certain user
Test Steps	<ol style="list-style-type: none"><li>1. User requests to view past emissions calculations providing valid filter options like calculation dates or period</li><li>2. System finds past emissions calculations matching filter conditions and belonging to the User</li><li>3. System returns the found past emissions calculations</li></ol>
Expected Result	The found past emissions calculations belonging to the User

<b>Test case ID</b>	<b>UC10_TC4</b>
Description	Verify that System returns an error when an invalid filter is provided
Test Steps	<ol style="list-style-type: none"><li>1. User requests to view past emissions calculations providing invalid filter options like invalid dates</li><li>2. System can't parse the provided filter</li><li>3. System returns invalid filter error</li></ol>
Expected Result	System error informing of an invalid filter provided

## UC11: Manage the previously stored emission calculations

Test case ID	UC11_TC1
Description	Verify that the system can handle delete requests for past emissions calculations.
Test Steps	<ol style="list-style-type: none"><li>1. User requests to delete a past emissions calculation</li><li>2. System finds past emissions calculations belonging to the User</li><li>3. System deletes the past emissions calculation</li></ol>
Expected Result	The past emissions calculation is deleted

Test case ID	UC11_TC1
Description	Verify that the system can handle edit requests for past emissions calculations.
Test Steps	<ol style="list-style-type: none"><li>1. User requests to edit a past emissions calculation</li><li>2. System finds past emissions calculations belonging to the User</li><li>3. System updates the meta data of the past emissions calculation</li></ol>
Expected Result	The past emissions calculation is updated

Test case ID	UC11_TC3
Description	Verify that the system returns an error when the User requests to manage an emission that does not exist
Test Steps	<ol style="list-style-type: none"><li>1. User requests to manage a past emissions calculation</li><li>2. System can't find past emissions calculations belonging to the User</li><li>3. System returns an error</li></ol>
Expected Result	System error informing of an invalid past emissions calculation

## UC12: API overview

Test case ID	UC12_TC1
Description	Verify that the API overview has been sent
Test Steps	<ol style="list-style-type: none"><li>1. Authenticate as a User of the system (Administrator/User)</li><li>2. Send a request to view the API overview</li><li>3. Verify that the system processes the request</li><li>4. Check if the system returns the API overveiw</li><li>5. Confirm that the User receives a success message</li></ol>
Expected Result	The API overview has been sent to the user

## UC13: Batch calculations

Test case ID	UC13_TC1
Description	Verify that the system can successfully execute batch calculations when all general information is provided
Test Steps	<ol style="list-style-type: none"> <li>1. User requests batch emission calculations providing the following information: <ul style="list-style-type: none"> <li>◦ Well-to-Wheel road transportation activity: <ul style="list-style-type: none"> <li>▪ Gasoline Van using Gasoline/Ethanol 95/5 Blend and consuming 85,364l</li> <li>▪ 7.5 t Diesel Truck using Diesel/Biodiesel Blend 95/5 and consuming 127,257l</li> <li>▪ 40 t/Class 8 Truck using Diesel/Biodiesel Blend 95/5 and consuming 7,486l</li> </ul> </li> <li>◦ Road transport activity: <ul style="list-style-type: none"> <li>▪ First Vehicle using a Diesel/Biodiesel Blend consumed 374,285l of fuel</li> <li>▪ Second Vehicle using a Gasoline/Ethanol Blend consumed 85,364l of fuel</li> </ul> </li> </ul> </li> <li>2. User sends the request to the application</li> <li>3. System accepts the request</li> <li>4. System performs calculation</li> <li>5. System responds with the following information: <ul style="list-style-type: none"> <li>◦ Total of 944,635 kg of CO2-equivalent emissions <ul style="list-style-type: none"> <li>▪ Gasoline Van total of 239,019 kg of CO2-equivalent emissions</li> <li>▪ 7.5 t Diesel Truck total of 403,404 kg of CO2-equivalent emissions</li> <li>▪ 40 t/Class 8 Truck total of 23,730 kg of CO2-equivalent emissions</li> <li>▪ Emissions by first vehicle type 235,800 kg of CO2-equivalent</li> <li>▪ Emissions by second vehicle type 42,682 kg of CO2-equivalent</li> </ul> </li> </ul> </li> </ol>
Expected Result	The kg of CO2-equivalent produced by the fuel consumption given by the User

Test case ID	UC13_TC2
Description	Verify that System returns an error when calculation can't be performed



Test case ID	UC13_TC2
Test Steps	<ol style="list-style-type: none"> <li>1. User requests batch emission calculations providing the following information: <ul style="list-style-type: none"> <li>◦ Well-to-Wheel road transportation activity: <ul style="list-style-type: none"> <li>▪ Gasoline Van using orange juice 95/5 Blend and consuming 85,364l</li> <li>▪ 7.5 t Diesel Truck using Diesel/Biodiesel Blend 95/5 and consuming 127,257l</li> <li>▪ 40 t/Class 8 Truck using Diesel/Biodiesel Blend 95/5 and consuming 7,486l</li> </ul> </li> <li>◦ Road transport activity: <ul style="list-style-type: none"> <li>▪ First Vehicle using a Diesel/Biodiesel Blend consumed 374,285l of fuel</li> <li>▪ Second Vehicle using a Gasoline/Ethanol Blend consumed 85,364l of fuel</li> </ul> </li> </ul> </li> <li>2. User sends the request to the application</li> <li>3. System accepts the request</li> <li>4. System tries to perform such calculation but provided data is not correct</li> <li>5. System responds with a calculation not possible error</li> </ol>
Expected Result	System error informing of not possible to perform such calculation