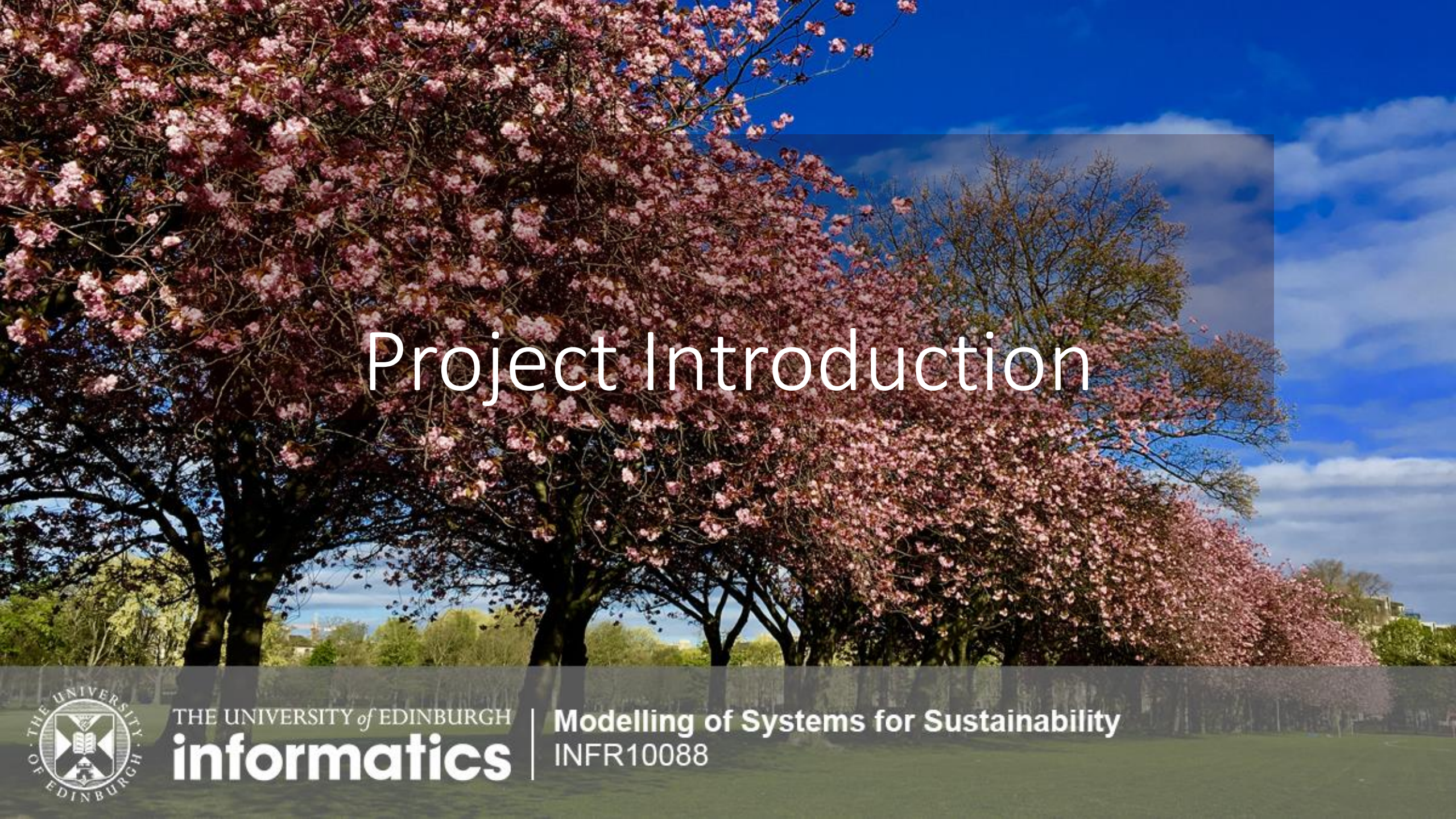
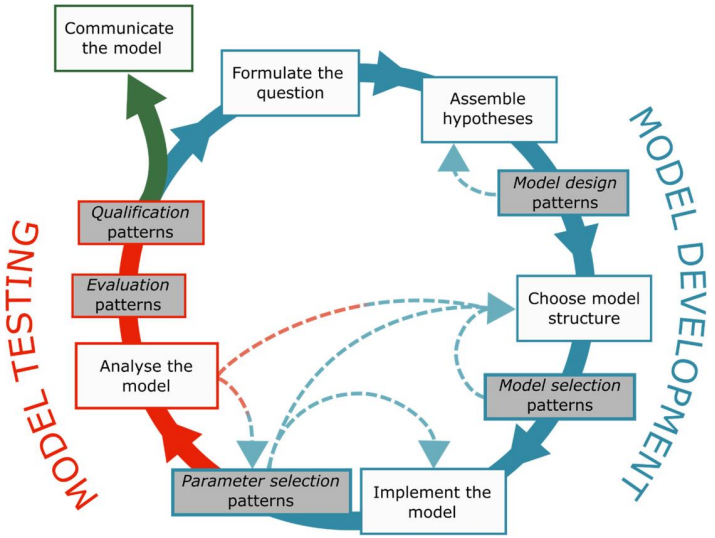

Project Introduction
THE UNIVERSITY of EDINBURGH
informatics
Modelling of Systems for Sustainability
INFR10088

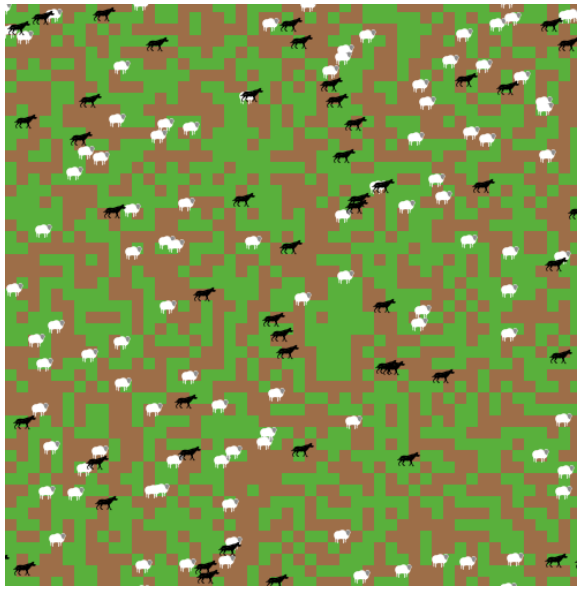
Coursework 1

- Clarification re word limit
  - EITHER: the **original 1000 word limit for the whole ODD**
  - OR: a **limit of 800 words on the Overview and Design Concepts sections combined, and no limit on the Details**.
    - However, in the Details section, please do use headings to separate out the submodels, and please keep the description as concise as you can within the time available [1]. If something is difficult to understand from the paper, you can indicate that this is the case, and say what you think the paper is saying.
- Usual +/- 10% applies to the length of the popular science article
- Critique of scientific paper, not popular science article
- More clarifications/FAQ on Learn Assessment page
- Any other questions?

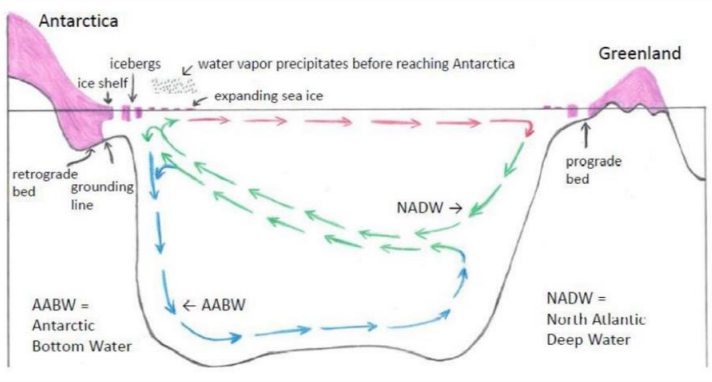
So far...



The modelling cycle

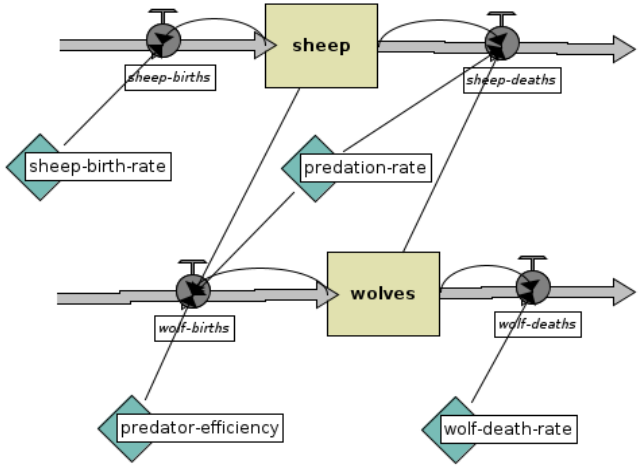


Agent-based modelling...



Real systems, e.g. Atlantic Meridional Overturning Circulation

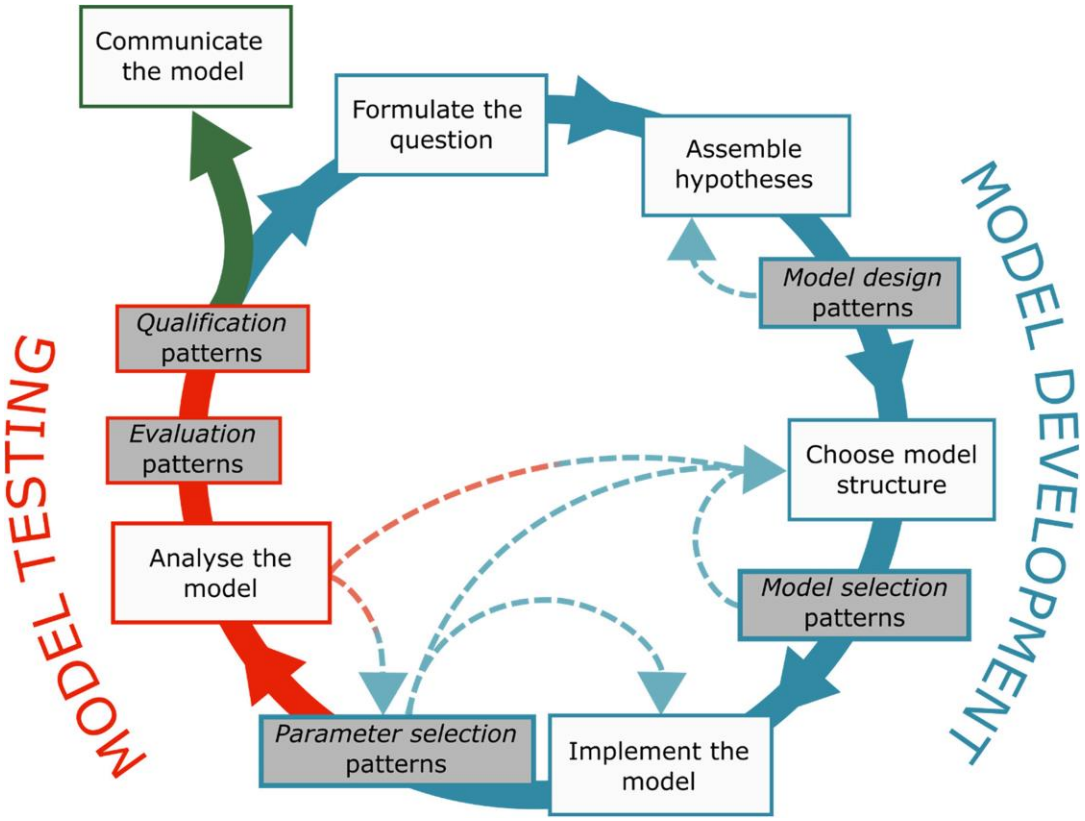
Overview
Design concepts
Details



...and system dynamics

Today...

- **Your turn!**
- Project outline
- Project example
- Questions as we go along



Learning outcomes assessed

Coursework designed to assess Learning outcomes 2 (partly), 3, and 4 and 5.

2) investigate a sustainability system question, identify system elements and their interactions, and codify a system model using an appropriate model description framework

3) critique and interpret the results / output of models of sustainability systems

4) communicate findings of sustainability modelling studies, including uncertainty, to a variety of audiences

5) work collaboratively and accountably with other students to formulate, explore and communicate a sustainability system model

Groups and task

- We have formed interdisciplinarity groups (I.e. mixes of Informatics and non-Informatics students) that we've tried to match to your interests as expressed in the survey in Week 5.
- Your task is to work accountably with the other members of your group:
  - to investigate a sustainability system question and
  - to communicate your group's findings to other members of the course and the course lecturers.

In more detail

1. Identify a question or questions about a system or connected systems, and either:
   - Formulate and implement a model of the system(s), or
   - Obtain existing model(s) from the literature and ensure you can run them.
2. Explore the behaviour of the system model(s) to address your question(s), with the focus on addressing the question(s) posed in Step 1.
3. Write up your findings, including a description of the model, in a report.
4. Give a group presentation of your results to the course lecturers and fellow students.

Group submission/presentation

1. A **project report** in a format of a paper from the field (length 5,000-8,000 words, excluding references) describing the question, the model(s), the results, and discussing the significance of the results and the limitations of the models.
   - Targeted at an expert audience, who are familiar with the systems being modelled and with the modelling framework.
2. An **ODD** for the model (as an appendix to the report), which may be based on an existing ODD, with clear acknowledgement.
   - No limit on the length of the ODD, but it should not be longer than necessary.
3. A **group presentation** of the material in the report.
   - The presentation should be targeted at an informed adult audience. Full requirements to be released.
4. An **archive file containing the simulation and analysis code** of your model.
5. **Evidence about how you have worked collaboratively and accountably** as a group
   - For example, a folder containing brief minutes of weekly meetings, stating who was present and absent, checking progress on actions from the previous meeting, and deciding on actions for the next week.

Individual submission

- A form with a question asking “Did each group member contribute reasonably equally to the project” and a short (max 250 word) reflection on how the group worked together, and your contribution.

Group assessment criteria

Project report including an ODD and evidence of accountability

- Clear description of question and systems modelled
- Success in getting existing models running and/or formulating and implementing new models
- Exploration of model behaviour
- Discussion of relevance of model results for question, and limitations of the work
- Clarity of exposition
- Clear evidence that the group has been working collaboratively and accountably

Presentation

- Clarity
- Appropriate level
- Communicates main report findings
- Shared group presentation

Allocation of marks to individuals

- In a multidisciplinary team in an industry, government or NGO setting:
  - Rarely an attribution of individual credit at the end of the process, leading to a ranking of team members
  - However, a team member who is clearly not doing their share of the work, or is uncommunicative, is held to account by their teammates and manager.
- If all members of the team agree that each other member contributed roughly equally to the project
  - All team members get the same mark.
- If not all members of the team agree that the contribution was roughly equal
  - We will investigate the group's evidence about who contributed, (e.g. the minutes of the weekly meetings), and the individual statements.
  - All team members may not get the same mark – group members who have clearly not engaged can expect to be deducted a significant fraction of the group mark

Working as a group - suggestions 1

- In your initial meeting, agree on how you will work together, e.g.
  - Where and when you will meet, perhaps roles, tools etc.
  - How you will communicate between meetings (Teams/Email/...)
  - What tools you will use to manage your work, including version control systems
  - Scheduling – are there any times when you're all going to be busy?
  - Roles: are you going to specialise in different roles or work in subteams?
  - Records: how will you keep a regular record of your progress? (E.g. minutes of weekly meetings, Microsoft planner or Trello board).
  - Perhaps share with each other things that you have found helpful or unhelpful in groupwork

Working as a group - suggestions 2

- Meet weekly, in person if possible – this should help with communication.
- Communication is key
  - as an individual it is your responsibility to respond in a reasonably timely fashion to questions from other members of your group
  - you might want to agree expectations about how soon to expect replies at the initial meeting.
- At weekly meetings, someone should act as minute-taker to ensure that a record of the meeting is kept that includes the names of those present or absent and a record of progress on actions and a list of action. This role could rotate.
- Try to deal with any issues as they arise, rather than letting them build up.
- Make allowances when other team members have unavoidable difficulties, e.g. illness.

If there are problems...

- In the first instance, we hope you can deal with issues within the group, but if it’s proving difficult to resolve a problem, please contact Nigel and David.
- Please raise problems as they become apparent – we would rather hear that a group member hasn't showed up in week 7 rather than in week 10.

Group support

- This session
- Weekly drop-in sessions in the lab slot (Thursday 16:10-18:00).
- Weekly sessions in the Friday Q/A time (11:00) for groups to report/discuss progress and issues
  - this is for project groups to learn from each other.

Academic integrity

- The usual rules apply...
  - https://web.inf.ed.ac.uk/infweb/admin/policies/academic-misconduct
- … but as you are all going to be doing different projects, we encourage groups to learn from each other's work
  - share tips on methods
  - e.g. NetLogo or analysis code

Anticipated Schedule

- Week 6: Getting started
  - Groups should meet, decide how to work together, and start thinking about ideas
  - Thursday: Lab? No Friday Q&A this week.
- Week 7: Deciding on project ideas
  - Groups should be formulating possible questions and finding relevant papers and models, and starting to write the purposes and patterns section of the ODD. If formulating a model, sketching influence diagrams.
- Week 8: Formulating/running models
  - Monday p.m. Submit (by email to Nigel and David) 1-2 side project summary for formative (non-graded) feedback – aims, purpose and patterns, outline methods, experiments to be run.
    - If formulating a new model, outline methods could give the approach (system dynamics or agent-based) and the entities and state variables, and perhaps a sketch influence diagram.
  - Wednesday: feedback on summaries emailed to groups
  - Start work on implementing or running models
- Week 9: Running experiments
  - Models should be running, with analysis being developed and results by the end of this week
- Week 10: Analysis and writing
- Week 11: Writing and presentation preparation
  - Thursday: presentation session (2 hours max), 10 mins per group, 7 groups
  - Friday: report, code and evidence of collaboration due 12:00.

Example of a project idea re-using a model

- Based on Martin and Schlüter (2015, Combining system dynamics and agent-based modeling to analyze social-ecological interactions—an example from modeling restoration of a shallow lake. Front. Environ. Sci., 3. https://doi.org/10.3389/fenvs.2015.00066)
- Obtain the agent-based and system-dynamics model from the authors, and become familiar with the models run in NetLogo.
- Run and analyse the system dynamics model of lake ecology, to explore the stable states and tipping points.
- Run and analyse the agent-based model of householder behaviour with regard to sewage systems, to explore for example sensitivity to parameters.
- Run the combined models as the paper authors did to see if results can be reproduced, and explore if/how model coupling can change the results.
- The report then writes up these explorations – essentially building on the original paper to explore details.
- The presentation would present these findings to a less expert audience.

Example of a project building a model

- First year of the course => no examples of previous projects.
- However, we have piloted the use of ODDs and NetLogo in a final year Informatics student project, shared with permission in "Examples of previous assessment" in Learn.
- With sections taken out, this dissertation could be an example of a project report.