

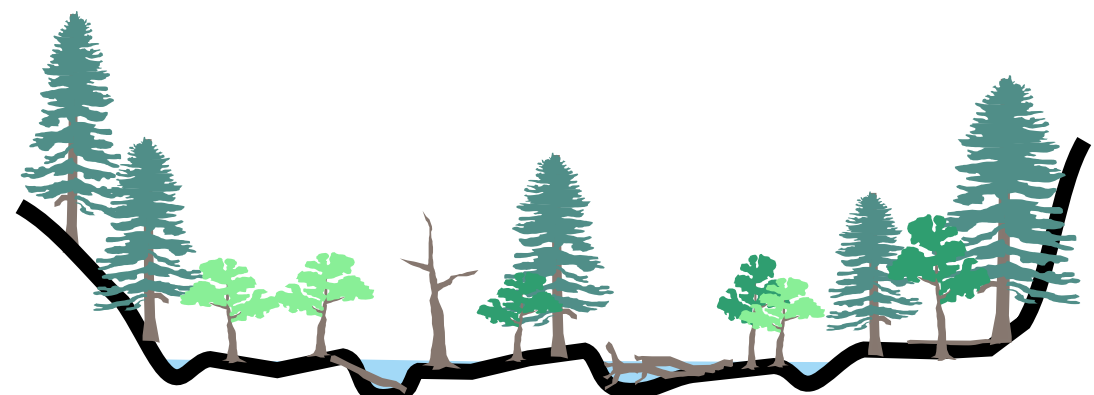
Stage Zero?

Exploring the potential of restoration to Stage Zero in UK agricultural landscapes

Richard Mason^{1,2} **Matthew Johnson³**, **Matthew Hemsworth⁴**, **Matt Parr⁵**, **Ben Eardley⁶**, Arnaud Foret^{1,7}, Alan Puttock⁸ & Luca Mao⁹

(authors in **bold** present at RRC 2025, please chat to them or email richard.mason@umu.se)

¹Umeå University, ²Loughborough University, ³University of Nottingham, ⁴JBA Consulting, ⁵The Environment Agency, ⁶National Trust, ⁷Universities of Lyon, ⁸University of Exeter, ⁹University of Lincoln



What is Stage Zero?

A river state characterised by valley width hydrological connectivity, often with an *anabranching* planform or *wetlands*¹.

Believed to be the state of many lowland rivers in unconfined valley settings before human disturbance².

Overview

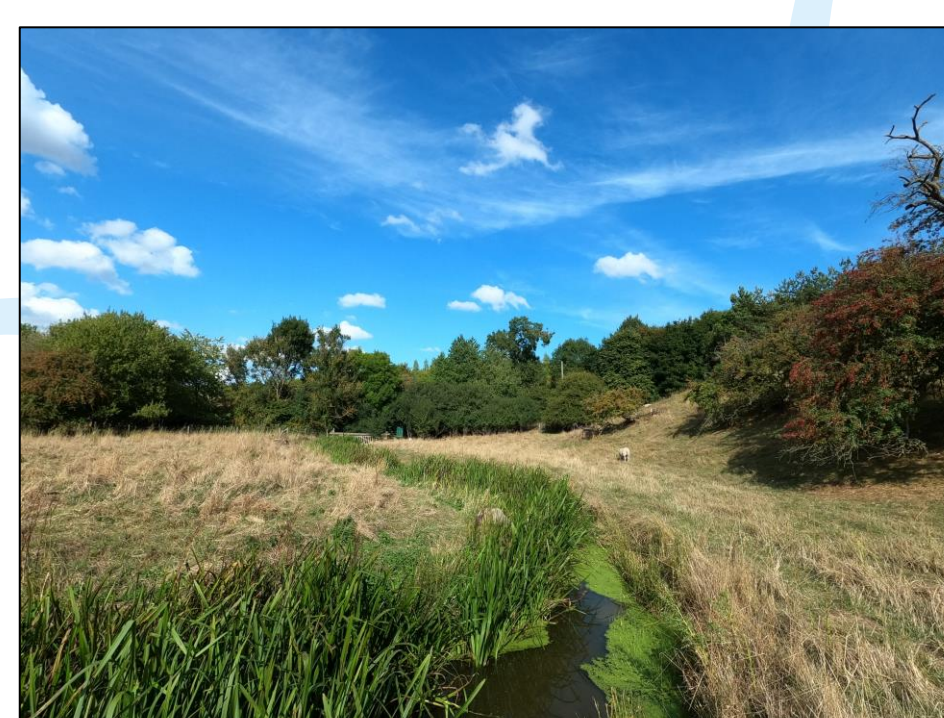
- Restoration of incised rivers to Stage Zero is gaining momentum globally as a tool to restore habitat and **lateral connectivity** between rivers and floodplains³.
- Whilst there are many ways to get to Stage Zero (e.g. beaver, wood, low-tech), **valley-reset** provides a novel approach. River channels are in-filled to floodplain elevation⁴, resetting channel development, connectivity and habitats.
- Restoration is disruptive and uncertainty is limiting application of the technique in anthropogenically constrained landscapes like the UK.
- A collaboration of academics and practitioners are evaluating the **potential** and **challenges** of Stage Zero in the UK, based on detailed monitoring of two of the first valley-reset restorations.

The River Aller

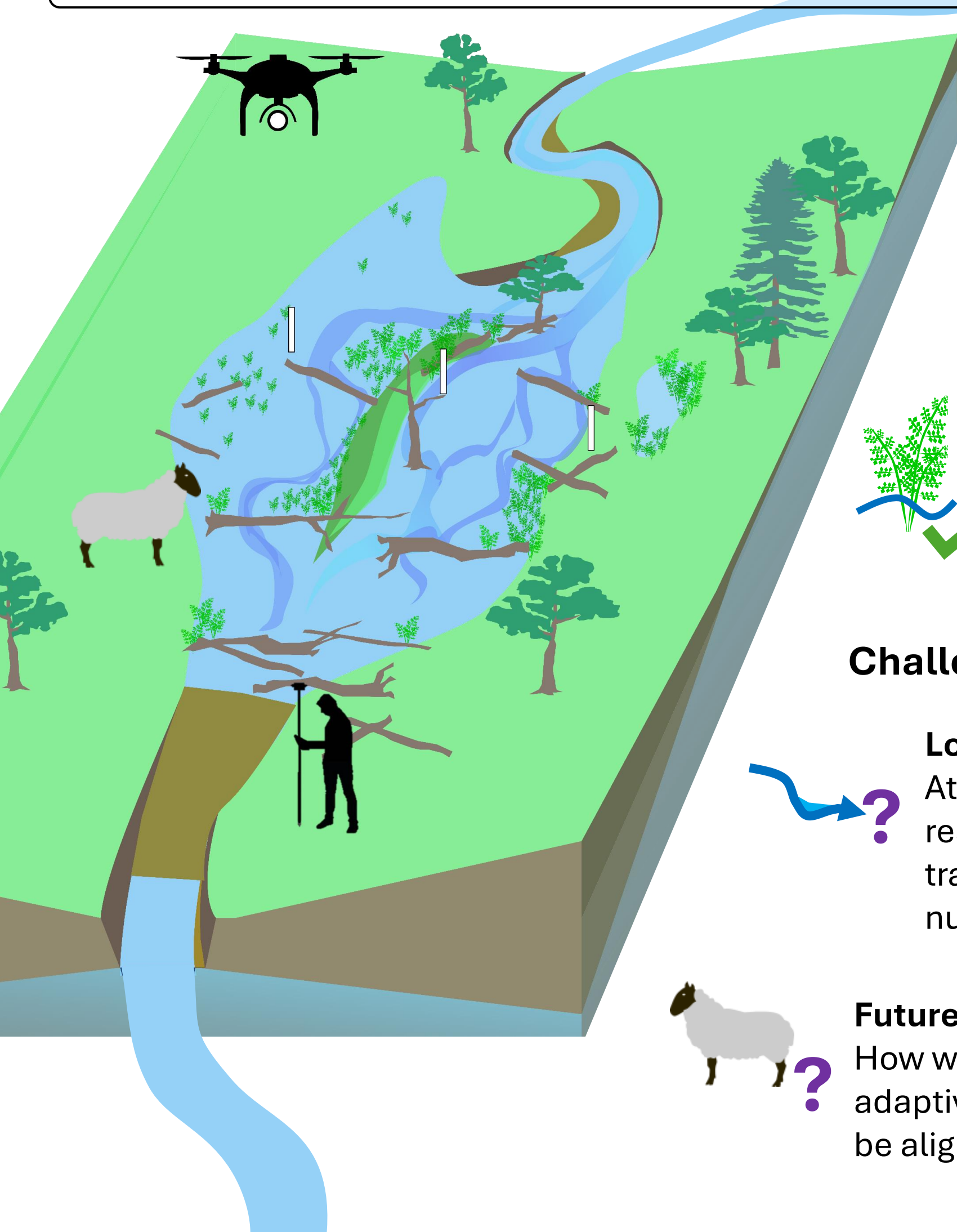


Catchment size: 18 km², width: 4 m (before restoration), slope: 1%, substrate: gravel
The Aller, Somerset, was restored in 2022-3 by The National Trust. Restoration involved a complete valley-reset over 550 m.

The River Witham



Catchment size: 55 km², width: 3 m (before restoration), slope: 0.2%, substrate: clay
The Witham, Lincolnshire, was restored in 2022 by the Environment Agency, by infilling 200 m of channel and re-scaping the floodplain.



Potential:



Hydrological re-connection

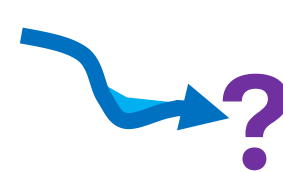
Increase in water table height by ~ 1 m at both sites. Increase in river width of 24 m (Witham) and 71 m (Aller).



Habitat

Both sites gained slow-flowing and vegetated habitat. For example, the Aller gained 2.8 ha of wetlands, critically lacking in UK landscapes.

Challenges:



Longitudinal (dis)connection

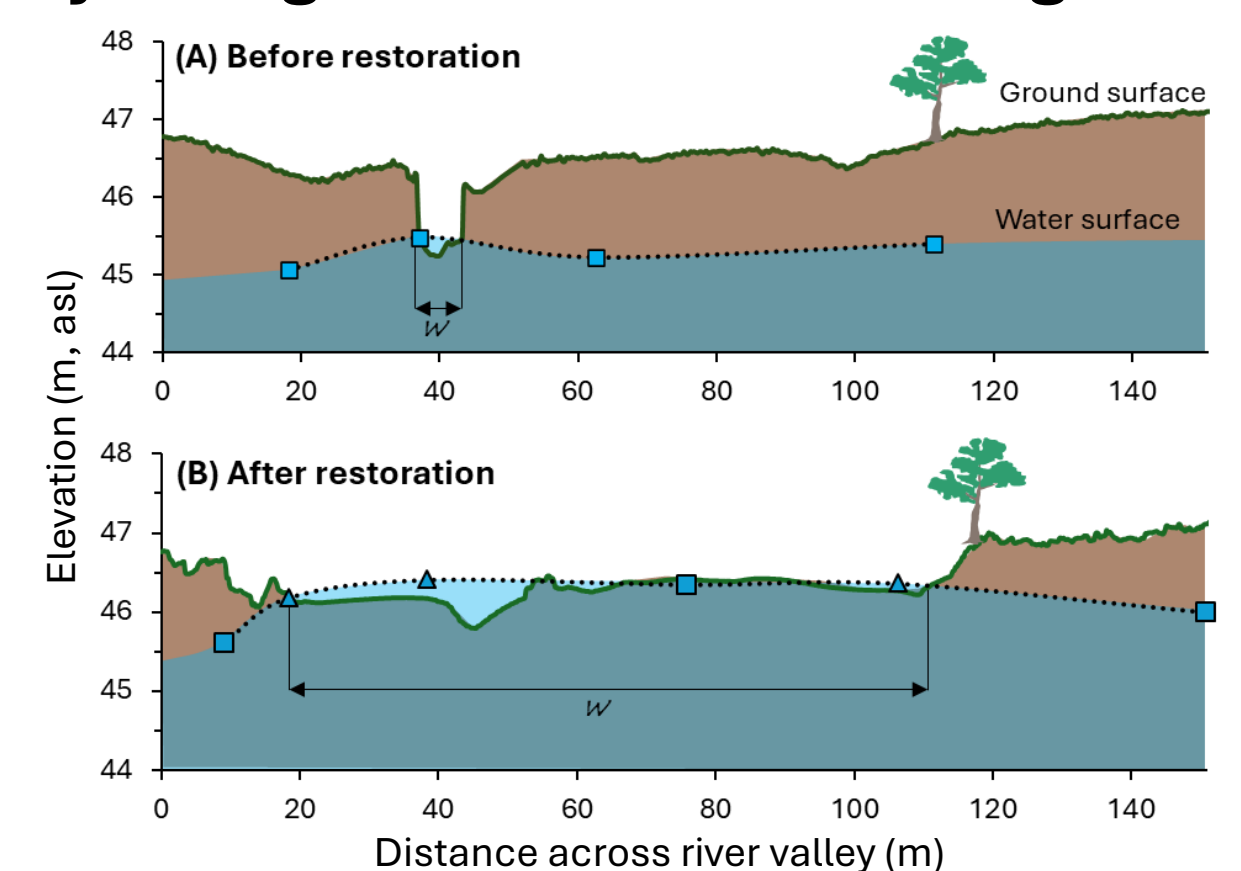
At the catchment scale, how does small-scale restoration to Stage Zero affect downstream transport and buffering of water, sediments and nutrients?



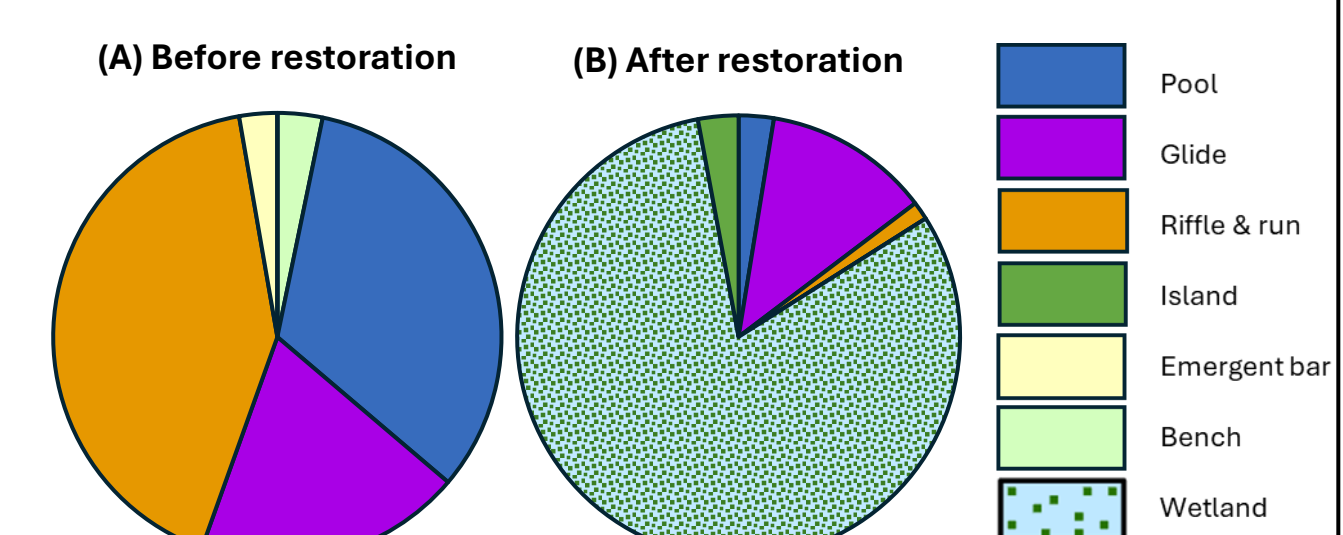
Future evolution & management

How will sites change in the future? What degree of adaptive management is required. How can restoration be aligned with other landuses like agriculture?

Hydrological and habitat changes



Hydrological re-connection of the Aller. Low flow water table elevation and wetted width increased dramatically.



Changes in habitat types at the Aller shows a large increase in wetland.

Takeaway message:

Stage Zero is a novel approach that has the potential to restore critically lacking ecosystem services and habitats in UK landscapes. Through ongoing detailed monitoring we hope to evaluate when and where restoration to Stage Zero is appropriate and how to increase restoration effectiveness and reduce risk.

References

- Cluer B, Thorne C. (2013). *RRA*. DOI:10.1002/rra.2631
- Brown AG, Lespez L, Sear DA et al., (2019). *Earth-Sci Rev*, DOI:10.1016/j.earscirev.2018.02.001
- Mason RJ, Johnson MF, Wohl, E. et al., (2025). *WiresWater*, DOI:10.1002/wat2.1766
- Powers P, Helstab M & Niezgoda SL. (2019). *RRA*. DOI:10.1002/rra.3378

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Find out more?

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Email: richard.mason@umu.se

