

Using a CLD and analogue simulation to facilitate learning and identify research opportunities in a public research organisation

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Background:

The Bioeconomy Science Institute (BSI) supports all activities in the bioeconomy – including pastures, crops, vineyards, orchards, forestry, etc. All are huge industries in Aotearoa New Zealand (NZ) and a large part of economic activity.

In this research we were interested in whether **land use choices** and configurations at a regional and national level would give us the **foundations for a resilient and prosperous bioeconomy into the future**.

Much research in land use in NZ focuses on the optimisation of certain things, so a narrow set of objectives. For example, production, water quality, biodiversity, etc. This project work was interested in what aggregate choices we would make if we were considering the **multiple and interacting complexities or challenges affecting land**. What would land use look like if we were thinking about water quality & quantity, biodiversity, biosecurity, fire, food security, soil quantity & quality, emerging contaminants, plastics, climate change, social & economic wellbeing, and the energy that enables it all?

Systems thinking suggests that a focus on optimisation in any one area is likely to be causing problems and unintended consequences in other areas. Therefore, as a research team we focused on building a CLD that tried to capture as many of these interacting complexities as possible. Team members interviewed experts and researched subject matter areas and coupled this with their own knowledge – then a stylised CLD was developed (Fig. 1).

What we did:

The objective was to expose senior researchers within the BSI to the CLD and increase their understanding of a wider range of factors influencing agricultural production, than those traditionally considered. We sought to see if this understanding might encourage research more focused on these aggregate and wider enablers and constraints on the bioeconomy, in addition to existing optimisation research.

To help make the insights of the CLD accessible, we developed an experiential activity based on ‘analogue simulation’. This worked through a series of timesteps (10 years) with a group, using the human participants as the ‘calculators’ and keeping track of relative change in variables with beans/tokens, to better demonstrate and help people appreciate/understand change over time. This resulted in a structured conversation that explored how multiple and interacting complexities might impact land use types, 30 years into the future.

How we did it:

We ran a full-day discussion and analogue simulation exercise as follows:

Pre-workshop:	Participants watched a 15 min ‘Systems 101’ video. This introduced feedback, delays and accumulation.
Full-day Workshop:	- Recap of the ‘Systems 101’ concepts to make sure everyone understood them. - A demonstration activity using beans/tokens to show how participants would need to physically move these around the CLD. - Research team ran the first decade from a pre-prepared script with agreed changes. This covered the <i>preceding</i> decade up to the present. - Participants then worked through the next (<i>future</i>) three decades, discussing potential influences and their impacts as they went (Figs 2-4).
Post-workshop:	Participants were interviewed by a member of the research team to explore how they found the activity and whether it might/did influence their approach to their work.

What we found:

We found three main insights:

Broadened perspectives:	• Most participants learned about influences they rarely thought of. • It also made people aware of critical (and under-appreciated) dependencies (e.g. liquid fuel) or flow-on impacts (e.g. the impact of urban sprawl or emerging contaminants on agricultural production).
The experience was important:	• All participants reported gaining a better understanding of 'the system', and they attributed this to the 'experience'. The learning-by-doing and physical nature of the activity. • The experience of delays was also very impactful. Having to wait for impacts to flow through the CLD before accruing somewhere was highly impactful on most participants. • The experience also helped people identify and reflect on intervention areas.
Ongoing usefulness:	• Most participants saw a useful application of the activity for different scales and audiences. • In the weeks following the workshop more than half of the participants had used what they learned somehow in their work. Mostly to broaden discussion to include more things when discussing an issue.

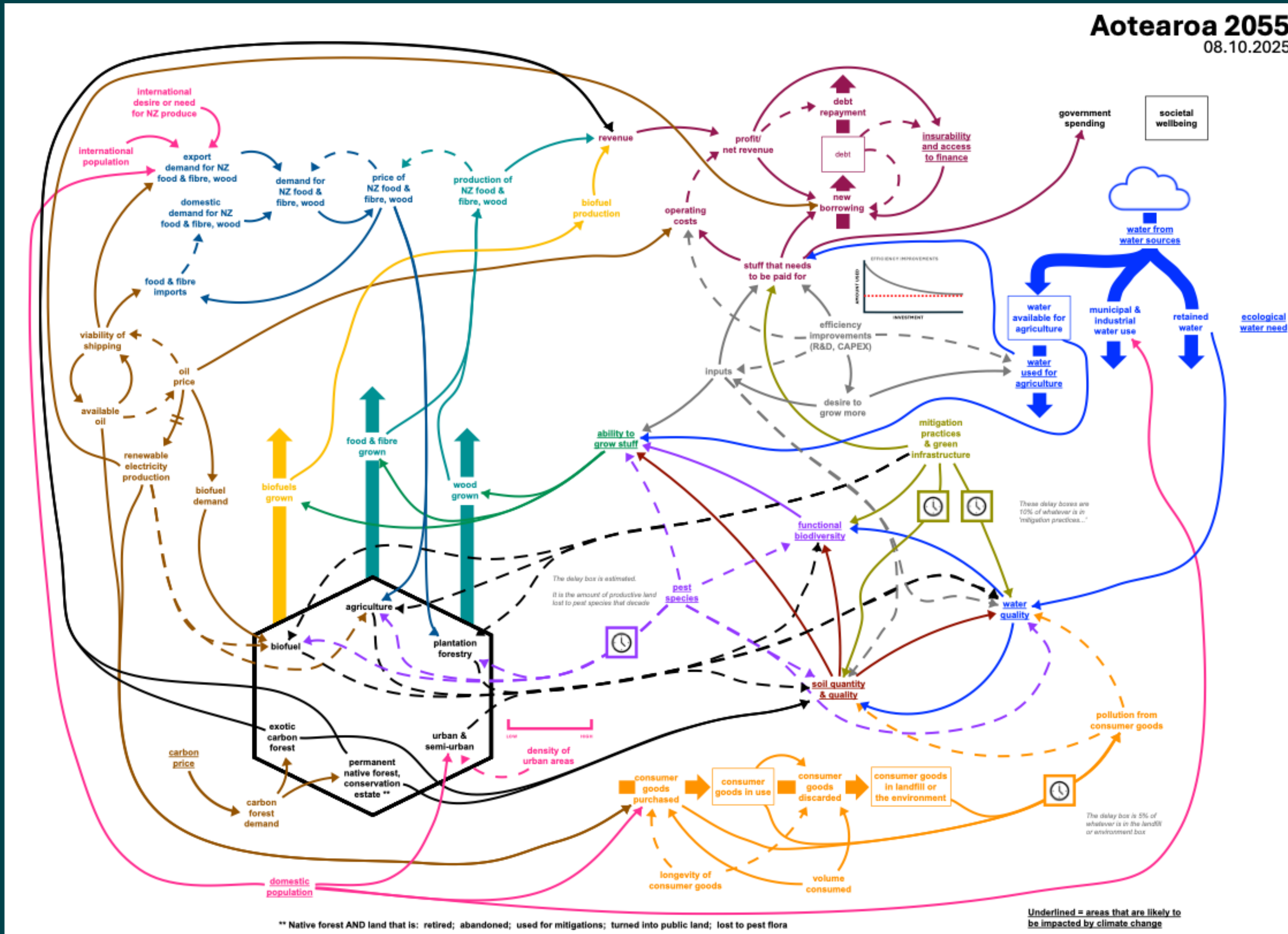


Figure 1. The CLD that was developed and was the core of the ‘analogue simulation’ experiential activity



Figure 2. Participants engaging in the ‘analogue simulation’ activity

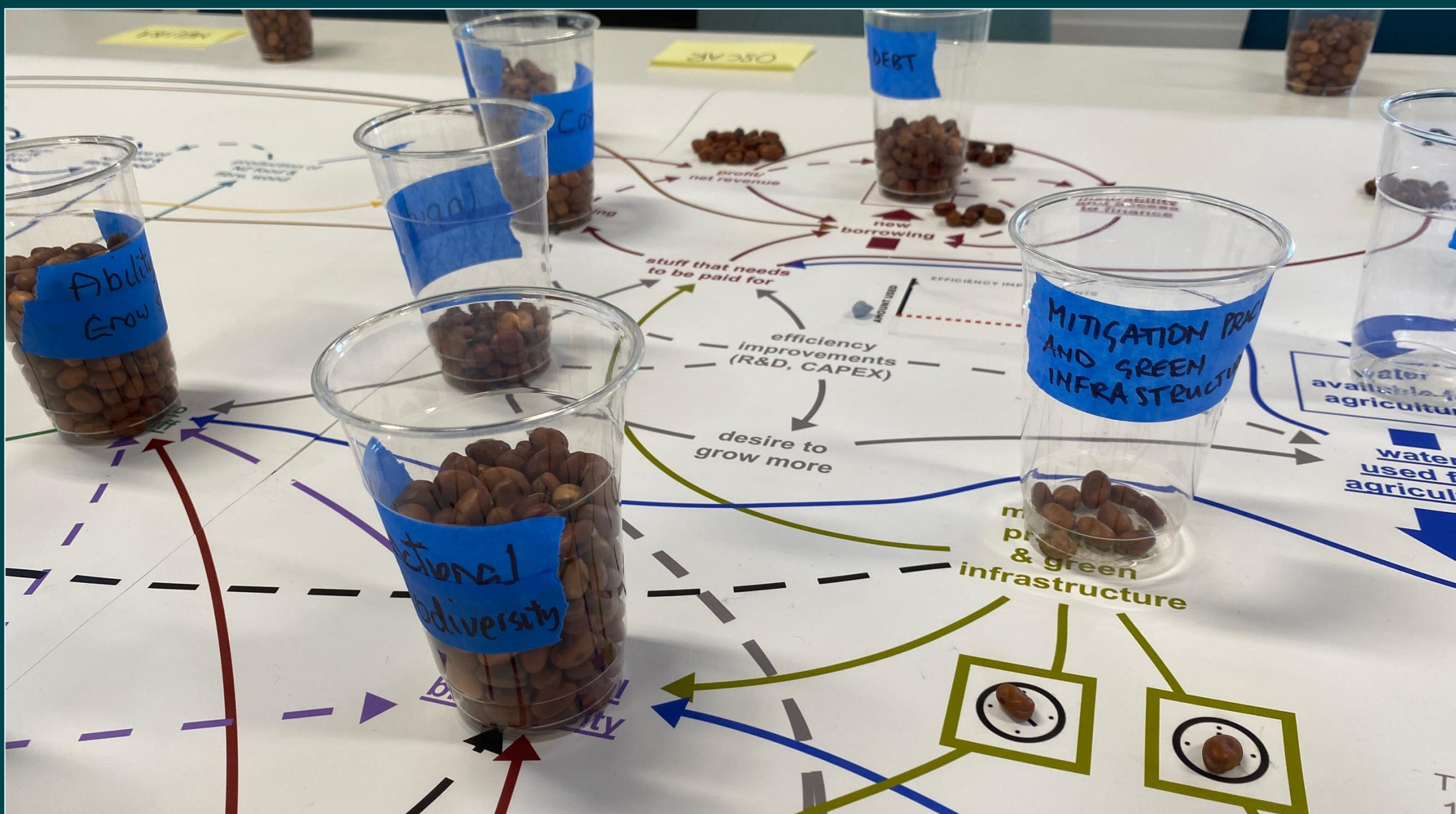


Figure 3. Beans moving through delays and accumulating in stocks

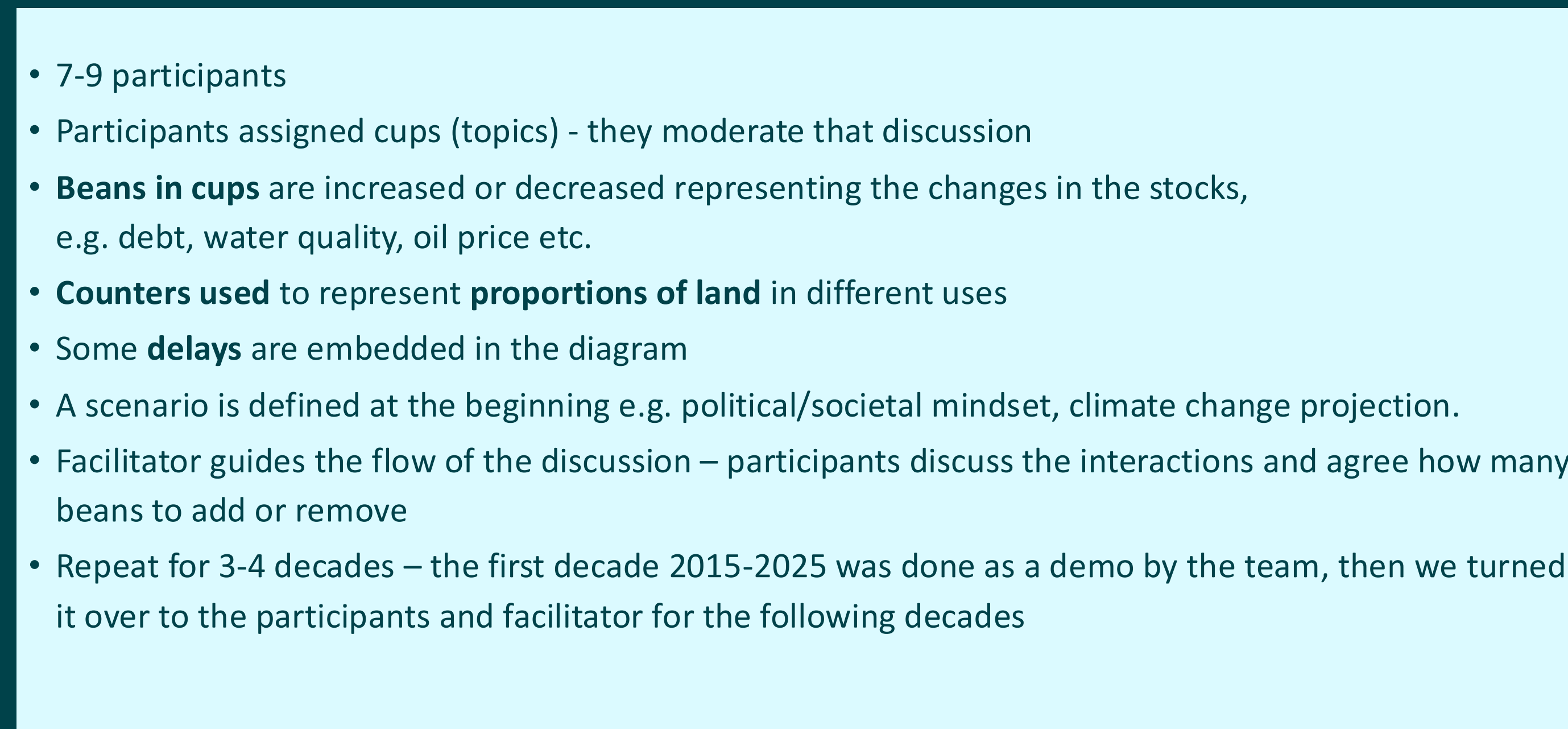


Figure 4. Greater details of analogue simulation activity