

Unity GIS Tech 2018-2021



GIS Terrain Loader

Powerful GIS Tools for Unity Engine

Documentation v1.7

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➤ Overview

Description

GIS Terrain Loader is **Runtime-Editor** plugin that gives you the ability to import geographic data directly into Unity Engine, designed to load not only **Real World Terrains data** but also any almost of customized terrain data exported from any GIS applications or external terrain generators (GlobalMapper, QGIS ,WorldMachin, ArcGIS ,SAS.Planet..etc).

GIS Terrain Loader create terrains basing on loading (Raster-Vector-DEM) data that makes importing and modifying large quantities of data fast and easy.

Via GIS Terrain Loader, you will be able to:

- Import Digital Elevation Model (DEM) data to create accurate Landscapes.
- Import GIS vector lines to create 3D Objects like Trees, roads, Buildings, Grass ... Etc.
- Import Raster (Textures) data to texturing Unity terrains.

Supported Files:

. DEM Data :

- *.Flt : Floating Point Raster File,
- *.Ter : Terragen File ,
- *.Tif (Tilled Tiff + Grayscale + Multi-Bands data) in (16-32bit) : GeoTiff Files,
- *.Asc : Arc ASCII Grid format,
- *.Raw : Unity Heightmap data,
- *.Png Grayscale : **Grayscale** Pixel File ,
- *.Las : Lidar Point Cloud *Format* ,
- *.Hgt : Shuttle Radar Topography Mission (SRTM) Data,
- *.Bil : Band Interleaved by Line (**BIL**) Image *File* “
- *.Bin : Binary Float point .

. Raster Data : { " *.jpg, *.Png " } .

. Vector Data : { " *.Osm : OpenStreetMap Informations , *.Shp : ESRI Geometry data ", *.GPX : GPS Exchange Format } .

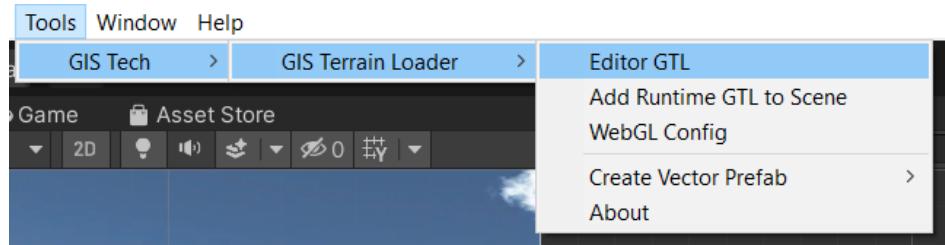
Specification

GIS terrain loader is completely an offline tool, if you need to download real world data download "[GIS Data Downloader](#)" asset, Also the plugin is unable to streaming terrains so if you looking for Streaming terrains try "[Terrain Streaming System](#)" Asset

➤ Getting started

- Editor GIS Terrain Loader

Select the menu item «Tools /GIS Tech/ GIS Terrain Loader », to open GIS Terrain Loader window.

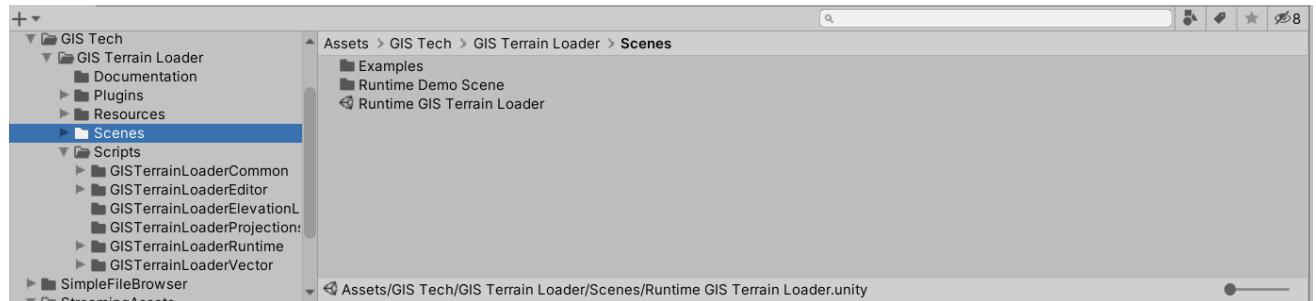


Drag and drop DEM file from « GIS Tech/ GIS Terrain Loader/Resources/GIS Terrains » folder into “Terrain File” field and click on «Generate terrain » button.

GIS Terrain Loader will automatically generate terrains by loading (DEM, Raster and Vector data).

- Runtime GIS Terrain Loader

Open the “Runtime GIS Terrain Loader Demo Scene” from « GIS Tech/ GIS Terrain Loader / Scenes » folder, click on “Load Terrain File”, Select Terrain resolution and click on “Generate terrain”.



➤ Editor GIS Terrain Loader

• GIS Terrain Loader (Editor) Window

Fields Description

We have added a tooltip to each field in GIS Terrain Loader (Editor-Runtime) to help users to understand how each element works.

1- Tool-Bar

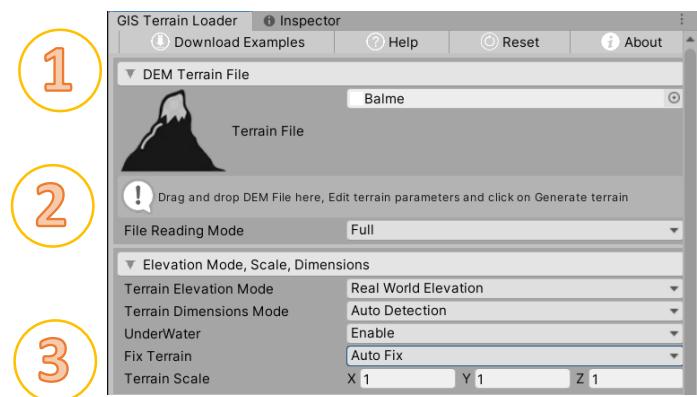
- “Download Examples” : Link to download some examples of DEM files that can be generated by GIS Terrain loader
- “Help”: Link to forum page to ask a question or to support any features or issues.
- “Reset”: used to set all inputs to default.

2- DEM Terrain File :

- Contains DEM Terrain field.
- File Reading Mode: Used to read full DEM file or Sub region by coordinates.

3- Elevation Mode, Scaling, Dimensions

- Terrain Elevation Mode: this option has two modes (Real World Elevation/ Exaggeration value); the first option used to generate terrain with width equal to the average of the lengths of the upper and lower parallels, the second used to set manually the factor of terrain highs in that range [0-1].
- Terrain Dimensions Mode : this option has two modes (Auto Detection/ Manual);
 - o One the first option is selected, GTL will read automatically the real terrain dimensions (Width/Length) for almost of supported Geo-files ;
 - o We can set it to manual to load non **Geo-referenced** Files like **Moon DEM's** or to edit terrain **dimensions** by setting new W/L values in [Km],
 - o In some cases this options appear when DEM file not loaded or has no real dimensions (When DEM is not Geo-File Like PNG, Raw) so we have to set Manually terrain **width/length** in [Km]
- Enable Under Water: to read negative values (under sea level terrains).
- Limit Terrain Elevation : Used to introduce manually min and max terrain elevation, recommended to avoid high or low values.
- Fix Terrain: If your terrain was not generated correctly, use this option to fix it automatically (Fix **Holes**, out of **bounds** height ... etc).



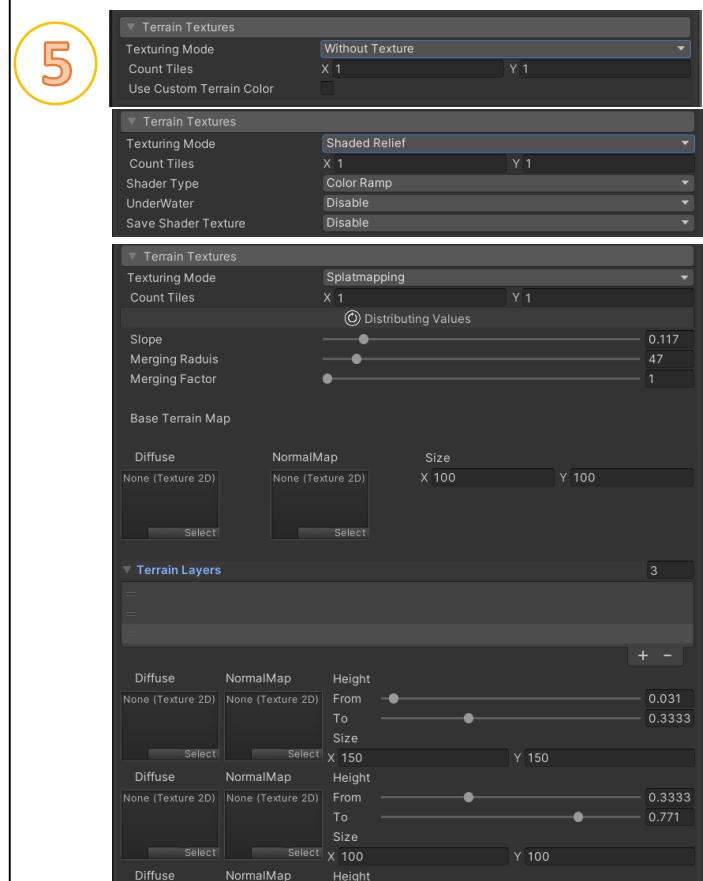
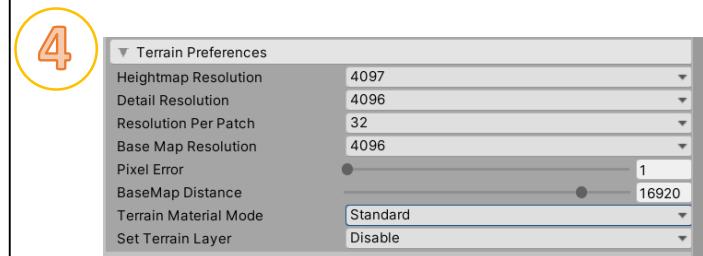
- Terrain Scale: used to scale (up/down) generated terrains, default value equal to (1,1,1) (if the terrain is large with 1 value, we can set small float value like 0.5f - 0.1f - 0.01f".

4- Terrain preferences

- Height Map Resolution: the pixel resolution of the Terrain's Heightmap.
- Detail Resolution: The number of cells available for placing details onto the Terrain tile used to controls grass and detail meshes. Lower you set this number performance will be better.
- Resolution Per Patch : The number of cells in a single patch (mesh), recommended value is 16 for very large detail object distance;
- Base Map Resolution: Resolution of the composite texture used on the terrain when viewed from a distance greater than the Basemap Distance;
- Pixel Error : The accuracy of the mapping between Terrain maps and generated Terrain. Higher values indicate lower accuracy, but with lower rendering overhead
- Base map Distance: The maximum distance at which Unity displays Terrain Textures at full resolution, This improves performance for far away patches.
- Terrain Materials Mode : Custom used when we want to change to main terrain material, used in case of HDRP
- Terrain Layer : Use this option to set the terrain layer

5- Terrain Textures

- Texturing Mode: (*Note that generated terrain tiles is based on the number of textures tiles exist in the terrains texture folder*)
 - **Without Textures** : Generate terrains without any textures, when this option is selected the existence of terrain texture folder is not needed;
 - *Custom terrain color*: Used to customize terrain color (this option available only in without texture mode).
 - **With Textures**: Select this option to generate terrains with textures basing on loading textures form texture folder.
 - *Textures loading mode*:
 - Auto Detection: when this option selected the GTL will read the count tiles automatically from the texture folder.



➤ Manual : if we want to change the number of textures tiles in the “TerrainName_Textures” Folder, we have to select this option, now set manually the number of terrain counts, GTL will split/merge the existing textures according to tile count previously put, “*GTL may crash because an error of memory when the textures are very large*”; GTL will keep the original texture folder and create a new one;

- **Splat mapping:** Select this option to texture the terrain basing on splat maps.
- **Shaded Relief :** Select this option to texture the terrain basing on reliefs shaders (Color Ramp Shader, Slop shader ... etc).

6- Terrain Smoothing :

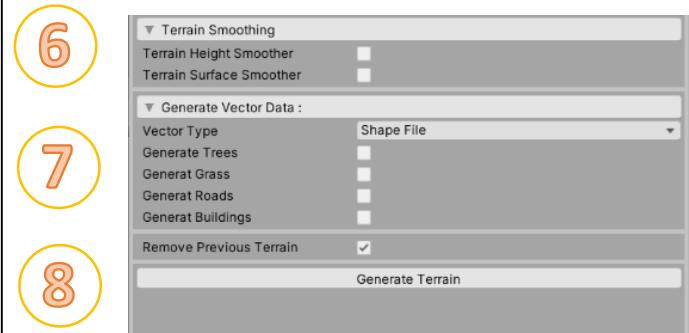
- Enable/Disable terrain Height Smoothing : Used to softens the landscape and reduces the appearance of abrupt changes;
- Enable/Disable terrain Surface Smoothing: this operation is useful when for terrains with unwanted jaggies, terraces, banding and non-smoothed terrain heights. Changing the surface smoother value to higher means more smoothing on surface while 1 value means minimum smoothing;

7- Generate Vector data :

- Vector Type : Select Vector data source (OSM, ShapeFile or GPX).
- Generating Trees : Loading and generating trees from Vector file;
- Generating Grass: Loading and generating Grass from Vector file;
- Generating Roads: Loading and generating Roads from Vector file (Optional Using Unity line render or EasyRoad3D);
- Generating Buildings: Loading and generating Buildings from Vector .

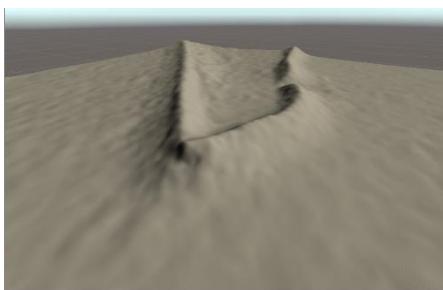
8- Generate Terrain :

- Remove previous terrain : Enable this Option to Remove the previous generated terrain existing in the scene;
- Generate Terrain Button: click to start generating terrains.

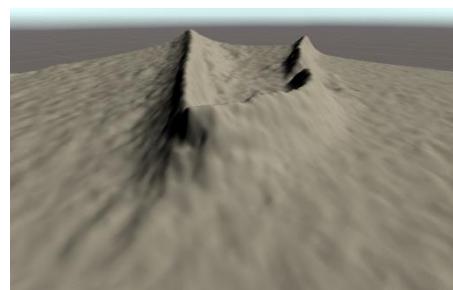


➤ Details and examples

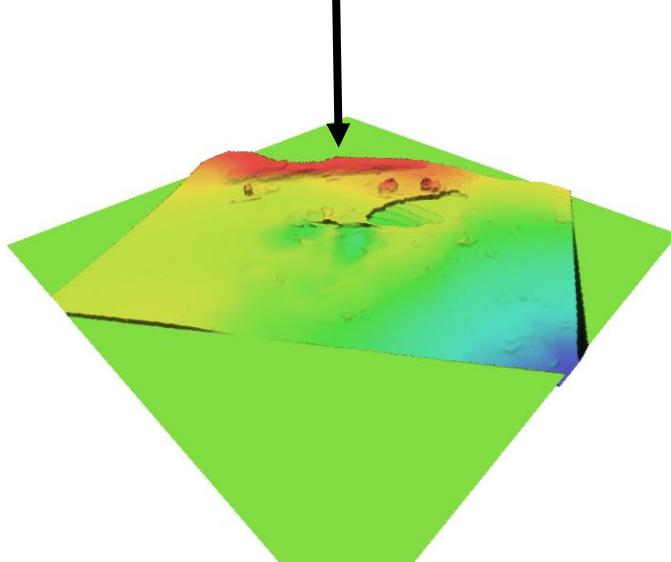
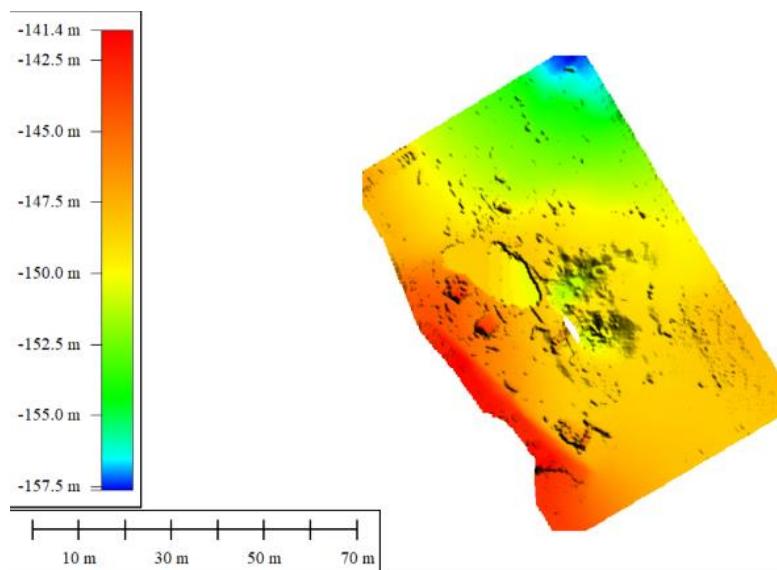
- Elevation Modes



Real World Mode (Elevation+ Dimensions)

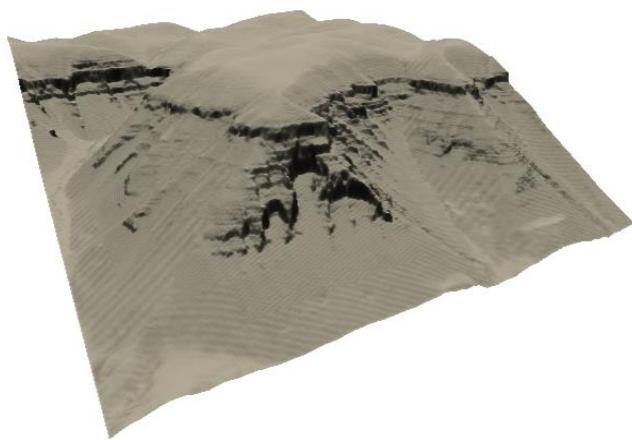


Exaggeration Mode Value= 0.2



Load underwater terrains + Auto Terrain Fix (For terrains with wholes and non-rectangular shape)

- **Texturing Modes**



Without texturing

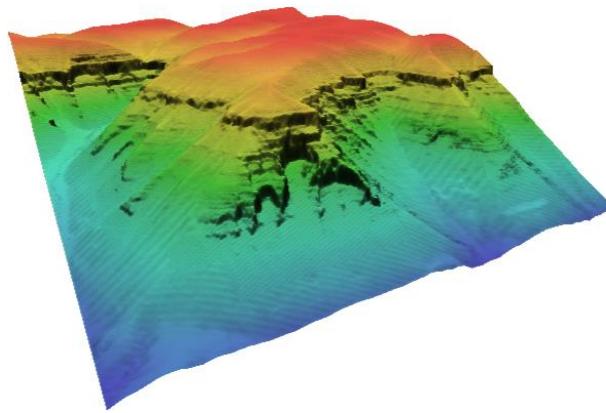


With real world textures

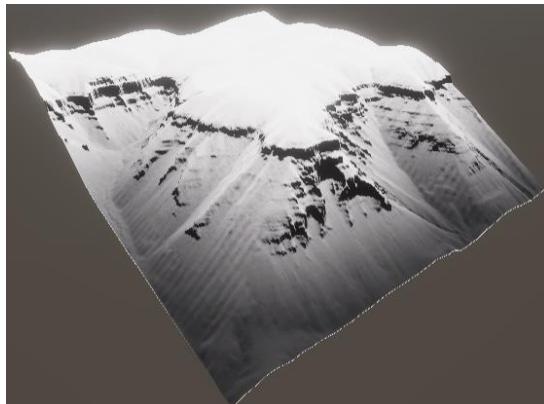


Splatmapping

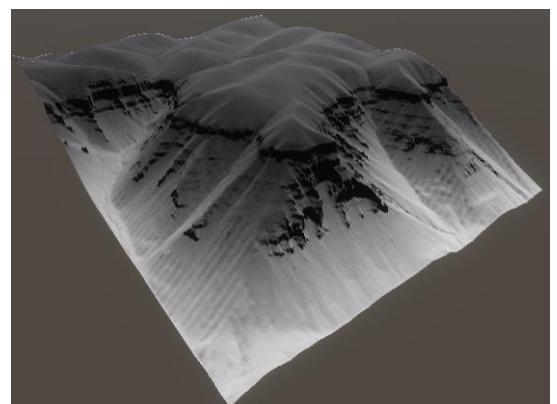
Shaded Reliefs



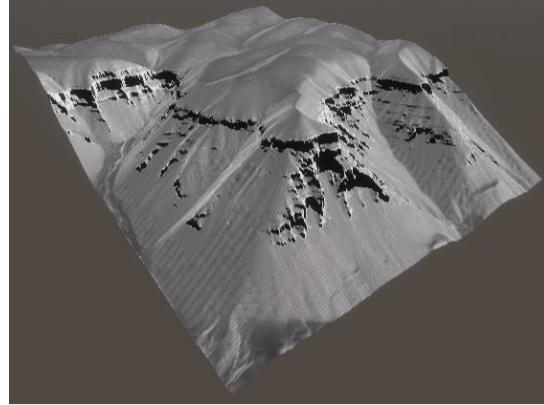
Color Ramp



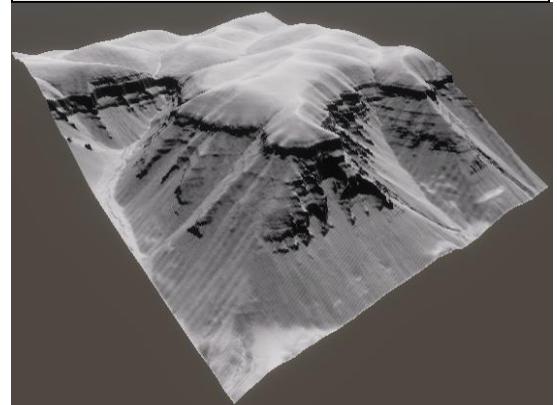
Elevation Grayscale



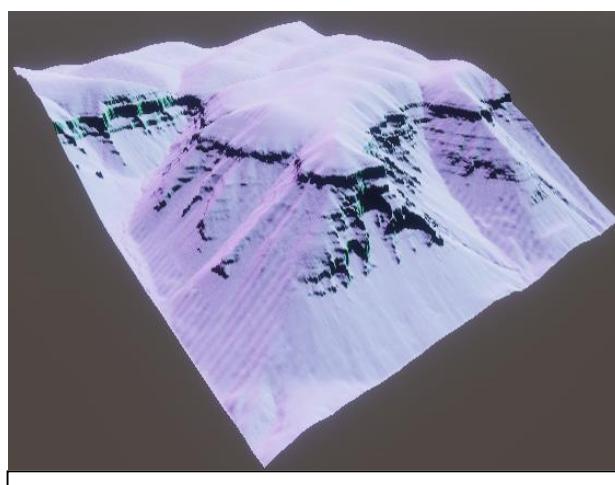
Inversed Elevation Grayscale



Slope

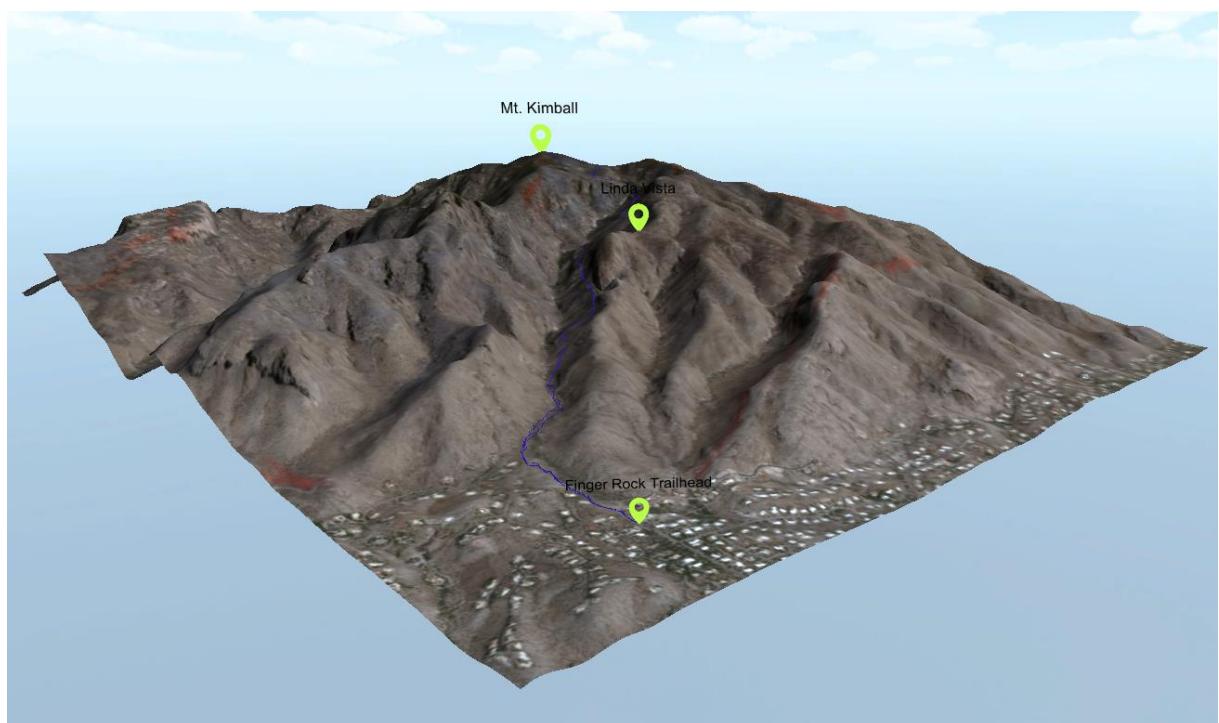
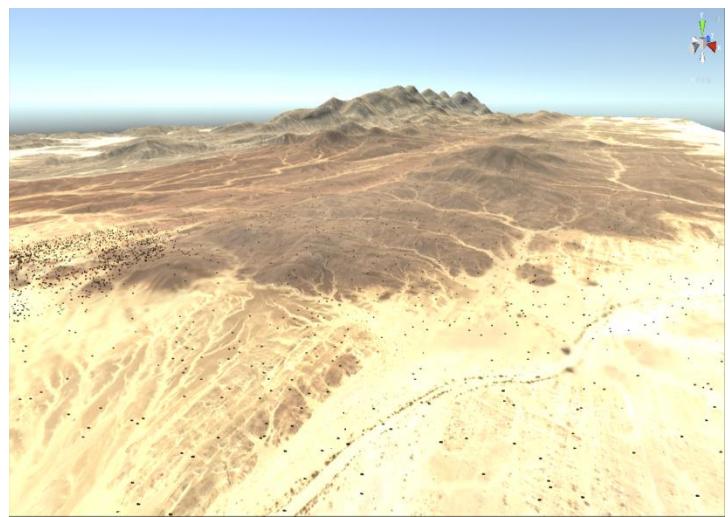
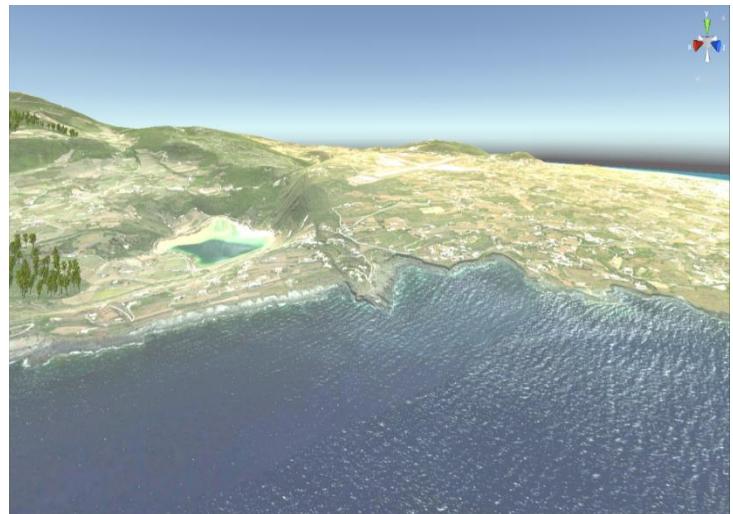
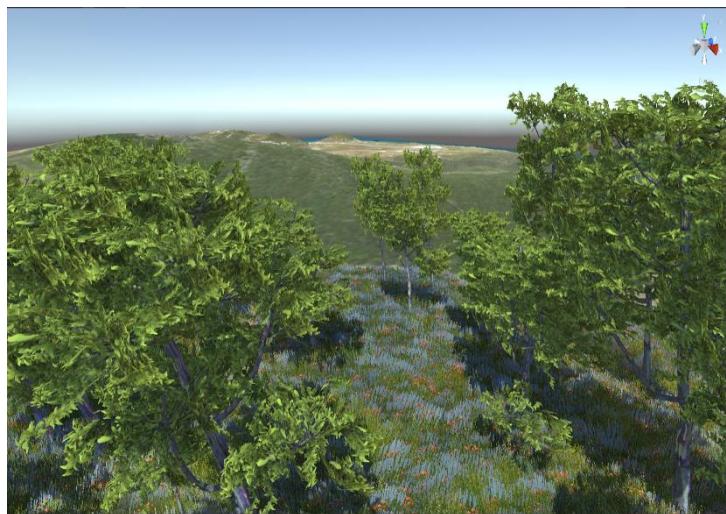


Inversed Slope



NormalMap

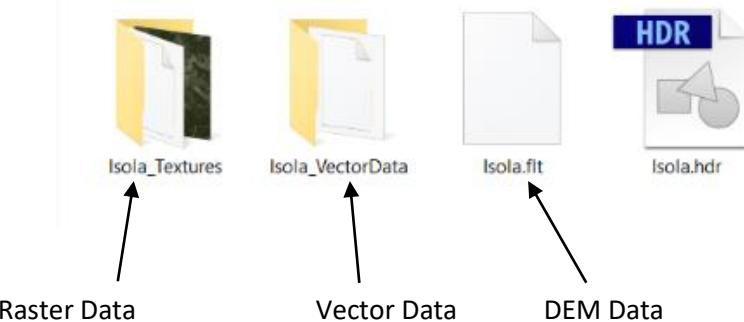
- **Terrains Generated via GTL**



➤ Preparing and Importing GIS data into Unity

- How to order terrain files?

Terrain files must similar to that order:



DEM file: The file that contains elevation data.

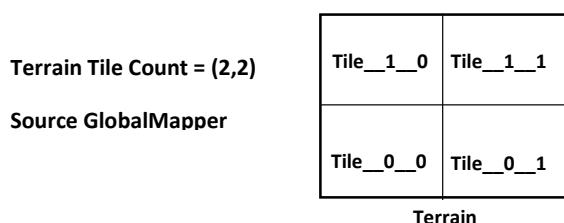
Raster data : Folder contains all terrain texture, named “DEMFileName_Textures”.

Vector data : The Open street map /Shape Files data used to generate trees, grass, roads, buildings ... etc, named “DEMFileName_VectorData”..

- How to order textures?

Check “GIS Tech\GIS Terrain Loader\Resources\TextureSourceDic\TextureSourceDic.json”, this file contains the formats that can be readed by GTL, we are able to add more format (by request).

Ex: Globalmapper : `Tile_{x}_{y}`



GTL will read textures from texture folder and set them on the terrains according to their names, all textures must renamed like it shown in that example.

- How to set “.Prj” projection Files?

GTL is able to load GeoFiles projected in Geographic Lat/Lon, UTM, Lambert.

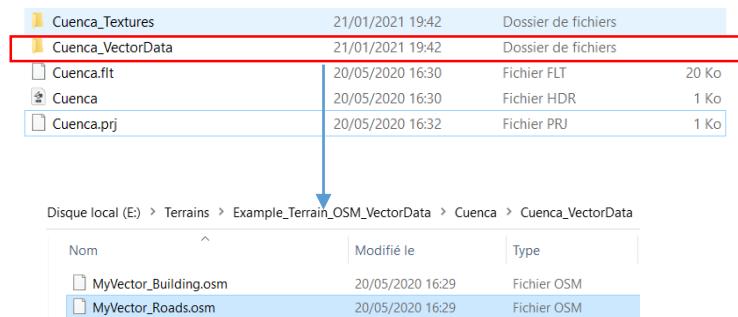
So to specify the projection we need to introduce the projection file (**Only for files, that are not projected in Geographic Lat/Lon**) for more check the example “Example_ASC/Example_FromLidar”).

Ce PC > Disque local (E:) > Terrains > Example_ASC > Example_FromLidar

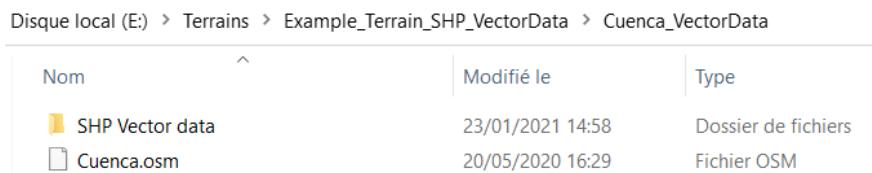
Nom	Modifié le	Type	Taille
ESRI_Textures	21/01/2021 19:42	Dossier de fichiers	
ESRI.asc	19/01/2021 12:47	Fichier ASC	88 005 Ko
ESRI.prj	19/01/2021 12:47	Fichier PRJ	1 Ko
Readme	23/01/2021 14:51	Document texte	1 Ko

• How to order VectorData ?

GTL support multiple Vector Data type, simply add your Osm,Shp or GPX to the Vector data folder.

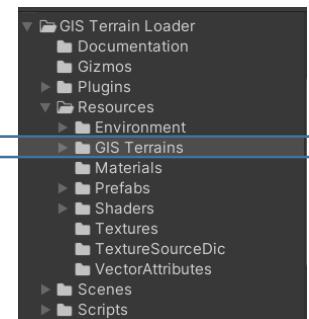


Example of ShapeFile + OSM files in the same Vector folder



• Where do I import GIS Data?

- For **Unity Editor**, All terrains must be imported into “GIS Tech\GIS Terrain Loader\Resources\GIS Terrains” folder.
- For **Runtime**, place the data in StreamingAsset folder or any custom location in the hard disk.



• Where to find the generated terrains data?

We can find all Generated Terrains data in the “Generated GIS Terrains” folder.



➤ Particularity for DEM's

- **GEOTIFF**

A GEOTIFF is a special kind of TIFF file that contains information about the map projection and registration, this format has a huge number of options, and some combinations might present problems for those who have less GIS knowledge.

GTL can read many GEOTIFFs, and will provide an error message if it cannot handle a particular file. If your file can not be read, report it and we will try to find a solution.

Almost of issues coming from projection case, so before load your file ensure that his projection is supported by GTL or use "DotSpatial" (refer to Supported Projections section).

Note that not all GeoTiff contains elevation data so you must correctly identify the Geotiff as either an image or a DEM.

Actually, GTL is able to read elevation from:

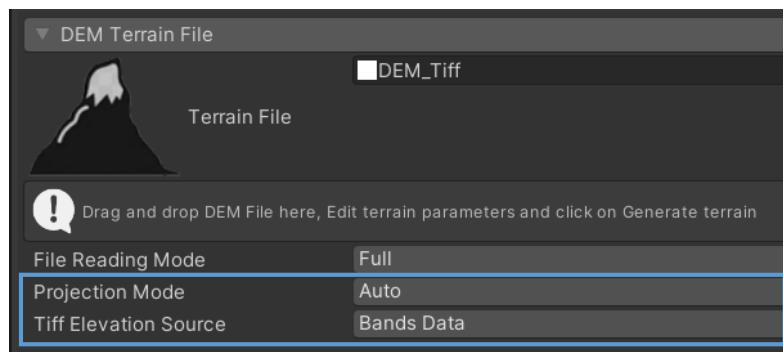
DEM Geo-Tiff : Like SRTM real world elevation data.

DEM Grayscale Geo-Tiff : based on raster elevation data and grayscale visualization of digital elevation model grayscale image, where the brightest white (closest to #FFFFFF) is considered as the highest point of the map, and the darkest black (closest to #000000) is considered as the lowest point of the map and each pixel from the file will read as stores value between 0 and 1.

DEM Multi-Bands Geo-Tiff : in this case GTL read will elevation from data stored in tiff Bands.

In GTL Editor :

When you set a geotiff file into the terrain field, a new fields will appear:



Tiff Elevation Source: used to define the source of the elevation stored in the geotiff .

Projection Mode: We developed this option to help users to define the projection of theirs geotiffs, note that this option appear only when "DotSpatial" lib was added to your project (Check the Projection Section).

Example : My geotiff projected in "NAD83 / Conus Albers" when I load it via GTL I'm getting errors, to get EPSG code go to that [site](#) and find the code which in that case is "EPSG:5070", now set the projection mode to custom and set you code.

In Runtime GTL:

```
RuntimePrefs.tiffElevationSource = TiffElevationSource.GrayScale;
```

```
RuntimePrefs.EPSGCode = 4269;
```

Load Multi-Bands Data from Tiff Files:

Code : To load all bands data at specific Lat/Lon Position

```
//Load Data from the Tiff File
var RasterBands = GISTerrainLoaderTIFFLoader.LoadTiffBands(FullTiffFilePath);
// Get All Values for Multiple Bands
var Values = RasterBands.GetValues(RasterBands.BandsNumber, new DVector2(-
119.9396850530, 38.9379800469));

foreach (var value in Values)
{
    //Debug Values or do anythings
    Debug.Log(value);
}
```

Code : To load specific value at defined bands Number for Lat/Lon Position

```
//Load Data from the Tiff File
var RasterBands = GISTerrainLoaderTIFFLoader.LoadTiffBands(FullTiffFilePath);
int BandNumber = 0;

var Value = RasterBands.GetValue(BandNumber, new DVector2(-119.9288328729,
38.9699398236));
```

• Unity RAW Files

GTL allows Unity to read a Heightmap from the RAW file format, and generate terrain in both Editor/Runtime.

In Some cases when we load a RAW and we see that the terrain was not generated as it expected

In GTL **Editor** :

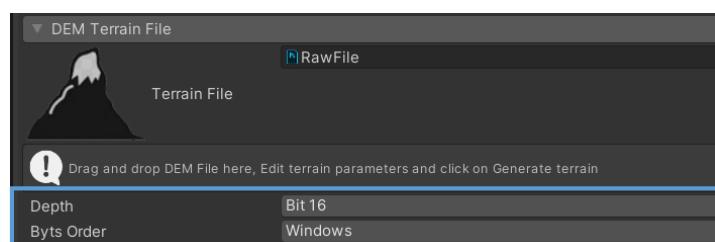
When you set a RAW file into the terrain field, new fields will appear:

Depth Determines how many bits Unity uses per pixel in the imported or exported heightmap.

- Bit 16: Uses 16 bits (2 bytes)
- Bit 8: Uses 8 bits (1 byte)

Byte Order Determines how Unity orders the bytes for each **pixel**

in the imported or exported heightmap. This mainly applies to bit-16 depth heightmaps, and is platform-dependent.



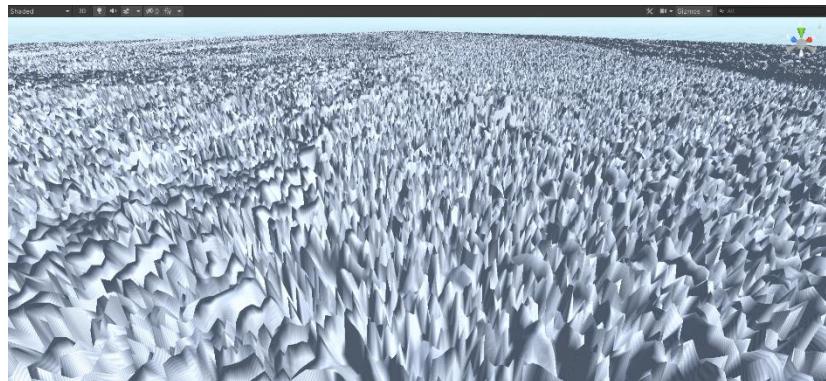
In **Runtime** GTL:

```
RuntimePrefs.Raw_Depth = RawDepth.Bit16;
RuntimePrefs.Raw_ByteOrder = RawByteOrder.Windows;
```

Example :

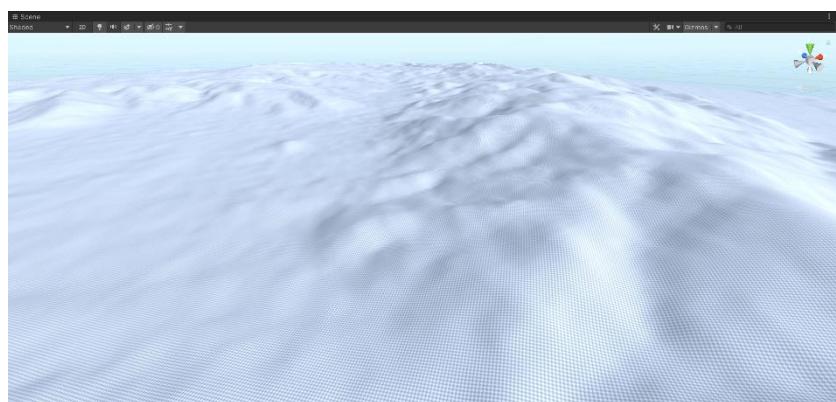
Depth = 16 bit

BytesOrder = Windows



Depth = 16 bit

BytesOrder = Mac



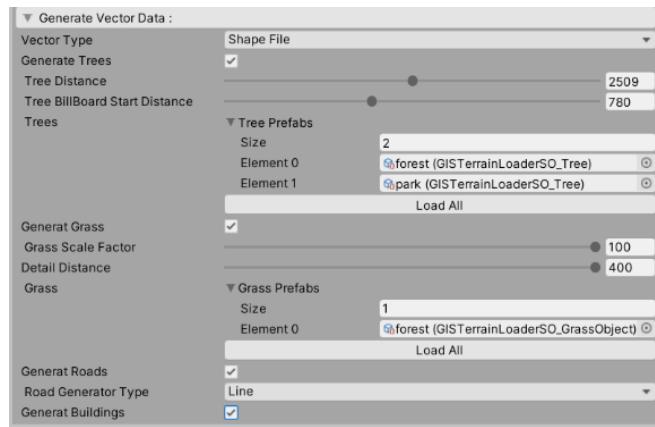
➤ Vector Data and Prefabs

GTL is able to generate grass, trees, roads and building from by loading the introduced Vector data (OSM or Shp).

All generated 3D object are customized prefabs (Based on scriptableobject), so we can add, modify or delete types and parameters in order to obtain 3D real world.

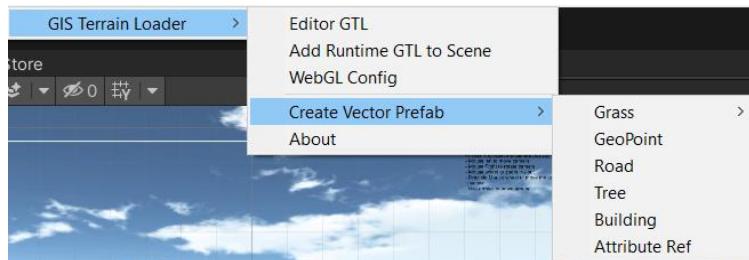
Important:

Building, Trees and Grass are loaded from vector of type 2D **Polygons**, Roads from vector of type 2D line and GeoPoints from 2D points.

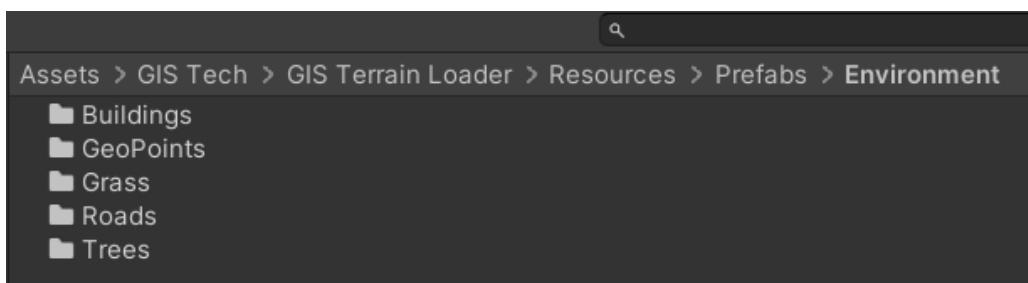


• Prefab Menu

In order to create a vector prefab go to “GIS Terrain Loader→Create Vector Prefab” menu and select a prefab type.

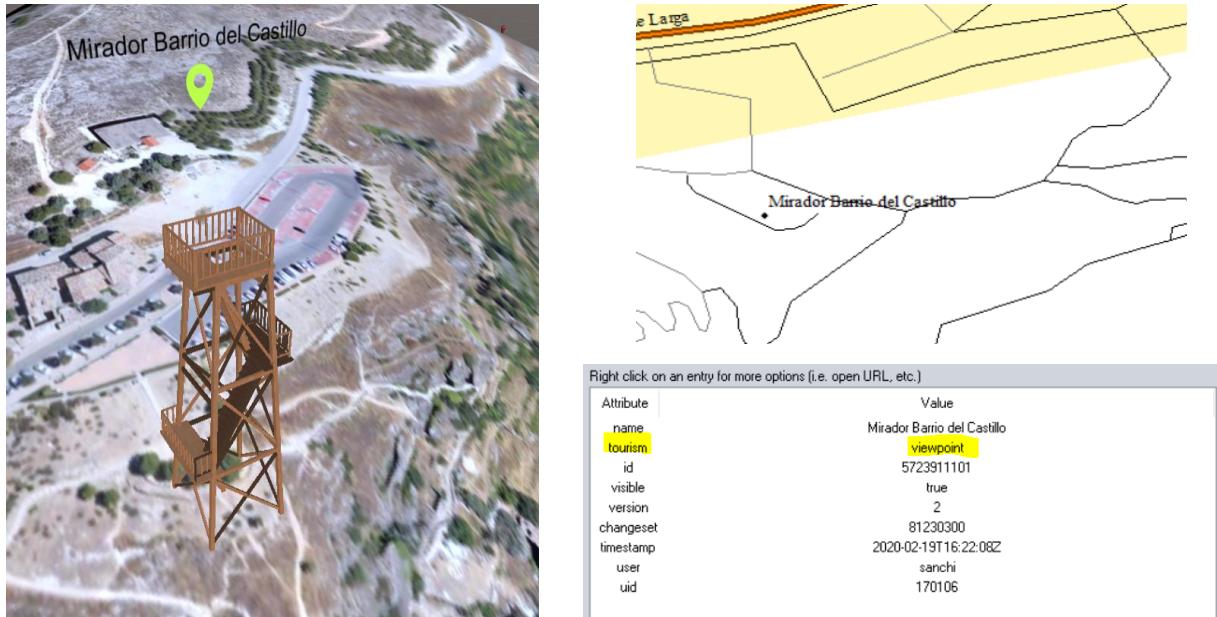


• Prefabs Folder

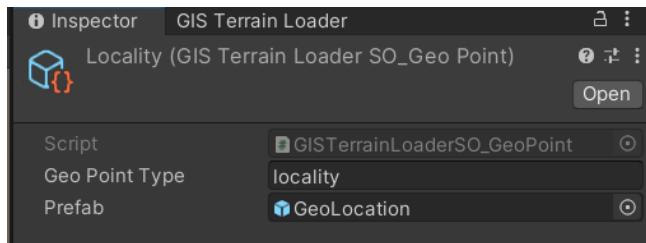


• GeoPoint Prefabs

- A Geopoint is a type of GameObject instantiated when the Vector file contains 2D points, this option is useful to define objects on the map only with attributes.
- Example :



- To Create tree prefab click on “GIS Terrain Loader→Create Vector Prefab→GeoPoint”.
- A new element will appear in the “GeoPoints” Folder.
- GeoPoint ScriptableObject parameters



GeoPoint Type: This parameter explained in the next section.

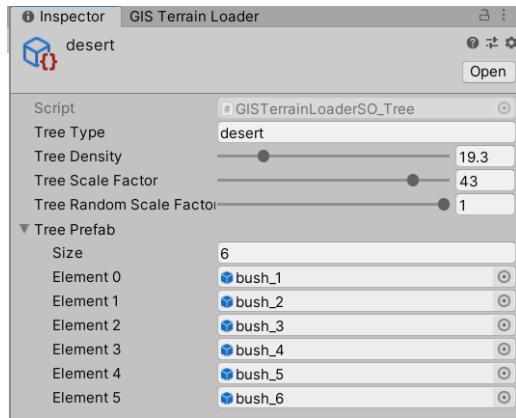
GeoPoint Prefab: Set the GameObject, which will be instantiated according to the attribute value.

• Tree Prefabs

- To Create tree prefab click on “GIS Terrain Loader→Create Vector Prefab→Tree”.
- A new element will appear in the “Trees” Folder.



- Tree ScriptableObject parameters



Tree Type: This parameter explained in the next section.

Tree Density: Tree Density controls the average number of Trees painted onto the loaded area defined by vector polygon size.

Tree Scale Factor: This will increase the size of all the trees set to the Tree Prefabs, only for that model that already defined by Tree Type.

Tree Random Scale Factor: Give some realistic by changing randomly the size of trees in the same zone.

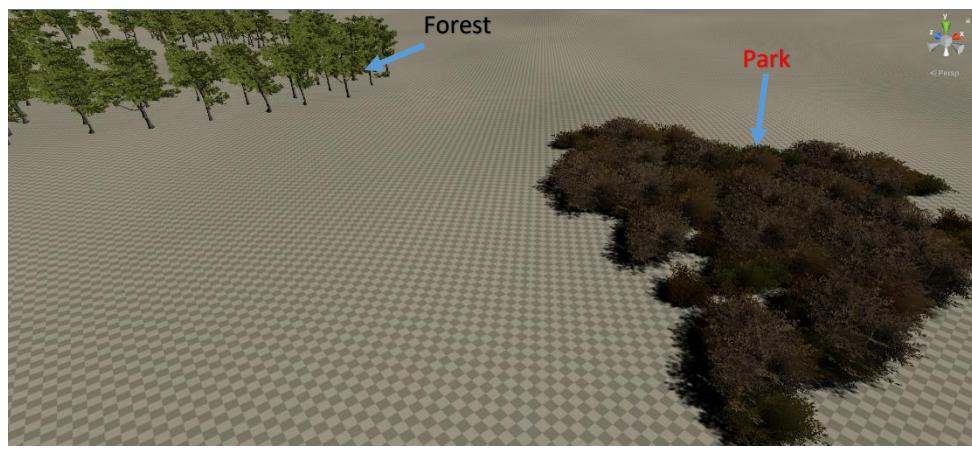
Tree Prefab : A list of tree prefabs that will generated in the defined zone.



Vector data created by GIS App



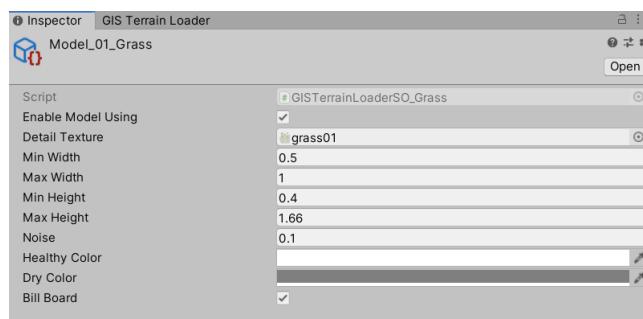
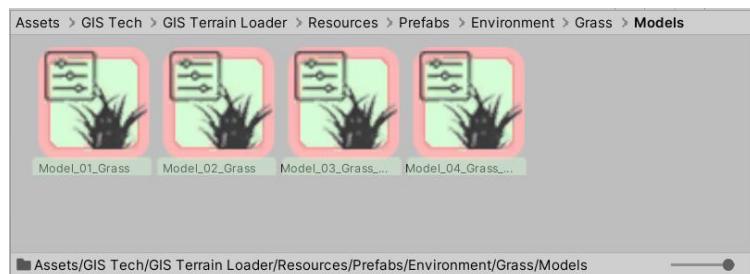
Trees generated via GTL



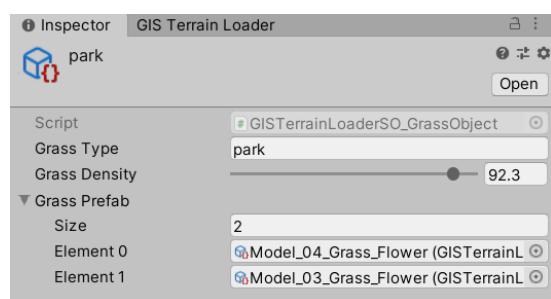
Result

• Grass Prefabs

- To Create grass model prefab click on “GIS Terrain Loader→Create Vector Prefab→Grass Model”.
- A new element will appear in the “Grass/Models” Folder.
- Grass Model is scriptable object that contains the grass data, his parameters are the same as unity details elements.



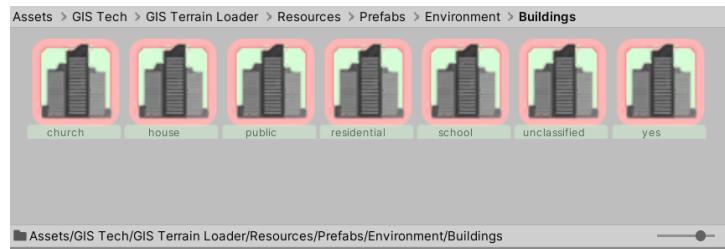
- To create grass prefab click on “GIS Terrain Loader→Create Vector Prefab→Grass Prefab”.
- A new element will appear in the “Grass” Folder.
- Grass Prefab is scriptable object defined by GIS type and grass model data.



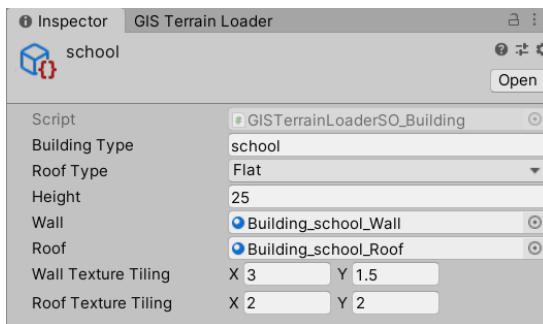
- Grass Type : (Go to the next article).
- Grass Density: Grass density on the same zone defined by grass type.
- Grass Prefabs: To generate a random grass model in that zone.

- **Building Prefabs**

- To Create building prefab click on “GIS Terrain Loader→Create Vector Prefab→Building”.
 - A new element will appear in the “Buildings” Folder.
- Note :** Building prefabs will be loaded automatically from that folder without adding them to any prefab list.



- Building ScriptableObject parameters



Building Type: This parameter explained in the next section.

Roof Type: Set the roof type to dome or Flat.

Height: Used to customize building height.

Wall and Roof Materials : used to set specific materials to the building.

Wall and Roof Tilling : used to correctly set UV textures into the generated building.

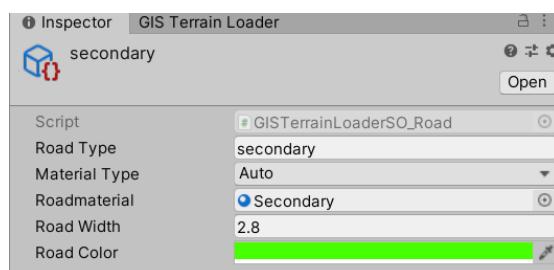


- **Roads Prefabs**

- GIS Terrain Loader is now able to generate roads (Runtime/Editor), to do that simply check "Generate Roads" and choice (EasyRoad3D-Simple Unity Line).
 - To Create building prefab click on "GIS Terrain Loader→Create Vector Prefab→Road".
 - A new element will appear in the "Roads" Folder.
- Note :** Roads prefabs will be loaded automatically from that folder without adding them to any prefab list.



- Road ScriptableObject parameters



Road Type: This parameter explained in the next section.

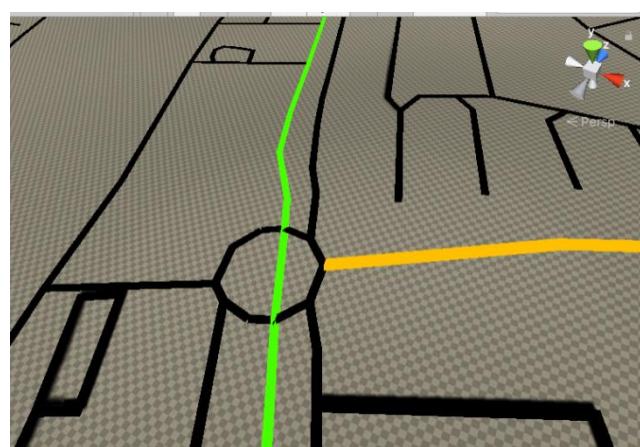
Material mode :

- Auto : Load Materials form "Resources\Environment\Roads\Materials" by switching between ES3/LineRender, in this case material will loaded according to the ScriptableObject name.
- Custom: Set Custom material.

Road Material: When the material mode is set to custom, GTL will use the customize material set to that field.

Road width: specify the width of that road.

Road Color: specify the color of that road.



Note :

- When EasyRoad3D is the selected option be sure that the asset was already downloaded and exist in the project.
- Generating 3d roads at runtime via EasyRoad3d requires the Pro version.

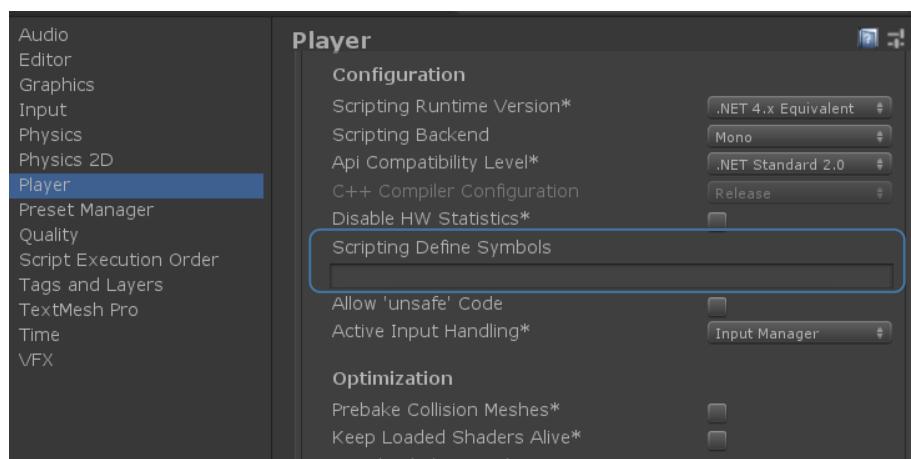
In some case unity may show some errors :

- Case 1 : when EasyRoad3d package exit in the project folder for the first time be sure that the part of the code shown on picture is enabled.

```
|namespace GISTech.GISTerrainLoader
{
    #if EASYROADS || EASYROADS3D
    |    using EasyRoads3Dv3;

        public class GISTerrainLoaderEasyRoadGenerator
    {
```

- If not try to add EASYROAD manually from: "Edit→Project Settings → Player" add EASYROAD or EASYROAD3D in "Scripting define symbol" field.



- Case 2: when you remove EasyRoad3D package from your project try to delete "EASYROAD" or "EASYROAD3D" from "Scripting define symbol".
- Roads material can be customized from on "@GIS Tech\GIS Terrain Loader\Resources\Environment\Roads" path.

➤ Customize prefab Types and GIS attributes

- **GIS Attributes**

Using GIS applications we are able to create vector data and set his attributes easily.

In this article we will talk on how to customize vector data base.

- **What is GIS Vector and database ?**

Vector data is arguably the most common kind of data you will find in the daily use of GIS. It describes geographic data in terms of points, that may be connected into lines and polygons. Every object in a vector dataset is called a feature, and is associated with data that describes that feature.

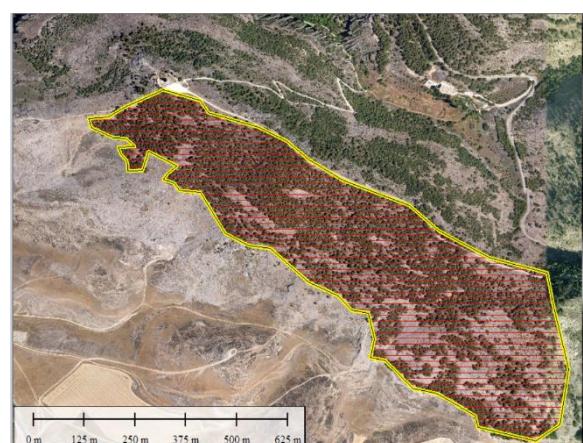
It's important to know that the data you will be working with does not only represent where objects are in space, but also tells you what those objects are.

- **Example : Create tree zone**

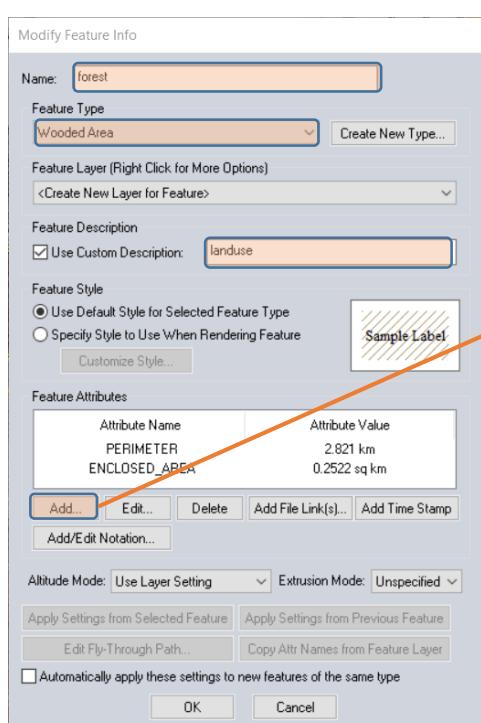
In this example, I will use Globalmapper to create tree vector.



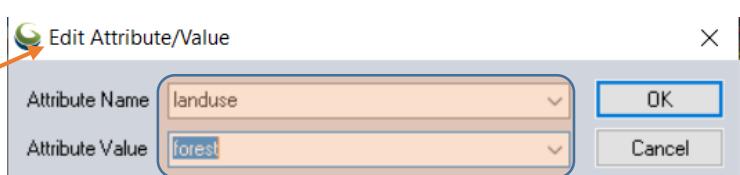
Forest zone



Create a Polygon for the forest zone



Add attributes

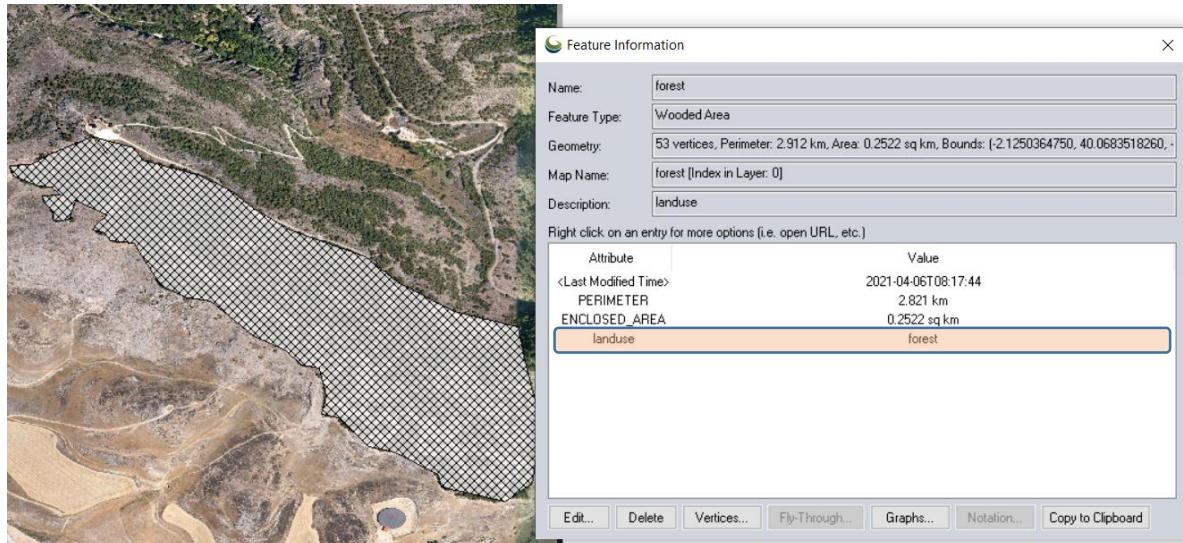


Set attributes

Landuse : is the attribute (column) name

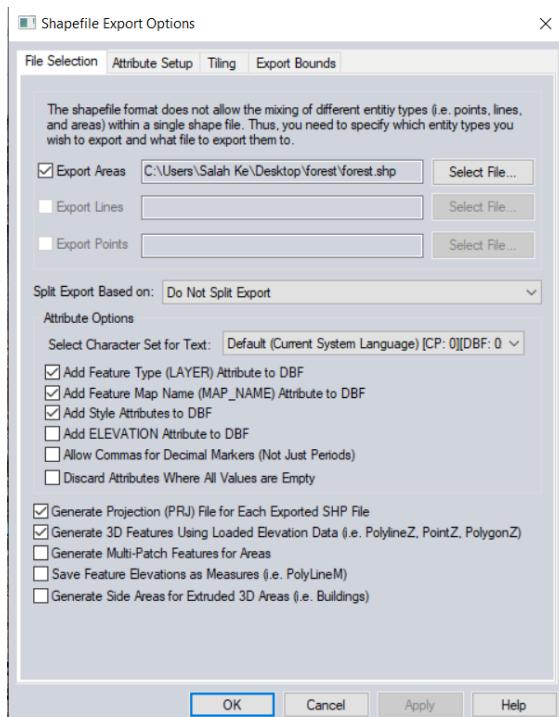
Forest : is the attribute value of that zone

When we click on feature info, we get this panel:



Info Panel

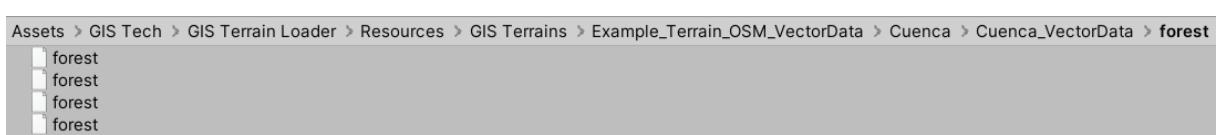
Now, the file is ready to export as an OSM or shapefile.



Export to shapefile

	Nom	Modifié le	Type	Taille
e	forest.dbf	06/04/2021 08:24	Fichier DBF	1 Ko
ments	forest.prj	06/04/2021 08:24	Fichier PRJ	1 Ko
s	forest.shp	06/04/2021 08:24	Fichier SHP	2 Ko
	forest.shx	06/04/2021 08:24	Fichier SHX	1 Ko

Exported shapes



Import to unity

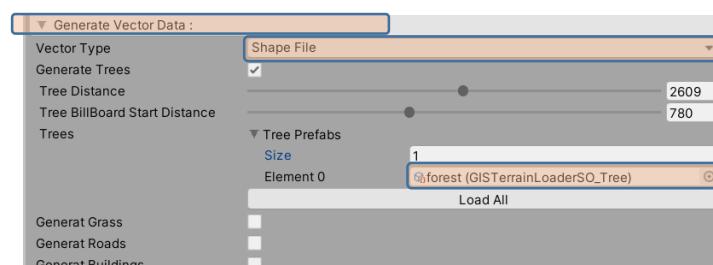
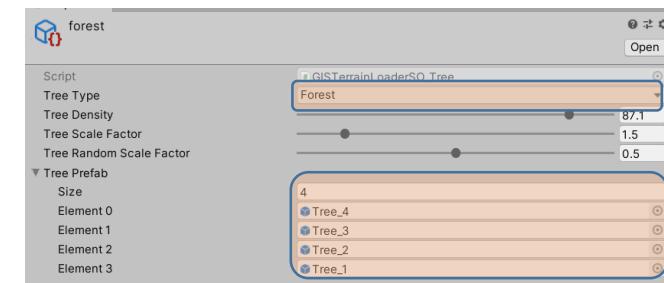
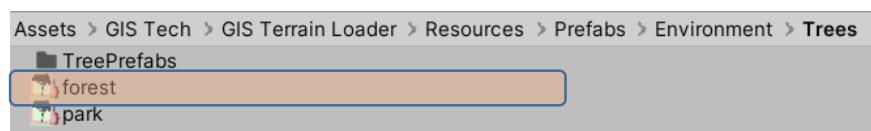
• Customize GTL Scripts

After importing, we have to ensure that GTL is able to read and filter file attributes, to do that :

- Open “GIS Tech\GIS Terrain Loader\Resources\VectorAttributes” folder.
- Select “Attribute_Trees” file and add the attribute name (Col Name) to the attributes list.
- Do the same things for other types.



- Next step, create your tree prefab and set the type to forest and add the prefab to the prefabs list.



Result

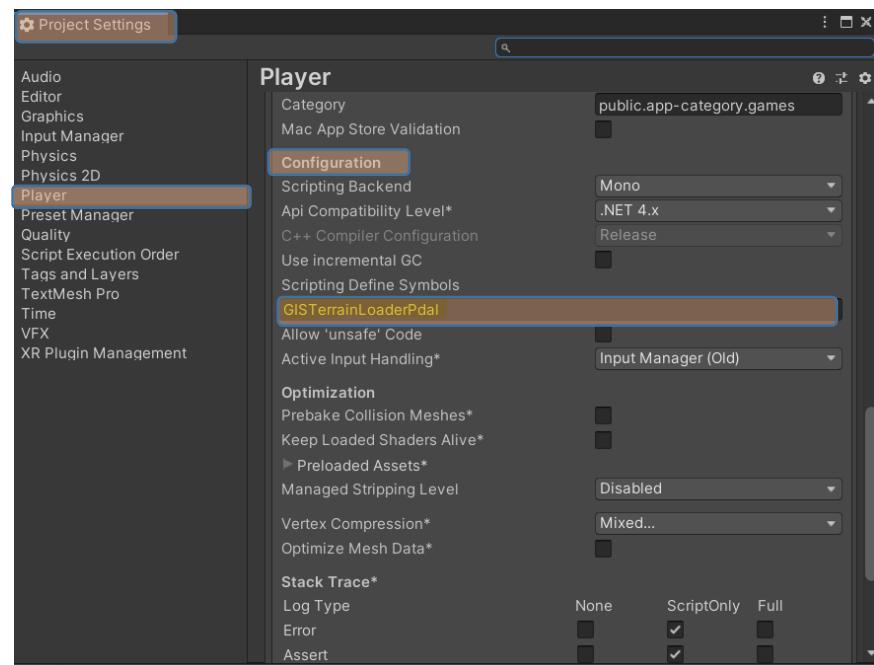
We can do the same steps for other vector prefabs!

➤ Loading Las files via Pdal pipeline

- GTL generate terrains from geo-referenced Las files thought Pdal pipeline, in some cases you will not use Las files in your project, in order to avoid using pdal lib, you can safely remove it from plugins folder without getting any issue (This option available only in GTL 2.4 or high).
- Pdal plugins will be a compressed file in plugins folder, so to activate that lib you should execute this steps :
 - 1- Extract Lidar.rar file into the plugins folder.
 - 2- Go back to Unity and open PlayerSettings.
 - 3- In Scripting define Symbols field add : GISTerrainLoaderPdal
 - 4- Unity will automatically recompile your project.
 - 5- Restart unity and Set your Las to generate a terrain.



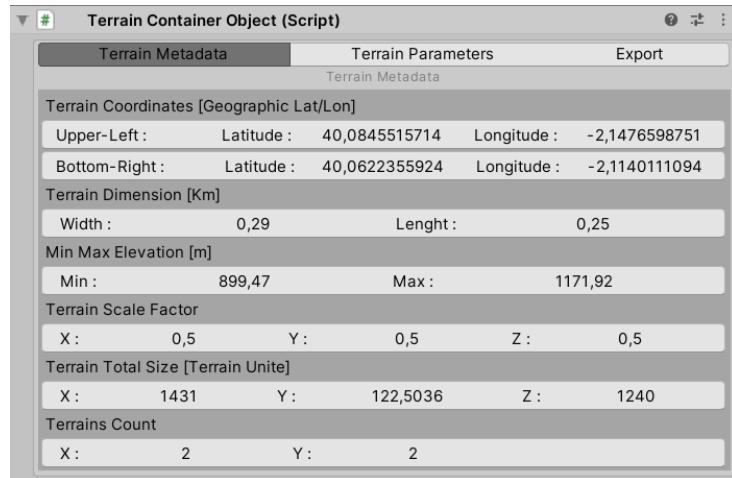
GIS Terrain Loader v1.6 > Assets > GIS Tech > GIS Terrain Loader > Plugins			
Nom	Modifié le	Type	Taille
LibTiff	03/03/2021 06:49	Dossier de fichiers	
Lidar	03/03/2021 06:49	Dossier de fichiers	
OSMSharp	06/04/2021 20:15	Dossier de fichiers	
Lidar	17/04/2021 16:12	WinRAR archive	12 354 Ko



➤ Terrain Container Parameters

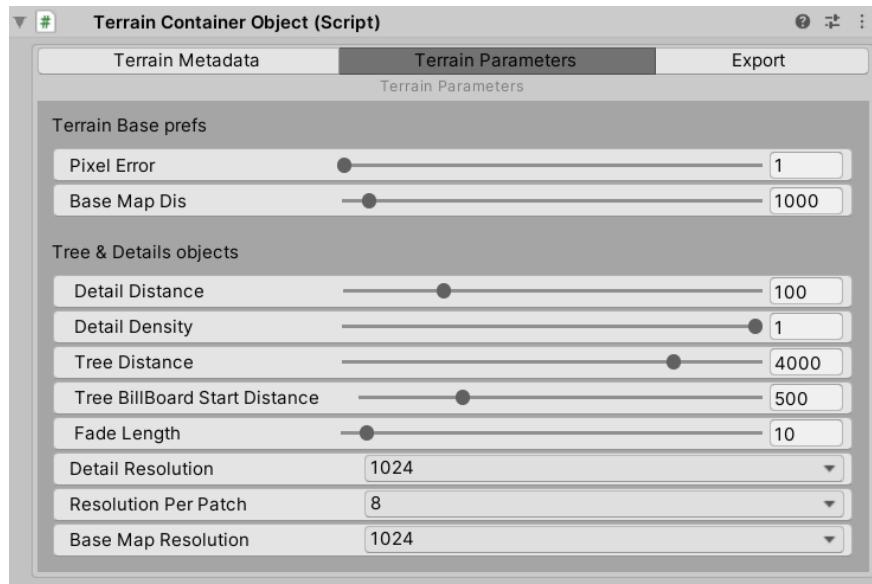
- **Terrain Metadata**

Once the terrain is generated, you can preview the metadata from the inspector



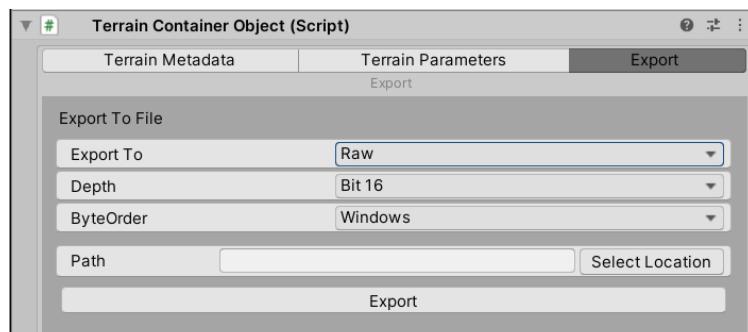
- **Change terrains parameters**

If we have a terrain with a multiple tiles and we want to change theirs parameters without doing that manually through each tile, we can simply change the wanted parameter directly from the container Object script or from the inspector.



- **Export Heightmap**

GTL able to export the generated terrain Heightmap to Raw (8-16) bit or PNG/JPG grayscale.

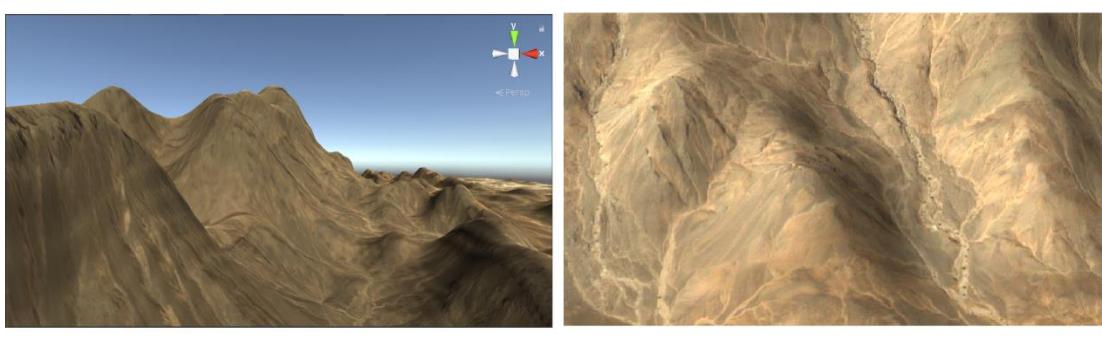
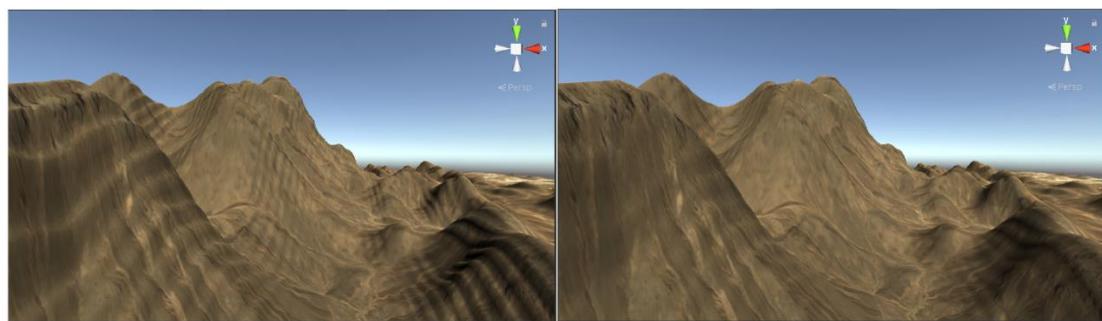


➤ Terrain surface and height Smoothen operations

GIS Terrain Loader is able to smooth terrain surface and heights; this operation is useful when we find that generated terrains with unwanted jaggies, terraces, banding and non-smoothed terrain heights as the following pictures, which shows a terrains with 1025 Heightmap resolution.

Changing the surface smoother value to higher means more smoothing on surface while 1 value means minimum smoothing.

Note that more smoothing steps result in more washed away surfaces and obviously losing some high frequency details.



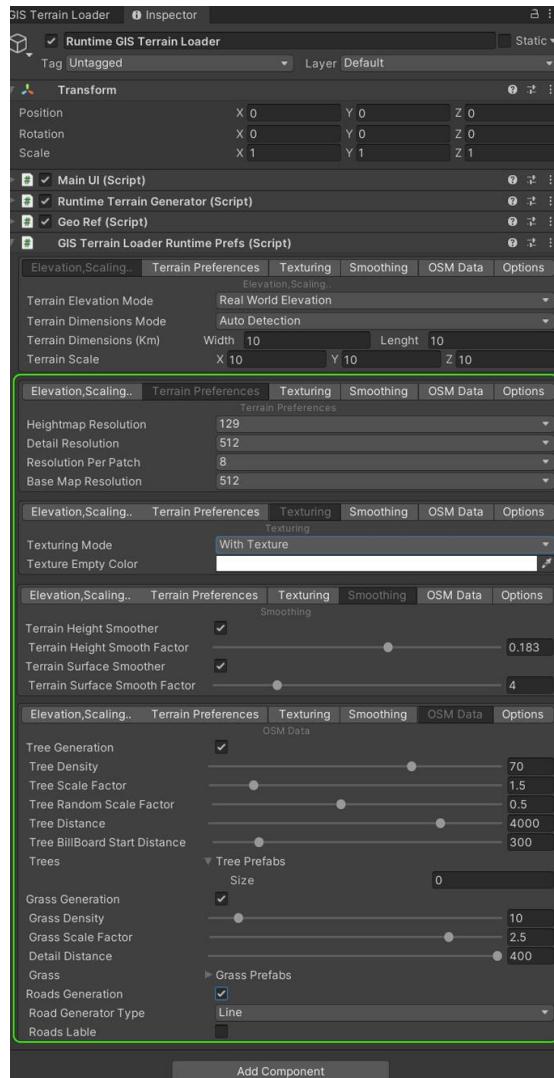
➤ Runtime GIS Terrain Loader

Open the “Runtime GIS Terrain Loader Demo Scene” from « GIS Tech/ GIS Terrain Loader / Scenes » folder and click on “Load Terrain File”, Select Terrain resolution and click on “Generate terrain”.

Use the camera to visualize terrains.



We can also modify terrain parameters from the inspector (parameters are the same to the GTL Editor).



- **How to use Runtime GTL script?**

- 1- From menu select « Tools/GIS Tech/ GIS Terrain Loader / Add Runtime GTL to scene »
- 2- Create your own simple script (**GenerateSimpleTerrain.cs**)
- 3- Add the Code bellow

```
/*      Unity GIS Tech 2020-2021      */

using System.Collections;
using System.Collections.Generic;
using System.IO;
using UnityEngine;

namespace GISTech.GISTerrainLoader
{
    // In this demo example we will load/Generate terrain from
    // StreamingAsset folder

    public class GenerateSimpleTerrain: MonoBehaviour
    {
        public KeyCode GenerateKey;

        private string TerrainFilePath;

        private RuntimeTerrainGenerator RuntimeGenerator;

        private GISTerrainLoaderRuntimePrefs RuntimePrefs;

        private Camera3D camera3d;

        void Start()
        {
            camera3d = Camera.main.GetComponent<Camera3D>();

            TerrainFilePath = Application.streamingAssetsPath + "/GIS Terrains/PNG
Demo/ASTER30m.png";

            RuntimePrefs = GISTerrainLoaderRuntimePrefs.Get;

            RuntimeGenerator = RuntimeTerrainGenerator.Get;

        }

        void Update()
        {
            if(Input.GetKeyDown(GenerateKey))
                GenerateTerrain(TerrainFilePath);
        }

        private void InitializingRuntimePrefs(string TerrainPath)
        {
            RuntimeGenerator.Error = false;
            RuntimeGenerator.enabled = true;
            RuntimeGenerator.FilePath = TerrainPath;
            RuntimeGenerator.RemovePrevTerrain = true;

            //Load Real Terrain elevation values
            RuntimePrefs.TerrainElevation = TerrainElevation.RealWorldElevation;

            //Note that GTL Can not Detect Real PNG dimensions so we need to set them
manually
            RuntimePrefs.terrainDimensionMode = TerrainDimensionsMode.Manual;
            RuntimePrefs.terrainDimensions = new Vector2(15, 15);

            RuntimePrefs.heightmapResolution = 513;
            RuntimePrefs.textureMode = TextureMode.WithTexture;
        }
    }
}
```

```

private void GenerateTerrain(string TerrainPath)
{
    if (!string.IsNullOrEmpty(TerrainPath) &&
System.IO.File.Exists(TerrainPath))
    {
        InitializingRuntimePrefs(TerrainPath);

        StartCoroutine(RuntimeGenerator.StartGenerating());
    }
    else
    {
        Debug.LogError("Terrain file null or not supported.. Try again");
        return;
    }
}
}

```

- **How to {get, set} Lat/Lon coordinates and elevation?**

To set unity world space position use:

```
myGameobj.Transform.position =
GeoRefConversion.SetRealWorldPosition(RuntimeTerrainGenerator.Get.GeneratedContainer,
LatLon, ElevationValue, SetElevationMode.RelativeToSeaLevel);
```

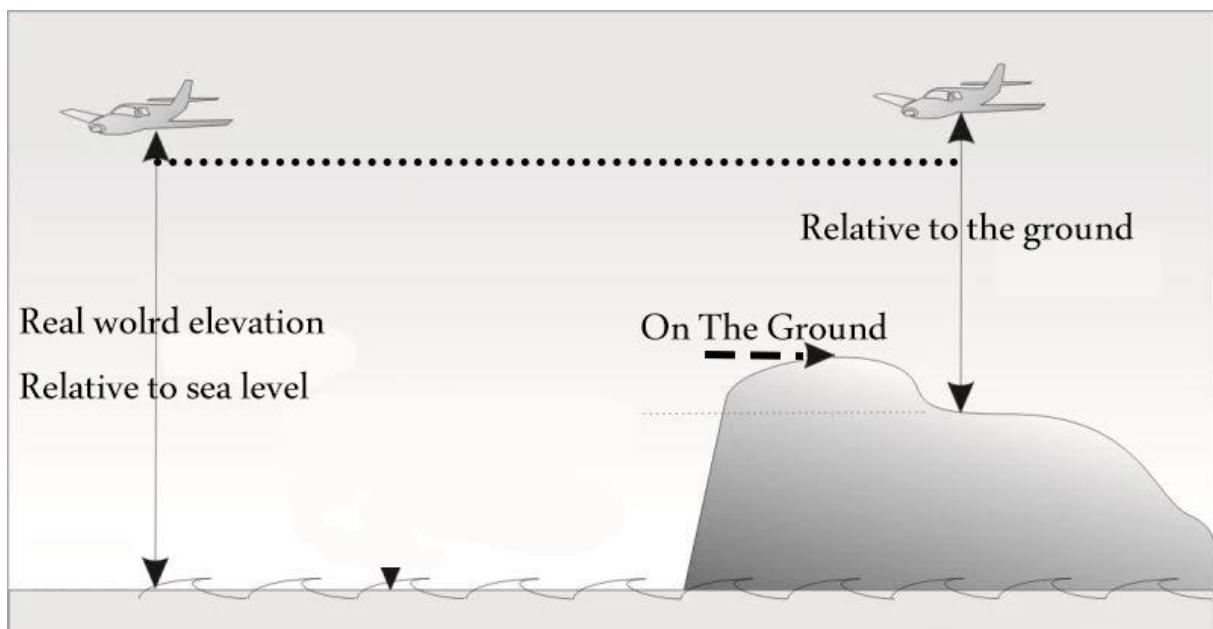
Where Lat-Lon is DVector represent a Real world position, ElevationValue is the elevation of the object from the terrain in [m], ElevationMode define if the elevation is :

```

OnTheGround
RelativeToTheGround
RelativeToSeaLevel

```

Where:



To get a gameobject lat/lon and elevation from space position use:

```
public DVector3 GetLatLonElevation(Vector3 position, TerrainContainerObject container)
{
    var LatLonPos = GeoRefConversion.UnityWorldSpaceToLatLog(position, container);

    return new DVector3(LatLonPos.x, LatLonPos.y,
    Math.Round(GeoRefConversion.GetRealWorldElevation(container, LatLonPos), 2));
    return Pos;
}
```

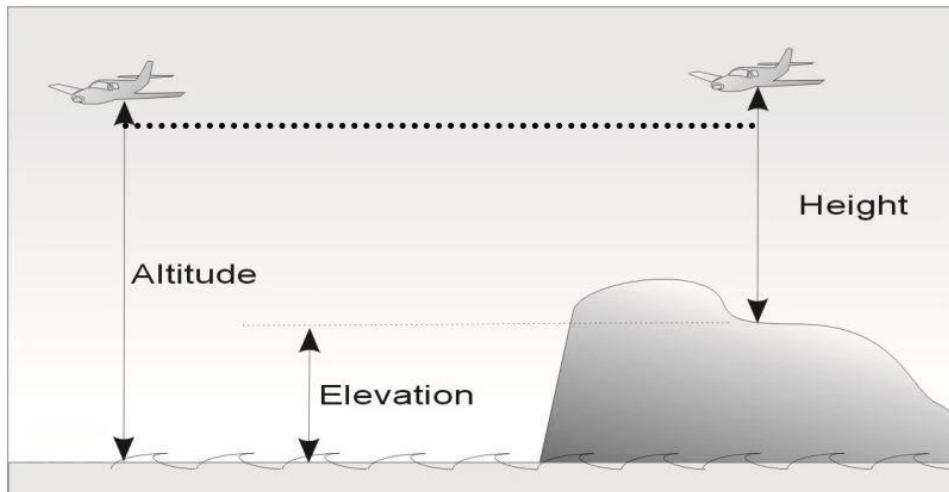
To only get the elevation [m] of a GameObject use this API: (Only for real world DEM's)

```
public RealWorldElevation ElevationMode = RealWorldElevation.Altitude;

var elevation = GeoRefConversion.GetRealWorldElevation(container,
Player.transform.position,ElevationMode);
```

There is three Modes:

Elevation: // Real world elevation on the ground
Height: // Height from the ground
Altitude: // Real world elevation + Height



- How to use projections?

(I want to Get coordinates in UTM in the place of Geographic Lat/Lon)?

```
//Set Projection Type
RuntimePrefs.Projection = Projections.UTM;

//Get Object unity world space position
var ObjPos= myGameobj.Transform.position;

string utmPos =GetPosition(ObjPos, RuntimePrefs.Projection) ;

//Debug or set string to UI text
Debug.Log(utmPos);

//Function to Get position in the selected projection
private string GetPosition(Vector3 SpacePos,Projections proj)
{
    var LatLon = GeoRefConversion.UWSToLatLog(SpacePos, Scale);

    return GeoRefConversion.ConvertLatLonTO(LatLon, proj); 
}
```

- **How to read coordinates from terrain generated in Edit mode?**

```
// Use this Option to georeference a terrain generated/Modified in the edit mode

public TerrainOriginMode OriginProjectionMode = TerrainOriginMode.FromEditor;

private GISTerrainLoaderRuntimePrefs prefs;
private TerrainContainerObject container;

void Start()
{
    prefs = GISTerrainLoaderRuntimePrefs.Get;

    RuntimeTerrainGenerator.SendTerrainOrigin += UpdateOrigin;

    if (OriginProjectionMode == TerrainOriginMode.FromEditor)
    {
        container = GameObject.FindObjectOfType<TerrainContainerObject>();
        if (container)
        {
            RuntimeTerrainGenerator.Get.SetGeneratedTerrain(container);
            container.GetStoredHeightmap();
        }
    }
}

private void UpdateOrigin(DVector2 origin, float minelevation, float maxelevation)
{
    GeoRefConversion.SetLocalOrigin(origin);
}
```

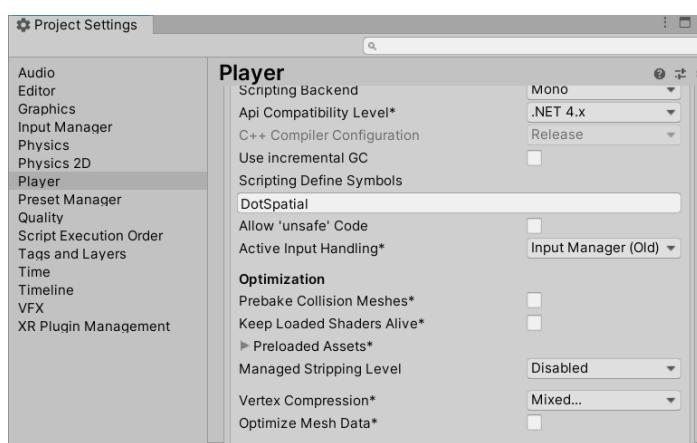
➤ Supported projections

- Geographic Latitude Longitude (Decimal Degree, Deg Min Sec).
- UTM (Meter, Military Grid Reference).
- Lambert.
- To Support Nad83 or any custom projection you need to download “DotSpatial” Lib

Link :

<https://drive.google.com/file/d/1FTHxCx84sFOZZIoc00JGDIhjqktd4rD0/view?usp=sharing>

Extract it to the plugin folder and add ‘DotSpatial’ To scripting Symbols.



➤ Render pipelines (SRP)

GIS Terrain Loader works with three different prebuilt render pipelines, or you can choice your own.

• Universal Render Pipeline (URP)

To use URP render pipelines follow the instructions:

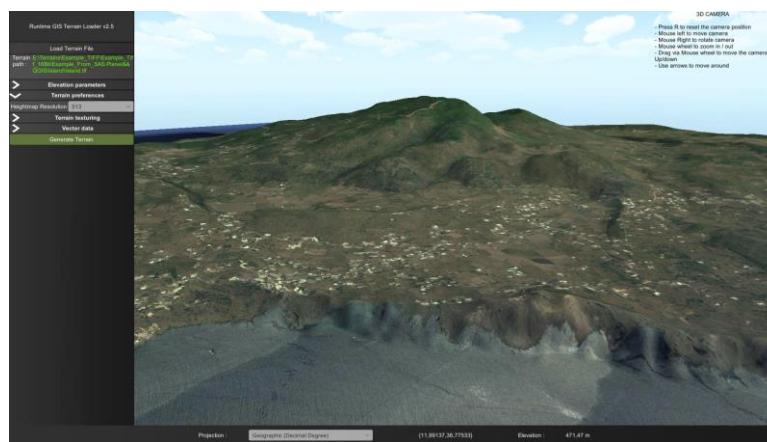
01 - Install and configure URP

02 - Create new material with “terrain URP” shader

03 - Set Terrain Material mode to custom and past URP material to the field.

Link to screenshots:

<https://drive.google.com/file/d/18SEgXo8aJevw-iJxrBK9aUvwBEfOUjaU/view?usp=sharing>



• High Definition Render Pipeline (HDRP)

To use HDRP render pipelines follow the instructions:

01 - Install and configure HDRP

02 - Create new HDRP asset

03 - Fix all Configurations

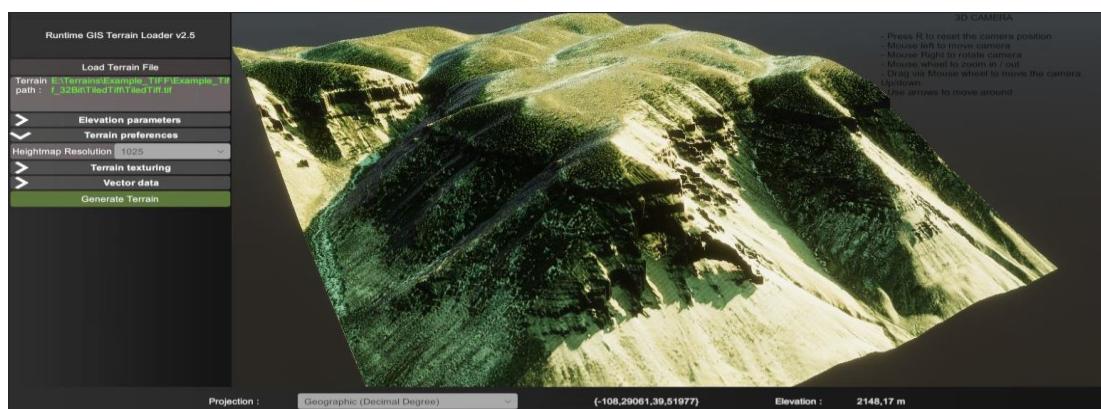
04 - Create new material with “terrain HDRP shader”

05 - Set Terrain Material mode to custom and past HDRP material to the field.

06 - Remove the current light existing in your scene and create a new one.

Link to screenshots:

<https://drive.google.com/file/d/1ccYhPXfDIBCBYLT6z1VaBdmG4UHLewfX/view?usp=sharing>



➤ Troubleshooting

// We fixed all issues encounter users in the previous version

➤ Limits

GIS Terrain Loader may crash because an error of memory when the amount of generated terrains is very big.

To avoid errors, we recommend the following steps:

- Generate one big terrain with high resolution or many small terrains with small a minimum resolution (128 or less);
- Using large textures may consume a lot of memory so using small textures is recommended;
- Still not tested on Unity Mac (**I hope that users test it and back with result**).
- Terrain Streaming is not supported (if you need streaming system check it on the asset store "[Terrain Streaming System](#)" asset).

➤ Supported Platforms

Windows: Fully Supported.

WebGL: The asset is based on loading data from external files, so it is not easy to have a full webgl support.

[WebGL DEM](#) : Only Tiff Files.

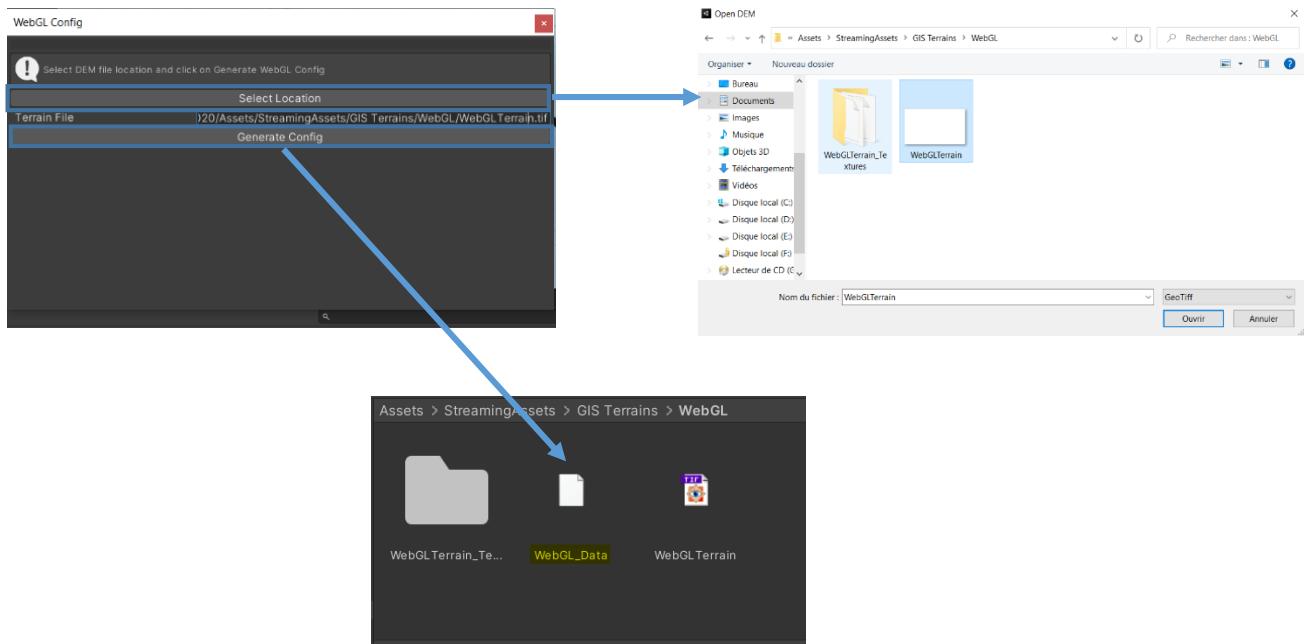
[WebGL Raster](#) : Jpg, Png

[WebGL Vector](#) : Still not supported .

(Other File Types may be added in the future by request)

To Configure Your WebGL Terrain DEM:

- Create StreamingAsset Folder
- Create New Folder inside the StreamingAsset then rename it to “GIS Terrains”.
- Click on “Tools/GIS Tech / GIS Terrain Loader/ WebGL Config
- Click on Get File Path and Click on Generate Config.
- A new file will appear (do not delete it).



Unity version:

The asset submitted by Unity 2020.3.14f1 and tested with 2018.3, 2019.2, 2019.3, 2020.1.6, 2021.1.0.

➤ Contact us for support

For any issues please contact us we will answer in 24 h maximum.

Email:

GISTech2008@Gmail.com

➤ Links

GIS Terrain Loader Asset (To rate and review):

<https://assetstore.unity.com/packages/tools/integration/gis-terrain-loader-147632>

GIS Terrain Loader Examples data:

<https://assetstore.unity.com/packages/tools/integration/gis-terrain-loader-data-exemples-152552>

Support page:

<https://forum.unity.com/threads/released-gis-terrain-loader.726206/>

YouTube page:

https://www.youtube.com/channel/UCEQ-QEpPvbUqHksoxSB8_cQ/videos?view_as=subscriber

Facebook group

https://web.facebook.com/groups/2842440552466636/?ref=br_rs&rdc=1&rdr

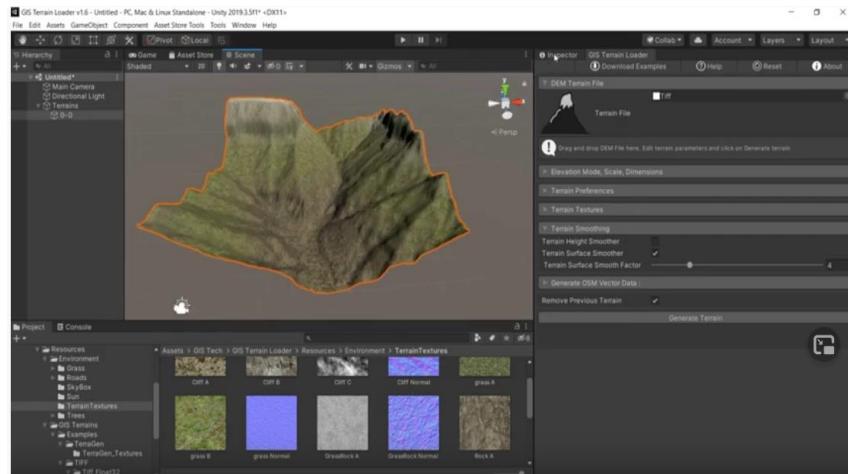
➤ Tutorials

- **Procedural Terrain Splatmap**

In this video tutorial, you will learn how it is easy to add textures to terrains via GIS Terrain Loader using three methods:

- With Texture: by loading textures from specific folder, in general real world images;
- Without Texture: without assigning any texture (Optional «Adding custom to terrain»);
- Splat mapping: Applying textures to terrain depending on customizable height.

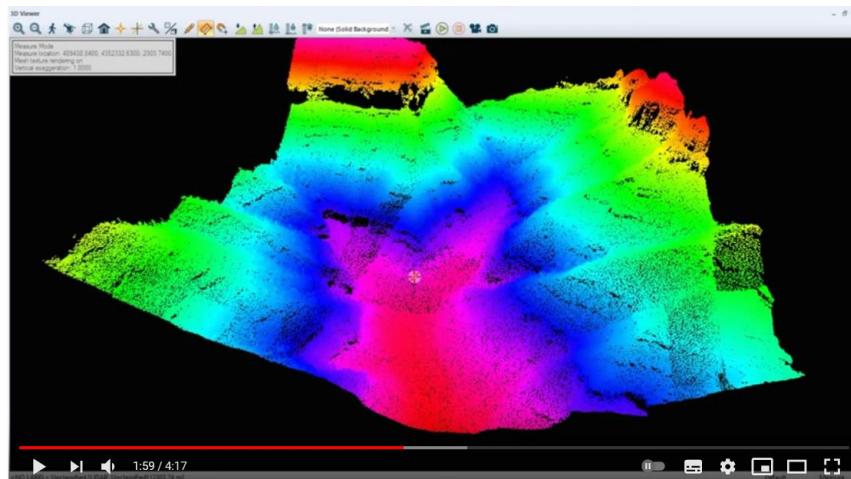
Video Link: <https://youtu.be/vhL1q3krPC0>



- **Lidar to Unity Terrain (LAS to DEM)**

In this tutorial video, you will learn how to convert (LAS Files) Lidar points to Unity Terrain through GIS Terrain .

Video Link: <https://youtu.be/78ZRL8x6MBE>



- **WorldMachine to Unity**

In this tutorial video, you will learn how Use GIS Terrain Loader to import Terragen files from WorldMachine to unity 3D for (Editor & Runtime).

Video Link: <https://youtu.be/liO8INqE6Jw>



- **QGIS and SAS Planet To Unity**

In this tutorial video, you will learn how Use GIS Terrain Loader to import GeoTIFF files from QGIS and Raster Data from SAS.Planet to generate unity terrains on (Editor & Runtime).

Video Link: <https://youtu.be/bluXQltyifI>



- **Download Free GIS Data**

In this tutorial video you will learn how to download GIS data (Raster, DEM and Vector) in order to use them with GIS Terrain Loader.

Video Link: <https://youtu.be/0WlfOIO7ByY>

