

Automated evidence synthesis for climate change mitigation

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Context

Problem

Our
approach so
far

Ongoing
work

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Climate change - a wicked problem

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Climate change is

- complex

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Climate change is

- complex
- uncertain

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Climate change is

- complex
- uncertain
- value laden

The IPCC

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Limited learning in the IPCC

AR3

"Energy-efficiency standards have reduced energy use in a growing number of countries... The main disadvantage of standards is that they can be inefficient, but efficiency can be improved if the standard focuses on the desired results and leaves as much flexibility as possible in the choice of how to achieve the results."

AR4

"Regulatory measures and standards generally provide some certainty of emissions levels, but their environmental effectiveness depends on their stringency. They may be preferable when information or other barriers prevent firms and consumers from responding to price signals."

AR5

"Direct regulatory approaches and information measures are widely used, and are often environmentally effective, though debate remains on the extent of their environmental impacts and cost effectiveness".

Big Literature

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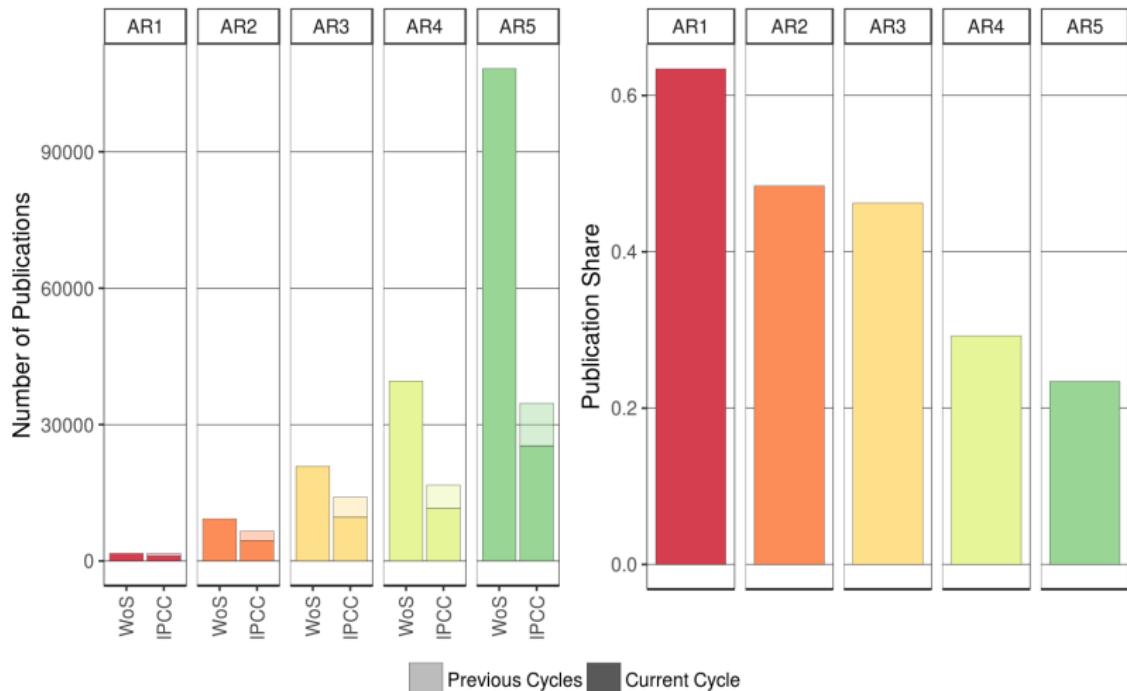


Figure: (Minx et al., 2017a)

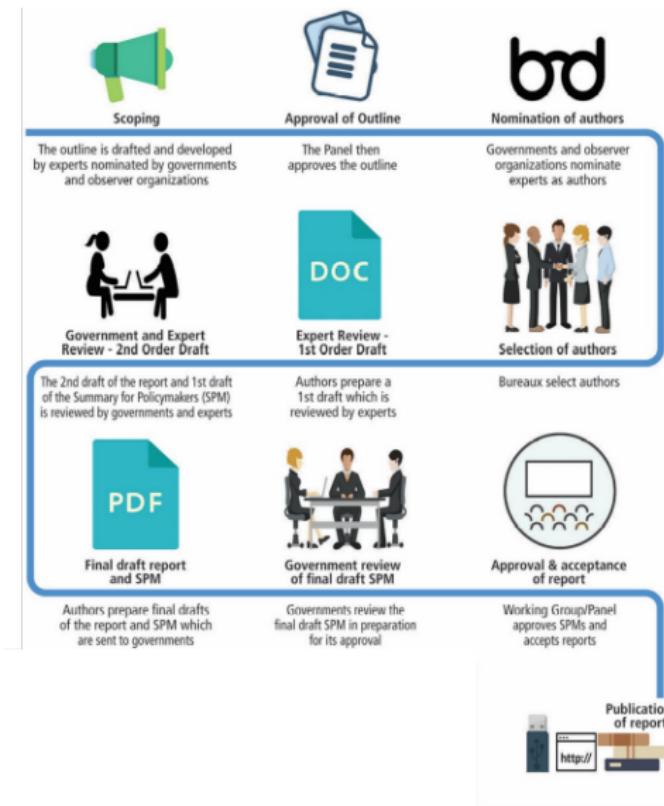
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The IPCC process



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Implications

- We need to develop ways of being more systematic in engaging with the literature

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Implications

- We need to develop ways of being more systematic in engaging with the literature
- We need more research on research results - What works, why and in what contexts?

Context

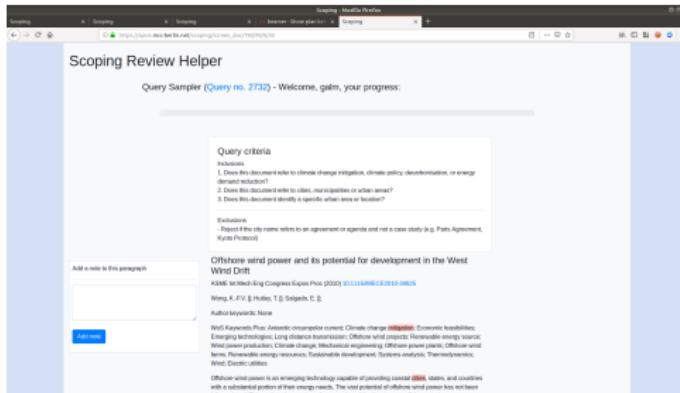
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Implications

- We need to develop ways of being more systematic in engaging with the literature
- We need more research on research results - What works, why and in what contexts?
- We need ways of engaging with more text than we can read ourselves



Online platform

- Django [link] web app.
Extension of topic modelling visualisation app (Chaney and Blei, 2012)
- Lots of data collection, analysis and exploration available through online web interface
- More detailed analysis made easier through structured access to data

Negative emissions technologies (NETs)

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- NETs describe technologies which remove carbon from the atmosphere and store it

Negative emissions technologies (NETs)

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- NETs describe technologies which remove carbon from the atmosphere and store it
- NETs (of one sort or another) are indispensable for reaching the 1.5 degree target

Negative emissions technologies (NETs)

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- NETs describe technologies which remove carbon from the atmosphere and store it
- NETs (of one sort or another) are indispensable for reaching the 1.5 degree target
- We produced a quick landscape of the literature using topic modelling (Minx et al., 2017b)

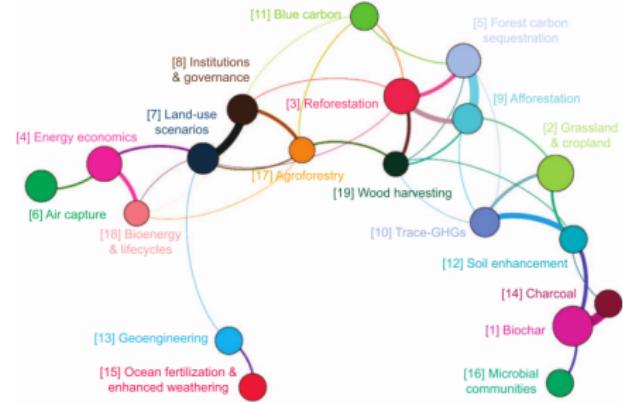


Figure 3. Correlation structure of negative emissions topics. Each node represents a topic, scaled by the marginal topic distribution (table 1); each line represents a positive correlation between two topics. The largest correlation is of 0.24 between biochar and charcoal. Nodes that are proximate to one another are more highly correlated than those which are distant. The visualization is generated from inter-topic correlations using the force-directed algorithm ForceAtlas2 in Gephi (Jacomy et al 2014).

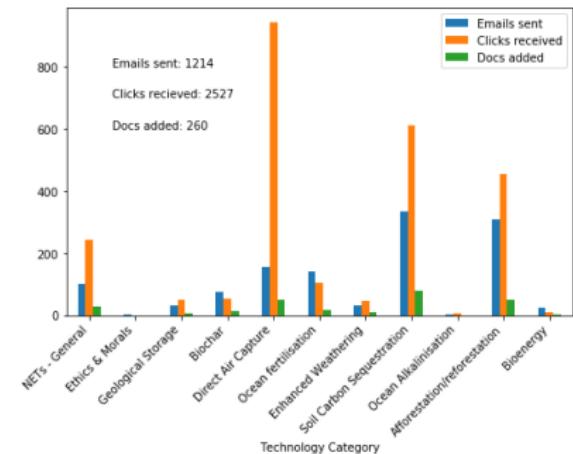
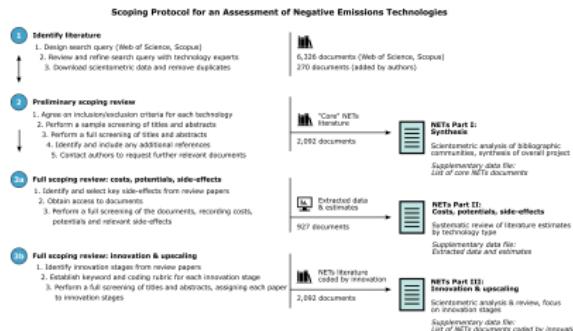
NETs 2 - systematic review - process digitalisation

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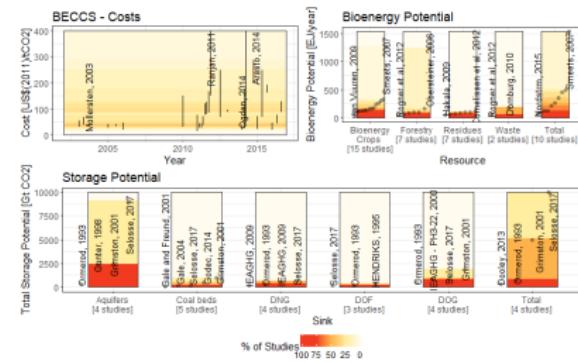
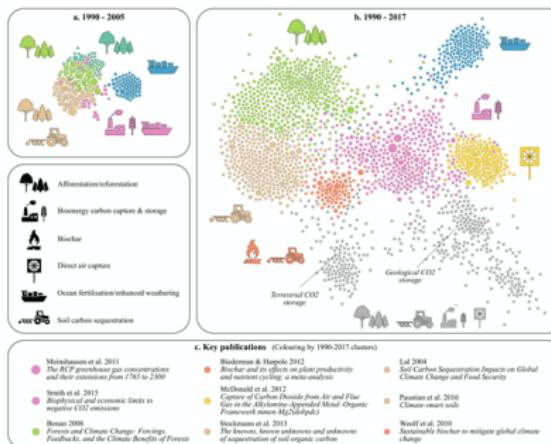
NETs 2 - systematic review - Results

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Urban mitigation research on cities

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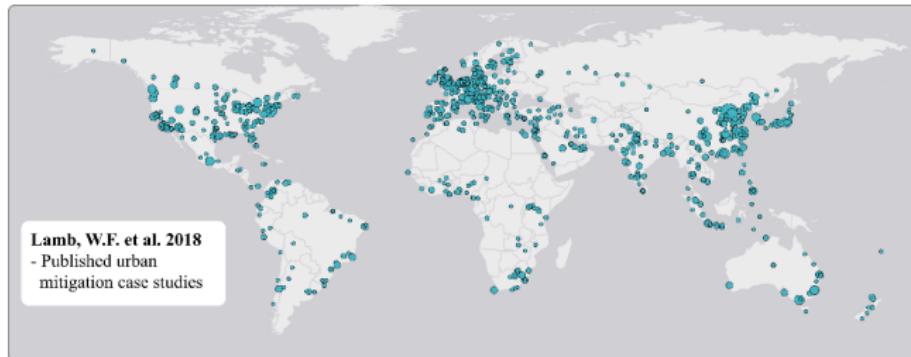
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Urban mitigation research on cities



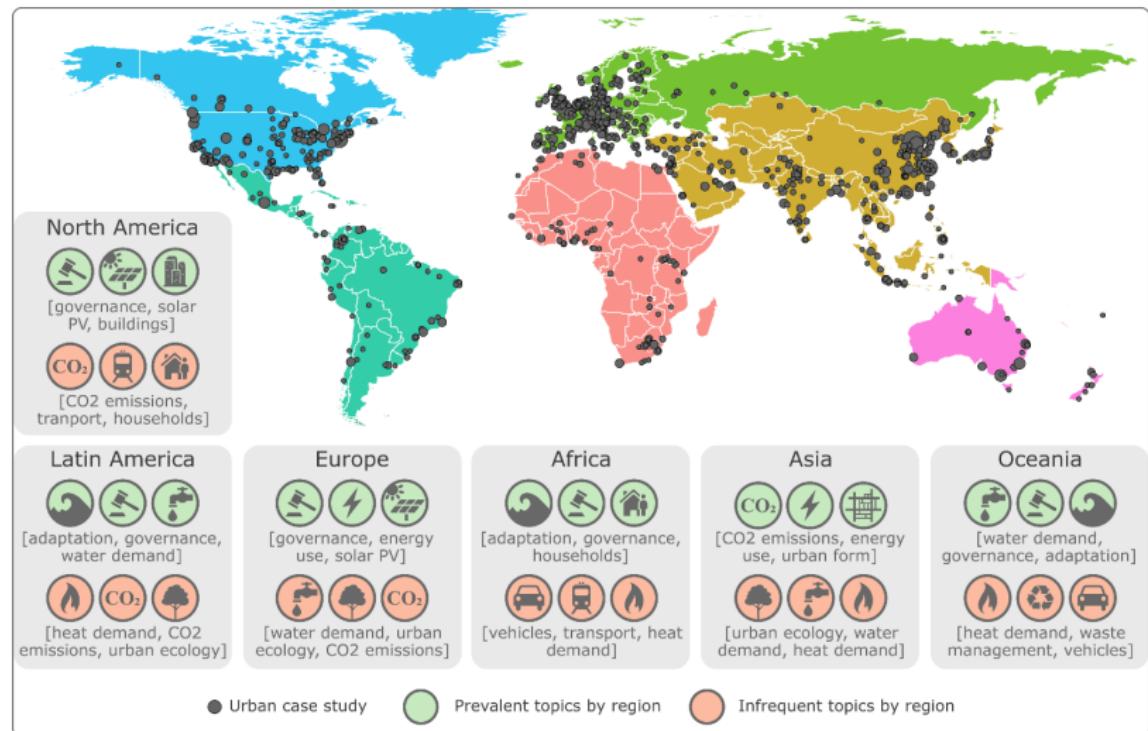
Urban mitigation research on cities

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(Lamb et al., 2018)

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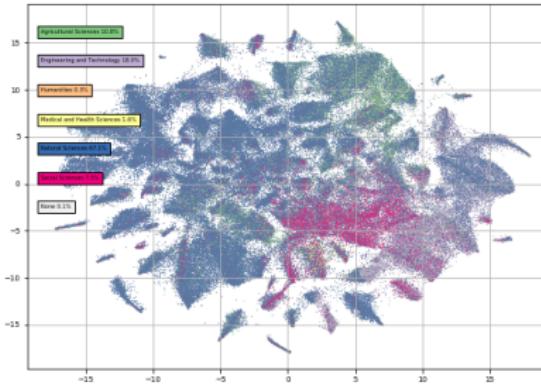
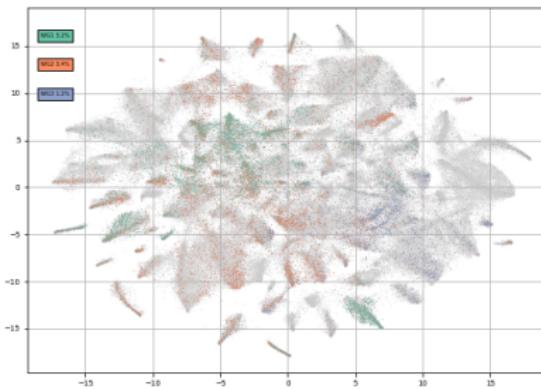
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A topography of climate change literature



- What's the literature on climate change *about*
- How have topics evolved
- How are topics represented in IPCC reports

Machine assisted screening

- For a landscape paper on “sustainability” we want to look at around 200,000 papers

Machine assisted screening

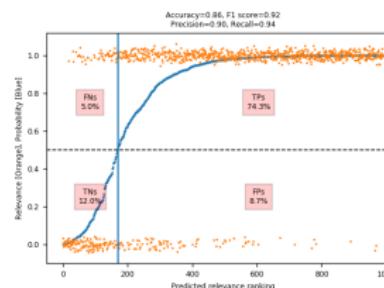
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Machine assisted screening

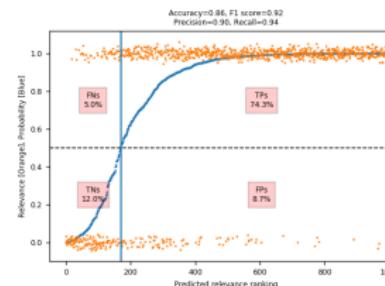
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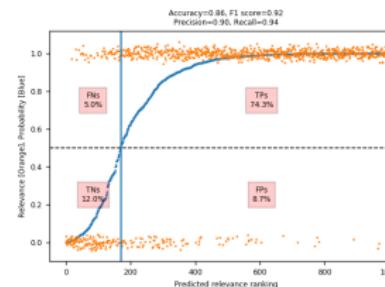
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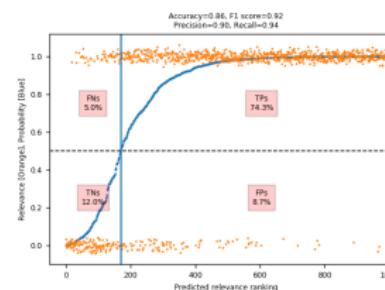
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- We have experimented with standard text classification approaches

- Each use case for machine learning is specific -> recipes/frameworks for analysis and evaluation

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- We have experimented with standard text classification approaches

- Each use case for machine learning is specific -> recipes/frameworks for analysis and evaluation
- What* (not just how much) is being misclassified

Machine assisted classification

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Validating topic models as *systematic maps* against human classification.
[Unsupervised/semi-supervised]

Using human classifications to train a model to predict study class.
[supervised]

References

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Our systematic review app: <https://github.com/mcallaghan/tmv>

Chaney, A. and Blei, D. (2012). Visualizing Topic Models. *Icwsrm*, pages 419–422.

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