Climate change, fisheries, management and modelling approaches

Dawit Yemane

2017-03-15 11:42:59

Background

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- Background natural environmental variability (and natural extreme events)
- Long-term directinal change in the environment (either the result of long-term natural cycles or man-made e.g. climate change or both)
- Direct and indirect effects of extraction activities (capture fishery on variety of species using different types of gears)

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- In addition the effects of the above operate/manifest at different spatial and temporal windows
- All of which making the whole problem of correctly/appropariately attributing observed response to the different drivers rather a difficult task.

Approaches

Analysis of literature on climate change and fisheries

A quantitative analysis of scientific publications on climate change, its impact and proposed adaptations

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- Classify the text from all the document into distinct themes (topics). Done using Topic modelling
- Latent Dirichtlet Allocation (LDA) model, commonly used, applied based to classifiy the documents into topics.

Data and methods

Most of the scientific publications used were obtained from within `Mendeley`

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- Analysis of policy and research document on climate change from threee developed countries: `Australia`, `Canada`, and `USA`

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- Extract commonality among the documents
- Similarly `FAO` technical report for 2008, 2009, and 2016 were processed.

Results

Summary of research on climate change in relation to fisheries

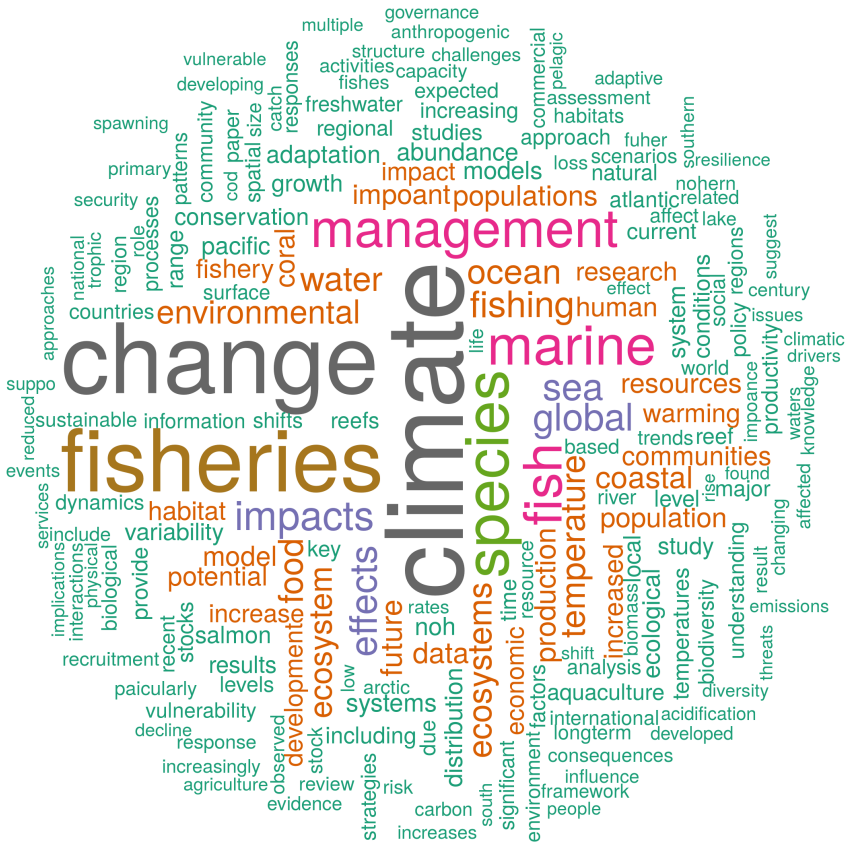

Figure 1: Most common terms global research on climate change and

Time series of topics/themes covered in the research on climate change and fisheries (all years)

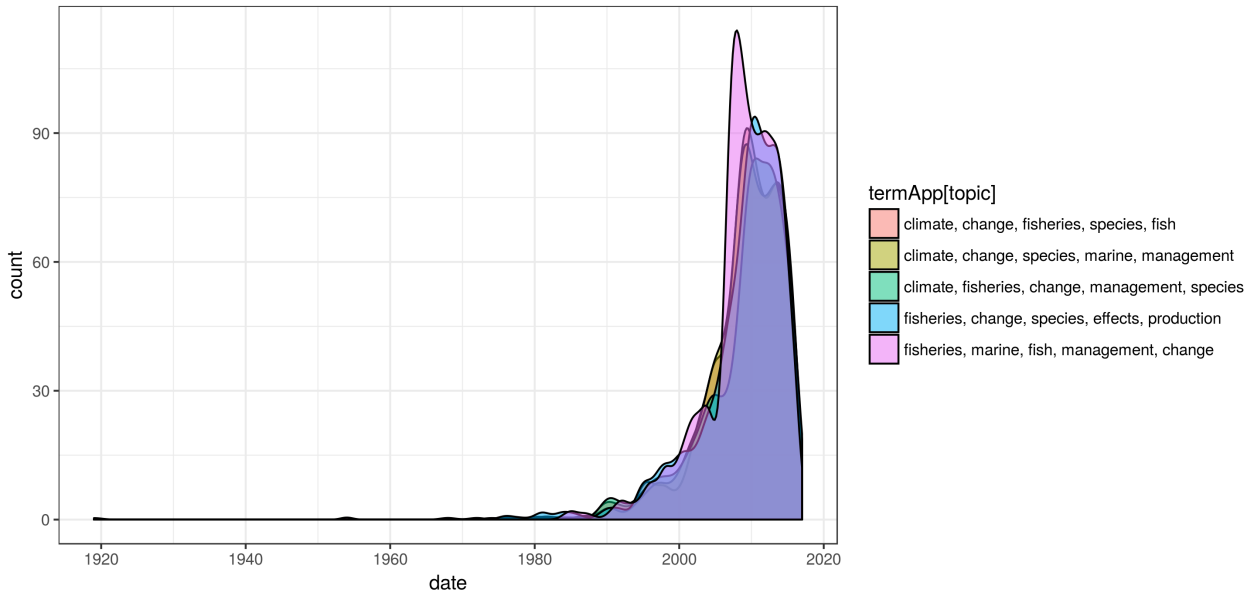

Figure 2: Classification of the abstracts into five topics all years

Time series of topics/themes covered in the research on climate change and fisheries (latest years)

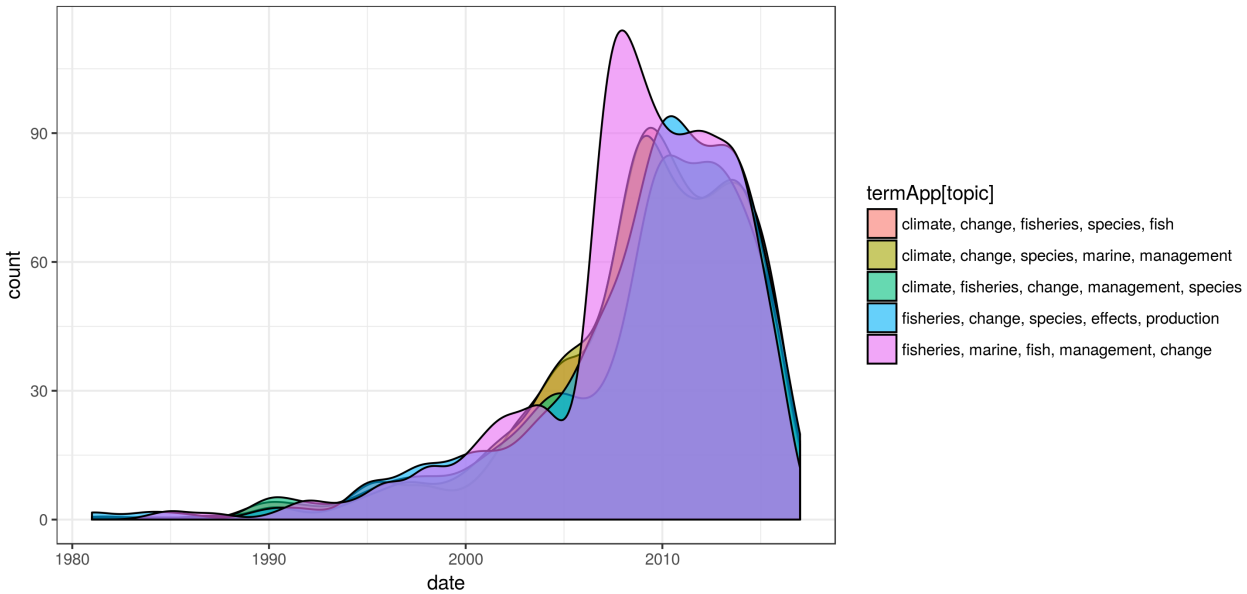

Figure 3: Classification of the abstracts into five topics since 1980

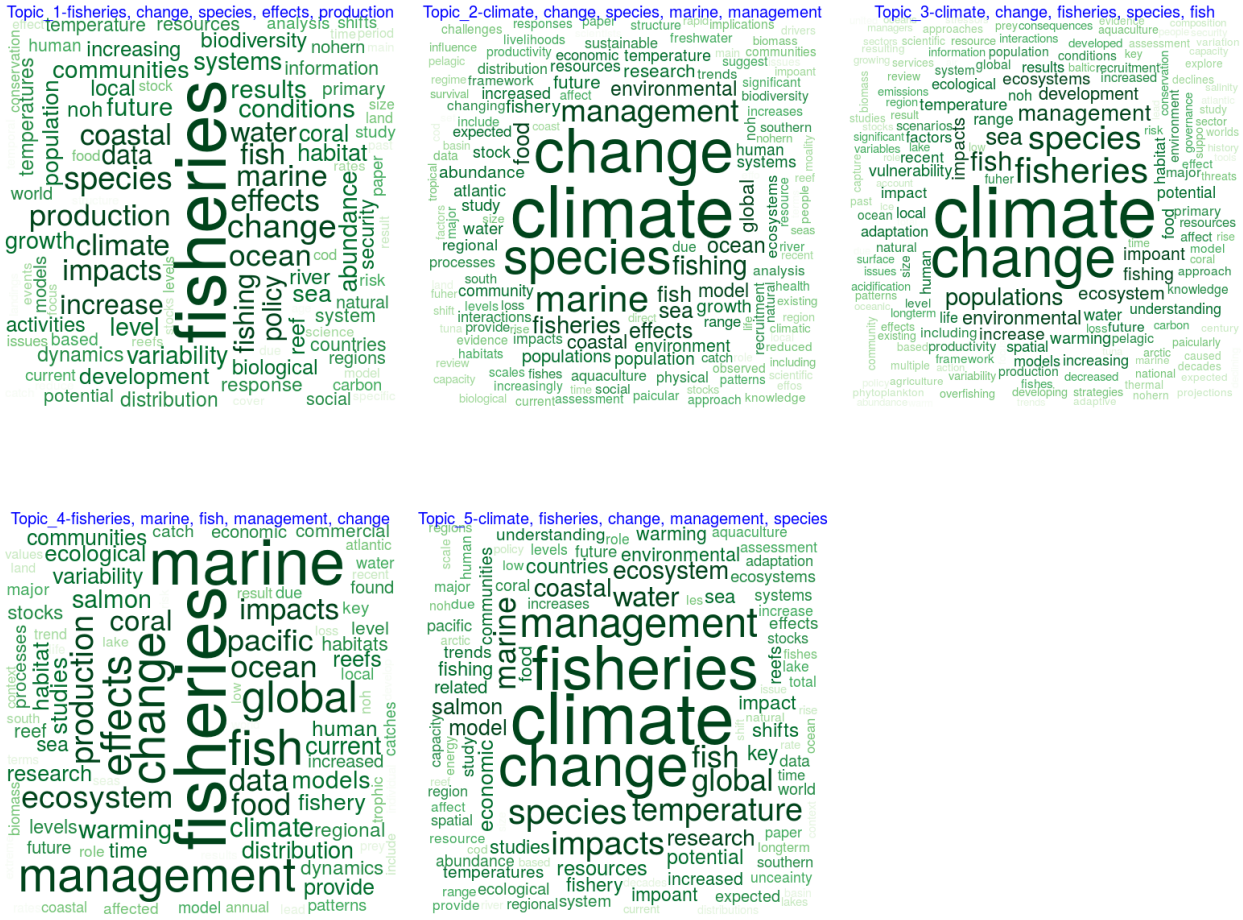

Figure 4: Sets of words characterizing the five topics

Most of the studies on climate change and fisheries can be gropuped into five themes/topics characterized by:

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- Topic 5: Climate change (e.g. change in temperature) and fisheries management

Network of author-coauthors: Most important authors in the climate change-fisheries research

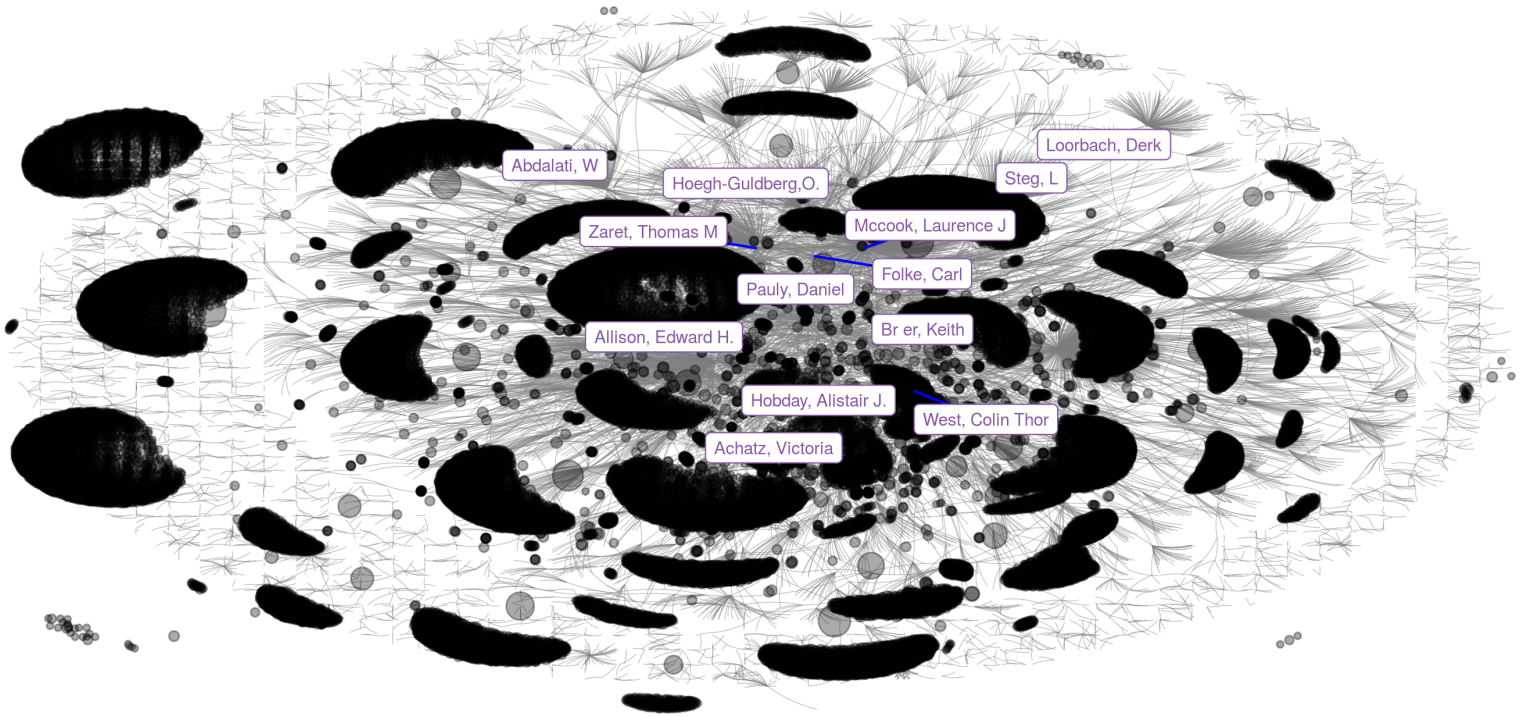

Figure 5: Most important authors in the research on climate chanage and fisheries

Synthesizing policy and research document from `FAO` for three years 2008, 2009 and 2016

- Comparing the most commonly used words/terms among the three years

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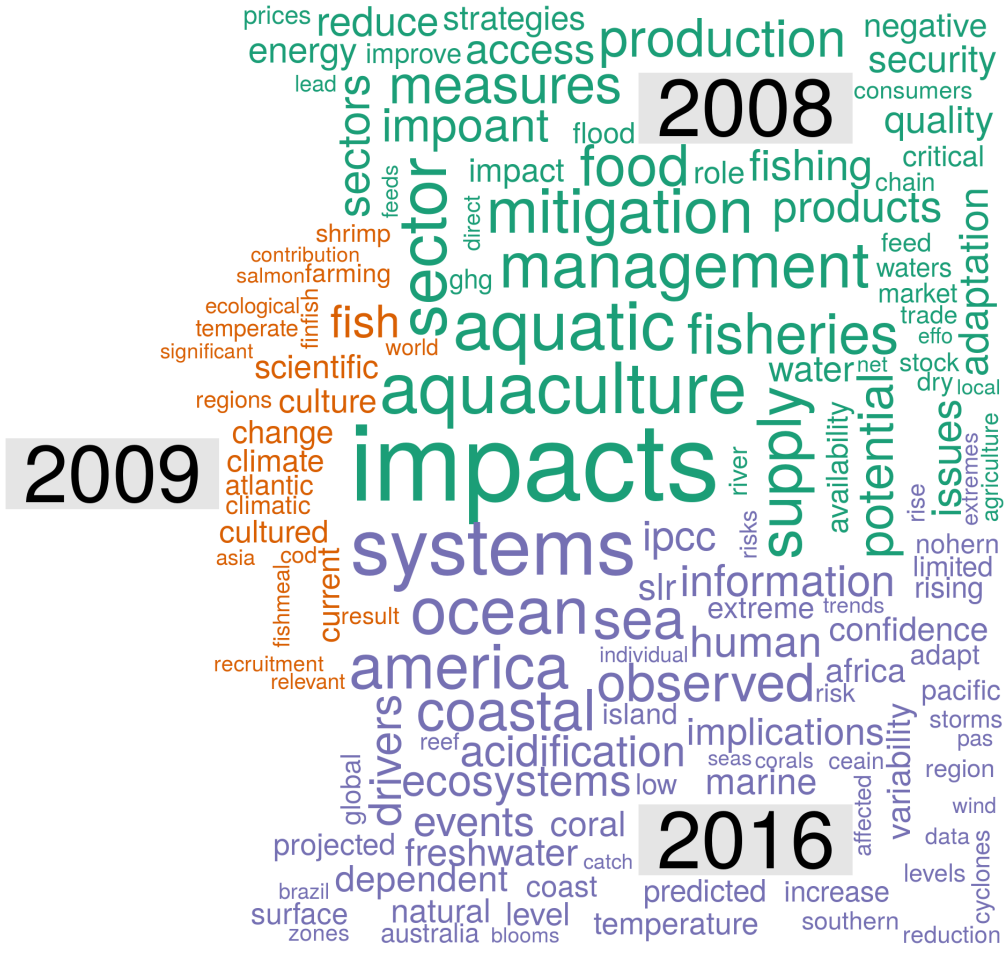

Figure 6: Comparison of words that are unique to the FAO technical report from 2008, 2009, 2016

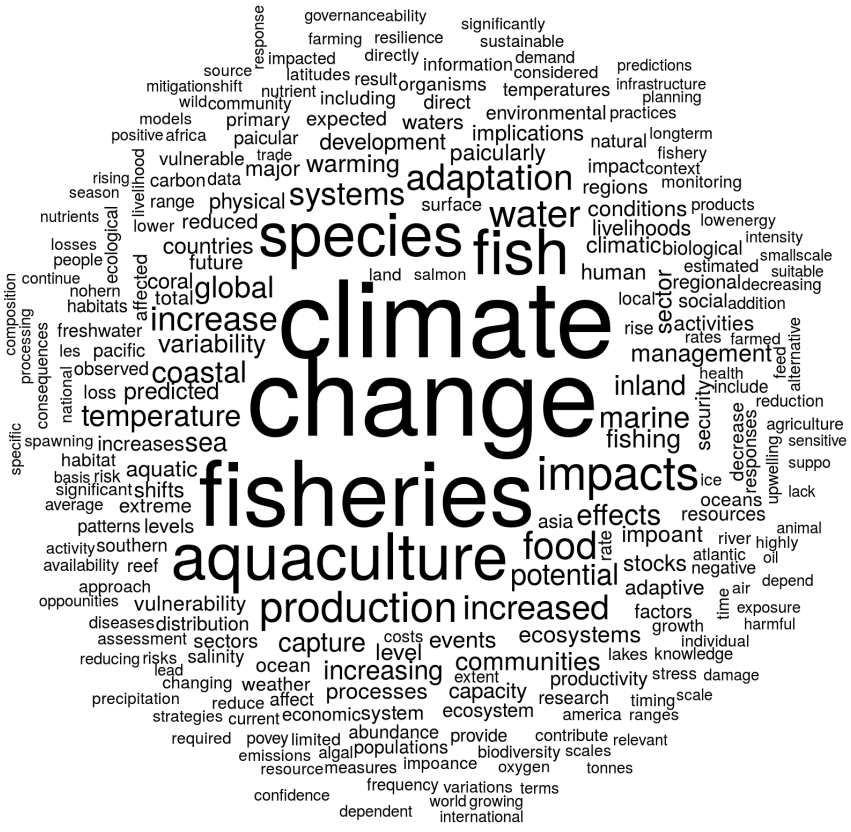

Figure 7: Comparison of words that are common to all FAO technical report from 2008, 2009, 2016

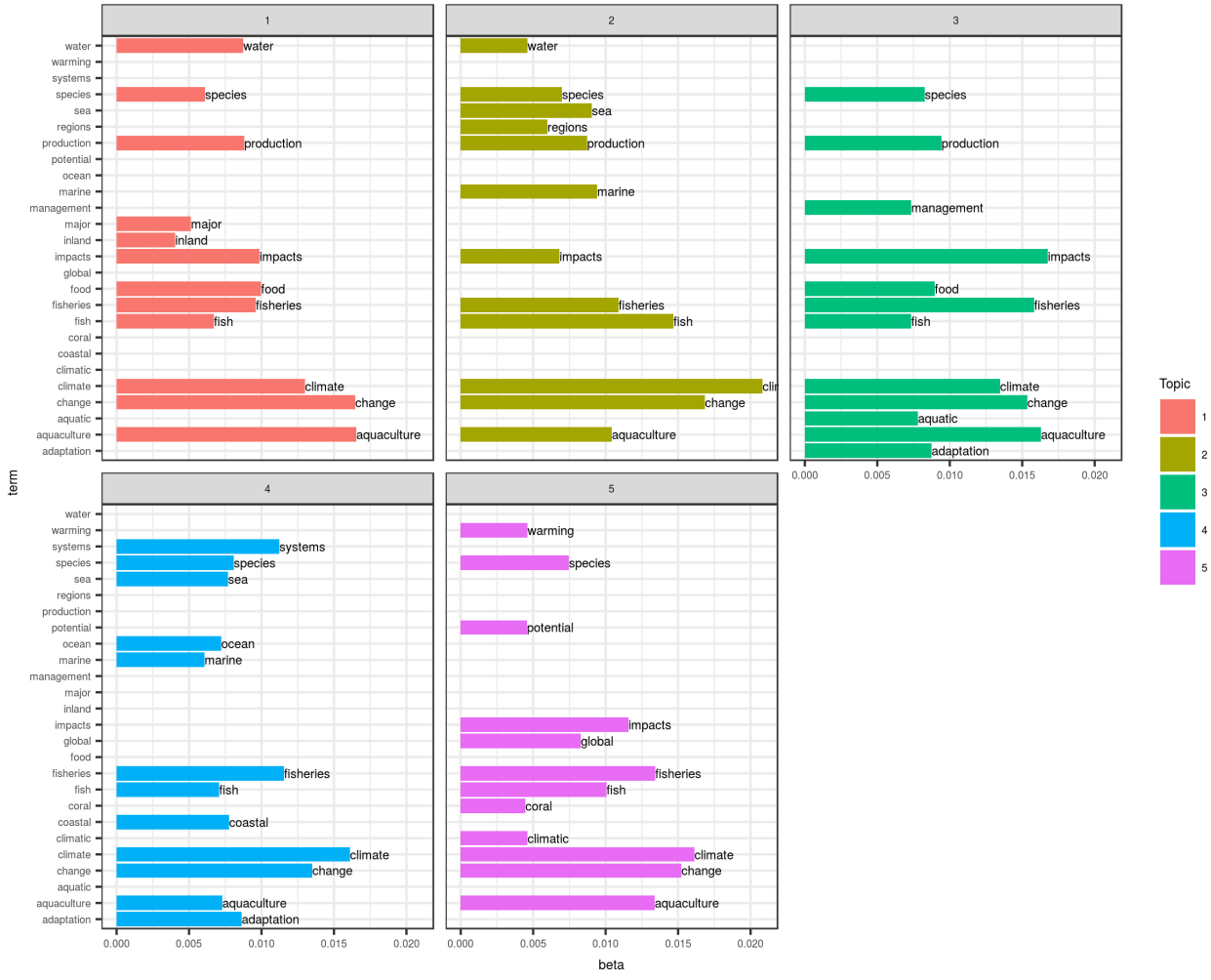

Figure 8: Classification of the three FAO technical reports into five topics and terms characterizing each topic

Approximate interpretation of the five topics

- Topic 1: Impact of climate change on production of fishes,fisheries, and aquauculture in inland systems

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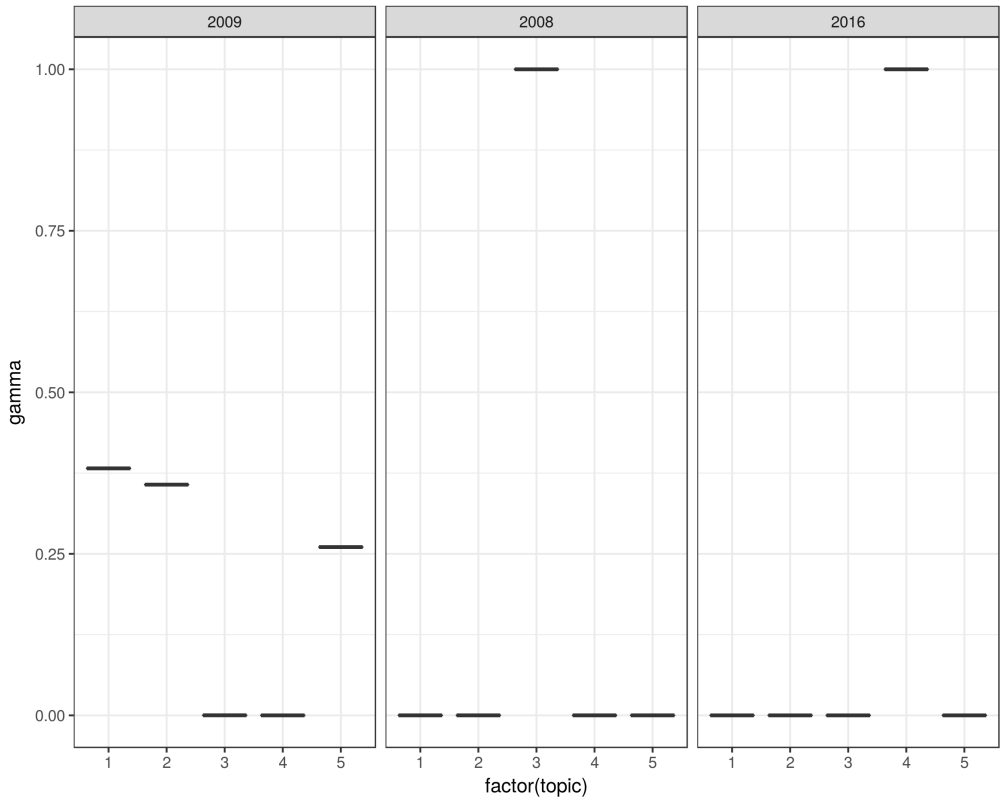

Figure 9:

Synthesizing policy and research document from Canada, USA, and Australia

- What are main focus of the policy and reserch document from the three countries (comparing terms)

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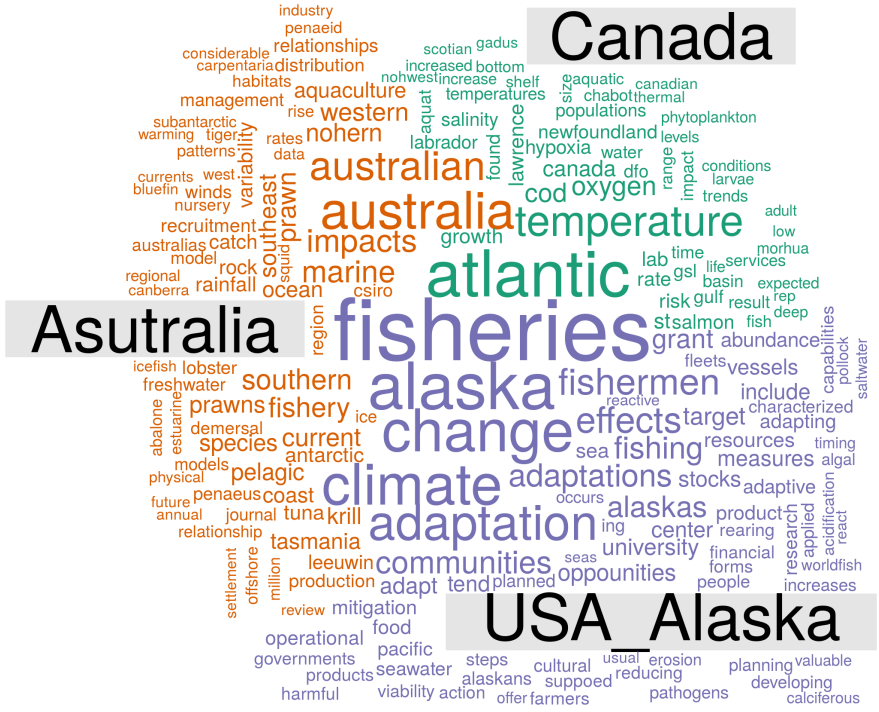


Figure 10: Comparison of words that are unique to the policy and research document from the three countries

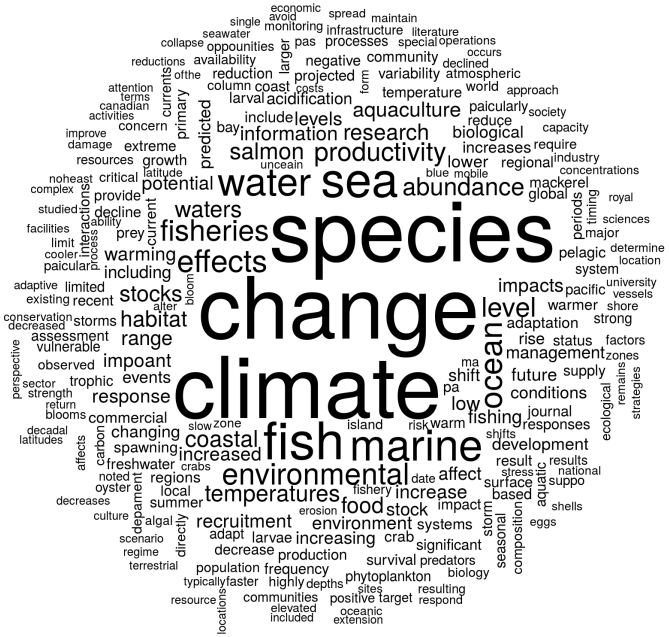
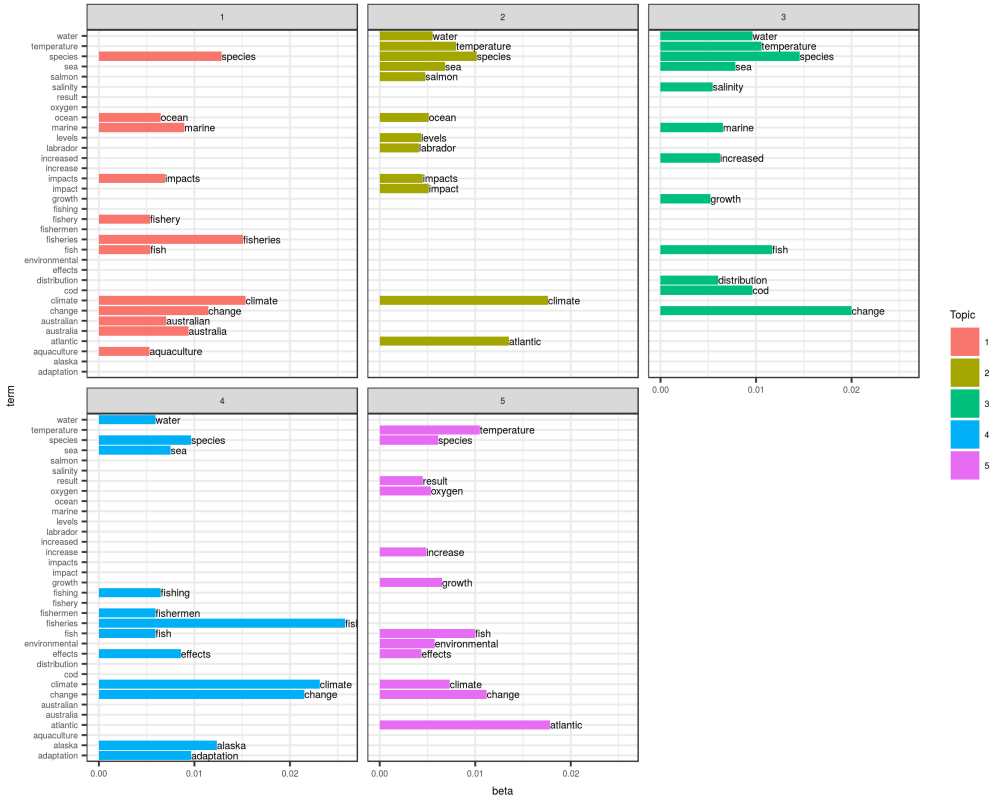


Figure 11: Comparison of words that are common to all the three policy document from Canada, USA and Australia



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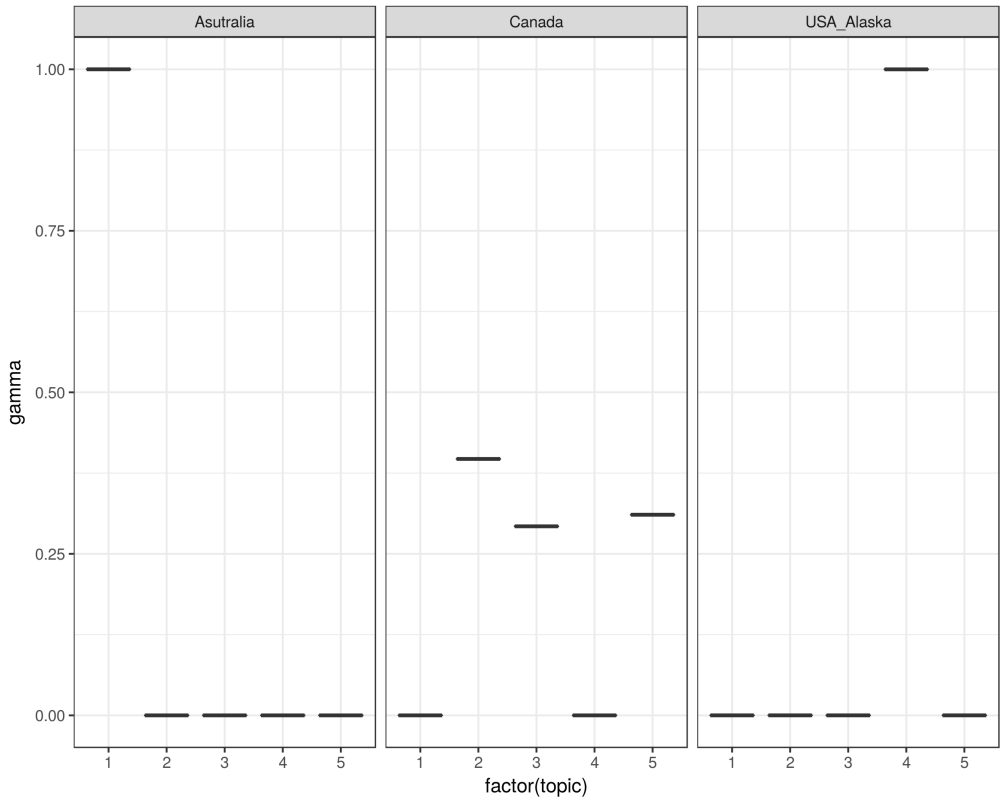
Asutralia
Canada
USA_Alaska
gamma
1.00
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0.50
0.25
0.00
1
2
3
4
5
factor(topic)

Figure 13:

Summary

Common themes in all document on climate change and fisheries

Document from `Canada`, `USA`, and `Australia`

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Modelling the effects of climate change

Studies of the effects of climate change on marine ecosystems

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- Coupled biogeochemical-hydrodynamic models (sometimes also linked to individual based models)

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- Modifying the spawner-recruit relationship incorporating both density depdence effect and the effect of environmental variable

Projection of the effect of climate change: important steps Hollowed et al. (2009)

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- Evaluation of the mean, variance and trend in the production of fish and shell fish under a changing ecosystem