



# **BUILDING AN URBAN SOLAR MAP FROM LIDAR DATA**

Case study. Fragment of Bilbao from LIDAR available at the National Center for Geographical

Information (Spain).

V2.1 (16-03-15)

(Note: Check the last version of this manual at www.huellasolar.com )

<u>1.</u>	INTRODUCTION	2
<u>2.</u>	OBJECTIVES	2
<u>3.</u>	STARTING POINT AND SOFTWARE	3
<u>4.</u>	DOWNLOADING LIDAR DATA FROM THE CNIG	4
<u>5.</u>	FORMATTING DATA WITH QGIS	5
<u>6.</u>	SPLITTING THE MAP IN TILES	9
<u>7.</u>	BUILDING DATA PACKAGES WITH HUELLASOLAR	12
<u>8.</u>	SETTING UP OUR MAP	14
<u>9.</u>	PUBLISHING AND VIEWING THE MAP. BRIEF LIST OF FEATURES AVAILABLE.	19
<u>10.</u>	APPENDIX I. TRASFORMING GEOTIF INTO PNG FILE SUPPORTED BY HUELLASOLAR	24
	<b>10.1.</b> Extracting the tiles of our map	30
<u>11.</u>	APPENDIX II. DIFFERENCES BETWEEN RESULTS WITH PNG OT TIF FILES	35
<u>12.</u>	APPENDIX III. TRIMMING A GEOTIF WITH A KML FILE	36
	12.1. SETTING UP THE COORDINATE REFERENCE SYSTEM IN QGIS	36
	12.2. MERGING THE GEOTIF 12.3. Adding the KML files	37 38
	12.3. Adding the rivil files 12.4. Trimming the tiles	38 39
	12.7. INIVIVING THE HES	22



# 1. Introduction

Solar maps of cities are every day more demanded by citizens, professionals, institutions etc.

The progressive reduction of costs of photovoltaic technologies has made these technologies a viable alternative as complementary source of energy. Nevertheless, to study the implantation of these infrastructures it is necessary to have data. Therefore several cities around the world have launched their solar maps.

Huellasolar is working some years ago to allow people to access this sort of data. When we launched our OpenPlatform we became the first web offering an on line environment where users around the world can build their own solar maps.

The solar maps built using huellasolar allow estimating electrical productions and economics savings for any area in the city, not only on roofs but also on streets or facades. They have a lot of features useful for companies, professionals in urban development, institutions working on energy and efficiency.

# 2. Objectives

This manual explains, step by step and with a lot of screen shots, how to make a solar map of a fragment of a city starting with a lidar file.

The map can be open from the viewer of radiation and sun exposure huellasolar with all the features available. Electrical productions and savings, Co2 savings, radiation in points and areas, detections of areas according to their sun exposure levels, chart of shadows, solar maps of facades etc.

Any data and software used in this guide has open licenses or are free. The map will have also an open license Creative Commons non commercial.

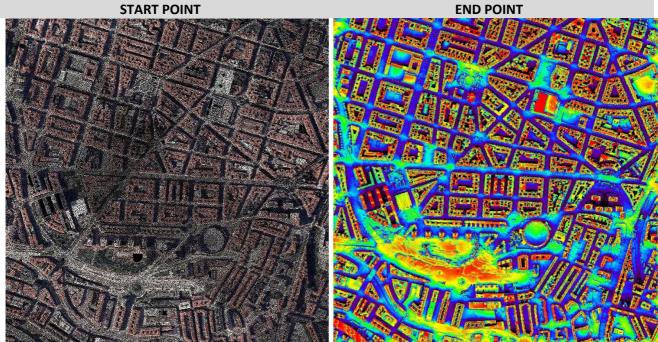
This manual uses lidar files available at the National Center for Geographical Information (CNIG. Spain). Nevertheless you can follow this guide using lidar from any other source.



Using the Open Platform of huellasolar you can build solar maps starting with other source of data (dwg, shp, asc etc). This guide focuses in the procedure using lidar files but is possible to build a solar map from any other format if you have the necessary information and it is possible to format your data to the format used by huellasolar.

If you have questions about how to generate a solar map starting with other sort of data contact the huellasolar team. We will support you.





Screen shot of the lidar file that we are going to use in this document. (Screenshot from the viewer fugroview)

The solar map built at the end of this manual. The solar map will be displayed with the huellasolar viewer.

We hope this document could help you. If you have any question o any issue trying to build your solar maps, please, contact us at info@huellasolar.com, we will support you.

# 3. Starting point and software

First of all we need the .las or .laz files from lidar. Below we explain how to download these files for the CNIG.

We are going to use the following software:

Qgis Desktop. (Screen shots from v.1.8.0)
 Qgis is a Geographical Information System (GIS) Open Source and GNU.
 Link: <u>http://www.qgis.org/es/site/</u>

It should have the plugin with the LasTools in order to deal with lidar data.

Link to download LasTools.zip: <u>http://www.cs.unc.edu/~isenburg/lastools/download/</u> Link to a tutorial to set up LasTools on Qgis: (Spanish) <u>http://mappinggis.com/2015/04/como-configurar-lastools-en-qgis/</u> (English and several versions of Qgis) <u>http://rapidlasso.com/2013/09/29/how-to-install-lastools-toolbox-in-qgis/</u>

Gvsig. (Screen shots from v.1.11.0)
 Gvsig is a Geographical Information System (GIS) Open Source and GNU.

Link: http://www.gvsig.org

We are using Qgis and Gvsig to forma tour lidar file and save it as a raster to be recognized by huellasolar.



Gimp. (Screen shots from v.2.8.14)
 Gimp is free software from manage image files.

Link: <u>http://www.gimp.org/</u>

We are using Gimp to Split the raster in the squares that form our map.

# Huellasolar Open Platform. Huellasolar is a web Project that offers tools and the environment to build solar maps. It has free accounts to build maps up to 1.44Km<sup>2</sup>. We are using the open platform of huellasolar to compile the map and publish it.

Link: http://www.huellasolar.com

# 4. Downloading lidar data from the CNIG

In this guide we are using lidar from de National Center for Geographical Information in Spain. If you have lidar files from any other sources you can go to the next step.

Here we are going to explain how to locate and download this data from the web of de CNIG.

Visit the CNIG here: http://centrodedescargas.cnig.es/CentroDescargas/catalogo.do

There you can find 'LIDAR' from a list of several products as the following image shows



	Busqu	ada Avanzada	
Seleccione Producto	Seleccione División administrativa:	Seleccione tipo de archivo:	
LIDAR (.laz 2x2 km)	Municipio 🔻	Todos 🔻	
Ver descripción de los productos	Escriba nombre municipio		
*Si desea superfici		de información, realice la seleccion de la zona en la <u>E</u> Buscar	lúsqueda en visor



 $\blacksquare \blacksquare \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \checkmark \blacksquare$ 4 Posicionar en mapa Derio Deustuko Unibertsitatea Localización por Nombre BI-373 + = BI-3743 1 Bilbao Parque de Doña Casilda de Iturriza + Localización Avanzada Mamés Parque Etxebarria Bilbao 5 CALLE AL 0061 Seleccionar producto a descargar A State of the sta Parque de Listado de Productos del área mostrada en el visor Parque urbano Se listarán los productos incluidos total o parcialmente en el área Đ mostrada actualmente en el visor Larreagaburu Parkea Filtrar por productos -Etxebarri 2 LIDAR (Jaz 2x2 km) Ibaleder Parkea Arrigoriaga-Oilargan Basauri BILDOO Opciones de selección de datos LIDAR Escala = 1 : 27.000 Mil -2.93286, 43.25715 SG:432 Seleccione el modo de búsqueda: Polígono dibujado en pantalla 🔻 3 Ver documento de ayuda (pdf) 0 Ver video de ayuda (avi) 1. Active la función del visualizador <<Seleccionar polígono>> 🎇 2. Dibuje en el visualizador un polígono que contenga los datos LIDAR que desea. 3. Termine de dibujar con doble click en el último punto. 4. Pulse << Buscar>> 5. El resultado es un listado de ficheros LIDAR. 6 Buscar

Once you are at the viewer follow these steps:

- 1. Select the city
- 2. Select the product 'LIDAR (laz 2x2km)
- 3. Search mode 'Polígono dibujado en la pantalla'
- 4. Click on the button to draw polygons
- 5. Draw a polygon over the area of your interest
- 6. Click on 'Buscar'

The list of files for the area will be displayed

Paso 1- Resultados de su búsqueda

#### Volver a buscar ቀ

	1			
	página 1 de 1			
Producto	Archivo	Formato	Tamaño(MB)	Seleccionar
LIDAR (.laz 2x2 km)	PNOA_2012_LOTE_PV_504-4790_ORT-CLA-COL.LAZ	LAZ	21,06	Añadir

Now you only have to follow the download process. So we now have our lidar file to start working.

# 5. Formatting data with Qgis

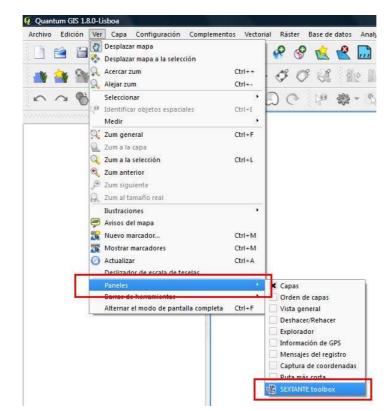
First we are going to format our .laz file (or .las) to a raster.

We go to the Sextante panel in Qgis. If it is not visible, open it from the Menu:

View->Panels->Sextante Toolbox

If you do not have this option available you must install the plugin.

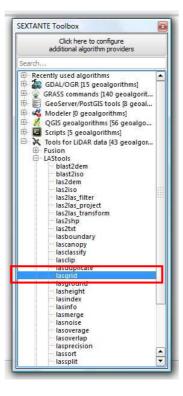




At the Sextante panel select 'Tools for LIDAR data' and double click on 'lasgrid' as you can see in the following image.



You must have the LasTools configured in your Qgis. Look at the links of the second section of this manual to install these tools.



Follow these steps in the pop up window:

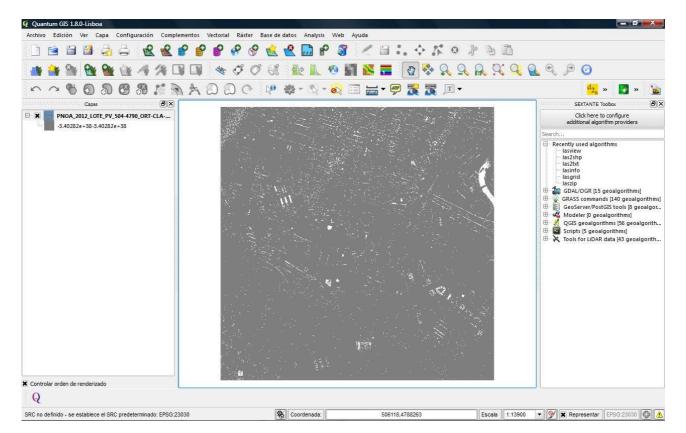
arameters Help	
verbose	
Yes	•
Input LAS/LAZ file	
C: \Users \hp \Documents \0-huellasolar \LIDAR \PNOA_2012_LOTE_PV	/_504-4790_ORT-CLA-COL.LAZ
filter (by return, classification, flags)	
	•
step size / pixel size	$\bigcirc$
2	2
Attribute	
elevation	3
Method	
lowest	-
Output raster file	4
C:/Users/hp/Documents/0-huellasolar/LIDAR/PNOA_2012_LOTE_PV	/_504-4790_ORT-CLA-COL
X Open output file after running algorithm	
0%	

- 1. Select the path to our laz file
- 2. Step size = 2

The user can test with other values depending of your lidar configuration.

- 1 With our file this value outputs a good result without excessive pixelation.
  - 3. Attribute 'elevation'
  - 4. The name for our output file. Select .tif format.
  - 5. Check in to output the file in the view.

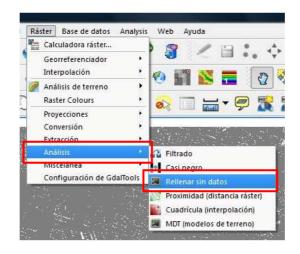
Ok, and we will have something like this:





Now we are going to fill the points without data of the raster.

Menu Raster->Analyze->Fill empty data



We will see the following window:

Modo de lotes (para proces	
Capa de entrada	PNOA_2012_LOTE_PV_504-4790_ORT-CLA-COL.tif V Select
rchivo de salida	NOA_2012_LOTE_PV_504-4790_ORT-CLA-COL_filled.tif Selec 2
Distancia de búsqueda	100
Iteraciones suaves	0
Banda sobre la que operar	1
Máscara de validación	
No usar la máscara de valid Cargar en la vista del mapa ci al_filinodata.bat -of GTiff C://	ación predeterminada

- 1. Select the input layer. It Is just what we have already created.
- 2. The name for the output file. The output format must be geoTIFF(\*.tiff)

**IMPORTANT**. Support to tif files is added from versión 2.0 of the desktop tool.

Nevertheless you can find in the appendix 'Trasforming Geotif into PNG file supported by huellasolar' the method used with the old version 1.0 which only supports png files with a specific format.

To know more about differences between use tif or png files while are working with huellasolar, go to the appendix 'Differences between results with PNG ot TIF files'



# 6. Splitting the map in tiles

By the moment we have just transform our lidar file to a geotiff file. Now we must split the tif file into the different tiles of our map.

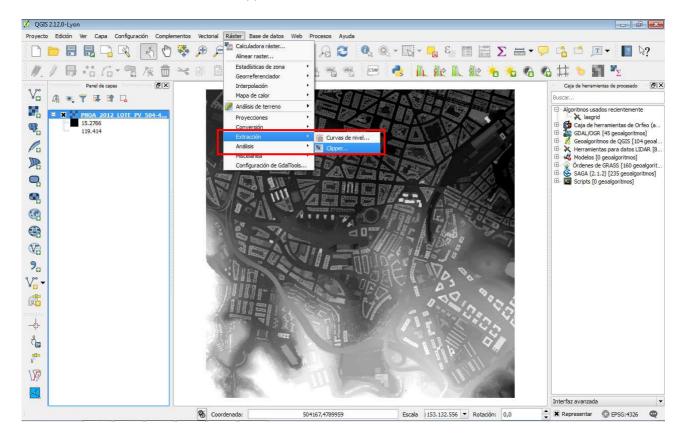
**(i)** 

If you are working in a **shared map of huellasolar**, a number of **Kml files** have been sent to your mail. In these cases you can skip this point and go to the **annex III 'Trimming a Geotif with a kml file'** 

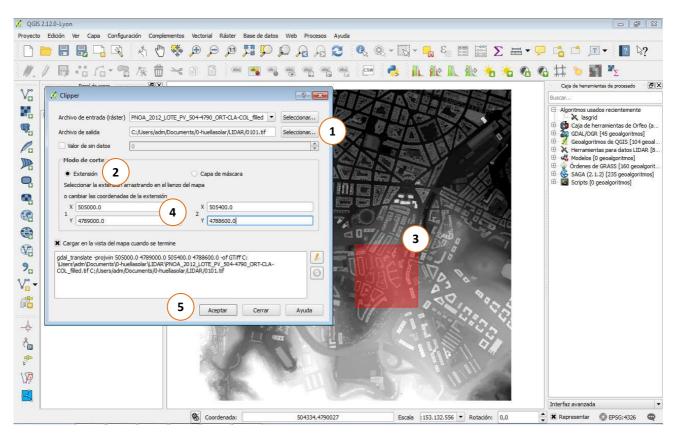
Note: Images of this point are taken from version 2.12.0-Lyon of Qgis

First let's open the tif file saved in the point 5 of this manual.

In order to save the different tiles of our map we are going to use the tool 'Clipper' of the Qgis software. Choose the menu Raster->Extract->Clipper



# The following window appears:



# 1. Select folder and name of file to save. In our case it will be the first tile of the map called 0101.tif. The output format must be tif.

The tiles of the map must be saved with names with four numbers each one. The first two digits correspond to the column and the last two digits are for the row. The tile 0101 is placed in the first column first row. It starts from the lower left corner. Null values such as 0000 are not admitted for the huellasolar system.

# 2. Clipping Mode Extent.

1)

This mode makes the selection directly drawing on the map. If your map has many tiles you could consider using the mode 'Mask Layer'. You should have a set of vector layers defining the different tiles of your map and use those layers to cut out the map in tiles.

3. Draw a rectangle approximately on the area of the first tile

 Adjust the coordinates. The area must size exactly the dimension we want for our tiles. In our case we want tiles of 400x400m so the coordinates have been adjusted as follows: Sector 0101 -> X1: 505000 X2: 505400 / Y1: 4789000 Y2: 4788600 We save these values to process with the following tiles. For example: Sector 0102-> X1: 505000 X2: 505400 / Y1: 4789400 Y2: 4789000 Sector 0201-> X1: 505400 X2: 505800 / Y1: 4789000 Y2: 4788600 Sector 0202-> X1: 505400 X2: 505800 / Y1: 4789400 Y2: 4789000

5. Finally we accept to save the file

Now is we see the dimension of the tif we have just saved we notice that it is 200x200pixels. However we want our tiles of 400x400m (Take into account that huellasolar's tools works with a coefficient m/pixel = 1)

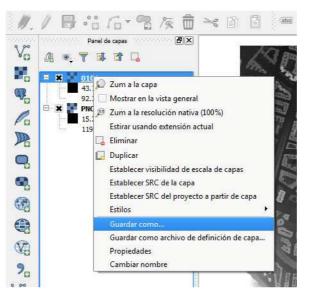
It is because we selected the value 'step size' = 2 when we processed the lidar with the 'las2grid' tool (See point 5 of this manual). We made this to reduce the pixilation of the data.



Now we are going to save the tif with the correct pixel/meter value.

It is pretty easy, we have just to 'save as' the file as follows.

We select the layer in the list of layers of Qgis and place the mouse pointer on it to open the contextual menu with right click. The we select 'Save as'



The following menu will be displayed

🕻 Guardar capa	de easter como			8	2
Modo salida 💿 D	atos crudos ု 🔘 Image	en renderizada			
Formato GTiff				▼ Crear V	/RT
and a set of the second se			Ki - 11833		
Guardar como	:/Users/adm/Documents/	0-huellasolar/LID	AR/0101.tif	1 Explorar.	
SRC SRC selecci	onado (EPSG:4326, WGS	6 84)		•	Ð
× Añadir archivo	guardado al mapa				
▼ Extensión (					-
	Norte	4789000			Ē
		100000			
Oeste 505000			Este 50	5400	
	Sur	4788600			1112
	Extensión de la c		Extensión de la vista	dal mana	
	Extension de la c	apa	extension de la vista	bermapa	
					-
▼ Resolución	(actual: definido por	el usuario) 🦳			
Horizontal	1	Vertical 1		Resolución de la capa	2
O Columnas	400	Filas 400	)	Tamaño de la capa	-
▼	s de creación			1	
Perfil Predete	rminado				
	Nombre		Valor	+ -	4
87.819					1
			(3)	Aceptar Cancela	r -

- 1. Select the same folder and file to overwrite it
- 2. In resolution select 1. You can see that the grey values of 'Layer size' change to 400 which is the real size of our tiles.
- 3. Accept to overwrite the file.

Now we can see that the tif size has changed to 400x400pixels which and therefore now the file has a relation 1pixel = 1meter.



We can repeat the same process for the rest of tiles of the map to have all the files of our map ready to be processed with the desktop tool of huellasolar.

# 7. Building data packages with huellasolar

Now we are going to build necessary data package to configure our solar map. To this purpose we are going to use the 'huellasolar data builder desktop tool'. We can download this free tool from the web <u>www.huellasolar</u>, section 'Documentation'. The tool is only available for windows systems.

### Herramientas

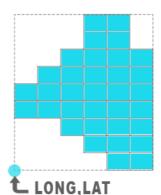
o	Generador de paquetes de datos huellasolar. Herramienta de escritorio. Si vas a construir tus propios mapas de radiación necesitarás esta herramienta de escritorio Es una pequeña aplicación para windows que debes usar para generar una serie de paquetes de datos. Estos datos deben ser subidos posteriormente desde tu	(ENG)
	panel de edición de proyectos. La descarga incluye una guía de uso y ejemplos.	21.022

# Download, install and open the tool.

Graph Output	🐞 huellasolar data builder	
	File Help	
2	Select Directory C:\Users\adm\Documents\0-huellasolar\Proyect	os\Bilbao
	Coordinates of the project	Select type of file
3	Longitude: -2.962389 Latitude: 43.271833	To learn more about supported forma 1 d if
	Files to process	Select All Deselect
4	0101.tif 0102.tif 0103.tif 0202.tif 0202.tif 0203.tif 0303.tif 0303.tif 0308.tif	5 Process
	Console Work directoy selected: CrUsers'adm/Documents\0-hueliasolar/Proyectos\ DISCARDED: All the raster in a project must have the same dimension - 070 DISCARDED: All the raster in a project must have the same dimension - 080 DISCARDED: The name of the file doesn't match requirements (see manual)	7.tif 7.tif
		Session: 160118

- 1. Select the type of file. In our case tif
- 2. Select the directory where the files of the tiles of our map are stored (These are the files we have just saved in the previous step).
- Once you select the directory the files will be listed. If this is not the case check the type of file. Check the directory. Check if there are other files named also with four numbers, finally check that all the files of the tiles have the same dimension in pixels.
  - 3. Type the coordinates of your map. Must be the coordinates for the lower left corner of the map as in the image below.





Save the values of long and lat of your map. You will need them later. Take into account that West and South values must be negative.

(j)

You can take the coordinates from Google Earth. They must be WGS 84 coordinates. If you take them from Google Earth they already are in WGS 84. Otherwise you should make the coordinates transformation.

- 4. Select of the files from the list
- 5. Click on 'Process'

The app will start the calculations.

Take into account that each tile can take several minutes. The whole map can take long time to be processed.



- 1. You can check the progress from the progress bar
- 2. You can see a session id in the lower right corner. The results will be stored in a directory with this id inside the work directory.

Once the work is done a pop up window will be displayed with the path to the results. They are stored in a directory with the following name: "[The selected work directory]/Session [The id of the work session]"

In this path you will find a group of files named as follow: "hso\_package\_[the number of tile]\_[the id of the package of data].hsp"



Example: hso\_package\_0101\_5.hsp

Additionally you will find png files for each tile formatted as it is explained in the appendix I of this manual. If you are working with png files, they will be just a copy of them.

If you are working with tif files, these png files are the ones which you should upload to your edition panel in the web huellasolar.

Finally we are going to set up our map from the huellasolar web.

# 8. Setting up our map

We are going to set up out map from the edition panel of huellasolar.

To enter the edition panel you must be registered. It is free and easy, only a user name a email is needed.

Once registered go to 'My projects' link from the OpenPlatform menu at the top right corner in the page.(You must be logged in to see this menu)



This will load the dashboard panel where you can create and manage all your projects. Go to the section 'Create new project':



Crear un	proyecto	nuevo
----------	----------	-------

Dilban Eine				ión de los proyectos publicados de Información Geográfica
States and states and		oartir de Lidar d	el Centro Nacional	de información Geografica
Descripción				
datos lida				torearen Zumarkalea. Este mapa ha sido desarrollado a partir de formación Geográfica. LiDAR-PNOA cedido por © Instituto Geográfi
Coordenad	las del proyecto			
Escribe aquí la	is coordenadas de la e	esquina inferior iz	quierda del cuadrado	que circunscribe tu mapa. Estas coordenadas deben ser las mismas que las usadas para genera
	erramienta de escritor			are a canad nee ta mapar tartar con achadas acarri nei na manas que no asadas para genar
Longitud	-2.946717	Latitud	43.251022	
Introduce	el país de tu proy	/ecto		
Spain				
si lo prefieres.	그는 것이 같은 것은 것이 같은 것이 같이 많이 많이 많이 많이 했다.	si estás pensando	en vender el acceso	nes una de las licencias Creative Commons disponibles, sin embargo puedes optar por otros tip a tu mapa, una licencia restrictiva puede desanimar a los usuarios. siempre podrás modificarla
Creative-Co	ommonsReconocim	iiento		
Si has selecc	cionado 'Otra' por fa	avor, especifica	1	
Atribución				
Atribución Autor : huel	llasolar			
	llasolar			<b>7</b> Cri
Autor : hue	<sup>Ilasolar</sup> ype the title fo	or your ma	מו	<b>7</b> Cri

- 3. The coordinates. They must be the same coordinates you used to generate the package data with the desktop tool of huellasolar. Once the project is created you cannot change the coordinates
- 4. The country of your map
- 5. The license you want to apply to your data. In our case we are using lidar data from the CNIG which allow us to use non commercial licenses. Our map will be Creative Commons By
- 6. The author of the map
- 7. And click on 'Create'

Now we have created our Project in huellasolar. The next step is to set up it.

We can start editing our map clicking on the blue message that is displayed the first time you create a project.

Proyecto creado con éxito! Comenzar la edición	Crear
	100000000

Or you can go to the edition panel of the map form the list of projects in the top of the page:



+ + Buscar Sessio... 🔎

Organizar por: Carpeta \*

1

🗢 🍌 « LIDAR 🕨 Session...

💥 Abrir 🛛 »

Biblioteca Docu...

hso\_package\_0101\_0.hsp

hso\_package\_0101\_1.hsp

hso\_package\_0101\_2.hsp

hso\_package\_0101\_3.hsp

hso\_package\_0101\_4.hsp

hso\_package\_0101\_5.hsp

hso\_package\_0101\_6.hsp

hso\_package\_0101\_7.hsp

hso\_package\_0101\_8.hsp hso\_package\_0101\_9.hsp

TIT. 4 elementos seleccionados

Session150917

¥ 0101.png ¥ 0102.png

🍀 0201.png

🖊 0202.png

C

E Ir

A L

V

Equ

🚢 C

Ca F

E Rec

1

Nombre

# Mis proyectos

Titulo	Descripción	Тіро	Estado	Acciones	
Bilbao. Ejemplo mapa solar a partir de Lidar del Centro Nacional de Información Geográfica	Área en torno a calle Autonomia Kalea y Areitza Doktorearen Zumarkalea. Este mapa ha sido desarrollado a partir de datos lidar disponibles en el Centro Nacional de Información Geográfica. LiDAR-PNOA cedido por © Instituto Geográfico Nacional de España.		No Publicado	×	*
					m •

Leyenda : 🖋 Editar 🛛 Borrar 🗺 Ver mapa 🔒 Bloqueado

Use any of those two links to enter your edition panel.

The edition panel has five tabs: Project, Map, Radiation, Production and Publish.

In this guide we leave the default values except the turbidity factor Linke.

If you want to know more about the edition panel, look up the OpenPlatform manual or the video tutorials available in the 'Documentation' section.

Anyway you can edit the map also after its publication.

First of all go to the 'Map' tab. Here we are going to upload the packages of data.

There you can see three gray regions to drag and drop the files saved in previous steps.

We will start uploading the raster files of elevations. These are the png files corresponding to each tile of our map. They are the png files generated with the 'huellasolar databuilder' in the previous point. You can find them inside the folder of results.

In our case are four png files corresponding to each tile of our map:

#### Ráster de Alturas (Dato necesario): Arrastra aquí el ráster que contiene la información de elevaciones. Debe ser el mismo archivo que usaste para generar datos con la herramienta de escritorio. Sólo aparecerán los archivos nombrados conforme a las normas descritas en la guía (Información adicional) Arrastra aquí tus ráster Organizar • 0102.png Fax 0201.png 슬 Di C 0202.png 🍵 E 0101.png -9 S 📄 Bib

# Paquetes de datos (Dato necesario): Arrastra aquí los paquetes de datos generados con la herramienta de escritorio de huella mapa). Sólo puedes subir un sector cada vez. (Información adicional)

Arrastra aquí tus archivos hsp

Vaciar lista

Vaciar lista

#### Ráster de máscaras (Dato opcional):

Los ráster de máscara son un tipo de dato opcional que añade algunas funcionalidades dae dontro do algunos rocultados do la s

- 1. Open the explorer and locate the files. Select them and drag and drop inside the first gray region
- 2. Click on the upload button

Now we are going to upload the packages of data generated with the desktop data builder in the section eight of this guide. These packages are a group of sixteen files for each tile of the map with the extension .hsp.

We proceed in the same way but drag and drop in the second gray region

You can only upload a tile each time. Select the sixteen files corresponding to the first tile, drag and drop and click the upload button. Once uploaded, click on 'Clear List' and repeat with the rest of tiles.

# Paquetes de datos (Dato necesario):

Arrastra aquí los paquetes de datos generados con la herramienta de escritorio de huellasolar (Los archivos hsp numerados del 0 al 15 para cada sector de tu mapa). Sólo puedes subir un sector cada vez. (Información adicional)

Arrastra aquí tus archivos nsp	0101 🗃	16/16	🕒 Organi	zar 🔻 🏢 Vistas 💌 »	(
nso package 0101 5.hsp	-		Vinculos f	Nombre	Fecha modificación
nso package 0101 6.hsp	4	(2)	Pr	hso_package_0101_0.hsp	17/09/2015 18:46
		$\smile$	1 Dr	hso_package_0101_1.hsp	17/09/2015 18:46
nso_package_0101_7.hsp				hso_package_0101_2.hsp	17/09/2015 18:48
nso_package_0101_8.			. D	hso_package_0101_3.	17/09/2015 18:49
nso package 0101 9.hsp	<b></b>		D	hso_package_0101_4.hsp	17/09/2015 18:51
nso package 0101 10.hsp	*		🖺 Im	hso_package_0101_5.hsp	17/09/2015 18:53
	-		🚺 🚺 M	hso_package_0101_6.hsp	17/09/2015 18:54
hso_package_0101_11.hsp			Vi	hso_package_0101_7.hsp	17/09/2015 18:56
nso_package_0101_12.hsp	<b></b>		Más :	hso_package_0101_8.hsp	17/09/2015 18:57
nso package 0101 13.hsp	-			hso_package_0101_9.hsp	17/09/2015 18:58
nso package 0101 14.hsp	*		Carpetas	hso_package_0101_10.hsp	17/09/2015 18:59
	-		La (A	hso_package_0101_11.hsp	and the second
nso_package_0101_15.hsp				hso_package_0101_12.hsp	17/09/2015 18:59
nso_package_0101_0.hsp	<b></b>			hso_package_0101_13.hsp	17/09/2015 18:59
nso_package_0101_1.hsp	-			hso_package_0101_14.hsp	17/09/2015 18:59
nso package 0101 2.hsp	*			hso_package_0101_15.hsp	17/09/2015 18:59
	4			hso_package_0102_0.hsp	17/09/2015 19:00
hso_package_0101_3.hsp				hso_package_0102_1.hsp	17/09/2015 19:01
nso_package_0101_4.hsp				·	• • • • • • • • • • • • •
				16 elementos seleccionados	

- 1. Select the sixteen files corresponding to the tile. Drag and drop in the second gray region
- 2. Click the button upload
- 3. Once uploaded, clear the list and repeat the process for the rest of tiles.

We can check that everything is ok from the table at the top of the page.

stado a	ctual del r	nana.																	
Sector	Ráster	napa.						Pa	aquete	s de da	atos							Råster de	Borrar
Sector	de Alturas	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	máscaras	BOITAI
0101	~	$\checkmark$	<	×	1														
0102	~	$\checkmark$	~	$\checkmark$	$\checkmark$	~	$\checkmark$	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×	Û
0201	$\checkmark$	$\checkmark$	~	$\checkmark$	×	ŧ.													
0202	1	1	1	~	$\checkmark$	~	$\checkmark$	~	$\checkmark$	$\checkmark$	~	$\checkmark$	~	$\checkmark$	$\checkmark$	~	$\checkmark$	×	ŝ



- 1. The list of tiles of our map
- 2. The png files of elevations for each tile have been correctly uploaded
- 3. The hsp files for each tile have been correctly uploaded



You can see a column titled 'Mask raster'. This is an optional data. If you want to know more about the use of mask raster in your solar map look at the manual of the OpenPlatform of huellasolar.

At this point you can already publish your map, but in this manual we are going to set up also the turbidity factor Linke.

We strongly recommend setting up this coefficient to improve the accuracy of the radiation results.

The turbidity factor values can be edited from the 'Radiation' tab:



In the web you can find a list of Linke values for different locations around the world. We are going to get the values from <a href="http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php">http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php</a> . (Valid for Europe). Visit the link and follow these steps.

JRC	CM SAF Photovolta	c Geographical Inform	nation System - Interactive Maps	📑 re.jrc.ec.europa.eu/pv	rgis/apps4/MRcalc.php - Google Chr 👝 回 🚿
EUROPA > EC > JRC > IE > R	E > SOLAREC > PVGIS > Interactive maps > euro	pe	Contact	🗅 re.jrc.ec.europa.e	eu/pvgis/apps4/MRcalc.php
Europe Africa-Asia	spre, Italy" or "45.256N, 16.9589E" Search	cursor position: 43.248, -2.918 selected position: 43.261, -2.936	PV Est 1 Monthly radiation Daily radia	Monthly Solar Ir	
Latitude:	Longitude:	Go to lat/lon	Monthly global irradiation data	PVGIS Estimates of	long-term monthly averages
Mapa Satélite	MATIKO	The lot	Radiation database: Climate-SAF PVGIS 🔻	Location: 43°15'39" Nort	th, 2°56'9'' West, Elevation: 27 m a.s.1.,
	BI-625	URIBARRI	Horizontal irradiation		
Botikazar Erribera	Guggenheim ≘ Gian G Bilbao Museoa ≘ Gian Kalka	BI-625	Irradiation at opt. angle	Solar radiation database	used: PVGIS-CMSAF
Barn	"taka	URIBARRI	Direct normal irradiation	Optimal inclination angle	- in 75 domon
Olabeaga Kaia Museo Artes	de Bellas 3	7017-101-1	☐ Irradiation at chos ngle: 90 deg.		it due to shadowing (horizontal): 0.1 %
🛁 Estadio San M		D ZURBARA	Linke turbidity		
and and	Bibao	- Line Kalille	Dif. / global radiation	Month	$r_L$ (5)
		AZPIKALEAK	Optimal inclination angle	Jan	3.5
BASURTU	INDAUTXU = Azkuna Zentroa	BI-625	and the second to a second	Feb	3.6
	Arriaga Antzokia	BEGONA	Monthly ambient temperature data	Mar	3.5
		Bilboko Donejakue katedrala	Average daytime temperature	Apr	4.0
	METZOLA Gone Kaleg	" katedrala	Daily average of temperature	May	4.4
	N-534	A STAN	Number of heating degree days	Jun	4.4
AR AND	ZABALA BILBO ZAHA	RRA	Output options	Jul	4.2
	the states of		Show graphs Show horizon	Aug	4.3
-1.04-12		SANTUT	Web page O Text file	Sep	4.2
URETAMENDI	LUEBEARI	VIII STATE		Oct	3.8
Si de la	116A 116	+	Calculate (4 [help]	Nov	3.6
- PENASCAL				Dec	3.0
Google	Google, Inst. Geogr. Nacional   Terminos de uso	Informar de un error de Mapa		Year	3.9
Solar radiation Temperate	ure Other maps				
				$T_L$ : Linke turbidity (-)	

- 1. Select the tab 'Monthly radiation'
- 2. Check in the option 'Linke turbidity' and set off the rest of outputs
- 3. Navigate the map to the location of your map an click on the place
- 4. Click on 'Calculate' button
- 5. A pop up window will show the values of Linke turbidity

Now we only have to translate these values to our edition panel.

Proyecto	Mapa	Radiación	Producción	Publicación					
Coeficient	e de <mark>tu</mark> rbic	lez atmo <mark>sf</mark> ér	ica Linke:						
ntroduce aqu	í los valores (	del factor Tik pa	ra tu localización. Si no	estás seguro acerc:	a de cuáles son ade	cuados para tu p	proyecto, pu	iedes consulta	r aquí una
lista de valore									
También pue	des obtener e	stos valores de	la página web de SoD	a (Solar Energy Serv	ices for Professiona	ls).			
Fen en cuenta	que, aunque	e ofrecemos un	os coeficientes por defe	ecto, usarlos sin con	nprobar los valores o	le tu localización	podría cau	isar una pérdic	la de
iabilidad en l	os resultados	de radiación d	e tu mapa.						
fiabilidad en l Enero	os resultados Febrero	s de radiación d Marzo	e tu mapa. Abril Mayo	Junio .	Julio Agosto	Septiembre	Octubre	Noviembre	Diciembre
					Julio Agosto 4.2 4.3	Septiembre	Octubre 3.8	Noviembre 3.6	Diciembre

- 1. Type the values of Linke turbidity
- 2. Save changes

9. Publishing and viewing the map. Brief list of features available.

Our map is ready to be published. Go to the tab 'Publish'

Once you have reached this point, to publish your map is quite simple. Only click on the button 'Publish now'

e publicación:			
		Al publicar como Mana Abierto todo el mundo podrá acceder y usarlo	
abierto		Publicar Ahora	
	abierto	abierto	Al publicar como Mapa Abierto todo el mundo podrá acceder y usarlo abierto Publicar Ahora

If everything goes right we will have a screen like this:

Mapa abi	erto	Al publicar como Mapa Abierto todo el mundo podrá acceder y usarlo Publicar Ahora
Hupu ubi	cito	Publicar Anora
		$\checkmark$
Proyecto Publicado!.	Para visitar tu ma	pa abre el visor huellasolar y selecciónalo en el mapa mundi o desde tu lista
Proyecto Publicado!.	Para visitar tu ma	pa abre el visor huellasolar y selecciónalo en el mapa mundi o desde tu lista de proyectos. Click aqui!
Proyecto Publicado!. Registro :	Para visitar tu ma	
51.8 C	Para visitar tu ma	
Registro :	~	
Registro : Comprobando cambios	~	
Registro : Comprobando cambios Comprobando integridad del proj	~	
Registro : Comprobando cambios Comprobando integridad del proy Paso 1/5	~	
Registro : Comprobando cambios Comprobando integridad del proy Paso 1/5 Paso 2/5	~	

# Our map is published!

We can click on the blue message to visit it.

You can enter the map also from the world map of the huellasolar viewer.



Here we have our map once opened In the viewer of radiation and sun exposure. Now we can start to analyze it with all the features available.

Below we made a brief description of the main features. If you want a more detailed explanation download the manual of the viewer from the section 'Documentation' of the web.



#### ESTIMACIÓN DE DATOS DE RADIACION EN UN ÁREA Radiación directa, difusa y global en condiciones de cielo despejado Área seleccionada: 100.732 m<sup>2</sup> Rad.Dir. Rad.Dif. Mes Global(Kwh/día) Porcentajes Radiación Producción (Kwh/día) (Kwh/día) 226.038 Jan 65.953 165.539 Feb 90.597 264.115 346.228 Directa Global 800 Mar 109.888 408.646 506.515 Difusa 151.197 525.705 669.428 Apr 600 May 183.618 597.415 772.852 190,991 641,451 827.190 Jun 400 Jul 177.760 637.714 804.667 167,559 546,713 Ago 703,162 200 142.410 423.695 557.520 Sep Oct 102.919 303.505 393.698 74.942 257.550 Feb Abr May Jun Jul Nov 191.597 Ago Sep Oct Dic Nov Ene Mar 51.914 158.772 200.283 Gráfico Datos Dec Total 1509.748 4864.867 6265.131

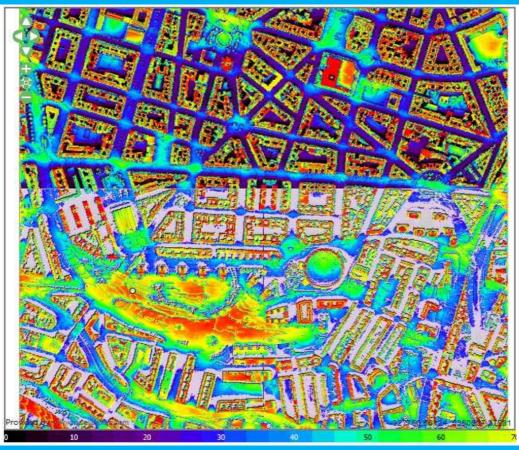
# Radiation in a point. This feature calculates monthly and hourly values of radiation in a point

Dr         -         -         somba         comba	11250500				8		10	11			14						001202000
DF         -         -         77.86         66.115         85.556         66.115         27.866         -         -         -         0.65           Global         -         -         77.86         66.115         85.556         66.115         27.866         61.15         27.866         61.15         27.866         61.15         27.866         61.15         27.866         61.15         27.86         35.5         16.5         1.62         -         1.02           DF         -         -         42.34         75.86         97.27         17.16 <th< td=""><td></td><td>1000</td><td>0706503</td><td></td><td>A State of the second s</td><td></td><td>and the second second</td><td>and the second second</td><td></td><td></td><td>and the second s</td><td>and the second second</td><td>- Contraction of</td><td>00000000</td><td>000500</td><td>2005022</td><td>Jan</td></th<>		1000	0706503		A State of the second s		and the second second	and the second second			and the second s	and the second second	- Contraction of	00000000	000500	2005022	Jan
Global         -         -         27.86         66.115         85.565         94.718         413.572         285.46         85.555         66.115         10.20         -         -         12.22           Preb         -         -         2.55         10.25         11.55         11.55         11.55         11.55         16.55         -         -         0.87           DF         -         -         42.554         76.840         95.272         112.10         553.255         553.255         112.106         99.272         76.840         0.000         -         -         0.48           OPF         -         -         77         8         9         10         11         12         13         14         15         16         17         -         -         0.48           OF         -         50.316         85.011         70.440         105.13         16.35         16         17         18         41.44         10.35         16.57         13.51         14         14.36         14.365         14.365         16.57         15.5         15.5         15.5         15.5         15.5         15.5         15.5         15.5         15.5         15.5		-	-												-	-	
Fab         -         -         Z.5         9.5         19.5         11.5         12.5         13.5         16.5         -         CB           DF         -         -         somba	CASE ANY				2012	1000	0.0000000					10 T 1		•	-		ST 67737663 11
DF         -         -         somba		-	-		2/.850	201000000000000	65,956							DIFFERENCE IN	-	-	
DF         -         -         -         -         -         -         -         -         -         0.88           Global         -         -         -         -         -         0.84         -         -         0.84           Global         -         -         -         -         -         0.85         -         1.11         1.2         1.3         1.4         1.5         1.6         1.7         -         -         Har           DV         -         -         50.316         63.714         10.84         11.77         12.77         11.772         10.5498         37.714         50.316         -         -         2.83           OP         -         50.316         23.8011         47.044         11.77         11.772         10.5498         37.714         50.316         -         -         1.38           OP         -         Somba         s	Children and All				12	COT III	2.2	and the second	· · · · · · · · · · · · · · · · · · ·		Contract of	and the second s	The Party of the P		000 000		
Global         -         -         4.34         7.6.40         9.272         112.10         99.272         76.40         0.000         -         -         1.72           Har         -         7         4         9         10         11         12         14         12         16         17         -         Har           Dr         -         50.316         83.714         105.48         95.764.9         65.913         57.6419         60.913         17.872         105.489         83.714         50.316         -         1.08           Global         -         50.316         83.714         105.491         17.872         105.489         83.714         50.316         -         1.09           Dr         -         6.807.87         116.255         85.787         10.13         11.42         13         14         16.255         85.777         10.75         16.55         16.57         16.255         85.787         0.000         -         4.312           Dr         -         Somba		-	-		and the second second		and the second se	and the second se			and the second s	and the second se	and the second s	and the second second	8 · · ·	-	
Har         -         7         8         9         10         11         12         13         14         15         16         17         -         1           Dr         -         50316         63,714         105489         137,72         105499         35,714         50,316         -         -         2,83           Global         -         50,316         58,011         472,034         51,311         700,557         700,587         700,153         117,872         105,498         33,714         0,000         -         3,387           Dr         -         sombra         somb		-															
DF         -         sembra         214.297         366.545         493.499         576.419         combra         sombra		-	COLUMN DO					112,105			112.106	99.272	/6,840	0.000	-		and delivery of the second
Dř         -         50.316         87,74         105.489         117.872         123.744         123.744         123.744         123.744         123.744         123.744         123.744         123.744         123.744         123.744         105.489         83.714         50.316         -         -         3.87           Apr         -         5         0.316         296.011         472.034         611.311         700.153         700.585         700.153         117.872         105.489         83.714         0.000         -         3.87           Dir         -         sombra		10.00		-	and the second second			10			14	15	16	1.7	1. 1. 1.		
Global       -       50.316       298.011       472.034       611.311       700.153       730.585       700.153       117.872       105.469       83.714       0.000       -       -       3.87         Apr       -       6       7       8       5       10       11       12       13       14       15       16       17       18       -       Apr         OF       -       50mba       somba		-									and a second second second				10-	-	
Apr         6         7         8         9         10         11         12         13         14         15         16         17         18         -         App           Dir         -         sombra         sombra         470.132         595.634         677.004         705.125         677.004         705.125         677.004         577.64         616.55         57.77         16.255         657.77         16.255         657.77         16.255         657.77         16.255         657.77         16.255         657.77         16.255         657.77         16.255         16.57         11.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         16.57         15.5         15.5         15.5 <td>1000</td> <td>•</td> <td>•</td> <td></td> <td>0.000.000</td> <td></td> <td></td> <td>100000000000000000000000000000000000000</td> <td></td> <td>1000000000</td> <td>2211212</td> <td></td> <td>000113700</td> <td>2000 200 h</td> <td>-</td> <td>-</td> <td></td>	1000	•	•		0.000.000			100000000000000000000000000000000000000		1000000000	2211212		000113700	2000 200 h	-	-	
Dir         sombra         sombra <td>a state of the later</td> <td>-</td> <td></td> <td>50,316</td> <td>298.011</td> <td>472.034</td> <td></td> <td></td> <td></td> <td>10.000000000000000000000000000000000000</td> <td>117.872</td> <td>105.489</td> <td>83,714</td> <td></td> <td></td> <td></td> <td></td>	a state of the later	-		50,316	298.011	472.034				10.000000000000000000000000000000000000	117.872	105.489	83,714				
Dif         42.816         85.787         116.235         135.046         144.846         149.993         148.954         144.846         135.046         116.235         85.787         42.816         -         1.49           Global         -         42.816         65.787         115.25         65.5         7.5         8.5         9.5         1.5         <				1	8	1					14	15	16		1.8		
Global       -       42.816       85.787       116.255       605.787       740.480       625.958       655.121       62.959       14.846       135.046       116.255       85.787       0.000       -       45.77         Hay       -       5.5       6.5       7.5       85.5       9.5       10.5       11.5       12.5       14.55       16.55       17.5       18.5       Max         Dir       -       88nbra       sombra       som	10.00	-								and the second second						-	3.125
Hay         5.5         6.5         7.5         8.5         9.5         10.5         11.5         12.5         13.5         14.5         15.5         16.5         17.5         18.5         Max           Dir         -         sombra							100000000000000000000000000000000000000									-	
Dr         -         sombra		-			Concert diversity of		and the second second		and the second second second	and the second s				DOM: NOT OCT		-	and the second s
DF         -         48.653         93.475         126.781         148.297         160.014         165.125         166.738         166.738         166.738         166.737         165.125         160.014         148.297         126.781         93.475         0.8003         6.56           Jun         5         6         7         8         9         10         11         12         13         14         15         16         17         18         193.075         68.633         33.038         63.345         11.05         12         13         14         15         16         17         18         193.078           Dr         sombra	May	11222	5.5	6.5	7.5	1 and the	9.5		11.5	12,5	13.5	14.5	15.5	16.5	17.5	and the second second	Мау
Global       -       48.653       93.475       126.761       148.297       749.669       684.192       908.227       884.192       749.669       602.497       426.146       93.475       0.000       6.556         Jun       5       6       7       8       9       10       11       12       13       14       15       16       17       18       19       Jun         Dr       sombra       somb		-			sombra	sombra	589.655	689.067		A A A A A A A A A A A A A A A A A A A		589,655		and the second second second	sombra		4.794
Jun         5         6         7         8         9         10         11         12         13         14         15         16         17         18         19         Jun           Dr         sombra		-															1.818
Dir         sombra         sombra <td>Global</td> <td></td> <td>48.653</td> <td>93.475</td> <td>126.781</td> <td>148.297</td> <td>749.669</td> <td>854.192</td> <td>908.227</td> <td>908,227</td> <td>854.192</td> <td>749.669</td> <td>602.497</td> <td>426.146</td> <td>93.475</td> <td>0.000</td> <td>6.564</td>	Global		48.653	93.475	126.781	148.297	749.669	854.192	908.227	908,227	854.192	749.669	602.497	426.146	93.475	0.000	6.564
DF         33.038         83.433         118.566         142.608         156.572         163.100         165.344         163.700         165.344         163.100         156.572         142.608         118.566         83.453         33.038         83.453         118.566         142.608         156.572         85.72         91.00         93.020         913.094         86.334         714.11         55.5         16.5         15.5		5	6	7	8	9	10							17	18	The state of the second	
Global       33.038       83.453       118.566       142.608       156.57       836.354       913.094       939.202       913.094       836.354       714.121       555.953       118.566       83.453       0.000       6.444         Jul       -       55       6.5       7.5       8.5       9.5       10.5       11.5       12.5       13.5       14.5       15.5       16.5       17.5       18.56       33.023       sombra       sombr	Dir	sombra	sombra	sombra	sombra	sombra	673.254	747.75	773.422	747.75	673.254	557,549	413.345	sombra	sombra	sombra	4.586
Jul         5.5         6.5         7.5         8.5         9.5         10.5         11.5         12.5         13.5         14.5         15.5         16.5         17.5         18.5         Jul           Dr         -         sombra	Dif	33.038	83,453	118.566	142.608	156.572	163.100	165.344	165.780	165.344	163.100	156.572	142.608	118.566	83.453	33.038	1.891
Dr         -         sombra		33,038	83.453	118.566	142,608	156.572	836.354	913,094	939.202	913.094	836.354	714.121	555.953	118.566	83.453		6.444
Dif         54.965         94.675         123.796         142.187         151.792         155.648         156.688         156.688         157.92         142.187         721.193         874.224         926.393         926.376         926.277         926.2																18.5	
Global         -         54,965         94,675         123,79         142,187         772,193         874,234         926,936         874,234         772,193         628,206         454,819         94,675         0.000         6.74           Ago         -         6         7         8         9         10         11         12         13         14         15         16         17         18         Ago           Dir         -         sombra         sombra         sombra         sombra         485,643         063.11         684,452         01.14         15         16         17         18         Ago           Global         -         57.251         99.341         128.972         447.033         156.267         147.013         125.972         99.341         57.251         -         1.65           Global         -         57.251         99.341         128.972         632.676         662.57         75         8.5         9.5         10.5         12.5         13.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         14.5         16.5 </td <td>Dir</td> <td>-</td> <td>sombra</td> <td>sombra</td> <td>sombra</td> <td>sombra</td> <td>620.401</td> <td>718,586</td> <td>770.248</td> <td>770.248</td> <td>718.586</td> <td>620,401</td> <td>486.019</td> <td>331.023</td> <td>sombra</td> <td>sombra</td> <td>5.036</td>	Dir	-	sombra	sombra	sombra	sombra	620.401	718,586	770.248	770.248	718.586	620,401	486.019	331.023	sombra	sombra	5.036
Ago         -         6         7         8         9         10         11         12         13         14         15         16         17         18         -         Ago           Dr         -         sombra         sombra         sombra         sombra         485,643         605,31         684,452         711,448         684,452         166,31         485,643         337,115         sombra         sombra         sombra         -         46,60           Dif         -         57,251         93,441         128,972         621,67         147,033         128,972         93,44         57,251         -         1.655           Global         -         6.5         7.5         8.5         9.5         10.5         11.5         12.5         13.5         14.5         15.5         16.5         7.5         Sep         -         5.5         7.5         8.5         9.5         10.5         11.5         12.5         14.5         15.5         16.5         17.5         Sep         3.04           Dif         -         48,060         91.811         240.25         546.051         600.225         640.51         140.15         12.197         91.811         0.000 </td <td>Dif</td> <td>-</td> <td>54.965</td> <td>94.675</td> <td>123.796</td> <td>142.187</td> <td>151.792</td> <td>155.648</td> <td>156.688</td> <td>156.688</td> <td>155.648</td> <td>151.792</td> <td>142.187</td> <td>123.796</td> <td>94.675</td> <td>54.965</td> <td>1.760</td>	Dif	-	54.965	94.675	123.796	142.187	151.792	155.648	156.688	156.688	155.648	151.792	142.187	123.796	94.675	54.965	1.760
Dir         -         sombra         sombra         sombra         485,643         666,31         684,452         711,448         684,452         606,31         485,643         337,115         sombra         sombra         -         4,600           Dif         -         57,251         99,341         128,972         147,003         156,267         160,015         160,031         160,015         166,277         147,003         128,972         99,341         57,251         -         1.65           Global         -         6.5         7.5         8.5         9.5         10.5         11.5         14.5         15.5         16.5         17.55         14.5         15.5         16.5         17.5         Sep         -         6.65         9.5         10.5         11.5         14.5         15.5         16.5         17.5         Sep         -         6.60         14.13         144,20         544,605         600.229         600.229         640,516         140.156         121,937         91.811         48,060         -         48,060         14.141         140.228         160,57         153,326         153,326         153,326         149,576         140,156         121,937         91.811         48,060 <td< td=""><td>Global</td><td></td><td>54.965</td><td>94.675</td><td>123.796</td><td>142.187</td><td>772.193</td><td>874.234</td><td>926.936</td><td>926.936</td><td>874.234</td><td>772.193</td><td>628.206</td><td>454,819</td><td>94.675</td><td>0.000</td><td>6.740</td></td<>	Global		54.965	94.675	123.796	142.187	772.193	874.234	926.936	926.936	874.234	772.193	628.206	454,819	94.675	0.000	6.740
Dif         57.251         99.341         128.972         147.033         156.267         160.015         156.267         147.033         128.972         99.341         57.251         -         1.65           Global         -         57.251         99.341         128.972         622.676         762.577         844.467         772.379         844.467         752.577         632.676         466.087         99.341         0.000         -         6.200           Step         -         -         5         7.5         8.5         9.5         10.5         11.5         12.5         14.5         15.5         16.5         17.5         Step           Dir         -         sombra         sombra         306.291         444.226         546.051         600.229         546.051         140.56         121.937         91.811         48.060         -         1.441           Global         -         48.060         91.811         140.255         548.32         573.555         695.57         10.55         16.5         10.55         16.5         10.000         4.400         0.000         4.400         0.000         4.400         0.000         4.400         0.000         4.400         0.000         4.400	Ago																Ago
Global         -         57.251         99.341         128.972         632.676         762.577         844.467         872.379         844.467         762.577         632.676         466.067         99.341         0.000         -         6.200           Sep         -         6.5         7.5         8.5         9.5         10.5         11.5         12.5         13.5         14.5         15.5         16.5         17.5         Sep           Dir         -         sombra	Dir	-	sombra	sombra	sombra	485.643	606.31	684,452	711,448	684,452	606.31	485,643	337.115	sombra	sombra	-	4.601
Sep         -         6.5         7.5         9.5         9.5         10.5         11.5         12.5         14.5         15.5         16.5         17.5         Sep           Dr         -         sombra         sombra         308.291         444.26         546.051         600.295         600.295         640.051         sombra         sombr	Dif	-	57.251	99.341	128.972	147.033	156.267	160,015	160.931	160.015	156.267	147.033	128.972	99.341	57.251		1.659
Dir         -         sombra         sombra         308.291         444.226         546.051         600.229         546.051         sombra         sombra <td>Global</td> <td>-</td> <td>57.251</td> <td>99.341</td> <td>128.972</td> <td>632.676</td> <td>762.577</td> <td>844.467</td> <td>872,379</td> <td>844.467</td> <td>762,577</td> <td>632.676</td> <td>466,087</td> <td>99.341</td> <td>0.000</td> <td>-</td> <td>6.203</td>	Global	-	57.251	99.341	128.972	632.676	762.577	844.467	872,379	844.467	762,577	632.676	466,087	99.341	0.000	-	6.203
Dif         -         48.060         91.811         121.937         140.156         149.576         153.326         149.576         140.156         121.937         91.811         48.060         -         1.41           Global         -         48.060         91.811         430.28         584.382         695.627         753.555         753.555         555.55         140.156         121.937         91.811         0.000         -         4.40           Oct         -         7.5         8.5         9.5         10.5         11.5         12.5         14.5         15.5         16.5         Oct           Dir         -         sombra         199.061         sombra         479.069         sombra         sombra         sombra         sombra         56.137         -         11.05           Dif         -         -         56.137         89.823         111.431         123.511         11.418         89.823         56.137         -         11.01           Global         -         -         56.137         89.823         111.431         122.131         111.431         89.823         56.137         -         1.01           Global         -         -         56.137							9.5								17.5		
Global         -         48.060         91.811         430.228         584.382         695.627         753.555         695.627         140.156         121.937         91.811         0.000         -         44.40           Occ         -         7.5         8.5         9.5         10.5         11.5         12.5         14.5         15.5         16.5         -         Oct           Dir         -         -         56.137         89.82         111.431         125.11         11.143         55.37         -         1.01           Global         -         -         56.137         288.84         111.431         123.511         128.723         123.511         111.431         89.823         0.000         -         2.12           How         -         -         56.137         288.84         111.431         123.511         111.431         89.823         0.000         -         2.12           How         -         -         8         9         0         1         12         13         14         15         16         -         -         Mov           Dir         -         -         44.130         74.681         94.086         104.490	Dir	-	-	sombra	sombra	308.291	444.226	546.051	600.229	600.229	546.051	sombra	sombra	sombra	sombra	-	3.045
Oct         -         7.5         8.5         9.5         10.5         11.5         12.5         13.5         14.5         15.5         16.5         -         Oct           Dir         -         -         sombra         199,061         sombra	Dif	-	-	48.060	91.811	121.937	140.156	149.576	153.326	153.326	149.576	140.156	121.937	91.811	48,060	-	1.410
Dir         -         -         sombra         199.061         sombra         sombra         479.069         479.069         sombra         sombra     <	Global	-		48.060	91,811	430.228	584.382	695,627	753,555	753.555	695.627	140.156	121.937	91.811	0.000	-	4.407
Dif         -         -         56.137         89.823         111.431         123.511         128.723         128.723         123.511         111.431         89.823         56.137         -         1.01           Global         -         -         56.137         288.84         111.431         123.511         111.431         89.823         56.137         -         1.01           How         -         8         9         10         11         12         13         14         15         16         -         -         Nov           Dir         -         -         sombra         -         -         0.67           Dif         -         -         44.130         74.681         94.086         104.490         94.086         74.681         44.130         -         -         0.74           Global         -         -         44.130         74.681         104.490         457.802         478.81         0.000         -         -         1.37           Dec         -         8.5         9.5							9.5							16.5			
Global         -         -         56,137         288,884         111.431         123,511         607,792         123,511         111.431         89,823         0.000         -         2,12           How         -         -         8         9         10         11         12         13         14         15         16         -         -         Nov           Dir         -         -         sombra         sombra         303,392         sombra         sombra         -         -         0.67           Dir         -         -         44,130         74,681         94,066         104,490         933,392         sombra         sombra         -         -         0.67           Global         -         -         44,130         74,681         94,066         104,490         94,086         74,681         04,130         -         -         0.74           Global         -         -         85,9         10.5         11.5         12.5         14.5         15.5         -         Dec           Dir         -         -         50mbra         50mbra         50mbra         50mbra         50mbra         50mbra         50mbra         50mbra </td <td>Dir</td> <td>-</td> <td></td> <td>-</td> <td>sombra</td> <td>199.061</td> <td>sombra</td> <td>sombra</td> <td>479.069</td> <td>479.069</td> <td>sombra</td> <td>sombra</td> <td>sombra</td> <td>sombra</td> <td>-</td> <td>-</td> <td>1.157</td>	Dir	-		-	sombra	199.061	sombra	sombra	479.069	479.069	sombra	sombra	sombra	sombra	-	-	1.157
Hov         -         -         8         9         10         11         12         13         14         15         16         -         -         Nov           Dir         -         -         sombra	Dif			-	56.137	89.823	111.431	123.511	128.723	128.723	123,511	111.431	89,823	56.137		-	1.019
Dir         -         -         sombra         sombra         sombra         348.081         323.392         sombra         sombra         sombra         -         -         0.67           Dif         -         -         44.130         74.681         94.086         107.721         104.490         94.086         74.681         44.130         -         -         0.74           Global         -         -         44.130         74.681         94.086         104.490         94.086         74.681         0.000         -         -         1.37           Dec         -         8.5         9.5         10.5         12.5         13.5         14.55         -         Dec           Dir         -         -         -         sombra         sombra         sombra         sombra         sombra         sombra         -         0.30	Global	-	-		56.137	288.884	111.431	123.511	607.792	607.792	123.511	111.431	89,823	0,000	-	-	2.120
Dir         -         -         sombra         sombra         sombra         348.081         323.392         sombra         sombra         sombra         -         -         0.67           Dif         -         -         44.130         74.681         94.086         104.490         107.721         104.490         94.086         74.681         44.130         -         -         0.74           Global         -         -         44.130         74.681         94.086         104.782         94.086         74.681         0.000         -         -         1.37           Dec         -         8.5         9.5         10.5         12.5         13.5         14.55         -         Dec           Dir         -         -         -         sombra         sombra         sombra         sombra         sombra         sombra         sombra         -         -         0.30	Nov																
Global         -         -         44.130         74.681         94.086         104.490         455.802         427.882         94.086         74.681         0.000         -         -         1.37           Dec         -         -         8.5         9.5         10.5         12.5         13.5         14.5         15.5         -         Dec           Dir         -         -         sombra	Dir	-			sombra	sombra	sombra	sombra	348.081	323.392	sombra	sombra	sombra	-	-	-	0.671
Global         -         -         44.130         74.681         94.086         104.490         455.802         427.882         94.086         74.681         0.000         -         -         1.37           Dec         -         -         8.5         9.5         10.5         12.5         13.5         14.5         15.5         -         Dec           Dir         -         -         sombra	Dif				44.130	74.681	94.086	104.490	107.721	104.490	94.086	74.681	44.130		-	-	0.742
Dir sombra sombra sombra sombra <u>301.478</u> sombra sombra sombra 0.30	Global	12	-		44.130	74.681	94.086	104.490	455,802	427.882	94.086	74.681		-	-	-	1.370
Dir sombra sombra sombra sombra <u>301.478</u> sombra sombra sombra 0.30	Dec					8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5				Dec
	Dir	-	-			sombra	sombra	sombra	sombra	301.478	sombra	sombra	sombra	-	-	-	0.301
	27.7		-							Contraction of the local sectors of the local secto		a second second second			-	-	0.514
Global 40.250 61.727 74.633 80.573 382.051 74.633 61.727 0.000 0.77	Global	12	-		÷.	40.250		74.633	80.573			61.727	0.000	-	2	2	0.776

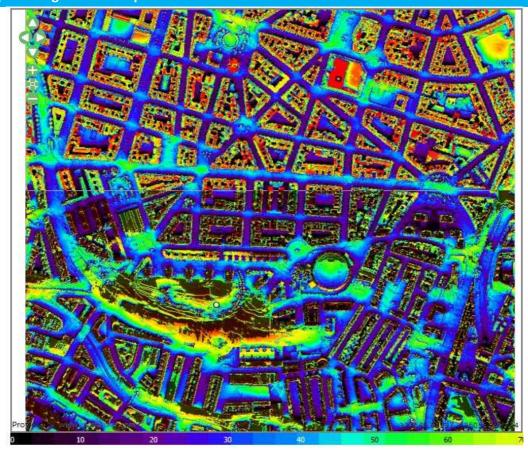




Filter of sun exposure. This feature allows to detect regions according to their average values of annual sun exposure



Monthly filter of sun exposure. This option detects regions according to their monthly percentages of sun exposure



₿

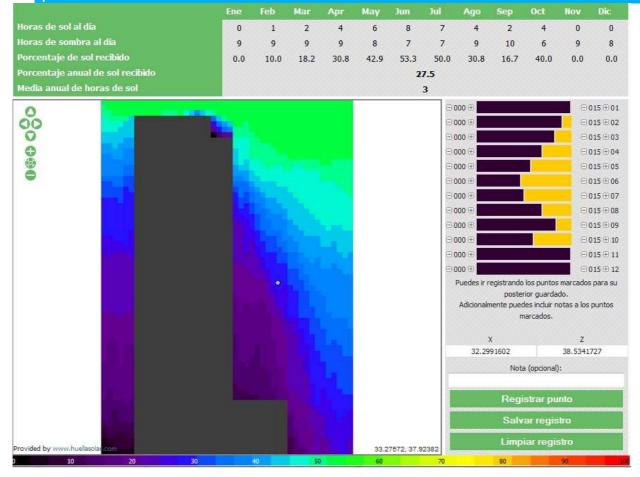
# Charts of shadows. This options display a chart with the line of horizon for any point in the map

min )

Ħ



Solar map for vertical planes or facades. Using the huellasolar viewer you can also generate solar maps for facades. These maps can also be analyzed with the most part of the features available in the viewer, so we can also make calculation of radiation, production, shadows etc on vertical planes.





# 10. Appendix I. Trasforming Geotif into PNG file supported by huellasolar

# **IMPORTANT:**

From version 2.0 of the data builder, Geotif files are supported.

Version 1.0 only worked with PNG files formatted in a specific way.

This appendix explains the method to transform tif files to png files supported by huellasolar. It can be useful depending of the source of your data if you prefer to work with png files instead of tif files.

Once we have transformed our lidar file into a tif file we are going to format it as png file supported by the huellasolar environment.

# To this purpose we are going to apply a color table to the geotif using the software Gvsig.



It is possible apply color tables using Qgis and save the result as image using the plugin 'one band raster to paletted or RGB raster'. However, this plugin make slight changes to the rgb values. We recommend to use the procedure in this manual using Gvsig to apply color tables.

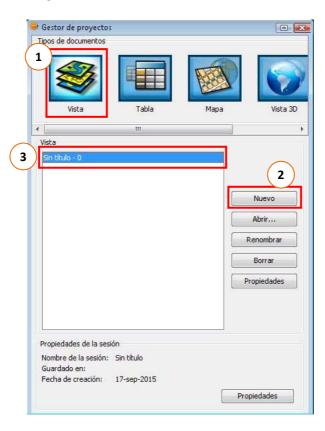


Huellasolar Works with png files where rgb values are the elevation. This means a simplification. The float values of the geotiff are transformed to integer values. In fact this approximation usually works fine because it regularizes the surface of buildings.

From huellasolar there are various internal criteria to use this format but may be in future we will give support to directly use geotiff in the platform.

# Now we are going to open the geotiff of the previous step using Gvsig.

Open Gvsig. In the projects manager select 'Vista' 'Nuevo' and double click on the name of the view.





Once opened the view we are going to load the geotiff.

gvSIG 1.11.0 final:Sin título	
vrchivo Capa Ver Vista Tabla Herramientas Ventana	
1 2 2 4 4 4 ≠ 2 0 2 1 >> 4 4	
v Vista : Sin título - 0	
Añadir cana 🛛	
Archivo GeoDB WCS ArcIMS WMS WFS Anotación	
Capas	
2 Añadir	
Eliminar	
	le Abrir
Arriba	Buscar en: 🔒 LIDAR 🔹 🗊 📰 🔚
Abajo	
	PNOA_2012_LOTE_PV_504-4790_ORT-CLA-COL.tif           PNOA_2012_LOTE_PV_504-4790_ORT-CLA-COL_filled.tif
	Elementos
	recientes
	Escritorio
	Documentos
	Equipo (4)
Proyección actual EPSG:23030	
	Nombre de archivo: PNOA_2012_LOTE_PV_504-4790_ORT-CLA-COL_filled.bf
(5)	Dod
	Archivos de tipo: gvSIG Raster Driver
Aceptar Cancelar	
	(3)
	$\smile$
	Metros X = 2 Y = 54 EP56;23030
	pretros pc = 2 pr = 54 EPSG:23030

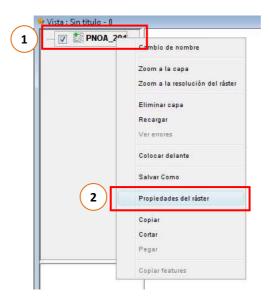
- 1. Click on the button add a new layer.
- 2. Select 'Add' in the pop up window.
- 3. Select type of file Raster.
- 4. Locate your raster in the explorer and select Open.
- 5. Finally select Accept.

In the viewer we will have something like this:

S <mark>IG 1.11.0 final:Sin título</mark> o Capa Ver Vista Tabla Herramientas Ven	itana Δuuda				
	r 🍳 🍳 🍣 💢 🙀 < 🕅 🛂 🛲 🛤 🥔		s & Q 🗖 Q 🗍		
眼 :_LOTE_PV_504-4790_ORT-CLA-COL_filled.tif					
a : Sin título - 0					6
9 🎊 PNOA_2012_L				R	
	States				
cón iniciada	ALC OF	1:11.216	Metros K = 506.4	30.54 Y = 4.788.748.5	EP5G:23030



Now we have to know the range of elevations of the raster to build or color table. Go to the properties of the raster following the next steps.



- 1. Select the layer clicking on its name in the list on the left. Once selected, right button of the mouse to open the floating menu.
- 2. Select the properties of the raster option.

In the pop up window select 'General' tab

Información Bandas Transparencia Realc <mark>a General</mark>	
Rango de escalas	
No mostrar la capa cuando la escala sea:	
Mayor de 1:	(Escala máxima
Menor de 1:	(Escala mínima)
NoData	
Desactivado Valor:  -10,000,000.000 Gu	ardar como predeterminado
Estadísticas	
Banda 1 Mínimo: -310.66998291015625 Máximo: 184.89999389648438	
Media: 58.283087286317524	
Varianza: 810.2207116272552	
Recalcular estadísticas	

There we can see the range of elevations of the raster. In our case from -310 to 185. So we are going to apply a color table from o to 185.



Negative values usually come from points without data of the lidar unless we are working on a city under the sea level.

Huellasolar do not admit negatives values of elevations. If your city is under the sea level you must fix the elevations so they start from cero.

To build the color table we are going to use the tool available at the web huellasolar. Go to the <u>www.huellasolar.com</u>, section 'Documentation'

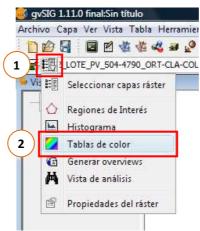


# Utilidades

Form tuto Ger Form Cons to to the l Nombre de la colortable_(( Cota mínima Comprueba los v		er usados en huell s. Caso práctico' par ales para ser usad formateando datos e builder for	asolar aplicán ara ver su fun ra Gvsig. los en huellasc a. Caso práctic Gvsig' ar	cionamiento. olar aplicándo o' para ver su nd follow	les los esque I funcionamie	mas de color genera nto. os below:	ados con <mark>e</mark> sta utilid	lad.	o P o P
tutor Ger Form Cons to the l Nombre de la colortable_(( Cota mínima Comprueba los y entre 211.28m y	orial 'Formateando datos enerador de esquema rmatea tus datos vectoria nsulta el video tutorial 'Fo link 'Color Table la tabla: (0-190) a - Cota máxima: s valores mínimos y máximos d	s. Caso práctico' par las de color par ales para ser usad formateando datos e builder for	ara ver su fun ra Gvsig. los en huellasc a. Caso práctic Gvsig'ar	cionamiento. olar aplicándo o' para ver su nd follow	les los esque I funcionamie	mas de color genera nto. os below:	ados con <mark>e</mark> sta utilid	lad.	o o o o o o o o o o o o o o o o o o o
Ger Forr Con: • to the l colortable_(C Cota mínima Comprueba los v	enerador de esquema rmatea tus datos vectoria nsulta el video tutorial 'Fo link 'Color Table la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	as de color par ales para ser usad formateando datos e builder for de elevación de tu ras	ra Gvsig. los en huellasc s. Caso práctic Gvsig' ar	olar aplicándo o' para ver su nd follow	the step	nto. os below:			e de tu raster es
Ger Forr Con: • to the l tombre de la colortable_(C Cota mínima comprueba los v	enerador de esquema rmatea tus datos vectoria nsulta el video tutorial 'Fo link 'Color Table la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	as de color par ales para ser usad formateando datos e builder for de elevación de tu ras	ra Gvsig. los en huellasc s. Caso práctic Gvsig' ar	olar aplicándo o' para ver su nd follow	the step	nto. os below:			es de tu raster es
Forr Const to the l tombre de la colortable_(C cota mínima comprueba los y ntre 211.28m y	rmatea tus datos vectoria nsulta el video tutorial 'Fo link 'Color Table la tabla: (0-190) a - Cota máxima: s valores mínimos y máximos d	ales para ser usad Formateando datos e builder for de elevación de tu ras	los en huellasc s. Caso práctic Gvsig' ar	o' para ver su	the step	nto. os below:			s de tu raster es
Const to the l ombre de la olortable_(C ota mínima omprueba los y ntre 211.28m y	Iink 'Color Table la tabla: (0-190) a - Cota máxima: s valores mínimos y máximos d	Formateando datos e builder for de elevación de tu ras	. Caso práctic Gvsig' ar	o' para ver su	the step	nto. os below:			s de tu raster e
to the l ombre de la olortable_(C ota mínima omprueba los v ntre 211.28m y	link 'Color Table la tabla: 1 (0-190) la - Cota máxima: s valores mínimos y máximos d	e builder for de elevación de tu ras	Gvsig' ar	nd follow	the step	os below:	iar Davisionale ei al		s de tu raster e
to the l to the l colortable_(C Cota mínima Conta mínima comprueba los y entre 211.28m y	link 'Color Table la tabla: 1 (0-190) la - Cota máxima: s valores mínimos y máximos d	e builder for de elevación de tu ras	Gvsig' ar	nd follow	the step	os below:	iar Dan sianala, si al	casos de alturas	s de tu raster e:
lombre de la colortable_(C cota mínima omprueba los v ntre 211.28m y	la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	de elevación de tu ras	-				iar Der sienels, ei al	casas de altruse	s de tu raster e
lombre de la colortable_(C Cota mínima comprueba los y ntre 211.28m y	la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	de elevación de tu ras	-				iar Der sienels, si al	capacità da alterna	s de tu raster e
lombre de la colortable_(C cota mínima omprueba los v ntre 211.28m y	la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	de elevación de tu ras	-				iar Der sienels, ei el	casas de altrese	s de tu raster e
ombre de la olortable_(C ota mínima omprueba los v atre 211.28m y	la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	de elevación de tu ras	-				iar Das signals, si al	capacida alteraci	s de tu raster e
ombre de la olortable_(C ota mínima omprueba los v atre 211.28m y	la tabla: 1 (0-190) a - Cota máxima: s valores mínimos y máximos d	de elevación de tu ras	-				iar Dar sianala, si al	ranna da alturas	s de tu raster e
olortable_(C ota mínima omprueba los v ntre 211.28m y	(0-190) la - Cota máxima: s valores mínimos y máximos d		ter e introduce a	iquí los valores i	unterna innu dia		iar Dav sionala, si al	rana da altura	s de tu raster e
olortable_(C ota mínima omprueba los v ntre 211.28m y	(0-190) la - Cota máxima: s valores mínimos y máximos d		ter e introduce a	iquí los valores i	ustorne inmedia		iar Dar vienala, ri el	espec do situras	s de tu raster e
ota mínima omprueba los v ntre 211.28m y	a - Cota máxima: s valores mínimos y máximos d		ter e introduce a	iquí los valores (	uteres invedia		iar Dar ciample ei ol	ranas da alturas	s de tu raster e
omprueba los v ntre 211.28m y	s valores mínimos y máximos d		ster e introduce a	iquí los valores i	unteres inmedia		ier Der siemele si el	espas do alturas	s de tu raster e
omprueba los v ntre 211.28m y	s valores mínimos y máximos d		ter e introduce a	iquí los valores i	unterne inmedia		ier. Der eiemele, si el	ranas do alturas	s de tu raster e
omprueba los v ntre 211.28m y	s valores mínimos y máximos d		ter e introduce a	iquí los valores (	unterne inmodia	percent and a second	ior. Dor ciomolo, ci ol	range de alturas	s de tu raster e
ntre 211.28m y			ster e introduce a	qui los valores					
	y 289,11m introduciremos io				since us inimedia	camence intenor y superi	ion For ejempio, si en	rango de alturas	
ota mínima (									
ota minima (	-				$\mathbf{D}$				
	0	Cota máxima 190	0	4	-)			<u> </u>	
					/			()	Gener
								()	Gener
opia y pega el	el texto con un editor de texto	to y cambia la extensió	ón a '.rmf'						
									3
<2vm1	version='1.0' end	coding=!ISO_8	850-15125						
	erMetaFile>	sourny 150 of	000-10 :/						
	rTable name="color	rtable (0_100)		lated="0"	wareion="	1 1			
	r value="0" name="					1.1 /			
	r value="1" name="	End (60) (1) Exception Exception							
	r value="2" name="	End Team in the second second second							
	r value="3" name="		the second se						
	r value="4" name="								
	r value="5" name="								
(00101	raide o name-	-90 0,0,0	Incerpor	uocu 00.0	1				-
					•••••			$\sim$	

- 1. Type the name for your table
- 2. Type the higher and lower elevations of the raster. They must be integer numbers.
- We could make a table with a wide range of altitudes, for example, 0-1000, this way this file could be used for several raster inside this values.
  - 3. Click on 'Generate'. In the gray text field it should be prompted the code of our table.
  - 4. Select the text and copy
  - 5. Paste the text in any text editor and save the file as .txt
  - 6. Change the extension of the file from .txt to .rmf.

Now we have our color table file. Now we are going to apply it to our raster in Gvsig.



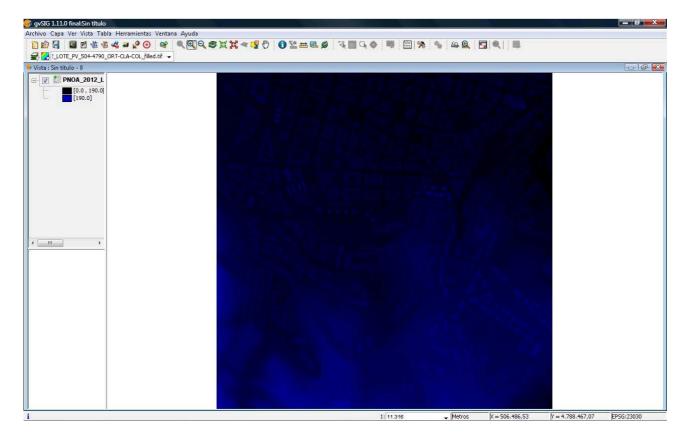
- 1. Click on the button 'Select raster layer'
- 2. In the menu of the button select 'Color Table'

The following window will be open:

abla	Rampa					Vista previa	
Color	: Clase	RGB	Valor	hasta	Tra		0
	<b>-</b> 1	0, 0, 0	0	1	255		
		0, 0, 1	1	2	255		
	60 T	0, 0, 2	2	3	255		
		0, 0, 3	3	4	255		
		0, 0, 4	4	5	255		
		0, 0, 5	5	6	255		
		0, 0, 6	6	7	255		
		0, 0, 7	7	8	255		
		0, 0, 8	8	9	255		
		0, 0, 9	9	10	255		
		0, 0, 10	10		255		
		0, 0, 11	11	12	255	Librería	
		0, 0, 12	12	13	255	tabla_color(0-715)	3 🔺
		0, 0, 13	13	14	255	tabla_color(0-715)	
		0, 0, 14	14	15	255	tabla_color(0-715)	
	Registro: 🚺	<b>1</b> 91 -	<b> </b>	de= 191 🦲	X	tabla_color(0-715)	_6
nimo:	-31	Máximo: 184.	<b>2</b>	calcular e	sticas	colortabl 4 (0)	and the second se
V	Activar Tabla	s de color 🛛 🕅	Interpolado	📃 Ajust	ar límites		- 10 - E

- 1. Check in the option 'Activate color table'
- 2. Check off 'Interpolated'
- 3. Check off 'Limits adjust'
- 4. Click on the button 'Import library'. In the explorer select the file .rmf we have just created.
- 5. Finally click on 'Accept'

Now our raster should be something like this:





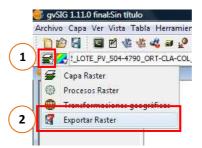


Depending of the elevations of your file the transitions from blue to black could be sharp instead of soft like in the image above. Do not worry it could be correct.

We have finished the format of our raster. Now we are going to save it as .png file.

The following steps split the image in the squares that build the map and we will start to generate data of the solar map using the huellasolar tools.

So let save the raster as png file using Gvsig.



- 1. Click on 'Raster layer' button
- 2. Select the option export to raster in the drop down menu'



- 3. Click the button on the right.
- 4. And in the drop down menu 'Save view to georeferrenced raster'

A message will be displayed to start the selection of the region of the view to be saved.

We are going to draw a rectangle over our raster. Our solar map is covering an area inside the raster we are working on. Now we are going to select all the raster and later we will clip the image to take only the region of our map.

Once we have drawn the rectangle a window will be displayed:

X: 504.022,4		Y: 4.	789.979		
X: 505.971,5		Y: 4.	788.020,	9	_
Método:					
© Escalar					
	Es	icala:	2.979	-	
Mts/Pixel			R	esolución:	75 👻
🔘 Tamaño	(2) M	:s/pixe	el: 1		
		-		-	
Ancho: 1.949	Alto: 1.9	58		Pixels	×
Ancho: 1.949 Archivo	Alto: 1.9	58		Pixels	
Archivo rchivo:bilbao <mark>r</mark> aw.png					



- 1. Method mts/pixel
- 2. mts/pixel value = 1
- 3. Click on 'Selection'. In the explorer we give name to the file to be saved and select type of file .PNG
- 4. Finally click on 'Apply'

Now we have saved our raster into a png file that can be recognized by huellasolar.

# 10.1. Extracting the tiles of our map

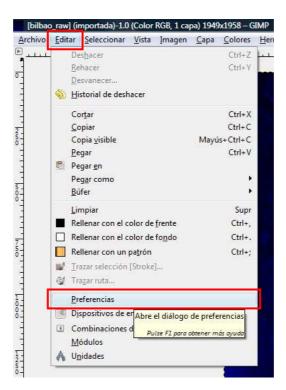
Our solar map will cover an area of 1200x1200m and it will have 4 tiles of 600x600m each one. The png file we have just saved is about 2000x2000m (2000x2000 pixels) So now we are going to split this file into four files, one for each tile of the map. To this purpose we are going to use Gimp.



You can also split the raster using Gvsig. You can take a look to our video tutorial 'Formatting data, case study' to see this alternative. Find the link to the video from the section 'Documentation' of the huellasolar web.

Run Gimp and open the png file we have just saved.

We are going to activate the grid so it helps us to draw our tiles. Select the menu 'Edit'->'Preferences'

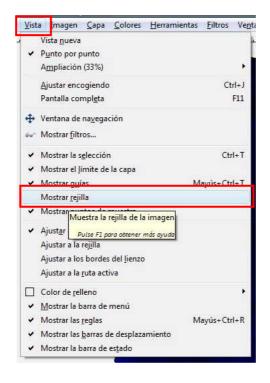


Preferences-> tab 'Default grid'. And type the values of Spacing Width and Height. We are going to use values of 100 pixels for the grid.



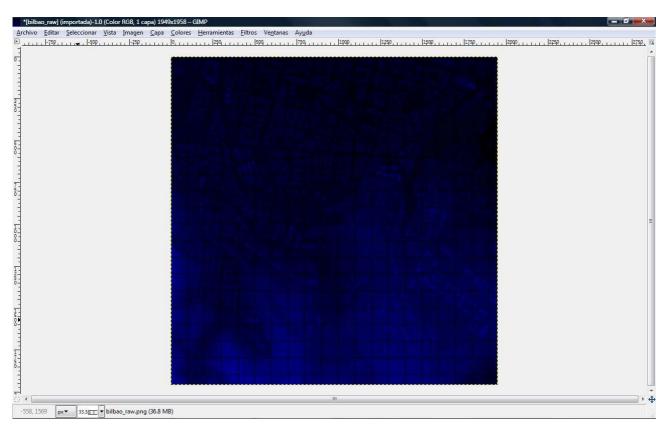
Entorno	Rejilla de imagen predeterminada	ū
<ul> <li>Tema</li> <li>Sistema de ayuda</li> <li>Opciones de herramienta</li> <li>Caja de herramientas</li> <li>Imagen predeterminada</li> <li>Rejilla predeterminada</li> <li>Ventanas de imagen</li> <li>Apariencia</li> <li>Título y estado</li> <li>Pantalla</li> <li>Gestión del color</li> <li>Dispositivos de entrada</li> <li>Controladores de entrada</li> <li>Gestión de la ventana</li> <li>Carpetas</li> </ul>	Apariencia         Egtilo de la línea:         Color de frente:         Color del fondo:         Espaciado         Anchura         100          100             1.389          in ▼         in ▼         in ▼         pixeles          1.389          0.000         Ø          Ø         Ø          ©	
Ayuda	Reiniciar Aceptar	<u>C</u> ancelar

The grid must be displayed. Select the menu 'View' and check in 'Show grid'.



Now our image has the grid overlayed:





We are ready to draw the tiles of our map.

Click on the guides and drag inside the image. Place the division lines marking the tiles of your map.

*[bil	lbao_raw] (importada)-1.0 (	or RGB, 1 capa) 1949x1958 - GIMP	
		Imagen <u>C</u> apa <u>C</u> olores <u>H</u> erramientas Filtros Ve <u>n</u> tanas Ay <u>u</u> da 	12500 12750 (Si
1			*
0001	Click on the place a divi	guide and drag to on line	
115 10000 11 11 115			Ę
		he position of the line is isplayed here while you are ragging it.	
-558,	1569 px - 33.3p	III ao_raw.png (36.8 MB)	· · · ·

Use the grid to draw the tiles of your map. All the tiles must have the same dimension. In our case 600x600px.

The tiles of your map do not have to size 600x600px. You can choose other dimension but huellasolar does not admit tiles of more than 600px.



You can zoom to place the lines exactly in their position.

The result is something like this:

We have marked our four tiles of 600x600px. In the screenshot we have numbered them as 0101,0102,0201,0202.

(j)

The tiles of the map must be saved with names with four numbers each one. The first two digits correspond to the column and the last two digits are for the row. The tile 0101 is placed in the first column first row. It starts from the lower left corner. Null values such as 0000 are not admitted for the huellasolar system.

Once we have drawn our tiles we are going to save each one as a png file. We will use the tool Guillotine placed at 'Image'->'Transform'->'Guillotine'



	<u>D</u> uplicar <u>Modo</u>	Ctrl+D	
<b>100</b> -14	<u>T</u> ransformar	٠	Voltear <u>h</u> orizontalmente     Voltear <u>vert</u> icalmente
	Tamaño del Jienzo Ajustar lienzo a las capas Lienzo al tamaño de la selección Tamaño de la impresión Escalar la imagen		<ul> <li>Rotar 90° en sentido <u>h</u>orario</li> <li>Rotar 90° en sentido <u>a</u>ntihorario</li> <li>Rotar 180°</li> </ul>
	Re <u>c</u> ortar a la selección <u>A</u> utorecortar imagen Recorte <u>Z</u> ealous		Guillotina Dividir la imagen en sub-imágenes utilizando las guía Pulse F1 para obtener más ayu
	Combinar las capas <u>v</u> isibles Aplanar la imagen Alinear capas <u>v</u> isibles	Ctrl+M	
⊞	Líneas <u>gu</u> ía Configurar la <u>r</u> ejilla	•	
	Propiedades de la imagen	Alt+Intro	

This will create a different image for each rectangle delimited by the lines of division. Save the fragments corresponding to your tiles as png files with their names (0101.png, 0102.png etc) Now we use the option 'File'->'Export As' to save the files.



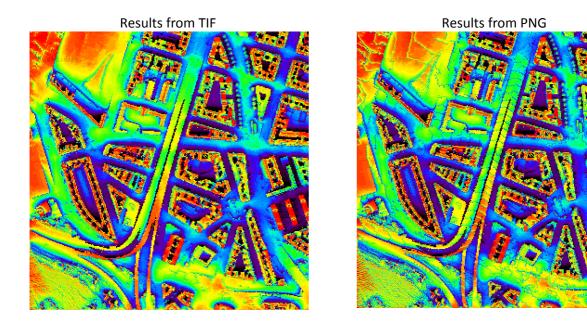
Once you have saved the png files we recommend to check that the size in pixels of all the files is the same. On the contrary you should adjust your lines of division.

We have our tiles ready to be processed by huellasolar. This png files must be uploaded to the server as it is explained in the section 9 of this guide.



# 11. Appendix II. Differences between results with PNG ot TIF files

Tif files deal with decimal values but png files only support integer values. For example, a pixel which in a tif file has the value of 34.2, in a png file will be 34. Therefore, results from tif files will have softer transitions than results from png files as it is shown in the following images.



As it can be seen, especially in inclined planes as in the roads in the center, results from png file are split up in horizontal sections while results from tif file have more gradual transitions.



# 12. Appendix III. Trimming a Geotif with a Kml file

Now multiple users can build a radiation map using huellasolar.

When a user decides to take part in a map in huellasolar, a number of kml files are sent to his inbox. These kml files contain the bounds of the tiles of the map.

This appendix explains how to trim geotif files using kml files and, therefore have the data split in files corresponding to the tiles of the map.

# 12.1. Setting up the coordinate reference system in Qgis

First of all we are going to open a new project using Qgis and set up the coordinate reference system that correspond to the source of data.

In the following example we are working with Lidar from the city of Vitoria-Gasteiz. These files are in projection EPSG:25830.

On the other hand, the KML sent by huellasolar are in EPSG:4326 (WGS 84)

Open a new project in Qgis:

QGIS 2.12.0-Lyon Project Edit View Laver Settings Plugins		12		
	Vector Raster Database Web Processing He		<u> </u>	E - 🛛 🖓?
			Hide deprecated CRss	
		ок 5	Apply Help	
	Coordinate:	1.076,-0.498	Scale 1:1.264.630 ▼ Rotation: 0,0	Advanced interface

- 1. Select the button on the bottom right where the current projection is displayed
- 2. Activate the option 'Enable on the fly CRS trasformation'
- 3. Type the reference for your data. In our case EPSG:25830
- 4. Select the item from the list below
- 5. Apply and Ok



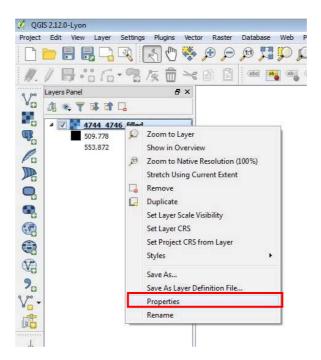
Is the work area is covered by several geotif we must merge them. Go to the Menu Raster->Miscellaneous->Merge

Input files	s/Vitoria/4746-tif_filled	l.tif Se	lect
Output file	itoria/4744_4746_filled	l.tif Se	lect
📃 No data value	0		l
🔲 Layer stack	- 11-23		
🔲 Use intersected	d extent		
🔲 Grab pseudoco	lor table from the first in	nage	
▼ 📃 Creation	Options		
Profile Default	2		×
Name	Value	+	
		Valid	late
a.		He	lp.
2 Load into canvas	when finished		
Load into canvas			

- 1. Select the tif files to merge. This field allows multiple selection
- 2. Enter the name for the merged file
- 3. Select the optio to load file into canvas when finished.

The layer with the merged file is now added to the project. We must check if the layer is in the correct coordinates system.

Select the layer from the layers panel. Right click and select 'Properties' in the pop-up window.





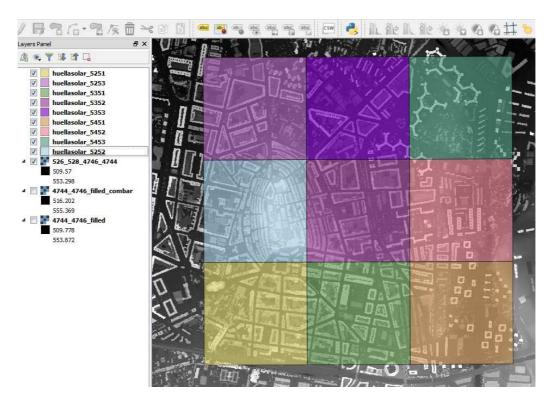
Check that the coordinate reference system of the layer is the correct one. In our case EPSG:25830. If it is not the case change it.

eneral	▼ Layer info				
- Seneral	Layer name	4744_4746_filled	displayed as	4744_4746_filled	1
🎸 Style	Layer source	C:/Users/adm/Documents/0-hue	llasolar/Proyectos/Vitoria/47	44_4746_filled.tif	
Transparency	Columns: 100	) Rows: 2000 No-Data Value: n/a	a		
Pyramids	▼ Coordinat	e reference system			
		(EPSG:4326, WGS 84)			- 🔿 🎰
🔄 Histogram	and the second	(EPSG: 4326 WGS 84) EPSG: 25830 - ETRS89 / UTM zone	2010		
Metadata	EPSG:3857 - EPSG:23030 EPSG:25829	EPSG:#320 - WGS 8+) WGS 84 / Pseudo Mercator ED50 / UTM zone 30N - ETRS89 / UTM zone 29N ETRS89 / Jersey Transverse Merc	ator.		

Make zoom to layer to center the view

# 12.3. Adding the KML files

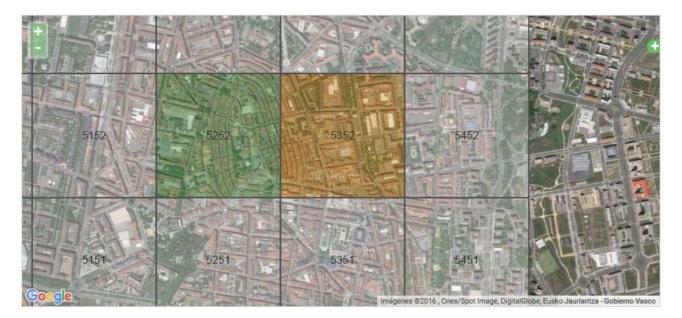
Go to the Menu Layer->Add Layer->Add Vector Layer and select the kml files If everything goes well we can see something like the image below



In the capture we have applied transparency to the kml layers to see the geotiff below. If you do not see the kml files overlapping the map check if the projection of the kml layers is (EPSG:4326 WGS 84).

If we are working in a shared project in huellasolar now it is recommendable to check if the position of the kml files is exactly the same location in the map in the web. To this purpose we can visit the edition panel of the shared map in huellasolar and make a visual verification.

For example, the image below is taken from the edition panel of the map in huellasolar.



As you can see the tiles are located exactly in the same position in both images.

# 12.4. Trimming the tiles

We are going to use the tool 'Clipper' from the Menu Raster->Extraction->Clipper However, before we must save again the raster using the tool Raster->Projections->Wrap (Reproject). Why do we do this step? Otherwise when we use 'Clipper' an error is prompted 'Cannot compute bounding box of cutline'. With layer saved using Wrap this problem is solved.

Raster->Projections->Wrap (Reproject)

chivo de entrada	4744_4746_filled 🔻	Seleccionar
chivo de salida	4744_4746_filled_comba	Seleccionar
SRE de origen	EPSG:25830	Seleccionar
SRE de destino	EPSG:25830	Seleccionar
Método <mark>d</mark> e remuestreo	Fréxine	
Valores sin datos	0	
Capa de máscara	huellasolar_5251 ×	Seleccionar
Memoria usada para cach	é (20MB	(A) (V)
Redimensionar		
Anchura 3000	Altura 3000	A 9
Usar implementación de re	eproyección multihilo	
Cargar en la vista del mapa	cuando no tormino	
zaigai en la vista del mapa	cuando se termine	-of GTiff

- 1. Input file the geotif merged in point 12.2
- 2. Type the name for the output file
- 3. Source and Target SRS are the same and correspond to the SRS of the data (EPSG.25830 in our example)

Now we can 'Clip' the layer. Raster->Extraction->Clipper

input file (raster)	4744_4746_filled_combar 🔹	Select
Dutput file	nts/0-huellasolar/Proyectos/Vitoria/5252.	Select
No data value	0	(A) (V)
Clipping mode	$\frown$ — — —	
C Extent	(3) Mask laver	
Extent	3 O Mask layer	
Mask layer	buellacelar 5757	Select
Mask layer		Select
Mask layer	4 huellasolar_5252 V	Select
Mask layer	4 huellasolar_5252 V	Select
Mask layer	4 huellasolar_5252 V	Select
Mask layer	tput alpha band	
Mask layer	4 huellasolar_5252 V	

- 1. Input raster. The one we have just saved using Wrap
- 2. Type the output name i.e. 5252\_cut.tif
- 3. Check the option 'Mask Layer'
- 4. Select the mask layer corresponding to the sector to clip

Ok to save the geotif.

Now we must check the dimension in pixels of the file.

If you have followed the method in this manual, when we transformed the lidar file in a tif file, we applied a ratio step-size/pixel-size = 2 (Point 5 in this guide).

This means that the file we have just saved sizes 1/2 of its real dimension.

For example, if the original lidar was for an area of 600x600m, the file we have saved is 300x300px.

If you are working in a shared map of huellasolar, it is always divided into tiles of 600x600m and huellasolar always works with a ratio m/pixel = 1. Therefore our tif files for each tile must size 600x600px.

Therefore we are going to 'save as' our tif in a new file of exactly 600x600px.

Put the mouse over the name of the layer in the Layers Panel, in our example layer '5252', and right click. Select 'Save as' in the pop-up window.



Layers Panel	₽×	- Kat			
1 . T I I I .		A 80		T 1 000 2	\$
🔲 📕 huellasolar_!	5251	1. A. A.			14 22
huellasolar_		rom	1 11		34
huellasolar_	5351		n part	15: 7 7	
🔲 📕 huellasolar_!		1	IL TIF	J Build I was	2
huellasolar_			A LA LEVEL	ana 10, 184	100
huellasolar_ huellasolar_		·		and the b	
huellasolar_			17200	<.135	5
🔽 📃 huellasolar_	5252			Land and the second	
4 🔽 📑 5252			LI L	A Jonn	
	Zoom to Layer				104
555.981	Show in Overview		A L TR	4/ MIRE 2010	1
516.202			STEAL	C State State	2
555.369	Stretch Using Curr	ent Extent	. H. 1		A
4 📝 📑 4744_4744			5		631
509.778 E	Duplicate		1		4
553.872	Set Layer Scale Visi	ibility			12
	Set Layer CRS		1 20		
	Set Project CRS fro	im Layer	1 A 1		1
	Styles	•	1 march	Sec. 1 1000	Trees a
	Save As		0 0 1 1	······································	A CONTRACT
0-	Save As Layer Defi	nition File	- marks		Bent
	Properties		N 10 112		4
	Rename		1 JA		-
Format GTiff	v data   Rendered ima m/Documents/0-huellasol		52_resize.tif	Create VRT     Browse	
CRS Selected CRS (E	PSG:25830, ETRS89 / UT	M zone 30N)		▼ 🚳	
Add saved file to m	пар				
▼ Extent (current					
	North 474	1434.975412253			
West 526315.2652			East 526918.139439	12521	
West 520515.2052				5331	
	South 474	3834.260550173			
ſ	Layer extent	Map	view extent		
			1		
<ul> <li>Resolution (cur</li> </ul>	rent: user defined)				
Horizontal 1.0	04	Vertical 1.001	L	ayer resolution	(2
Columns 600	)	Rows 600		Layer size	
Create Optio	ons				
Pyramids -					
Vo data valu					
From	То				
			OK	Cancel	
			-		

- Name the output file. We recommend do not to overwrite the original file to avoid errors while saving. In the image we are naming the new file as '5252\_resized.tif'. However when you process the file with the desktop tool of huellasolar it must be named again as '5252.tif' (following with the example) otherwise the file will be discarded.
- Resolution Horizontal and Vertical must be 1. Check that the values of columns and rows are exactly 600x600 (in this example we are working with tiles of 600x600m). Notice that it is probably that you need to add some decimal corrections. In the image we have use coefficients 1.004 and 1.001 instead of 1. This is caused because of decimal variation when we change from coordinates systems.

Ok and the tif file will be saved with the correct dimensions.

Now you can proceed to generate the data for the tile. You can continue in the point 7 of this manual 'Building data packages with huellasolar'

Remember that, when you are generating the data for a tile it is strongly recommended that you had also the tif files for the adjacent tiles, and that all these files were located in the work directory. This way there is no lost of reliability in the edges of the tile.