Supplementary Guidelines for ENVSOCTY 3GI3

Exercise 5

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Let's hang in there... one more exercise... and a little bit of final
then we are about to enter Epiphany

Knowledge Check before working on E3

Slide 16: Standardization Approaches

1. Maximum Score Procedure
2. Score Range Procedure
3. AHP

Slide 17: Fuzzy Analysis

Slide 18?

Proclamation

You should first view Patrick's *course slides*, *course videos*, *Exercise 5 Overview Notes (3GI3-W25)*, *EX5 - Instructions (3GI3-W25)*, *E5 Introductory Video*, *"Fuzzy Overlay Examples March 28" Video* before reading this **Supplementary Guidelines**.

These slides are only provided as tips that may help you deal with tasks and questions, but they should never become rigid workflow sheets to limit your imagination or inner drive to learn and explore things.

1. AHP Model

- Review the different numeric transformation methods and their respective pros & cons: Rescale by Function, Reclassify, Score Range Procedure, …
- Different factors may use different standardization methods and procedures, in general, my personal thought is that the 10 factors have some similarities in processing and could be grouped as below:
    - Existing Land Use (7th): constraint
    - Solar Radiation (1st) + Slope (2nd)
    - Aspect (3rd)
    - Land Cover (4th) + Agricultural Capability (10th)
    - Proximities (5th, 6th, 8th, 9th)
- For AHP model, the final 9 factor results (except for Existing Land Use) should come in [0,1].
- **Weighted Sum** should be used with the weights calculated by pairwise comparison.

1. AHP Model

- When Reclassifying Land Cover, after clipping it to City of Hamilton Area, you should rank the layers in 1-21 or 21-1. Be sure to carefully match its previous (e.g., 11, 12, 51) with its land cover name.
- To apply for the constraint factor, I guess you could either use **Extract by Mask** (need to reclassify 0s as NoData to only have “1”s) or **Raster Calculator** (to Times the original values back).
    - There are differences though, as the former method requires the constraint layer to be either vector or raster, while in the latter method it must be raster.
- When using **Score Range Procedure**, be very care with the criteria (i.e., *Benefit* or *Cost*)

2. Fuzzy Overlay Model

- Choose carefully the type of **Fuzzy Membership** you will apply to each of the 9 factors.
- Choose carefully the type of **Fuzzy Overlay**. There should be one type that suits the best for the model.

Deliverable 1: choice of standardization method and how each method helps represent the underlying suitability criteria. (8 marks)

- Hints: could focus on the standardization method used to derive [0, 1] values. And also the two criteria of this method (e.g., how the 9 factors could be grouped by the two criteria).
- Other things that could be talked: other numerical transformation methods used, or general standardization approaches (HCS/VCS, resolution, etc.).
- Only 8 marks.

Deliverable 2: an **Excel spreadsheet** demonstrating the pairwise comparison calculations, including the consistency ratio. (12 marks)

- Should come with 4 times of calculations (each 3 mark):
  - One calculation between the three **objective levels** of 10 factors (*Physical*, *Social/economic*, *Environmental*)
  - Three separate calculations under each objective (i.e., 4 factors under *Physical*, 2 factors (excluding *Existing Land Use*) under *Social/economic*, 3 factors under *Environmental*)
  - For each calculation, should include a few sentences talking about "*Justification of the choices that informed your weighting decisions (e.g., why was a particular factor weighed higher than another).*" You could write this in the excel sheet or in your PDF sheet, both are fine for me.
- *"Retain the equations within the cells to show accurate calculations."*
- Refer to page 36-53 in *Slide 16*

Deliverable 3, 7: Models (each 10 marks)

- On the arrows connected to Wighted Sum, you ***must*** **include the weights**.
- Write **Labels** beside each step (yellow rectangles) and **Rename** the output files (green circles).
- Include **data sources** as required in the question.
- Everything must be linked together with arrows. If they miss the arrows, you can manually draw the arrows.
- Don’t leave any parts in grey color.
- Export it directly into a PDF/SVG and insert hem into PDF

Deliverable 4, 8: Maps (each 15 marks)

- Should be inserted to PDF as single pages.
- Map elements:
    - **Basic Elements** (refer to Map Rubrics on A2L**)**
        - ✓ Clear **boundary** line
        - ✓ Informative **title**
        - ✓ **Legend** (e.g., layer title…)
        - ✓ some form of **orientation**
        - ✓ a **scale** indicator (scale bar ? texted scale ratio?)
        - ✓ **credits** (e.g., data source, projection (HCS/VCS) info, (c) your name, your institution, date of making the map, …)
        - ✓ **Aesthetics!!**
    - Additional info for this map
- "Use **Locate Regions** to highlight the most suitable areas for solar farm development, and clearly label areas in order of suitability (D4) / present the regions with varying degrees of suitability (D8)."
    - Each region must be set for "**400ha in total area"** (check the requirements in page 2 of the Instructions)

Deliverable 5 (10 marks) :

- ❑ Potential conflict between two or more factors (e.g., higher solar potential versus proximity to sensitive environmental zones).
- ❑ How you addressed this conflict in your weighting or decision-making process.
- ❑ Consider how different stakeholders (e.g., developers, environmental groups) might perceive and prioritize this trade-off.

- Three aspects as the question suggests. So **at least three aspects/paragraphs**. Under each aspect you could structure your answers in bullet points as suggested.

Deliverable 6: one-paragraph summary of the methodology used to 'fuzzify' the layers … (10 marks)

- Could be structured as: 9 bullet points + 1 short paragraph of summary
    - 9 Fuzzy Membership methods used in 9 factors (excluding ExistingLandUse)
    - 1 short para talking about the overall fuzzy methodology.

Deliverable 9: strengths and limitations of using the **fuzzy overlay** method for solar farm siting. … challenges or limitations you encountered when using this method for your analysis and how these limitations could impact the final decision on suitable solar farm locations. (10 marks)

- Could use generalized aspects and bullet points to better structure your answers.
- One reasonable argument one point.

Deliverable 10 (10 mark):

- ❑ Assess the **viability of each of these located regions** based on the suitability factors
- ❑ Are there any **factors** that may affect the feasibility of these locations that were not fully captured in the analysis?
- ❑ What **adjustments or additional considerations** could be made to **improve** the suitability of these regions for solar farm development?"

- Three aspects as the question suggests. So **at least three aspects/paragraphs**. Under each aspect you could structure your answers in bullet points as suggested.

Final Submission

- 1 single PDF Document + **1 Excel Spreadsheet** (pairwise comparisons + CR)
    - *Any map (always worth 15 marks) must be a full page, either in portrait or landscape depending on the orientation of the map!*
    - *Cover page contains: the exercise number and name (Exercise 5: Multi-Criteria Evaluation II), your name, submission date, and your TA's name.)*
    - *Use 12-point font, 1.5 spacing between lines and 1-inch borders*
    - *Correct all spelling and grammatical mistakes/issues*
- Due date: please submit to the Avenue Drop Box by **Tuesday, April 8, 2025 at 11:59PM.**

Good luck and enjoy a coming-late spring.