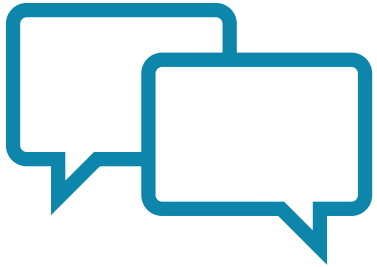
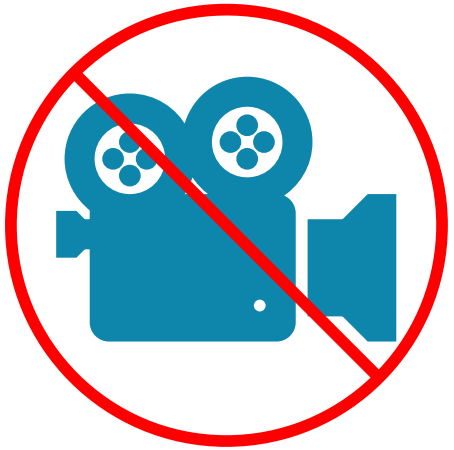
Oide

Modelling with Python using Pygal

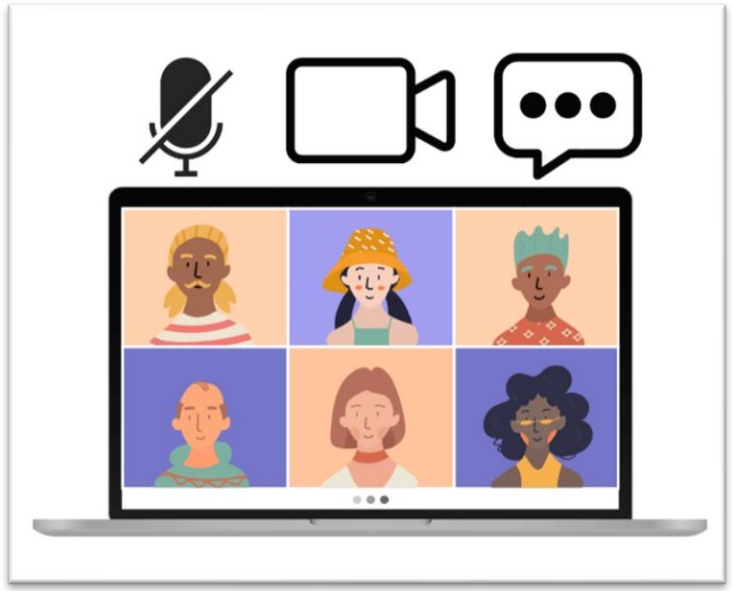
Computer Science Collaborative

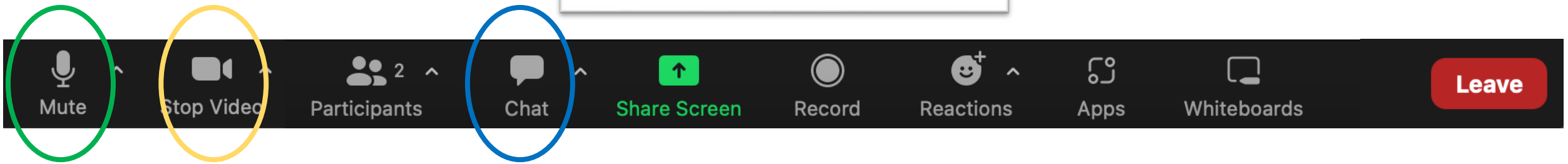
Before we begin…





Zoom Functions/Breakout Rooms





Schedule

6:00 – 6:30	• Welcome • What is a model? • Modelling in Python with Pygal
6:30 – 19:15 **19:15 – 19:30**	• Developing models in Python • Feedback on models developed

Learning Intentions

- To develop a shared understanding of a model
- To develop a model using Python to represent a real-life situation
- To use the model to simulation different scenarios
- To represent model output in an interactive graphical format

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Supporting the Professional Learning of School Leaders and Teachers

Models and Modelling

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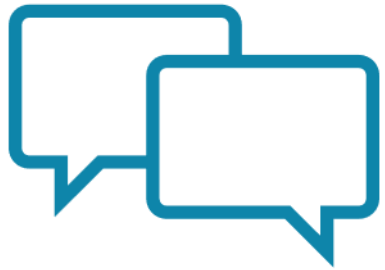
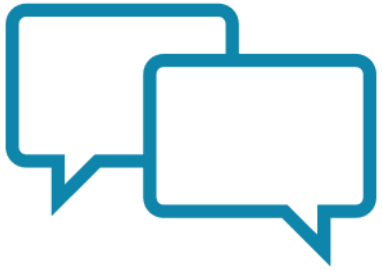
What is a model?



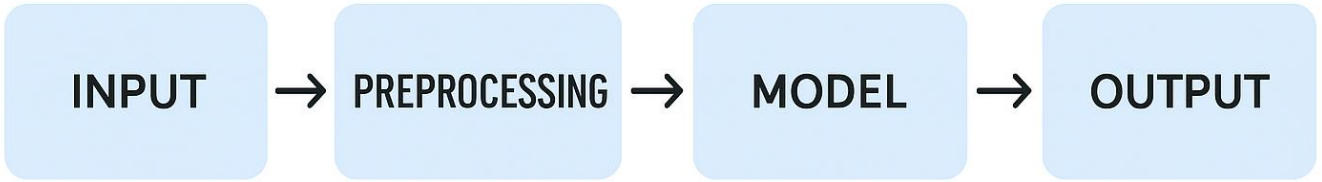
What real-world situations do students encounter where using a model would help them think or make decisions?



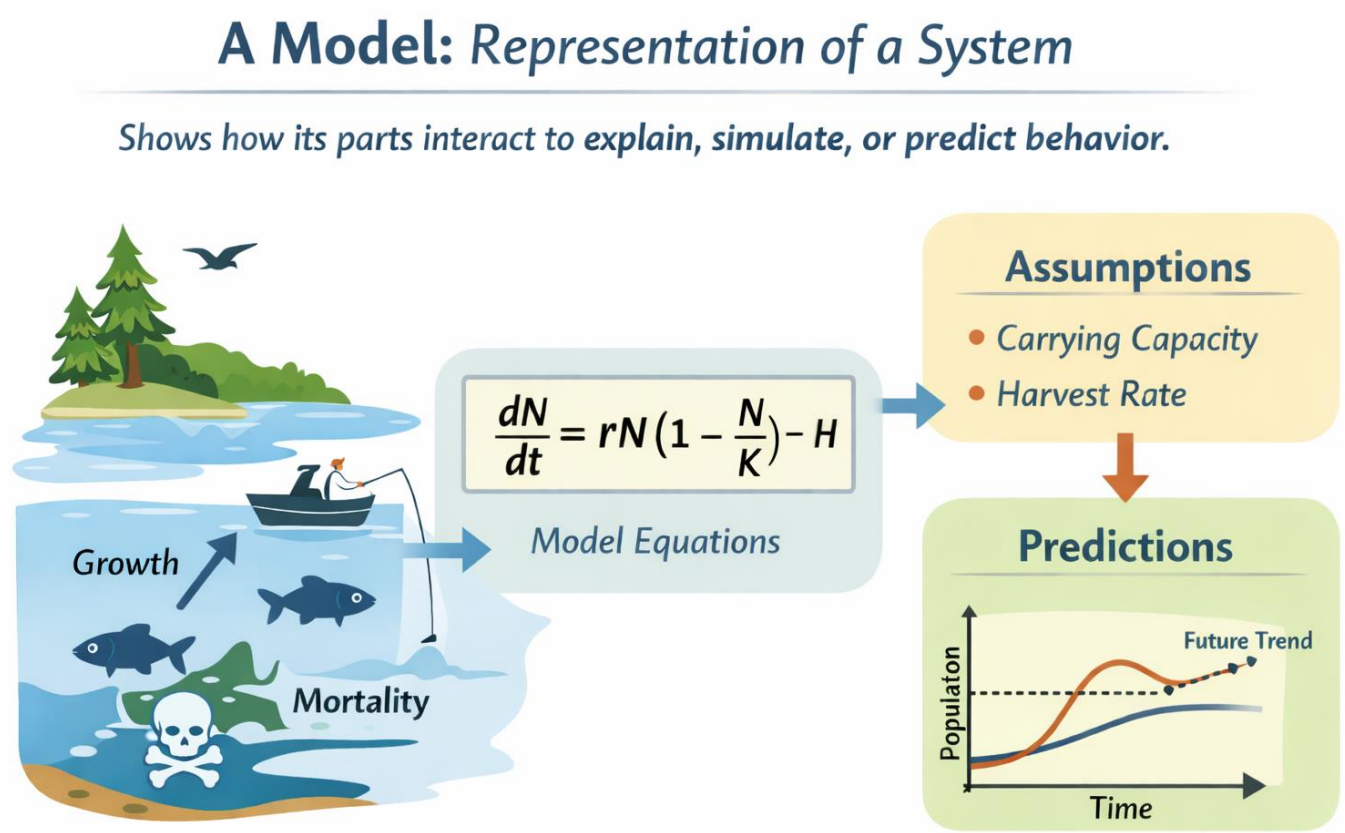
What is a model?

- A model is a representation of a system, showing how its parts interact to explain, simulate, or predict behaviour

- Abstraction allows for the creation of a model which applies to a range of circumstances.



Example of a model: Fish stocks in a lake



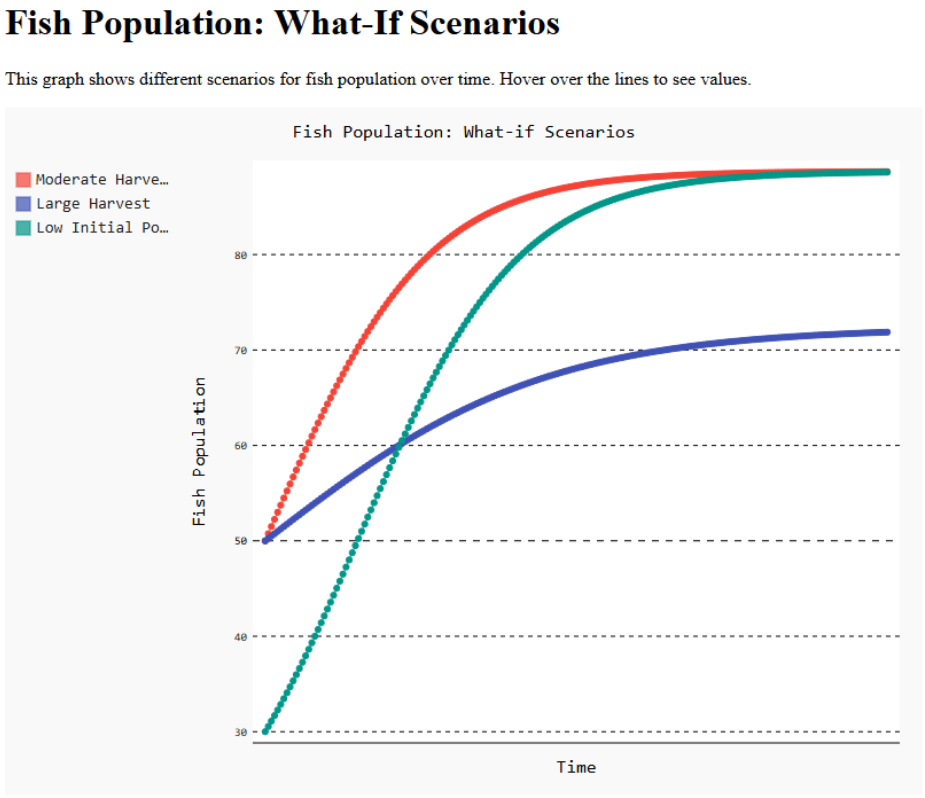
Fish Stock Model

$$\text{Change in population} = \text{Growth rate x Current Pop x } (1 - \frac{\text{Carrying Capacity}}{\text{Current Population}}) - \text{Harvest}$$

Model as a function in Python:

```
#Fish stock model
def fishModel(population, growthRate, carryingCapacity, harvestRate):
    return growthRate * population * (1 - population / carryingCapacity) - harvestRate
```

Model in Python



- Fish population modelled with different harvest values and starting population values (what-if scenarios).
- Pygal library used to render interactive SVG file which can be embedded in a web page

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Using Python to develop models and simulations

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Collaborative modelling

45 min

- **Scenario 1:** Simulate a human population over time.
- Variables: population: current population - growth_rate: annual growth fraction - years: simulation duration
- **Scenario 2:** Model disease spread in a herd.
- Variables: susceptible, infected, recovered - infection_rate, recovery_rate, years
- **Scenario 3:** Model insect population affected by birth, mortality, and food availability.
- Variables: insects, birth_rate, mortality_rate, food_factor, years

Activities

In the breakout rooms:

- If one participant could share their screen
- Choose a model or develop your own model
- Develop your model in Python and use the pygal library to render an interactives SVG graphic to display your model
- Give feedback on the resource developed to rest of participants

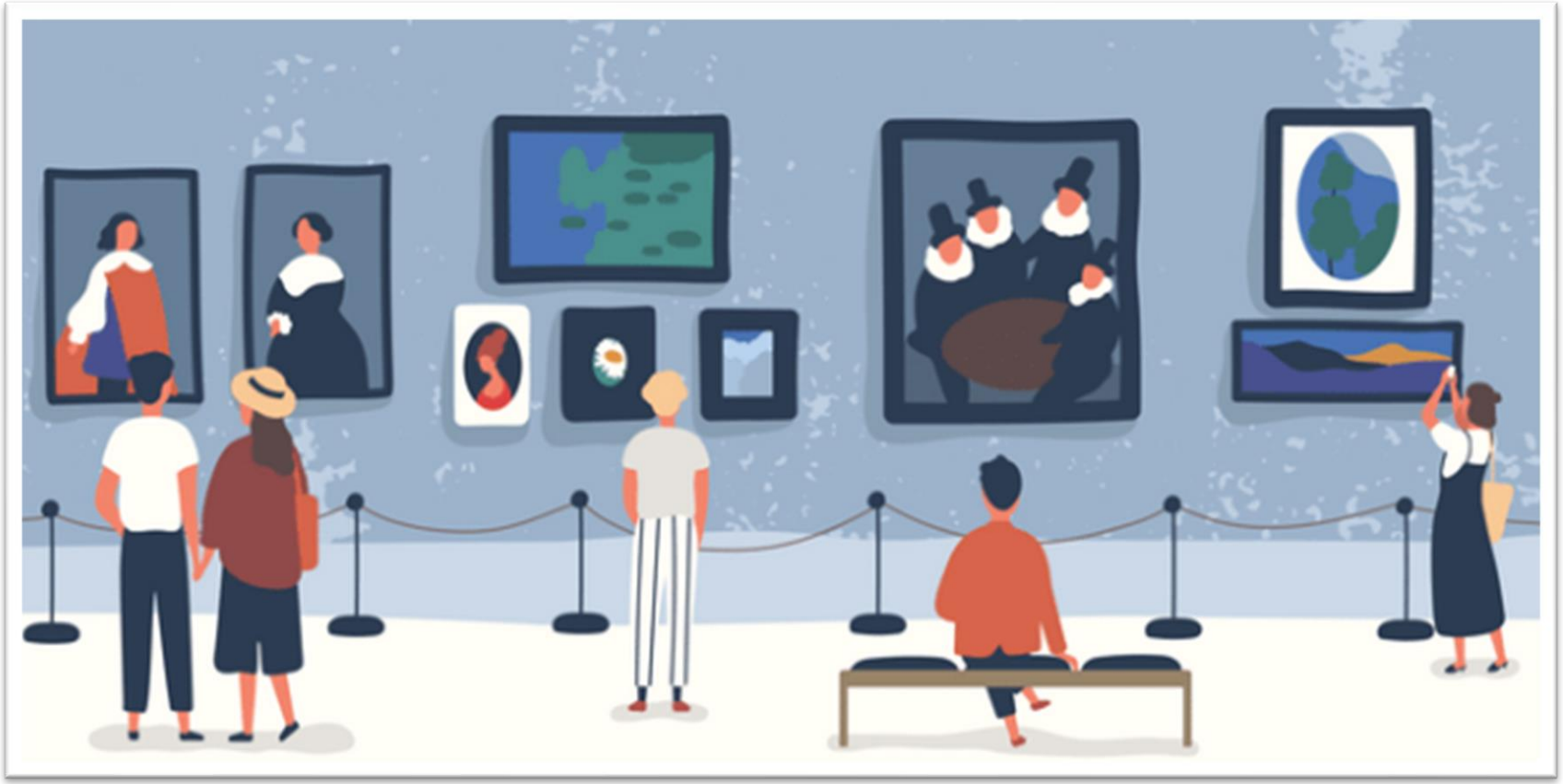
45 min

Link for starter code: http://tiny.cc/pygalmodel

Breakout rooms

Breakout Room	Scenario
1	1
2	2
3	3

Feedback - Sharing our Resources



Key functionality of Pygal

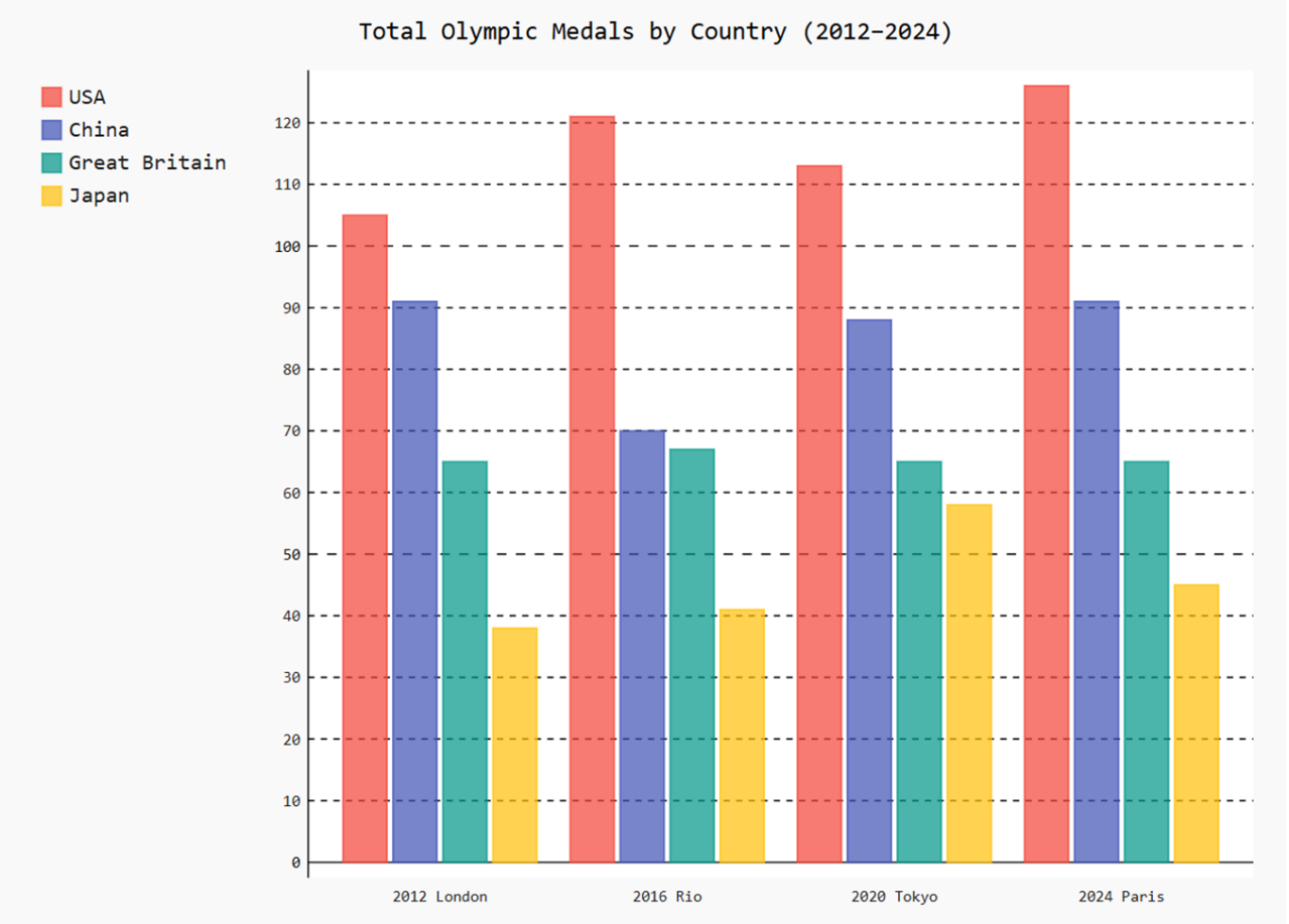
- Create interactive SVG charts that can be embedded in websites and scaled without losing image quality
- Supports many chart types including line, bar, pie, radar, XY plots and world maps
- Easy to customise and style with multiple options for colours, labels and legends supporting dynamic interaction
- Can be exported to multiple formats such as PNG if interactivity is not required.

Sample visualisations in Pygal

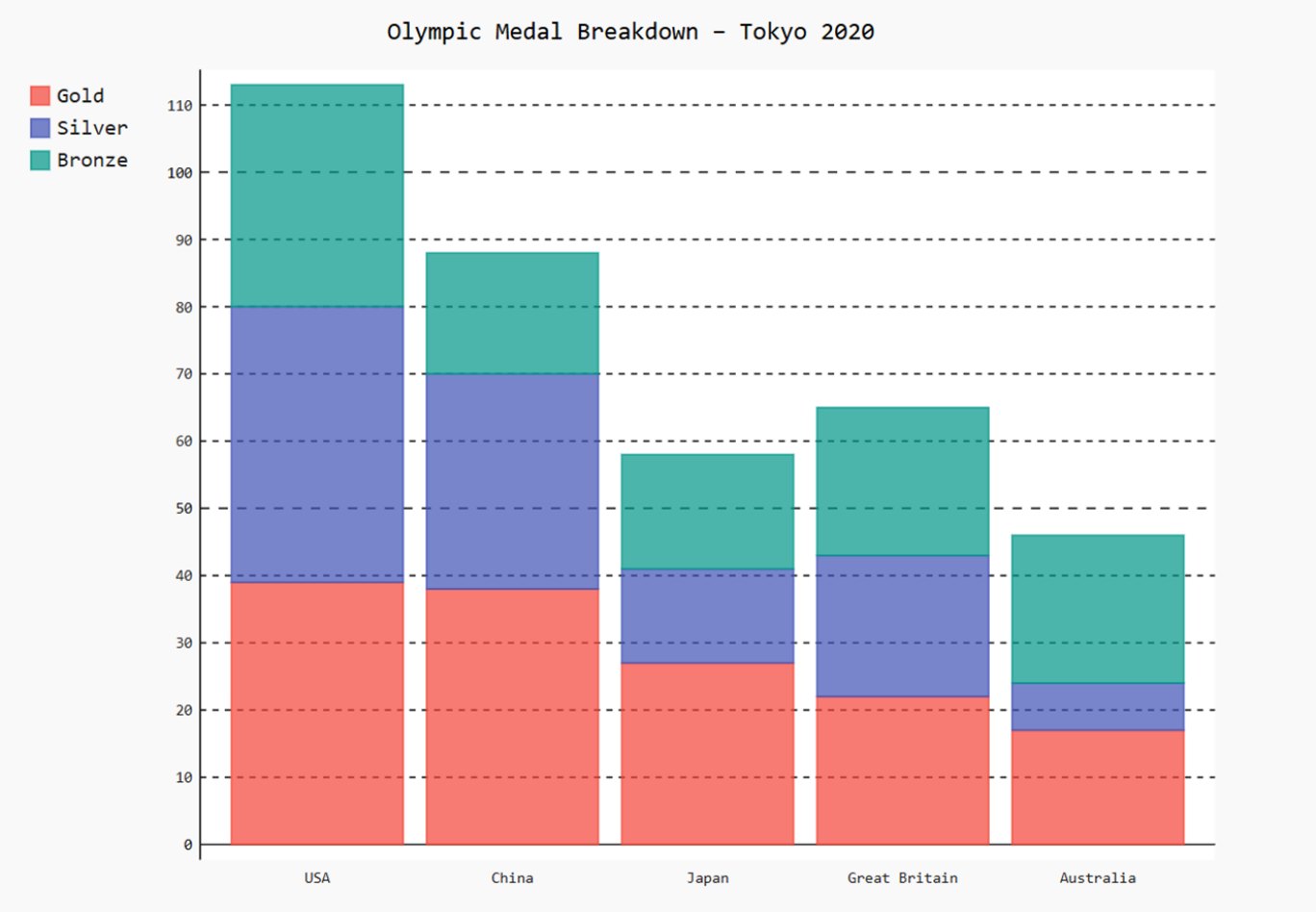
Pygal can be used to create other types of charts for data

- Bar
- Pie
- Radar
- XY Plots
- Maps

Sample visualisations in Pygal



Sample visualisations in Pygal



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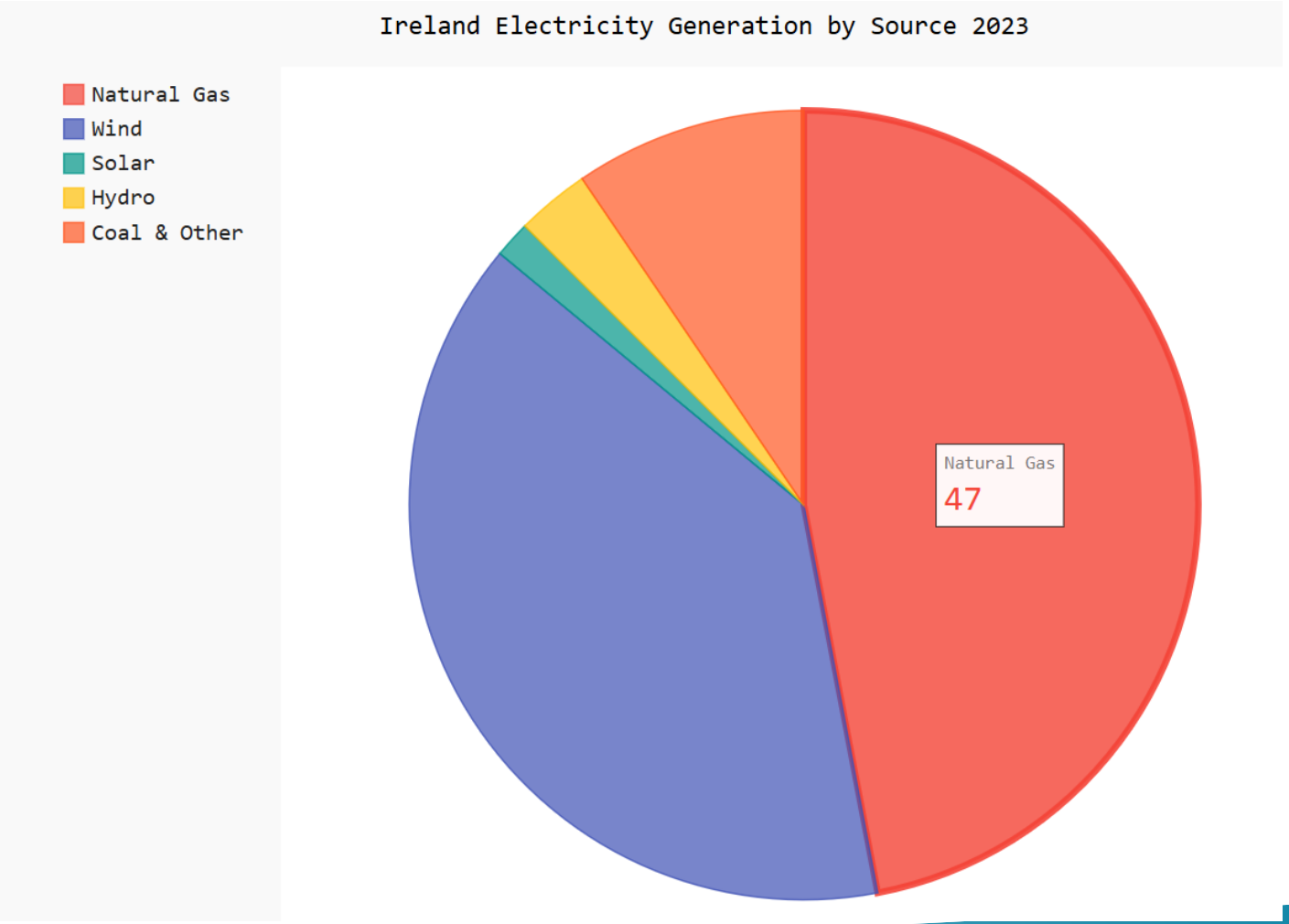
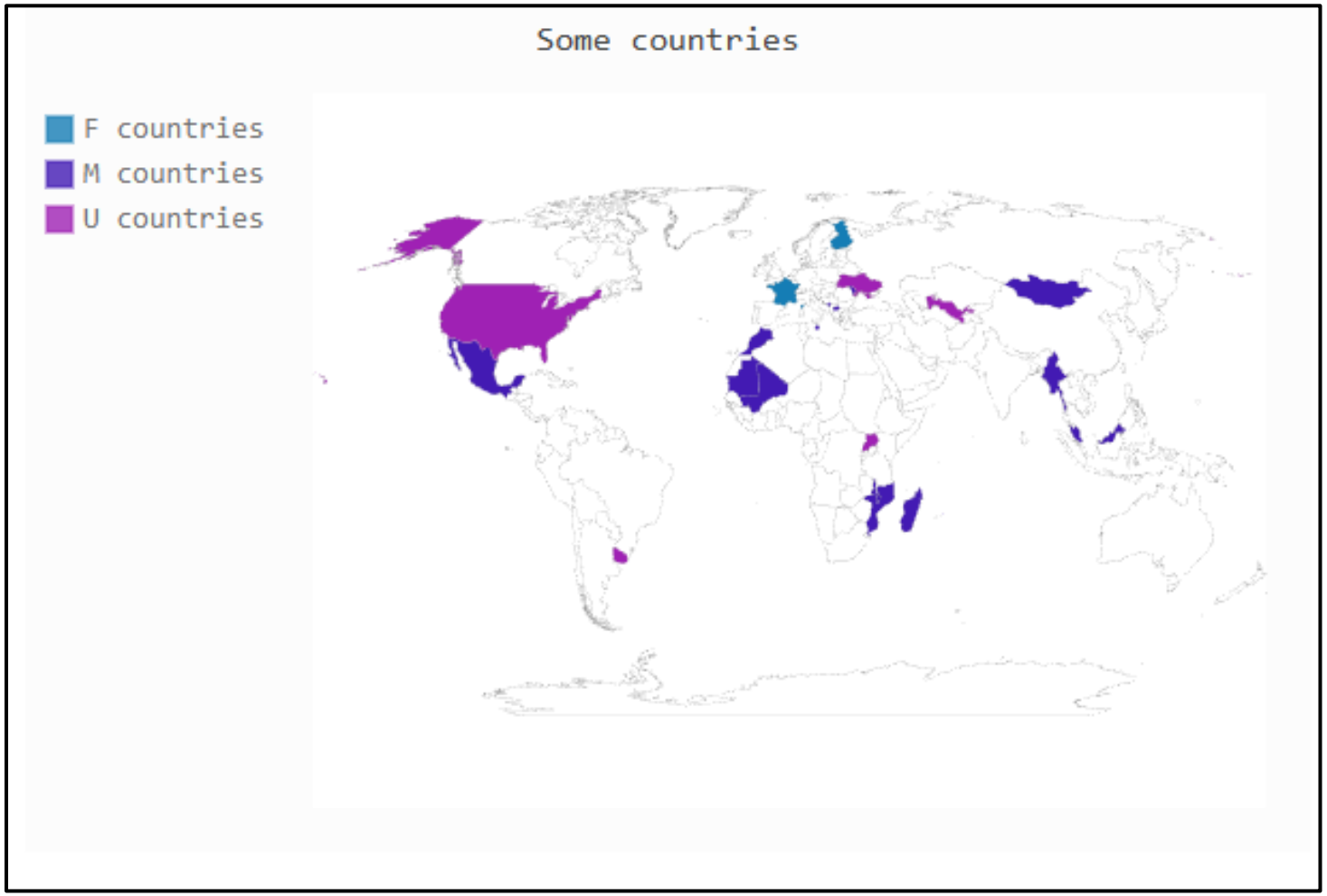
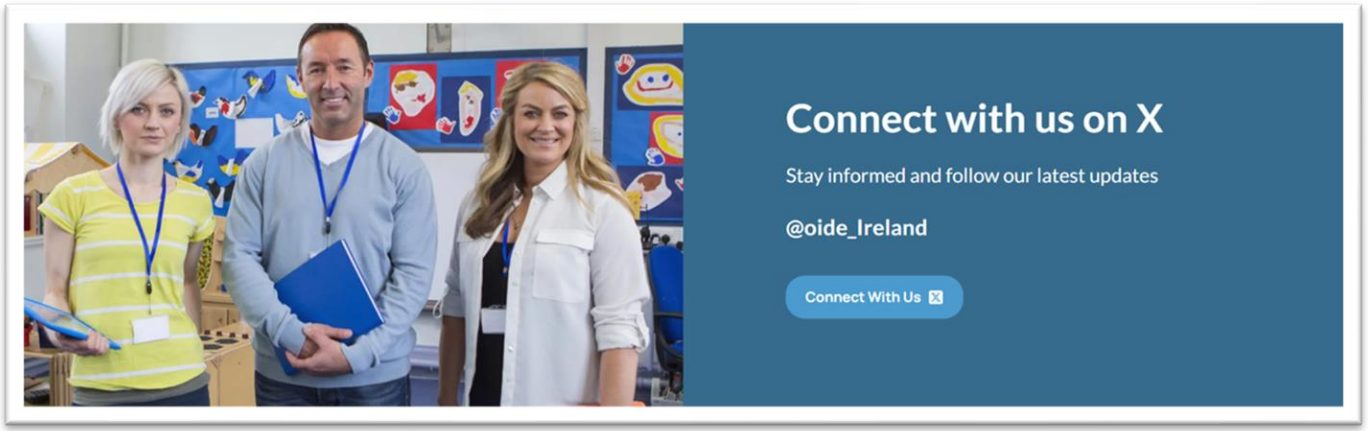


Sample visualisations in Pygal



Pygal Resources

- Further Pygal resources are available on the Oide website
- https://tinyurl.com/python-pygal

- Pygal code resources are available
- https://tinyurl.com/OideCSpygal

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