

3rd Digital Mapping Course

Tutorial: Water-Food Nexus

The importance of the Water-Food Nexus in agriculture is significant to produce grains, fruits and vegetables on a large scale, and specifically rice, which is the main food for more than half the world's population. The availability of water resources must be considered to meet the global food demands of today and for future generations. In this tutorial you will learn how to develop a StoryMap by using ArcGIS Online public data, improve the visualization of digital features (i.e. polygons and points), create a comparative thematic map application of the water/rice nexus, and connect through social media platforms the gastronomic experience of rice culinary traditions in Italy.

Goal #1: Create two maps to visualize:

- A. World rice production (tons)
- B. World water availability

Data sources:

- Food and Agriculture Organization of the United Nations (<http://www.fao.org/faostat/en/#data/QC>)
- Google Research Tables (<https://research.google.com/tables>)

Note: All data presented comes from the above sources and has been postprocessed with the sole purpose to improve the overall quality of the data. In addition the presented data will make it easier for the user to read the content, improve the visualization of features, and avoid inherent issues that arise when using open data.

1. First, visit the [ArcGIS website](#) and sign in using your credentials

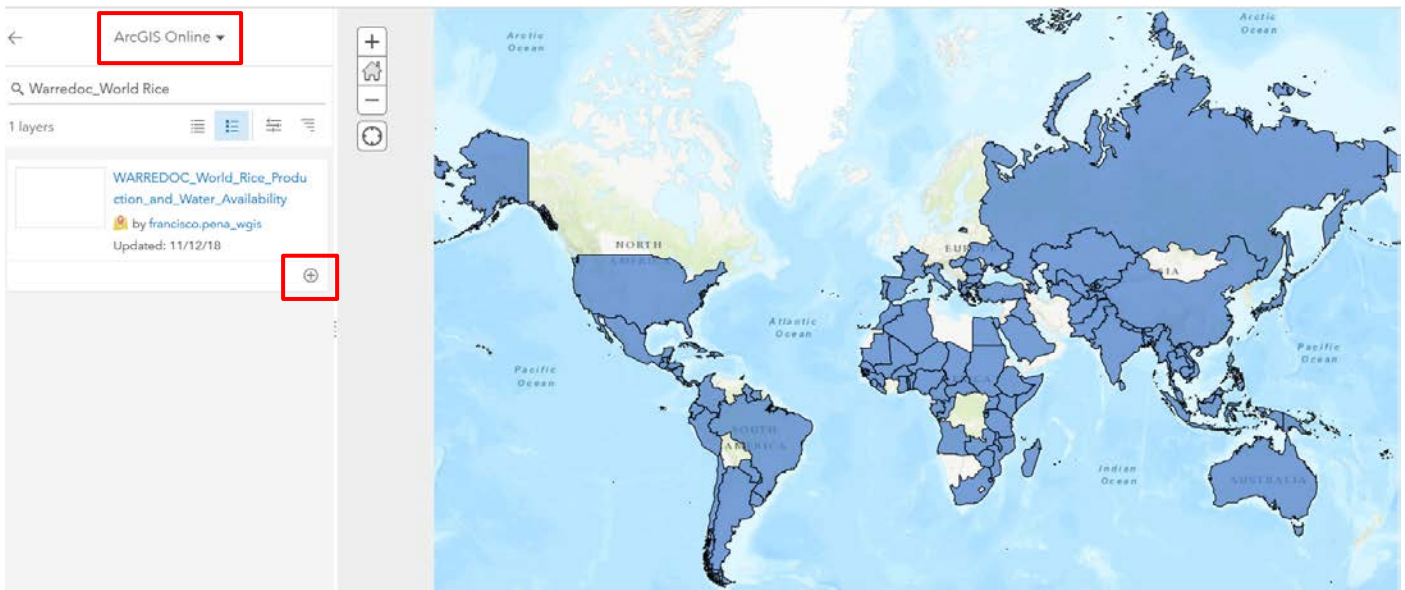
The screenshot shows the ArcGIS Sign In interface. On the left, there is a section titled 'Need an ArcGIS Public Account?' with a 'CREATE A PUBLIC ACCOUNT' button. On the right, the 'Sign In' form is visible, containing fields for 'Username' (filled with 'francisco.pena_wgis') and 'Password' (masked with dots). Below the password field is a checkbox for 'Keep me signed in' and a 'SIGN IN' button, which is highlighted with a red box.

2. On the upper menu:

- Click on Map

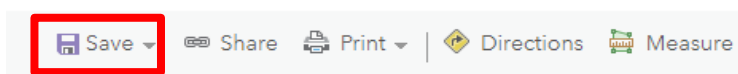


- Add > Search for Layers > ArcGIS Online > Search for the following files:
 - i. WARREDOC_World Rice Production and Water Availability (Polygon)

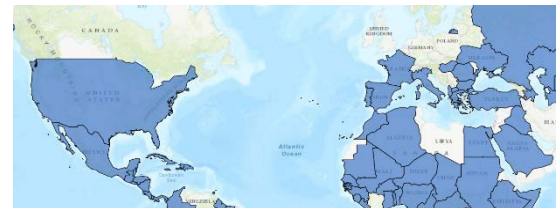


3. Before you start developing your map:

- Click on the layer name > more options icon (three points) > change Name: World Rice Production
- To save the project click on Save > Save as > Water-Food Nexus (Rice)



Home ▾ Water-Food Nexus (Rice) ✎



4. Now open the Attribute Table to check the data and the default selected attribute of the map. We are creating a thematic map that uses a range of colors in proportion to values:

World Rice Production: (Polygons)

- A total of 109 countries are included in the list. We are interested in the latest world rice production data, stored in the column 'Value'
- Change Style > Choose an attribute to show: Value
- Select a drawing style > Counts and Amounts (Color) > Options > Classify Data using Natural break with 5 classes > Set ranges 0, 100, 1000, 10M and 100M
- Change symbols > Brown scale > Transparency > 25% > OK

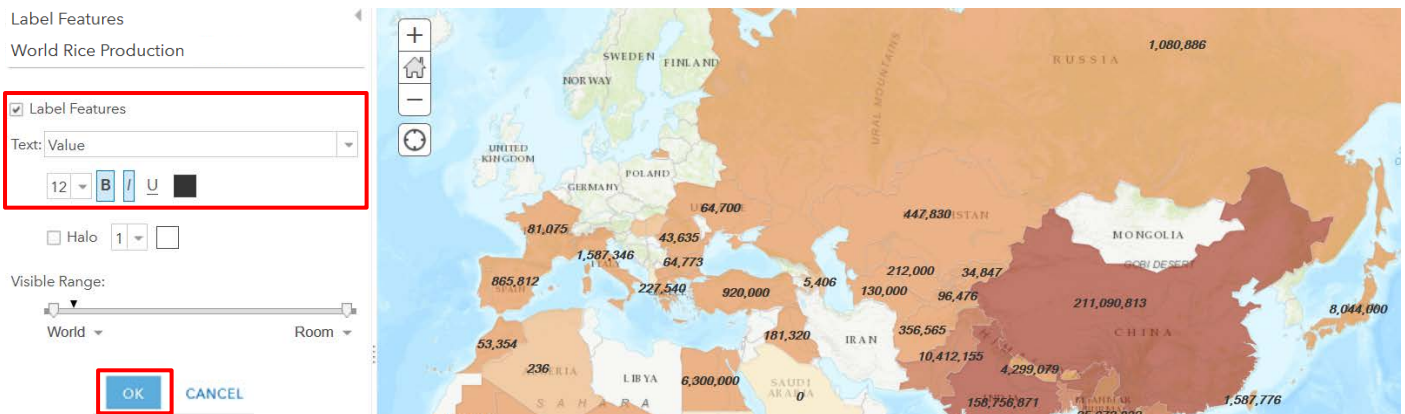
World Rice Production

WARREDOC World Rice Production (Features: 109, Selected: 0)				
Area_1	Element_Co	Element	Item_Code	Value
China	5,510	Production	27	211,090,813
India	5,510	Production	27	158,756,871
Indonesia	5,510	Production	27	77,297,509



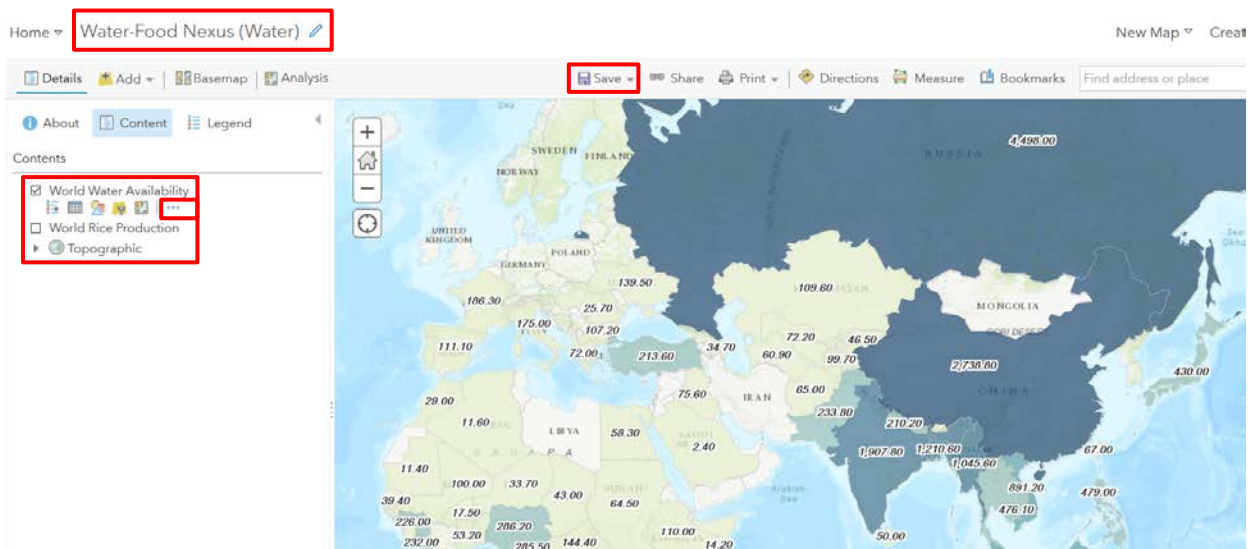
5. The thematic map is now ready, but the amount of rice production is still missing. To make the map self-explanatory, label the rice production value on top of each country:

- Click on the layer name > more options icon (three points) > Create Labels > Activate Label Features > Text: Value > Size: 12 > Style: Bold and Italic > OK
- Click save to record all changes



6. The world rice production map has been created. Now we will repeat the same procedure to create the water availability map for each country:

- Deactivate the Water-Food Nexus (Rice) layer
- Repeat step #2, search again for the WARREDOC_World Rice Production and Water Availability layer and change the name to 'World Water Availability'
- To save the new map click on Save > Save as > Water-Food Nexus (Water)
- Change Style > Choose an attribute to show: Annual_renewable_water_resource
- Select a drawing style > Counts and Amounts (Color) > Options > Classify Data using Natural break with 5 classes > Set ranges 0, 200, 500, 1000 and 2000
- Change symbols > Blue scale > Transparency > 25% > OK
- Click on the layer name > more options icon (three points) > Create Labels > Activate Label Features > Text: Value > Size: 12 > Style: Bold and Italic > Activate Halo: 1, White > OK

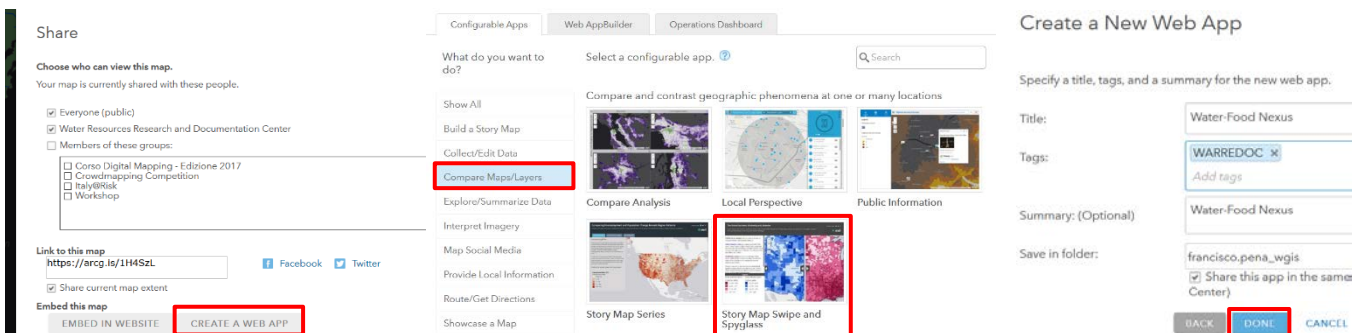


Goal #2: Create a Web Swipe App

ArcGIS Online enables users to compare maps and layers simultaneously in a dynamic single map, improving the visualization of features before and after an event has taken place (i.e. earthquake disasters, land use changes, deforestation), different values from macro to micro scale or the display of related comparative maps. In this tutorial we will use the Map Swipe feature to compare global rice production and water availability.

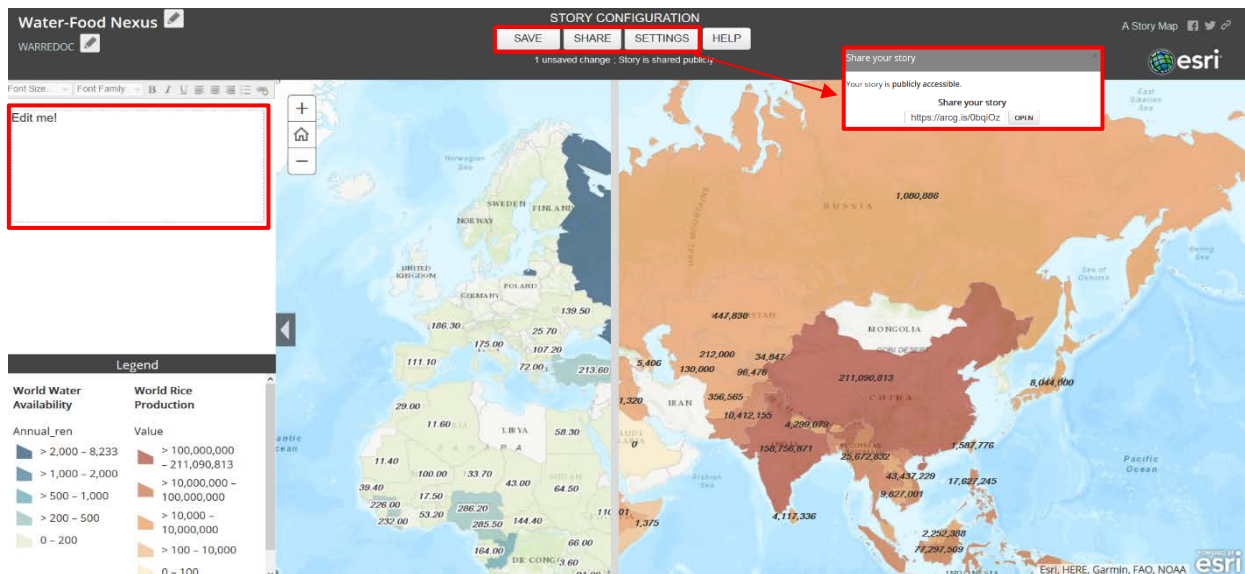
7. To create the Map Swipe App:

- Share < Share with everyone < Create a Web App < Compare Maps/Layers < Story Map Swipe and Spyglass < Create Web App
- Title: Water-Food Nexus
- Tags and Summary: As desired < DONE



8. The Swipe/Spyglass builder will appear on the screen:

- Swipe Style > Vertical bar > Next
- Swipe Type > Two web maps > Click on the magnifying glass > Select Water-Food Nexus (Rice)
- App Layout > Activate Description, Legend and Pop-Up > Next
- Pop-Up > Left Map: World Water Availability > Right Map: World Rice Production > Open app



- 9. You have created the Swipe App. Feel free to customize the Story settings as desired, including theme, logo, header, extent and content panel. Click save when done and share to obtain the link that will be used to connect the Swipe App to final StoryMap.

Goal #3: Create a Social Media App

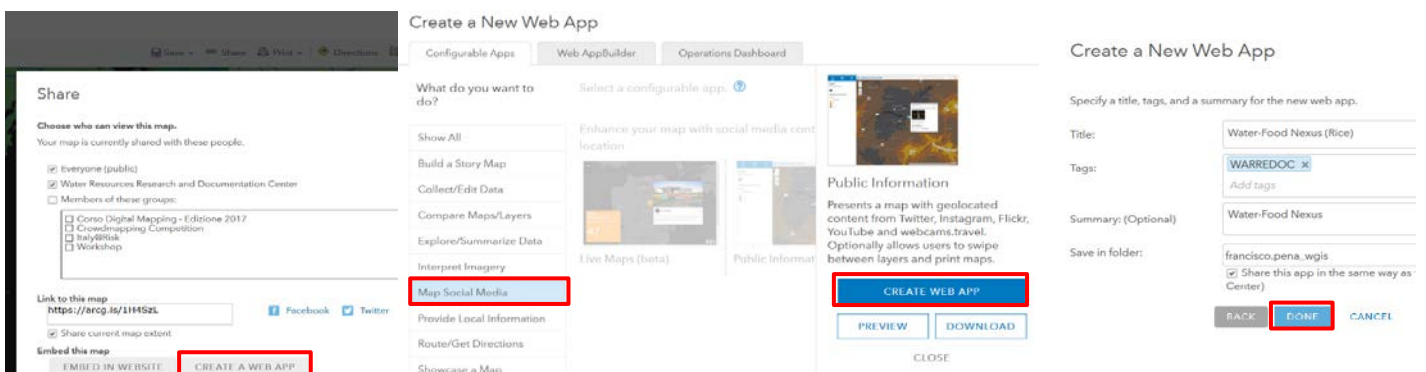
While the integration of open big data in digital maps is the cornerstone for spatial analysis and location intelligence (to understand natural and anthropic processes), the perception of locations, activities and experiences are broadened with the use of social media content. The selection of keywords provide a more precise understanding of anticipated, expected and unexpected human behaviors related to your search.

Note: In case you exit the ArcGIS Online Map screen interface, it's recommended to open a new browser app and repeat step #1 to return to the tutorial. Once you are on the Map web interface, on the right corner click on New Map and select Water-Food Nexus (Rice)



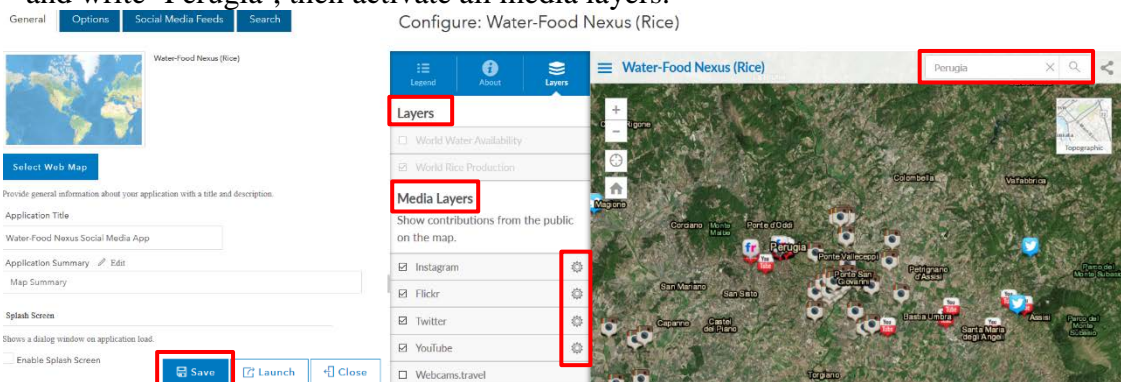
10. To incorporate social media content into the map:

- Share < Share with everyone < Create a Web App < Map Social Media < Public Information < Create App
- Title: Water-Energy Nexus Social Map
- Tags and Summary: As desired < DONE



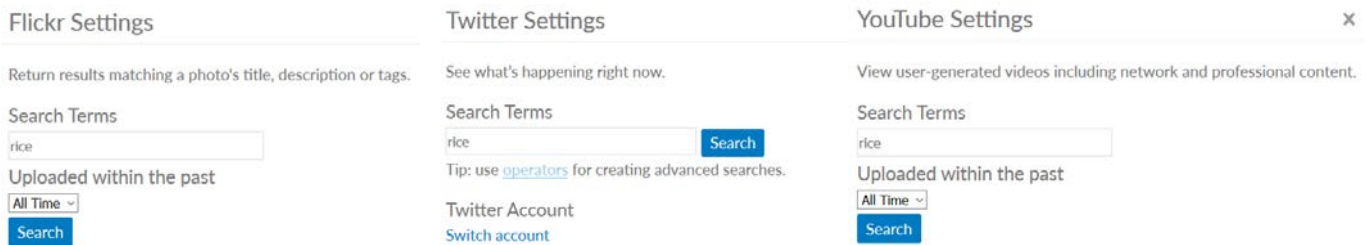
11. The web app pane will appear on the right side of the screen, which displays three tabs:

- The Legend provides names and colors of layers represented in the map
- The About tab includes the name of the project, last edition and additional information
- Layers are subdivided into two parts. The first one includes all shapefiles from the Water-Food Nexus Map, and the second layers provide a list of social media platforms. Go to the search bar and write 'Perugia', then activate all media layers.



Note: Some social media platforms may request login verification to access and visualize the content

12. Click on the settings tool and write the keyword 'water' in each media layer.



13. Click on Share to get the map link. You will use this link to connect the social media component with the StoryMap. The map should look like this:

Configure: Water-Food Nexus (Rice)



Goal #4: Create a Story Map

The resulting maps are rich in content, self-explanatory to the audience and provide preliminary conclusions:

- **China** by far is the biggest producer of rice in the world and is ranked fourth on water availability; thus, theoretically the country is self-sufficient to provide water for rice irrigation purposes.
- The production of rice in **Sub-Saharan African countries** is quite high; nevertheless, the water availability is limited in the region and a shortage in the resource could cause devastating consequences for agriculture.
- We may think that the contrast in rice production by neighbor countries is based on their water resources availability and national economies, but this is generally incorrect. While high values on water availability and rice production may appear to be a correct generalization, some countries break this stereotype. For instance, **Papua New Guinea** has moderate values of water availability

(801) but has low rice production (848 tons), while **Indonesia** is ranked in the top 10 of world rice producers (77,297,509 tons), but has limited water resources (69.70).

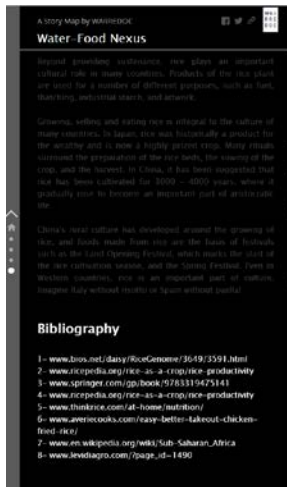
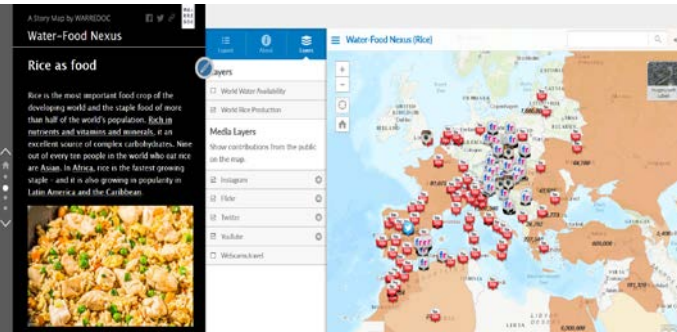
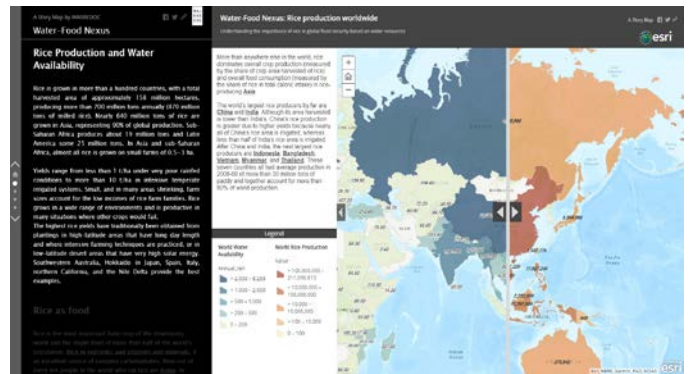
14. The integration of multiple open data layers in digital maps can result in rich content stories that provide additional value to your work at the geographic context. These results can answer complex questions and visualize new trends. Now you can incorporate text, media content and the human experience to your story. To create a Story Map:

- Share > Everyone (public) > Create a Web App > Build a Story Map > Story Map Journal > Create Web App > Title: Water-Energy Nexus > Fill the Tags and Summary > DONE
- Select Side Panel

15. According to the 3rd Digital Mapping Terms and Conditions, the Story Map must comply with the following requirements:

- **Introduction (1 page):** Select a video that best describes the topic and write a brief introduction
- **GIS section (1 page):** Create two maps to display a comparison web app between food and water (rice production and water availability)
- **Human experience (1 page):** Integrate the user experience into your map by adding social media content (using keywords and hashtags) to obtain meaningful insights on human behavior
- **Discussion and References (2 page):** Create a brief summary of your main points and also include a bibliography.

The following illustrates the potential outcome of a well-developed StoryMap:



Take a look at the StoryMap: [Water-Food Nexus](#)

Congratulations!

You have successfully **completed** this tutorial.