Identifying Climate Targets in National Laws and Policies Using Machine Learning

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Introduction

- Climate law and policy are fundamental levers for national and international climate action.
- Targets – quantified, measurable expressions of prospective policy outcomes – are a signal of effective climate policy. They bolster the credibility of countries' policy commitments, and inform policy design, implementation and monitoring.
- We define a target as satisfying three criteria: it (1) contains an aim to achieve a specific outcome, (2) is quantifiable, and (3) has been given a deadline. We consider targets set by governments which are focused on their specific national objectives and actions, rather than regional or global goals.
- Targets are buried in long, difficult-to-parse documents, written in many different languages and with different terminology. Existing databases of targets rely on manual extraction, limiting their scalability and inclusion of all necessary types of targets.
- NLP has been applied to extract climate-related targets before (Schimanski et al. (2023)). We extend this work by:
  - Extending the definitions of targets to include those addressing individual greenhouse gases and sectors of the economy.
  - Introducing a new 'Other' category of climate targets which don't explicitly mention emissions reduction, capturing e.g. targets to reduce deforestation or scale up renewable energy capacity.
  - Predicting in a multilabel setting: one paragraph can contain mentions of multiple types of targets.

Dataset

We introduce an expert-annotated dataset of **2.6k paragraphs labeled with 1.6k targets**. Text is sourced from the Climate Policy Radar database.

Reduction targets refer to a reduction of GHG emissions. Net Zero targets ('NZT') constitute a commitment to balance GHG emissions with removal, effectively reducing the net emissions to zero. "Other" targets are those that do not fit into the Reduction or Net Zero category.

Dataset Label Count

https://huggingface.co/datasets/ClimatePolicyRadar/national-climate-targets
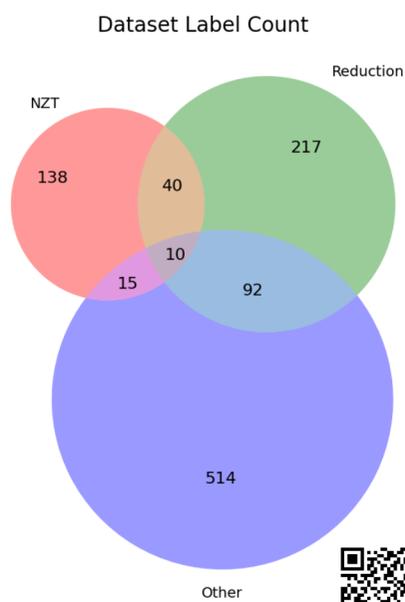
Classifier Training

After a model selection process, we train ClimateBERT (Webersinke et al. (2022)) in a multilabel setting, achieving an overall **F1 score of 0.849**.

The lower performance of net zero targets is due to the low volume of ground truth net zero targets in climate laws and policies.

	NZT	Other	Reduction	all
f1	0.8373 (0.0235)	0.8424 (0.0083)	0.867 (0.036)	0.8488 (0.0124)
precision	0.7767 (0.0428)	0.801 (0.0222)	0.8274 (0.0628)	0.803 (0.02)
recall	0.911 (0.0422)	0.8891 (0.016)	0.9139 (0.0453)	0.9003 (0.003)

https://huggingface.co/ClimatePolicyRadar/national-climate-targets

Impacts and Equity Considerations

We measure the effect on F1 score of machine translation to English and find no significant drop.

Our classifier is more likely to predict paragraphs containing dates divisible by 5, or containing certain country names, as containing targets. The date bias seems to be also present in the pretrained RoBERTa model.

Classifier Bias Towards Round Dates (105 paragraphs)
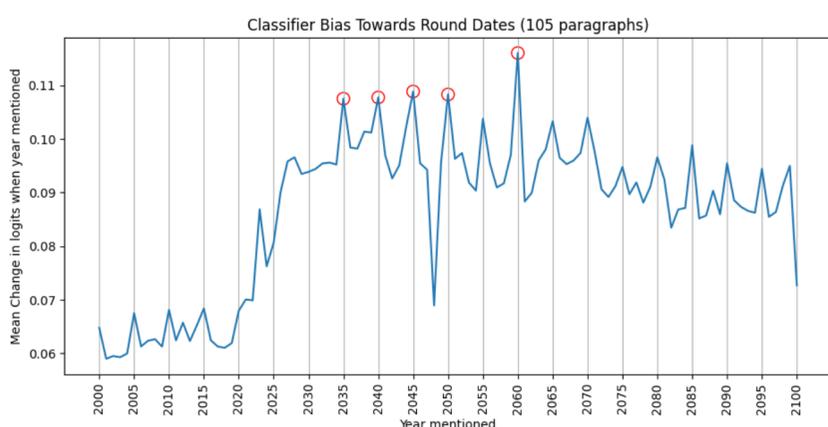
Model Application

To investigate further application we extracted features of predicted targets:

- Future years mentioned e.g. target year (rule-based);
- Subjects of 'Other' targets (topic modelling).

The final dataset and these features is demonstrated at labs.climatepolicyradar.org/targets.

We're also exploring the use of this model to automate already-existing manual processes of target extraction in different NGOs.
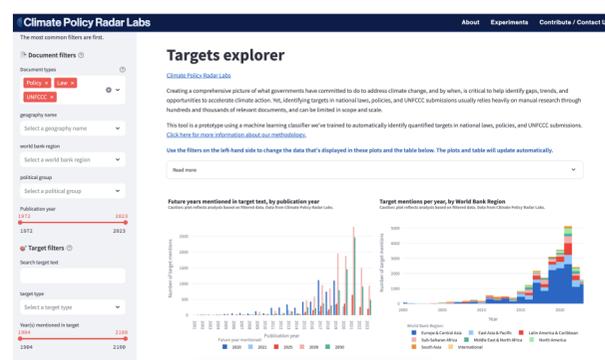
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