THE UNIVERSITY of EDINBURGH

Approaches to sustainable land use

Postgraduate Taught
School of Geosciences

Prof Alistair Hamilton, 29th May 2026

EDINBURGH
Extraordinary futures await

Welcome live from Edinburgh!

- Audio Check
- Recording of the session
- Presentation
- Question and Answer

Audio check

- In this session, your microphone will be muted but you should be able to hear the speaker
- Can you hear the presenter speaking?

If you can't hear:

- In the bottom left corner of your screen, select the drop down next to 'Unmute'
- then select 'Test Speaker and Microphone'
- Carry out the audio check

If you still can't hear:

- Select the 'Audio Settings' option and change your speaker settings here
- For more support, visit: https://support.zoom.us/hc/en-us/articles/201362283-Testing-audio-before-Zoom-Meetings

Recording

- Today's session is being recorded
- Any information that you provide during a session is optional and in doing so you give us consent to process this information
- If you don't want your question or name read out in public, you can email your question to futurestudents@ed.ac.uk
- The session will be stored by the University of Edinburgh and published on our website after the event on a non-indexed web page
- **You will be emailed with a link to the session recording next week**

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About me

- Upland ecologist, now with spatial/modelling focus, and increasingly involved interdisciplinary
- SRUC
- MSc Programme Director, you'll maybe see me on various courses during your year here
- Often found in the hills/on a bike/reading a book!

- Multi-functional
- Natural capital
- Land sparing v land sharing
- Ecosystem services

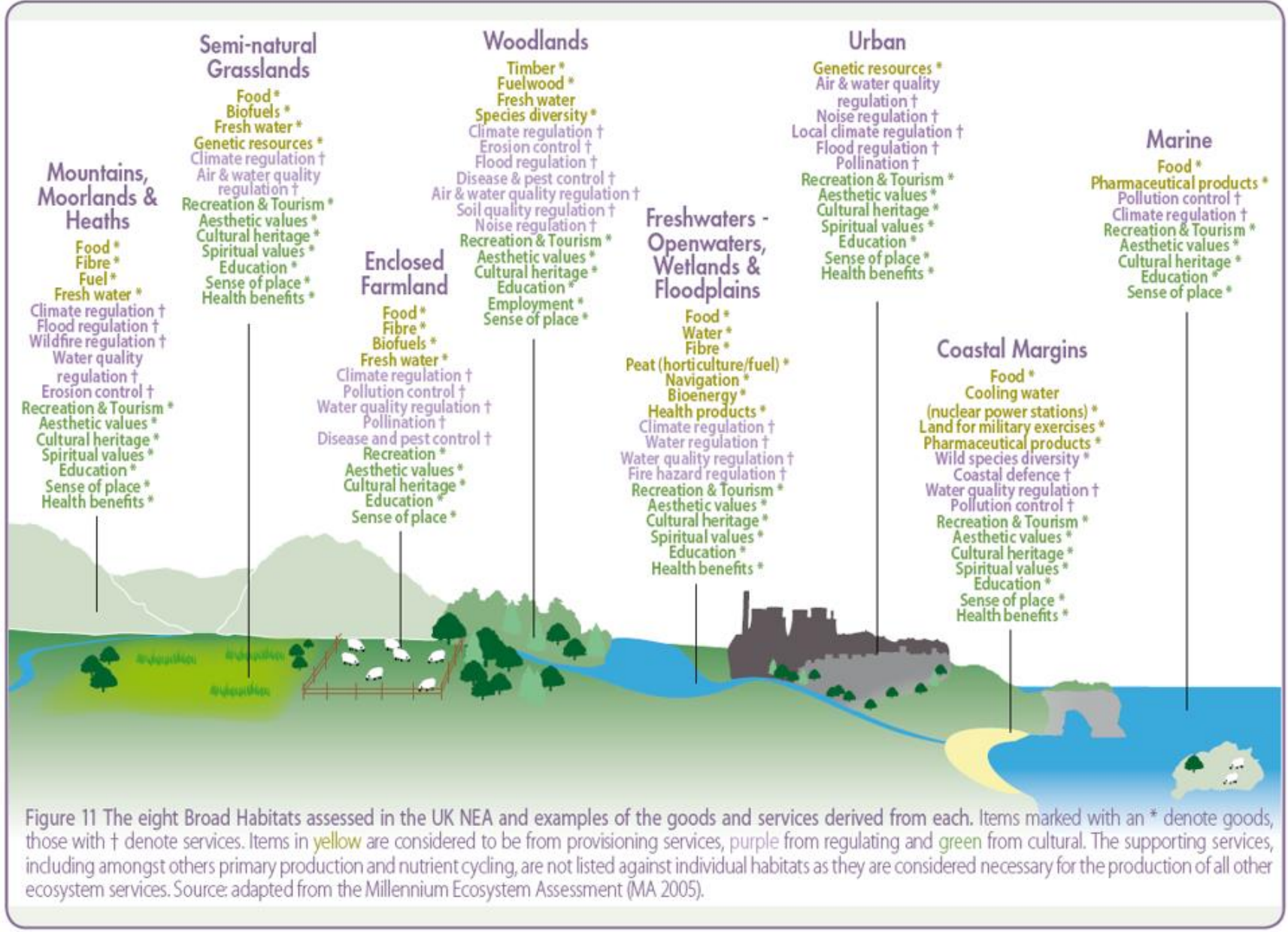
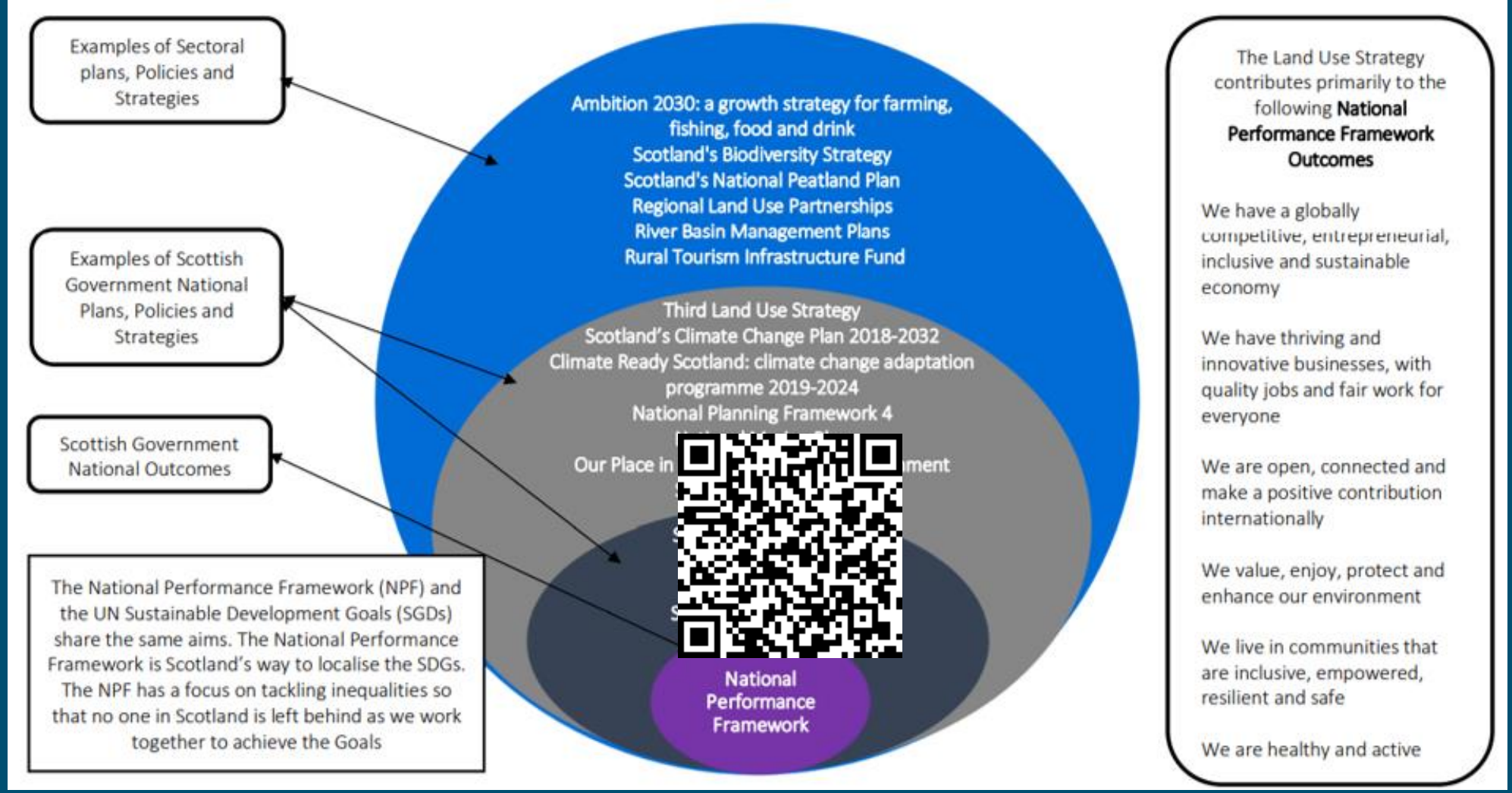


Figure 11 The eight Broad Habitats assessed in the UK NEA and examples of the goods and services derived from each. Items marked with an * denote goods, those with † denote services. Items in yellow are considered to be from provisioning services, purple from regulating and green from cultural. The supporting services, including amongst others primary production and nutrient cycling, are not listed against individual habitats as they are considered necessary for the production of all other ecosystem services. Source: adapted from the Millennium Ecosystem Assessment (MA 2005).

It’s most definitely not just about science…..

- Socio-economic drivers
- Policy (and politics!)
- Human behaviours
- Natural science approaches
- Just transitions https://www.justtransition.scot/



- Get involved! https://www.sruc.ac.uk/research/research-impact/rural-policy-centre/ https://www.parliament.scot/get-involved/cross-party-groups/current-cross-party-groups/2021/rural-policy

Stakeholder engagement

Stevens (2022)

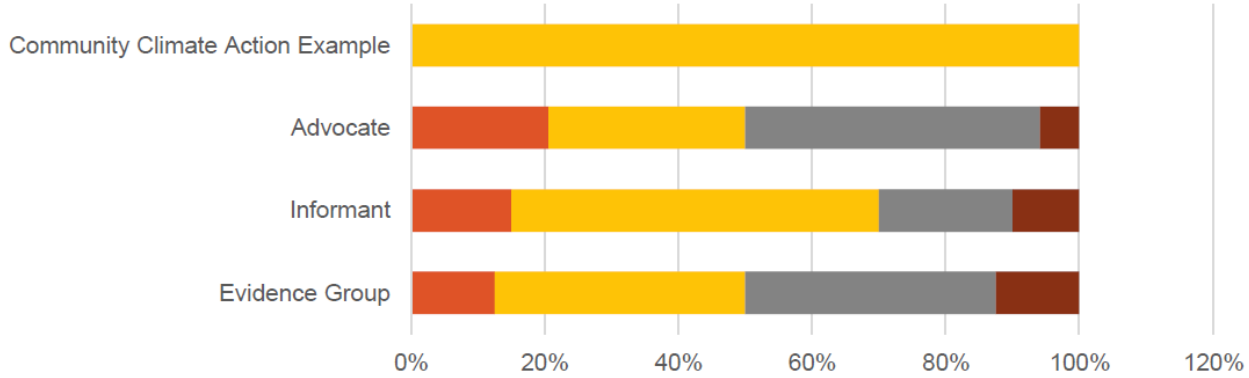
‘A proving ground for climate change solutions - a stakeholder analysis in a Scottish Regional Land Use Partnership’

Part 1: Land use context and previous experience, 25 mins 1) What is (your / your organization’s) interest / involvement in land use? 2) At what scale (do you / does your organization) operate? 3) Who do you work closely with in the context of land use? 4) How familiar are you with the Regional Land Use Partnership initiative? Have you been involved in the 2013-15 pilot or the current one? 5) Do you expect (you / your organization) will participate or be board members within the SoS RLUP? 6) How do you expect RLUPs to affect your (organization’s) operations? 7) How would you describe your stake in RLUP outcomes? In RLUP development?
Part 2: Q method exercise, 1 hour (if remote, completed beforehand) Clearly explain Q grid exercise, answer any questions. Begin sorting statements, offering any clarification as necessary. Recording continues. Offer 10min break at halfway point. Finish Q sort, photograph / save grid.
Part 3: Q method discussion, 25 mins 8) How did you find the Q exercise? 9) Discuss Q sort choices; Highest / lowest priority, neutral, reasoning behind it, any that were difficult to place. 10) Were there RLUP outcomes that you had not considered before? 11) Are there any other outcomes you hope / expect to see from RLUPs which were not included in the statement concourse? 12) What are your concerns / fears about the RLUP development / implementation process? Do you foresee RLUPs having any negative consequences? 13) Do you have any other thoughts about RLUPs you would like to share? 14) Who else do you recommend I speak to in this research?

Understanding messaging

Green (2023)

‘How can framing of climate action create a social mandate for change? A case study of communications used in Scotland’s Climate Assembly’



	Evidence Group	Informant	Advocate	Community Climate Action Example
Transformational	13%	15%	21%	0%
Incremental	38%	55%	29%	100%
Both	38%	20%	44%	0%
None	13%	10%	6%	0%

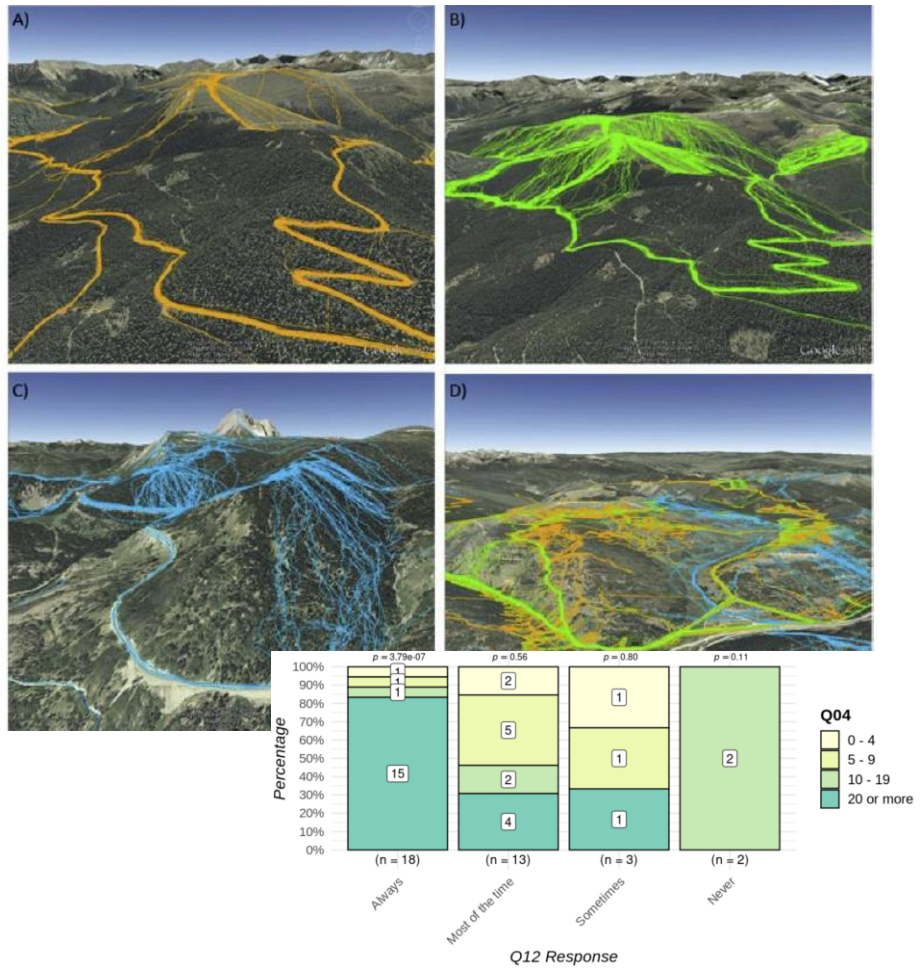
https://lumivero.co

“Change happens – think of where we were a year ago with COVID, we never thought we would probably be sitting in our own homes, working from home. Or where we were ten years ago and the digital change we’ve seen and how much Zoom would never have been part of our lives. And even thirty years ago – all of us might have been in different contexts and different places, some of us might not have even been born. Things have changed dramatically, and things will continue to change. And it’s possible to influence that change.”

Engaging stakeholders with new technologies

Polzin (2025)

‘Data for outdoor recreational trail design: implications of GIS and remote sensing data on trail science and building’

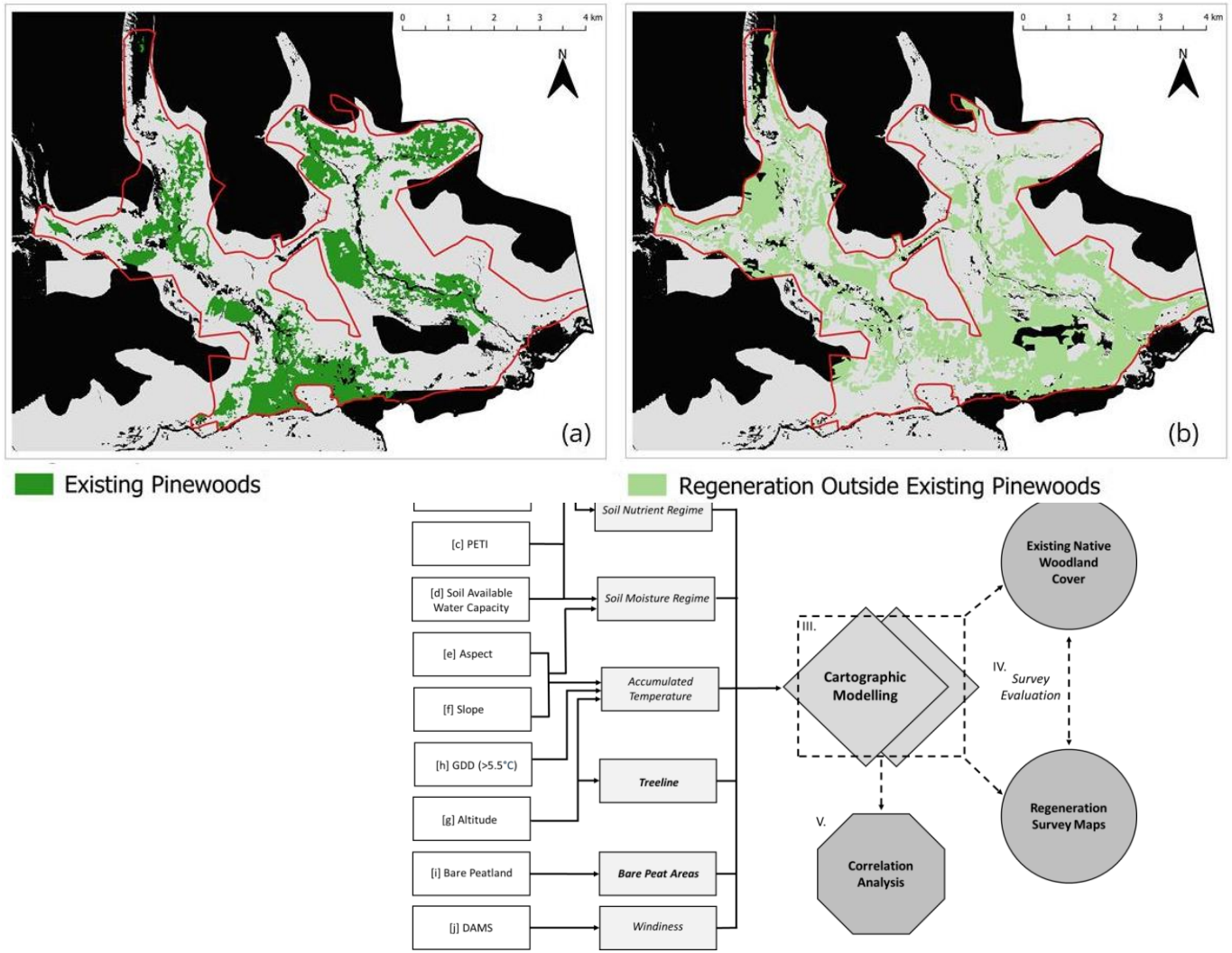


(in draft)

Spatial (GIS) modelling

Willis (2025)

‘Landscape-Level Multi-Criteria Suitability Modelling for Native Woodland Regeneration’



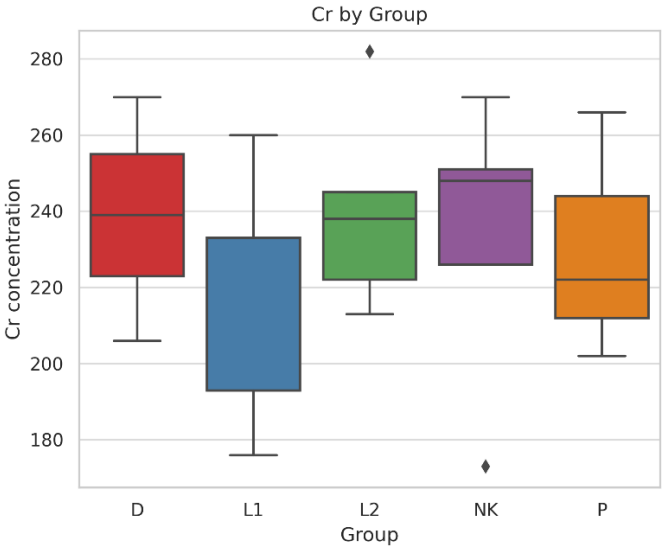
In draft

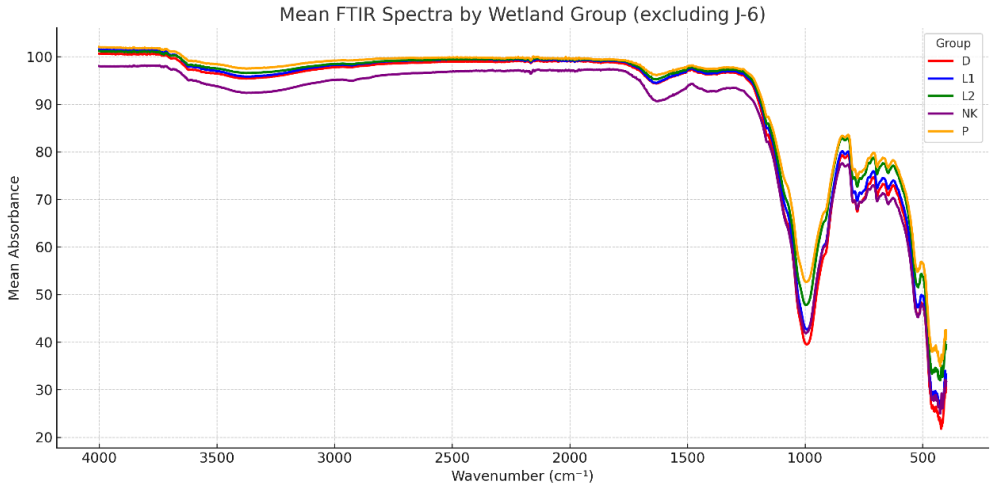
https://www.osgeo.org/projects/qgis/

Field sampling and lab analysis

Li (2025)

‘Evaluating differences in soil properties between newly restored and long-established wetlands in the Eddleston catchment’





Landuse impacts on water management

Selman (2023)

‘Assessment of the Impacts of Habitat Quality and Nature-Based Solutions on Flood Severity in Montserrat Under Contrasting Rainfall Scenarios’

Landscape modelling software https://www.hec.usace.army.mil/software/hec-hms/

Basic model development

1. Import DTM into HEC-HMS
2. Set minimum drainage area to 0.2 km^2
3. Identify outlet to digitalise model subbasins and reaches
4. **Transformation method**: SCS Unit Hydrograph method
5. **Routing method**: Muskingum routing method
6. **Loss method**: SCS-CN method

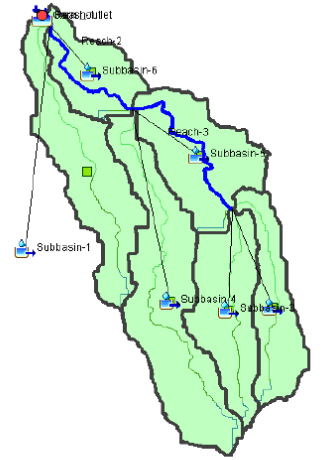
Basic model testing

Creation of rainfall scenarios

1. Use daily Airport gauge data to estimate a moderate scenario and heavy scenario using existing rainfall events
2. Model hypothetical extreme event using literature of tropical hurricanes in Central America and the Caribbean.
3. Model a representation of a typical rainfall event hyetograph using local knowledge.

Preparation of soil and habitat layers in QGIS

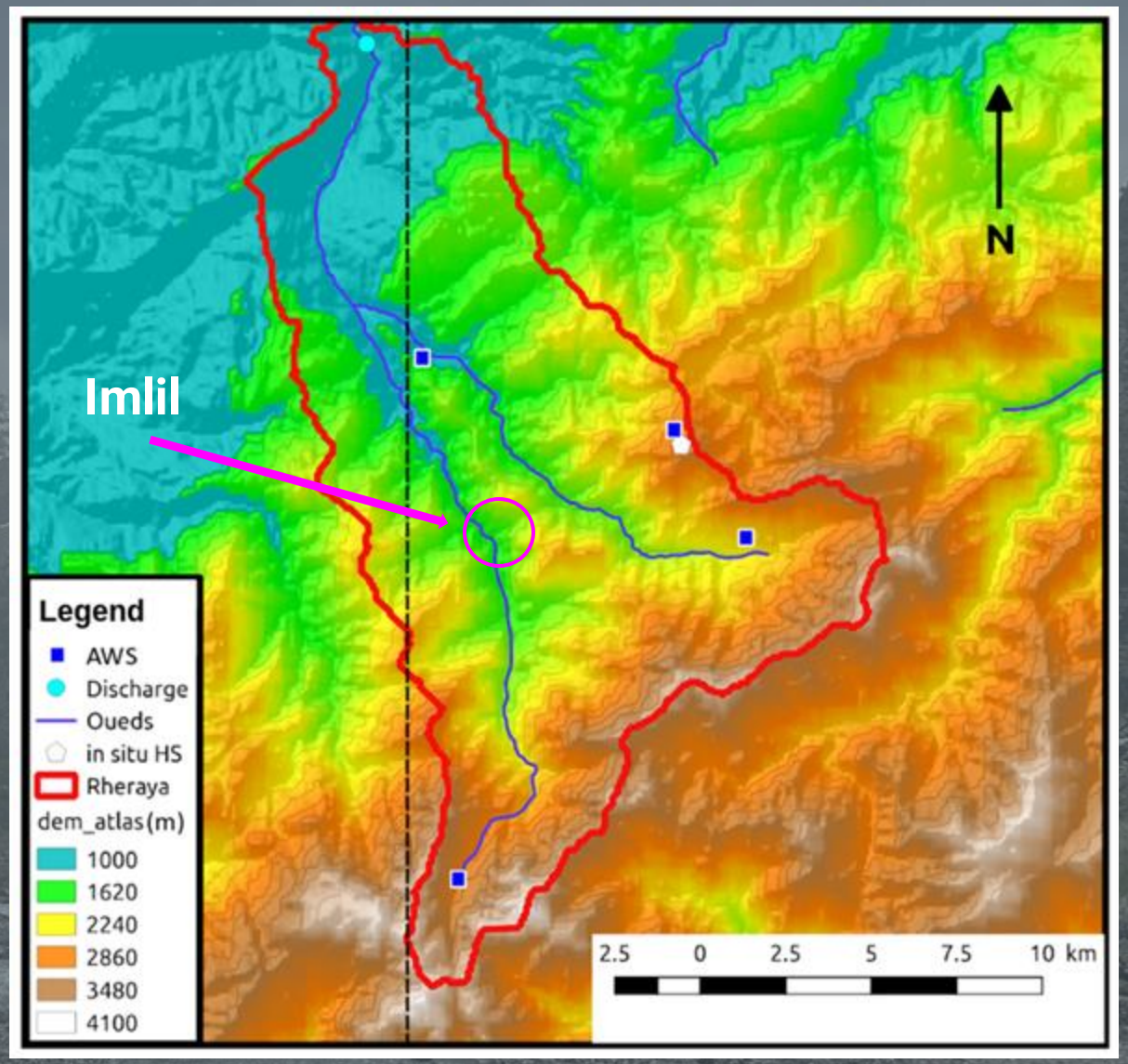
1. Import JNCC habitat layer and soil layers
2. Assign hydrological soil classification to soil layer
3. Assign a CN to each land-use classification, habitat quality and soil hydrological classification to create Table 6.



The Rehraya Catchment

- **The Rehraya catchment is a semi-arid mountainous climate that covers 227km^2** and is one of nine catchments feeding into the Houz plain in southern-central Morocco
- The entire plain and High Atlas Mountains collectively **form the Tensift drainage basin covering 20,450 km^2**
- **Average rainfall of 363mm per year**
- **Contains bare rock faces, steep slopes** and gravelly riverbeds
- Little soil is found on the slopes due to erosion
- In the narrow alleys, deep soils are found due to sediment accumulation
- **Villages make use of the land with terracing and gravity fed irrigation** for agriculture and livestock

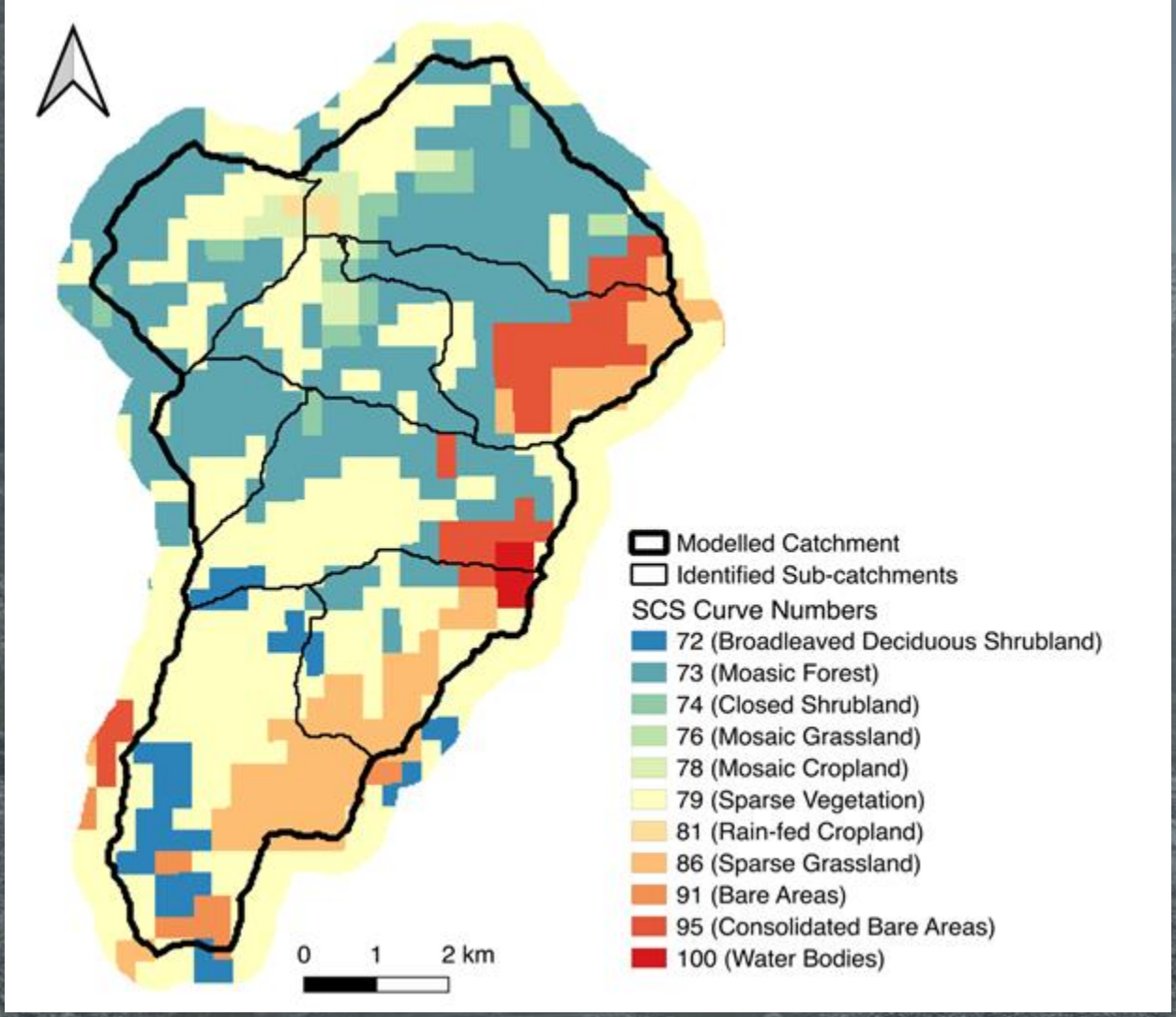
(Discover Ltd, 2015)



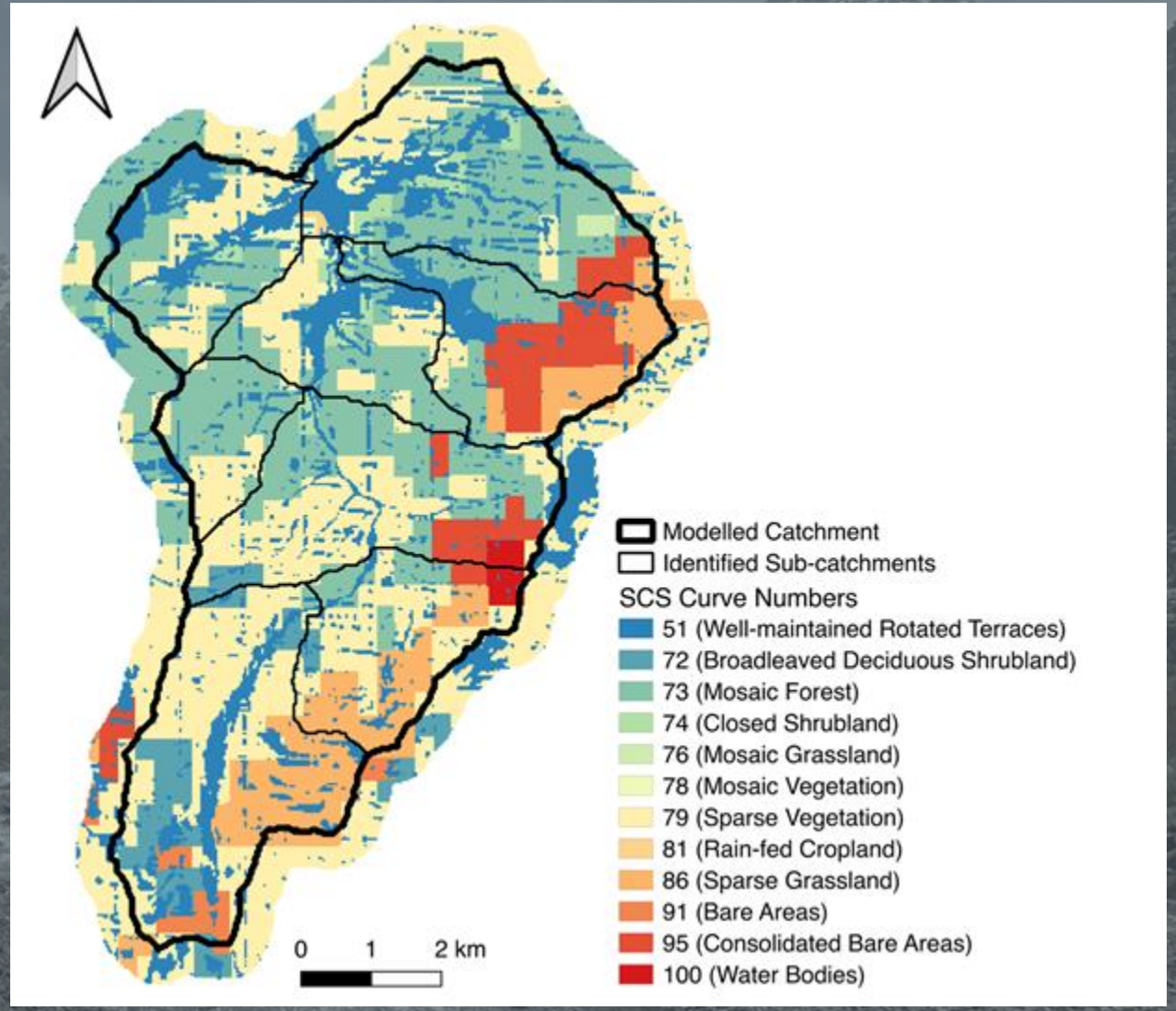
(Baba et al., 2018)

Terrace v No Terrace Curve Number

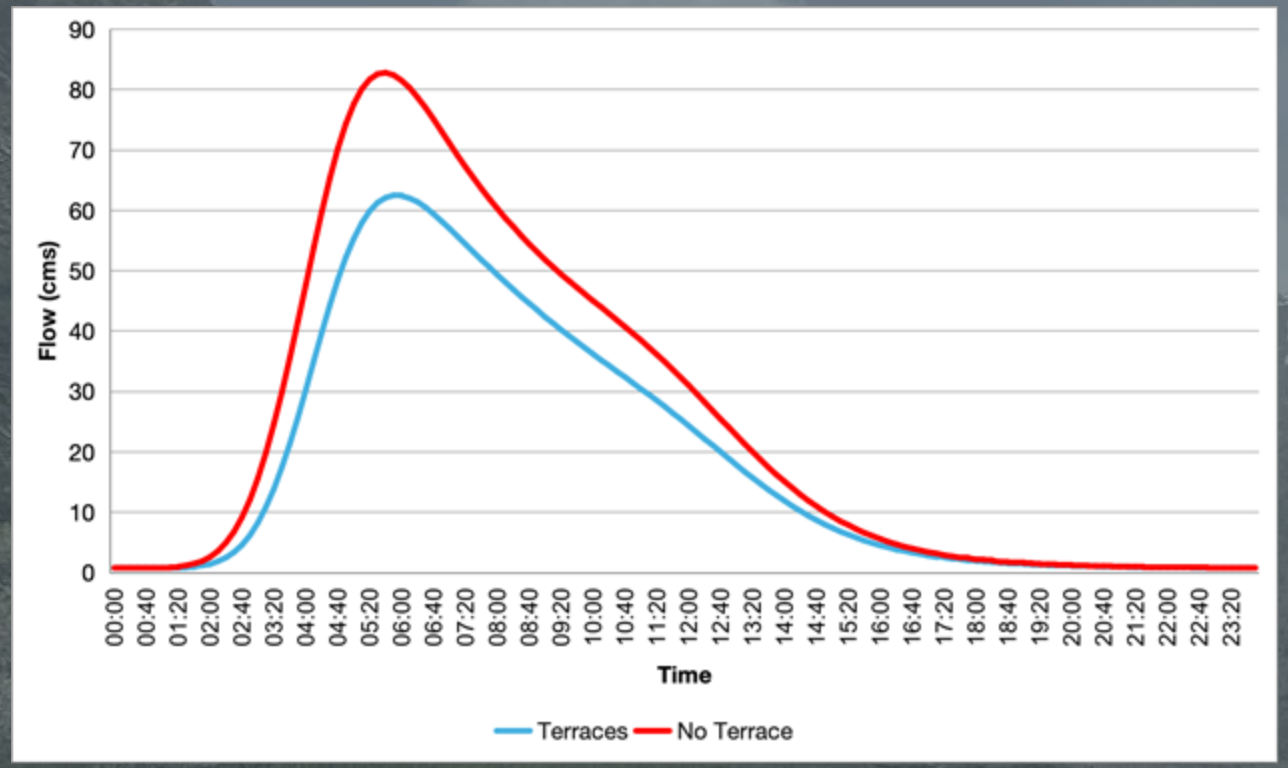
Gridded Curve Dataset without Terracing



Gridded Curve Dataset with Terracing



Results



Graph 2. Catchment water flow in 1995 rainfall event (70mm, 2.5 hrs) for no terrace and with terrace scenarios

- Peak discharge is **lower with terraces:** 32.5% decrease of peak flow
- Total flow is reduced by 30.6%

Without terrace → higher CN → rapid run off

With terraces → lower CN → more infiltration before saturation

Flood modelling following habitat change

Garland (2020)

‘Modelling flood behavior of possible nature-based solution interventions’

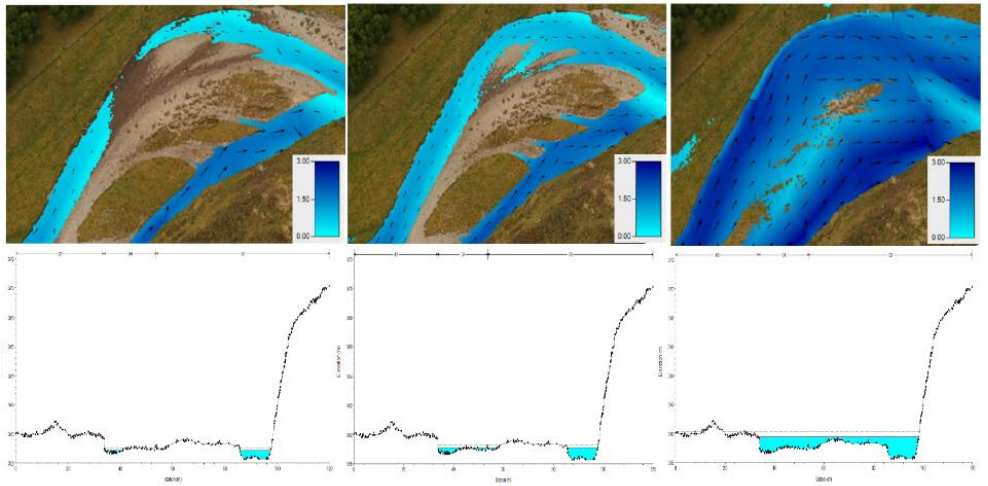
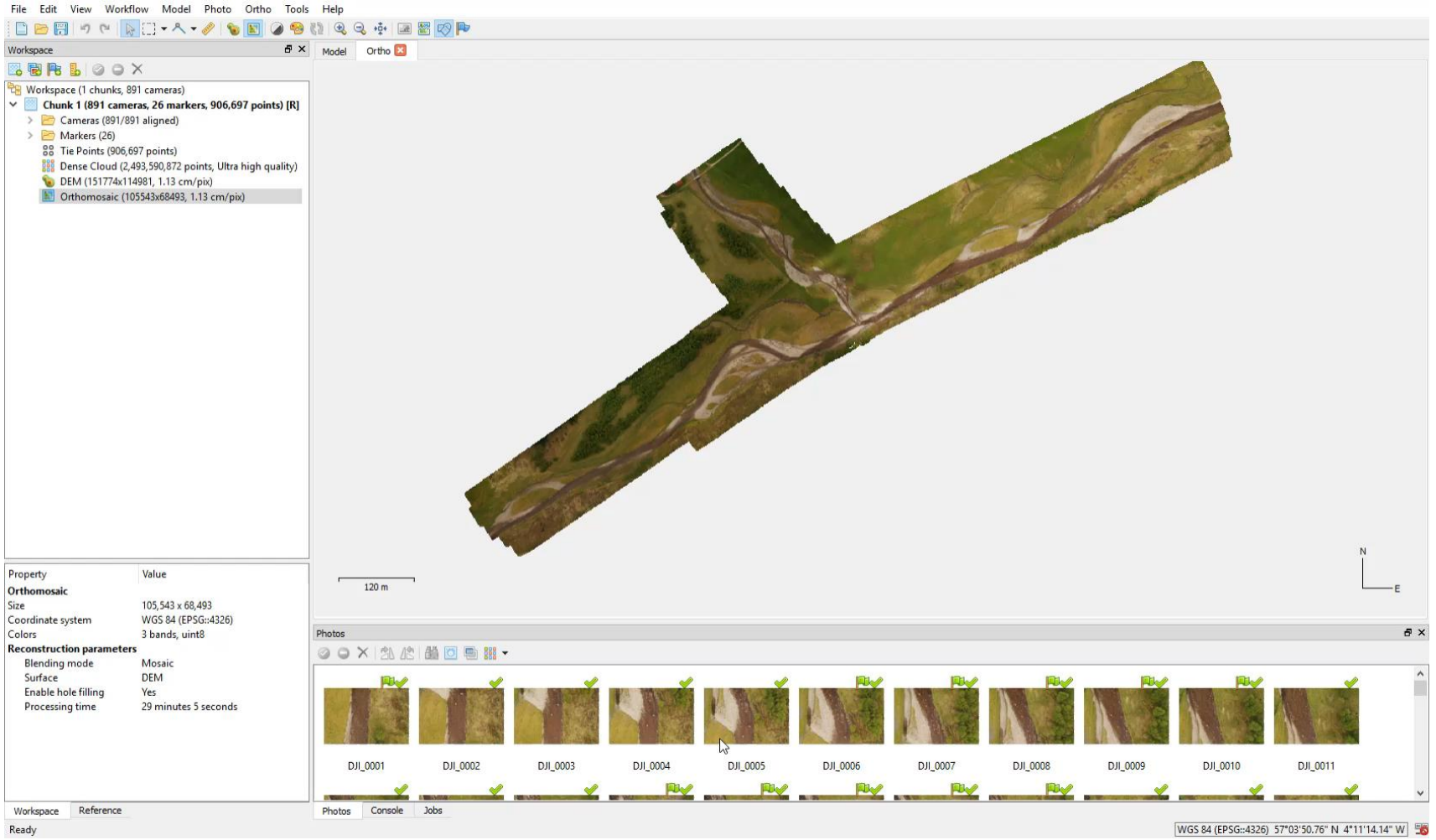


Figure 26. (Top) flow area and velocities within upstream cross section 2872 across baseline scenarios with left – summer, middle – winter, right – flood. (Bottom) 2872 cross section profile indicating water level and surface area for

- https://www.hec.usace.army.mil/software/hec-ras/

Often using UAV (drone) or satellite data

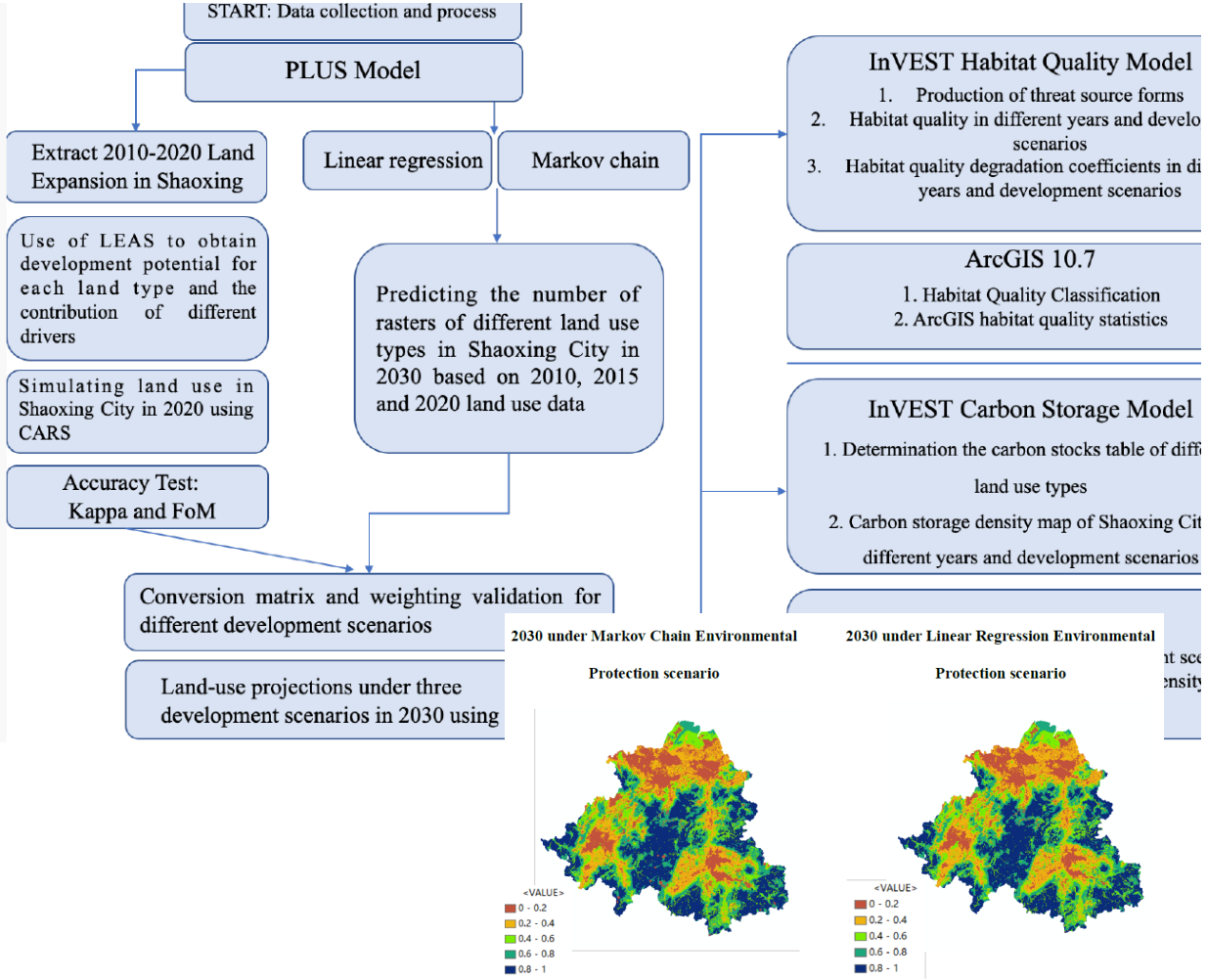
Data like this collected for dissertations and on fieldtrips



Combining policy, landuse and ES change

Kong (2020)

‘Land use prediction and evaluation of habitat quality and carbon storage in Shaoxing City in 2030 based on PLUS and InVEST models’



- https://naturalcapitalalliance.stanford.edu/software/invest

Any questions or comments, add to the chat. . .. . ..

For further questions, feel free to email me: Alistair.Hamilton@sruc.ac.uk

Questions about your application? Email: future.students@ed.ac.uk