

## GOAL

Generate a new grid on which each pixel's value indicates, as a percentage, how much of that pixel's country is occupied by whichever type of landscape occupies the greatest amount of territory within that country.

## Understanding of the Goal

Requirement	Translation in GIS
"Indicate as a percentage"	Value equals to a number, which is a percentage
"landscape occupies the greatest amount of territory"	Only the percent of largest landscape within a country is given as the raster value
"whichever type"	The specific type of the greatest landscape is not what the new raster must contain
"each pixel has a country's percentage"	Each country gives all its pixels the same raster value-final step of zonal statistics should be zoned by countries.

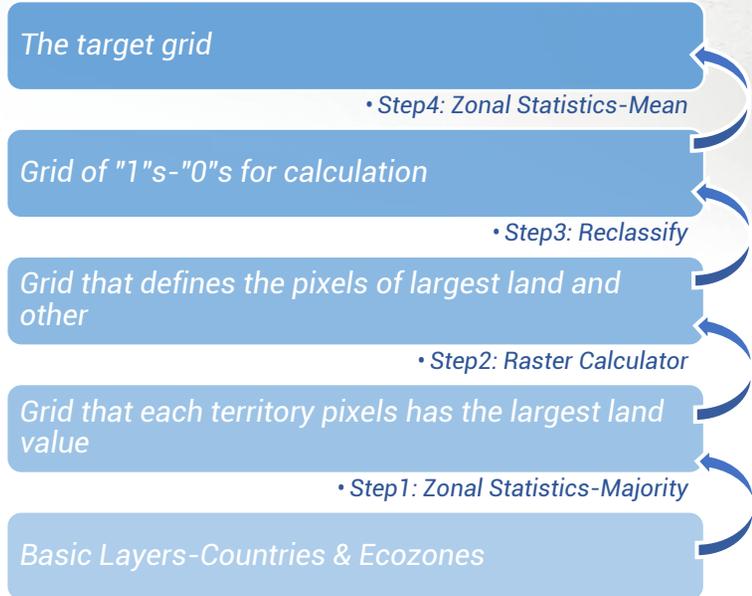
## Final Step of Solution- Core Formula

Based on the understanding of the goals, the core step of generating the grid must be zonal statistics.

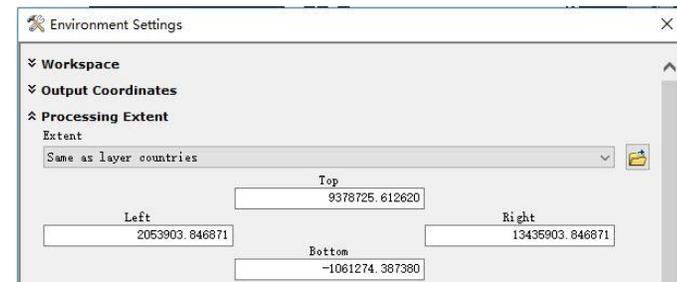
$$\text{Largest Percent} = \frac{\text{All Largest Land Area Pixels}}{\text{Territory Pixels}} = \frac{\text{All the "1"s}}{\text{Territory Pixels}}$$

We just need to find a raster that has all the largest land pixels within each country equal to 1, while all other pixels are equal to zero (which will not influence the result) before we make a zonal statistics that will generate the target grid we need.

## Reverse Thinking Mode – Basic Steps

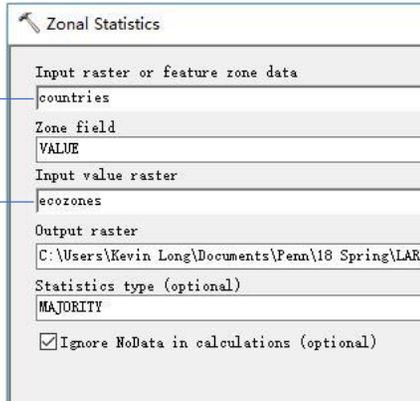


## Environment Preparation



Before we do the major steps in ArcMap, we should set "Environment Settings-Processing Extent-Same as layer countries", so that we will not miss any content of the countries.

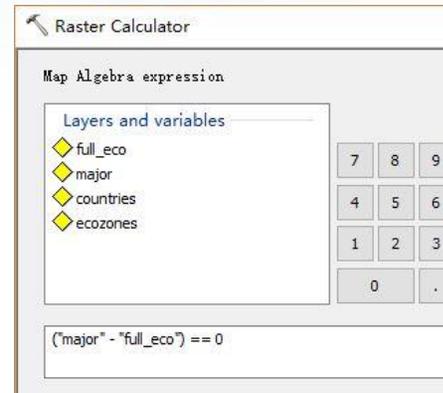
## Step 1: Zonal Statistics-Majority



At first, we need to give the value of largest landscape within a country to all pixels within that country.

*(Warning: that this zonal step might leave some countries to null if no value pixels appears within its territory, which will cause trouble in final step.)*

## Step 2: Raster Calculator



Then we need to calculate and make a reclassification that separate largest landscape from other type

The Formula is:

$$(\text{"major"} - \text{"full\_eco"}) == 0$$

The result grid should have 2 values:

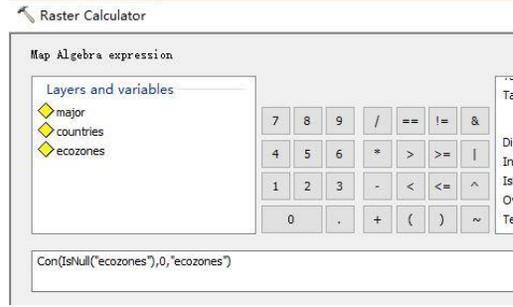
"1"s- Largest landscape pixels

"0"s- Other landscape pixels

We save it as "major\_loc" raster.

Since the layer has already have all its value set to 1 and 0, which is exactly what we want in final step, we can jump step 3 of reclassify.

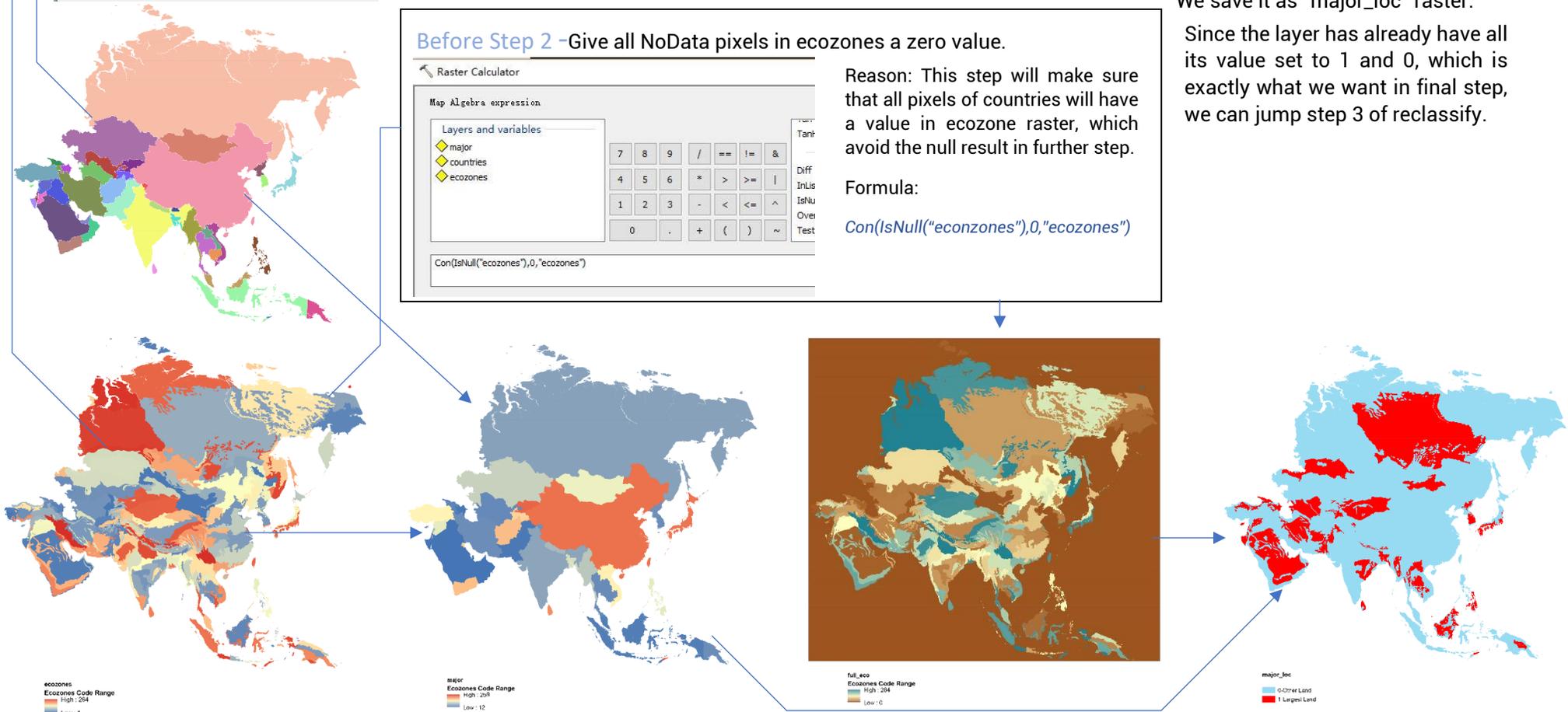
### Before Step 2 -Give all NoData pixels in ecozones a zero value.



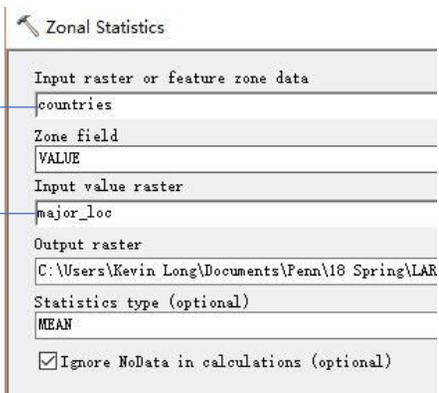
Reason: This step will make sure that all pixels of countries will have a value in ecozone raster, which avoid the null result in further step.

Formula:

$$\text{Con}(\text{IsNull}(\text{"ecozones"}), 0, \text{"ecozones"})$$



## Step 3: Zonal Statistics – Mean

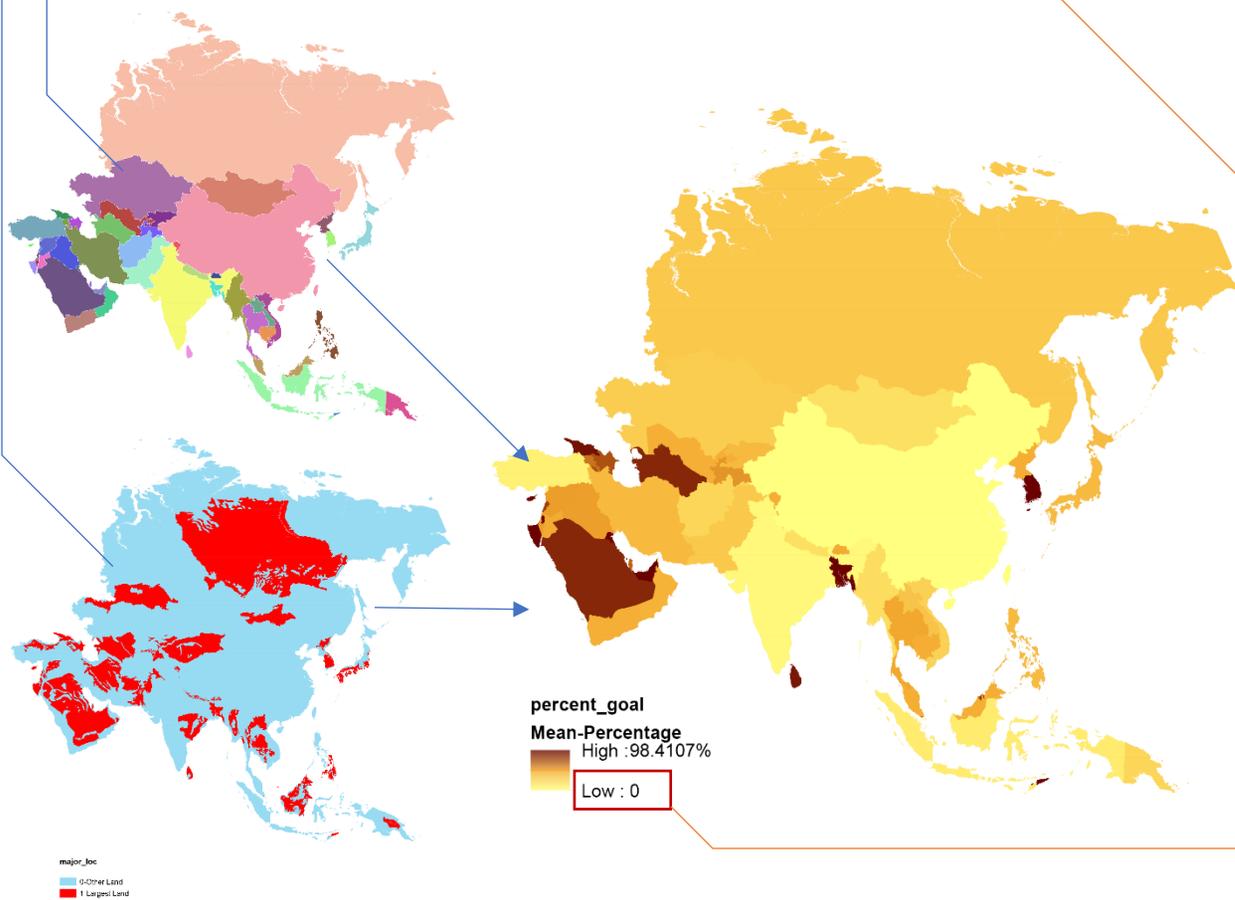


We keep using countries as the zoned layer, since final raster should answer the question based on country level.

However, the generated map shows there are some "0" pixels. This means the proportion of largest landscape in some countries is 0 percent, which is wrong intuitively.

Since I have explained in step 1 that the "NoData" pixels in landscape will make some countries "null", this will make all

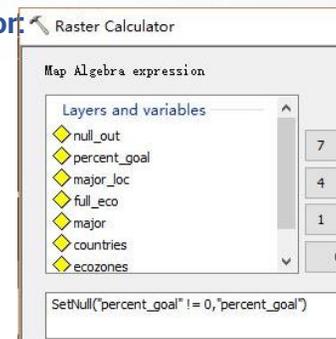
the pixels 0 in step 2, thus causing some 0 pixels in step 3.



## Step 4: Discussion

We need to know if there is indeed some countries that have all its territory null in ecozones before we decide to exclude them or not. Here is a list of steps that can find all "0" pixels in percentage raster of step3:

### a. Raster Calculator:



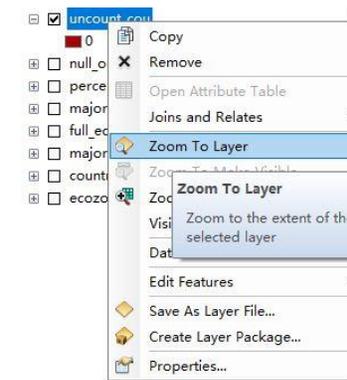
Formula:

*SetNull("percent\_goal" != 0, "percent\_goal")*

This will identify all the 0 pixels and make null all other pixels

### b. Zoom to Layer:

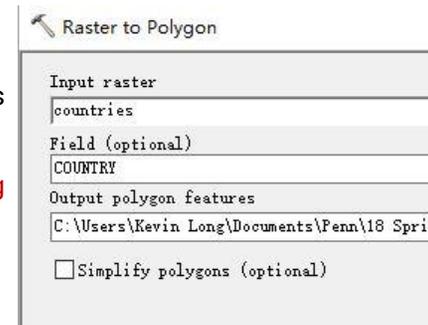
Right click the layer you just generated. This will display all 0 pixels within your screen



### c. Raster to Polygon :

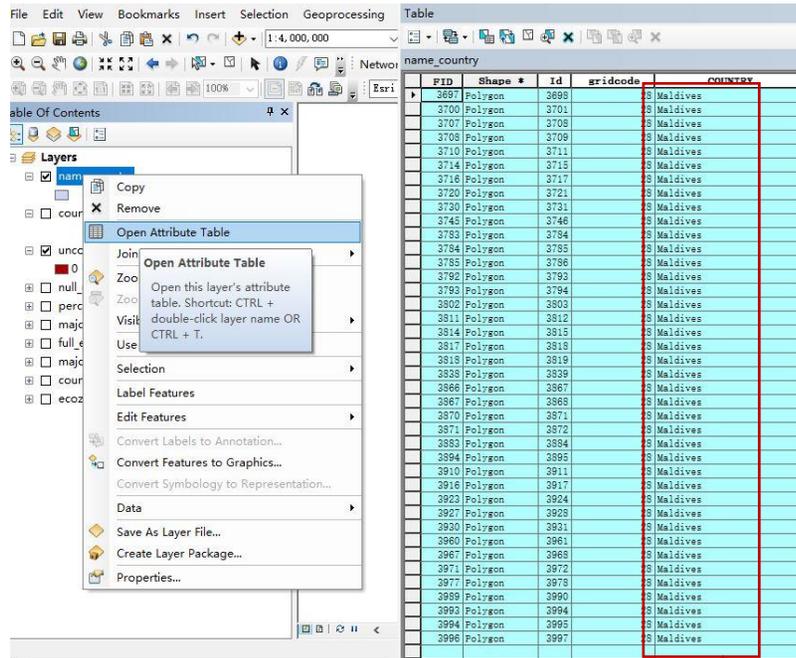
Do this step for countries raster.

(Remember unchecking the "Simplify polygon"!!!!)



## d. Look at Polygon Attribute:

Select all the polygons within your screen, and right click to check the attribute.



See? All the pixels are from one country! Maldives!

(This is a very tricky but lucky step. If we have more than a country in the screen, we will also do "raster to polygon" to raster in step a, and then select all country polygons than intersect with this "0" polygon. This will involve the vector knowledge, so I try not to do it in this semester.)

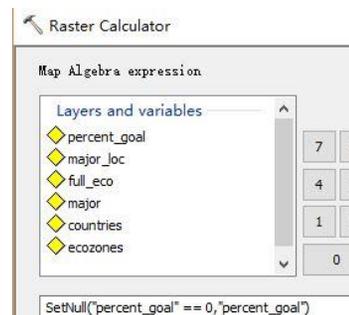
Finding the special "null-ecozone-type" country, we can exclude it and generate the final map we need to answer the goal question.

## e. Raster Calculator:

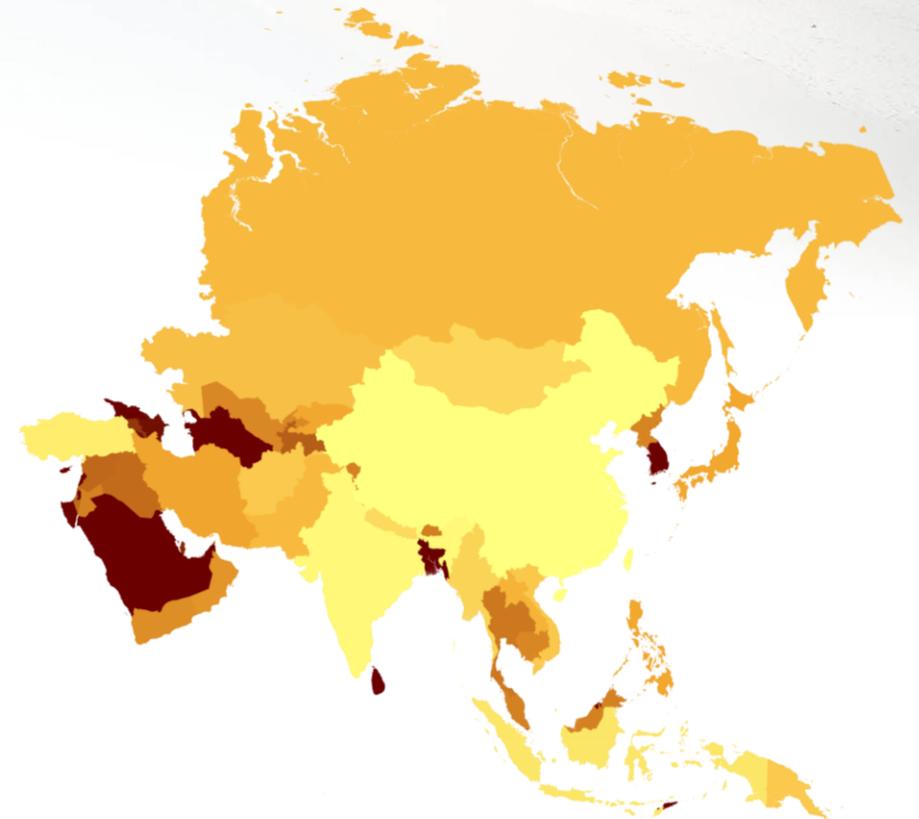
Formula:

SetNull ("percent\_goa" == 0, "percent\_goal")

This step will set all the 0 pixels null and keeps all other pixels the same value.



## Step 5 : Final Grid



We can see from the legend that the most uniformed country has 98.4 percent of its territory the same type of landscape. The lowest only has 8.33 percent of its territory the same type of landscape. (This map is based on current ecozones raster and did not take other types of landscape into consideration. Nor did this map regard all unclear types of landscape as a single type, because this will make Maldives 100 percent uniformed in its territory landscape. If we can find an ecozone raster that overlay perfectly with territory map, we will get the most correct answer.)