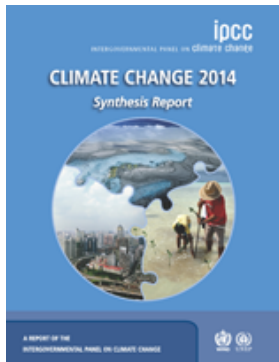


# A Topography of Climate Change Research

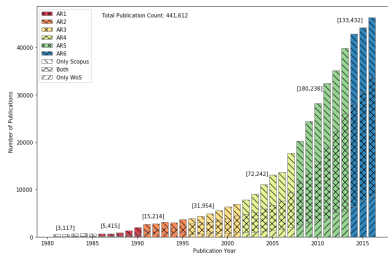
Max Callaghan



September 22, 2017



- Climate Change is complicated
- The IPCC assess the science on climate change
- These assessments should be comprehensive, credible and relevant



- Comprehensive, credible and relevant assessments become more challenging as the literature grows

*To understand, and to aid, scientific assessments of climate change, we need to machine read the literature*

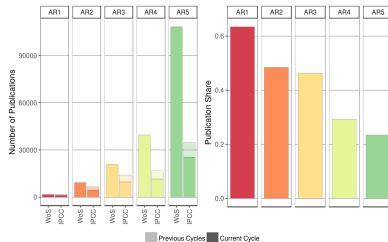
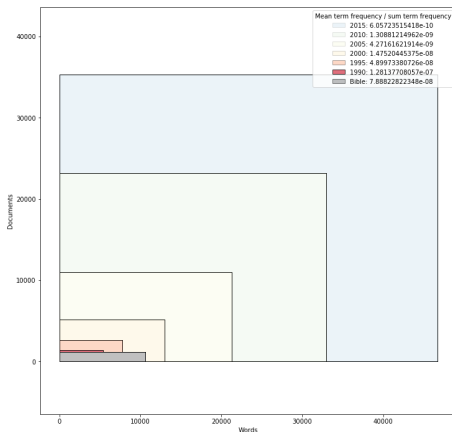
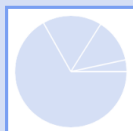


Figure: Source: Minx et al. (2017)



- Topic modelling is a way of reducing the dimensionality of a corpus of documents
- A large matrix of documents  $\times$  words is factorised by a matrix of topics  $\times$  words and a matrix of topics  $\times$  documents (Lee and Seung, 1999)
- Topics describe the latent structure of the document corpus

## Biomass carbon density of hunan typical forest types



### related topics

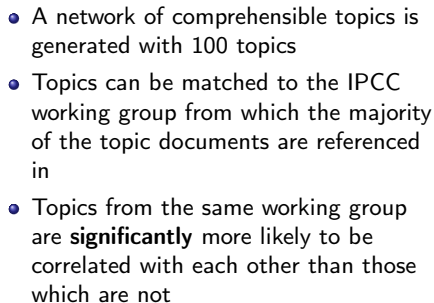
(forest, tropic, deforest)  
(biomass, aboveground, root)  
(carbon, sequestr, organ)  
(food, agricultur, secur)

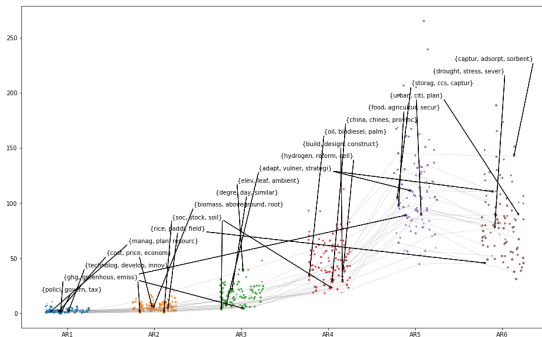
Chen, J.; Li, X.; Wang, E.; Zeng, Y.; Zeng, Z.; 2016

The forest carbon reserve is very important to forest ecosystems. The amount of carbon of forest plays an important role in improvement of the global warming. Both field surveys and laboratory analysis were employed to investigate biomass and biomass carbon density in six typical forest types (Cupressus funebris forest, Eucalyptus forest, Pinus massoniana forest, Cunninghamia lanceolata forest, Quercus fabri forest and Populus tremula forest) of the Hunan Province. Results show that the biomass, biomass carbon and carbon density of the selected six forest types increase with the increasing ages. The carbon density per unit for young forests, middle forests and premature-mature-overmature forests of each forest type were as follows: 30.1, 73.4 and 121 t/hm<sup>2</sup> in Cupressus funebris forest, 25.6, 39.7 and 97.1 t/hm<sup>2</sup> in Eucalyptus forest, 17.7, 48.4 and 80.9 t/hm<sup>2</sup> in Pinus massoniana forest, 22.5, 43.9 and 99.5 t/hm<sup>2</sup> in Cunninghamia lanceolata forest, 16.6, 19.6 and 59.1 t/hm<sup>2</sup> in Quercus fabri forest, and 16.6, 26.7 and 53.7 t/hm<sup>2</sup> in Populus tremula forest. Because the forest types in Hunan Province are mainly in the young and middle-aged forest stands, the biomass carbon density is regarded to increase. This study provides important information for forest management and evaluation of carbon sequestration. © 2016, World Food Ltd. and WFL Publishers. All Rights Reserved.

Adjust topic threshold:  0.002

- Documents are mixtures of topics, based on the words which occur in them

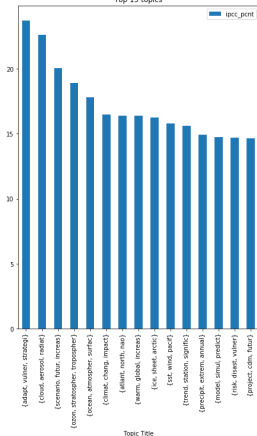




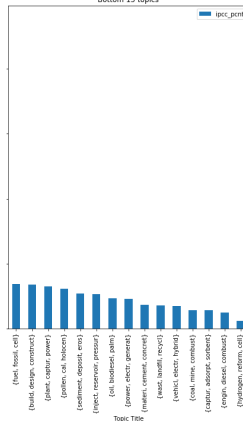
- Negative emissions related topics have shown strong growth in recent years
- As have topics on food security and cities

# Preliminary results - gaps in coverage

Top 15 topics



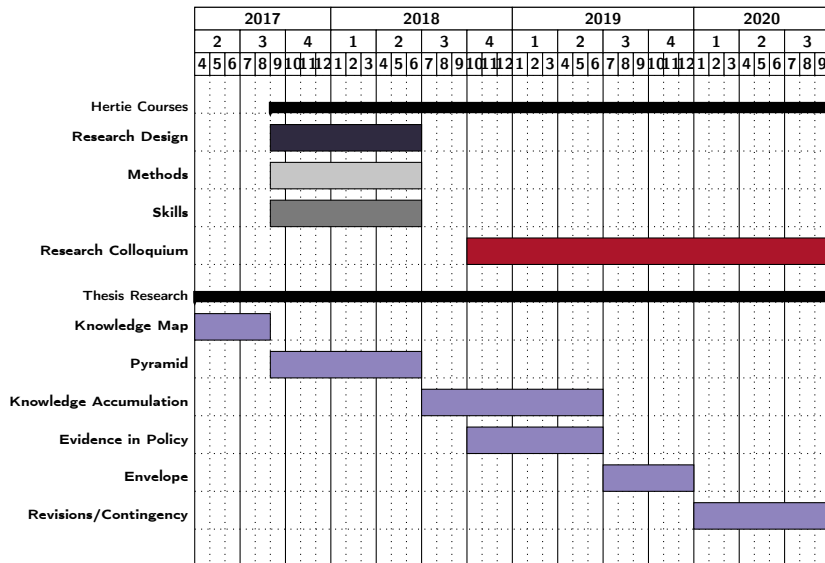
Bottom 15 topics



- The physical science aspects of climate change, as well topics on impacts, adaptation and scenarios are well covered by the IPCC
- “Niche” topics on specific technological solutions, are less well covered



- Can I get a clearer research question, and make the analysis less descriptive?



- Lee, D. D. and Seung, H. S. (1999). Learning the parts of objects by non-negative matrix factorization. *Nature*, 401(6755):788–91.
- Minx, J. C., Callaghan, M., Lamb, W. F., Garard, J., and Edenhofer, O. (2017). Learning about climate change solutions in the IPCC and beyond. *Environmental Science & Policy*.