Networks of Climate Watch: Interdependencies and biodiversity effects of municipal climate actions

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COMPON workshop

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Slides: https://github.com/onerva-korhonen/presentations/blob/master/COMPON220323.pdf

Why municipal climate actions?

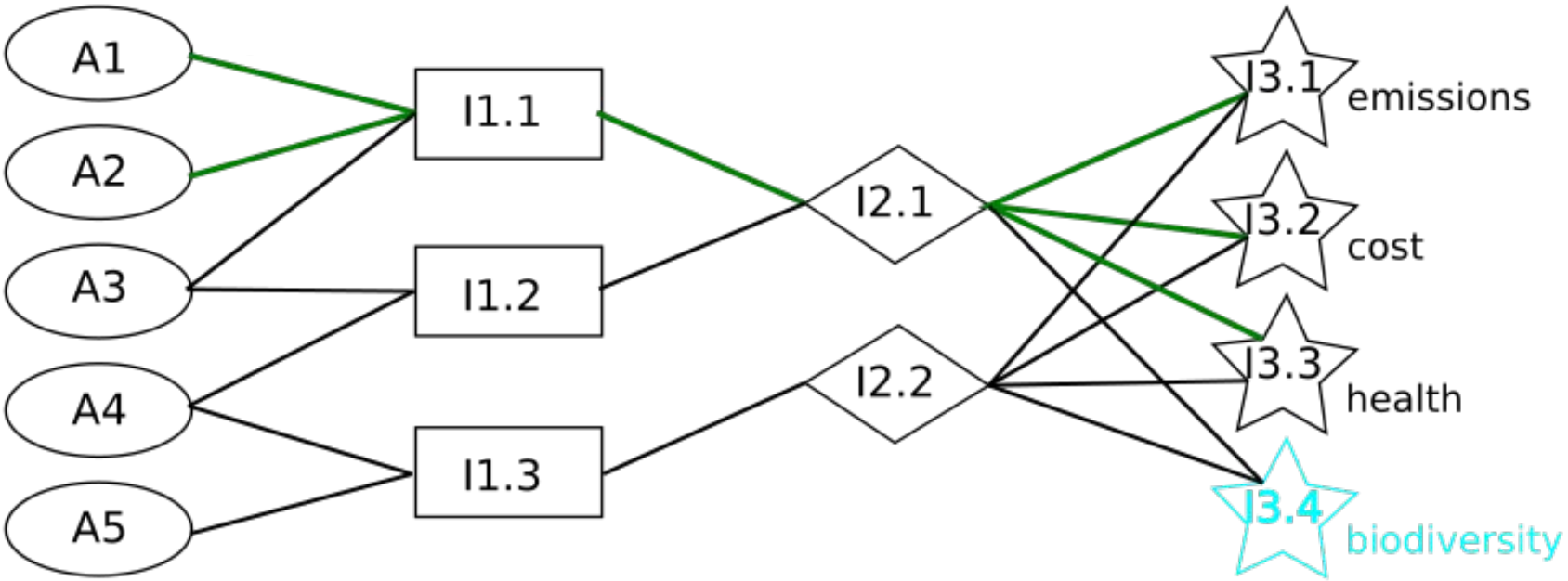
- Crucial: understanding dependencies of actions, actors, and impacts
- **Why** & **how** municipalities do?
  - policy networks (= social & semantic networks)
- **What** municipalities do?
  - aggregation studies: overall contribution from region's climate pledges (Hsu et al. 2019, Kuramochi et al. 2020)
  - case studies: zoom-in to single actors through document analysis & interviews (Lamb et al. 2019)
- **Network approach** (Holme & Rocha 2023, Kim 2020) combines the best of both:
  - Large number of municipalities as in aggregation studies
  - Ability to zoom in as in case studies

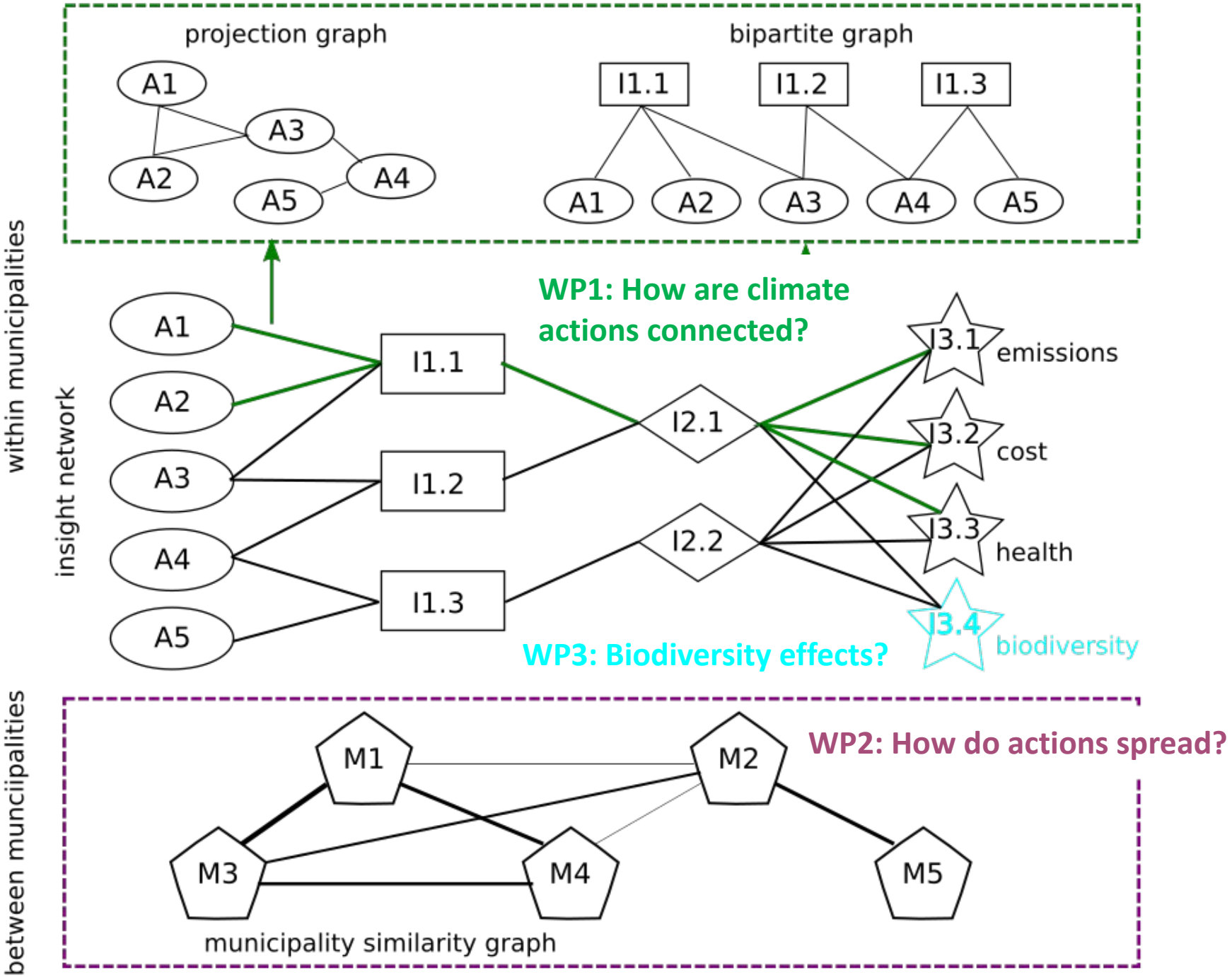
Why *Climate Watch*?

- Web-based tool for monitoring progress of climate actions
  - developed in Helsinki, Finland 2020
  - currently ~30 users worldwide
  - free if self-maintained, Kausal Ltd. sells support + extra features
- Data:
  - semi-open: municipalities publish under CC-BY 4, database access through Kausal
  - climate actions + 3 levels of indicators for progress
  - causal paths from actions to indicators
  - metadata: descriptions, schedules, key words, responsible parties, …

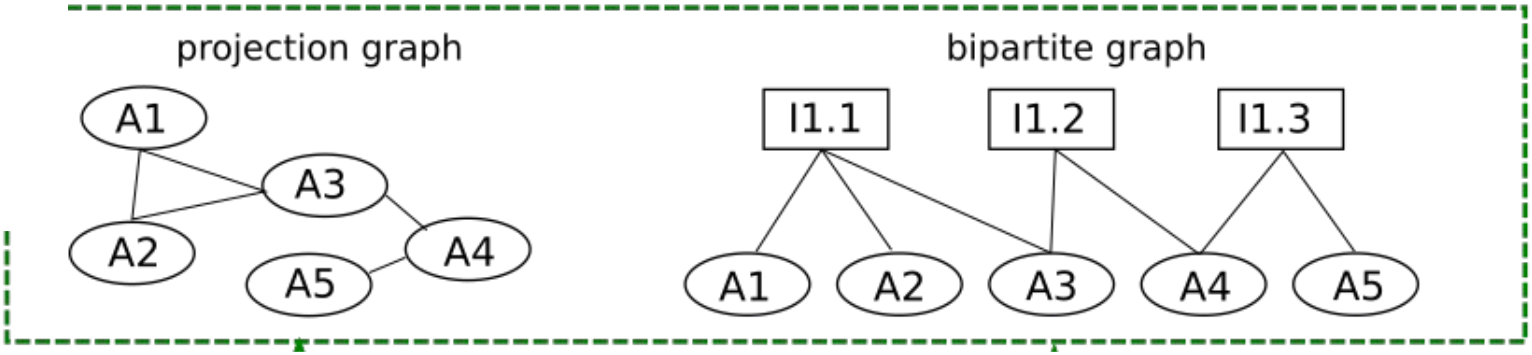
Why *Climate Watch*?

Insight network




projection graph
bipartite graph
A1
A2
A3
A4
A5
I1.1
I1.2
I1.3
within municipalities
insight network
WP1: How are climate actions connected?
I2.1
I2.2
I3.1
emissions
I3.2
cost
I3.3
health
I3.4
biodiversity
WP3: Biodiversity effects?
between municipalities
WP2: How do actions spread?
M1
M2
M3
M4
M5
municipality similarity graph

WP1: How are climate actions connected?

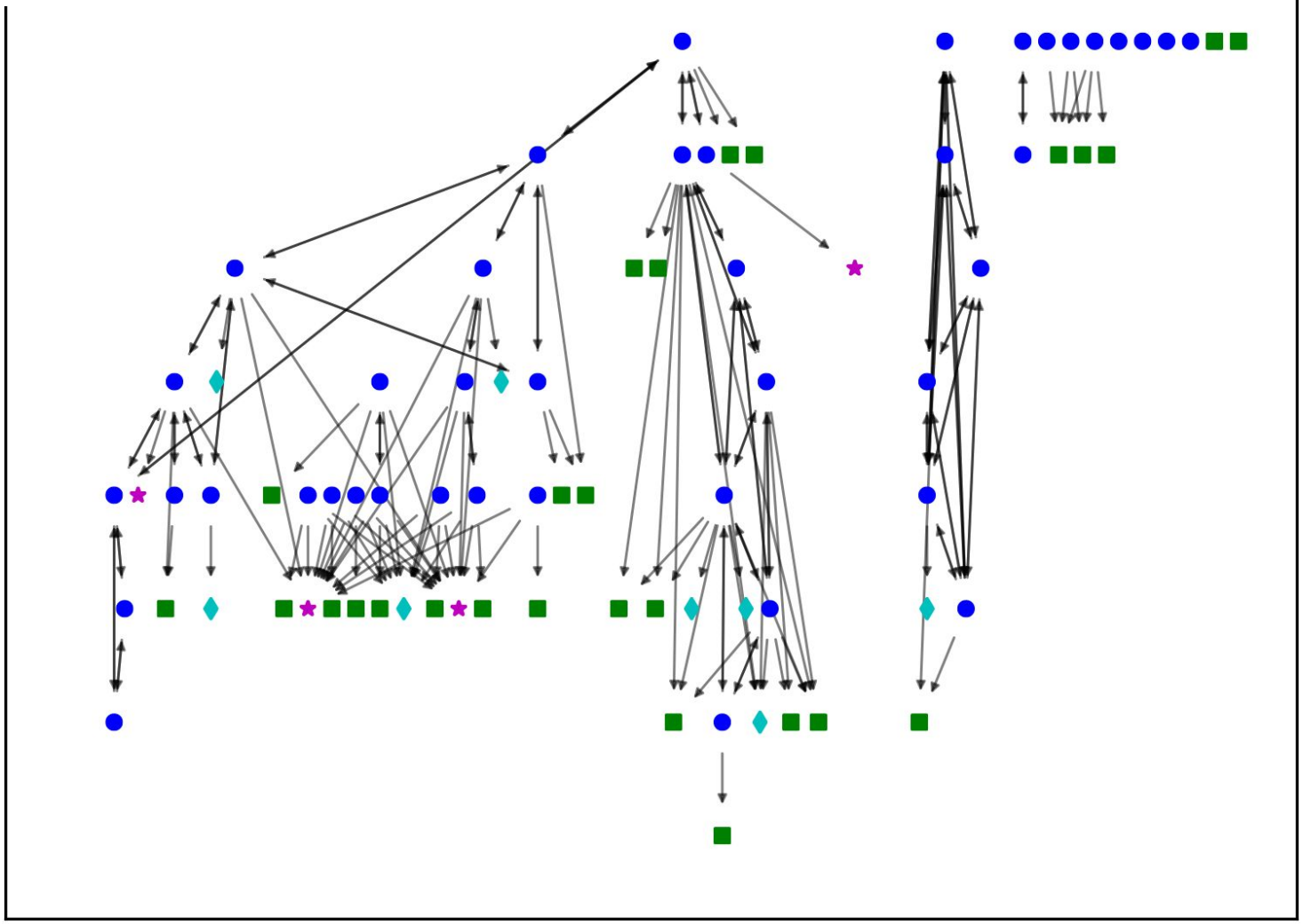


- Which actions **support and hinder** each other?
- What's the **optimal level of interconnectivity**?
- What's the **optimal set of actions**?

- To be answered through network analysis (ask about details!)

(Very) preliminary results

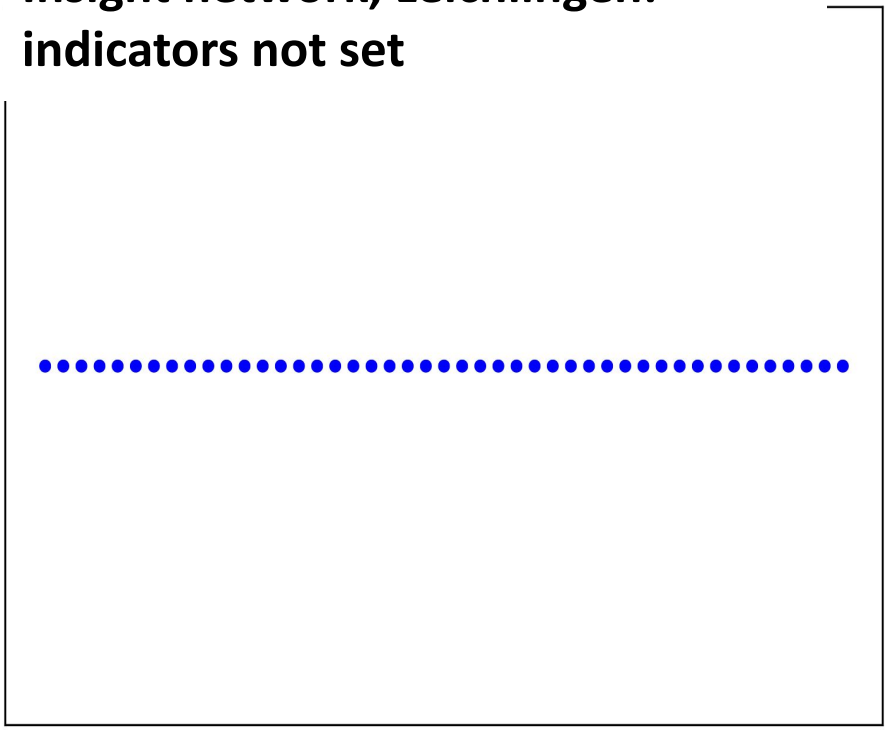
Great (insight network, Indigo Shire)...

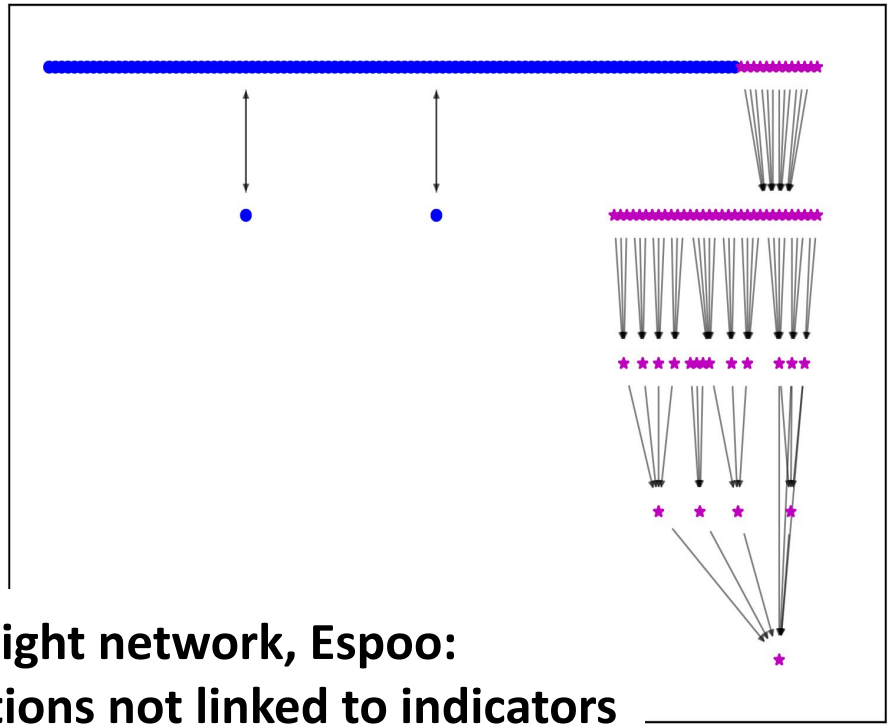


(Very) preliminary results

… but also…

Insight network, Leichlingen: indicators not set





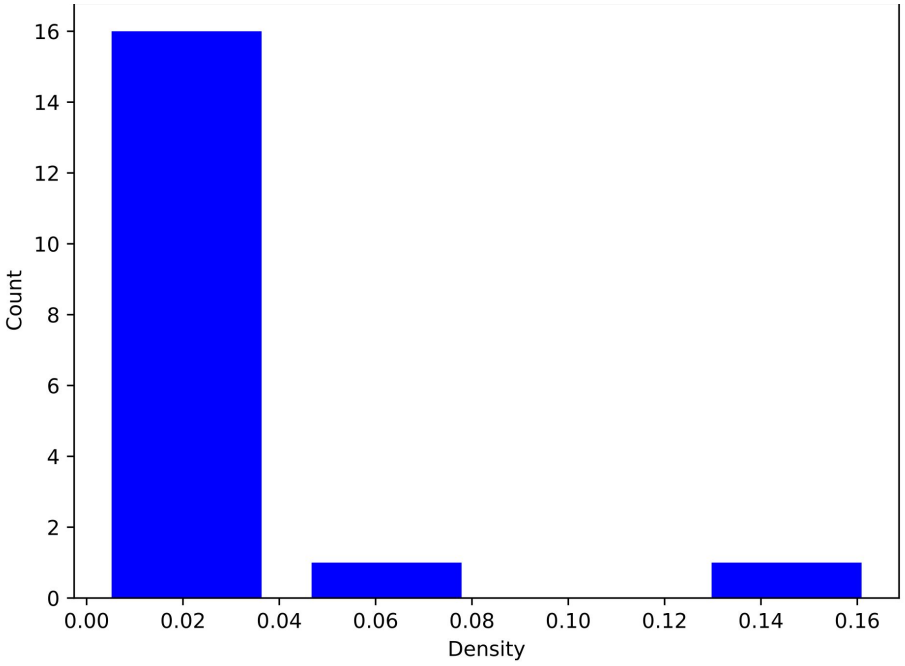
Insight network, Espoo: actions not linked to indicators

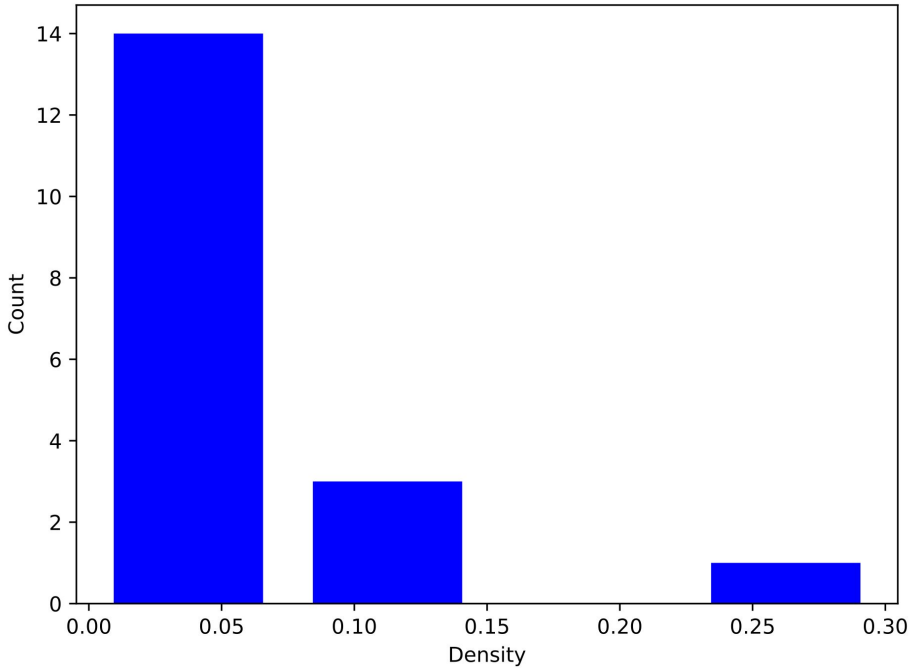
Data issues to be fixed through document analysis, interviews, …?

(Very) preliminary results

- **Projection graph:** nodes = actions, link= contributing to same indicator
- **Density** = fraction of all possible links present

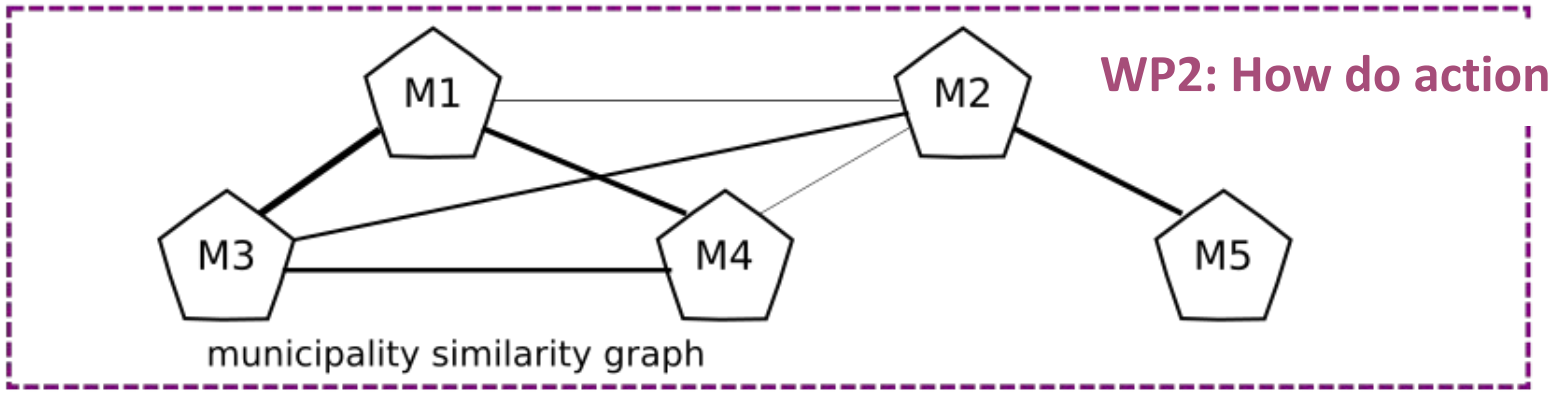
Projection graphs are sparse…





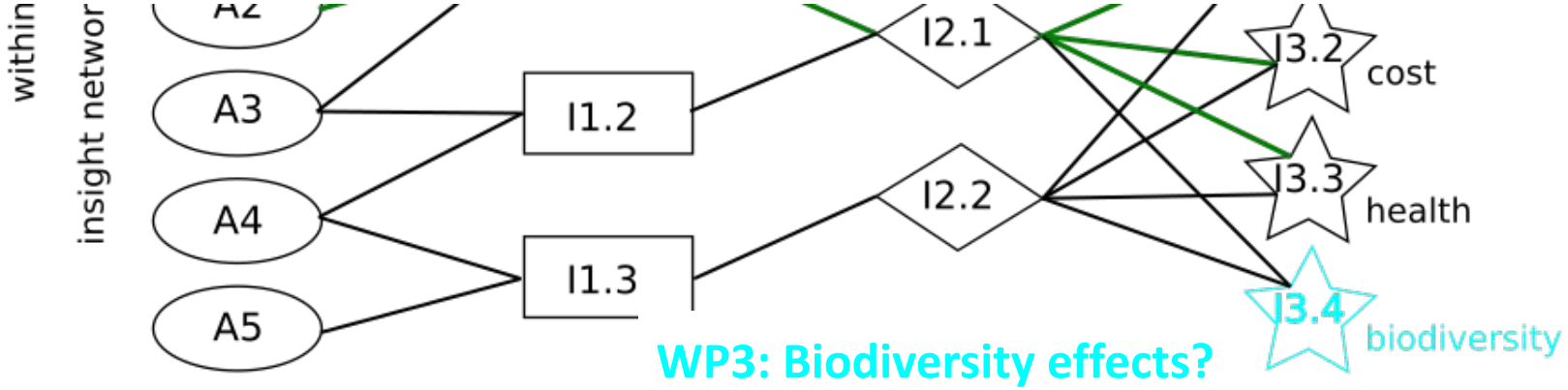
… also after excluding linkless nodes

between municiipalities



WP2: How do actions spread?

- **Similarity of municipalities:** average similarity of action descriptions
- **Quantifying learning:** do municipalities with similar pasts have similar futures?



- **Biodiversity effects** to be added as a new top-level indicator (based on document analysis, interviews, …)
- Optimal interconnectivity and actions for climate-biodiversity nexus through network analysis

Conclusions

- Understanding dependencies between actions is crucial for efficient climate action
- Network analysis: zooming in to multiple municipalities at once
- Climate Watch data: semi-open & diverse, currently from ~30 municipalities
- Issues with missing data: fixing possible but requires manual work, document analysis, interviews, …
- Municipalities either don’t list the dependencies between actions or don’t know them

References

Holme & Rocha, Networks of climate change: Connecting causes and consequences. *Applied Network Science* 8, 1 (2023).

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Thank you!

Questions, comments?

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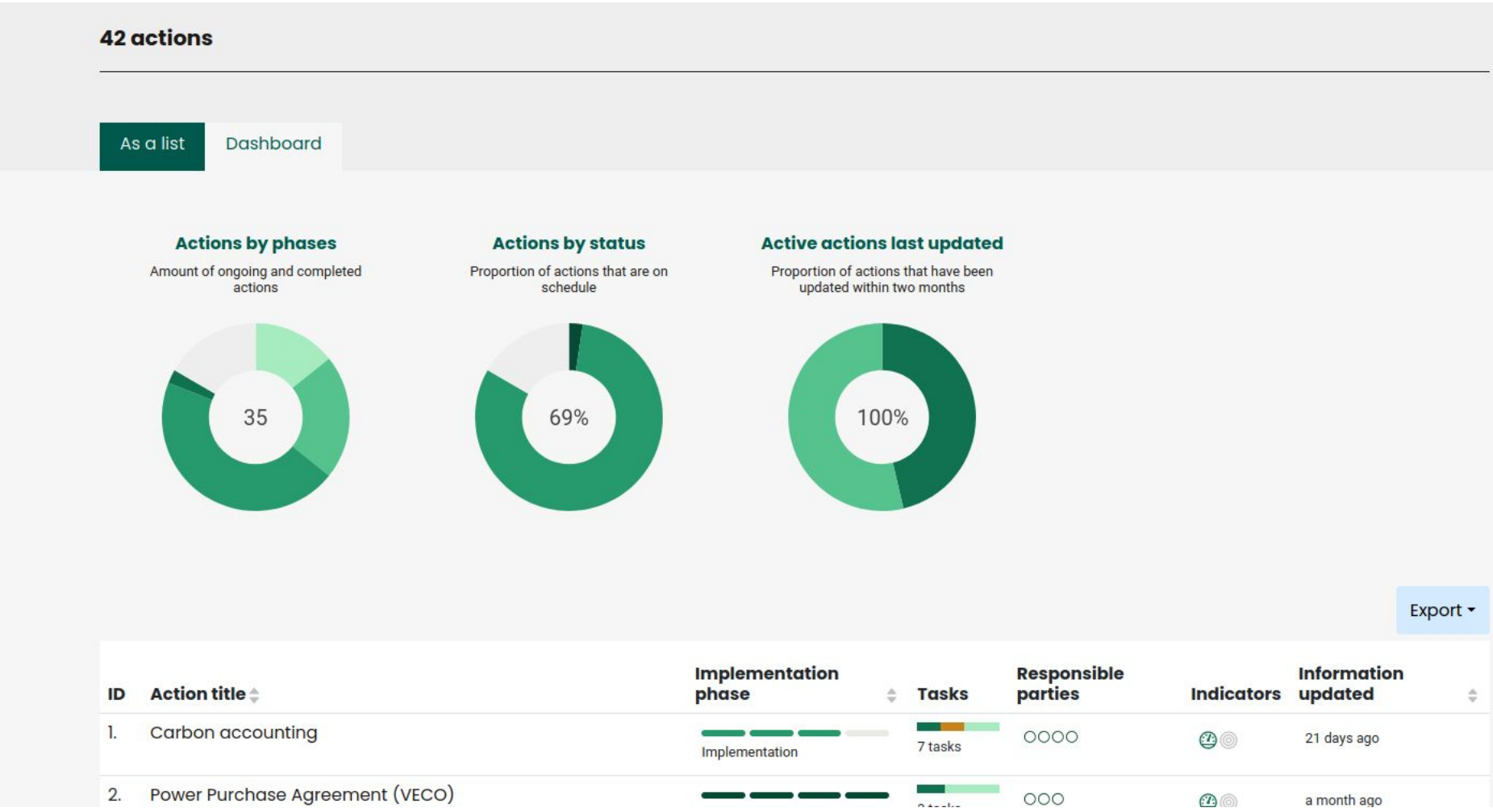

From https://climateaction.indigoshire.vic.gov.au/