



USER MANUAL

The Ecometrica Mapping Platform admin tool allows you to easily build cloud-based web-mapping applications.

Each application can be set up in a number of different ways, depending on how you want your community of users to interact with the data.

This user guide provides detailed instructions for managing general application settings, uploading different data types and setting up query results extracted from your spatial data using ready-to-use widgets including bar charts, tables and time-series graphs.

The appendices included give important additional information, such as how to format vector and raster data for upload to the platform.

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1. PLATFORM ADMINISTRATION OVERVIEW

The Administrative interface of the Ecometrica Mapping platform can be accessed by certain users to create and manage applications. You can access the Admin by adding **/admin** to the end of any application URL and logging in or by selecting 'Admin' from the drop-down menu in the top right corner of the application interface. If you working within an EO Lab and are setting up the first application for your EO Lab, you can log into the admin using 'admin.{yourEOlabname}.ourecosystem.com/admin'.

The Admin Dashboard displays the name of the application you are logged into and includes links to the settings for this site and the Admin User Manual.

Global Settings

The options under 'Global settings' can be used to create, edit and manage all applications and their content on the EO Lab.

- ❖ **Applications and Users** displays a list of all applications currently on the platform. General settings for all applications can be managed and adjusted, and new users can be added here.

- ❖ **Global Areas** lists all the areas of interest drawn or uploaded to your EO Lab.

Application Areas are grouped into Application Area Groups – these areas are assigned to individual applications and are visible to all users of that application.

User Areas are linked to individual user accounts and can be viewed and queried by that user on any application they have access to. User areas are listed in 'My Areas' under 'Area Groups' on the map interface when a user is logged in.

- ❖ **System** can be used to check that the 'Workers' (which allow uploads) are online, and that the tiling servers used to create display layers are configured correctly. 'Tasks' can be used to check the status of both shapefile and GeoTIFF uploads to the platform.

Application Admin

The options under 'Application Admin' can be used to upload new datasets, display layers and areas of interest to the application you are logged into. Application Admin is also used to create new queries and results.

- ❖ **Areas** lists the Application Area Groups and Application Areas for the application you are logged into. New Application Area Groups can be created here, and Application Areas can be uploaded as shapefiles and CSV into those groups.
- ❖ **Datasets and Display Layers** lists both Dataset Groups and Display Groups on the application you are logged into. New Datasets and Display Layers can be uploaded into these groups as GeoTIFFs.

Datasets are 1-band GeoTIFFs which contain the spatial values your users can extract information from, for example average carbon or land-use types. The results and graphs are generated for an area of interest from these layers.

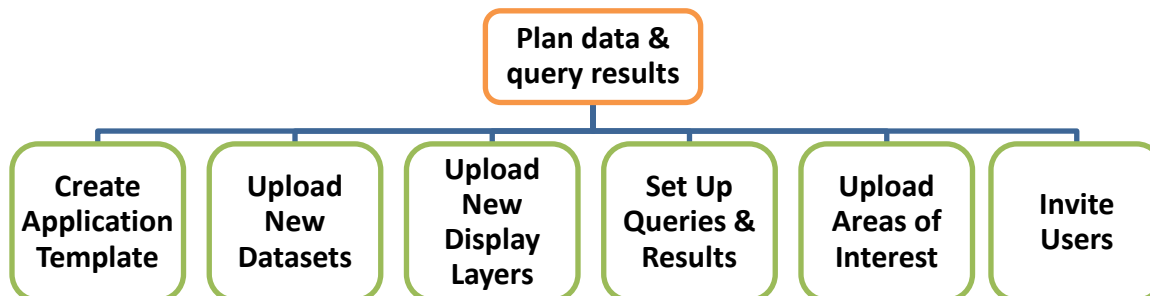
Layer legends, that specify the colours and names for classified category raster datasets for charts in the results, are also created here.

Display Layers, the coloured maps of spatial data that can be viewed under 'Display Groups', are uploaded separately to datasets. 3-band RGB GeoTIFFs in WGS 1984 Web Mercator Auxiliary Sphere (EPSG 3857) are used to create display layers, which are then tiled to allow for zooming in online.

- Queries and Reports** allows you to set up Tabs, Questions and Widgets to create the query results for the application you are logged into.


2. SETTING UP A NEW APPLICATION

This section describes the workflow for setting up a new mapping application:

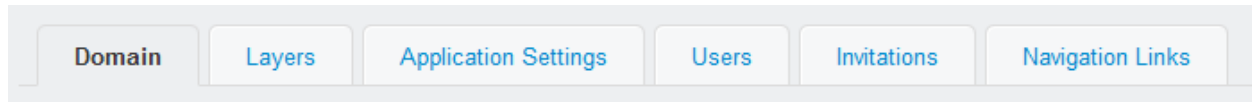


Basic work flow for creating a new application

To create a new application, Select 'Applications and Users' > 'Add application'

 Add application

Using the listed 'Application Options' tabs, you can create your application settings and select from existing datasets to include:



- a) Enter a domain name relevant to the purpose of your app and your data – this is the url used to access the application and **should not include upper-case letters or spaces**. All applications within your EO Lab should have the extension '{yourEOlabname}.ourecosystem.com' for example 'forestry.{ yourEOlabname}.ourecosystem.com'.
- b) Enter a display name - this will be the application title, displayed in the browser tab on the map interface. This name will also appear in downloaded PDF reports from the application. Both the domain and display name can be changed at any stage; however, be cautious about changing the domain name of an app that is used by others.
- c) You can enter additional URLs to redirect to your application using the 'Add another Alias' option

Layers

Under 'Layers' you can select existing Dataset Groups and Display Layers to be used on your application. If none exist, you can create new datasets and layers under 'Application Admin' at a later stage.

- a) Select the existing Dataset Groups to include in your new application:
 - Dataset Groups are groups of raster GeoTIFF files that cover a similar extent and theme, for example 'Global NDVI Resolution 17'
 - Datasets are individual raster files uploaded as GeoTIFFs into Dataset Groups.
 - Datasets are used to generate your query results and charts on the results page
- b) Any associated Display Layers will automatically be moved to your application as soon as you move a Dataset Group across. However, you will still need to create 'Display Groups' to make these visible on the map interface.

Application Settings

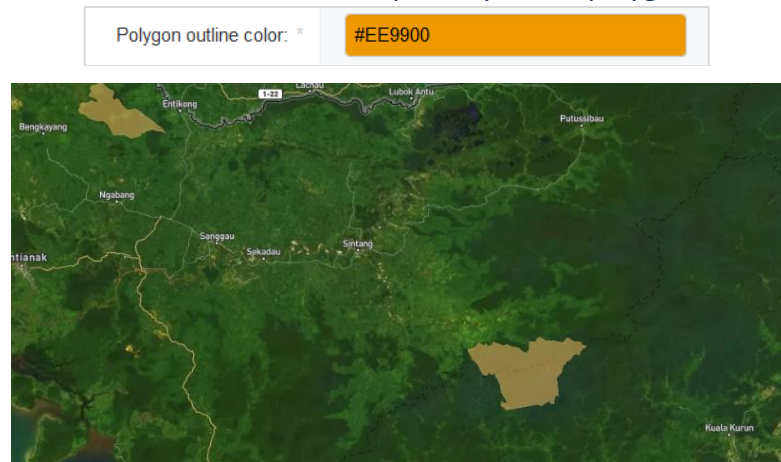
- a) Under 'Application Settings' you can choose whether the site is to be publicly available by ticking the 'Is public' box. No log in is required for public applications, and visitors to the application will be taken directly to the map interface. **Do not check the 'Is public' if the site access should be secure and only available to invited users with login details.**

- b) Deselecting the 'Custom Polygon Drawing' option means that users cannot draw personal areas on the interface. This option is selected as default so that all users can draw and query polygons on the interface.
- c) When selected, the 'Show warnings for small areas' will display a warning message in the query results for very small areas that have been created manually. This is to warn users that they have created an area smaller than the pixel size of the dataset, and results may therefore be inaccurate.
- d) Check the 'Cache site areas' if you would like the caching for the display of the areas on your app to start immediately when the app is opened. This means you may have to wait before you can view your areas when you first open the app, but when an Area Group is turned on (after the caching is complete) the areas will display right away - rather than spending time loading at this stage. Checking this option is recommended if you have a lot of areas on your app, or if your area boundaries are quite complex.
- e) Check the 'Allow users to self-register as viewers' box if you want to allow visitors to the application to register for a user account with Viewer permissions. If this option is enabled, any visitors to the application will be directed to the log in screen and will have the option to create a new account.

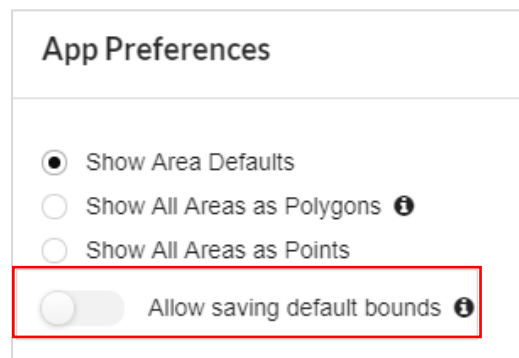
The screenshot shows the 'Ecometrica Platform Login' page. At the top, it says 'Logging in to https://jilapp-react.ourecosystem.com/'. Below this are two input fields: 'Username *' and 'Password *'. Each field has a small icon of a document with a lock. Below the fields are three buttons/links: a green 'Login' button, a green 'Don't have an account?' link (which is circled in red), and a 'Forgot your password?' link.

- f) Using the 'Default Map Style' drop-down menu, you can select the map style which will automatically display as the base map for the application interface.
- g) In the 'Introduction' text box, type the text you would like included in the introduction window that appears when first loading the application. This can be added in plain text, or in html if you click the 'Source' button in the top left corner of the text box. If left blank, no introduction window will appear on loading. If a logo is added (see section 'n') it will show in this introduction section along with your text.
- h) In the 'Description' box, add the text that you want to appear in the 'About' section in the drop-down menu in the top right corner of the interface. This can be written in plain text or in html using the 'Source' option. If a logo is added (see section 'l') it will show in this 'About' section as well.

- i) Under 'Invite message' you can add additional text that will be inserted in the invitation email.
- j) Check the 'Invite Application Description' box if you would like the text from the 'Description' box added to your invitation email.
- k) Choose the colour for displaying areas of interest on the map interface using the 'Polygon outline colour' picker tool, as well as the transparency of the polygons:



- l) Adjust the opacity/transparency of the fill for your areas of interest by changing the 'Polygon Opacity'. Set a value between 0 (completely transparent) and 1 (completely opaque).
- m) Under 'Logo', you can upload a PNG or JPEG file of an organisation or company logo. The logo will be displayed in the introduction/about section. Note that there must also be text in the introduction box (see section 'h') for the introduction window to appear on the front end.
- n) The 'Bounding Box' is the extent of the map seen when you first load the application. Enter coordinates here in degrees or use the "Allow saving default bonds" in the App Preferences on the interface to set up the Bounding Box for your app.



Users

- a) Under 'Users' you can directly add new or existing users to this application. Users can also be invited by an Application Administrator or Administrator directly from the map interface using the 'Invitation' icon in the drop-down menu. Applications with 'Self-Register Viewers' enabled allow users to register themselves through the login page.

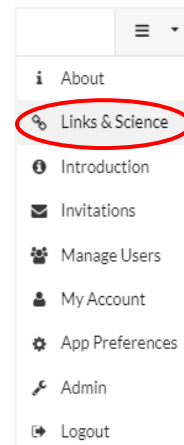
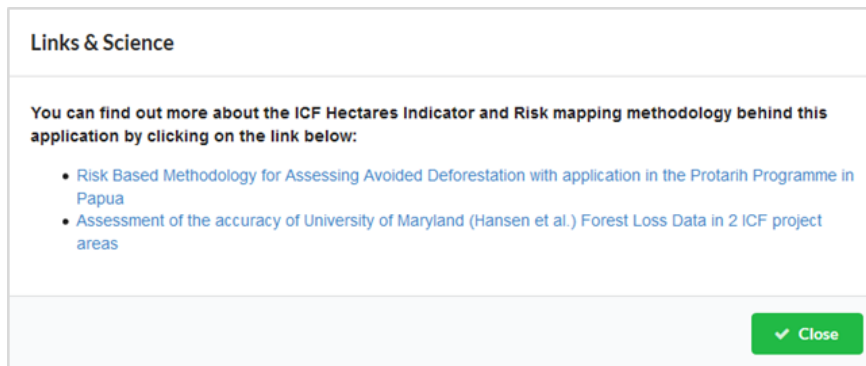


Superusers, Application Administrators and Administrators can define the access level for each person invited to the application:

- ❖ **Viewers** are able to draw, save and query their own areas of interest, as well as query site areas and view map layers
- ❖ **Collaborators**, in addition to Viewer permissions, can edit all area descriptions directly from the interface.
- ❖ **Administrators** can do all of the above and also invite, block and set permissions for other users to the application.
- ❖ **Application Administrators** have the same capabilities as an Administrator, but they are also able to log into the admin to create new applications. They are only able to view and edit applications that they have 'application administrator' status for. Application administrators are able to upload data and create queries, but they can only delete data that they have created and can only view queries on their applications.
- ❖ **Superusers** have overall control of the application, or, if working within an EO Lab, Superusers have overall control of all the applications and users on that EO Lab. They are able to add, edit or remove any layer, area file or query that is available on the application or EO Lab, and can access the list of users across all the applications on the EO Lab. Superuser permission can only be given by another superuser.

Navigation Links

Additional 'Navigation Links' can be added as link icons in the drop-down menu in the top right corner. These can include text and attachments such as documents, or can be links that open directly to another URL by selecting the 'Link' option. Navigation links are essentially customisable menu items that you can add to the drop-down menu on the interface.



3. ADDING NEW DATASETS, DISPLAY LAYERS AND AREAS TO YOUR APPLICATION

Dataset Groups

Raster datasets must be uploaded to a Dataset Group. Dataset Groups can be used to organise your raster datasets according to certain themes or extents. If a suitable Dataset Group already exists, you can upload your raster dataset to an existing Dataset Group, or you can create a new Dataset Group.

To create a new Dataset Group, go to 'Data and Display Layers' > 'Dataset Groups' > 'Add Dataset Group'

- Add in a name for your Dataset group (this can be in Camel Case with or without spaces)
- Select 'Is Public', which means it is available for use
- Choose the site(s) it should be available on. You can select more than one by holding 'Control' when selecting.
- Save your changes

A Dataset Group should not become too full, as it may take longer to upload new data layers or affect query times.

Datasets

Datasets are 1-band Geotiffs which contain the spatial values used in your query results, charts and graphs, for example average carbon or land-use types. Raster datasets can be uploaded in any projection; however, equal-area projections are required if you are planning to query your raster data, and the pixels must be square. The default projection for the platform is GCS WGS

1984 (EPSG 4326). All datasets used within one result set should be uploaded in the same projection and resolution for accurate query results.

Datasets should be uploaded as Geotiffs and should be signed or unsigned 16-bit or 32-bit float - **avoid 2-bit, 4-bit and 8-bit data** as they are not always read properly by gdal. No accompanying .tfw files that contain projection information are required for the upload.

See detailed instructions on how to prepare a raster dataset for upload to the platform in Appendix 1 of this manual as there are several important attributes to check to ensure the files upload and are read correctly:

- Make sure you know what the NoData value in your file is (such as -9999) and that there is only ONE value that indicates NoData
- Avoid using ArcGIS's default value for floating point. You can use the Export > Raster to different format option in ArcCatalog (for batch setting of nodata values for floating points, see the FAQ & troubleshooting document).
- Avoid using 0 (zero) as a NoData value for quantitative data layers because zero is likely to represent a valid pixel value
- Check that the file extents are appropriate for your projection – for example, if your raster is in GCS WGS 1984 (EPSG 4326) the maximum extent of the file can only be -90 to 90 degrees latitude and -180 to 180 longitude.
- Compress larger .tif files to speed up uploads and save database space

A 'Worker' must be online to upload raster datasets. You can check if a worker is online under 'System' > 'Workers'. If they are all offline you will need to contact the support team before uploading. The progress of your upload can be checked under 'System' > 'Tasks'. When the upload indicates 'success', the file has successfully uploaded.

Once the raster dataset is in the correct format, you can upload the file to a cloud service, such as Dropbox (make sure you use the direct download URL link). Do not zip the file, make the URL public and copy the URL. You can also upload your dataset directly from your desktop using the "Desktop File Import" button.

New Datasets can be uploaded under 'Data and Display Layers' > 'Datasets' > 'Add Dataset'

- a) Add in a Layer name for your dataset - this MUST be less than 50 characters long, be in small case letters and without spaces, for example 'carbon_brazil_2020_gcs'. This name cannot be changed later.
- b) Select the Dataset Group to upload your file to.
- c) 'Data Timestamp' is only needed for timeseries uploads and can be left as the default (9999-12-31 23:59:59.999999 if no date is associated with this dataset or for single file uploads).
- a) A description can be added for the dataset– this is optional and will not be displayed on the interface.
- d) The 'Dataset Type' should be set to 'Qualitative' for rasters with classes/ categories or 'Quantitative' for quantitative data.

- e) For datasets in GCS WGS 1984 (EPSG 4326) choose the resolution level (between 1 and 28) for the dataset.
 - The platform resamples raster datasets in GCS WGS 1984 to a grid with up to 28 resolutions, see Table 1 on the following page for the exact pixel size for each resolution level.
 - For datasets in GCS WGS 1984 you will need to select the resolution level from the dropdown menu. For any other projection, the native pixel size will be read from the file and any resolutions set in the dropdown menu will be overridden.
- f) Choose the Resampling method to resample your raster dataset. 'Nearest neighbour' is used as the default for both quantitative and qualitative data.
- g) A 'Legend' will need to be added for qualitative raster datasets with categories but can be created later
- h) 'Is Public' should be enabled so that the dataset is accessible for use
- i) To upload your file, enter the URL in the 'Import file URL' field, or use the Desktop File Import option.
- j) To upload a dataset that is not projected in GCS WGS 1984 (EPSG 4326), check the 'Keep native projection' box. Checking this box will override the 'resolution' value and the pixel size will be read from the file.

The screenshot shows a web form titled 'Import'. It has three main sections: 'Import file URL:', 'Desktop file import:', and 'Keep native projection'. The 'Import file URL:' section has a text input field and a note: 'The dataset will be downloaded and imported from this URL. Supports http://'. The 'Desktop file import:' section has a 'Choose file' button, the text 'No file chosen', and a link 'Choose a file to upload from'. The 'Keep native projection' section has a checkbox and the text 'Import this file as is, without doing any resampling or reprojecting. Choose'. The checkbox is highlighted with a red box.

- k) A description of the file and upload details such as the resampling method can be added in the 'Comment' field.
- l) A 'NoData value' can be included for the file or the field can be left blank if the NoData value has been set within the file already
- m) Under 'Import (Advanced)':
 - 'Warp to Grid' should be selected so that the raster dataset is resampled to match the platform grid.
 - 'Build Overviews' is only needed for cross-querying layers with different resolutions and can be left disabled
 - Raster band should be set as 1, as only single band rasters should be uploaded as datasets
- n) Date and attributes can be added to individual dataset adding a key for 'date' and 'display_name'. 'date' defines the order that the raster datasets are plotted for time series results, and should be in the format MM/DD/YYYY (i.e. 1st of May 2017 would be 05/01/2017). The key 'display_name' is the name that will be displayed on the interface as table headings or data points on a graph, for example 'May 2010' or 'NDVI 2010'.

- For time series and table widgets, any datasets included in a time series or table must have name and date 'attributes' added so that they can be plotted in the correct order on the interface.

Dataset attributes		
Cell	Key	Value
<input type="text"/>	date	1/1/2010
<input type="text"/>	display_date	Jan 2010

*Please note if you include a 'display_name' or display_date' attribute it will display on your bar charts and tables for quantitative layers

o) Click 'Save' to upload your file

When selecting a resolution for a raster dataset in GCS WGS 1984 (EPSG 4326), choose the closest platform resolution level that is finer than that dataset. For example, for data with a resolution of 1km x 1km, set the dataset to resolution 16 (see Table 1). The data will be resampled to 611.5m at the equator.

Choose the resolution level closest to the original data, as the maximum size for a user-drawn query is 1 million pixels - so the finer the data resolution, the smaller user-drawn areas must be.

For example, for datasets with a resolution of 250m, the data is resampled to 152.8m. User drawn polygons will run for areas up to 2 334 784 ha (152.8m x 152.8m x 1 000 000 pixels). For data with 1km resolution, the data is resampled to 611.5 - user drawn areas will run for polygons up to 37 380 996 ha.

The resolution information above can be ignored for rasters that are in their native projection (rasters that have not been projected into GCS WGS 1984). The pixel size for these native projections, is read from the file. Once your native projection dataset has been uploaded, the pixel size will be returned in the metadata for your dataset. The corresponding platform resolution will also be returned, but no resampling will have taken place and this value can be ignored. This value may, however, be useful for determining the max zoom level for any associated display layers (see page 15-16).

Table 1: Ecometrica Mapping Platform Resolution Table

Resolution Level	Cell size at the equator (m)	Cell size (Arc Seconds) [div by 3600 to get degrees]	Cell size (Degrees) [mul by 3600 to get arc seconds]	Max Zoom Level (for Display Layers)
1	20037581	648000	180.0	6
2	10018790	324000	90.0	6
3	5009395	162000	45.0	6
4	2504698	81000	22.5	6
5	1252349	40500	11.25	6
6	626174.4	20250	5.625	6
7	313087.2	10125	2.8125	6
8	156543.6	5062.5	1.40625	6
9	78271.8	2531.25	0.703125	6
10	39135.9	1265.625	0.351563	6
11	19567.95	632.8125	0.175781	6
12	9783.975	316.4063	0.087891	6
13	4891.987	158.2031	0.043945	6
14	2445.994	79.10156	0.021973	10
15	1222.997	39.55078	0.010986	10
16	611.4984	19.77539	0.005493	12
17	305.7492	9.887695	0.002747	13
18	152.8746	4.943848	0.001373	14
19	76.4373	2.471924	0.000687	14
20	38.21865	1.235962	0.000343	15
21	19.10933	0.617981	0.000172	16
22	9.554663	0.30899	0.000086	17
23	4.777331	0.154495	0.000043	17
24	2.388666	0.077248	0.000021	17
25	1.194333	0.038624	0.000011	18
26	0.597166	0.019312	0.000005	18
27	0.298583	0.009656	0.000003	18
28	0.149292	0.004828	0.000001	18

You can check the status of your dataset upload under 'System' > 'Tasks'. Below are the more common reasons why uploads fail:

- File extent larger than -90 to 90 degrees latitude and -180 to 180 longitude for datasets in GCS WGS 1984 (EPSG 4326).
- If no tasks are listed at all, make sure at least one 'Worker' is online under 'System'

The 'Dataset Upload History' at the bottom of the each dataset page shows the time and date of the upload as well as the file name and any details entered into the comment field when uploaded. This can be used to check the correct file and version is used within the query results.

Display Groups

Display layers are the coloured maps of spatial data that can be viewed under 'Display Groups' on the interface. Existing display layers that were selected when creating the application under 'Application Options' > 'Layers' can be added to the map interface by creating a Display Layer Group and choosing the display layers to add to the group from the drop-down menu.

New Display Layer Groups can be created under 'Data and Display Layers' > 'Display Groups' > 'Add Display group'

- a) Add a name for your Display Group
- b) Select the application the display layers will be enabled for.
- c) From the drop-down lists, select the existing display layers to add to the group
- d) Save your changes

Layer Legends

Layer legends are needed to specify the colours and text to display in tables, pie charts, bar charts and time series graphs for classified category layers (qualitative datasets).



- a) Click 'Layer Legends' under 'Data and Display Layers' and 'Add layer legend'.
- b) Create a name for the legend.
- c) You can upload a legend colour file (ArcGIS .clr file or QGIS .txt – see the next page for more information on these supported file formats) or you can enter legend information manually.

If you are uploading legend colours from a file, **all** information previously saved in the legend will be overwritten. If you need to make changes to 'Uploaded legend colours' (aside from changes to the Index or Label), you can either:

- edit the original legend colour file and reupload
- create a new legend colour file and upload it to the mapping platform
- delete unwanted entries in the 'Uploaded legend colours' table and create new ones in the 'Manually selected colours' table

'Manually selected colours' can be added and edited at any time using hex colour code or the colour picker tool. If you are using hex colour code to manually select colours and your colours do not change or display as expected, make sure you are entering a valid hex colour code. Because black (#000000) is a place holder value for blank legend entries, it cannot be saved as a 'Manually selected colour' – however, near black colours (like #000001) can be saved instead.

Name: Must not include upper-case letters or spaces

Image path: No file selected.

Legend colour file: No file selected. Colour map file, in ArcGIS (.cpr) or QGIS (.txt) format, with fields for: value R G B alpha label (last two optional). THIS WILL OVERWRITE ANY COLOUR VALUES BELOW. Alternatively, you can pick colours manually.

Uploaded legend colours					
Index	RGBA	Value	Label	Preview	Delete?
1	(202, 0, 100, 255)	1	my_label_1	<div>#CA0064</div>	<input type="checkbox"/>
2	(244, 165, 130, 255)	2	my_label_2	<div>#F4A582</div>	<input type="checkbox"/>
3	(255, 255, 255, 0)	3	my_label_3	<div>#FFFFFF</div>	<input type="checkbox"/>

Manually selected colours				
Index	Colour	Value	Label	Delete?
4	<div>#0B9227</div>	4	my_label_4	<input type="checkbox"/>
1	<div>#000000</div>			
1	<div>#000000</div>			

- d) The 'index' value specifies the order in which legend items occur in widgets. When uploading a legend from a file, index values will be automatically assigned. When entering legend colours manually, simply order them 1, 2, 3, 4 etc. – keeping in mind that index values must be unique across 'Uploaded legend colours' and 'Manually selected colours'.
- e) The 'value' is the pixel value in the raster dataset which the colour represents.
- f) The 'label' is a description of the pixel value or class. The text will be displayed in tables for each category/class, and when using 'label_length' in the pie chart widget. In order to save your legend layer, a label must be provided for each legend entry.

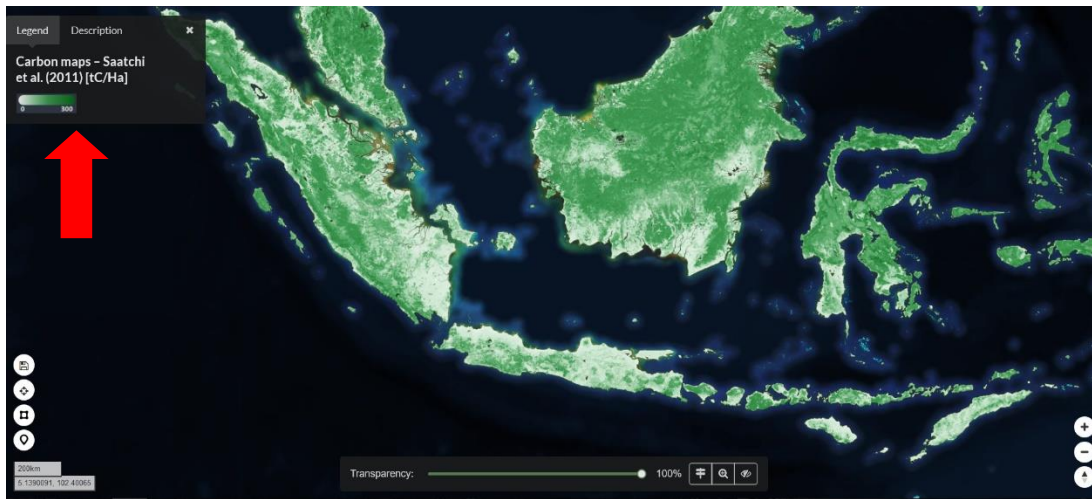
Layer legend graphics for **qualitative datasets** are automatically generated from the legend layer. The Dataset type (in the dataset layer metadata) must be set to Qualitative for a legend graphic to be generated automatically. These graphics are displayed in the bottom-left of the platform interface when a display layer is selected and the legend button is pressed:



For layers that contain many different legend entries, legend colour files can be uploaded to the Ecometrica mapping platform as either a ArcGIS .clr file or a QGIS .txt file.

Legend Colour File Format	Creation Instructions	Generated Fields
ArcGIS .clr file (space separated)	Once the symbology is set for your display raster: Click on the Symbology tab in the layer's Properties, select Unique Values, click the Colormap button and click Export a Colormap.	value red green blue 1 202 0 100 2 244 165 130 3 255 255 255
QGIS .txt file (comma separated)	Once the symbology is set for your display raster: Click on the Style tab in the layer's Properties and click on the save icon ('Export color map to file'). Labels, if included, will also be stored in the resulting .txt file.	value, red, green, blue, alpha*, label* *these values are not required by the platform, but will automatically upload if included in the file 1,202,0,100,255,label1 2,244,165,130,255,label2 3,255,255,255,0,label3

For **quantitative layers**, a legend is not needed for query results. However, if desired, a legend graphic (.PNG) can be uploaded to the platform using the "Image path" option. The Dataset Type (in the dataset layer metadata) must be set to the quantitative for a .PNG legend graphic to display on the interface. For the best results, upload an image with a transparent background colour and white text. For details on how to create a legend graphic to be displayed with a quantitative display layer, see the section on How to create a layer legend graphics/images under Appendix 1.



You can clone an existing legend using the “Save as New” option. Change the name of the legend you would like to clone, and click “Save as New” to copy all the legend colours and entries that were saved in the original legend, as well as the attached legend image if present.

Home > Oe > Layer legends > hansen forestloss 2001 to 2014 highlight

Name:

Image path: No file chosen

Legend colour file: No file chosen

Colour map file, in ArcGIS (.arx) or QGIS (.qgs) format, with fields for value R G B alpha label (last two optional). THIS WILL OVERWRITE ANY COLOUR VALUES BELOW. Alternatively, you can pick colours manually.

Uploaded legend colours

Index	RGBA	Value	Label	Preview	Delete?
1	#FFD4F9	1.0	2001		<input type="checkbox"/>
2	#FFC4EA	2.0	2002		<input type="checkbox"/>
3	#FFB3E4	3.0	2003		<input type="checkbox"/>
4	#FFA3DF	4.0	2004		<input type="checkbox"/>
5	#FF94DA	5.0	2005		<input type="checkbox"/>
6	#FA7DD0	6.0	2006		<input type="checkbox"/>
7	#F75C7	7.0	2007		<input type="checkbox"/>
8	#F550F	8.0	2008		<input type="checkbox"/>
9	#E3404	9.0	2009		<input type="checkbox"/>
10	#E04A1	10.0	2010		<input type="checkbox"/>
11	#D4139D	11.0	2011		<input type="checkbox"/>
12	#C2198F	12.0	2012		<input type="checkbox"/>
13	#CA7AF5	13.0	2013		<input type="checkbox"/>
14	#73FFDF	14.0	2014		<input type="checkbox"/>
1	#000000				<input type="checkbox"/>
1	#000000				<input type="checkbox"/>

Manually selected colours

Index	Colour	Value	Label	Delete?
1	<input type="text" value="#FFD4F9"/>	<input type="text" value="1.0"/>	<input type="text" value="2001"/>	<input type="checkbox"/>
2	<input type="text" value="#FFC4EA"/>	<input type="text" value="2.0"/>	<input type="text" value="2002"/>	<input type="checkbox"/>
3	<input type="text" value="#FFB3E4"/>	<input type="text" value="3.0"/>	<input type="text" value="2003"/>	<input type="checkbox"/>
4	<input type="text" value="#FFA3DF"/>	<input type="text" value="4.0"/>	<input type="text" value="2004"/>	<input type="checkbox"/>
5	<input type="text" value="#FF94DA"/>	<input type="text" value="5.0"/>	<input type="text" value="2005"/>	<input type="checkbox"/>
6	<input type="text" value="#FA7DD0"/>	<input type="text" value="6.0"/>	<input type="text" value="2006"/>	<input type="checkbox"/>
7	<input type="text" value="#F75C7"/>	<input type="text" value="7.0"/>	<input type="text" value="2007"/>	<input type="checkbox"/>
8	<input type="text" value="#F550F"/>	<input type="text" value="8.0"/>	<input type="text" value="2008"/>	<input type="checkbox"/>
9	<input type="text" value="#E3404"/>	<input type="text" value="9.0"/>	<input type="text" value="2009"/>	<input type="checkbox"/>
10	<input type="text" value="#E04A1"/>	<input type="text" value="10.0"/>	<input type="text" value="2010"/>	<input type="checkbox"/>
11	<input type="text" value="#D4139D"/>	<input type="text" value="11.0"/>	<input type="text" value="2011"/>	<input type="checkbox"/>
12	<input type="text" value="#C2198F"/>	<input type="text" value="12.0"/>	<input type="text" value="2012"/>	<input type="checkbox"/>
13	<input type="text" value="#CA7AF5"/>	<input type="text" value="13.0"/>	<input type="text" value="2013"/>	<input type="checkbox"/>
14	<input type="text" value="#73FFDF"/>	<input type="text" value="14.0"/>	<input type="text" value="2014"/>	<input type="checkbox"/>
1	<input type="text" value="#000000"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="checkbox"/>
1	<input type="text" value="#000000"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="checkbox"/>

Tools

You can then edit your newly cloned legend by adding/deleting entries in the “Manually selected colours” section.

Display Layers

Display layers are separate from the data layers that are used in queries and have to be created separately as 3-band RGB GeoTiffs. Display layers are uploaded in the WGS 1984 Web Mercator Auxiliary Sphere: EPSG 3857 projection and can be uploaded in their original resolution without needing to be resampled, although it is preferable to create a display layer with approximately the same resolution as the data layer it represents.

Not all data layers have to be displayed on the map interface. Those that you want to display on the map interface should be uploaded separately and are tiled to allow for zooming in online.

You can use the Data > Export Data > Use Renderer > Force RGB tool in ArcGIS to convert a 1-band classified raster to a 3-band RGB file. In QGIS, use the Raster > Conversions > PCT to RGB tool. Areas that should be transparent on the display layer should be set to one colour- usually magenta (RGB 255,0,255) is used as transparent.

Upload the 3-band .tif file to a cloud service, such as Dropbox (make sure you use the direct download link). Do not zip the file, make the URL public and copy the URL. You can also upload your display layer directly from your desktop using the Desktop File Import button.

See details instructions on how to prepare a display layer for upload to the platform in Appendix 1 of this manual.

New display layers can be uploaded under 'Data and Display Layers' > 'Display layers' > 'Add Display layers'

- a) Add the name for the display layer – this will be the name displayed on the interface and can be in Camel Case with spaces.
- b) Select 'Active' to enable the display layer to be used.
- c) Select 'MBTilesD' as the tile server.
- d) Projection for all display layers should be set to 'EPSG 3857 aka Web Mercator'.
- e) A description can be added for your display layer – this will be displayed on the interface, when pressing the 'Info' button at the bottom of the screen.
- f) Select the dataset the display layer is linked to. A dataset can only be attached to one display layer.
- g) Under 'Import file URL' paste the URL for your display layer, or use the Desktop File Import option.
- h) Leave the transparent colour as 255, 0, 255 that has been saved as the background colour in your raster or change it to the NoData colour in your file.
- i) Choose the max zoom level for your display layer. See Table 2 below for the max zoom level to choose depending on the resolution of your data.
- j) Click 'Save and continue' to upload your file.

As display layers must be tiled at each zoom level to enable zooming in and out on the interface, display layers may take a few hours to create once uploaded depending on the size of the file.

Table 2: Choosing the Max Zoom Level in the display layer import section

Resolution Level	Cell size at the equator (m)	Cell size (Arc Seconds) [div by 3600 to get degrees]	Cell size (Degrees) [mul by 3600 to get arc seconds]	Max Zoom Level (for Display Layers)
1	20037581	648000	180.0	6
2	10018790	324000	90.0	6
3	5009395	162000	45.0	6
4	2504698	81000	22.5	6
5	1252349	40500	11.25	6
6	626174.4	20250	5.625	6
7	313087.2	10125	2.8125	6
8	156543.6	5062.5	1.40625	6
9	78271.8	2531.25	0.703125	6
10	39135.9	1265.625	0.351563	6
11	19567.95	632.8125	0.175781	6
12	9783.975	316.4063	0.087891	6
13	4891.987	158.2031	0.043945	6
14	2445.994	79.10156	0.021973	10
15	1222.997	39.55078	0.010986	10
16	611.4984	19.77539	0.005493	12
17	305.7492	9.887695	0.002747	13
18	152.8746	4.943848	0.001373	14
19	76.4373	2.471924	0.000687	14
20	38.21865	1.235962	0.000343	15
21	19.10933	0.617981	0.000172	16
22	9.554663	0.30899	0.000086	17
23	4.777331	0.154495	0.000043	17
24	2.388666	0.077248	0.000021	17
25	1.194333	0.038624	0.000011	18
26	0.597166	0.019312	0.000005	18
27	0.298583	0.009656	0.000003	18
28	0.149292	0.004828	0.000001	18

Selecting the correct zoom level for your display layer is important as it sets the number of times the user can zoom in before the pixels look blurry. The following screenshots show zoomed in pixels with lower and higher max zoom levels set on upload. The max zoom level on the left has not been set high enough and the pixels become blurry as you zoom in, while the image on the right shows a display layer with the max zoom level set high enough for the pixel resolution of the dataset.

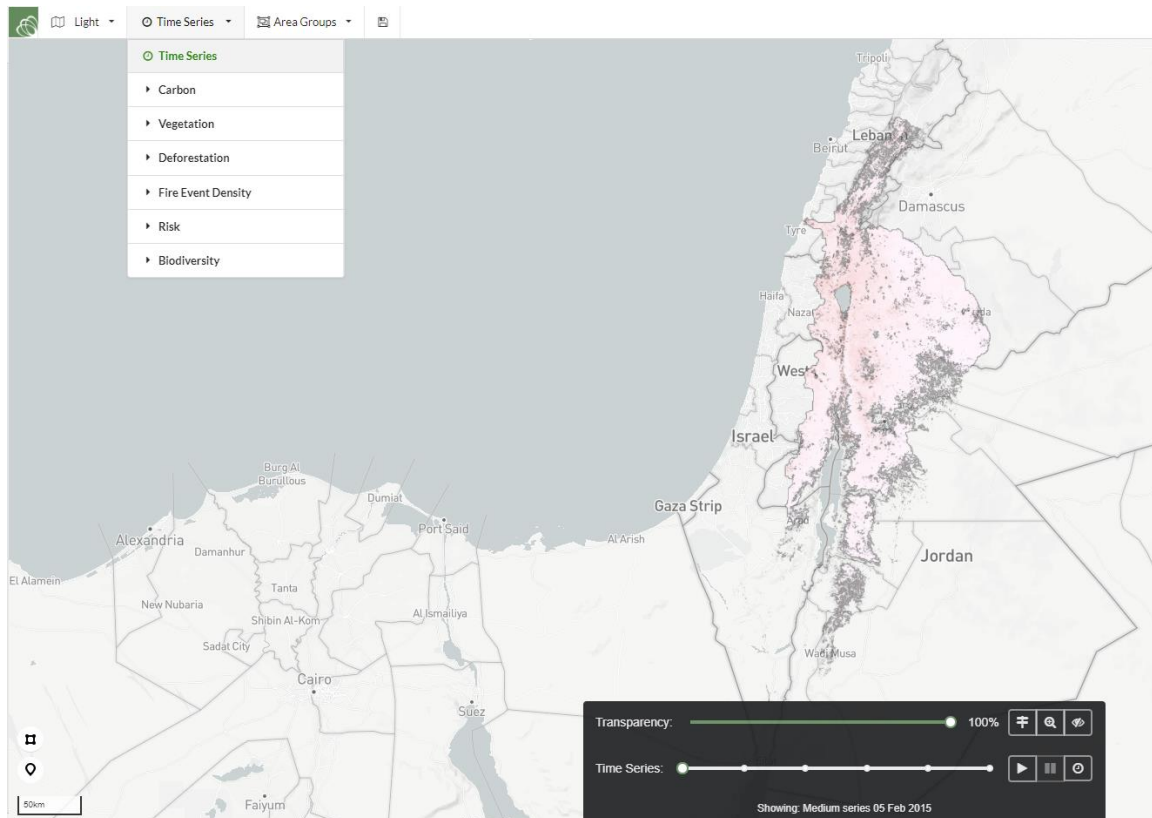


Display Series

Multiple display layers can be added to a Display Series to be presented as a time series on the interface. Upload your display layers following the steps described in the previous section. New Display Series can be created under 'Application Admin' > 'Display Series' > 'Add display series'.

- a) Add the name for the display series – this will be the name shown on the interface and can include upper-case letters and spaces.
- b) Select the order the display series will be presented on the interface (i.e. the position of the display series within the 'Display Groups' drop-down menu).
- c) Add some description for the series. This will be displayed on the interface when the display series is switched on.
- d) A legend for the display series can be added either by selecting an already existing legend from the drop-down menu, or by creating a new legend using the "Add another layer legend" option (see the Layer Legends section page 14 for more details on legends)
- e) Select the display layers to be included in the display series using the drop-down menu. The Layer order section sets the order display layers will appear in the time series.
- f) Press Save and Continue

Display Series are also displayed in the Display Groups page ('Application Admin' > 'Display Groups') and have a green mark to specify they are time series. They are displayed in the same menu as single display layers in the interface, and their order within this menu can be changed along with adding/deleting display layers from the time series, by clicking on the display series name and editing the related section. Alternatively, they can be edited directly in the Display Series section.



Application Areas and Groups

Areas of Interest can be polygons drawn by users on the map interface or uploaded as shapefiles of points, polygons and multipolygons. Points can also be imported from CSV files which must include latitude and longitude columns. Shapefiles should be compressed (all files zipped together) and uploaded in GCS WGS 1984 (EPSG 4326) into an Application Area Group, even if your raster datasets are in another projection. The platform will reproject your areas of interest on the fly when querying a dataset that was uploaded in an equal-area projection.

Shapefiles should be polygons, without any gaps or silvers. Ensure that polygons are 2D (without M or Z values). The area names and descriptions can be imported directly from the shapefile attribute table if it has fields called 'name' and 'description'. (Note that you should use 'description' without the 'n' because ArcGIS cannot handle such long field names).

For detailed instructions on how to prepare a shapefile for upload to the platform see Appendix 1 of this manual. **It is very important to simplify your areas, as polygons with many vertices will slow down query results and displaying them on the map interface.**

Once the shapefile is in the correct format, compress all the parts of the shapefile into a zipped file and upload the file to a cloud service, such as Dropbox. Make the URL public and copy the URL.

If using DropBox, make sure you use the direct link URL by replacing the 'www.dropbox.com' in the file URL with 'dl.dropboxusercontent.com'.

So https://www.dropbox.com/s/jlqfyh74i03wzsy/ANP_Estatales_Chps1984.zip?dl=0

becomes

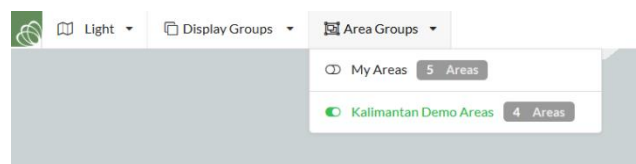
https://dl.dropboxusercontent.com/s/jlqfyh74i03wzsy/ANP_Estatales_Chps1984.zip?dl=0

Shapefiles must be uploaded into an Application Area Group or User Area Group.

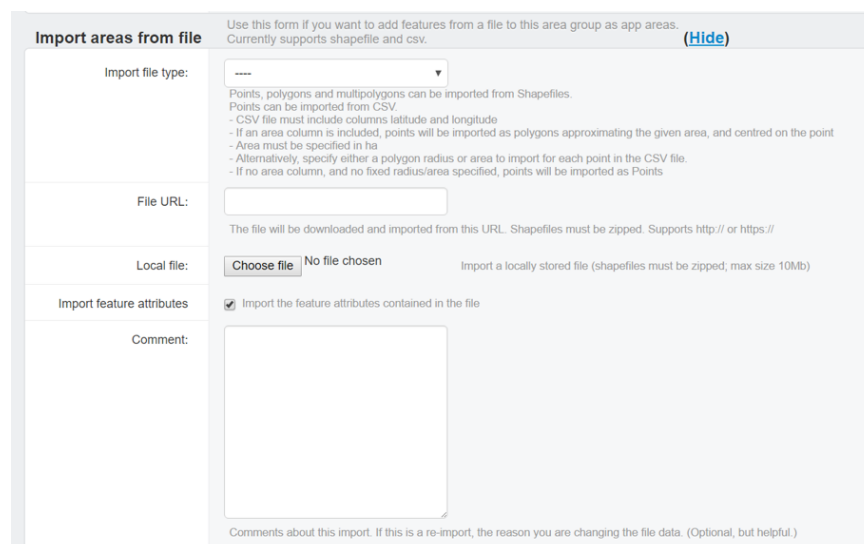
A new Application Area Group can be created under 'Areas' > 'Application Area Groups' > 'Add Application Area Group'

 A green rectangular button with a white plus icon and the text "Add application area group".

- b) Add a name for your Application Area Group – this will appear on the interface as the heading for a group of areas and can be changed later. Note that this heading will not be displayed on the interface until a shapefile has been uploaded to it.



- c) Select the application the Application Area Group will be enabled for.
d) Choose the order that the group will be displayed in relation to other area groups. Groups with the same order value will be ordered alphabetically.
e) Add a description to your group – this is optional and will not be displayed on the interface.
f) When you save your area group, an 'Import areas from file' field will be displayed. Click 'Show' to display all the options for uploading a shapefile or CSV.

 A screenshot of a web form titled "Import areas from file". The form has a sidebar with labels: "Import file type:", "File URL:", "Local file:", "Import feature attributes", and "Comment:". The main content area contains a dropdown menu for "Import file type:" with a value of "----". Below this is a text area for "File URL:" with a placeholder "The file will be downloaded and imported from this URL. Shapefiles must be zipped. Supports http:// or https://". There is a "Choose file" button and a note "No file chosen" and "Import a locally stored file (shapefiles must be zipped, max size 10Mb)". A checkbox for "Import the feature attributes contained in the file" is checked. There is a large text area for "Comment:". At the bottom, there is a small text: "Comments about this import. If this is a re-import, the reason you are changing the file data. (Optional, but helpful.)".

- g) If you select Zipped shapefile from the import file type, you can paste the URL for your shapefile into the 'File URL' field, or import your shapefile locally.

The screenshot shows the 'Import areas from file' form. The 'Import file type' dropdown is set to 'Zipped Shapefile'. To the right, a list of instructions explains that points, polygons, and multipolygons can be imported from Shapefiles, and points can be imported from CSV files. It specifies that CSV files must include latitude and longitude columns, and that an area column is required for polygons. The 'File URL' field is empty, with a note that the file will be downloaded from this URL. The 'Local file' section has a 'Choose file' button and a 'No file chosen' status. The 'Import feature attributes' checkbox is checked. A 'Comment' field is at the bottom.

- h) If you select CSV file from the import file type, you can paste the URL for your CSV file or upload it locally.

This screenshot shows the same 'Import areas from file' form, but with 'CSV file' selected in the 'Import file type' dropdown. The instructions on the right are updated to reflect CSV file requirements. The 'File URL' and 'Local file' sections are identical to the previous screenshot. The 'Import feature attributes' checkbox is checked. A 'Comment' field is present. A red box highlights the 'CSV Import Options' section at the bottom, which includes: an 'Ignore errors' checkbox with a note about missing or incorrectly formatted data; a 'Radius in m' field with a unit selector set to 'm'; and an 'Area in ha' field with a unit selector set to 'ha'.

If only latitude and longitude columns are included in the CSV files, then the rows will be uploaded as Points. If a column “area” is included, the rows will be imported as polygons of approximately the given area. Areas must be specified in ha. Alternatively, you can specify either a radius or an area for each point in the CSV file under the CSV Import Options. If you specify a radius or an area in this section, then this will overwrite the area column in the CSV file. Finally you can choose to tick the ‘Ignore errors’ option. If ticked, the rows in the CSV file with missing or incorrectly formatted coordinates/areas will be ignored and the valid rows will be uploaded. The File Import History (at the bottom of the Application Area Group page) will contain a record of the rows that did not upload and an explanation of the errors found. If you leave the ‘Ignore errors’ unchecked, then the CSV import will fail if it contains rows with missing or incorrectly formatted columns.

- Note that there might be several pages of areas, and you can view them page by page or use the search options above the list of areas. Area attributes, descriptions and geometry can be viewed when you click into an area under 'Application Area'. The 'geometry' field will show the polygon vertices uploaded from the shapefile.

User Areas, which are attached to a user account rather than an application can be uploaded into 'User Area Groups' using the same process. User Area Group can be created under 'Global Settings' > 'User Area Groups' > 'Add User Area Group'

You can make a copy an individual Application Area or a whole Application Area Group in order to use them on a different application.

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Name	Application	Display order
Protected Areas	brazil.ourecosystem.com	1
Protected Areas	ecosur.ourecosystem.com	1
Protected Areas	icf-ghana.ourecosystem.com	1
Protected Areas	landcoverchange.ourecosystem.com	1
Regions	bioenergy.ourecosystem.com	1
Sites Grenoble	operas-frenchalps.ourecosystem.com	1
South West Region	sw-cameroon.ourecosystem.com	1

When you click 'Go', a clone of the group or area will be created with the "Copy of" in front of the original name. The cloned application group or area will be assigned to the same application as the original group or area. An option will be available to edit the cloned application group or area once cloned, or you can locate it using the search options.

To move the cloned area or group to another application, go into the 'Global Areas' menu. Find your 'Copy of' application area or group using the search option. Click into it and select the application you would like to move the areas to using the drop-down next to 'Application'. You can then rename the area or group of areas as required.

4. SETTING UP QUERY RESULTS

The area results extract information from your raster datasets and can be used to answer specific questions, such as how land use has changed over time or what is the total biomass within an area. Note that raster datasets that are not in an equal-area projection may return unexpected results, and if you are planning on combining several raster layers in a query, the raster layers should be in the same projection and resolution.

To set up queries and operations to run on drawn or pre-defined polygons for any of your uploaded datasets, 'Tabs' 'Questions' and 'Question Widgets' need to be created.

'Tabs' are the main headings for each query result, for example 'Total Biomass', 'Land Cover Type' or 'Vegetation Type' or 'Average NDVI'.

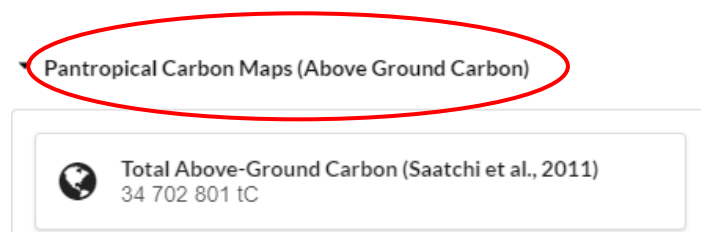
'Questions' are the types of operations to be run on each layer. For example, to get the average biomass and error for a group of carbon layers, you would create a slug (name) for the question e.g. `get_avg_agb_bgb_c_error` and specify which layers the operation will be carried out on.

Under 'Questions', you will need to create a Query (or use an existing one). Queries are the coded operations written in python-like script e.g. to sum, average or group values for each pixel included in the drawn or uploaded polygons.

'Widgets' are then created to define how the question results are displayed, for example as a title, numeral (total), pie chart, table or bar chart. Finally, 'Question columns' are created to define the unit to include with each result, for example t, tC, t/ha or m.

Create Tabs

Tabs are the headings the question results are groups under. Note that each tab will use a different 'query', with its one question, code and widgets:



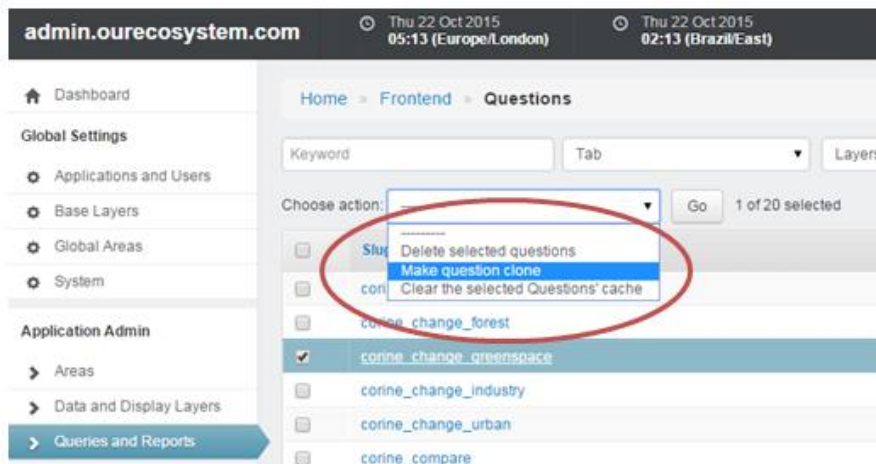
To create a new Tab, select 'Queries and Reports' > 'Tabs' > 'Add Tab'

- Select the application for the tab you are creating
- Name the tab as the heading you would like displayed on the interface, and then add the 'Order' (1 or 2 or 3 etc) that you want this tab to appear in the results in relation to other tabs
- When the checkbox labelled 'Public' is unticked, the corresponding tab in the interface will only show for superusers ("Staff Only" will be indicated in brackets). When you tick the checkbox, the result will start appearing for all users. It is best to leave this box unticked until the complete result has been finalised and tested. When you make a new tab, or a copy of a tab, it will default to being visible by superusers only.

Create Questions

Questions can be duplicated or cloned within an application or across different applications from existing questions.

In the list of Questions in admin; select the question you want to duplicate and in the drop-down menu just above the list of questions, choose the action called 'Make Question Clone'.



Click the 'Go' button, and a copy of the selected question (including the tab, layers, widgets and widget parameters) will be created. The cloned question will be named 'Copy of ' the original question and it will be added to bottom of the results page. The duplicated question is automatically not 'public', so only superusers can see these results. Once you have finished modifying it, you can tick the 'Make public' option under its tab.

To move the copied question to another site, you can click into the new tab and select the application to move it to. It will then no longer be visible from the original site, and the page in the admin will return a 404 page-not-found error. You can click back to return to the previous page.

To create a completely new question, select 'Queries and Reports' > 'Questions' > 'Add Question'

- Enter a name ('slug') without spaces, for example 'get_avg_ndvi_anomalies'
- Select the 'Tab' the question result will display under.
- 'Code' is the query language code of calculations to be run on the dataset. Simple codes can be copied and pasted from other queries. See the separate guide on the query language structure and writing queries under the 'Help' section of the admin.
- Select the 'Spreadsheet export columns' – these are the results you want include in the downloadable excel spreadsheet. When no columns are specified, all the columns in the query code will be included.

Spreadsheet
export
columns:

layer, true_average

Comma separated list of column names to include.

For time series results, if you would like the date included next to each result in the spreadsheet then you should add 'layer' both in the 'Spreadsheet export column' as a 'Question Column':

Question columns	
Key *	Value *
<input type="text" value="layer"/>	<input type="text" value="Date"/>
<input type="text" value="true_average"/>	<input type="text" value="NDVI"/>

[Add another Question Column](#)

- e) Select the format of the downloadable spreadsheet:
- If the question contains totals widgets, select 'List Total Widgets'.
 - If the question contains table widgets, select 'Tables as shown in Interface'.
 - If the question does not contain total or table widgets, for example if for a time-series graph, (or they don't need to be included in the download):
 - At "Spreadsheet format", select "Raw Data Export Spreadsheet" or
 - At "Spreadsheet export columns", add a comma-separated list of the columns you want to export, in the order you want them to appear (e.g. category, area, average, total, coverage).
- * If you want to leave out a Totals Tab in a worksheet, select the "Raw Data Export Spreadsheet" format and leave the "Spreadsheet export columns" blank.
- f) Select the 'layer' or 'layers' that the query should run on. The 'layer' is the dataset on which the query will be executed. For example, your 'query' could be grouping the sum of carbon stocks by a risk category (so that the result will show how much carbon stock is under different risk categories), but the layer on which you execute this is not the 'risk' dataset, but the 'carbon' layer.
- g) Next the 'widgets' and 'question columns' need to be created. **Save your question before you create widgets so that the widget can be linked to your new question.**

Question columns

'Question columns' are used to define the column headings and units for the values within pie charts, tables, columns, etc. For example, if 'average_carbon' is specified in the query code, the units for average carbon should be included in the 'question columns':

- a) Click on 'add question column'
- b) Enter the 'key' which identifies the value from the query
- c) Enter the 'value' which labels the results for this column, for example on the y-axis for charts and as headings for tables.
- d) The units are optional and will be added behind individual values

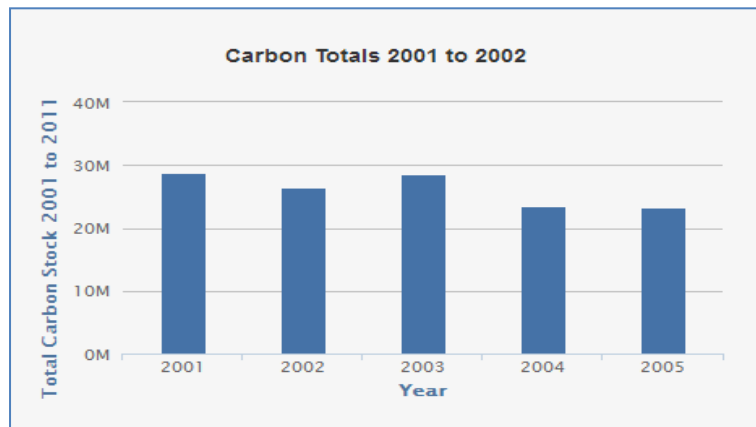
For example, if the query includes 'average_carbon' this will be used as the 'key, while the units and display name would be included as:

Key: total_carbon

Value: Total Carbon Stock 2001 to 2011

Unit: tC

The chart would then be displayed as:

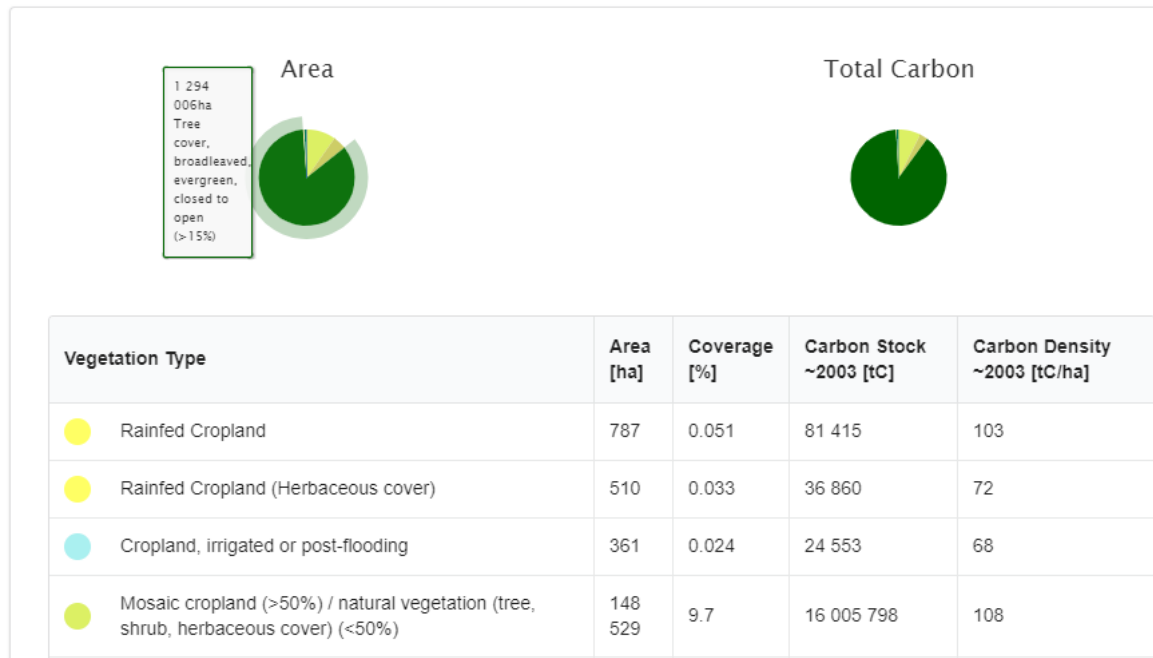


Create Widgets

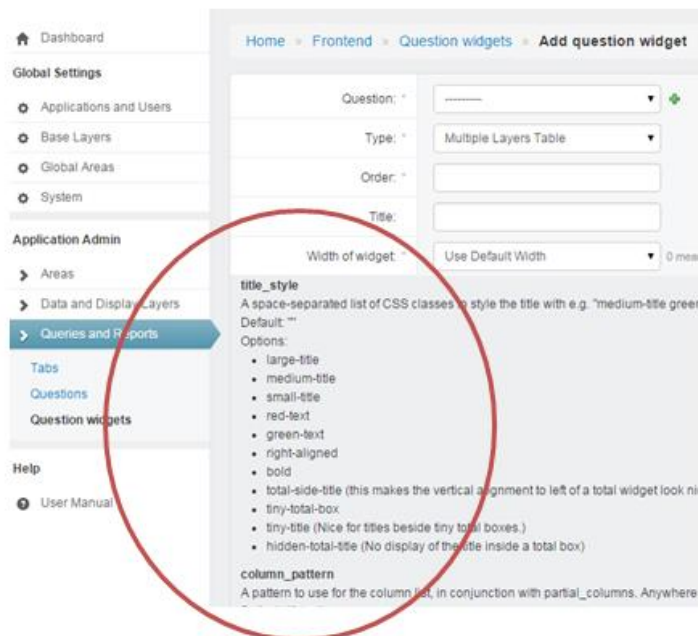
Widgets are the type of format your results will be displayed in - for example titles, bar charts, pie charts, graphs or tables. Certain parameters need to be filled in for widgets and these depend on the annotations that were defined in the queries. This is best explained using an example as described below.

- Click on 'Create New Widget' - this will redirect you to the 'Question Widgets' page
- Select the 'question' that the widget will be used for
- Choose the type of output (a full list of widget types is included below this section)
- Select the order the widget should display in relation to other widgets
- Choose a title for the widget, for example 'Vegetation Type'. This can also be left blank.
- Select the 'width of widget' - this specifies the width the widget will be displayed on the results page. For example, widgets can be displayed over the full page width, or two table category widgets can be displayed together using the 'half' width option, for example to compare results for different years or sensors:

▼ Carbon in Vegetation Types (ESA CCI 2010)



- g) Choose the widget parameters under 'Question widget parameters'. Depending on the type of widget selected, a number of different parameter options and explanations for each will be shown above the question widget parameters fields:



These parameters should be included under question widget parameters, for example:

- 'size', which is 'small' or 'large', which pretty much just determines the height.

- 'column', which column to show data from (output value is query ie “true_average”)
- 'default_colour', which specifies the graph/chart colour in hexadecimals

***Note for time series and table widgets, any datasets included in a time series or table must have name and date 'attributes' added so that they can be plotted in the correct order on the interface.**

Date attributes can be added to individual dataset by clicking each and adding a key for 'date' and 'display_name'. 'Date' defines the order that the raster datasets are plotted, should be in the format 1/5/2010 (1st of May 2010). 'display_name' is the name that will be displayed on the interface as table headings or data points on a graph, for example 'May 2010' or 'NDVI 2010'.

Dataset attributes		
Cell	Key	Value
<input type="text"/>	date	1/1/2010
<input type="text"/>	display_date	Jan 2010

These attributes can also be added when uploading the dataset.

Query and Widget Examples

A catalogue of different query types available and examples of how they display on the interface can be viewed using the demonstration applications available on your EO Lab such as 'country-demo.{yourEOlabname}.ourecosystem.com'.

Example of query codes to use for different query types can also be found in the 'Query Language Guide' in the Help section of the admin interface.

These queries can be cloned, moved to other applications and modified to use with different datasets and widget parameters.

This section shows examples of the different queries and widget types available on the platform, and the question and widgets parameters required for each of them.

1. **Title Widgets** display a large title for result in bold text:

▼ **Pantropical Carbon Estimates - Bar Charts**

Total Carbon and Carbon Density

Question widget parameters can be used to format the text style for titles, such as 'small-title bold', 'green-text'.

The full list of available parameters with explanations for each widget type is displayed above the 'Question Widget Parameters' field once you have selected your widget type.

2. **Notes/Text Widgets** can also be used to display information or explanation below or above results for a query:

2000	21 240	20 091	11	0.4	11
2010	25 952	24 869	11	7.1	15
2015	24 972	24 840	10	7.8	13
2020	24 287	23 231	10	8.6	12

Gridded Population of the World, Version 4 (GPWv4) Population Density consists of estimates of human population density based on counts consistent with national censuses and population registers, for the years 2000, 2005, 2010, 2015, and 2020. Since countries conduct their censuses at different times, annualized growth rates were used to adjust census counts to the target year of 2010 to allow for global comparison.

The text should be included in html with 'text' used as the question widget column 'key' field shown below:

Question widget parameters	
Key	Value
text	<p>Source data: This map was procured in a collaboration between the Colombian government, Colombian researchers, and the Carnegie Airborne Observatory. Details of this methodology can be found in </p>

[Add another Question Widget Parameter](#)

Below are examples html text formats to use to add images or links to text widgets:





``

Example of adding links to points, text widgets or descriptions:

This graph shows precipitation & Southern Oscillation Index (SOI) values over the whole of the Murray-Darling Basin between 2001 and 2011.
 Precipitation in the MDB is not distributed evenly, the highest rainfall is often in the southeast and lowest in the west area. Please refer to the full report on Drought in the Murray-Darling Basin under the Science page links. Meteorological data were sourced from the Bureau of Meteorology of Australia, which provides daily and monthly data for precipitation and temperature.

3. **Break widgets** are used to start subsequent widgets on a new line, and can be used if a previous widget fills half the page, but the next is still wanted on a new line
4. **Total Widgets** display a numerical value within a border, and can be used to display any mathematical result derived from your raster dataset (for example sum, average, minimum or maximum).

▼ Pantropical Carbon Maps (Above Ground Carbon)

 Total Above-Ground Carbon (Saatchi et al., 2011) 4 899 578 tC	 Average Above-Ground Carbon Density (Saatchi et al., 2011) 35 tC/ha
 Total Above-Ground Carbon (Baccini et al., 2012) 4 935 474 tC	 Average Above-Ground Carbon Density (Baccini et al., 2012) 35 tC/ha

For this query, 'AGB_total' and 'AGB_avg' (above ground biomass) are the 'columns' - the values to be calculated from the raster datasets). These columns are defined within the query code, in this case to sum or average the values of all the pixels that fall within the queried polygon. These values are then multiplied by 0.5 to calculate the carbon stock and density:

Code: *

```

AnnotateResultSetsOperation(
  rs=(
    AggregateOperation(
      operations=('Sum', 'Avg', 'Count'),
      layers=(requested_layer,),
    ),
  ),
  annotate_ops=(
    #this part calculates the totals - i.e. sum of all pixels plus conversion
    calcs
    Annotation(
      annotate_name='AGB_total',
      field_name=LayerOperationFieldName(
        layer=requested_layer,
        operation='Sum',
      ),
      operation='mul',
      annotate_value=(
        polygon.cell_area #calc total AGB for query area
      ),
    ),
  ),
)

```

The layers for the query to run on are the Saatchi & Baccini Pantropical carbon maps:

Order	Layer	Start date
1	Pantropical Carbon Maps > saatchi	Date: <input type="text"/> Today Time: <input type="text"/> Now
2	Pantropical Carbon Maps > baccir	Date: <input type="text"/> Today Time: <input type="text"/> Now

[Add another Layer](#)

Four total widgets were created to display these values in bounding boxes:

Widget	Order	Title	Width of widget
Total column: C_total icon: icon-globe layers: saatchi_pantropical_agb	3	Total Carbon (Saatchi et al., 2011)	Half
Total column: C_true_ave_density icon: icon-leaf layers: saatchi_pantropical_agb	4	Average Carbon Density (Saatchi et al)	Half

The Question columns specify what the columns should be called on the interface and what unit to use for each:

Question columns		
Key *	Value *	Unit *
<input type="text" value="AGB_total"/>	<input type="text" value="Mg"/>	<input type="text" value="Mg"/>
<input type="text" value="C_total"/>	<input type="text" value="tC"/>	<input type="text" value="tC"/>
<input type="text" value="C_true_ave_density"/>	<input type="text" value="tC/ha"/>	<input type="text" value="tC/ha"/>

[Add another Question Column](#)

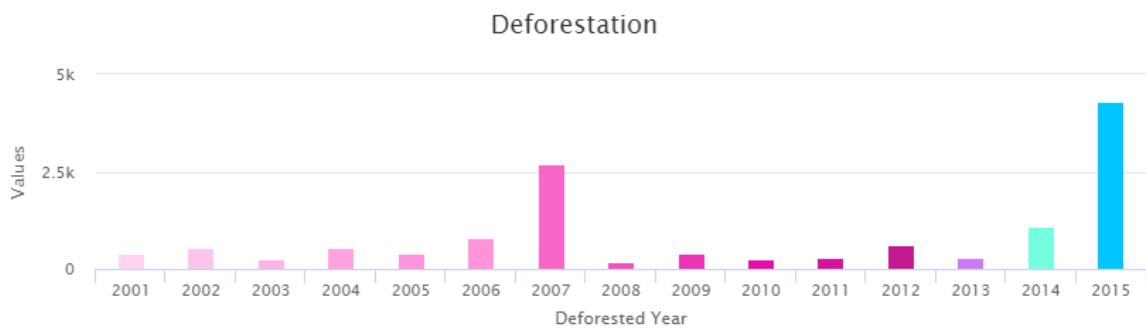
The question widget parameters define which 'column' (value from dataset) it should display (average or total), which layer it should get the result from and that a globe and leaf icon should be displayed with the result:

Question widget parameters	
Key *	Value *
<input type="text" value="column"/>	<input type="text" value="C_total"/>
<input type="text" value="icon"/>	<input type="text" value="icon-globe"/>
<input type="text" value="layers"/>	<input type="text" value="saatchi_pantropical_agb"/>

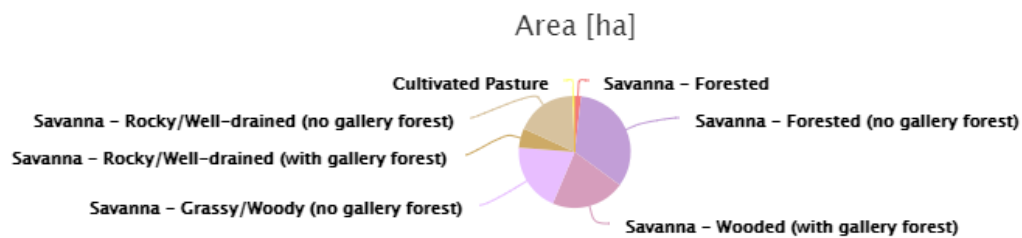
The full list of available icons for total widgets can be found [here](#).

- Pie & Bar Chart widgets** can be used to display categories within a qualitative dataset, or to compare results from multiple datasets.

To classify a qualitative dataset, a 'Layer Legend ' must be set up and saved so that the correct colours and names will be used for the different classes:



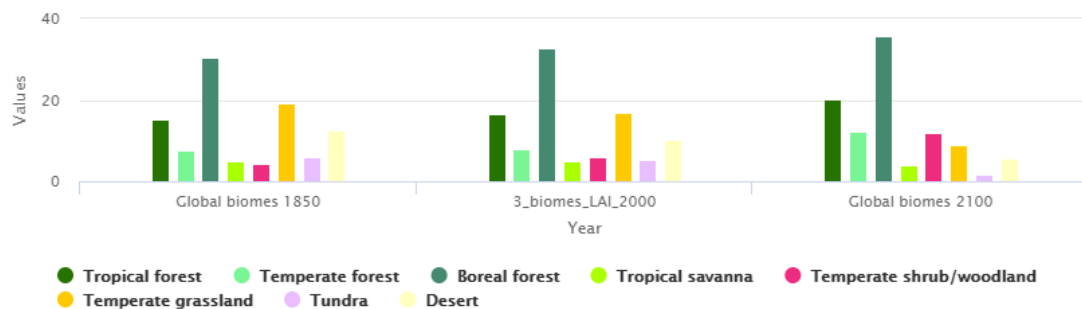
▼ Probio Landcover (2002)



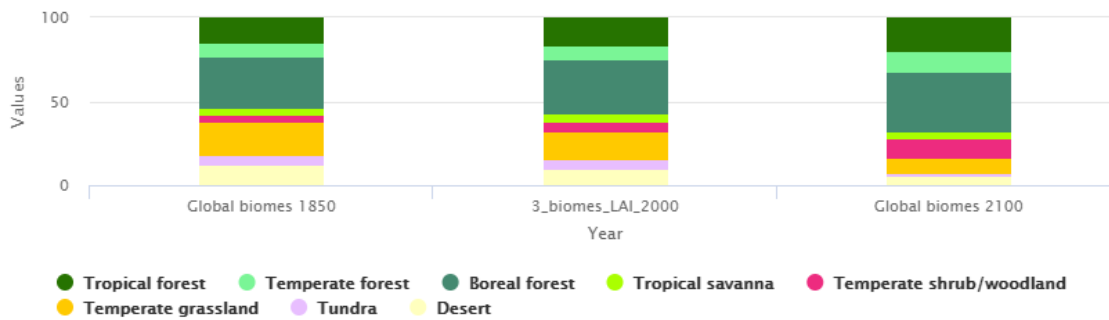
6. **Layer + Category Bar Chart** widgets show multiple qualitative layers classified by categories so that they can be compared to each over (for example for different time periods). The bar charts can also be 'stacked' by values or as a percentage by including the 'stacking' parameters for the widgets:

▼ % Coverage of major biomes, per year

The graph below shows the % coverage of each of the major land biomes within the selected area, as modeled for 1850, 2000, 2100.



The graph below shows the % coverage of each of the major land biomes within the selected area, as modeled for 1850, 2000, 2100.



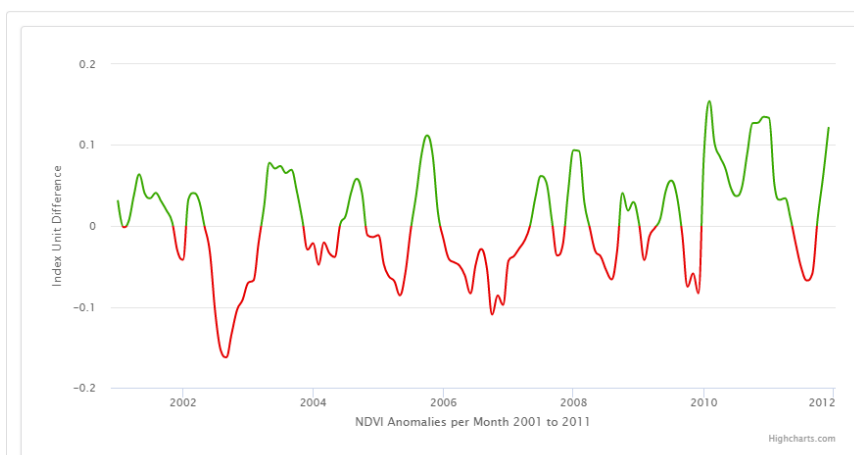
7. **Time Series widgets** can be used to display results for a series of quantitative dataset over time as graphs or bar charts, such as NDVI values or land cover changes over time.

Multiple dataset series can be plotted in a graph. There are also a number of question widget parameter keys to customise a time series chart:

- 'negative_colour' allows you to specify a different colour for negative values within a time series
- 'secondary' adds a second axis if you want to show two columns
- 'error_column' and 'error_layers' lets you add uncertainties as error bars for your time series values

To create the above graph, all the datasets should be added to the question using the drop-down selector. The below parameters should be included for the question widget parameters for a time series widget, including a comma-separated list of the datasets, which 'column' (or value from the data) you are plotting and a colour for negative values:

▼ NDVI Anomalies per Month 2001 to 2011



Time Series Chart

by:
layer

column:
true_average

default_colour:
#38A800

layers:
ndvi_01_01, ndvi_01_02, ndvi_01_03, ndvi_01_04, ndvi_01_05, ndvi_01_06, ndvi_01_07, ndvi_01_08, ndvi_01_09, ndvi_01_10, ndvi_01_11, ndvi_01_12, ndvi_02_01, ndvi_02_02, ndvi_02_03, ndvi_02_04, ndvi_02_05, ndvi_02_06, ndvi_02_07, ndvi_02_08, ndvi_02_09, ndvi_02_10, ndvi_02_11, ndvi_02_12, ndvi_03_01, ndvi_03_02, ndvi_03_03, ndvi_03_04, ndvi_03_05, ndvi_03_06, ndvi_03_07, ndvi_03_08, ndvi_03_09, ndvi_03_10, ndvi_03_11, ndvi_03_12, ndvi_04_01, ndvi_04_02, ndvi_04_03, ndvi_04_04, ndvi_04_05, ndvi_04_06, ndvi_04_07, ndvi_04_08, ndvi_04_09, ndvi_04_10, ndvi_04_11, ndvi_04_12, ndvi_05_01, ndvi_05_02, ndvi_05_03, ndvi_05_04, ndvi_05_05, ndvi_05_06, ndvi_05_07, ndvi_05_08, ndvi_05_09, ndvi_05_10, ndvi_05_11, ndvi_05_12, ndvi_06_01, ndvi_06_02, ndvi_06_03, ndvi_06_04, ndvi_06_05, ndvi_06_06, ndvi_06_07, ndvi_06_08, ndvi_06_09, ndvi_06_10, ndvi_06_11, ndvi_06_12, ndvi_07_01, ndvi_07_02, ndvi_07_03, ndvi_07_04, ndvi_07_05, ndvi_07_06, ndvi_07_07, ndvi_07_08, ndvi_07_09, ndvi_07_10, ndvi_07_11, ndvi_07_12, ndvi_08_01, ndvi_08_02, ndvi_08_03, ndvi_08_04, ndvi_08_05, ndvi_08_06, ndvi_08_07, ndvi_08_08, ndvi_08_09, ndvi_08_10, ndvi_08_11, ndvi_08_12, ndvi_09_01, ndvi_09_02, ndvi_09_03, ndvi_09_04, ndvi_09_05, ndvi_09_06, ndvi_09_07, ndvi_09_08, ndvi_09_09, ndvi_09_10, ndvi_09_11, ndvi_09_12, ndvi_10_01, ndvi_10_02, ndvi_10_03, ndvi_10_04, ndvi_10_05, ndvi_10_06, ndvi_10_07, ndvi_10_08, ndvi_10_09, ndvi_10_10, ndvi_10_11, ndvi_10_12, ndvi_11_01, ndvi_11_02, ndvi_11_03, ndvi_11_04, ndvi_11_05, ndvi_11_06, ndvi_11_07, ndvi_11_08, ndvi_11_09, ndvi_11_10, ndvi_11_11, ndvi_11_12

negative_colour:
#e60000

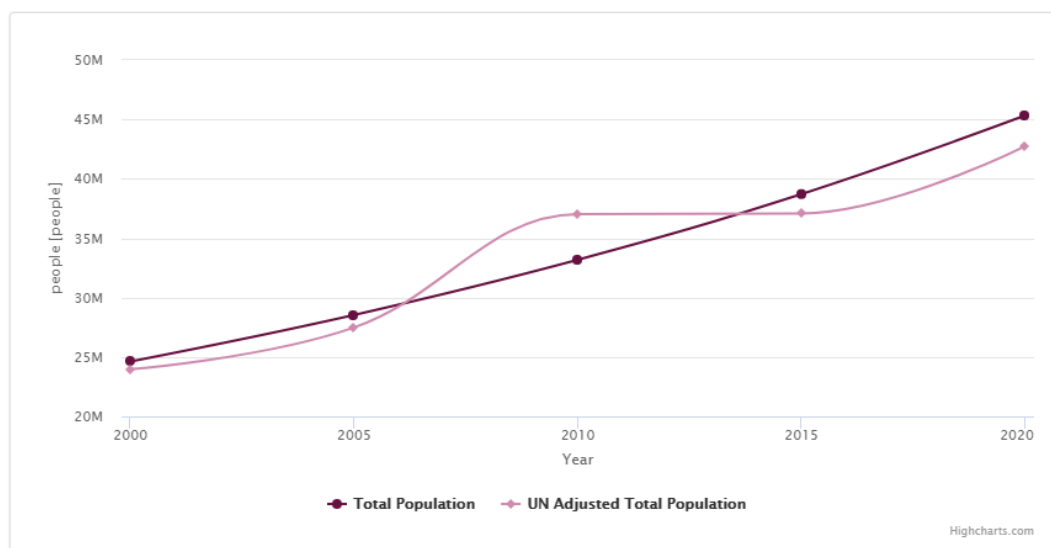
size:
large

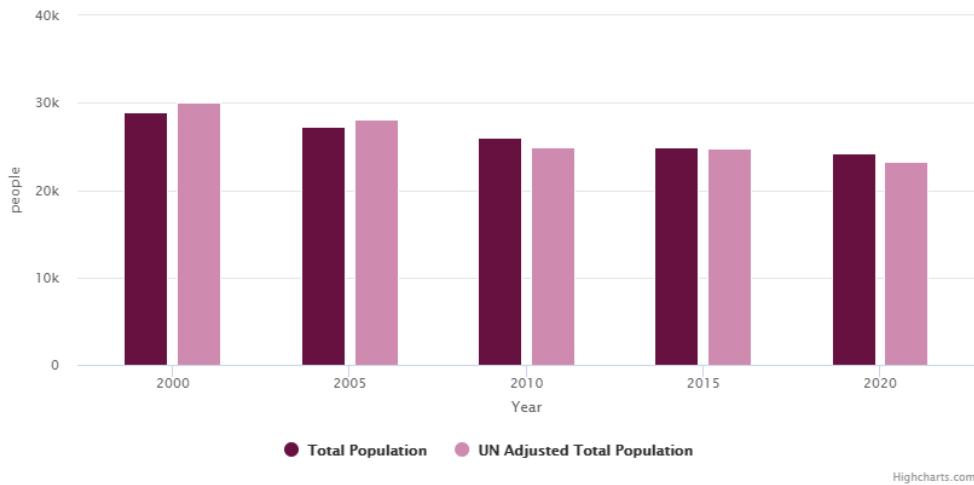
xAxisLabel:
NDVI Anomalies per Month 2001 to 2011

To plot multiple time series datasets on one graph, you should list each series as 'layers', 'layers_1', 'layers_2' etc in the question widget parameters. Corresponding error or uncertainty layers to create error bars can be added as 'error_layers', 'error_layers_1', 'error_layers_2'

Error bars can also be calculated using another value or 'column' from the primary dataset, such as standard deviation using the keys 'error_column', 'error_column_1', 'error_column_2'

Each dataset will be plotted in a different colour automatically, but you can specify the colours as well using 'default_colour', 'default_colour_1'. A legend for time series datasets can be added, and the displayed name for each series should be specified using 'layers_name', 'layers_1_name', 'layers_2_name'





Widgets

Widget

[Time Series Chart](#)

column:

total

default_colour:

#671140

default_colour_1:

#CE8AAF

layers:

global_pop_dens_2000_ciesin_v4, global_pop_dens_2005_ciesin_v4, global_pop_dens_2010_ciesin_v4,
global_pop_dens_2015_ciesin_v4, global_pop_dens_2020_ciesin_v4

layers_1:

global_pop_dens_2000_ciesin_v4_un_adjust, global_pop_dens_2005_ciesin_v4_un_adjust, global_pop_dens_2010_ciesin_v4_un_adjust,
global_pop_dens_2015_ciesin_v4_un_adjust, global_pop_dens_2020_ciesin_v4_un_adjust

layers_1_name:

UN Adjusted Total Population

layers_name:

Total Population

size:

large

xAxisLabel:

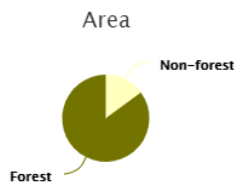
Year

Question columns

Key *	Value *
<input type="text" value="average"/>	<input type="text" value="people per km²"/>
<input type="text" value="maximum"/>	<input type="text" value="people per km²"/>
<input type="text" value="minimum"/>	<input type="text" value="people per km²"/>
<input type="text" value="stddev"/>	<input type="text" value="Standard Deviation"/>
<input type="text" value="total"/>	<input type="text" value="people"/>
Add another Question Column	

8. **Category Table widgets** classifies qualitative data in classes with a table, for example land cover classes or forest loss per year. Similar to the pie and bar charts, a layer legend must be created to define the colours and names for each category:

▼ Forest cover 2010 (250m) - MODIS VCF



Land Cover	Area [ha]	Coverage [%]
Non-forest	286 556	15
Forest	1 630 250	83

Forest cover data layer created from MODIS VCF V5 TREE data. For Indonesia, all pixels $\geq 30\%$ were classified as "Forest". All pixels with a value $<30\%$ were classified as "Non-Forest". The % Coverage shown in the results above refers to the ratio of pixels classified as forest using the definition above within the query AOI.

Category layers can also be cross-queried with quantitative layers. For example, the below query shows the amount of carbon according to Saatchi et al's 2011 pantropical carbon map in each land cover type using the ESA CCI land cover 2010 dataset:

▼ Carbon in Vegetation Types (ESA CCI 2010)

Area



Total Carbon










Vegetation Type	Area [ha]	Coverage [%]	Carbon Stock ~2003 [tC]	Carbon Density ~2003 [tC/ha]
Rainfed Cropland	473	0.037	60 154	127
Rainfed Cropland (Herbaceous cover)	148	0.012	8 935	60
Cropland, irrigated or post-flooding	741	0.058	28 066	38
Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	24 941	2.0	3 257 504	131

For category table queries, the 'classification' layer can be specified within the query code. The quantitative datasets/s to be grouped within these classes is included as a 'requested_layer', and the operation will run on every layer listed in the query. Note that when cross-querying layers, all datasets must be in the same projection and resolution.

9. **Category Pairing Table widgets** can be used if you have multiple qualitative/classified datasets that you want to display in one table:

Land Cover Class









	Area (ha)		
	1990	2000	2006
 Continuous urban fabric	25 298	25 298	25 495
 Discontinuous urban fabric	38 497	39 399	41 740
 Industrial or commercial units	9 758	10 068	11 196
 Road and rail networks and associated land	310	310	338
 Port areas	1 213	1 241	1 354
 Airports	2 538	2 538	2 623
 Mineral extraction sites	5 076	5 189	5 782

Specify the value you want to compare between the datasets as the 'column' for example 'area'. Use the '**layer_pairs**' parameter to tell the platform to either classify each qualitative map by itself:

layer_pairs (qual_2001, qual_2001),(qual_2002, qual_2002)

Or to cross-query each with a quantitative dataset of the same projection and resolution, for example a carbon map when you want to show how carbon values have changed between 2 landcover maps:

layer_pairs (quant_2001, qual_2001),(quant_2002, qual_2002) or
layer_pairs (quant_2001, qual_2001),(quant_2001, qual_2002)

	Total Carbon (x 1000 tC)		
	Saatchi	Baccini	Avitabile
 Mosaic cropland (50-70%) /vegetation (grassland /shrub /forest) (20-50%)	3.6	2.7	0.53
 Mosaic vegetation (grassland /shrub /forest) (50-70%) /cropland (20-50%)	611	837	965
 Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	24 155	36 365	43 492
 Open (15-40%) broadleaved deciduous forest / woodland (>5m)	11 041	10 607	7 687
 Mosaic forest or shrubland (50-70%) /grassland (20-50%)	237	238	143
 Mosaic grassland (50-70%) /forest or shrubland (20-50%)	1 130	1 048	629
 Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)	151	123	75
 Water bodies **	161	156	125

10. **Multiple Layers widgets** can be used to organise results and values from multiple quantitative datasets of the same projection and resolution into a table:

Miscanthus - High Heat & Demand Scenario

Year	Expected Area (ha)	Coverage (%)	Market Price (£/odt)	Total Biomass Grown (odt)
2015	No Data	No Data	2015	No Data
2020	12	0.22	2020	161
2025	9.2	0.20	2025	123
2030	8.6	0.21	2030	121
2035	0	0	2035	0
2040	0.23	0.083	2040	3.4
2045	No Data	No Data	2045	No Data
2050	0.045	0.013	2050	0.70

Miscanthus - Very High Heat & Demand Scenario

Year	Expected Area (ha)	Coverage (%)	Market Price (£/odt)	Total Biomass Grown (odt)
2015	No Data	No Data	2015	No Data
2020	5 116	0.85	2020	52 465
2025	2 492	0.65	2025	26 927
2030	2 522	0.64	2030	28 445
2035	631	0.27	2035	7 984
2040	464	0.34	2040	6 571
2045	348	0.47	2045	5 287
2050	501	0.60	2050	7 488

For a series of related datasets, use a similar naming structure when you upload them, for example:

ndvi_modis_201401, ndvi_modis_201404, ndvi_modis_201406, ndvi_modis_201408

Use the '**column_pattern**' parameter to tell the platform which series of layers.columns to use, for example:

```
ndvi_modis_(partial).layer,  
ndvi_modis_(partial).true_average,  
ndvi_modis_(partial).minimum,  
ndvi_modis_(partial).maximum
```

Each column (ie. true_average, minimum) is placed in a new column in the table.

In the series of datasets, '(partial)' is use like a wild card so you don't have to list each layer - '**partial_columns**' is used to list the part of the dataset name replaced in the order you want them listed:

201401, 201404, 201406, 201408

'table_titles' is used for each column heading and should be in the order you would like them displayed:

Year, Average, Minimum, Maximum

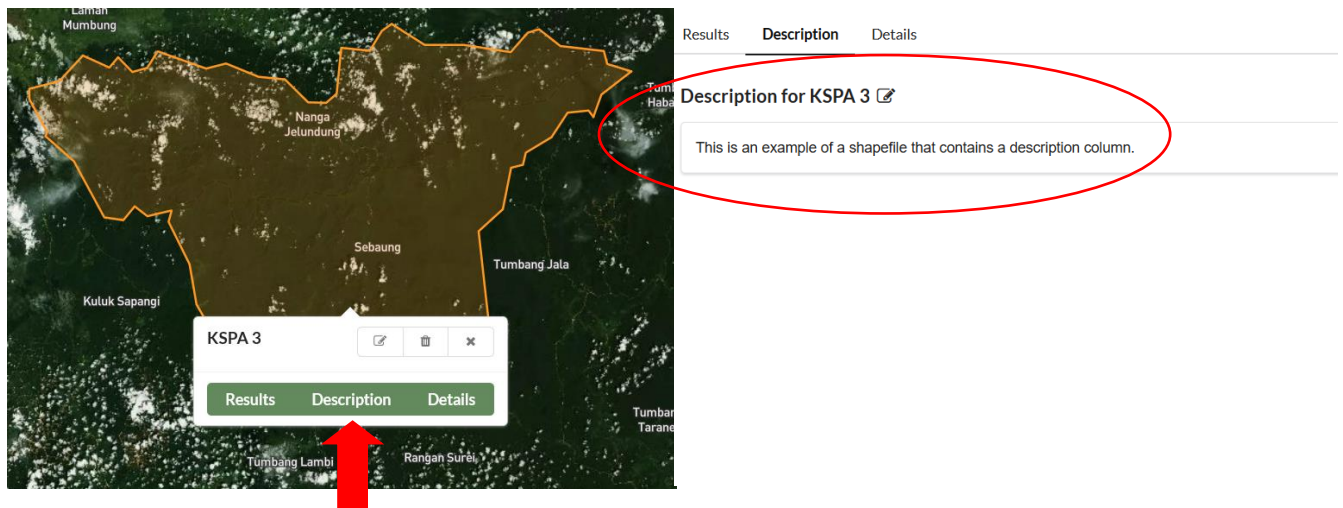
APPENDIX 1: Instructions for preprocessing & correct formats for data uploads

SHAPEFILES

Areas of interest are uploaded as shapefiles (.shp)

1. Make sure it contains the .prj projection file and that it is the “EPSG:4326” projection (i.e. GCS_WGS_1984). The file name should indicate the projection and contents (ie ghana_GCS.shp).
2. Ensure the polygons do not contain any gaps or overlap (slivers) between or within polygons. Sometimes gaps/overlaps can be difficult to identify as they occur on the boundary between 2 polygons - creating a topology within a feature dataset can help to remove gaps and slivers; alternatively, the Editor tools can be used to manually correct topology errors.
3. Make sure the shapefile is 2D (without M or Z values). This can be checked under the shapefile properties and will be shown under ‘Coordinates have Z values: No/Yes’. M or Z values can be removed by using the copy features tool to create a new shapefile:
 - a. Select the output shapefile
 - b. Click the Environments button at the bottom of the tool dialog box.
 - c. Expand the General Settings.
 - d. For the parameter, Output has Z Values, change the value to Disabled.
 - e. For the parameter, Output has M Values, change the value to Disabled.
 - f. Click OK in the Environments dialog box.
 - g. Click OK to execute the geoprocessing tool.
4. Check how many vertices are in your polygons - processing speed on the platform increases if you “simplify” polygon shapefiles.
 - a. Experiment to find the minimum amount of vertices that still accurately represent the shape of your polygons. For example, it is quite possible to simplify a polygon with 6000 vertices to 2000 vertices without losing important information.
(This is very easy to do in QGIS: Vector>Geometry tools>Simplify Geometries - be careful not to ruin the topology of your polygons though by creating small gaps and silvers)

5. If you include a column in the attribute table of the shapefile called “name”, this will automatically become the AOI name when uploaded. This text can be edited for each AOI after upload, but for shapefiles with many polygons adding a name field can save a lot of time. You can also add additional text, upload images, tables or links for each AOI once uploaded.
6. If you include a column in the attribute table of the shapefile called “description” (the shapefile character limitation in ArcGIS will only let you create a “descriptio”, this still works), this will automatically become the AOI description on the interface (also editable after upload):



7. Finally, all of the shapefile parts (.shp; .prj; .shx; .sbn; .sbx etc) should be sent to a single compressed folder using zip software (Winzip/Peazip/7zip). The compressed folder can then be uploaded to a shared Dropbox account, emailed (depending on the size) or transferred via a file transfer service such as WeTransfer.

How to simplify a polygon vector layer if it has too many vertices

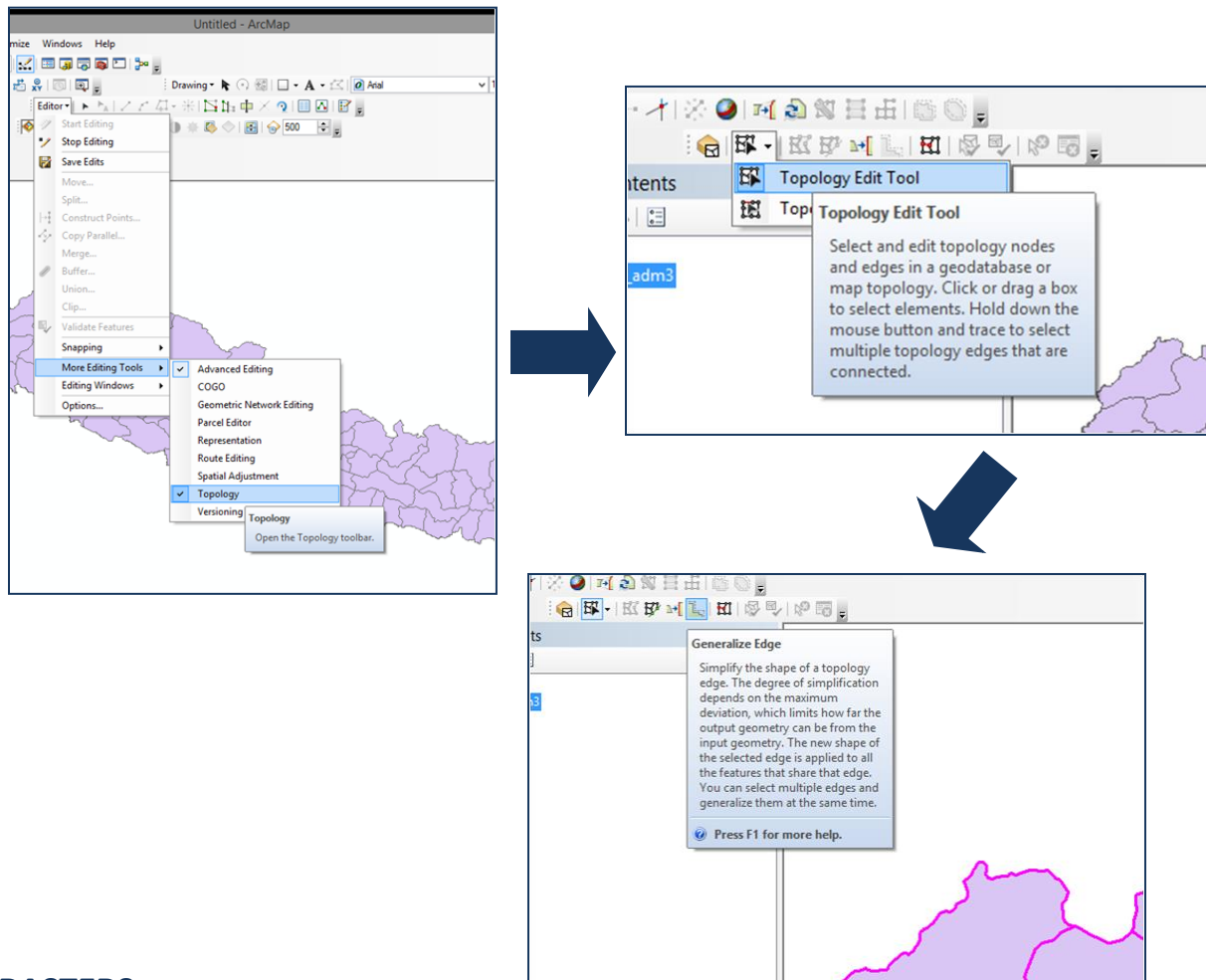
In QGIS:

1. Open vector file in QGIS
2. In the menu on top, click Vector -> Geometry Tools -> Simplify Geometry
3. Choose an appropriate tolerance (high values = fewer vertices).
4. Run and test your file

In QGIS, simplifying polygons can sometimes cause small gaps or extra tiny polygons between existing polygons. Make sure to use a tolerance that doesn't ruin the topology of your shapefile.

ArcGIS has a 'topology edit tool' that is the easiest way to simplify polygons without causing topology errors:

1. Start editing
2. under 'More editing tools, make sure 'Topology' is selected in the topology toolbar
3. Select 'Topology Edit tool'
4. Select the polygons to simplify
5. Use 'Generalise edge to simplify without creating gaps between polygons - you'll need to select a tolerance based on the units your polygon is in.



RASTERS

1. Raster datasets can be uploaded in any projection; however, to ensure that your results are accurate, equal-area projections and square pixels are strongly recommended. The default projection for the platform is GCS WGS 1984 (EPSG 4326).
2. Make sure your raster file is saved in either 16 bit integer or 32 bit float format
 - If a time series of rasters is used, make sure all are either integer or floating point as the Ecometrica Mapping Platform cuts off the last 2 decimals
3. Make sure that you have assigned only 1 value as the NoData value.
 - It is best to use something easy such as -9999 rather than using ArcGIS's default value which can be quite complicated. Avoid using 0 (zero) as the NoData value

because zero is likely to represent a valid pixel value.

4. Ensure that the raster layer has only one field of information.
 - Delete raster attribute table or count field if needed
5. Check that the file extents are appropriate for your projection – for example, for rasters projected in GCS WGS 1984 (EPSG 4326) the maximum extent of the file can only be -90 to 90 degrees latitude and -180 to 180 longitude.
6. The file format should be Geotiff (we will only upload the .tif file, so make sure there are no accompanying .tfw files that contain projection information).
 - You can test whether the .tif file will work on its own (without associated files) by saving only the .tiff file in a separate folder and opening it in a newly opened GIS project. Check that the coordinates make sense when the file is opened.
7. Ensure the raster layer is in the required resolution - if you are planning on combining several raster layers in a query, then the raster layers should be in the same projection and resolution.
 - The platform handles 28 resolution levels as set out in the Ecometrica Mapping Platform resolutions Table 1 on the following page. For datasets in GCS WGS 1984 (EPSG 4326) you will need to select the resolution level (between 1 and 28) for the dataset. For datasets in any other projection, the following information can be ignored as the resolution will be automatically read from the file and no resampling will occur.
 - Raster data is uploaded to the closest resolution level that has smaller pixels than the original data. Nearest neighbour or average is normally used as the resampling method when uploading data, however cubic convolution and bilinear resampling methods can also be used.
 - You can now upload the file to Dropbox or any other cloud storage service. Make sure the web URL for your file is publicly accessible. Upload the raster under Raster Layers > Add Raster Layer > Import file URL
 - Do not ZIP the geotiff before you upload it to the cloud service.

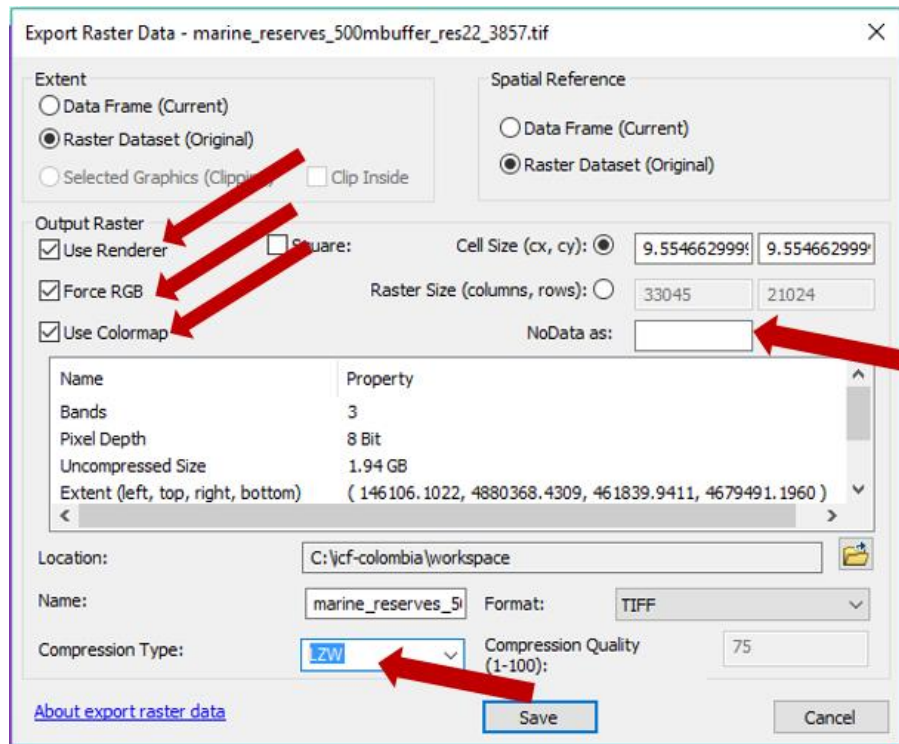
Table 1: Ecometrica Mapping Platform Resolution Table

Resolution Level	Cell size at the equator (m)	Cell size (Arc Seconds) [div by 3600 to get degrees]	Cell size (Degrees) [mul by 3600 to get arc seconds]	Max Zoom Level (for Display Layers)
1	20037581	648000	180.0	6
2	10018790	324000	90.0	6
3	5009395	162000	45.0	6
4	2504698	81000	22.5	6
5	1252349	40500	11.25	6
6	626174.4	20250	5.625	6
7	313087.2	10125	2.8125	6
8	156543.6	5062.5	1.40625	6
9	78271.8	2531.25	0.703125	6
10	39135.9	1265.625	0.351563	6
11	19567.95	632.8125	0.175781	6
12	9783.975	316.4063	0.087891	6
13	4891.987	158.2031	0.043945	6
14	2445.994	79.10156	0.021973	10
15	1222.997	39.55078	0.010986	10
16	611.4984	19.77539	0.005493	12
17	305.7492	9.887695	0.002747	13
18	152.8746	4.943848	0.001373	14
19	76.4373	2.471924	0.000687	14
20	38.21865	1.235962	0.000343	15
21	19.10933	0.617981	0.000172	16
22	9.554663	0.30899	0.000086	17
23	4.777331	0.154495	0.000043	17
24	2.388666	0.077248	0.000021	17
25	1.194333	0.038624	0.000011	18
26	0.597166	0.019312	0.000005	18
27	0.298583	0.009656	0.000003	18
28	0.149292	0.004828	0.000001	18

DISPLAY LAYERS

Maps to be displayed on the map interface visually need to be created as 3-band RGB rasters should be in EPSG:3857 -- WGS84 Web Mercator (Auxiliary Sphere) projection. The steps below describe how to create a “display layer” for the platform in ArcGIS and then in QGIS:

1. Resample the raster layer to the appropriate resolution if needed
 - The resolution should preferably be the same or at least closely resemble the up-loaded data layer.
2. Make sure the layer is re-projected to EPSG:3857 -- WGS84 Web Mercator (Auxiliary Sphere)
3. Convert 1-band classified rasters to RGBs:
 - Open the file in ArcGIS.
 - Set the symbology to the display colours/categories.
 - Set the ‘Display noData as’ to 255,0,255. (Magenta 255,0,255 was chosen as the colour to set as transparent for nodata as few classifications use it, however if the colour is included in the file, it should be set to the next closest colour ie. 255,1,255).
4. You can export a layer file (.lyr) if the display colours are likely to be used again.
5. Under the table of contents, right-click the layer > Data > Export Data
6. Select Use Renderer > Force RGB to convert a 1-band raster to an RGB image. Make sure to leave the nodata value blank if the nodata class was changed to a class value. LZW compression may also be necessary as the exported 3-band rasters are usually very large.



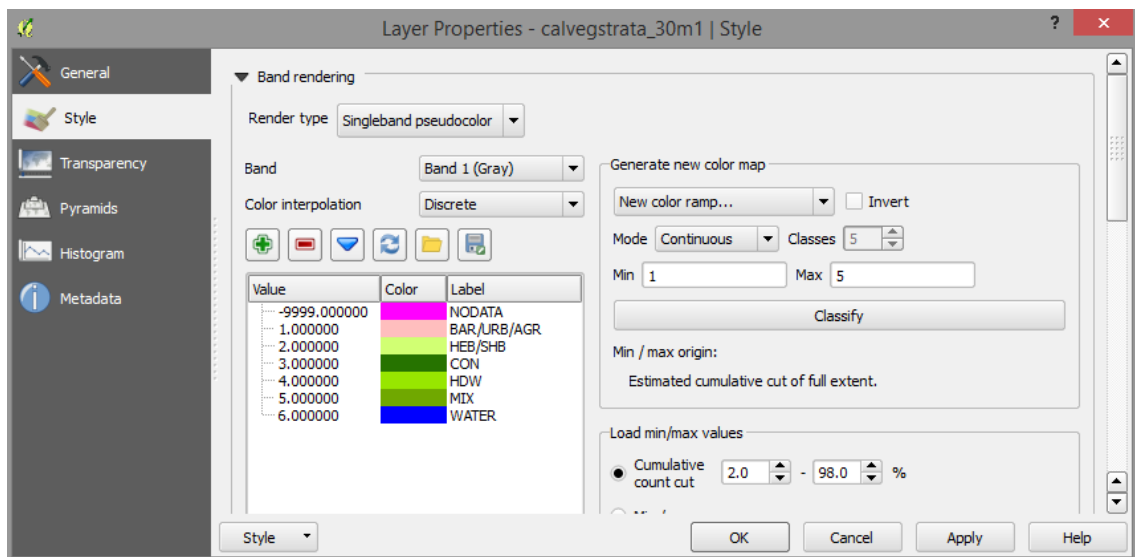
7. Check the output colours.

- Note that ArcGIS always automatically applies a histogram & gamma stretch. Make sure to remove the stretching under the 'Symbology' tab. The unstretched file is how it will look on the map interface.
- Double-check that the background of the RGB correctly displays 255,0,255.

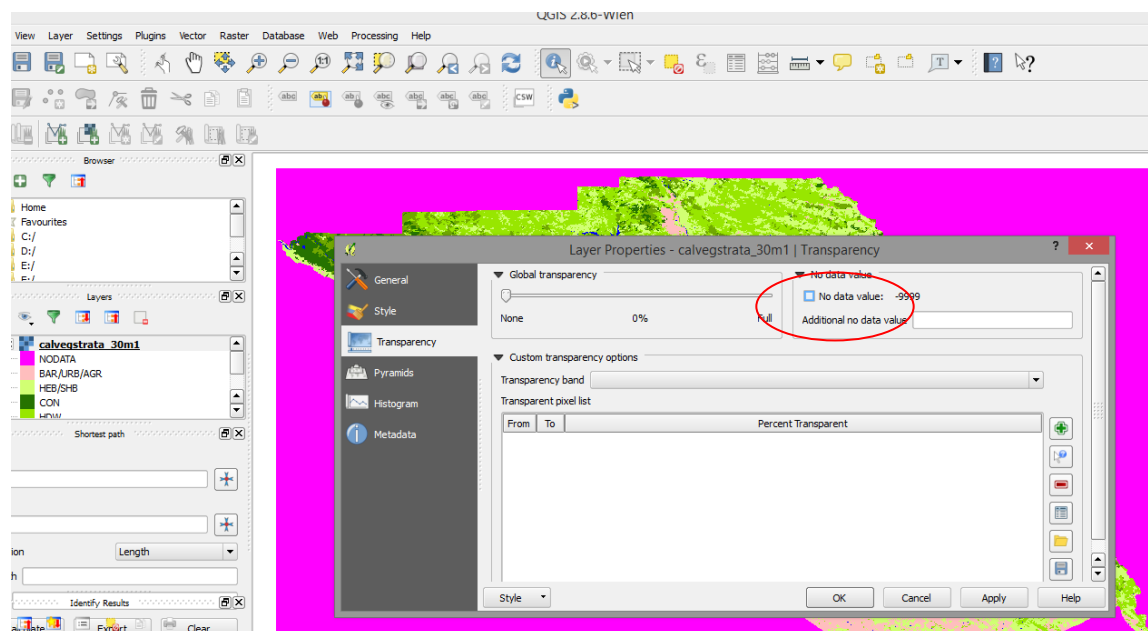
8. You will need to run the 'Calculate Statistics' tool in ArcCatalog or under the 'Data management' toolbox for the RGB layer so that gdal can read the file when uploading to the mapping platform. Make sure you calculate the statistics within the same session.

In QGIS:

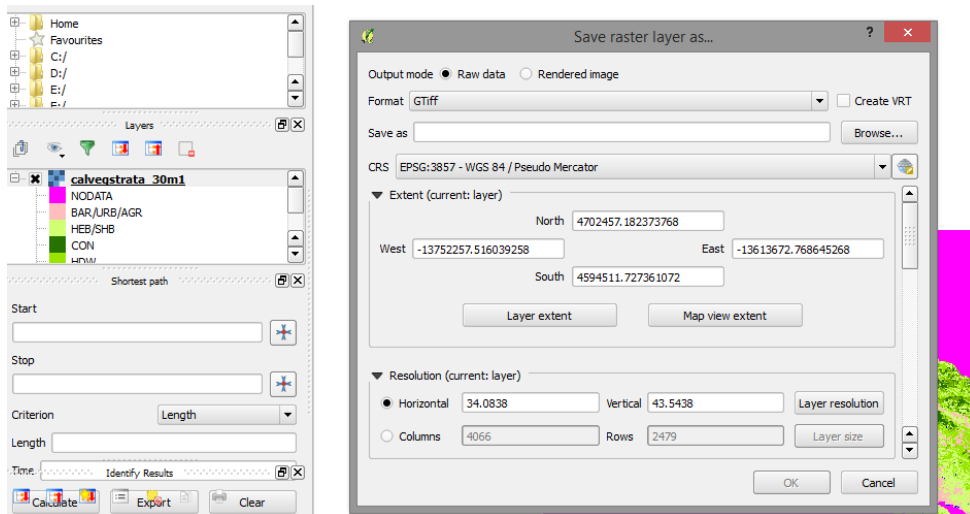
1. Make sure the layer is re-projected to EPSG:3857 -- WGS84 Web Mercator (Auxiliary Sphere)
2. In the 'Style' tab under 'Layer properties', select 'Render Type' as 'Single Pseudo-color'. Set the colour for each of your raster values, or classify quantitative rasters using the colour ramp drop-down:



- In QGIS, if your nodata value is set correctly in your file as NoData, it will automatically be transparent (even if you add it as a separate value in your colour scheme).
- If you convert to an RGB with nodata set as transparent without a colour assigned to the value, your nodata values will come out as a black frame in your RGB.
- To view or change the colour of your nodata values, make sure to assign the nodata value a colour in your style settings (preferably 255, 0, 255). Go into the 'Transparency' tab under 'Layer Properties' and uncheck the 'No data value' field:

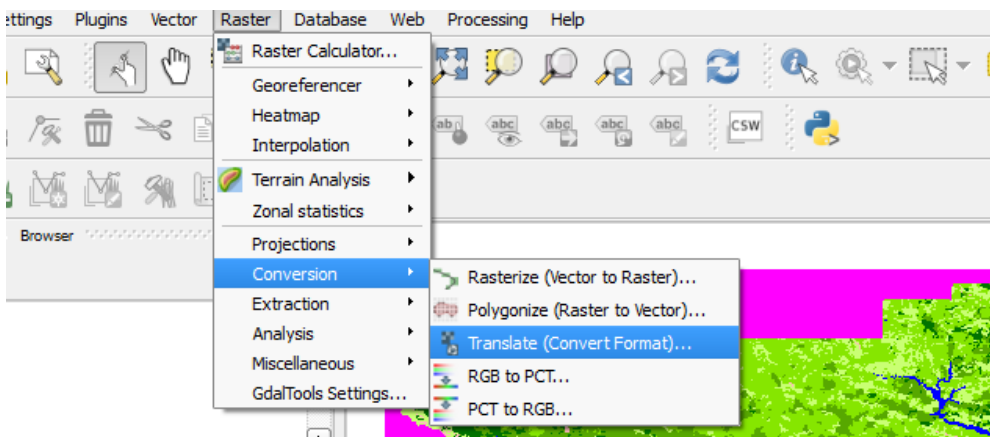


3. To convert your coloured map into a 3-band RGB .tif, right-click on the layer and select 'Save As'



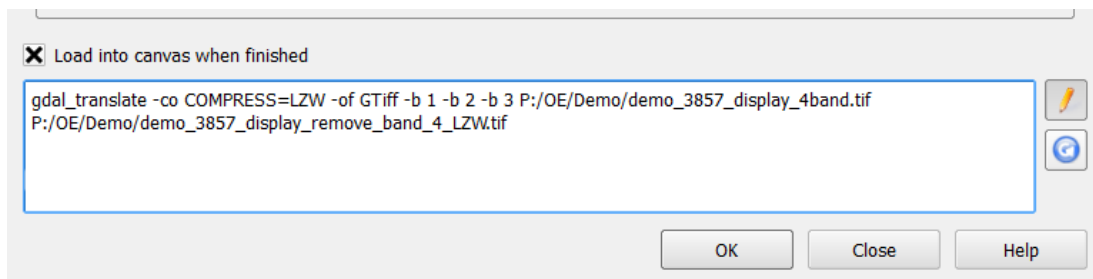
- Select 'Rendered Image', make sure the project is '3857- Pseudo Mercator', choose a location and name, and then click 'OK'.
- Most recent versions of QGIS will create an additional transparency band when converting to a rendered image - so in QGIS you will have created a 4-band RGBA instead of a 3-band RGB.

4. To remove the 4th band you can use the Raster > Conversion > Translate tool:



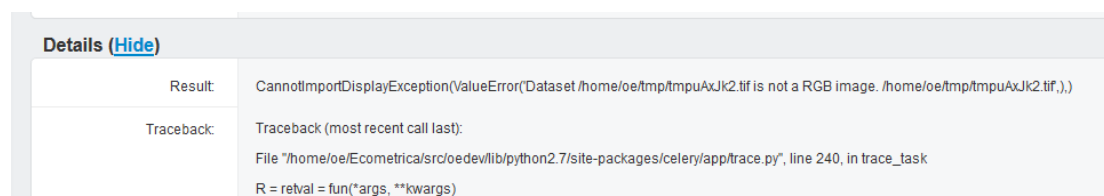
- In the gdal code area, click the edit button and use the below script to extract bands 1, 2 & 3 and apply LZW compression:

```
gdal_translate -co COMPRESS=LZW -of GTiff -b 1 -b 2 -b 3 input.tif output.tif
```



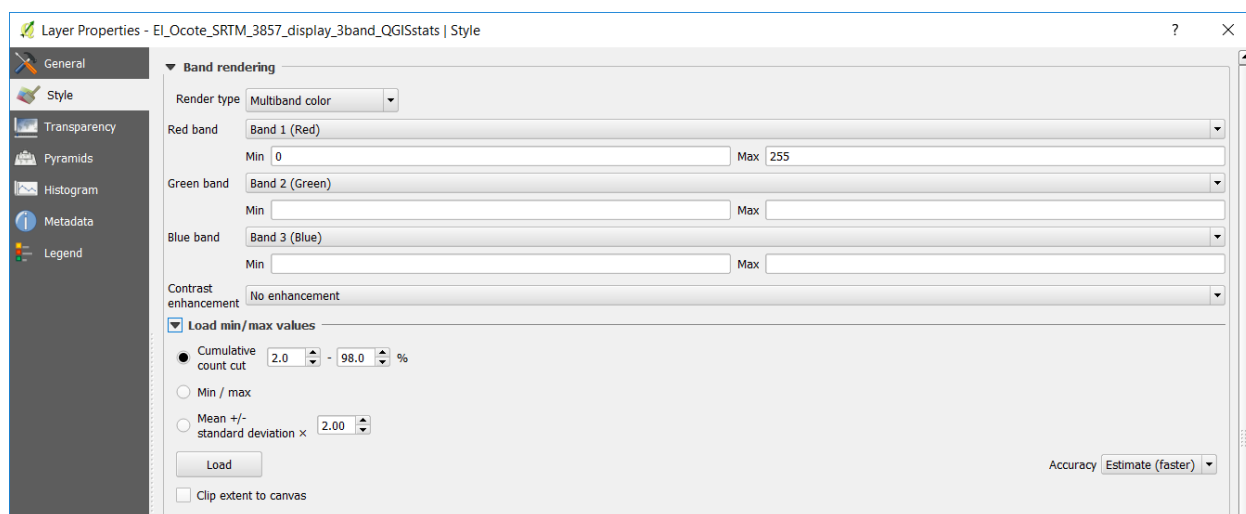
- If you don't remove the 4th band created when using QGIS, you will get the below upload failure message (shown under 'System' > 'Tasks') on the platform:

Result: CannotImportDisplayException(ValueError('Dataset /home/oe/tmp/tmpuAxJk2.tif is not a RGB image. /home/oe/tmp/tmpuAxJk2.tif'),)



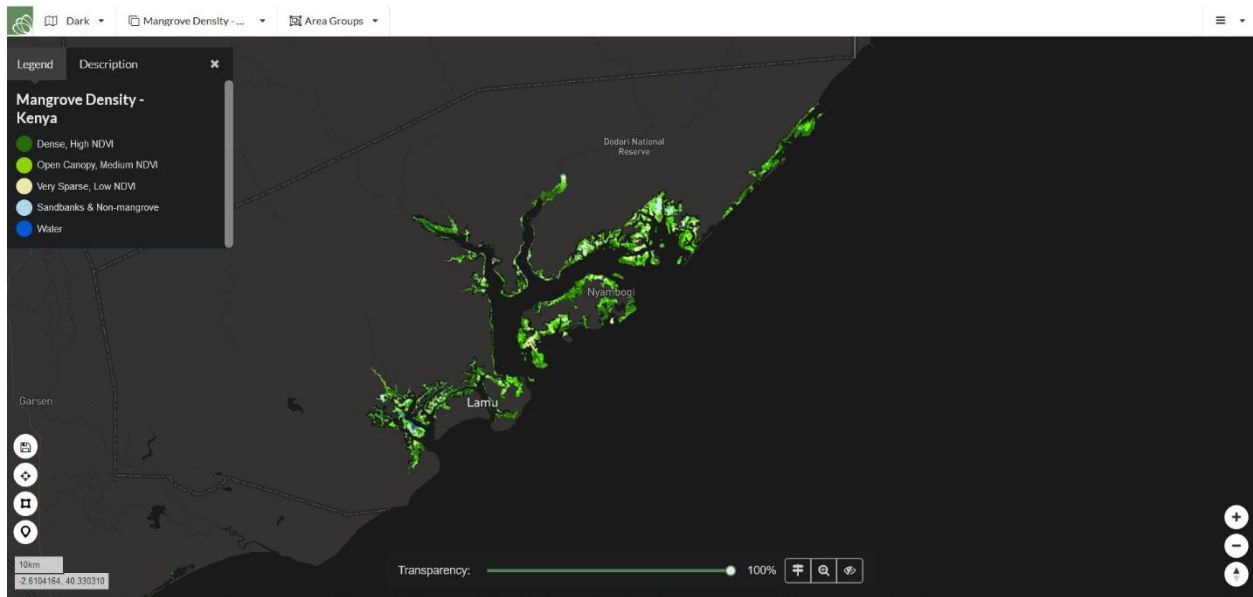
Note: When using ArcGIS, if the statistics for the display layer are not calculated (in the same map session), the layer incorrectly displays as a black or white frame on the platform. While this is usually only an issue with ArcGIS, you can calculate the statistics for the display layer in QGIS using the following steps:

- Right-click on the layer and select 'Properties'. Next, click on 'Style', expand the 'Load min/max values' menu, select the 'Min/Max' button, change the accuracy to 'Actual (slower)' and press 'Load'.
- When you look in the 'Metadata' tab, under 'Properties' it should now show statistics for Band 1, 2 and 3.



DISPLAY LAYER LEGEND GRAPHICS

Layer legend graphics for qualitative datasets are automatically generated from the legend layer (see the Legend section of this manual). Map layer legends are displayed in the top-left corner of the interface when a display layer is selected:

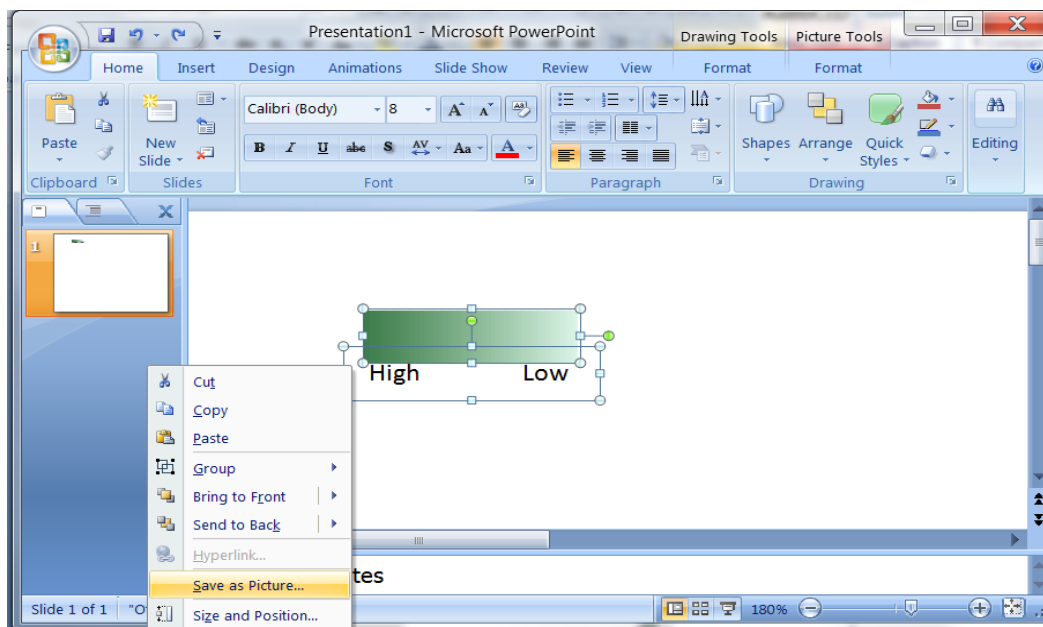


However, you can manually upload legend graphics for quantitative datasets.

1. Legend graphics should have a maximum width of 4.3cm and height of approximately 0.3cm (or approximately 400 pixels x 130 pixels). Smaller legends tend to display better on the web interface. The text above or below the colour ramps can be added separately using a program such as Microsoft Word or PowerPoint, or OpenOffice Impress.
2. For the best results, the background colour should be transparent.
3. The graphics can be created by copying a legend in ArcGIS or QGIS and saving it as a .PNG to keep the background transparent.

In ArcGIS:

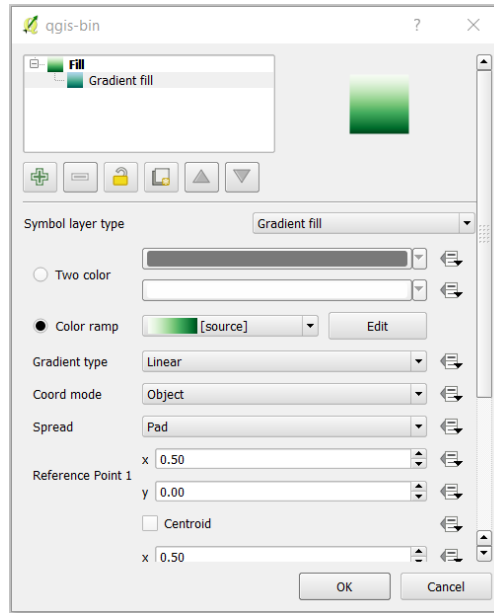
- Go to the 'Layout View'. Insert a legend and adjust the labels, colours or stretch as required.
- Select the legend by clicking on it, right-click and copy it. Paste the legend in a word or presentation document (like Microsoft Office PowerPoint).
- Crop, rotate or re-shape your legend graphic as needed. You can add text labels as a text box as well (white text works best).
- Select your legend graphic (and text box if you have made one) and right-click to select 'Save as Picture'. Save as a .PNG file.



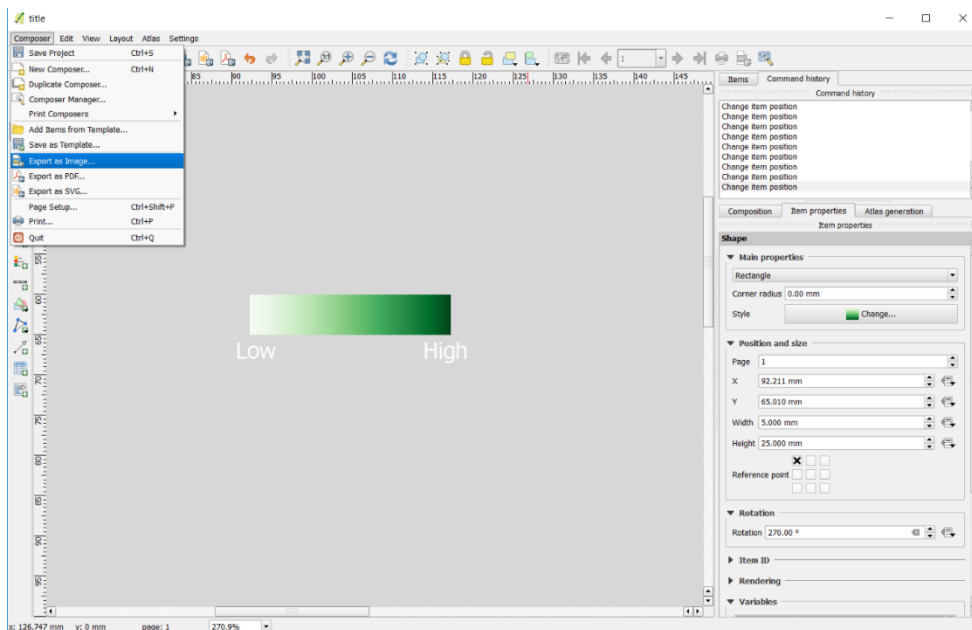
In QGIS:

- Go to Project > New Print Composer. Under Layout, select Add Shape > Add Rectangle and draw a rectangle. Adjust the height and width to a maximum of 35 x 10 mm under the Item Properties tab/panel. Smaller legends tend to display better on the platform.
- Set the page itself to 100% transparency. This is done through the Composition tab/panel under Page Settings > Page Background. (Panels can be changed under View > Panels.)
- Change the Style in the Item Properties tab/panel by switching the Symbol Layer Type to Gradient Fill. Select Color ramp and choose the colour ramp that was ap-

plied to your display.



- Under the Item Properties tab/panel edit the Rotation so that the rectangle lies horizontally.
- Add labels by selecting Layout > Add label. Change the colour of the text to white and adjust font size as needed.
- Under Composer > Export as Image, and crop or re-size as needed in an image editing or word document. Right-click the image and select Save as Picture to save your legend graphic as a .PNG file.

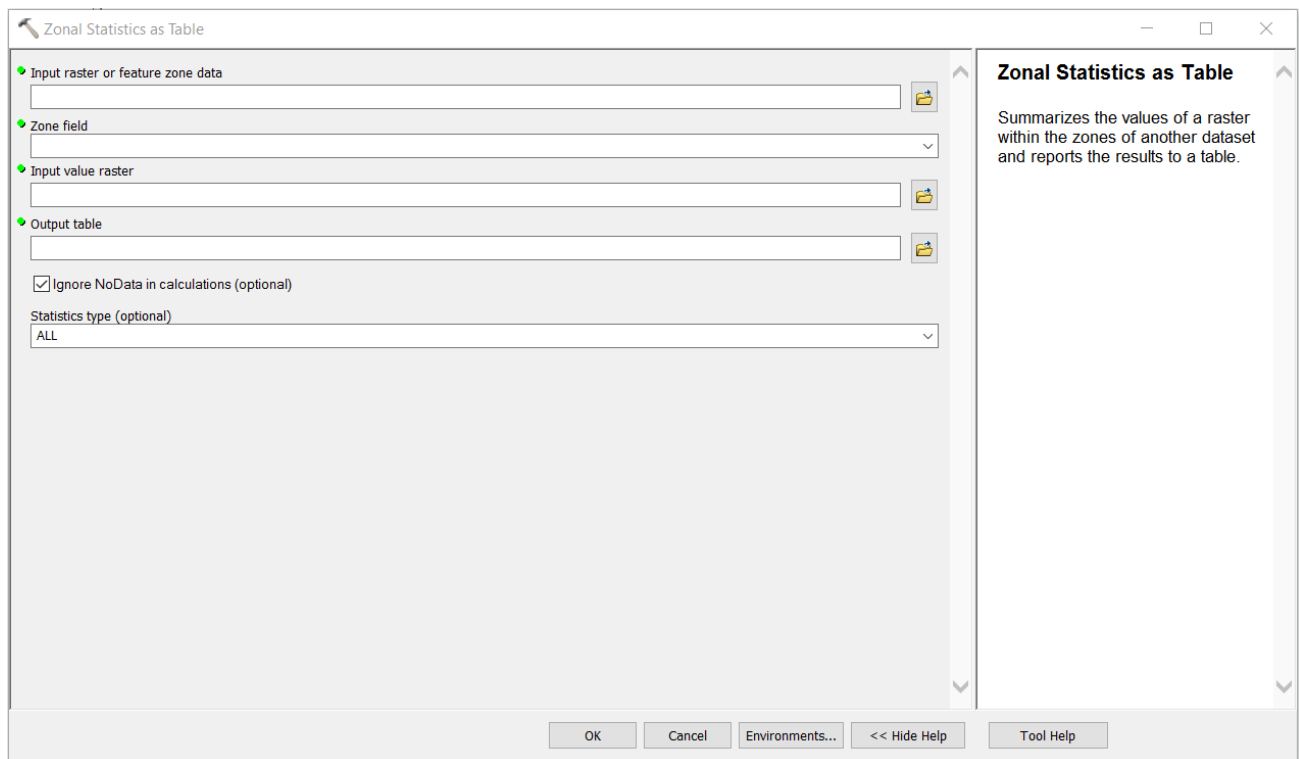


APPENDIX 2: Testing Platform Results

The steps below describe how to extract raster values for polygon areas using ArcGIS and QGIS in order to compare results generated from offline GIS software with the mapping platform results and ensure that datasets have been properly uploaded. Because of the way ArcGIS' Zonal Statistics tool works, querying a raster with complex polygon shapes in ArcGIS may produce results that differ from platform results – the following steps aim to explain these differences, and provide a method for accurately comparing results across mapping tools.

In ArcGIS:

1. Load your raster dataset and area file, ensuring that they are in same projection.
2. Run 'Zonal Statistics as Table' tool.
 - This tool applies a vector-to-raster conversion internally in order to extract results from a raster dataset: <http://pro.arcgis.com/en/pro-app/tool-reference/spatial-analyst/zonal-statistics.htm>
 - ArcGIS statistics produced using this method are therefore representative of a rasterized version of your polygon area files; to replicate ArcGIS results on the Ecometrica Mapping Platform, rasterized polygons can be uploaded.



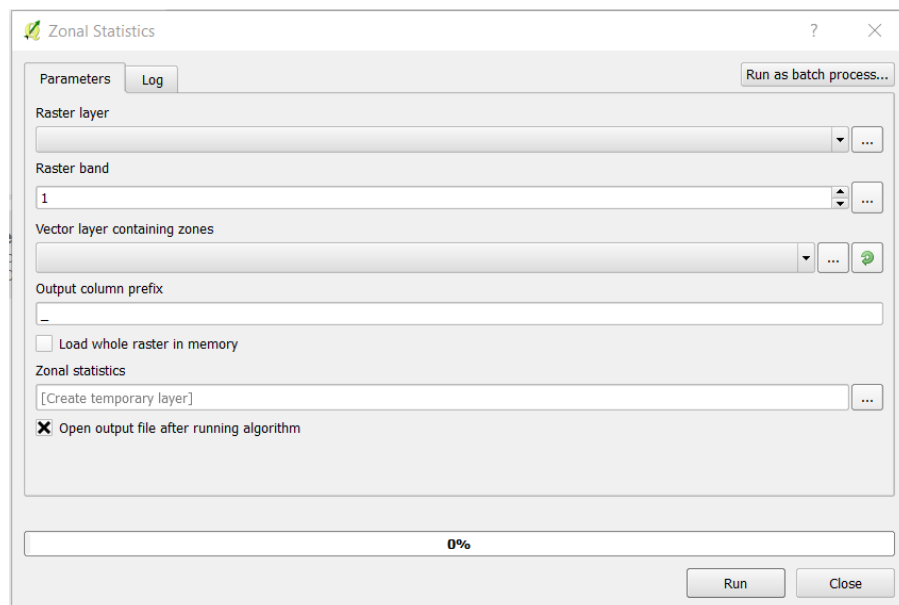
3. Rasterize your polygons.
 - In order to compare results produced by ArcGIS and your online results, rasterized versions of your area files will need to be uploaded to the platform.

- Use the 'Feature to Raster' conversion tool. Under 'Output cell size' select the same size than the raster you are querying.
- Note: if Zonal Statistics were to be run on these rasterized polygons, the results from Step 2 should be the same.

4. Upload the rasterized polygons to your application on the platform using the instructions starting on page 17 and set up query results using the instructions starting on page 21. The platform and ArcGIS should match.

In QGIS:

1. Load your raster dataset and area file, ensuring that they are in the same projection.
2. Run the 'Zonal Statistics' plugin.
 - The plugin will generate output columns in the vector file (area file) with a user-defined prefix.
 - This tool operates in the same manner as the mapping platform (based on a GDAL library) and should produce results that are directly comparable to the online results. There is no need to rasterize any vector layers as with ArcGIS.



APPENDIX 3: Ecometrica Platform – Terms of Use (June 2016)

This document explains to you the basis on which you may make use of the Ecometrica Platform. Please read these terms of use carefully before you start to use the Ecometrica Platform. By using the Ecometrica Platform, you indicate that you accept these terms of use and that you agree to abide by them. If you do not agree to these terms of use, please refrain from using the Ecometrica Platform. We may revise these terms of use from time to time. Such variation will be notified to you.

Information about Ecometrica

The Ecometrica Platform is operated by us, Ecometrica Limited, registered in Scotland as a limited company under company number SC339323 and having its registered office at Orchard Brae House, 30 Queensferry Road, Edinburgh EH4 2HS.

Accessing the Ecometrica Platform

Access to the Ecometrica Platform is restricted to registered users. You must keep your user identification code, password or any security information safe and not disclose them to anyone. We have the right to disable any user identification code or password at any time, if you have failed, or we reasonably suspect you have failed, to comply with any of the provisions of these terms of use.

You are responsible for making all arrangements necessary for you to have access the Ecometrica Platform. You are also responsible for ensuring that all persons who access the Ecometrica Platform through your internet connection are permitted to do so, are aware of these terms and to ensure that they comply with them.

Intellectual property rights

We are the owner, or licensee, of all intellectual property rights in the Ecometrica Platform, and in the material published on it. Those works are protected by database rights, copyright laws and treaties around the world. All such rights are reserved.

You shall not, except as may be allowed by any applicable law which is incapable of exclusion:

- attempt to copy, modify, duplicate, create derivative works from, frame, mirror, republish, download, display, transmit, or distribute all or any portion of the Ecometrica Platform in any form or media or by any means; or
- attempt to reverse compile, disassemble, reverse engineer or otherwise reduce to human-perceivable form all or any part of the Ecometrica Platform; or
- access all or any part of the Ecometrica Platform in order to build a product or service which competes with the Ecometrica Platform; or
- use the Ecometrica Platform to provide services to third parties except as expressly permitted in a written agreement between us; or

- license, sell, rent, lease, transfer, assign, distribute, display, disclose, or otherwise commercially exploit, or otherwise make the Ecometrica Platform available to any third party without our written consent; or
- knowingly introduce viruses, trojans, worms, logic bombs or other material which is malicious or technologically harmful; or
- attempt to gain unauthorised access to the Ecometrica Platform, the server on which the Ecometrica Platform is stored or any server, computer or database connected to the Ecometrica Platform. You must not attack the Ecometrica Platform via a denial-of-service attack or a distributed denial-of service attack.

Reliance on the Platform

We make commercially reasonable efforts to ensure that the information contained or made available on the Ecometrica Platform is complete and accurate at the time it is produced. However, we make no warranties, representations or undertakings about the content of the information contained on the Ecometrica Platform or the results generated using the Ecometrica Platform (including, without limitation, any as to the completeness or fitness for any particular purpose of such content). In addition, we have no responsibility for any information or materials that may be included on the Ecometrica Platform from you or other third parties.

Our liability

To the extent permitted by law and except where expressly stated in this document, we hereby expressly excludes all conditions, warranties and other terms whether express or implied by statute, common law or otherwise.

We shall not in any circumstances be liable whether in contract, tort (including for negligence and breach of statutory duty howsoever arising), misrepresentation (whether innocent or negligent), restitution or otherwise, for any loss (whether direct or indirect) of data, profits, business, business opportunities, revenue, turnover, reputation or goodwill or any other indirect or consequential loss.

Our total aggregate liability in contract, tort (including negligence and breach of statutory duty howsoever arising), misrepresentation (whether innocent or negligent), restitution or otherwise, arising in connection with your use of the Ecometrica Platform and under these terms of use shall in all circumstances be limited to fifty thousand pounds Sterling (£50,000).

Information about you and your visits to the Platform

You acknowledge that by making the Ecometrica Platform available to you, we may process some of your personal data (e.g. your name, contact details and email address). By using the Ecometrica Platform, creating an account you hereby consent for us to:

- a. process your personal data for the purpose of these terms and making the Ecometrica Platform available to you;

- b. transfer your personal data to destinations outside the European Economic Area (EEA) which may have lower standards of data protection than those applicable in the EEA; and
- c. retain your personal data for as long as is necessary for the purpose of these terms and making the Ecometrica Platform available.

We shall have the right to disclose your identity to any third party who is claiming that any material posted or uploaded by you to the Ecometrica Platform constitutes a violation of their intellectual property rights, or of their right to privacy.

We may report any such breach to the relevant law enforcement authorities and we will co-operate with those authorities by disclosing your identity to them. In the event of such a breach, your right to use the Ecometrica Platform will cease immediately.

Uploading material to The Ecometrica Platform

When using the Ecometrica Platform, you must not distribute or transmit any material that:

- is unlawful, harmful, threatening, defamatory, obscene, infringing, harassing or racially or ethnically offensive;
- facilitates illegal activity, depicts sexually explicit images or promotes unlawful violence;
- is discriminatory based on race, gender, colour, religious belief, sexual orientation, disability, or any other illegal activity; or
- causes damage or injury to any person or property.

We will not be responsible, or liable to any third party, for the content or accuracy of any materials posted by you or any other user of the Ecometrica Platform.

We will have the right to remove any material or posting you make on the Ecometrica Platform if, in our opinion, such material does not comply with the standards set out above.

We will not be liable for any loss or damage caused by a distributed denial-of-service attack, viruses or other technologically harmful material that may infect your computer equipment, computer programs, data or other proprietary material due to your use of the Ecometrica Platform or to your downloading of any material posted on it, or on any website linked to it.

Links from the Ecometrica Platform

Where the Ecometrica Platform contains links to other sites and resources provided by third parties, these links are provided for your information only. We have no control over the contents of those sites or resources, and accept no responsibility for them or for any loss or damage that may arise from your use of them.

Term and termination

We may terminate your access to the Ecometrica Platform immediately by written notice to you if you commit, or we have reasonable grounds for suspecting that you have committed, a material or persistent breach of these terms which you fail to remedy (if remediable) within 14

days after the service of written notice requiring you to do so. Upon termination for any reason:

- a. all rights granted to you under these terms shall cease;
- b. you must cease all activities authorised by these terms, including accessing the Ecomet-rica Platform;
- c. we may destroy or otherwise dispose of any data in our possession unless we receive, no later than ten (10) days after termination, a written request for the delivery to You of the then most recent back-up of data. We will use reasonable commercial endeavours to deliver the back-up to you within thirty (30) days of receipt of such a written request, provided that you have, at that time, paid all fees and charges outstanding at and resulting from termination (whether or not due at the date of termination). You shall pay all reasonable expenses incurred by us in returning or disposing of the data; and
- d. the accrued rights of the parties as at termination, or the continuation after termination of any provision expressly stated to survive or implicitly surviving termination, shall not be affected or prejudiced.

Jurisdiction and applicable law

The English courts will have exclusive jurisdiction over any claim arising from, or related to, a visit to the Ecometrica Platform although we retain the right to bring proceedings against you for breach of these conditions in your country of residence or any other relevant country.

These terms of use and any dispute or claim arising out of or in connection with them or their subject matter or formation (including non-contractual disputes or claims) shall be governed by and construed in accordance with the laws of England.