Exercise 1: Create a suitability model

How can I print an exercise to PDF format?

Introduction

Suitability modeling is one of the most foundational approaches to solving spatial problems—where are the best, or most suitable, locations for something? Whether you are trying to identify the most suitable location for a store or conservation area, you will follow the same basic steps.

1. **Define the problem:** Defining the problem will help you identify a specific and measurable goal for the suitability analysis.
2. **Identify the criteria:** The subject of your suitability model will respond to different phenomena, referred to as criteria (for example, slope). The criteria should support the defined goal of the suitability model.
3. **Derive the criteria:** If you do not have data that represents each criterion, you can derive the criteria from a base dataset (for example, a slope criterion is derived from an elevation base dataset).
4. **Transform criteria values:** Criteria values are measured using different scales, so you must transform these values to a common scale so that they can be compared and combined.
5. **Weight and combine criteria:** Some criteria may be more important than others. You can weight the criteria relative to one another before combining them to create a single suitability layer.
6. **Locate the site:** The suitability layer reflects the characteristics of a location. In this step, you integrate the spatial requirements of the subject of your suitability model and use these spatial requirements to identify the best locations from the suitability layer.
7. **Analyze the results:** Analyze the results to confirm that the selected site meets the requirements and ensure that you achieve the goals of the analysis.

Scenario

A global company wants to identify the best location for its carbon-neutral headquarters. The owner would like the headquarters located in the state of Vermont.

In this exercise, you will complete each step of suitability modeling to locate the best, or most suitable, location for the company's carbon-neutral headquarters.

Note: The exercises in this course include View Result links. Click these links to confirm that your results match what is expected.

Estimated completion time in minutes: 90 minutes

Expand all steps | Collapse all steps

- Step 1: Define the goal

Before you begin your analysis, your first step is to define the goal of the suitability model.

a Read the goal below for the suitability model that you will create.

Goal: Choose a location for a corporate headquarters that has a minimal carbon footprint. This location should be situated and designed in a way that is attractive to prospective employees.

You will use this goal to define the criteria that are used to create your suitability model and to evaluate the model to ensure that it is successful.

- Step 2: Identify the criteria

Based on the goal for this suitability model, and a discussion with corporate leaders and subject-matter experts (SMEs), the criteria were identified. These criteria have been organized into four objectives to clarify how the criteria relate to each other.

- **Building site:** A location that reduces construction cost and is easily accessible by employees
- **Energy independence:** An optimal location to incorporate renewable energy devices
- **Access to amenities:** A location that is accessible to various amenities
- **Environmental concerns:** A location that will minimally disrupt critical environmental areas and corridors

The following tables list the criteria for each objective and the required data.

Building site		
Criteria	Required data	Derived criteria layer name
Wetlands and high-density areas are less preferred	Land-use layer	LandUse
Steep slopes are less preferred	Elevation layer	Slope
Closer to major roads is preferred	Distance from major roads layer	Dist_MRoads
Visibility from major roads is less preferred	Viewshed layer	Views

Energy independence		
Criteria	Required data	Derived criteria layer name
Higher solar radiation potential is preferred	Solar radiation potential layer	Solar
Closer to electric lines (to connect solar energy to the utility grid) is preferred	Electric distributions layer	Dist_Elect
South-facing angles are more preferred	Aspect layer	Aspect

Access to amenities		
Criteria	Required data	Derived criteria layer name
Closer to the airport and the city of Burlington is preferred	Airport locations layer	Dist_Airport
Closer to recreational areas is preferred	Recreation layer	Dist_Rec
Closer to residential areas is preferred	Residential density layer	Dist_Resident

Environmental concerns		
Criteria	Required data	Derived criteria layer name
Farther from protected areas is preferred	Protected areas layer	Dist_Protect
Farther from biological areas is preferred	Biological areas layer	Dist_Biol
Farther from wetlands is preferred	Wetlands layer	Dist_Wetlands

Farther from streams is preferred	Streams layer	Dist_Streams

Note: These criteria were chosen for this exercise and are not intended to be an exhaustive list of the criteria that are used in this type of suitability model.

Esri Academy course: Suitability Modeling: Introduction

- Step 3: Download the exercise data files

In this step, you will download the exercise data files.

a Open a new web browser tab or window.

b Go to https://links.esri.com/Section03/Data and download the exercise data ZIP file.

Note: The complete URL to the exercise data file is https://www.arcgis.com/home/item.html?id=fc530feb4ffb489484b359f4a5b7cebe.

c Extract the files to the EsriTraining folder on your local computer.

- Step 4: Open an ArcGIS Pro project

In this step, you will open an ArcGIS Pro project that focuses on the area of interest (AOI) for your suitability model.

a Start ArcGIS Pro.

b If necessary, sign in using the provided course ArcGIS account.

c From the Start page, near Recent Projects, click Open Another Project.

Note: If you have configured ArcGIS Pro to start without a project template or with a default project, you will not see the Start page. On the Project tab, click Open, and then click Open Another Project.

d In the Open Project dialog box, browse to the Suitability folder that you saved on your computer.

e Select the Headquarters_Siting.aprx project and click OK.

*Step 4e***: Open an ArcGIS Pro project.*

Your ArcGIS Pro project includes a map of Vermont with a layer that outlines the AOI, or study area, for this suitability model. This study area spans across several counties in Vermont, including the cities of Burlington, Hinesburg, and Stowe. A mountain range, called the Green Mountains, runs north to south in the eastern part of the study area. The map includes additional layers that represent the other datasets required to locate the most suitable location for the corporate headquarters.

f In the Contents pane, turn off the Study_Mask layer and the Hillshade layer.

g Review the following layers that you will be working with by turning them on and off:

- MajorRoads
- GreenMTRidge
- Views_Zero
- LandUse
- Elevation_30

h Turn the Study_Mask layer back on.

i On the ribbon, from the Analysis tab, in the Geoprocessing group, click Environments.

j In the Environments dialog box, under Raster Analysis, click the Mask down arrow and choose the Study_Mask layer.

k Click OK.

Note: You can also use the Browse button to choose the Study_Mask layer from the Data geodatabase (Data.gdb).

Geoprocessing environment settings are additional parameters that affect a tool's results. A mask is a dataset that defines which locations in the inputs will be considered in the execution of the tool. The Study_Mask layer will define the mask of the tools that you will run in the next step.

- Step 5: Derive a criterion

Each criterion in a suitability model begins with a base dataset. The base dataset can be used as the criterion dataset, or it can be used to derive the required criterion dataset. In this step, you will use the elevation base dataset to derive a slope layer for the study area. The slope layer is one of four layers that are required for the building site objective.

a In the Geoprocessing pane, search for **Surface Parameters**.

- Hint

  If you closed the Geoprocessing pane, from the Analysis tab, in the Geoprocessing group, click Tools.

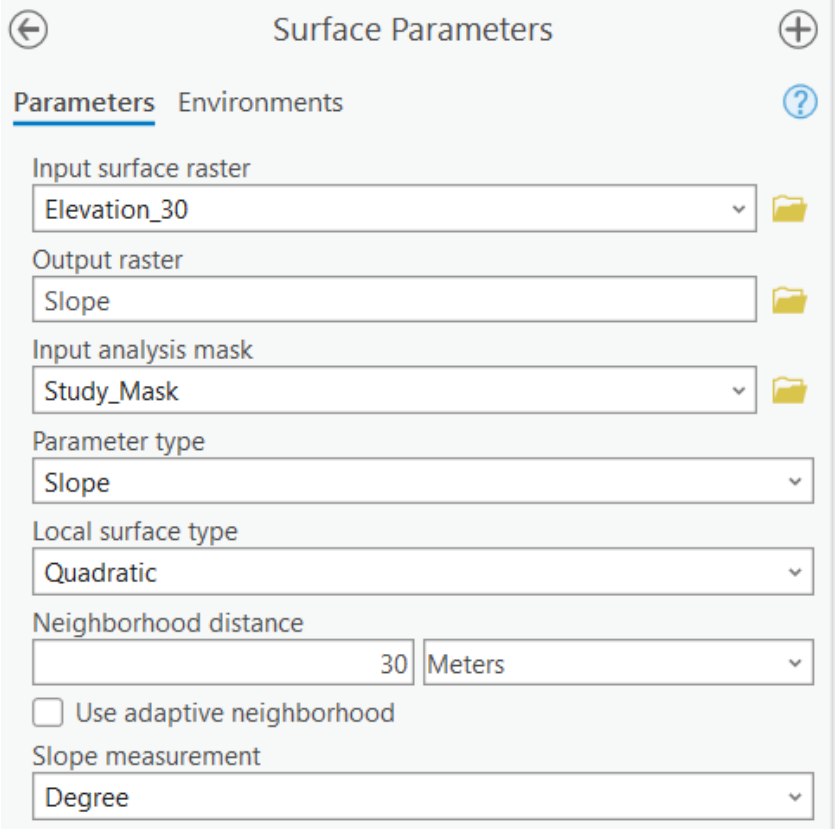
Note: Bold text in the exercise steps indicates that you will type this information.

b Select the Surface Parameters (Spatial Analyst Tools) tool.

c For Input Surface Raster, choose Elevation_30.

d For Output Raster, type **Slope**.

e For Parameter Type, confirm that Slope is selected.



*Step 5e***: Derive a criterion.*

f Leave the remaining defaults and click Run.

*Step 5f***: Derive a criterion.*

The Slope layer is added to the map. The Surface Parameters tool derived the slope, or gradient, for each cell in the Elevation_30 base data. The Neighborhood Distance parameter is set to 30 Meters to match the cell size of the input surface raster. The cells in this raster are symbolized in colors ranging from black, indicating gentler slopes, to white, indicating steeper slopes. To learn more about the Surface Parameters tool, go to ArcGIS Pro Help: Surface Parameters (Spatial Analyst).

- Step 6: Derive the remaining criteria

Next, you will derive the remaining criteria for the building site objective.

a In the Contents pane, turn off the Study_Mask and Slope layers.

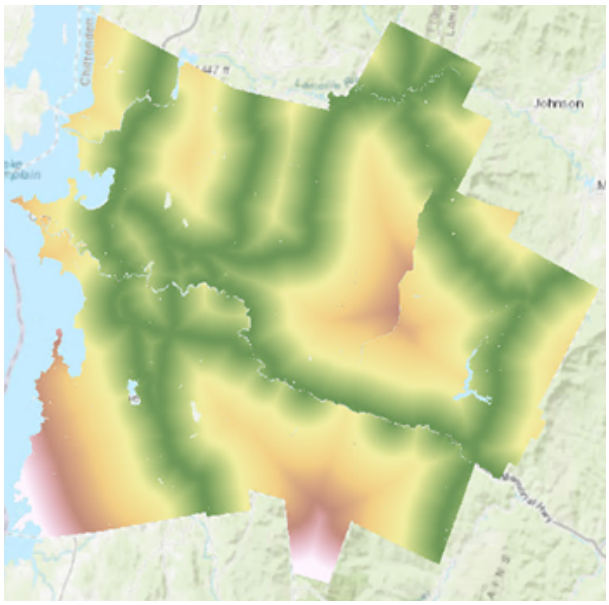
b At the top of the Geoprocessing pane, click the Back button.

c Search for **Distance Accumulation**.

d Select the Distance Accumulation (Spatial Analyst Tools) tool, and then set the following parameters:

- Input Raster Or Feature Source Data: MajorRoads
- Output Distance Accumulation Raster: **Dist_MRoads**
- Input Barrier Raster Or Feature Data: GreenMTRidge

e Leave the remaining defaults and click Run.



*Step 6e***: Derive the remaining criteria.*

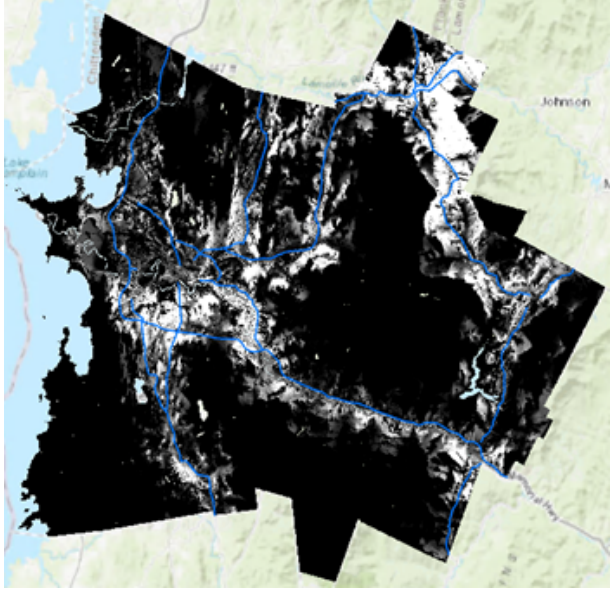
Note: You will see a message that the tool completed successfully but with warnings, which is due to the mask that is set in the project's environments. Tools that honor the mask environment will consider only those cells that fall within the analysis mask in the operation. This warning will not affect your results.

The tool calculates the straight-line, or Euclidean, distance from the major roads. The study area for this analysis includes the Green Mountain Ridge. Cars must drive around the ridge, which you have indicated by adding it as a barrier. The resulting layer illustrates the accumulated distance from major roads, where green indicates shorter distances and yellow to pink indicates farther distances. Areas around the ridge may be relatively close (straight-line distance) to a major road. However, the Distance Accumulation tool indicates that these areas are far from major roads because you would have to drive around the ridge. To learn more about the Distance Accumulation tool, go to ArcGIS Pro Help: Distance Accumulation (Spatial Analyst).

f In the Contents pane, turn on the following layers:

- MajorRoads
- Views_Zero

g Turn off the Dist_MRoads layer.



*Step 6g***: Derive the remaining criteria.*

The Views_Zero layer shows visibility from major roads. According to the building site criteria, visibility from major roads is less preferred. Areas that are not visible from major roads have a cell value of zero and are represented using black. As the cell value increases, the symbology lightens to gray and eventually white. The white areas are the most visible from the major roads, making them the least preferable areas.

h In the Contents pane, turn off the following layers:

- MajorRoads
- Views_Zero

i Turn on the LandUse layer, and expand the layer to view its categories.

The LandUse dataset can be used directly as the criterion, so no geoprocessing tool was necessary to derive any criterion from this base data.

j Turn off all the layers except the World Topographic Map basemap, and then save your project.

- Hint

  Press Alt and click the check mark next to the World Topographic Map basemap to turn off all the layers except the basemap.

- Step 7: Create a submodel

You will complete the remaining steps using the Suitability Modeler. The Suitability Modeler is an interactive, exploratory environment for creating and evaluating a suitability model. In general, constructing a suitability model is a nonlinear, iterative process. The Suitability Modeler provides analytical feedback at each stage of the suitability modeling process and allows seamless back-and-forth movement between each stage of the model development. To learn more about the Suitability Modeler, go to ArcGIS Pro Help: What is the Suitability Modeler?

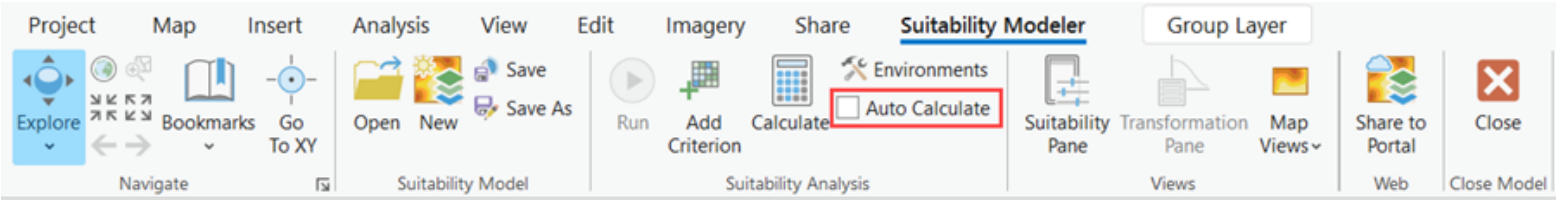
ArcGIS Pro 3.1 allows you to work with submodels when using the Suitability Modeler. When creating a suitability model, you make trade-offs between individual criteria and their importance (or weight). That is also true for competing objectives. Each objective can be captured in a different submodel and then combined to create a final suitability model.

In this step, you will create the submodel for the building site objective.

a On the ribbon, from the Analysis tab, in the Workflows group, click Suitability Modeler.

The Suitability Modeler tab on the ribbon opens, and the Suitability Modeler pane opens. The Suitability Modeler tab is where you can adjust settings and save the model. The Suitability Modeler pane is where you will transform criteria values, weight criteria, and, finally, locate regions.

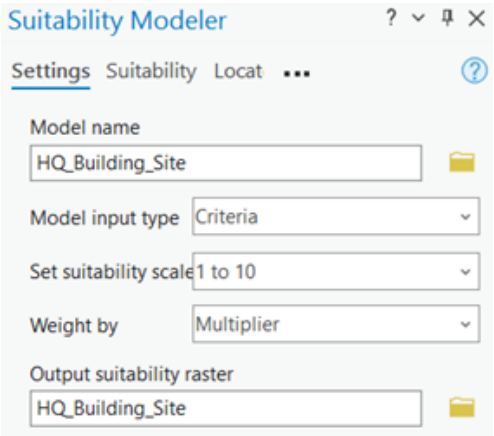
b From the Suitability Modeler tab, in the Suitability Analysis group, uncheck the Auto Calculate box to turn off this option.



By unchecking this option, the model data will not automatically update every time a parameter is changed.

c In the Suitability Modeler pane, for Model Name, type **HQ_Building_Site**.

d For Output Suitability Raster, type **HQ_Building_Site**.



*Step 7d***: Create a submodel.*

You created the submodel for the building site objective. A group layer, named HQ_Building_Site, is added to the Contents pane. Group layers help organize related kinds of layers in a map and can be used to define advanced drawing options.

Next, you will transform the criteria values for the building site submodel.

- Step 8: Transform categorical criteria for a submodel

The values of the criteria datasets are relative to the criteria that they represent. Land use utilizes categorical values, such as open water, whereas slope uses continuous values ranging from 0 through 90. Before you can weight these criteria relative to each other, you must transform their values to a common scale. In this step, you will transform the land-use layer.

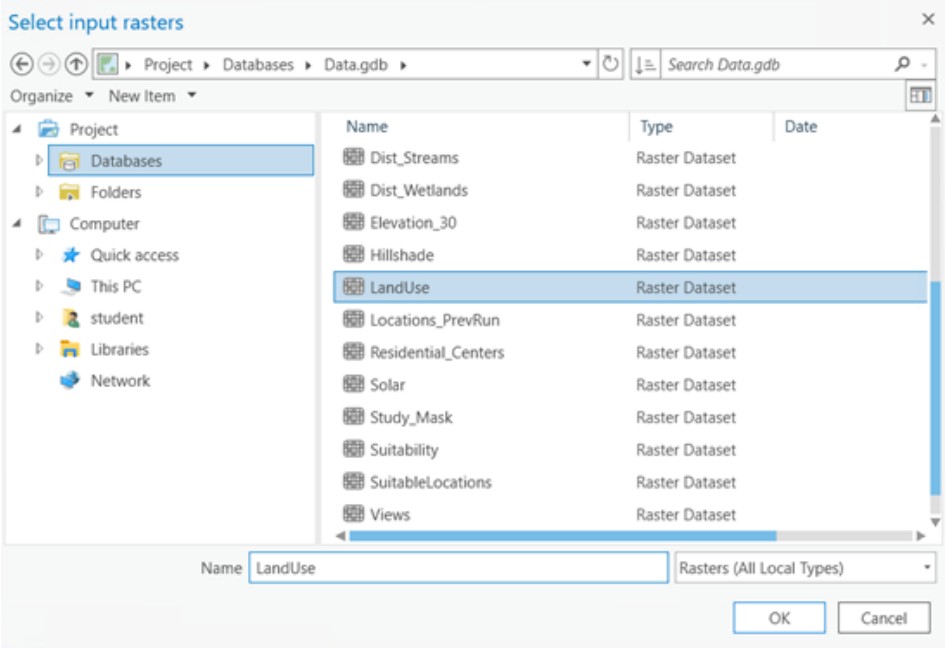
a At the top of the Suitability Modeler pane, click the Suitability tab.

b Next to Input Rasters, click the Add Raster Criteria Datasets By Browsing To Them button ⊕.

c In the Select Input Rasters dialog box, under Project, double-click Databases.

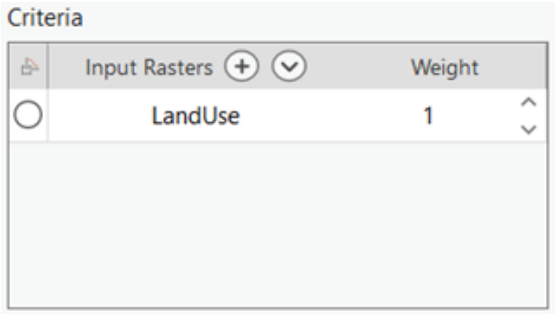
d Double-click the Data geodatabase (Data.gdb).

e Click the LandUse raster dataset.



*Step 8e***: Transform categorical criteria for a submodel.*

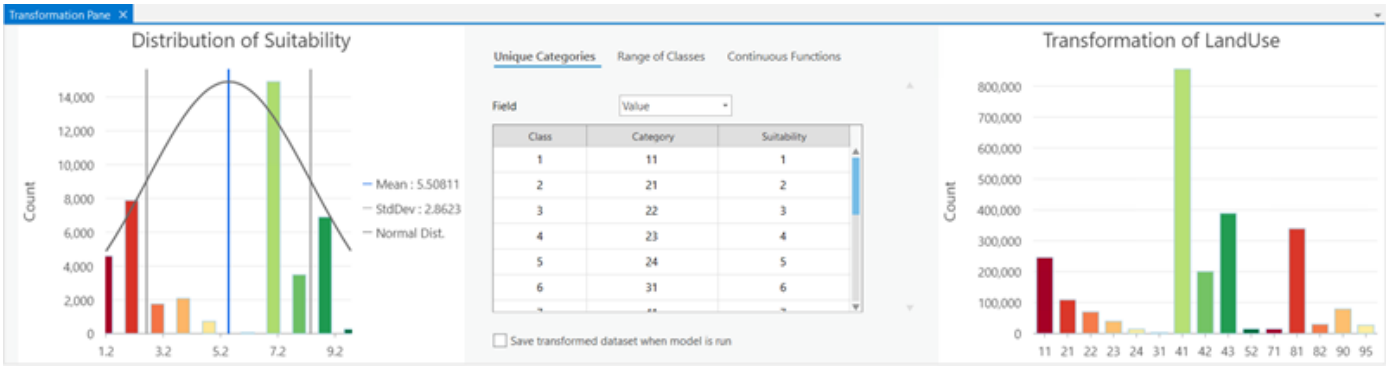
f Click OK.



*Step 8f***: Transform categorical criteria for a submodel.*

The LandUse layer is added to the Criteria table and displays in the map. The layer is also added to the HQ_Building_Site group layer in the Contents pane.

g In the Suitability Modeler pane, in the Criteria table, click the circle to the left of LandUse.



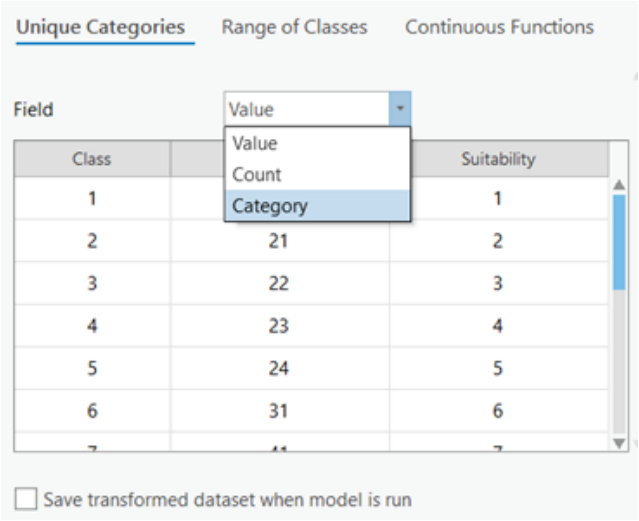
*Step 8g***: Transform categorical criteria for a submodel.*

The Transformation Pane opens, and the button next to LandUse in the Suitability Modeler pane turns green, indicating that it is the active criterion in the Transformation Pane.

The Transformation Pane has three sections: a histogram of the overall suitability values (Distribution Of Suitability), the transformation window where the active criteria layer values can be transformed, and a resulting histogram of how the active

criteria layer will be transformed to the suitability scale.

h In the Transformation Pane, in the transformation window (middle section), on the Unique Categories tab, click the Field drop-down list and choose Category, as shown in the following graphic.



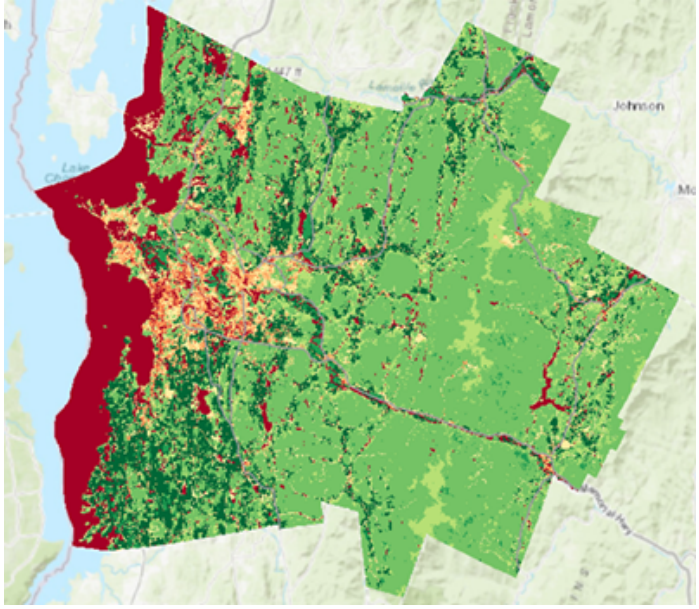
i In the Category table, under Suitability, double-click the numbers to make them editable and adjust the Suitability values as needed to match the following table.

Class	Category	Suitability
1	Open Water	1
2	Developed, Open Space	**5**
3	Developed, Low Intensity	**4**
4	Developed, Medium Intensity	**3**
5	Developed, High Intensity	**1**
6	Barren Land	**8**
7	Deciduous Forest	**8**
8	Evergreen Forest	**7**
9	Mixed Forest	**8**
10	Shrub/Scrub	**9**
11	Herbaceous	**7**
12	Hay/Pasture	**10**
13	Cultivated Crops	**9**
14	Woody Wetlands	**1**
15	Emergent Herbaceous	5

SMEs who are working on the building site submodels have decided on the suitability rankings in the table for the land-use categories.

Note: This table defines the preference scale for each category, where 1 is not preferable and 10 is very preferable.

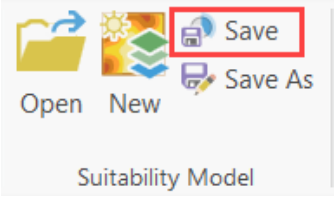
j On the ribbon, from the Suitability Modeler tab, in the Suitability Analysis group, click Calculate.



*Step 8j***: Transform categorical criteria for a submodel.*

The Transformed LandUse layer updates with the calculated values. The categorical land-use data (open water, mixed forest, and so on) was transformed to a common scale ranging from 1 to 10, where 1 is not preferable and 10 is very preferable. The Transformed LandUse layer indicates that the most preferred areas are in green and the least preferred areas are in red.

k On the ribbon, from the Suitability Modeler tab, in the Suitability Model group, click Save.



You saved the edits made to this model. Saving the model does not save the project; also, saving the project does not save the model.

l Save your project.

- Hint

  To save the project, in the top-left corner of the app, click the Save button .

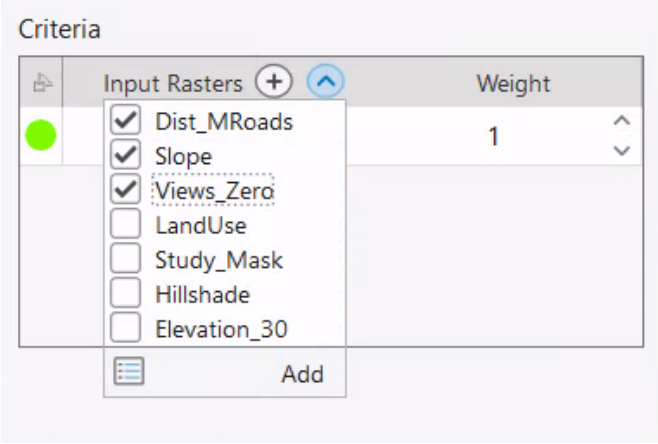
- Step 9: Transform continuous criteria for a submodel

In this step, you will transform the criteria with continuous values, such as slope, for the building site submodel. Data with continuous values is known as continuous data, or a continuous surface. This type of data is not spatially discrete, and the transition between possible values on a continuous surface is without abrupt or well-defined breaks between values.

a In the Suitability Modeler pane, next to Input Rasters, click the Add Raster Criteria As Layers From The Contents List button .

b In the contents list that appears, check the boxes to the right of the following layers:

- Dist_MRoads
- Slope
- Views_Zero



*Step 9b***: Transform continuous criteria for a submodel.*

The criteria are selected in the contents list.

c Click Add.

d In the Criteria table, click the circle to the left of Slope.

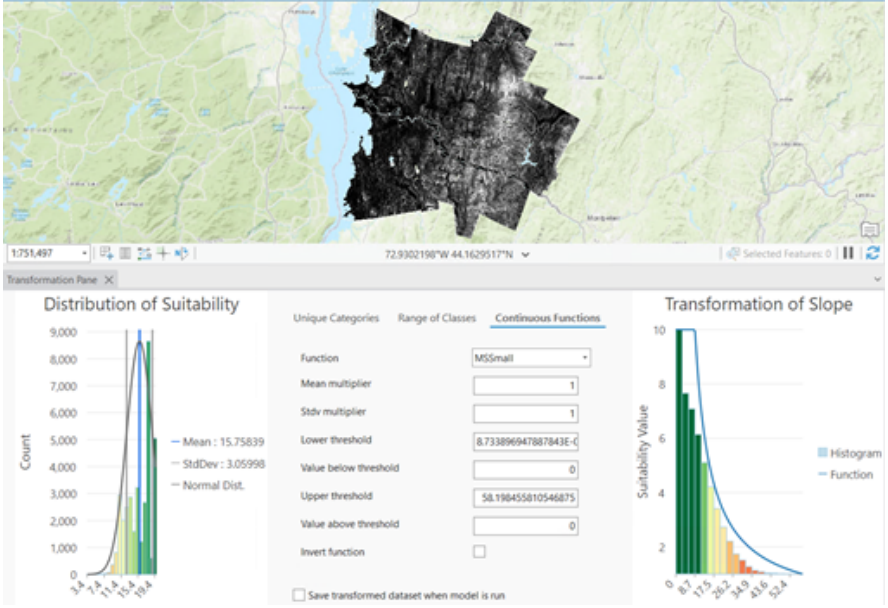
*Step 9d***: Transform continuous criteria for a submodel.*

The button next to LandUse in the Suitability Modeler pane turns gray because LandUse is no longer the active criterion in the Transformation Pane, and it has already been transformed. Slope is now the active criterion in the Transformation Pane.

e In the Contents pane, in the HQ_Building_Site group layer, turn off all the layers except Slope.

- Hint

  Press Ctrl and uncheck one of the layers in the HQ_Building_Site group layer to turn off all the layers in the group, and then turn back on the appropriate layers.



*Step 9e***: Transform continuous criteria for a submodel.*

The Slope layer is active in the map view and the Transformation Pane. The Suitability Modeler identifies that the Slope layer is represented by continuous values, so the Continuous Functions method is automatically selected in the Transformation Pane. This method applies linear and nonlinear functions to transform the values continuously to the suitability scale. There are various transformation functions, and each varies in its calculation and application. Which transformation function to use is based on which function best captures the item that is being modeled. You can further refine the characteristics of each function through a series of input parameters. You can explore the different functions by selecting a function and calculating the results.

f In the Contents pane, in the HQ_Building_Site group layer, if necessary, turn on the Transformed Slope layer.

g In the Transformation Pane, in the transformation window (middle section), for Function, choose Small.

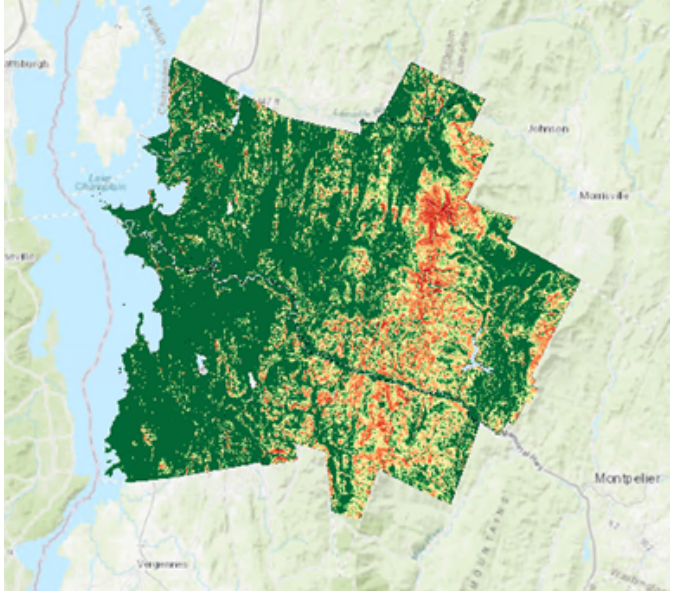
*Step 9g***: Transform continuous criteria for a submodel.*

h On the ribbon, from the Suitability Modeler tab, in the Suitability Analysis group, click Calculate.

As you explore the methods and functions and their parameters, the transformation histogram of the layer, the distribution of suitability histogram, and the transformed and final suitability map layers in the HQ_Building_Site group layer are updated. This process provides feedback about the effects that the transformation will have on the transformed criterion as well as the impact on the final suitability map for your submodel.

In this example, the item that is being modeled is the location for a corporate headquarters, and the criterion is slope. The preference decreases as the slope increases, which means that the MSSmall function is the best function for this transformation. The MSSmall function rescales input data based on the mean and standard deviation where smaller values in the input raster have higher preference. To learn more about the transformation functions, go to ArcGIS Pro Help: The transformation functions available for Rescale by Function.

i For Function, choose MSSmall, and then calculate again.



*Step 9i***: Transform continuous criteria for a submodel.*

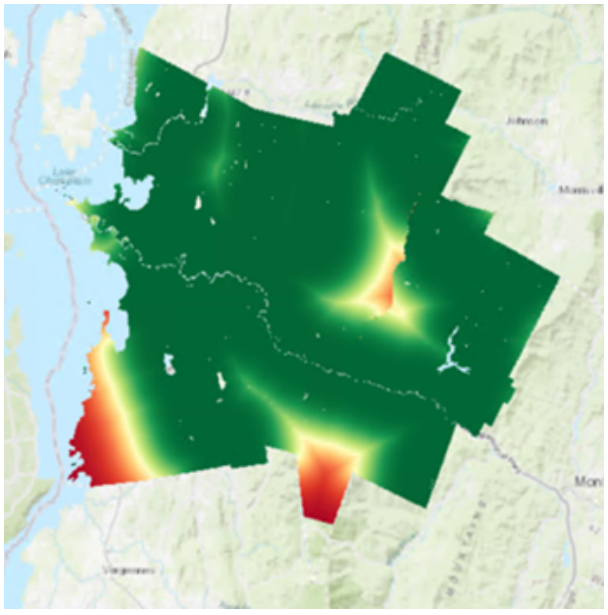
The Transformed Slope layer is set to a common preference scale ranging from 1 to 10, where 1 is not preferable and 10 is very preferable. The most preferred areas are in green and the least preferred areas are in red.

j In the Suitability Modeler pane, click the circle to the left of Dist_MRoads.

k In the Transformation Pane, for Function, choose Small.

The distance from roads uses the Small function to indicate that locations that are closer to roads (smaller values) have the highest preference.

l From the Suitability Modeler tab, click Calculate.



*Step 9l***: Transform continuous criteria for a submodel.*

The Transformed Dist_MRoads layer is set to a common preference scale ranging from 1 to 10, where 1 is not preferable and 10 is very preferable. The most preferred areas are in green and the least preferred areas are in red.

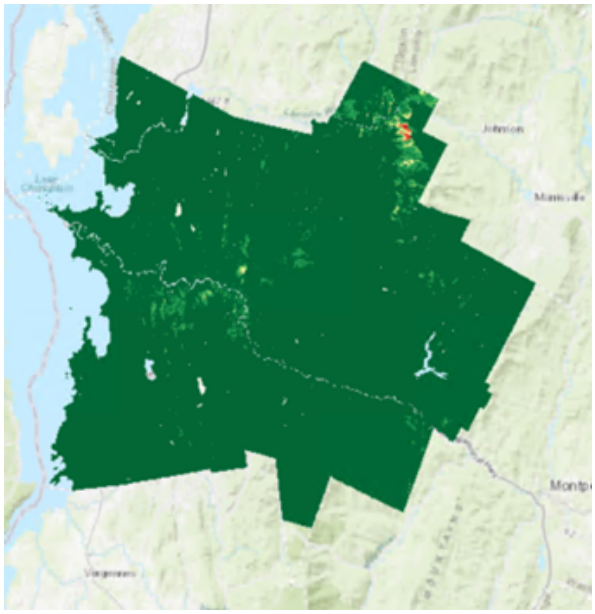
m In the Suitability Modeler pane, click the circle to the left of Views_Zero.

n In the Transformation Pane, at the top of the transformation window (middle section), click the Continuous Functions tab.

o For Function, choose LogisticDecay.

The visibility from roads uses logistic decay to indicate that preference decreases the more visible the site is to the road.

p From the Suitability Modeler tab, click Calculate.



*Step 9p***: Transform continuous criteria for a submodel.*

The Transformed Views_Zero layer is set to a common preference scale ranging from 1 to 10, where 1 is not preferable and 10 is very preferable. The most preferred areas are in green and the least preferred areas are in red.

Each criterion for the HQ_Building_Site submodel has been transformed to a common preference scale ranging from 1 to 10, where 1 is not preferable and 10 is very preferable.

q Save the model, and then save your project.

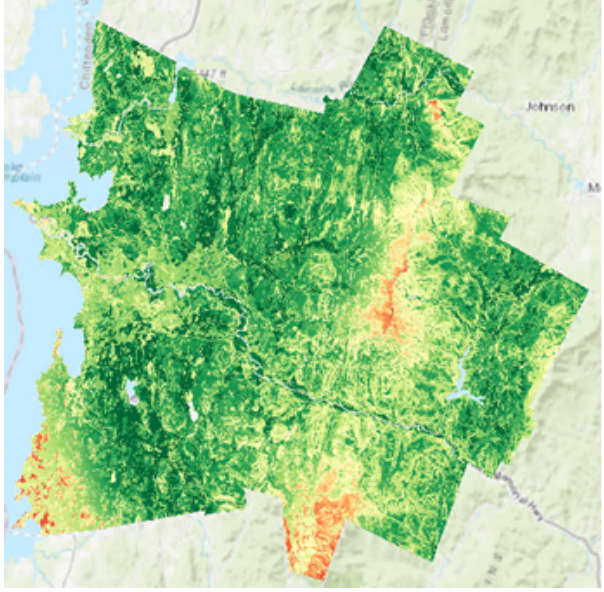
- Step 10: Weight the criteria for a submodel

Certain criteria in the submodel may be more important than others. The application of weights enables the ability to account for the importance of each criterion to the objective. To account for these differences, you will weight the criteria relative to one another before combining them.

In ArcGIS Pro, two different methods can be used to weight the criteria: multiplier or percent. When you created the HQ_Building_Site group layer, the multiplier method was selected to weight the criteria. The transformed criterion values are multiplied by the value that is specified in the Criteria table in the Suitability Modeler pane. The multiplied transformed criterion values are then added together. A weight of 2 means that the criterion is twice as important as a criterion with a weight of 1. A weight of 10 means that the criterion is 10 times more important. Common weights are between 1 and 2. This method is best when you can directly weight the criteria relative to one another.

a Close the Transformation Pane.

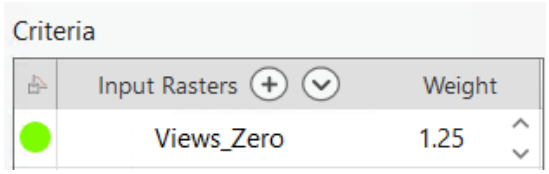
b In the Contents pane, turn off all the layers in the HQ_Building_Site group, and then turn on the HQ_Building_Site layer.



*Step 10b***: Weight the criteria for a submodel.*

The HQ_Building_Site layer is the active layer. The Suitability Modeler calculates a partial-resolution suitability map (suitability surface) every time that the model is calculated. You will now apply a weight to each criterion.

c In the Suitability Modeler pane, next to Views_Zero, under Weight, update the number to **1.25**.



*Step 10c***: Weight the criteria for a submodel.*

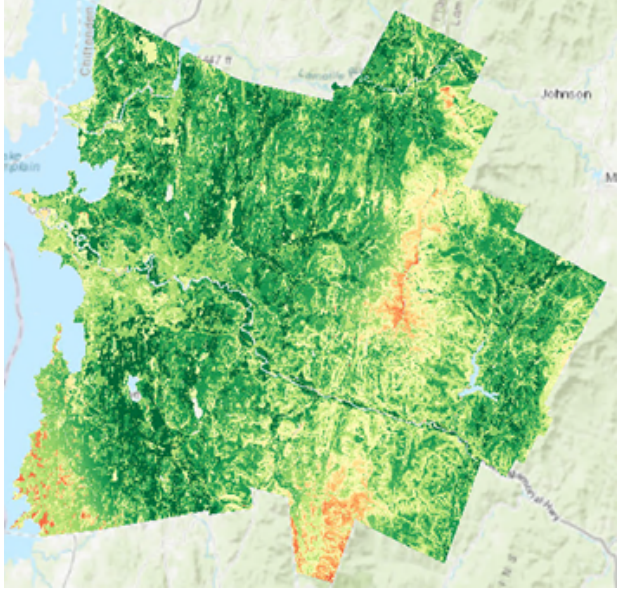
The suitability map will not update until you click Calculate. You will continue adjusting the weights for each input raster before you calculate the suitability map to account for the weights.

d Use the following table to update the weights for the remaining criteria:

Input rasters	Weight
Slope	**1.6**
Dist_MRoads	**1.25**
LandUse	**1.6**

Many different approaches are available for determining weights for a specific submodel, which may require collaboration with SMEs.

e From the Suitability Modeler tab, click Calculate.



*Step 10e***: Weight the criteria for a submodel.*

The values in the suitability surface are calculated as the weighted sum of the values in the transformed data. The higher the value, the more preferred the location is for the corporate headquarters site.

f At the bottom of the Suitability Modeler pane, click Run.

By running the suitability modeler, you created a full resolution raster dataset for the HQ_Building_Site submodel. Next, you will combine the HQ_Building_Site submodel you created with three submodels that other SMEs created to represent the objectives for this suitability analysis.

g Save the model, and then save your project.

Esri Academy course: Suitability Modeling: Creating a Weighted Suitability Model

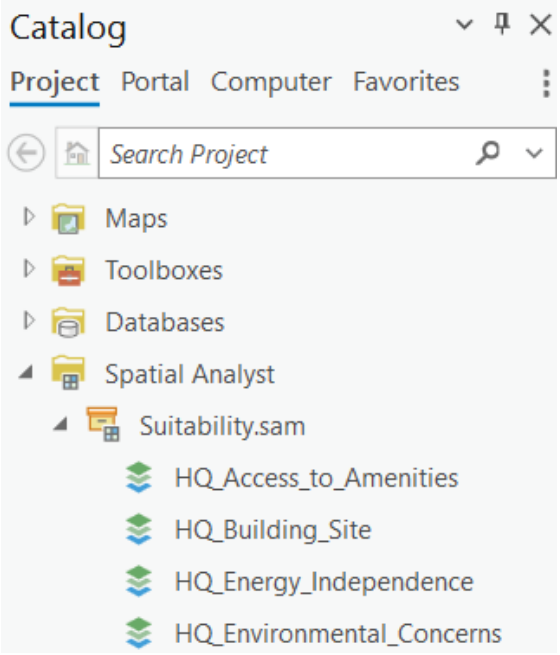
- Step 11: Combine the submodels

You created the submodel for the building site objective. Other SMEs have created and shared three more submodels with you. The submodels have already been transformed to a common suitability scale, and it is a best practice to use the same suitability scale and weight method (multiplier or percent). To learn more about working with submodels in Suitability Modeler, go to ArcGIS Pro Help: Work with submodels.

In this step, you will combine the four submodels.

a In the Catalog pane, expand the Spatial Analyst folder.

b Expand the Suitability.sam container.



*Step 11b***: Combine the submodels.*

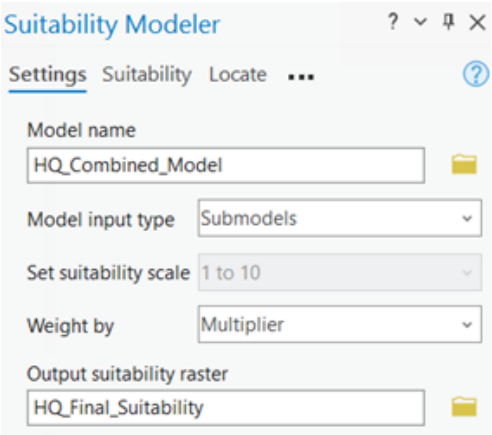
An effective way to work with submodels is to create them in the same Suitability Modeler container (.sam). The HQ_Building_Site submodel is listed in the Suitability.sam container along with the three other submodels that you will combine.

c On the ribbon, from the Suitability Modeler tab, in the Suitability Model group, click New.

d In the Suitability Modeler pane, for Model Name, type **HQ_Combined_Model**.

e For Model Input Type, choose Submodels.

f For Output Suitability Raster, type **HQ_Final_Suitability**.



*Step 11f***: Combine the submodels.*

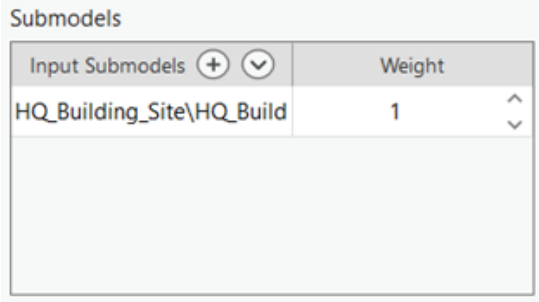
You created a new model that you will use to combine all four submodels. A group layer, named HQ_Combined_Model, is added to the Contents pane.

g At the top of the Suitability Modeler pane, click the Suitability tab.

h In the Contents pane, turn off the HQ_Building_Site group layer.

i In the Suitability Modeler pane, next to Input Submodels, click the Add Raster Submodels As Layers From The Contents List button .

j In the contents list that appears, check the box for the HQ_Building_Site\HQ_Building_Site layer, and then click Add.



*Step 11j***: Combine the submodels.*

The raster dataset of the HQ_Building_Site submodel that you created is added to the Submodels table. Next, you will add the remaining three submodels to the Submodels table.

- Step 12: Add the remaining submodels

The SMEs who created the remaining three submodels have provided you with the raster datasets for their respective objectives. In this step, you will add these submodel raster datasets to the HQ_Combined_Model group layer so that you can finalize your suitability analysis.

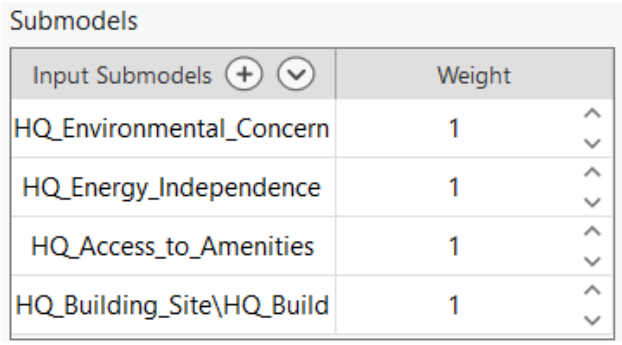
a In the Suitability Modeler pane, next to Input Submodels, click the Add Raster Submodel Datasets By Browsing To Them button ⊕.

b In the Select Input Rasters dialog box, click Databases, and open Suitability_Submodels.gdb.

c Press Ctrl and select the following raster datasets:

- HQ_Access_to_Amenities
- HQ_Energy_Independence
- HQ_Environmental_Concerns

d Click OK.

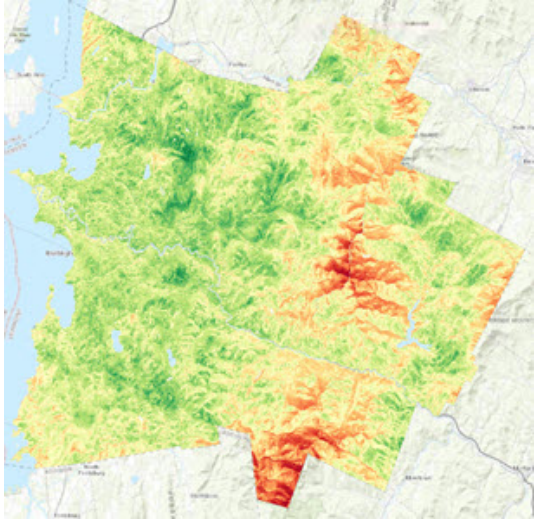


*Step 12d***: Add the remaining submodels.*

All the submodels are added to the Submodels table. The criteria for the input submodels were already transformed by yourself and the other SMEs who worked on their objectives, so there is no circle control next to any of the submodels in the table.

The SMEs already weighted the criteria for their submodels, so you do not need to weight each submodel. You can explore the weights they used in each submodel by opening the submodel from the Suitability.sam container in the Catalog pane.

e Click Run.



*Step 12e***: Add the remaining submodels.*

After combining all four submodels, you ran the model to create the HQ_Final_Suitability map at full resolution. When the full-resolution suitability map is ready, a message will appear at the bottom of the Suitability Modeler pane that shows it ran successfully. Next, you will use the HQ_Final_Suitability map to locate the most suitable site for the corporate headquarters.

f In the Contents pane, turn off all the layers except the World Topographic Map and the HQ_Final_Suitability layer in the HQ_Combined _Model group layer.

g Save the model and the project.

- Step 13: Locate the site

The locate step of the suitability modeling process allows for the specification of the spatial requirements, such as the total area, number of regions, and shape characteristics of the desired areas. In this step, you will use the full-resolution suitability map that you created to identify the best location for the headquarters using specified spatial requirements.

a At the top of the Suitability Modeler pane, click the Locate tab.

Note: If you do not see the Locate tab, click the ellipsis next to the Suitability tab and choose Locate.

The corporate shareholders have indicated that they want the headquarters to be a campus with five buildings within walking distance of each other. After further research and discussion, you used this information to define the following spatial requirements:

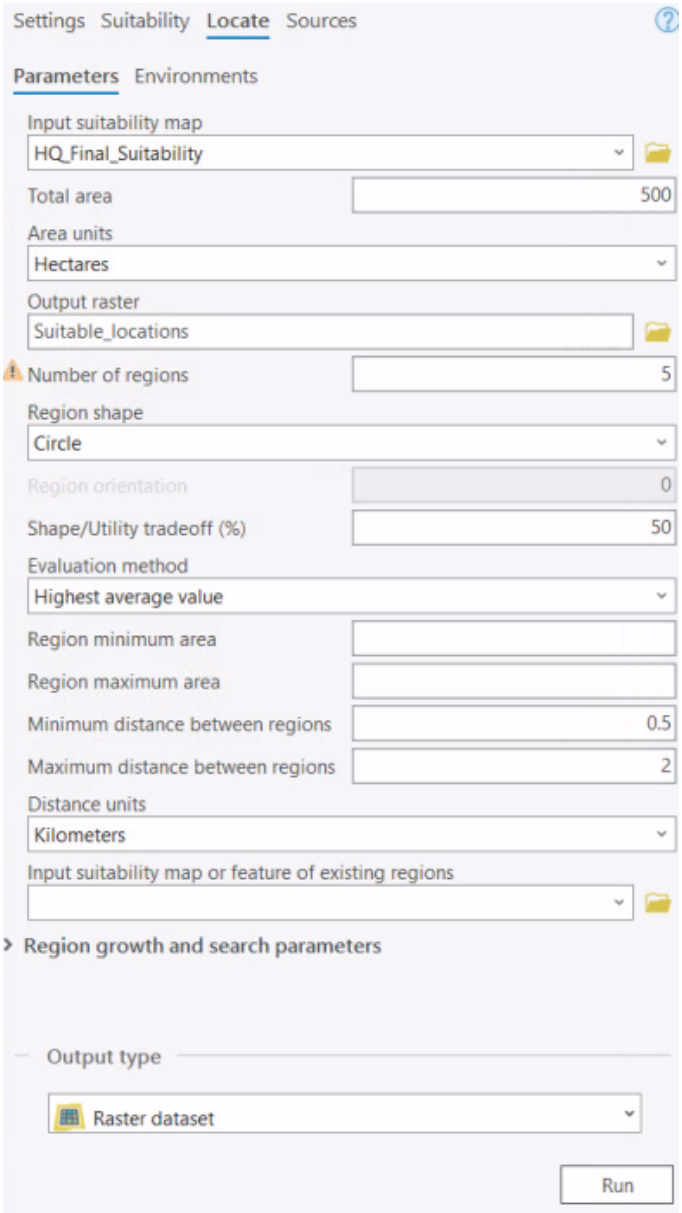
- The site must include 500 hectares of total area.
- The areas will be divided into five different areas, or regions.
- No two regions can be closer than 0.5 kilometers or farther than 2 kilometers.

b On the Locate tab, review the parameters.

c Use the following parameters, translated from the shareholders' spatial requirements, to set or confirm the tool parameters:

- Input Suitability Map: HQ_Combined_Model\HQ_Final_Suitability
- Area Units: Hectares
- Total Area: **500** *(Note: Set Area Units before Total Area.)*
- Output Raster: **Suitable_locations**
- Number Of Regions: **5**

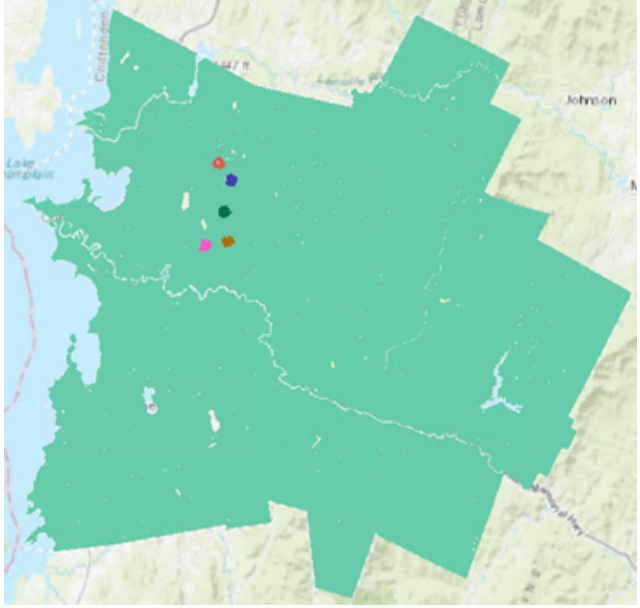
- Region Shape: Circle
- Shape/Utility Tradeoff (%): 50
- Evaluation Method: Highest Average Value
- Minimum Distance Between Regions: **0.5**
- Maximum Distance Between Regions: **2**
- Distance Units: Kilometers



*Step 13c***: Locate the site.*

The warning next to the Number Of Regions parameter will not affect your results. It states that the number of regions is less than or equal to eight, so, for convenience, the selection method is set to Combinatorial.

d Click Run.



*Step 13d***: Locate the site.*

Note: The model will take several minutes to run, and your map symbology colors may differ from the View Result graphic.

The Suitability Modeler used the full-resolution suitability map to select the best, or most preferable, configuration of five regions that meets the specified spatial requirements. The five regions are categorized using different cell values. You can change the symbology to better identify the five areas.

e In the Contents pane, under Suitable_Locations, right-click the symbol next to 0 and select No Color.

f If necessary, adjust other symbology colors to view the locations more clearly.

g In the Contents pane, confirm that only the following layers are turned on:

- Suitable_Locations
- HQ_Final_Suitability
- World Topographic Map

h From the Map tab, in the Navigate group, click Bookmarks and choose Headquarters.

*Step 13h***: Locate the site.*

Note: Your results may vary slightly from the View Result graphic.

The five regions are located within the dark green areas of the suitability map, which represent the more preferable locations of the suitability analysis. Based on the suitability site criteria and the spatial requirements, these areas are the most suitable configurations of five building sites to locate the corporate headquarters.

i Save the model and the project.

- Step 14: Analyze the results

After locating the most suitable locations for the headquarters, you can analyze the results to ensure that they meet the requirements of the analysis. Various methods can be used to analyze the results:

- Validate the suitability model with experts from different disciplines.
- Confirm that the sites meet the required criteria.
- Modify parameter values in the data transformations and weights to gauge the effect on the overall model.

In this step, you will visually confirm that the sites meet the required criteria.

a In the Contents pane, in the HQ_Combined_Model group layer, turn off the HQ_Final_Suitability layer.

b In the HQ_Building_Site group layer, turn on the Transformed Views_Zero layer.

c Select the Suitable_Locations layer.

d From the Raster Layer tab, in the Compare group, click Swipe.

Note: You must select the layer that you want to compare in the Contents pane for the Swipe tool to swipe (or hide) the selected layer and reveal content beneath it.

e Near the top of the map, click and drag your pointer down and up to compare the Suitable_Locations and Transformed Views_Zero layers.

The site locations are generally in areas that are not visible or have limited visibility (dark green) from the major roads.

f In the Contents pane, turn off the Transformed Views_Zero layer and turn on the Slope layer.

g Use the Swipe tool to compare the Suitable_Locations and Slope layers.

The site locations are situated in areas with fairly gentle slopes (black and dark gray), which is in alignment with the original criteria in the analysis.

h Continue using the Swipe tool to compare the suitable site locations with the remaining criteria.

Overall, the site locations meet the requirements for a corporate headquarters that has a minimal carbon footprint. A second part of the goal for the suitability analysis is that the location should be situated and designed in a way that is attractive to prospective employees. To complete the second part of the analysis, move on to the stretch goal to identify the most suitable network of paths that can connect the five headquarters buildings to each other and to the park. Employees can then walk or bike between the campus buildings and the park.

i If you would like to continue this analysis, proceed to the optional stretch goal; otherwise, save the project and exit ArcGIS Pro.

- Step 15: Stretch goal (Optional)

The shareholders would also like the headquarters to connect to a nearby park so that employees can walk or bike between the campus buildings and the park. In this analysis, you will identify the best paths, or corridors, using ModelBuilder. ModelBuilder allows you to visualize and record a series of analyses, or a model. It uses shape, color, text, and symbols to

visually communicate information about the model. ModelBuilder helps you organize, document, and share your analysis with others.

The models for this analysis have been completed for you using ModelBuilder and are available in the Catalog pane, under Toolboxes, in Suitability.atbx. Use these models to review, validate, and run the analysis. If necessary, go to ArcGIS Pro Help: What is ModelBuilder? to help you complete the stretch goal.

The two models that are provided for you are the following:

- **Cost Surface:** This model identifies the cost that a traveler (walker or biker) encounters as they move through each cell. The criteria that the traveler prefers include fewer steep slopes, being farther from roads, and being closer to streams. The preferred values are assigned a lower cost. The result is a cost surface identifying the cost to move through each cell with the most preferred areas having lower values. This model is the reverse of a suitability model.
- **Connect Campuses:** This model converts the park from a vector polygon to a raster, adds the park to the layer with the five headquarters buildings, and then runs a connectivity tool. The tool connects the five headquarters buildings and park by using the cost surface created in the previous model. The result identifies the most suitable network of paths that can connect the buildings to each other and to the park.

a Use the following high-level steps to continue the analysis with ModelBuilder:

1. Edit the Cost Surface model first.
2. Validate and run the Cost Surface model.
3. Review the results on the Map tab.
4. Edit the Connect Campuses model.
5. Add and connect the necessary data variables to complete the model.
6. Validate and run the Connect Campuses model.
7. Turn off the Cost Surface layer and review the results on the Map tab.

If you would like to view the results without running the models, you can add the Neigh_Connections results to your map from Data.gdb.

b Turn on and review the following layers:

- HQ_Final_Suitability
- Suitable_Locations
- Neigh_Connections

c Use the Lesson Forum to post your questions and observations. Be sure to include the **#stretch** hashtag in the posting title.

d When you are finished, save the project and exit ArcGIS Pro.