



EDUCATIONAL HANDBOOK FOR USING AR/VR IN STEM EDUCATION IN SCHOOLS

**A Guide for Educators on Integrating Augmented and
Virtual Reality into Science, Technology, Engineering,
and Mathematics Curricula**

PART IV: Practical Implementation

In Part IV, we provide step-by-step tutorials on how to use the tools of **STEM-IT**.

Chapter 12: Quick-Start Guide to STEM-IT Interactive Tools

SCP 3D Model Viewer

For the STEM-IT Project, **SCP** has undergone the task of creating an interactive application that allows teachers and students to inspect **3D Models** by rotating around and zooming in on them, while also providing pins with relevant information about the specific pinned spot or object. This helps students to get a visual, sometimes animated perspective on topics they are learning about.

The game engine **Godot** was used to develop this application. It is an open source engine which can be used to develop fully featured **games or simulations**, however it can also be useful when creating smaller scope, targeted **tools** allowing developers complete freedom to build the application. The **SCP 3D Model Viewer** is one such tool. It is also useful that **internet access is not required** beyond downloading the application files initially, which can help schools that do not have a stable internet connection.

The application contains two pre-packaged scenarios as **examples** and to demonstrate its capabilities: “*Heart*” and “*Earthquakes*”, guiding a user through various heart and blood related organs and showing how earthquakes can affect different parts of the Earth, respectively. In this guide, we will first walk through how to use the application and look at the example scenarios, as well as guide a teacher to create their own scenario in the application.

Downloading the Application

In order to view the sample scenarios or to create new scenarios, first the application must be downloaded. Please follow the link below to download the package:

(In this version of the handbook, the files are already downloaded - as this guide itself comes from the download. This is left for consistency.)

<https://stem-it.eu/scp-stem-it-3d-model-viewer>

We will use the files in this package through the guides, so please save it in an organized location on your computer such as “**Documents**”. It is a **.zip** file which means it needs to be extracted first, which can be done by right clicking on the **.zip** file and then choosing to extract/unzip, though this may vary depending on your operating system. After unzipping,



the original .zip file can be safely deleted, as now there should be the extracted files in a new folder.

This package includes:

- Applications for **Windows, Android Smartphones, VR Headset** in the “**APPLICATIONS**” folder, each in their respective folder.
- The project source code along with the game engine **Godot** inside the “**PROJECT SOURCE**” folder. These are used when creating new scenarios.
- **Example documents** as **samples** for coming up with new teaching plan scenarios in the “**PLAN SAMPLES**” folder. The plans used when creating the default sample scenarios are included.
- A text file containing credits for the assets used in the sample scenarios or the application.

Installing/Running the Application

Windows

No installation is needed, the executable files are included. Simply navigate to the **APPLICATIONS -> WINDOWS** folder and double click on the application file to run it. Note that there may be a warning regarding the trust of the application, it is recommended to click any option such as “**Allow**” or “**I trust this source**” to proceed. An anti-virus may also flag it as potentially harmful, in this case it must be allowed in the anti-virus, which may vary depending on the anti-virus software.

Android Smartphone

NOTE: The Windows version is recommended over Android Smartphone.

The application is not available on an official store like **Google Play Store**. In order to install applications **not from the official Google Play Store**, the smartphone must be set to “**Developer Mode**”. In most cases, this involves going to the phone’s **Settings -> About Phone** and then tap on **Build Number** 7 times, then a popup will appear saying that developer mode is enabled. With Developer Mode enabled, the file in **APPLICATIONS -> ANDROID -> SCPSTEMIT.apk** must be moved to the phone’s storage via connecting it with a **USB**. On the phone, find the file using a file explorer application like **Files** and select the file, allowing the install. After installing, you may disable developer mode by going to the Phone’s **Settings -> Developer Mode** and toggling Developer Mode OFF, but this is optional.

After installing successfully, the application can be started by tapping on the SCPSTEMIT icon in the library of apps.

VR Headset (Standalone)

Installing unofficial applications on VR headsets, especially **Meta Quest**, can be a bit complicated and must be done through a 3rd party app called **SideQuest**.

SideQuest: <https://sidequestvr.com/setup-howto>

In the above link, there are good videos guiding users on the setup. Keep in mind you must follow the tutorial on the **right**, which is about installing SideQuest on your desktop PC, which must then be used to install the **SCPSTEMITVR.apk** file in **APPLICATIONS -> VR**

VR Headset (Connected to Desktop)

Alternatively, **VR Mode** can be enabled within the Windows application by clicking on the **VR button** on the bottom right while in the application. This requires a relatively strong graphics card in the computer, and for the necessary drivers to be installed.

- Go to the Meta Quest Setup page: <https://www.meta.com/quest/setup/>
- Download and install the **Meta Quest Link App** for Windows/Mac.
- Open the app, log in, and click **"Add Headset"**.
- Connect your Quest to your PC using a high-quality USB 3.0 cable.
- Put on your headset and enable **Quest Link** in your **Quick Settings** menu.

Using the Application

Selecting a Scenario

By following the instructions above for the device of your choice, you should now be met with a screen like this:

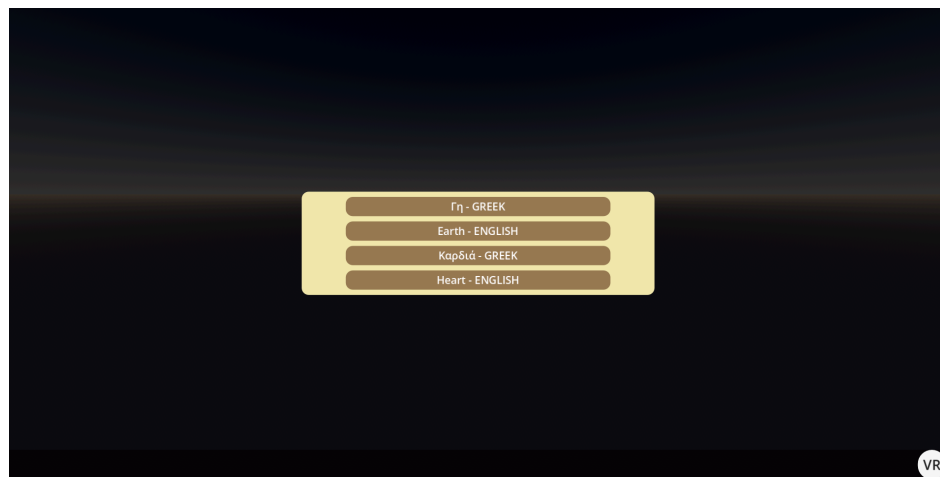


Figure 1: Scenario Selection Menu

This is the **Scenario Selection Menu**. As its name suggests, a scenario can be selected here.

To select a Scenario, the controls for each device are listed below.

Desktop	Android	VR
Click on Scenario title	Tap on Scenario title	Point to Scenario title with either controller and press the “Trigger” (back) button

For the sake of this start-up guide, the **“EARTH - ENGLISH”** scenario should be selected. The screen should show the following:



Figure 2. Earth Scenario Starting Scene

Basic Controls

Control	Desktop	Smartphone	VR
Rotate Camera	Hold Right Click + Move Mouse	Touch and Drag	Hold “Grip” button (on the side) of RIGHT Controller and rotate controller
Zoom In/Out	Mouse Wheel Up/Down	Pinch Gesture In/Out	Left Controller Control Stick Up/Down
Pan Camera	Hold Middle Mouse Wheel + Move Mouse	N/A	Hold ‘Grip” Button (on the side) of LEFT Controller and rotate controller
Select/Deselect Pin	Left Click on Pin	Tap on Pin	Point to Pin with either controller and

			press “Trigger” button (on the back)
Return to Scenario Select	Click on the three-bar button on the bottom left.	Tap on the three-bar button on the bottom left.	Press “Y” Button (Left Controller)
Return to Previous Scene	Click on the Bottom Left Arrow button (when available)	Click on the Bottom Left Arrow button (when available)	Press “X” Button (Left Controller) (when available)

OPTIONAL NOTE: As mentioned before, VR Mode can be entered from the Desktop Application by clicking on the bottom right “VR” Button, if a supported headset and link program is installed on the desktop.

In *Figure 2*, we can see a **model** of the Earth and various **numbered** or “**i**” **labeled Pins**. Use the controls guide to rotate, zoom or pan the model and look around. Pins can be clicked on to either **display information** or to **move to another model scene**. Start by clicking on the “**i**” pin to see an information popup.

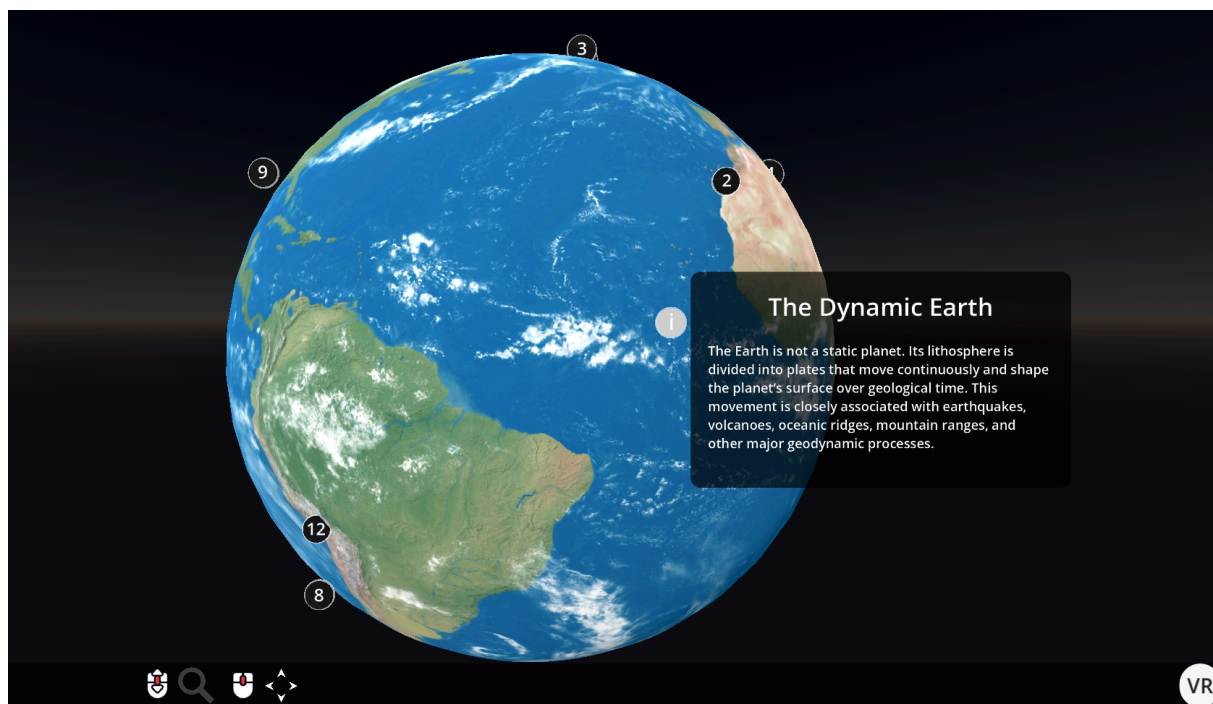


Figure 3. Information Pin

A selected pin can be clicked on again to **close** the information popup. Next, we can click on any of the numbered pins. In this lesson plan, each pin takes us to different parts of the planet demonstrating different effects of earthquakes and volcanoes. Let’s click on **Pin 10**, which is located in *Japan*.

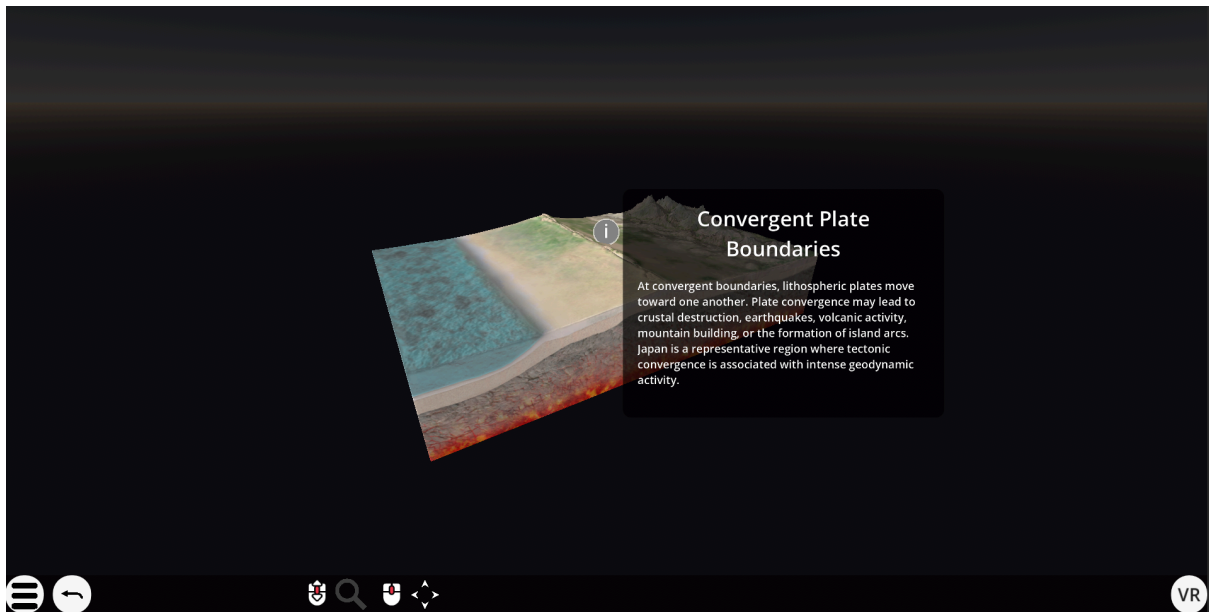


Figure 4. Pin 10

We can see a model showing what earthquakes might look like in Japan beneath the surface, as well as an information pin. The pin can be selected to view information. To return to the Earth scene, we can **Return to the Previous Scene**(refer to the *Basic Controls* above).

The same process can be repeated for all the pins. Once finished looking at the models, return to the **Scenario Select Screen**(refer to the *Basic Controls* above).

The same process can be repeated for the “*HEART - ENGLISH*” scenario, as the controls are the same, and will be the same for any newly created scenarios. In the Heart Scenario, we can follow a tour from outwards to inwards towards the microscopic level of the Heart.

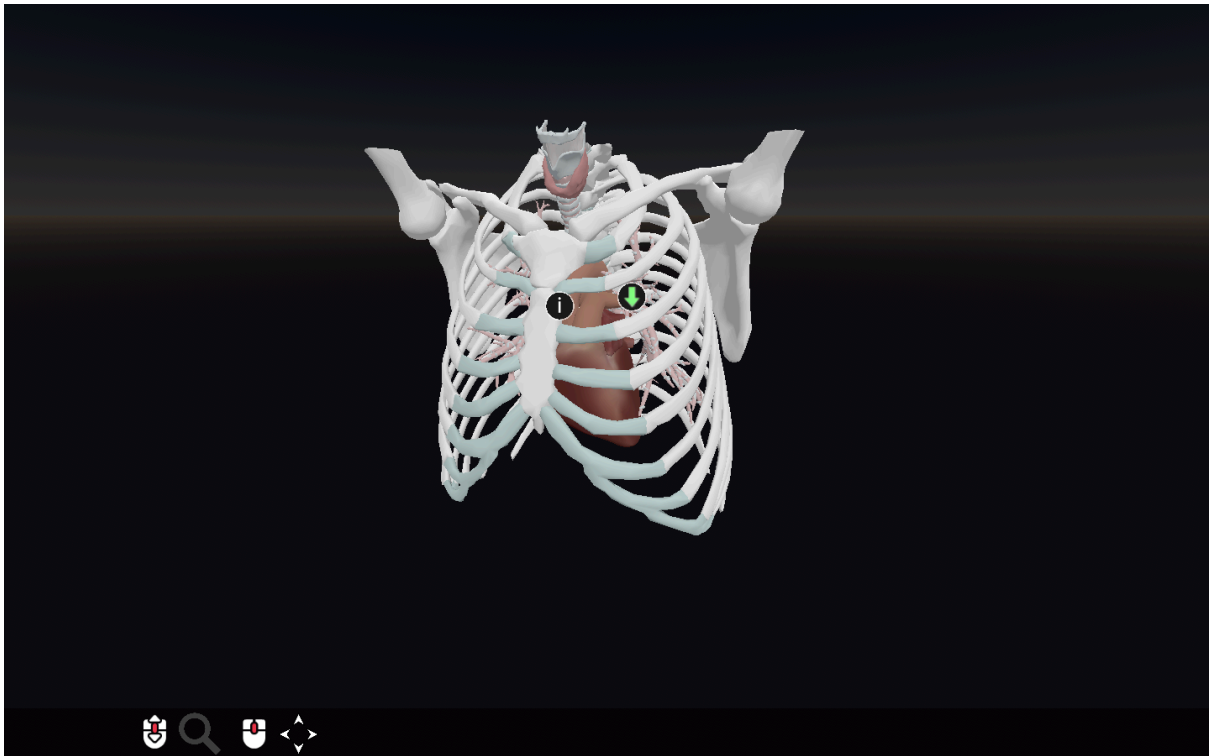


Figure 4b. Heart Scenario beginning

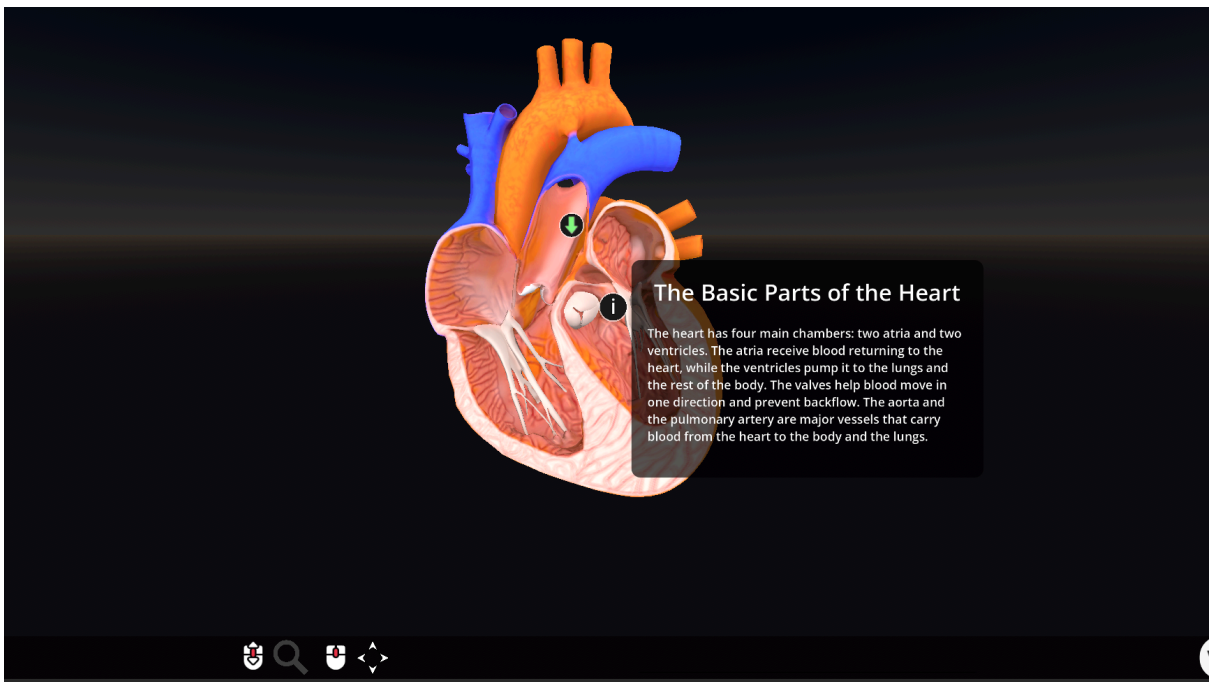


Figure 4c. The Basic Parts of the Heart

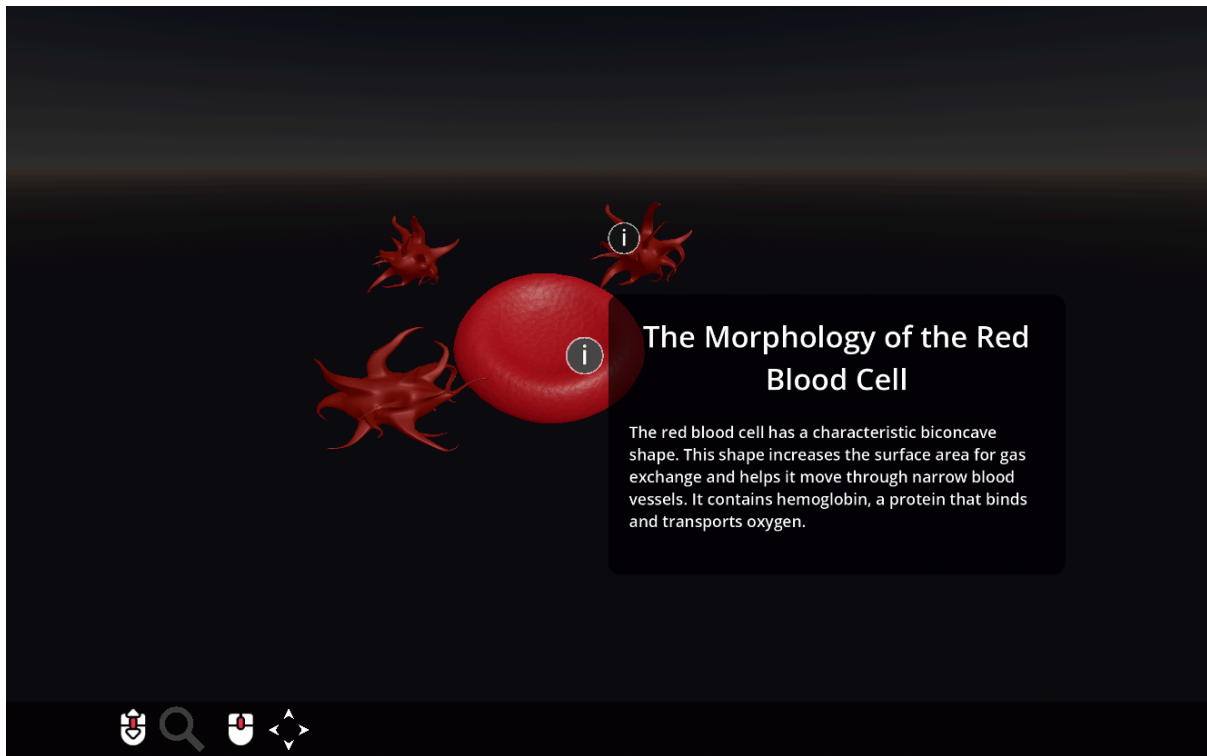


Figure 5c. Red Blood Cell & Platelets

This concludes the *Application Usage Guide*.

Creating New Scenarios for SCP 3D Model Viewer

The scenarios viewed in the tutorial are examples of what can be made. They were created using the same method that this guide will go through.

Summary of the process:

- Choose a subject and write down a **lesson plan** as a document
- Look for and **download relevant models** on sketchfab.com
- **Import** the models into the project in **Godot**
- Setup scenes with the models and add pins to them
- **Export** the application with the new content

Lesson Plan

The first step is to write down a plan for the scenario. Knowing beforehand what will be made should make the process *much* easier. Write on a document details about the subject you'd like to create a scenario about, find relevant models on sketchfab.com (*explained in next step*), the information on pins or if they would lead to another model, and this document is to be followed when creating the scenario.

This document can be written in any way you like; such as *Google Docs*, *Microsoft Word*, or a *plain text file*. It will only be used as a **reference** when creating the scenario and is **not part of the actual application**.

You can find the lesson plan documents used for the sample scenarios to use as a reference in the downloaded files in the **“PLAN SAMPLES”** folder.

Downloading Models from Sketchfab

Creating 3D Models is a complicated task which can be done by professional 3D Artists. As such, it is not realistic to expect to create your own models for these lesson plans. Many 3D Artists share their work on websites such as sketchfab.com to show them as their portfolio, however, some are kind enough to allow downloading the models and allow free use of them - usually for educational purposes.

First, go to <https://sketchfab.com> and *create an account(required for downloading models)*. Then search for keywords for the objects you'd like models of, e.g. *“volcano”*. Now, in order to view **only** downloadable models, the *“Downloadable”* filter must be enabled.

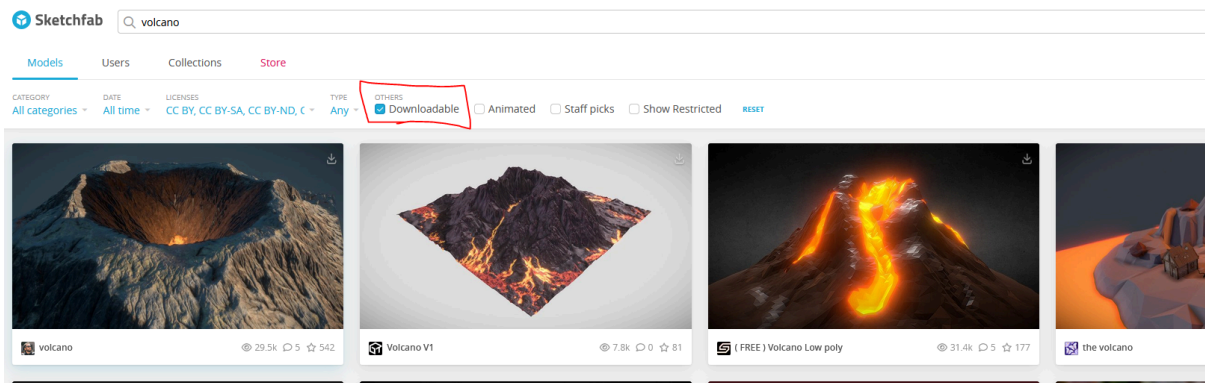


Figure 5. Enabling “Downloadable” on Sketchfab search

Additionally, a filter on the “License Type” must be set as well. When clicking it and the choices appear, hovering over them summarizes in what situations you would be allowed to use the **3D Model**. Generally, as long as you don’t **sell** or **redistribute (put up for public download)** the application you export with the new content, **all** license types (except for the last 2 red ones) can be **enabled**.

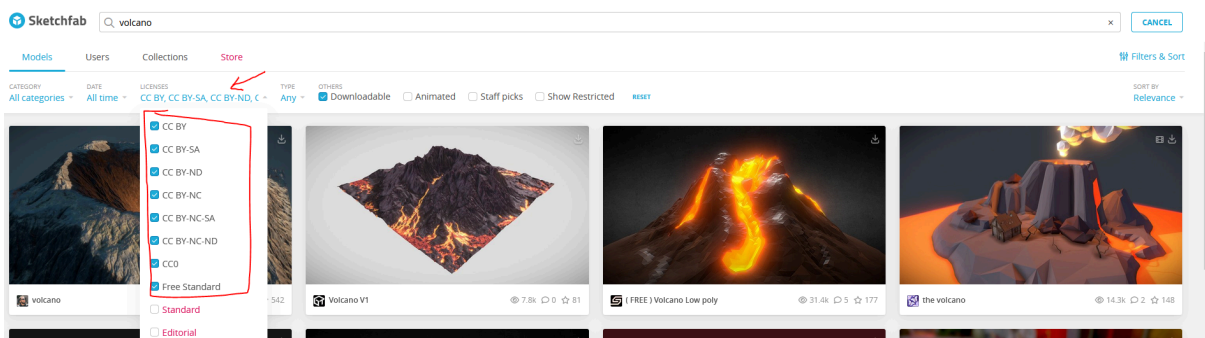
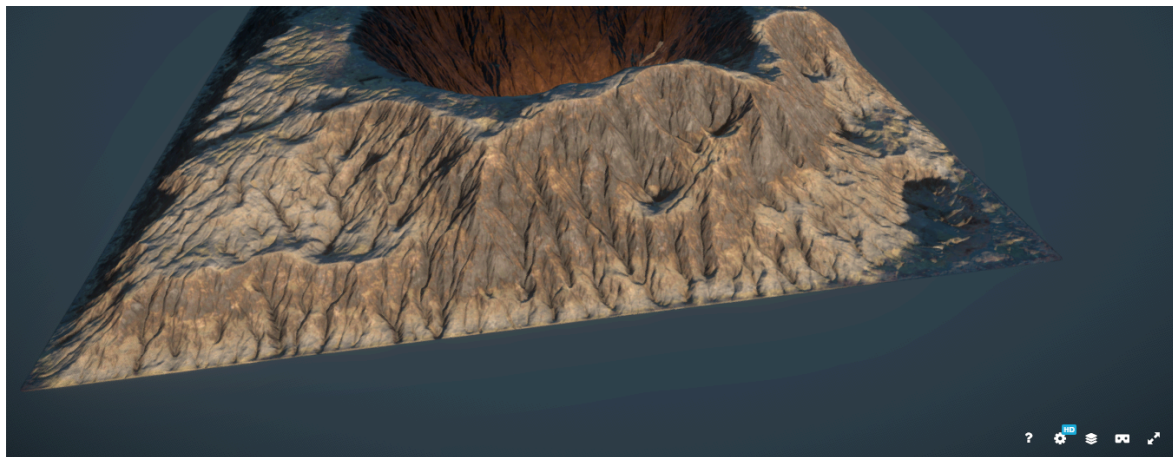


Figure 6. Sketchfab Search license types filter

Clicking on a 3D Model opens up sketchfab’s model viewer, along with details about the model.



volcano
3D Model

[FOLLOW](#)

7.3k 29.5k 542

[Download 3D Model](#) + Add To </> Embed ↗ Share

Report

Triangles: 157.2k Vertices: 78.8k [More model information](#)

vulcano mouth

Figure 7. Sketchfab Model Details

In *Figure 7*, we can see the “**Download 3D Model**” button under the model name and author. We also below it have the amount of triangles the model is comprised of, **which is slightly relevant to us**. The more triangles there are, the higher the processing load will be on devices. Even up to a **million** triangles should be fine, however be wary of any higher fidelity models with much higher triangle count than a million, as they cannot effectively be used in the game engine without slowing down the application.

Now, if the download button is pressed, we will see a new dialog.

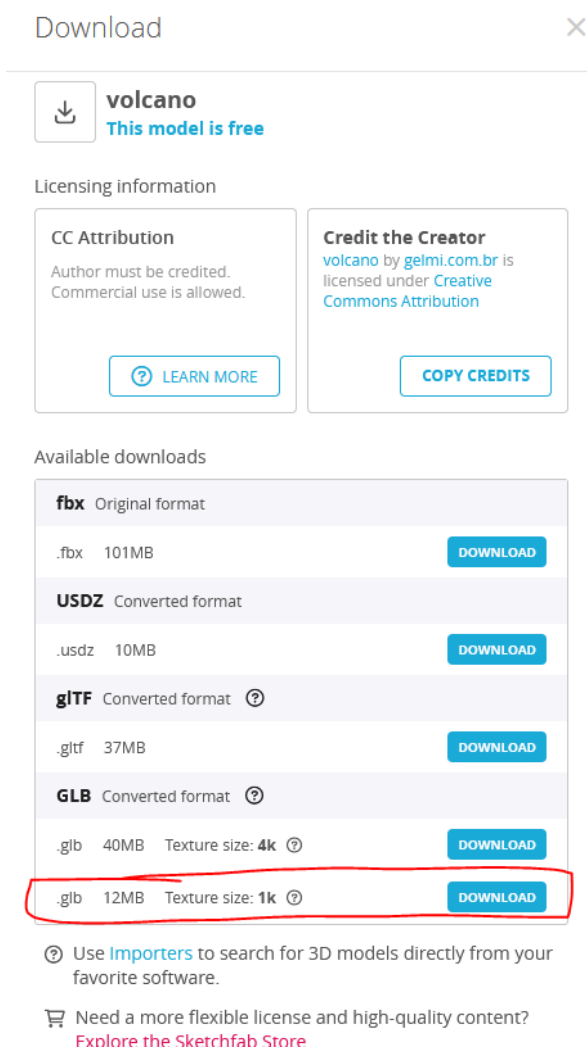


Figure 8. Sketchfab Model Download Dialog

Make sure to **always** download the **GLB** converted format, and with the **lowest** texture resolution available. The format is most compatible with the game engine, and low texture size saves disk space.

You may create a folder named after the subject in your **‘Downloads’** folder to download these files into.

Now that downloading models is explained, the *lesson plan* document can finish.

Creating New Scenarios in the Engine

With the lesson plan in hand, the scenario can now smoothly be prepared in the engine by building on top of the source project. While it is the actual game engine itself we will delve into, we will only look at very surface-level controls and buttons, mostly drag and dropping objects the developers have pre-made. **No code knowledge is required.**

In short, the sample scenarios we've seen consist of **scenes** that contain **one model** and some **pins** are placed around it. The goal is for us to create a few scenes, place pins in them, and place pins that take us to another scene to create a full scenario based on the previously constructed **lesson plan**.

Opening the Project

Find **"Godot 4.6"** in the **PROJECT SOURCE** folder and double-click it to open it. The project selection screen will appear. Click on the **"Import"** button at the top to begin locating the project.

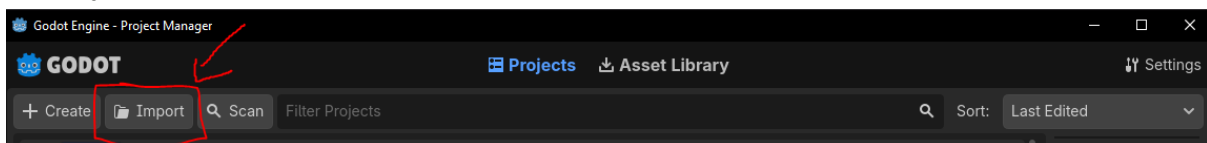


Figure 9. Godot Project Selection

A window will popup that asks you to locate the project. By pressing on the **"up arrow"** button, you can move up a directory. If the project files were placed in **"Documents"** as previously instructed, the **"Documents"** folder should be easily accessible by pressing the **"up arrow"** button a few times.

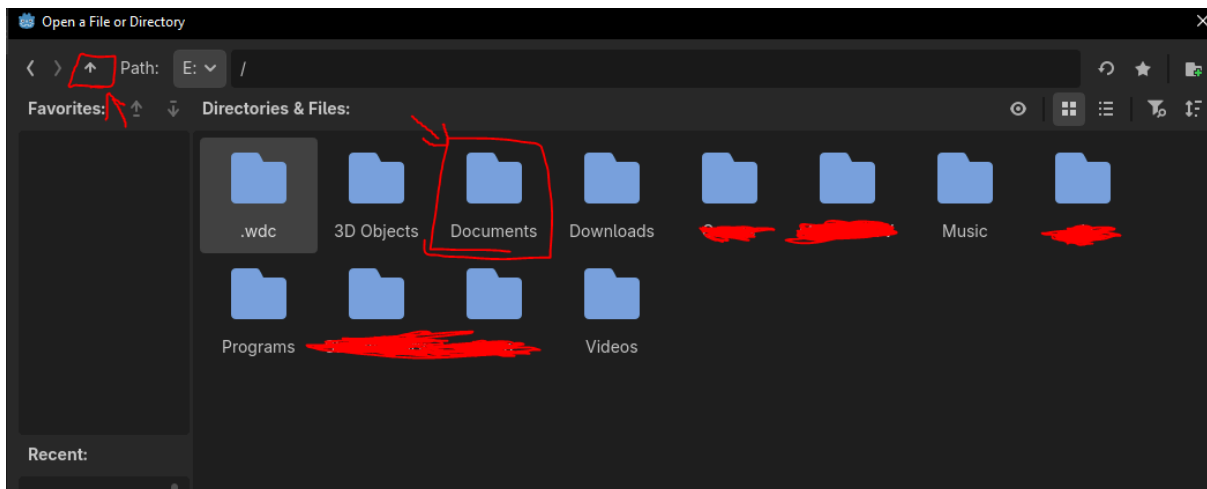


Figure 10. Project Finder Window

Navigate to the folder **SCPSTEMIT -> PROJECT SOURCE-> scp-stemit** and double-click **"project.godot"**.

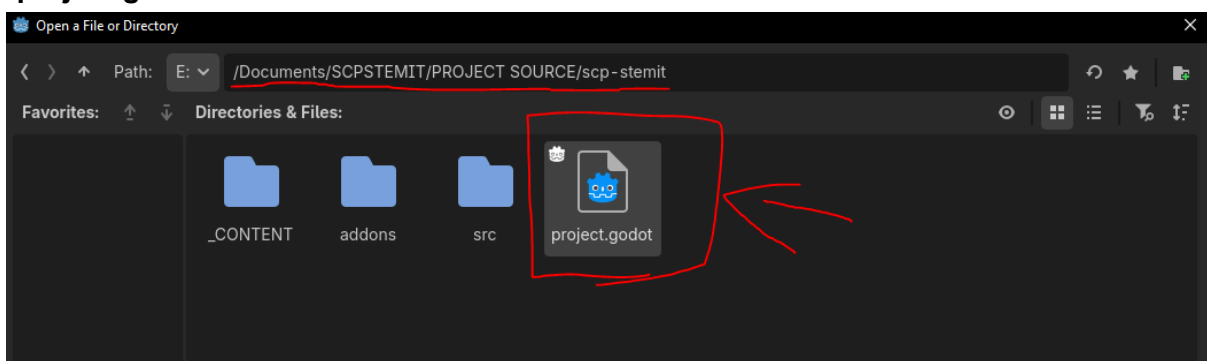


Figure 11. Project location

On the next window that pops up, click “Import”. Since “Edit Now” is ticked, this will open the project as well.

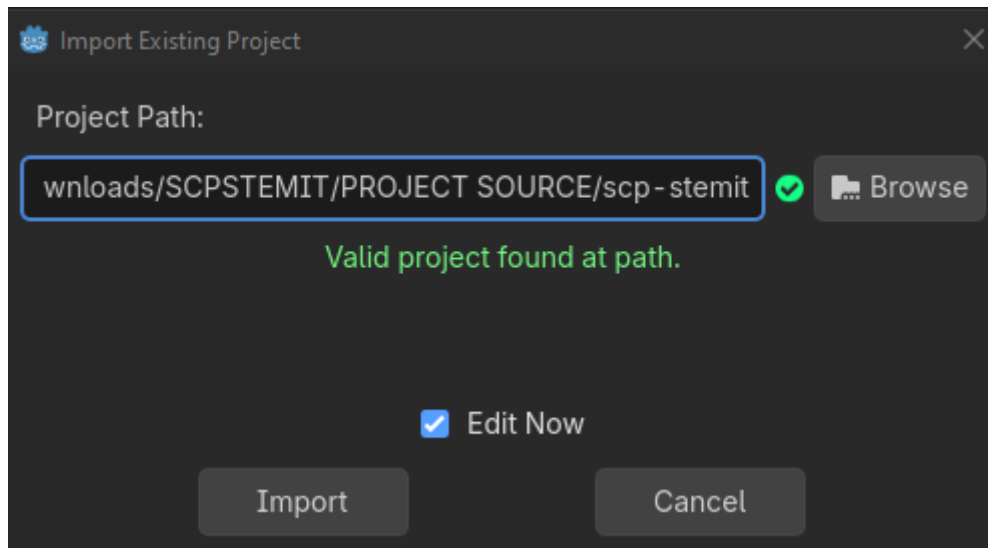


Figure 12. Project Import Confirmation

NOTE: The import process is done only for the first time. In the future, the “SCP Stemit” project will appear in the project list and can be double-clicked there to open the project.

Note that opening the project for the first time may take a few minutes.

Basic Interface Controls

Once the project is opened, we should see a screen like below.

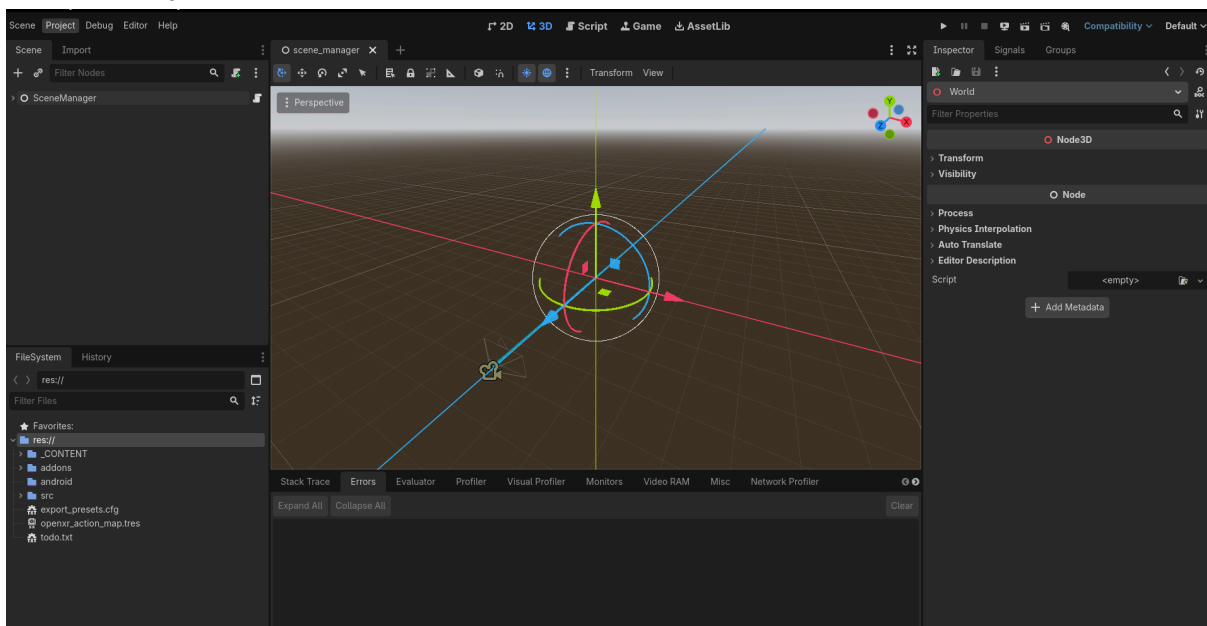


Figure 13. SCP Stemit Project Main

To briefly explain, on the **left** we have the “**Scene Tree**” which lists the objects in the scene. When we add a model and pins, they can be found here. There are also objects that the developers have placed before as well, so they can be ignored.

On the **bottom left** we have the project files, which we will use when importing the downloaded 3D Models into the project.

On the **right**, we have the **Inspector**, which allows setting **properties** of a selected object. We will use this to set the text for the **pins**.

In the **middle**, we have the **Viewport**, which displays the current scene in 3D. Objects can be selected by clicking on them here or in the Scene Tree list. However, there are no visible objects yet in the scene we are on, so this cannot be tested yet. **It is important** to take a few minutes to learn to navigate the camera in this middle viewport right now:

- The camera can be reset to the **center of the scene** by pressing “**O**” on your **keyboard** after clicking anywhere on the viewport.
- **Zoom in/out** with **scroll wheel up/down**, while scrolling the zoom level appears on the left. A good zoom level we are using is “**4.5m**”.
- **Hold Right Click and drag the mouse** to rotate the camera view.
- **Hold Middle Mouse Click and drag the mouse** to orbit around the center.
- **Hold Right Click and press W, A, S, or D** on your keyboard to **pilot** the camera. This is the most useful feature.
- Remember again that the “**O**” key can be pressed to reset to the center, which is where our focus is on.

We will look at these slowly in the guide. It is time to import the models.

Import Models into the Engine

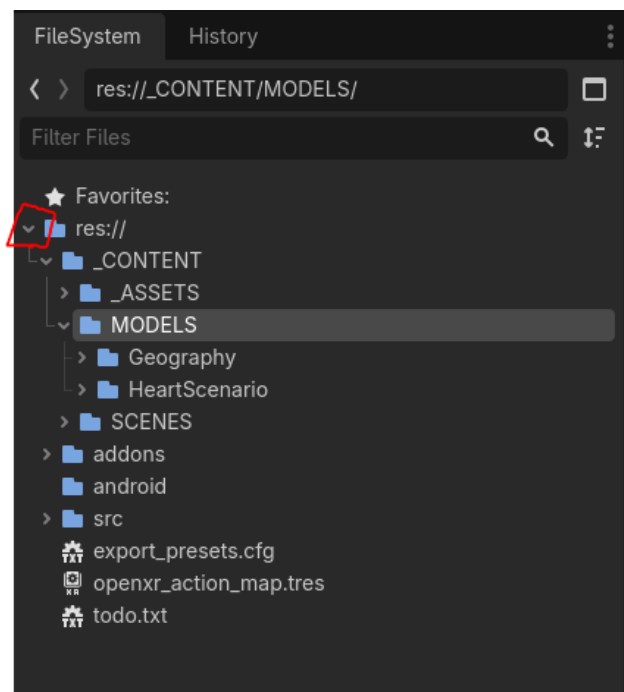


Figure 14. Project Files

Before importing the models, let's create a new folder to put them in. This helps keep things organized. In the **bottom left**, the project file section, the folders can be expanded by clicking on the arrow to the left of the folder. Locate the **_CONTENT -> MODELS** folder. **Right click on the MODELS** folder, hover over **"Create New"** (The first choice) and then click on **"Folder..."** to create a new folder under MODELS. The new folder dialog will appear, so enter a name such as the theme of your subject.

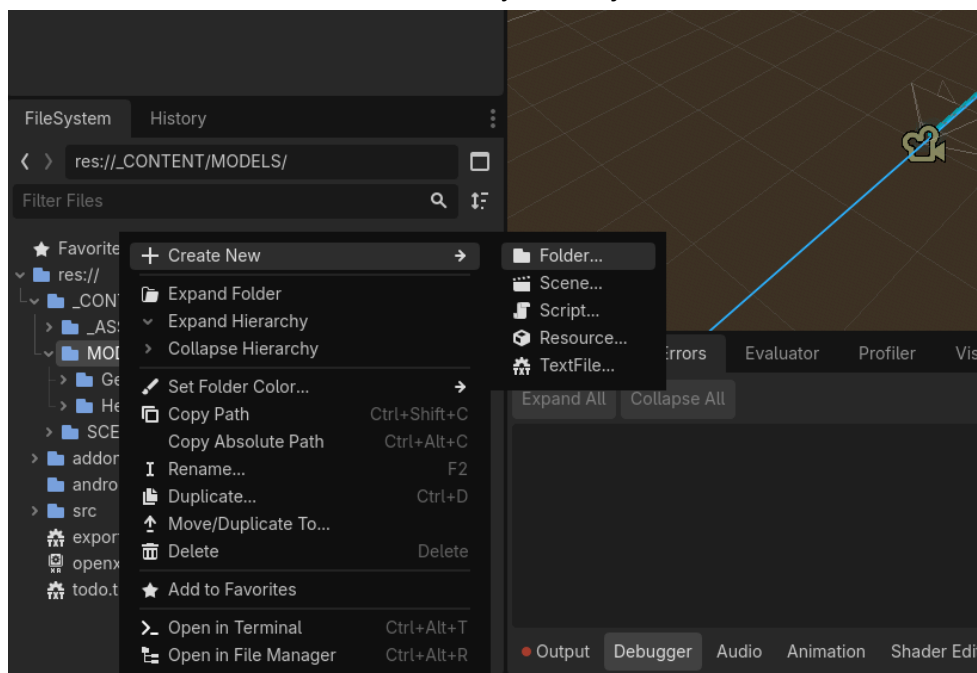


Figure 15. Create New Folder

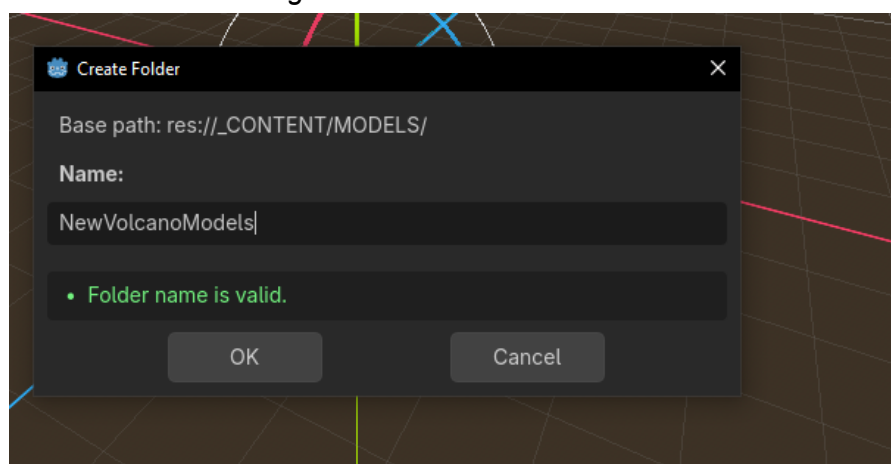


Figure 16. Create Folder Window

Now we can drag & drop the downloaded model files into the folder. To do so, open or return to your operating system's File Explorer and navigate to the folder where you previously **downloaded** the 3D Models. Unmaximize the file explorer window so that the project can be seen in the back and drag & dropping is possible, then simply select all the models and drag & drop them onto the folder in the project.

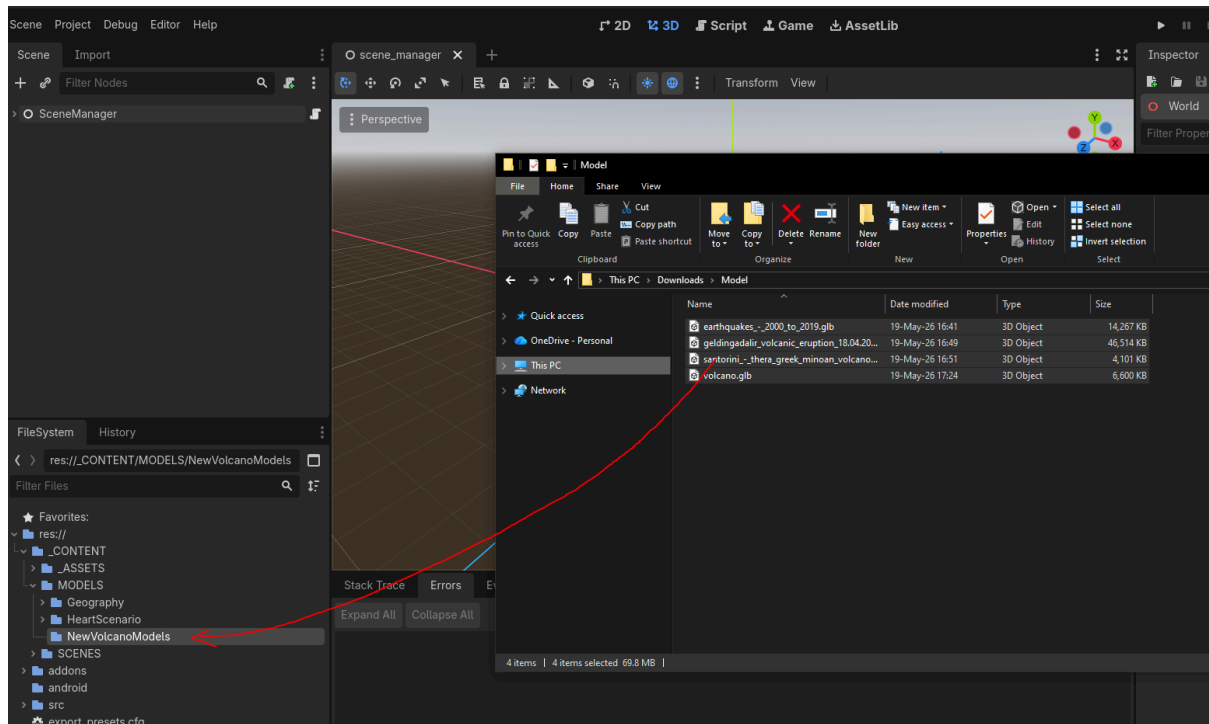


Figure 17. Drag & Drop Models

These may take some time to import. It is also a good idea to not select ALL of the models if there are many and instead import them slowly in chunks. We should have this result in the folder now:

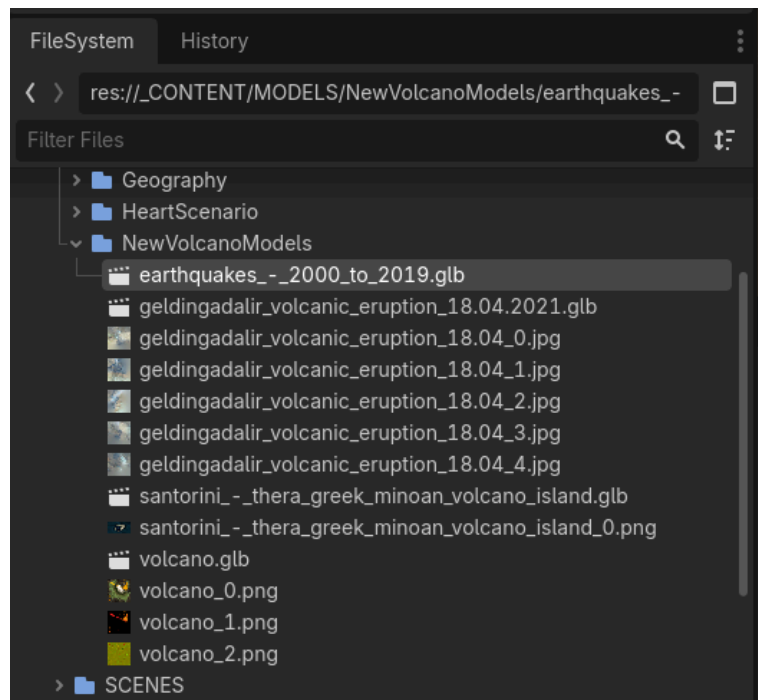


Figure 18. Imported Models in the File System

The files that end in **.glb** are the model files. Some **texture image files** have also been extracted from the model in order to be used by the engine, but we can ignore them completely. We will focus on **.glb** files only.

Scenes Setup

It is finally time to start working on the 3D Scenes. This is the **most important part** and needs the **most attention**. In the sample scenarios, each screen we saw that contains a model and pins is **one scene each**.

Creating a New Scene

On the **bottom left** File menu, navigate to the **_CONTENT -> _ASSETS** folder. **Right Click** on **_SCENE.tscn** and select **“New Inherited Scene...”**

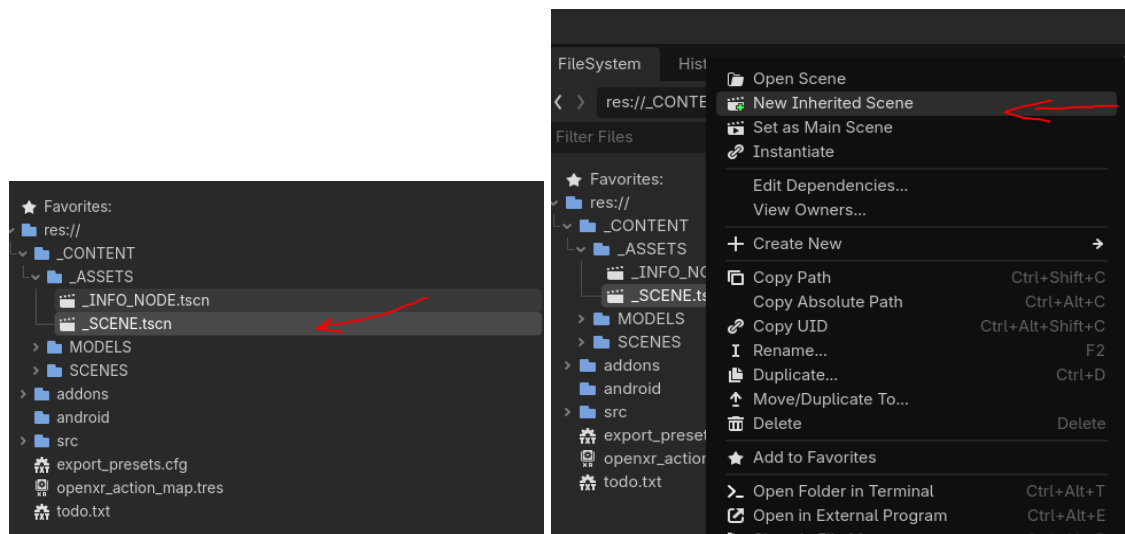


Figure 19. Creating new inherited scene

This will now create a new scene that inherits the functionalities given by the developer.

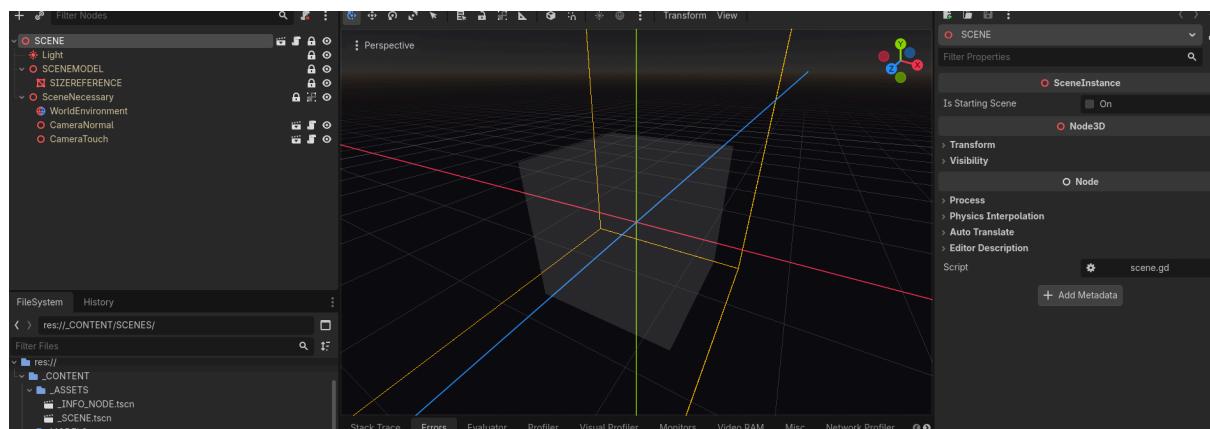


Figure 20. New SCP STEMIT Scene

While we can save this new scene at any point, we should take care of it now. In the same fashion that we created a new folder for the **models** under **_CONTENT -> MODELS -> (New Folder)** we should do the same for the scenes. Navigate to **_CONTENT -> SCENES**, right click on **SCENES** and create a new folder with the name of your subject.

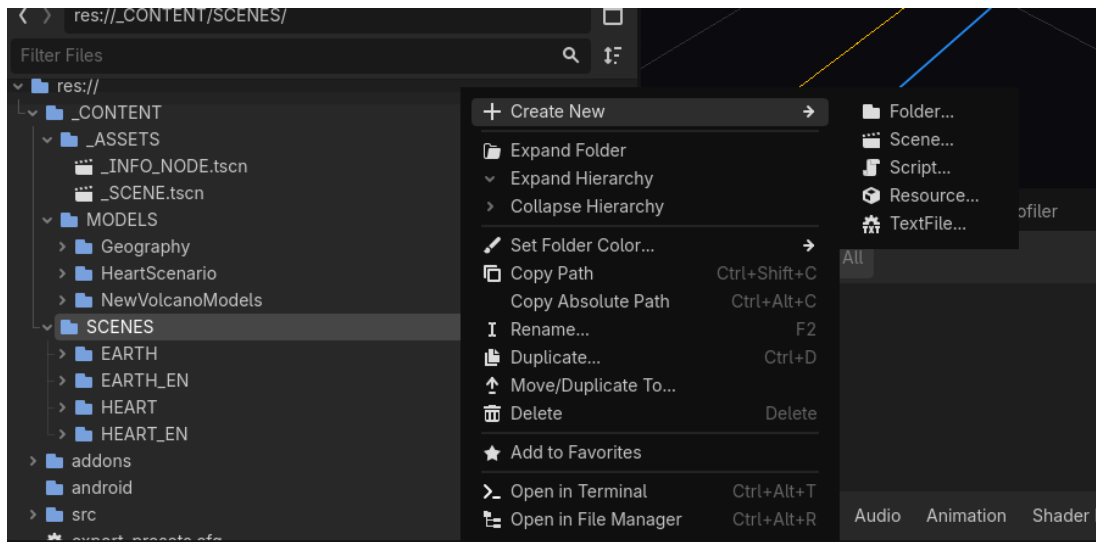


Figure 21. Creating new folder for Scenes

Now we can save the scene into this folder. Click on **“Scene”** on the top left and select **“Save Scene As...”**. A window will popup where the save location must be specified. Navigate to **_CONTENT -> SCENES** and into the new folder you have created for the subject. The scene should be named according to what model is to be displayed in this scene, which should be the first one in your previously constructed **lesson plan**.

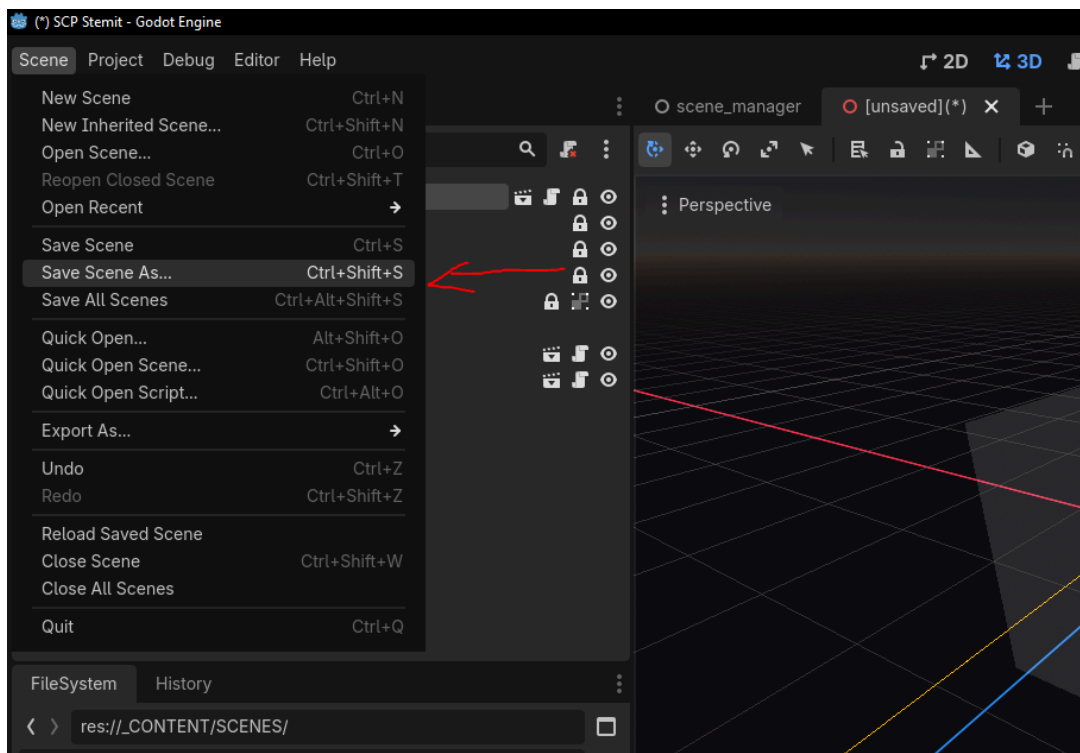


Figure 22. Save Scene As...

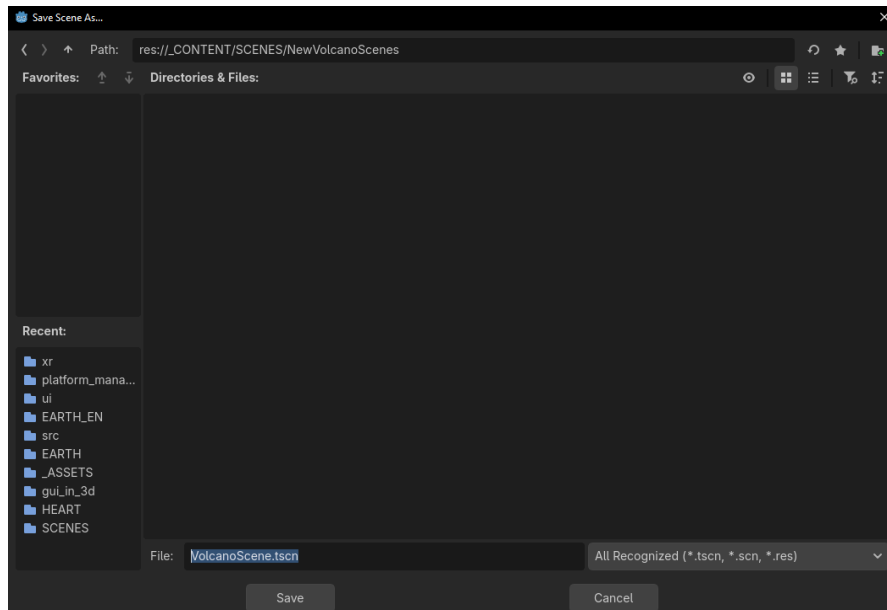


Figure 23. Saving the new scene with a name.

Adding Model to the Scene

To add a model to the scene, it can be directly drag & dropped into the center of scene from the folder in MODELS that was created earlier. As a reminder from the interface controls, “O” can be pressed after clicking on the viewport to reset the camera to the center, and you can zoom in/out (to a recommended value of 4.5m) with mouse wheel up/down.

With the camera properly pointing to the center of the screen, **drag & drop the .glb file to the center.**

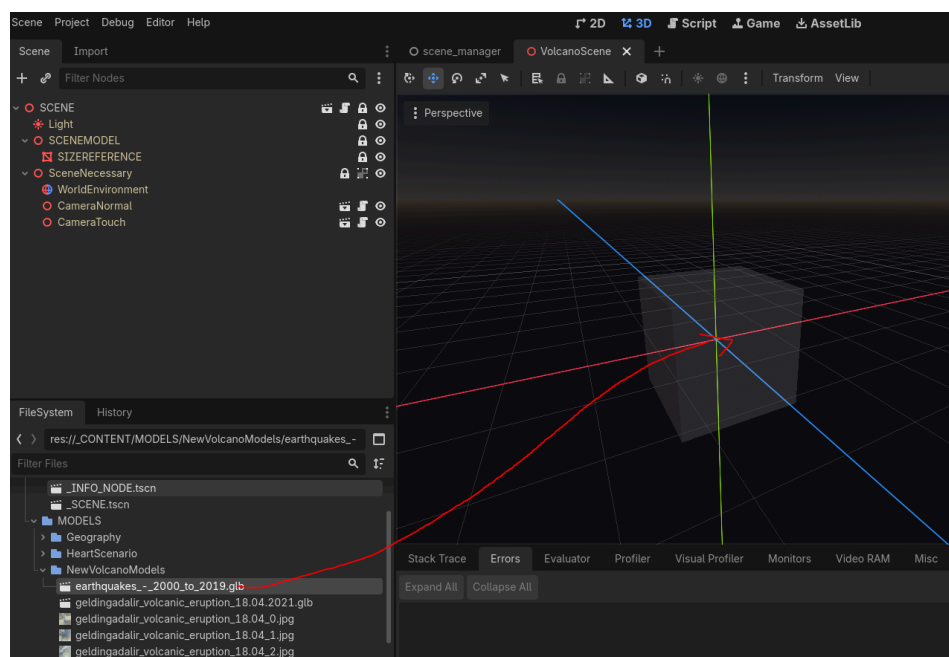


Figure 24. Drag & Drop the .glb into the scene

Resizing the Model, Size Reference

The model should now be visible in the scene. However, 3D Artists may work on different size scales when creating the models. As such, the model that is now placed may be **too big** or **too small** in relation to what our program is working with.

This is why there is a faint cube in the middle of the screen. The developers have placed it there as a reference for what a good size is for the application. Fortunately, we can resize the model within the engine by **scaling** it. The model can be selected either from the **Scene Tree** on the left (it is likely called “*Sketchfab_scene*”) or by clicking on it in the **Viewport** (the middle screen). With it selected, we can now edit its properties. In this case, we want to edit its position and the scale. Click on the arrow next to “**Transform**” in the “**Inspector**” on the right of the screen to expand some positional properties.

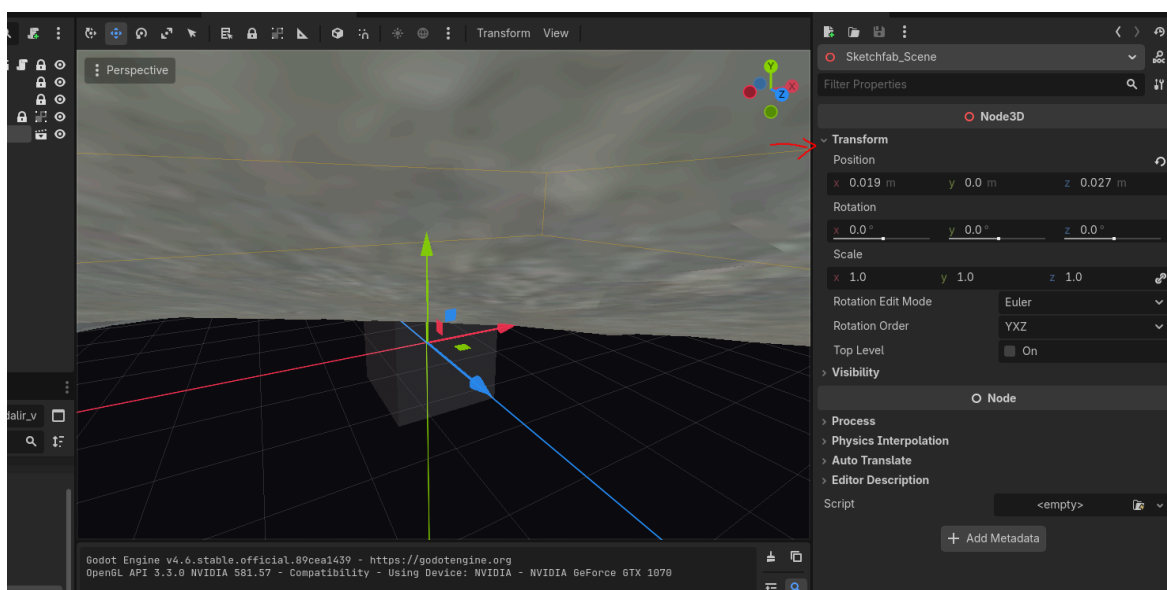


Figure 25. Expanding Transform

It is highly recommended to **edit values by inputting numbers here directly**, though it is possible to move objects also with the green, red and blue arrows in the viewport.

It is recommended to set the **x, y and z** Position values to **0**. Click on the **number**, **input 0** then press **Enter** for each. This makes sure our model is located in the center.

The **scale** is what is important here. Currently it is at 1.0 (default scale), however in the screenshot's case the model is very big compared to the **size reference** cube. To scale it down, manually input a value of for example **0.1** on any of the x, y or z axis for Scale and press Enter, and we can observe a change in size. By default, changing one scale axis also uniformly changes the rest. If we see that a scale of 0.1 is still too small or too big, we can further adjust the scale.

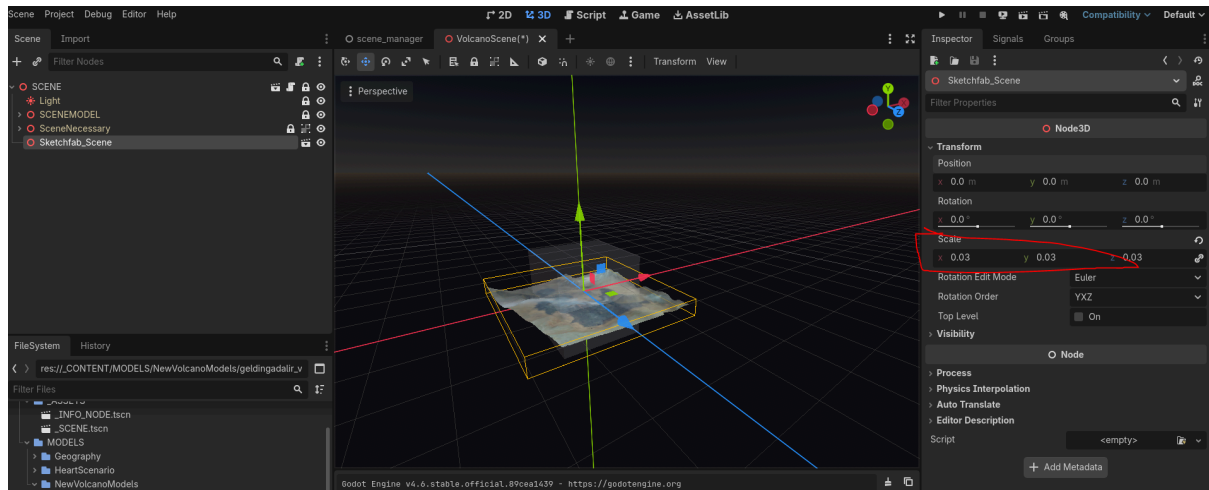


Figure 26. Setting the scale. A scale of 0.03 for this particular model was needed to fit into the size reference cube.

The scene can be saved again by pressing Scene on the top left -> Save Scene.

Adding Pins to the Scene

Pins can be added to the scene by drag & dropping a pin object into the scene. Navigate to **_CONTENT -> _ASSETS** in the **File** menu and drag & drop an **INFO_NODE.tscn** into the scene, similarly to the model.

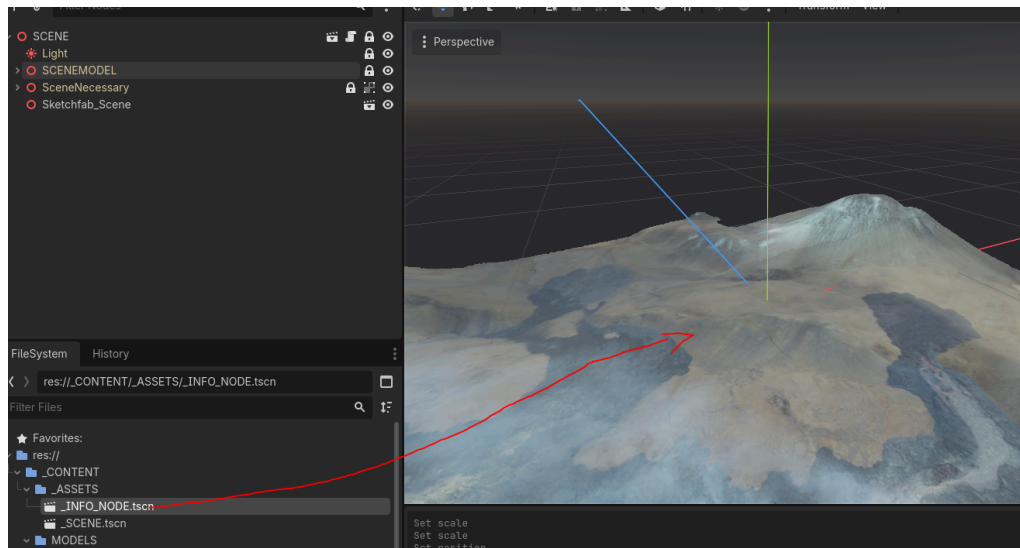


Figure 27. Adding a Pin to the Scene

Keep in mind, the pin object can be quite small so in order to locate it you may need to navigate the camera as described in *“Basic Interface Controls”* earlier. When the application is actually running, the size is auto-adjusted for the screen and zoom size, so there is no need to worry about scaling it up/down like we do with the model.

Once the pin is in the scene, it can be **positioned wherever we want**. **Select it** by either **clicking on it after finding it in the scene**, or by **clicking on it in the Scene Tree on the left**.

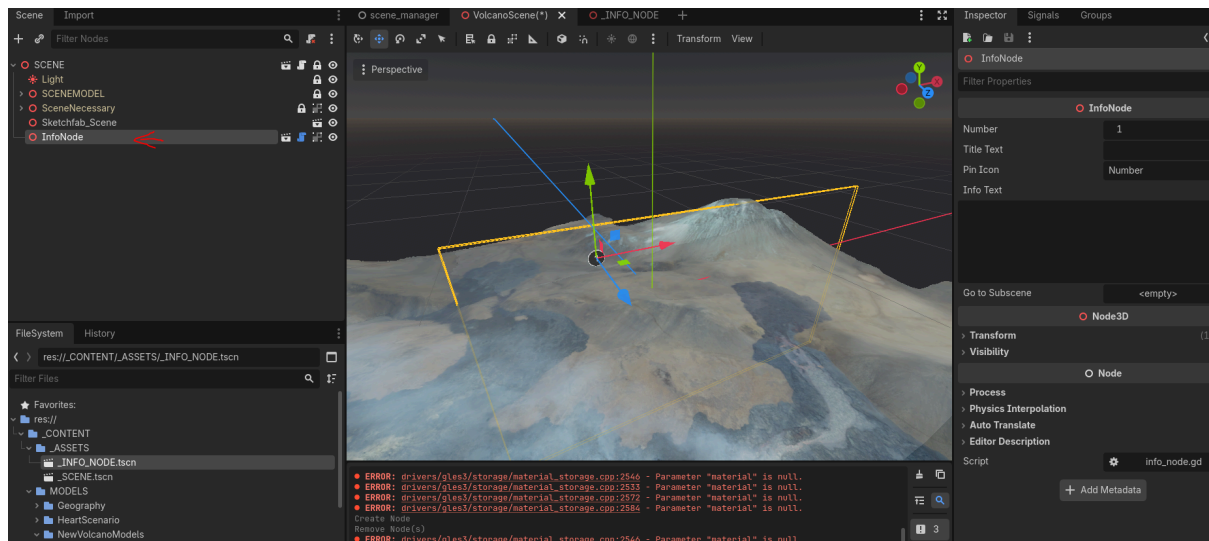


Figure 28. Selecting the added Pin

If you cannot find it in the **Viewport**, but can see it in the **Scene Tree** (it will be named **InfoNode**, or **InfoNode** and some number if multiple are in), please continue adjusting the camera and zoom to find it. Similarly to the model, we can set its **Transform's Position** to 0, 0, 0 to make sure it is at the center, and press “O” key to reset our camera view and it should be there.

To position the pin where we want, use the green, red and blue arrows to move it into the position you'd like. The arrows will appear only while the Pin object is selected. Make sure also that “**Move Mode**” is selected in the toolbar.

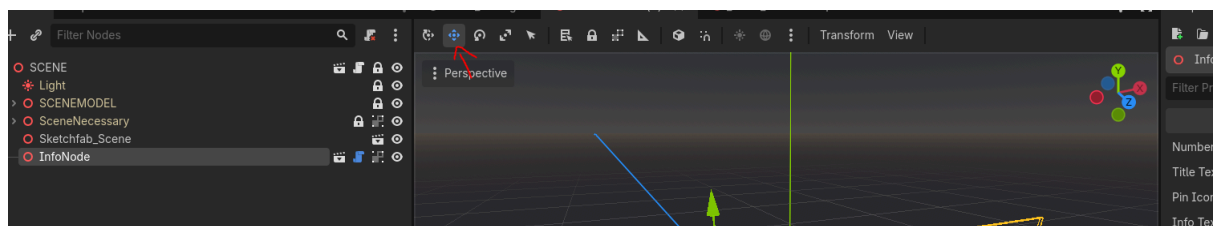


Figure 29. Making sure “Move Mode” is enabled

With a pin selected, we can now also **edit its properties** in the **Inspector on the right** by clicking on the field next to each property. If the property is changed, clicking on the circular arrow to the left of the property field **reverts it to default** which might be needed sometimes.

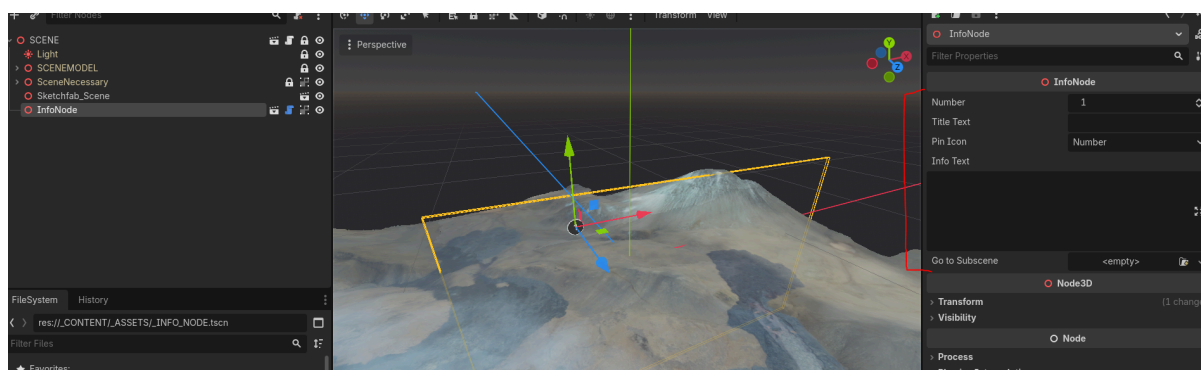


Figure 30. Pin properties

Property	Function
Number	Changes the number displayed on the pin.
Title Text	Set the Title of the information popup that appears.
Pin Icon	Change the icon that appears on the Pin. "Number" displays the set number, "Info" displays an "i" icon, and "Arrow" displays an arrow icon that indicates this pin moves us to another scene.
Info Text	Set the text that appears on the information popup.
Go to Subscene	Drag & Drop another scene to create a transition from this scene to the specified scene when clicking on this pin. If this is set, the information popup will not appear.

The process can be repeated for as many pins as we'd like in a scene. It is also possible to duplicate a pin and change its properties to slightly speed up the process by **selecting it in the Scene Tree** on the left and pressing **Ctrl + D**. Once finished, save the scene again by clicking on **Scene** on the top left and then **Save Scene**.

Transitioning Between Scenes

Transitions between scenes are done entirely using the Pin's **"Go to Subscene"** property. Repeat the **"Scenes Setup"** process for the scenes/models that you'd like, and then drag & drop the scene into a pin's **"Go to Subscene"** property. For example, I've created a scene with a Volcano and another one with Earth and saved them to my subject's folder in **_CONTENT -> SCENES -> Volcanoes**. Now after adding a pin to the Volcano scene, I can drag & drop the Earth scene into "Go to Subscene".

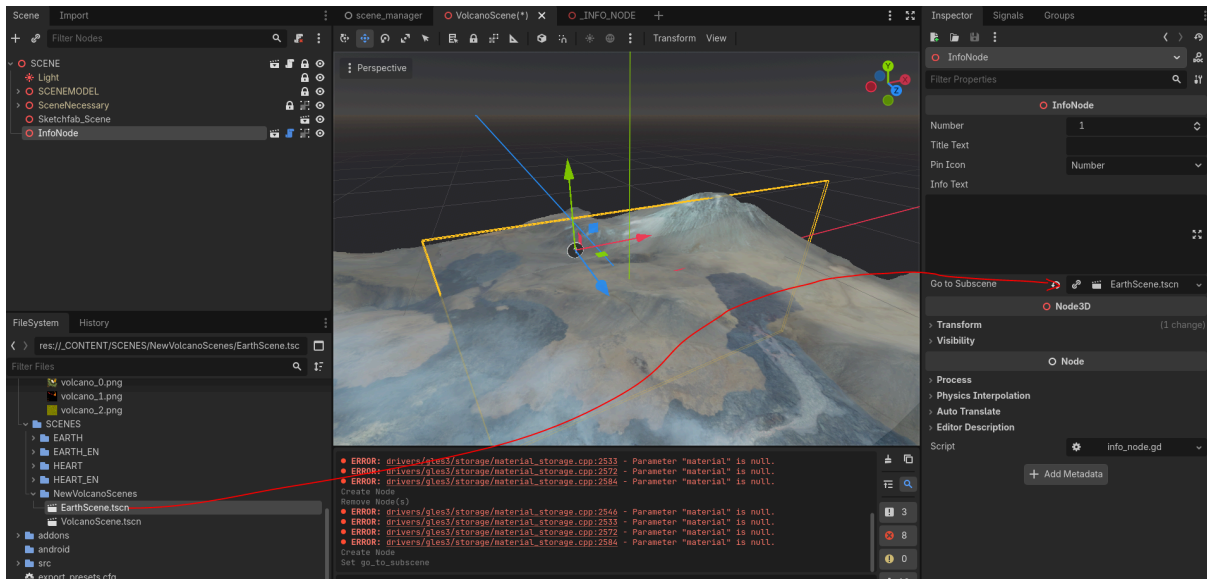


Figure 31. Drag & Dropping another Scene to the pin

Now when that pin is clicked during the application runtime, the scene will change to the specified Earth scene.

NOTE: Since we have a models folder and a scenes folder, make sure to not confuse the two of them! Models are different from the scenes we create, but the scenes contain the models.

Closing/Reopening Scenes

Godot can keep multiple scenes open so that you can switch between them easily. Remember to close them when not needed anymore, as if they add up then the computer can slow down. This is done by clicking on the **X button** next to the **Scene Tabs** above the Viewport.

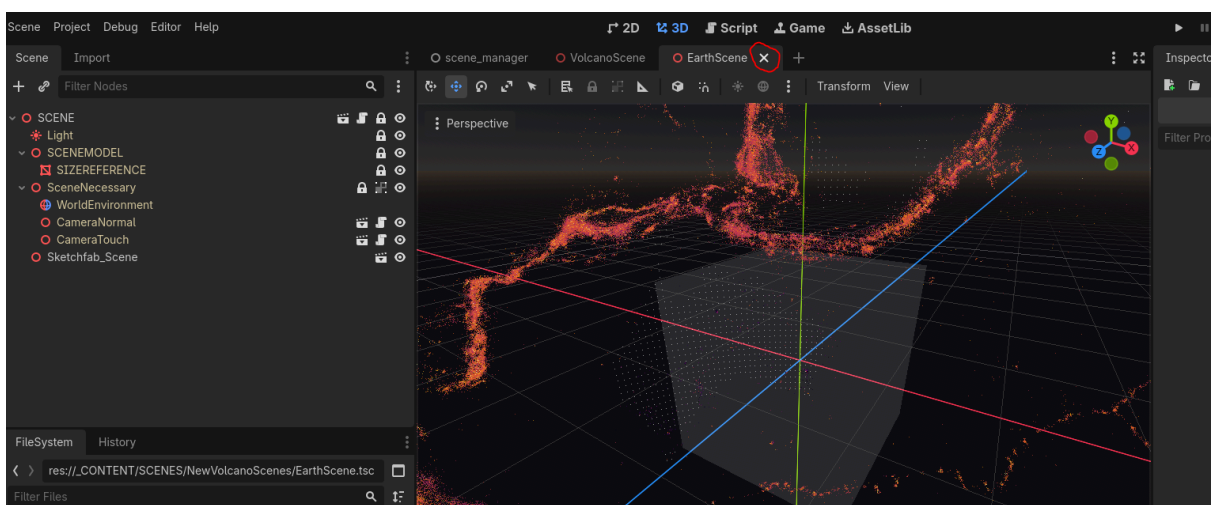


Figure 32. Closing Scene Tabs

Of course, any previously created Scenes can be re-opened by finding them in **_CONTENT -> SCENES** and the folder you have created and double clicking them, and any changes to the model position/scale and pins can be done here.

Setting a Scene as a “Starting Scene”

In order for the scenario to appear in the **Scenario Select** menu, its first scene must be marked as a “starting scene”. To do this, open the scene you’d like to be the first scene and click on the root object called **“SCENE”** on the left-side Scene Tree to select it. Its properties appear on the right side, the Inspector, and **“Is Starting Scene”** is the only exposed property. It can be ticked on/off. Put it **ON** for the starting scene. This should **only be done** for the scene that we want to start on when selecting this scenario.

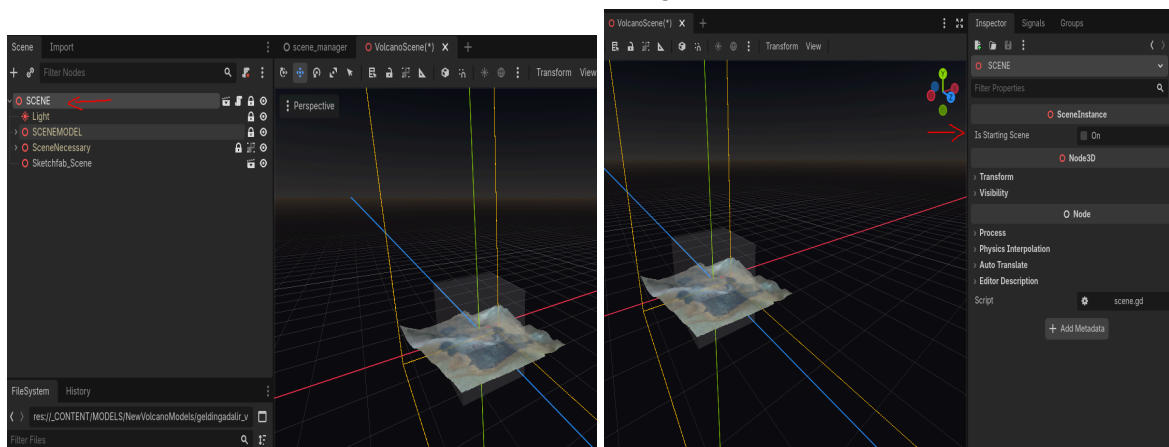


Figure 33. Setting Scene as Starting Scene

Summarize The Scenario Development Process

- Create new scenes by creating a new Inherited Scene from **_CONTENT -> _ASSETS -> _SCENE.tscn**
- **Drag & drop** a model(.glb) from the FileSystem to the center. Adjust its **scale and position** to fit into the **size reference cube**.
- **Add Pins** by drag & dropping **_CONTENT -> _ASSETS -> _INFONODE.tscn** into the scene much like the model, and reposition them with the Transform arrows. Set also their text properties on the right when selecting it.
- **Repeat for** all the scenes/models in your lesson plan.
- **Revisit** the scenes you have saved to now add transitions from one to the other by drag & dropping scene to any pin’s “Go to Subscene” property. This is **done later when revisiting because** when creating the scenes, you likely **do not yet have the next scenes ready**.
- **Revisit** the scene you’d like to be the first scene that appears when selecting the scenario and set its “Is Starting Scene” property to ON.

Now the scenario can be tested!

Testing

The scenario can be tested within the engine. On the top right bar, we can find the “**Play**” button that runs the game. Likewise, the “**Stop**” button close to it ends the test when needed.

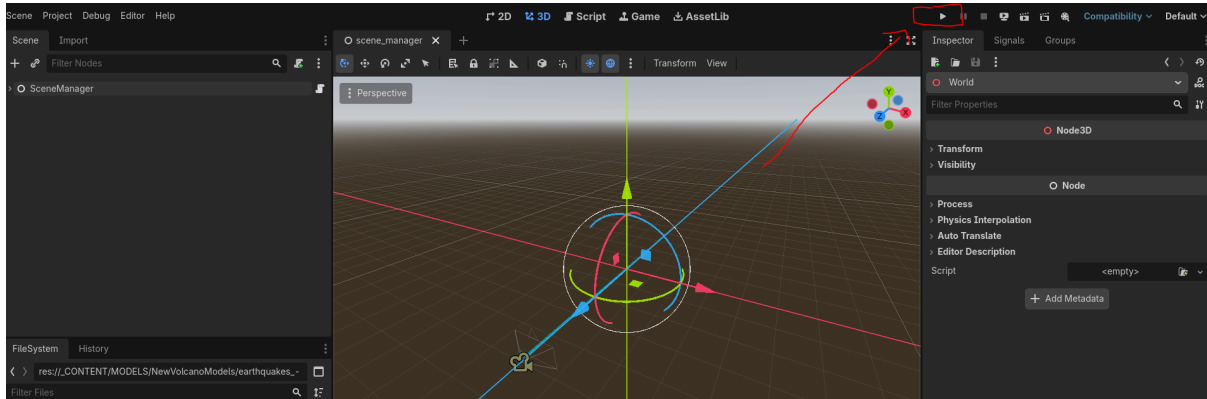


Figure 34. Play Test Button location

It is recommended to test often when building the scenario.

If the new scenario is not visible in the test, something must have gone wrong during the process, but please double check that the scene that should load first has “**Is Starting Scene**” selected, as mentioned previously.

Exporting the Application

Upon reaching this point, we have a scenario that can be played on the desktop PC through just the testing method. If the goal of the lesson is to simply show these models from the Desktop PC and the testing method is enough, **it is possible to end here!** However, if you’d like to have an exported **.exe** version that you can save to a **USB** or other device, then an **export** of the application is needed.

Windows

Exporting the application for Windows is the easiest of the platforms. On the top toolbar of Godot, click “**Project**” and then “**Export**”.

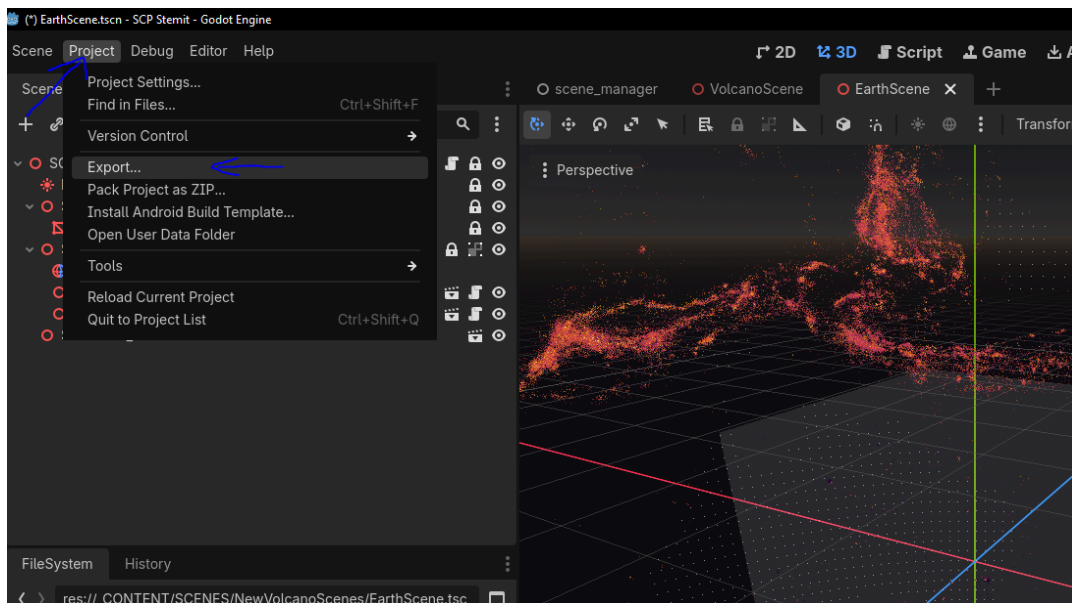


Figure 35. Location of “Export” option

The Export window should popup. On the left are three export presets that can be used to export the application to Windows, Android, or Android VR.

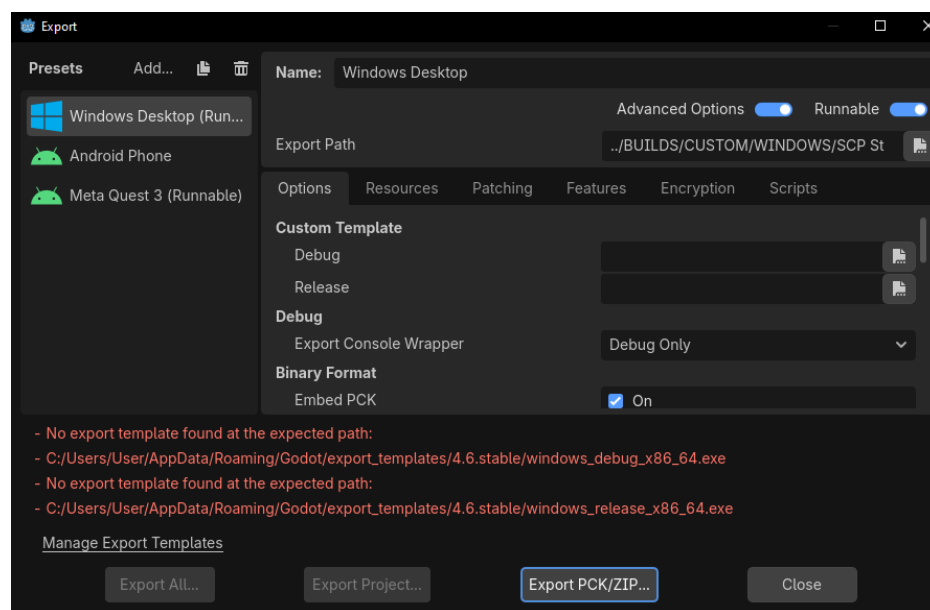


Figure 36. Export Window

In order to export to Windows, an export template must be downloaded, as the warnings in red text say. It is a process done automatically, with a few clicks. On this screen, click “**Manage Export Templates**”.

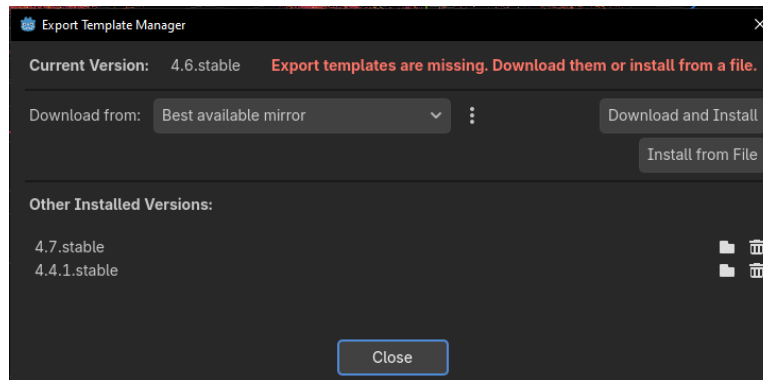


Figure 37. Export Template Manager

The Export Template Manager will open. From here, simply press **“Download and Install”** and wait for the download to complete. Keep in mind, the download size is around **1.16GB**. This needs to be done **only once**. Any subsequent exports will not require you to download the export template again.

When completed, click **“Close”** and then go to the **Export Window** again by pressing **“Project”** -> **“Export...”** on the top toolbar as done previously.

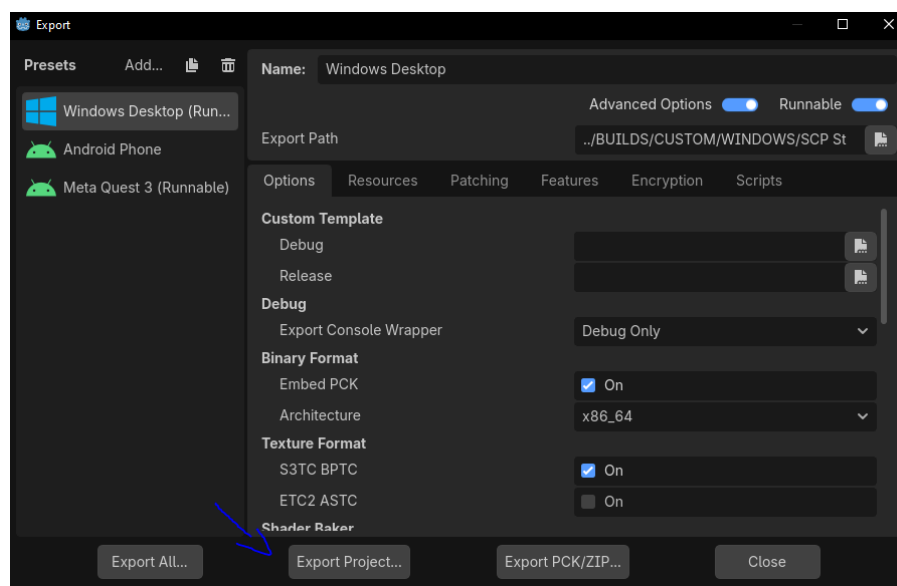


Figure 38. Export Window with no Warnings

The warnings in red text should be gone now. Simply click on **“Export Project”** now.

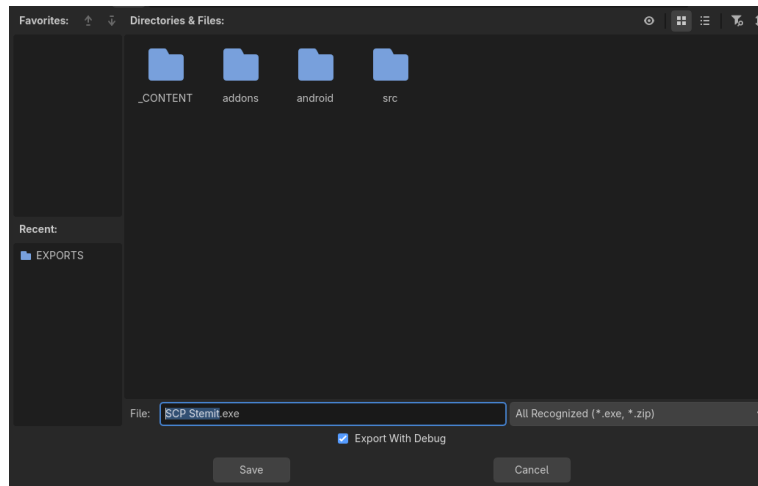


Figure 39. Export location

You are now given the choice to export the application to a location of your choice. We have pre-configured the export location to be in the project folder “**APPLICATIONS -> CUSTOM**”, so it is recommended to simply press “**Save**” to begin the export process, unless you know where else you would want to export. Since it is a simple **.exe** file, it can also just be moved anywhere else later.

Wait for the export to finish, then go to the specified folder. The application should be there, and can be ran!

Android Smartphone

Exporting for Android has a bit more technicalities, and as such it is **not recommended**. It requires installing **OpenJDK** and temporarily installing **Android Studio** to get some necessary components for exporting to Android and then setting up the paths to those components in Godot. This official guide in the Godot documentation explains the process:

https://docs.godotengine.org/en/stable/tutorials/export/exporting_for_android.html

After those are set up, the exporting method is the same as for **Windows**, except that the “**Android Phone**” template must be selected.

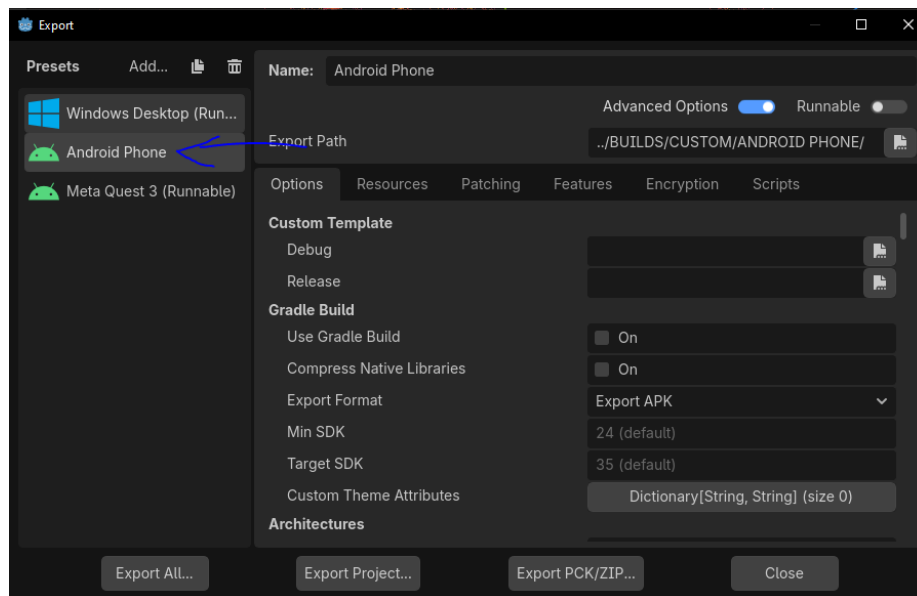


Figure 40. Selecting the Android Phone Template.

As in Windows, the export path is pre-configured to be in the project folder “**APPLICATIONS** -> **CUSTOM**”. The resulting export is a single **.apk** file, which in order to be installed to a device, the guide for installing to Android that was in this guide before must be followed again: [Geography.docx](#)

VR

VR Headsets use Android OS, and as such requires the same process for set up as the Android Phone export. If the guide for the Android Phone export was already followed, it is also possible to export for VR already by just selecting the “Meta Quest 3” export template in the Export Window. Upon export, the guide to install to VR must be followed again: [Geography.docx](#)

Due to the technical requirements of exporting to VR and Android Phones, it is recommended to stick to Windows, as that can also run VR if your desktop is capable of it.