Sustainability Analysis in Python

Flowcharts

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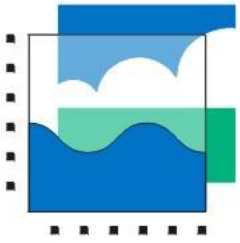
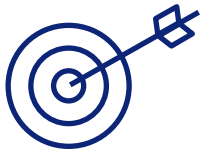


CML
Institute of Environmental Sciences

Learning Goals



- Process unclean data, describe datasets with metadata, and apply fair data principles
- Validate and assess uncertainties of models
- Test hypotheses and verify the underlying assumptions
- **Develop** clear and efficient **code** in Python, integrate user interaction, and keep track of versions

Outline

Flowcharts

Handout of assignment

Exercise

Software Development

1) Design, e.g., using **flowcharts**
2) Implementation, e.g., using Python
3) Testing
4) Documentation (→ lecture 5)

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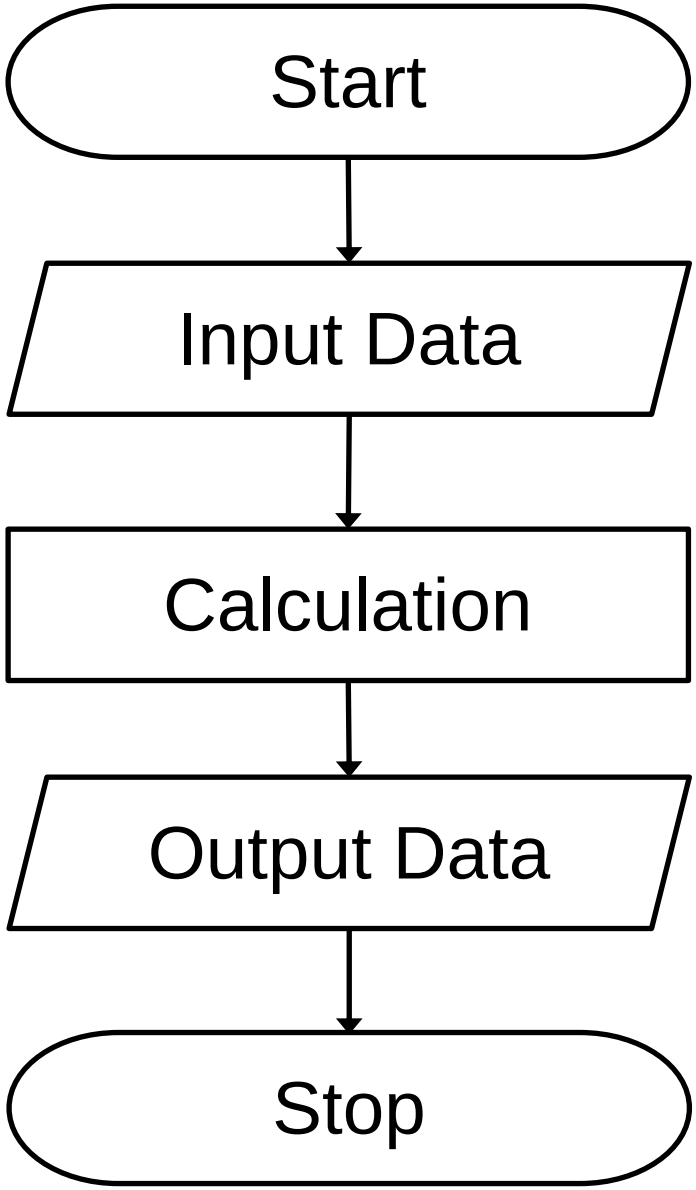
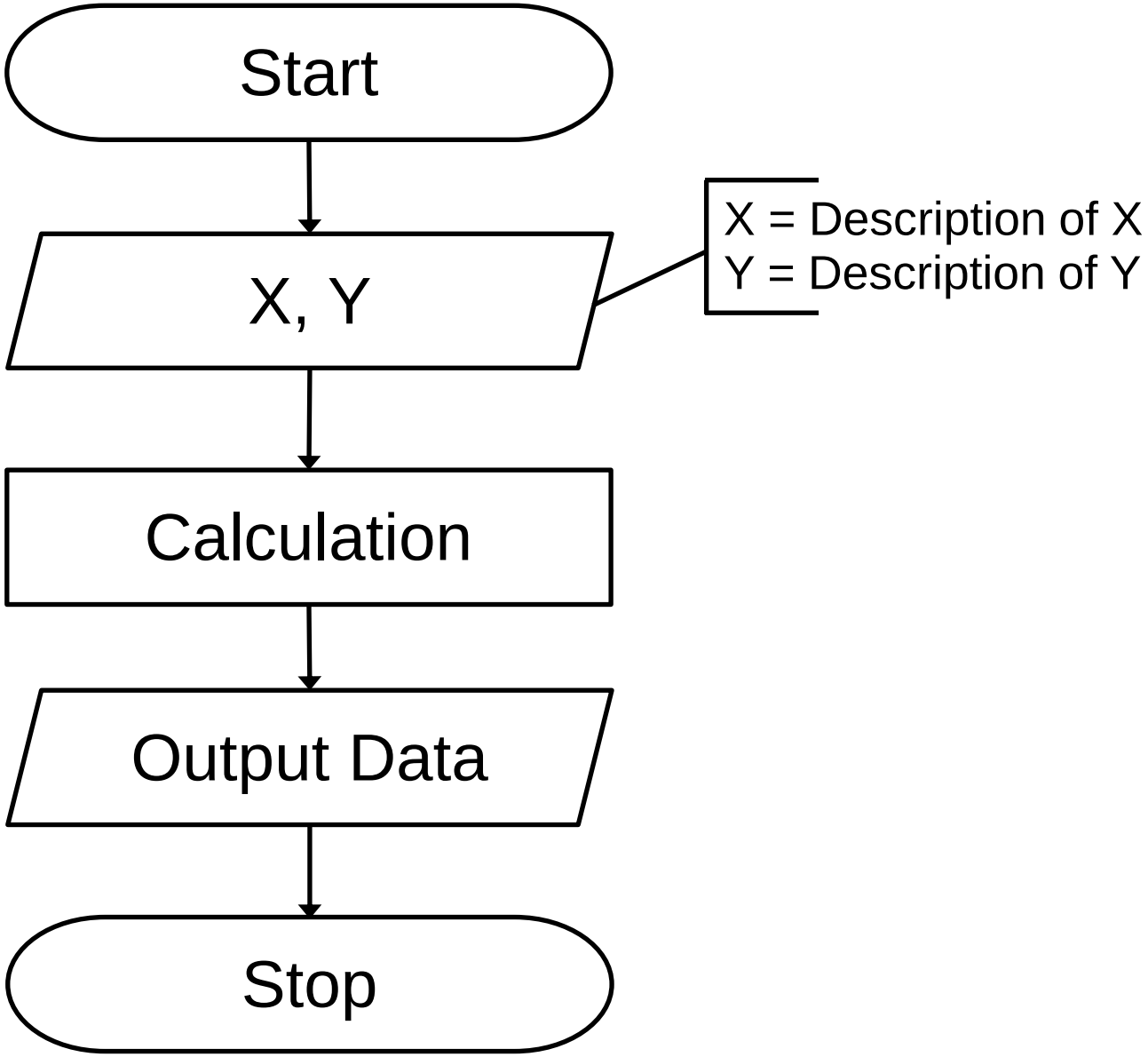
Flowchart

→ Design and documentation of the computer programme





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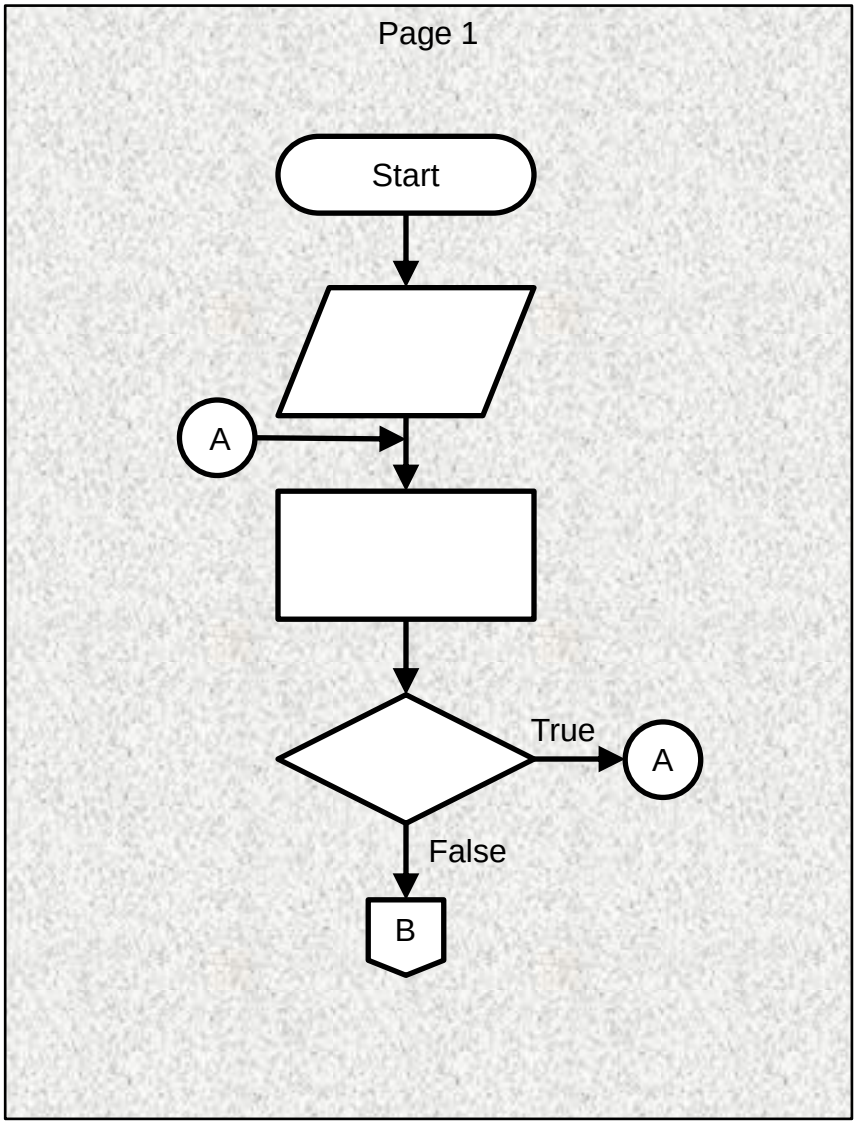

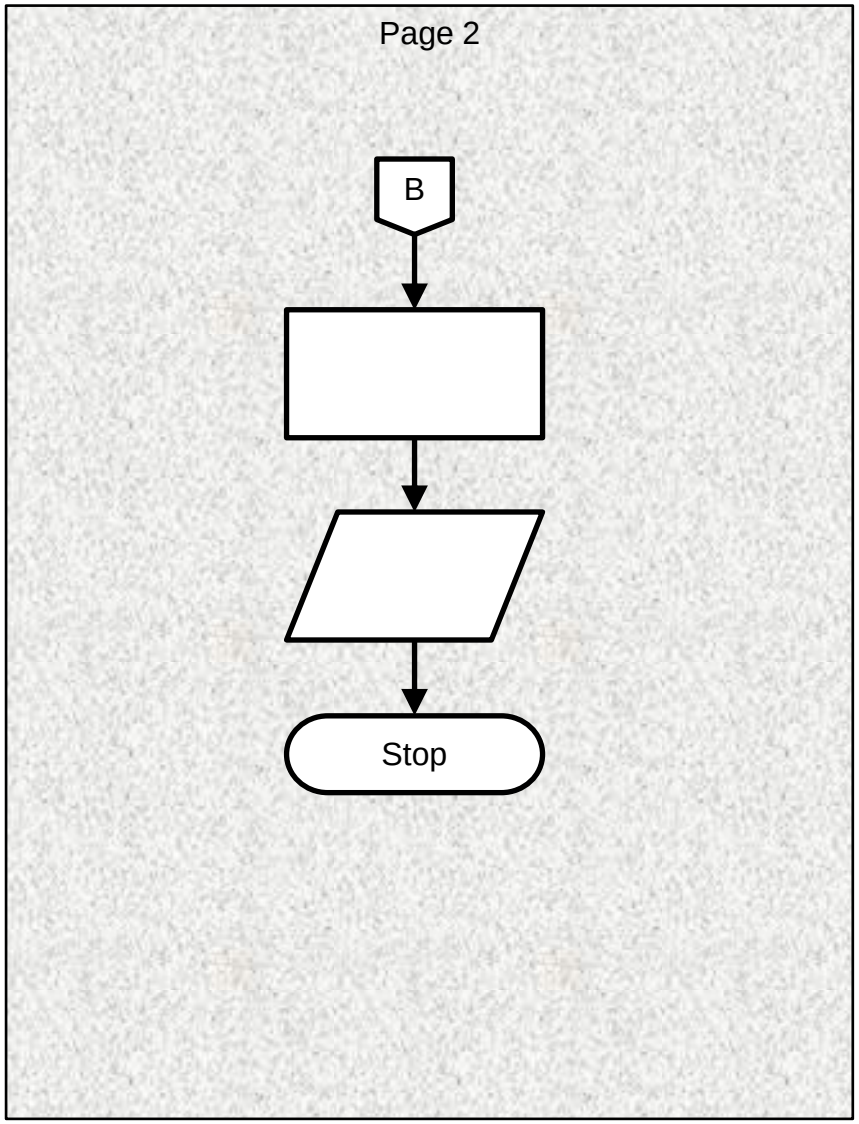

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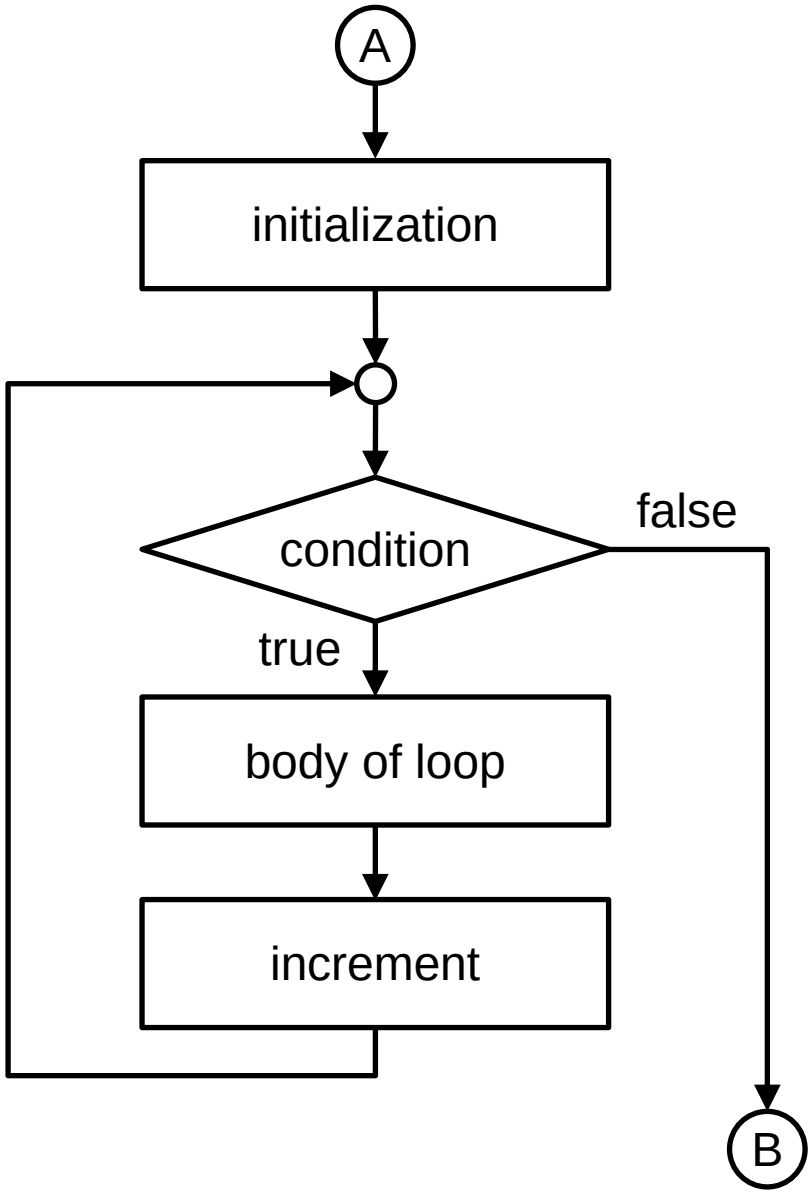
Loop



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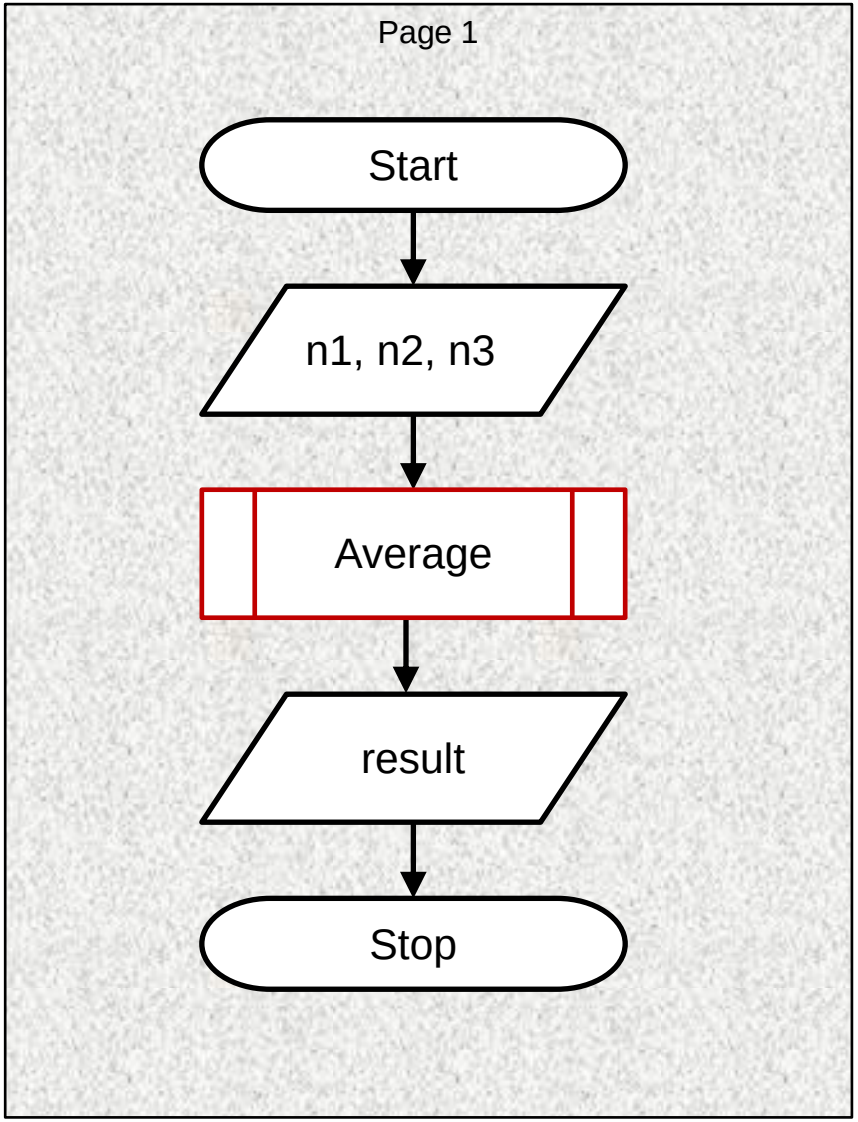
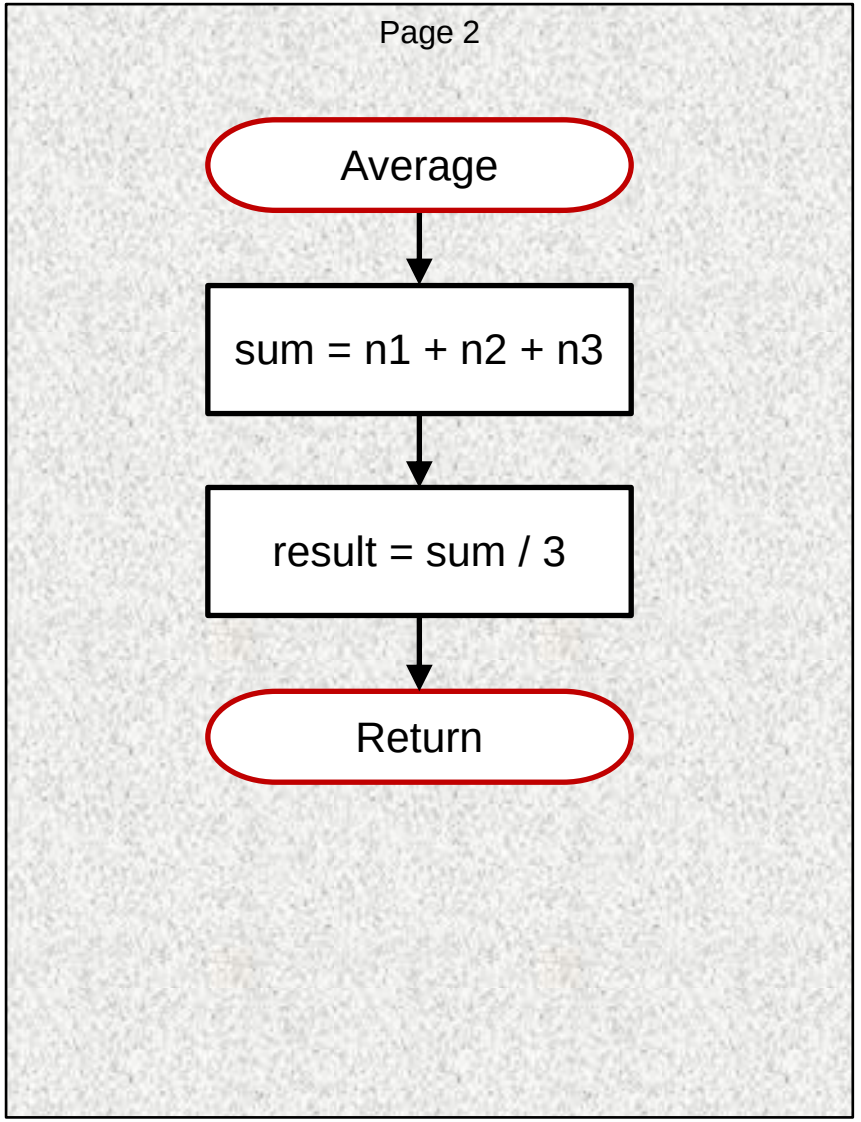
Function





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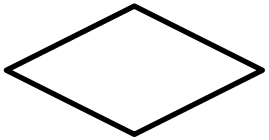
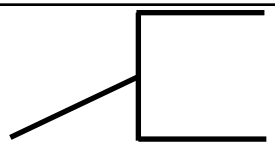
	Flowline
	Terminal
	Process
	Input/Output
	Decision
	Function/Subroutine
	On-page connector
	Off-page connector
	Annotation/Comment

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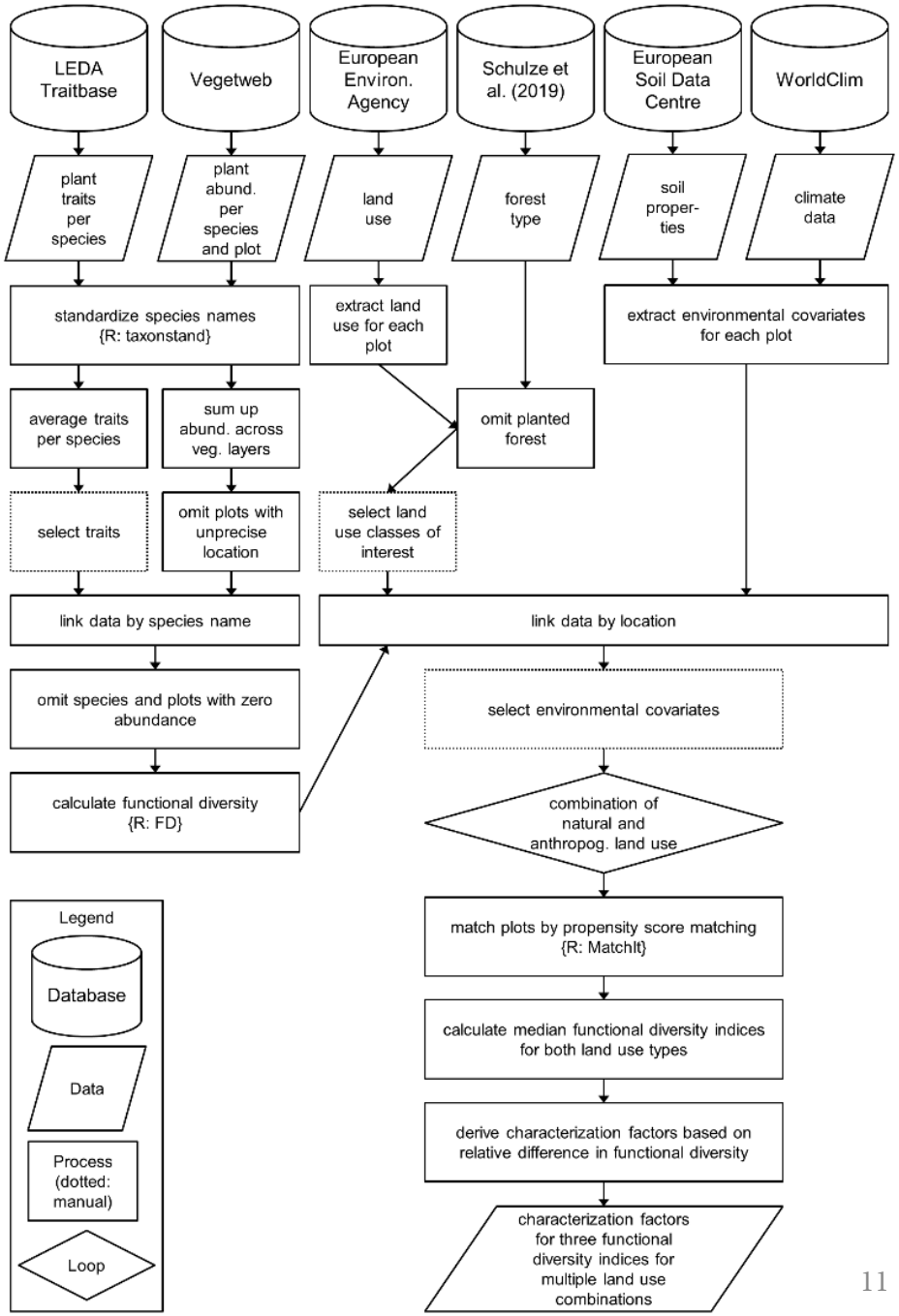
Example from master thesis



Outline

Flowcharts

Handout of assignment

Exercise

Assignment

Group A
Research question: Are social and environmental sustainability indicators correlated, and is there rather a trade-off or a synergy between the two?
Main analysis: hypothesis testing, including testing assumptions (→ Lecture 2)

Group B
Research question: How well do countries perform regarding sustainability, and does the overall distribution change if more countries are considered through imputation?
Main analysis: Imputation, including validation (→ Lecture 3)

→ Indicate your preference for a group here and sustainability-related indicators here (A) or here (B)

Logo source: https://en.m.wikipedia.org/wiki/File:The_World_Bank_logo.svg

Assignment

Expected skills practiced more: Using Python for function definitions, loops, conditions, reading and writing to files, and plotting.

- Work with pandas data objects (→ Lecture 1).
- Write nice code (→ ESSA Lecture 5, slide 9).
- Use Python for developing Python modules, i.e. create a separate script for functions that is sourced in the main script (function: import, script name without extension).
- Integrate a GUI element (→ Lecture 4).
- Track your code changes with git (→ Lecture 2).
- Document your code according to a standard style (→ Lecture 5).
- Profile your code to find slow sections and potentially optimize them (→ Lecture 5).
- Work in a virtual environment (→ Lecture 1).

Logo source: https://en.m.wikipedia.org/wiki/File:The_World_Bank_logo.svg

Assignment

Data from the World Bank can be found here.

Submission: Hand in on Brightspace

See deadlines in assignment instructions, course schedule in introduction lecture slides, and on Brightspace.

See deliverables (more than just the Python scripts) and assessment rubrics (more than just a working code) in assignment instructions.

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Outline

Flowcharts

Handout of assignment

Exercise: Draw a flowchart for the assignment of group A or B

Group A – Trade-offs

In a nutshell:

- Input: 3 environmental and 3 social indicators
- Filter selected country
- Verify test assumptions
- Choose either Pearson or Spearman correlation analysis
- Run correlation analysis
- Output: trade-off or synergy

Flowchart for group A

Group B – Distribution

In a nutshell:

- Input: primary and secondary indicator
- Filter a recent year
- Impute data
- Validate imputation
- Segment data
- Output: imputation performances
- Output: distribution

Flowchart for group B

Key Issues to Keep in Mind

Based on common mistakes in exams

- Draw **flowlines** with arrow heads that indicate the direction of the flow.
- Use the right **symbology**, as it gives additional information.