

MESSAGE_{ix} Workshop – Modelling Forum Developing an Energy Model

MESSAGEix Workshop team:

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Developing an energy model.

How to develop an energy model?

1. Before starting to model.
2. Scenario storyline vs. scenario variants.
3. Reference Energy System - the model map!
4. Start simple; add complexity in a stepwise manner to understand each change.
5. Data

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Before starting to model.

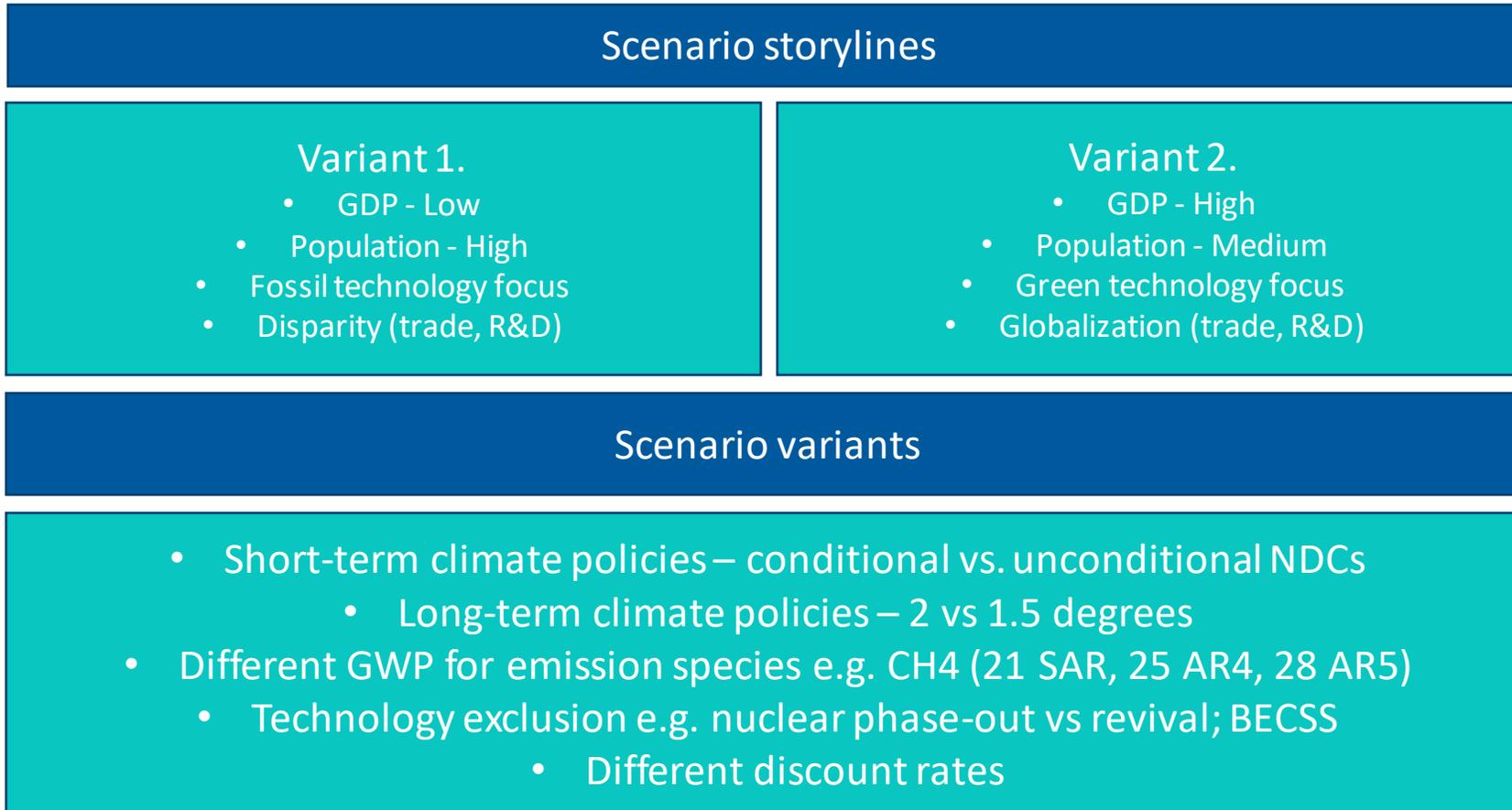
1. What is my research question(s)?
 - ⇒ Point of reference - focus on key requirements to answer questions.
 - ⇒ Distinguish “nice-to-have” features from “essentials”.
 - ⇒ What is non-target?

2. What is the hypothesis?
 - ⇒ What are the expected results?
 - ⇒ What additional information can I provide other than the obvious?

3. Who is my target audience?
 - ⇒ Journal, fellow researchers, political audience, students.
 - ⇒ Determines messages and level of detail to be communicated.

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Scenario storyline vs. scenario variants.



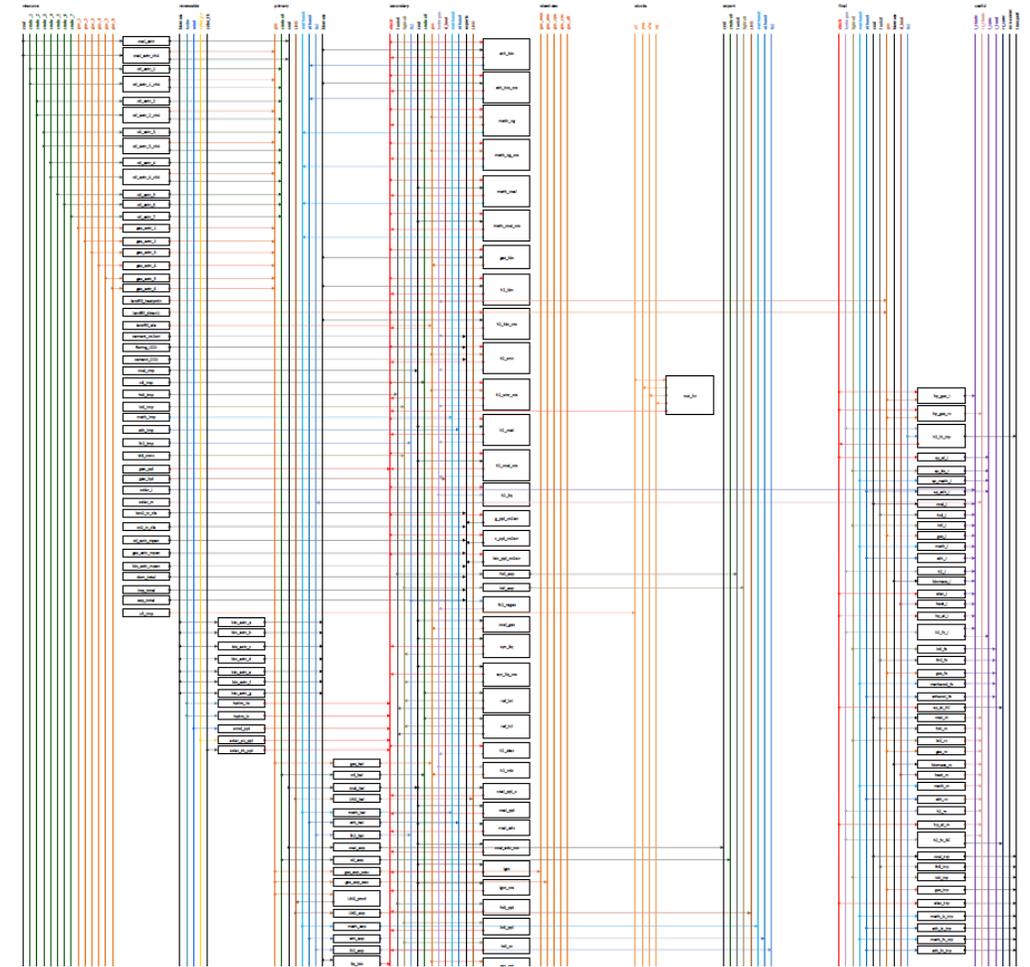
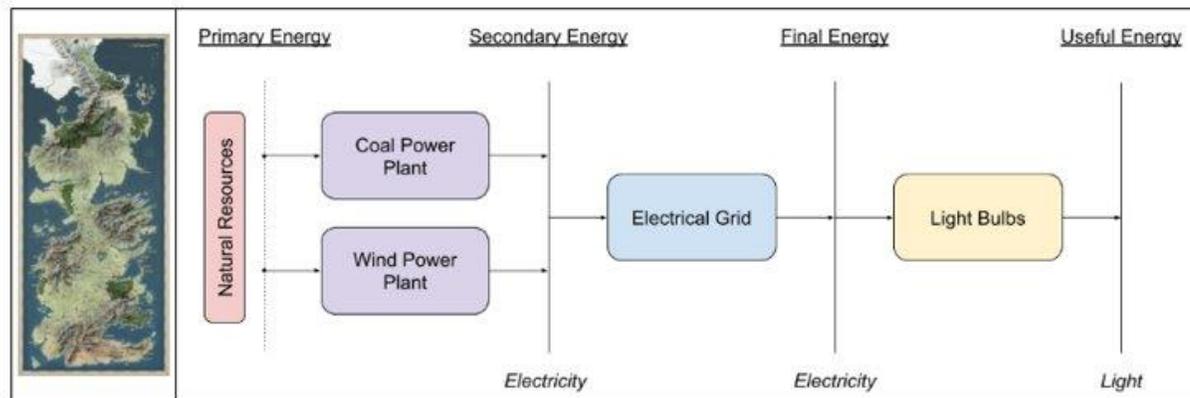
The target is to provide consistent and logically entwined “plots” with underlying drivers. These will essentially also determine demand projections.

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Draw out a Reference-Energy-System

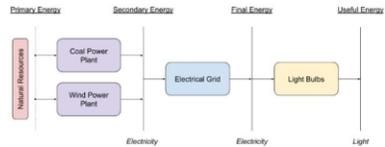
A stylized reference energy system model for Westeros

This tutorial is based on the country of Westeros from the TV show "Game of Thrones".



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Start simple and gradually introduce complexity.



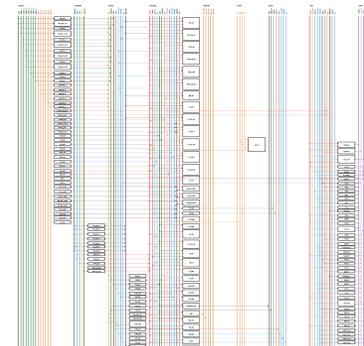
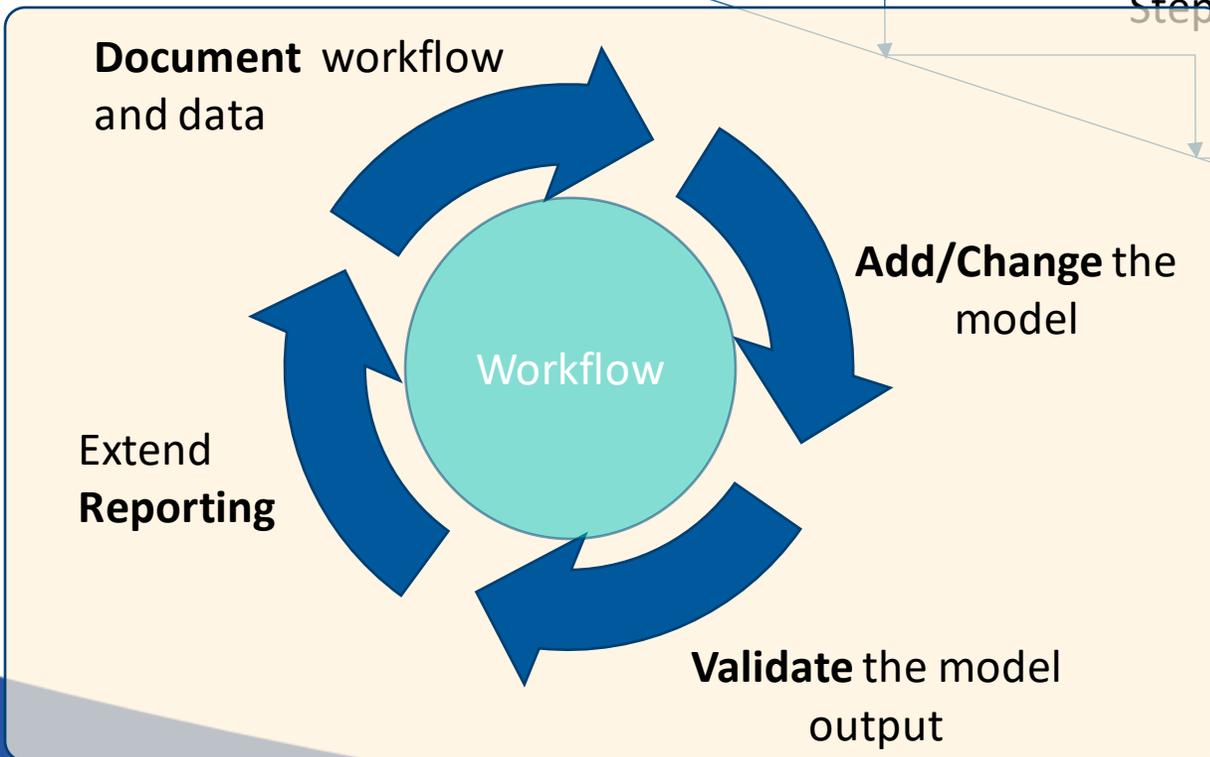
Step 1. Add more supply technologies

Step 2. Add resources

Step 3. Detail End-Use

Step 4. Add Land-Use

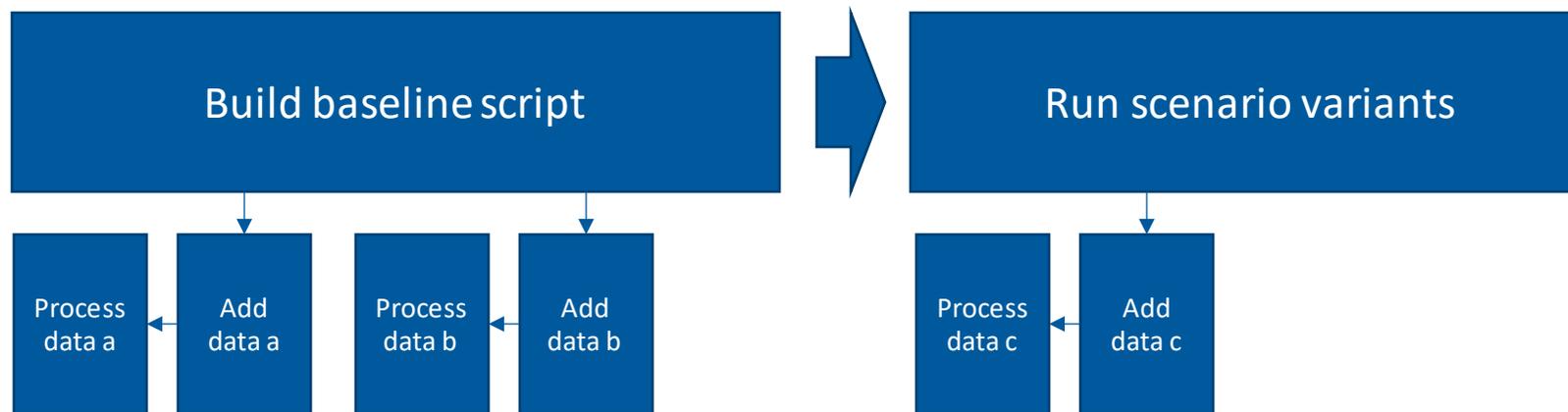
Step 5. Add other regions



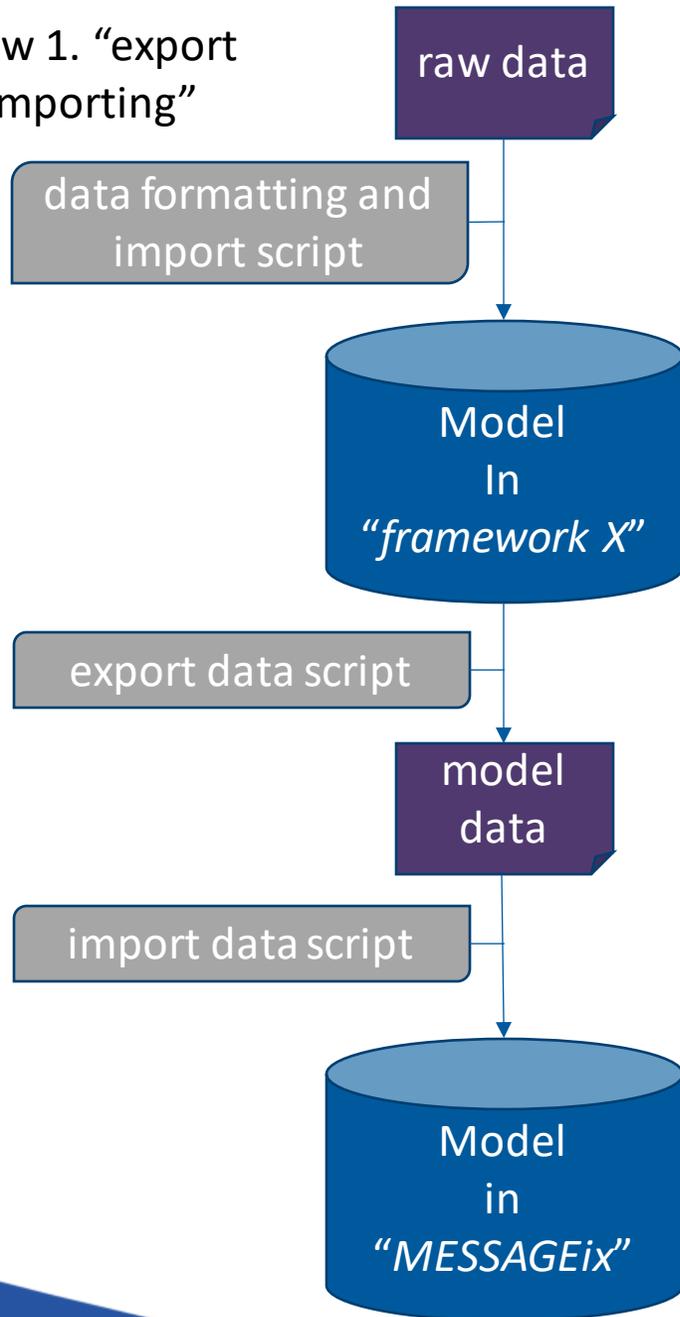
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Data

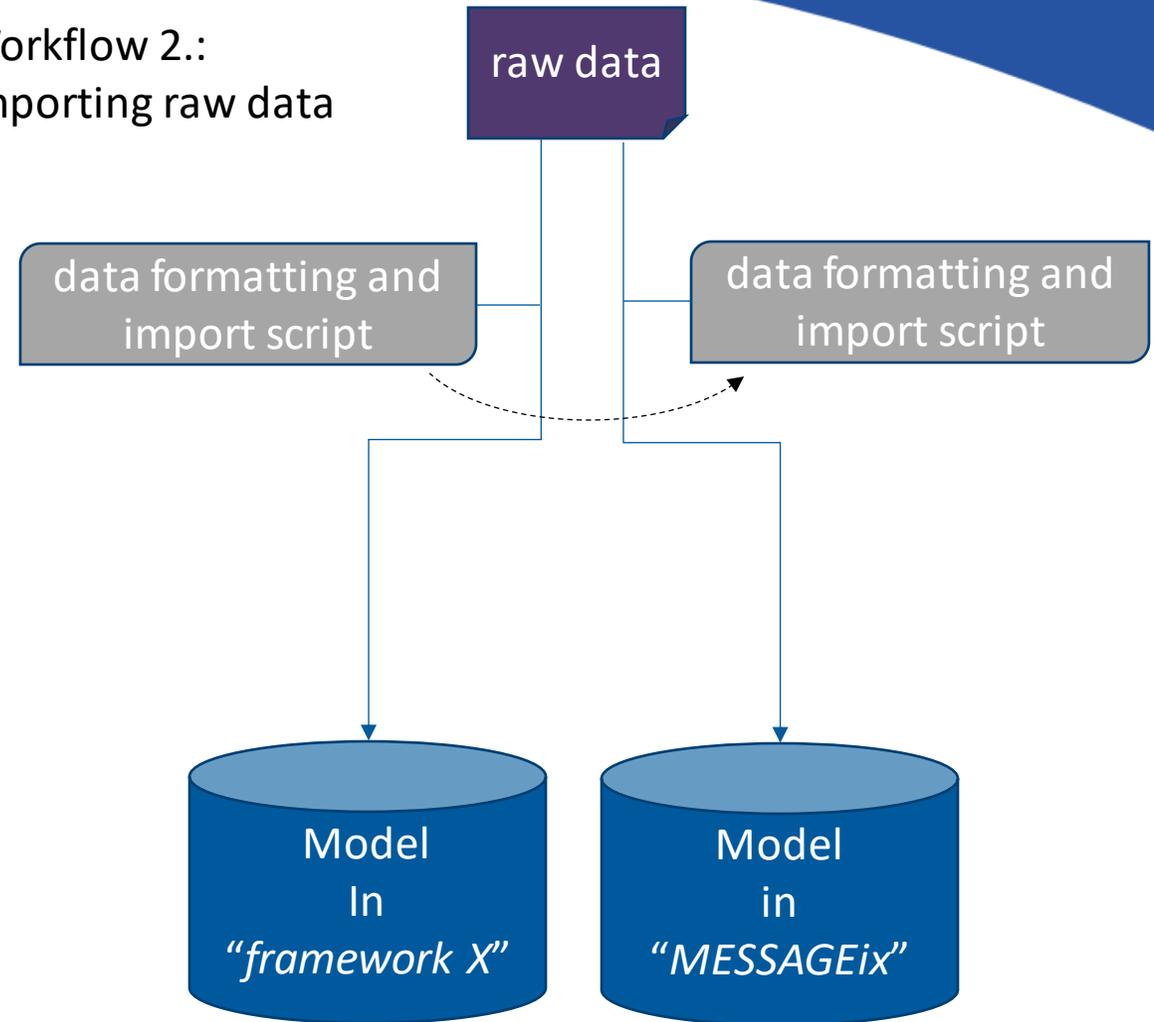
1. Separate data processing for use as input from “inputting” data into the model.
2. More granularity ≠ better model.
3. Scaling – units should be adjusted to avoid too large or too small numbers.
4. Avoid “flat” optimization – avoid too similar options.
5. Be transparent – when adding assumptions; be clear about what and why they have been used.
6. Document, document, document



Workflow 1. "export and re-importing"



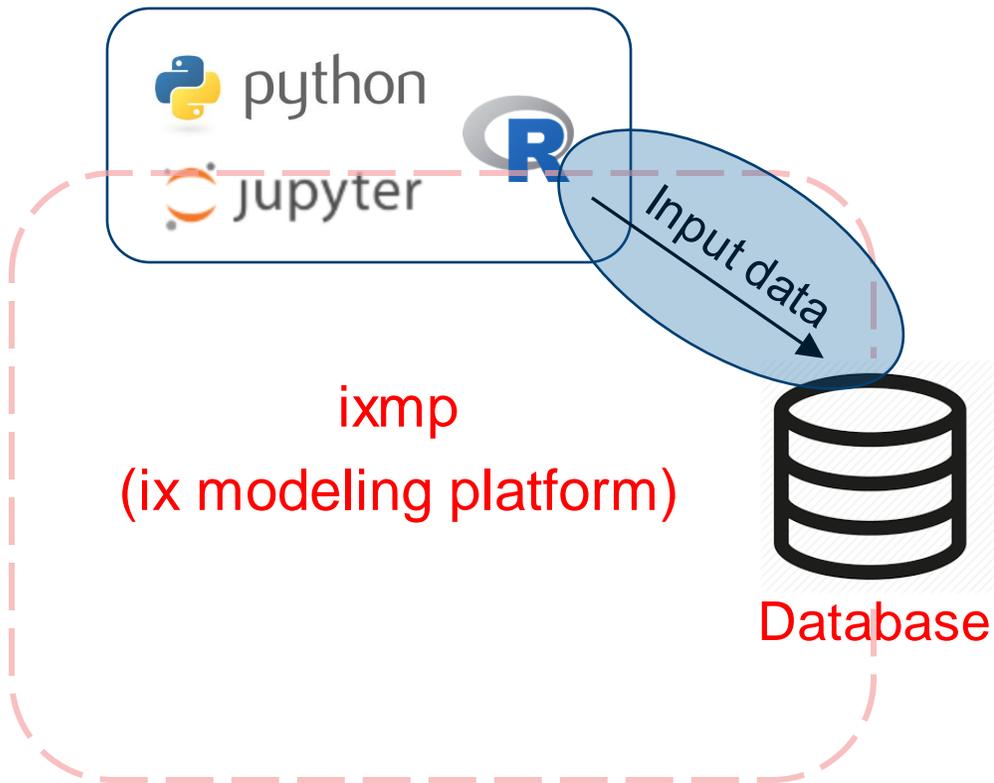
Workflow 2.: Importing raw data



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Data

1. Interface



Option 1.:

- a) Create a pandas dataframe with data.
- b) Use commands ``add_set()``, ``add_cat()``, ``add_par()``

Option 2.:

- a) Prepare data in the correct format in an Excel file.
- b) Use commands ``read_excel()``

...the latter can be an option for model transition process i.e. moving data from a given modeling platform to MESSAGEix.

Two tutorials to illustrate the use age.:

- [westeros/westeros baseline using xlsx import part1.ipynb](#)
- [westeros/westeros baseline using xlsx import part2.ipynb](#)