Beyond characters: identifying building blocks of narrative framing

Anonymous ACL submission

Abstract

Narratives help humans to understand, conceptualize and communicate complex problems such as climate change, by mapping them to simplified yet internally coherent stories. While the impact of narratives in media has been widely acknowledged, their reliable formalization, annotation, and large-scale prediction remains elusive in both the social sciences and NLP. Here, we introduce a functional definition of narratives into NLP and present a modular taxonomy of narratives. We annotate and release a data set of news articles, and show how our framework significantly improves narrative prediction with LLM compared to less structured prompts. Our work lays the foundation for larger-scale investigation into the emergence and effects of narratives in climate change discourse.

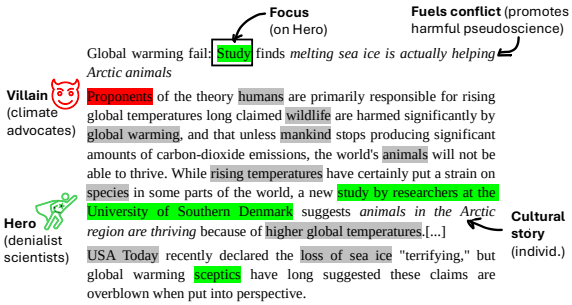

Figure 1: An except from a newspaper article (sample 596), with `hero` marked in green and `villain` in red. Entities that are characters at local (sentence-level), but not overall context, are grayed out. The box shows the focus character (here, `hero`). The phrases in italic are cues which show that the article has an *individualistic* cultural story ("the nature can fix itself") and that it *fuels conflict* by actively promoting bad science.

1 Introduction

Narratives[1] help individuals understand and contextualize their observations and experiences (Fisher, 1984), and they underpin public discourse around complex issues such as climate change. The news media are no exception, where articles present issues in a (necessarily) simplified but internally coherent way – a phenomenon identified as narrative framing (Crow and Lawlor, 2016). For example, decades of climate change discourse has shaped a landscape of impactful media narratives that conceptualize aspects of the issue, spark action ("Political inaction destroys our future"), or advance denialist claims ("Climate solutions won't work"; Fløttum and Gjerstad (2017); Bushell et al. (2017); Bevan (2020); Lamb et al. (2020)).

The "power" of storytelling has been attested empirically: stories capture the public's attention more effectively than generic reporting (Daniels and Endfield, 2009), and so narratives, rather than rational arguments or data, are one of the most potent instruments of political influence (Rodrigo-Alsina, 2019). Such strategic, or policy narratives, which can be spread in media to move or even manipulate masses, are especially important in areas of deep uncertainty such as climate change, where there is a lack of direct, observable impacts and a tendency to emotionally attach to one of the "social cues", or narratives, existing in our culture (Moezzi et al., 2017; Constantino and Weber, 2021).

Climate narratives and their effects are complex and diverse (Carvalho and Burgess, 2005). Apart from narratives that deny the reality of climate change (Lamb et al., 2020), even the ones that seemingly support climate actions can have a detrimental effect on public perception of the issue. For instance, a disproportionate focus on the "doom and gloom" may cripple the motivation to take action (Hinkel et al., 2020), or distract from the real social issues and solutions (Jerneck, 2014).

Thus, it is important to reliably differentiate be-

[1] This paper is about policy narratives as used in the media to present and frame issues. This is not to be confused with the study of narratology (e.g., Piper et al. (2021)).

tween media narratives, especially very similar ones, for a better understanding of the meaning and effects of climate communication as a first step towards large-scale analyses of narrative framing strategies and their effects. Here, we introduce a functional definition, taxonomy and annotated data set to identify media narratives on the topic of climate change (Figure 1).

Reliable identification of narrative structure is hard. Recent efforts in the communication sciences attempted the issue from two angles: the Narrative Policy Framework (NPF, Jones et al. (2023)) detects prototypical character roles – Hero, Villain, and Victim – in articles but fails to link them to abstract but recurring media narratives. On the other hand, a body of literature has identified such major narratives (for example, for climate change, see Bushell et al. (2017); Bevan (2020); Lamb et al. (2020)). However, no framework exists to reliably describe and detect these narratives in news.

In this work we close this gap by abstracting away from the local structures of the NPF, arriving at a taxonomy of narrative components that allow us to reliably detect recurring climate narratives.We present a formalization, annotation framework and data set to support such an investigation, and show how our framework can significantly improve the automatic prediction of narratives with LLMs. Thus, we make the following contributions:

1. We introduce a functional definition of media narratives based on social science theories and concepts.
2. We present a comprehensive taxonomy of media narratives and their structure. While the taxonomy is topic-agnostic, we here present it in the context of climate change.
3. We release a dataset annotated with detailed narratives according to our taxonomy.
4. We report the performance of state-of-the-art LLMs on detecting such narrative structures, and overall find them unable to reliably identify both narrative structures and the resulting narratives. We also present preliminary results that show that incorporating structural elements helps LLMs distinguish between narratives,[2] showing that narrative structure leads to significant improvements.

[2]We submit the dataset as supplementary material and provide the prompts in the Appendix. We will release the dataset and code publicly upon acceptance.

2 Background

2.1 Narratives in political communication

Following Fisher (1984)'s seminal paper coining the term 'homo narrans' to illustrate the importance of storytelling for society, narratives in political communication have attracted substantial research attention (see also Bennett and Edelman (1985); Patterson and Monroe (1998)), exposing its effects from a critical vehicle in deliberative democracy (Boswell, 2013) to its use persuasive device (Skrynnikova et al., 2017). Similar to related concepts such as 'framing', a principled and empirically testable definition of 'narrative' has long been lacking. However, recent work has progressed in developing frameworks that are testable and amenable to computational modelling (Shenhav, 2005; Robert and Shenhav, 2014), most prominently the Narrative Policy Framework (NPF; Jones et al. (2023)), which we build on in this work. The NPF has been particularly instrumental in studying climate change narratives (Fløttum and Gjerstad, 2017), and identifying dominant narratives in the discourse (Bushell et al., 2017; Bevan, 2020). This paper refines the NPF into a rigorous framework for climate narratives, and demonstrates its potential for automatic prediction.

2.2 Policy narrative understanding and NLP

Policy narratives intersect the concepts of storytelling and *framing*, i.e, the presentation of information in a way to evoke a specific association in the audience. Automatic narrative understanding has attracted substantial attention in NLP (Piper et al., 2021), however, has focussed mostly on fictional narratives (Bamman et al., 2014; Iyyer et al., 2016), on personal narratives in social media (Lukin et al., 2016; Shen et al., 2023) or specific elements such as event chains (Chambers and Jurafsky, 2009). Few works have considered the intersection of stories and framing (Levi et al., 2022). In particular, while the policy narrative research in social sciences is normally grounded in the so-called Narrative Policy Framework (Jones et al., 2023), it is yet to gain sufficient recognition and adoption in NLP approaches. Closest to our work are Stammbach et al. (2022) and Frermann et al. (2023) who study some narrative elements of framing devices (such as entities framed as heroes or victims), but do not model full narratives. In addition to such entities Gehring and Grigoletto (2023) attempt to model relationships between them such as "harm"

or "protect"; however, their approach is closer to named entity and relation extraction than to narrative understanding, and does not allow to map the specific identified elements to more abstract ideas such as narrative frames. Overall, our approach is the first to go beyond storytelling elements to policy narrative structures used as framing devices.

3 Narrative taxonomy

In this section we define the building blocks of a policy narrative, bringing together the definition of a narrative as adopted in Narrative Policy Framework (NPF), the definition of frame components from framing theory (Entman, 1993), and culture stories based on the theory of narratives as cultural constructs (Thompson, 2018). Next, we map the annotated structures to prototypical templates of common narratives previously identified in the literature (Bushell et al., 2017; Bevan, 2020, etc). Finally, we discuss how narrative components can be generalized to other news domains.

3.1 Narrative components

We motivate and define four core components which jointly define a narrative.

3.1.1 Characters

The core requirement which differentiates policy narratives from other types of framing is that they should include **at least one prototypical character**, that is, `hero`, `villain`, or `victim` (HVV) (Shanahan et al., 2018). Not all of the HVV roles must be instantiated: many narratives have only one or two required characters. Moreover, a character does not need to be alive. It can be an object or concept (such as "environment") as long as it occupies a central part of the story and actively influences (or is influenced by) other characters.

The HVV slots in any given article are filled by the *single most central character* fulfilling the respective role, since they are essential for identifying the overarching, main narrative of the article rather than its local, less prominent narratives. Figure 1 illustrates this, where the main characters are highlighted in colour, while less central entities (which may fulfill local `hero`, `villain` or `victim` roles, too) are grayed out. To decide which entities correspond to the main characters in the article, we follow a systematic process considering the focus, active roles and explicit mentions of characters (details in Appendix B).

To be able to compare different instances of a particular narrative type across stories with different people and events, it is useful to abstract away from specific characters in the HVV roles and understand which categories (common people, elites, etc.) they represent. For this reason, we map the specific text spans that represent characters to general classes of actors in the climate change debate. We follow Frermann et al. (2023) who identified 10 stakeholder categories for the climate change domain such as GOVERNMENTS_POLITICIANS or ANIMALS_NATURE_ENVIRONMENT (full list and details in Appendix A).

3.1.2 Focal characters

Unique combinations of characters do not necessarily map to unique narratives. To see this, consider the following triad

`hero`	ENV.ORGS_ACTIVISTS
`villain`	GOVERNMENTS_POLITICIANS
`victim`	GENERAL_PUBLIC

which underlies two well-known narratives, both of which describe actions against governments such as protests which are aimed at attracting attention to climate issues. One of them ("The Collapse is imminent") focuses on the government's "failure to act to mitigate anthropogenic climate change" (`villain`), while the other ("You're destroying our future") emphasises "the role of 'small' people in achieving large aims" (`hero`; Bevan (2020)). Thus, in addition to identifying the main HVV characters, we need to specify which character is the main focus of the narrative. We do so based on the discourse structure of newspaper articles (the inverted pyramid where the most important content is usually placed at the beginning), and the relative proportion of text devoted to `hero`, `villain`, and `victim`, respectively.

3.1.3 Conflict and resolution

Following the NFP, in addition to having at least one character, a policy narrative must "refer to the public policy of interest" by directly proposing a solution, or by describing the problem motivating the policy, its consequences, or related behaviours (Shanahan et al., 2018). Since policy narratives are also a type of media framing, we link this (somewhat vague) requirement to Entman's components of a frame (Entman, 1993): a policy narrative should either define a problem, describe its causes, contain a judgement regarding it, or

suggest a solution. Here, the "problem" is not a general topic of the article (such as, in our case, climate change), but a specific *conflict* between the actors regarding it. In particular, `hero`, `villain` and `victim` can either *fuel conflict* (in our case, perform actions that exacerbate climate crisis), *fuel resolution* (perform actions that help to resolve climate crisis), *prevent conflict* (oppose actions that exacerbate climate crisis), or *prevent resolution* (oppose actions that help to resolve climate crisis). This four-way distinction links the possible interactions between the characters to Entman's components of a frame (i.e. characters can either create conflict or resolve it, or link the causes of a problem to the opposite party and give their moral judgement). Thus, our narrative structures overcome one of the common weaknesses of framing analysis approaches (Ali and Hassan, 2022; Otmakhova et al., 2024) where frames are reduced to generic topics ("Economy", "Security" as in Boydstun et al. (2013)) or stances on a particular issue ("Abortion as a woman right" vs "Abortion as violation of right to live" as in Sagi et al. (2013)).

Practically, the *conflict and resolution* component allows to differentiate between narratives which have the same set of stakeholders but the relationships between them are different. For example, the following character triad

`hero`	GOVERNMENTS_POLITICIANS
`villain`	GOVERNMENTS_POLITICIANS
`victim`	GENERAL_PUBLIC

This set of characters can represent *preventing resolution*, where a denialist politician (`hero`) criticises pro-climate action politicians (`villain`) ("Debate and scam" narrative in Appendix D), *fuelling resolution*, where a pro-climate action politician (`hero`) proposes specific actions to remedy actions of a denialist politician (`villain`) ("Government officials declare a climate emergency" narrative), as well as other two relationships. Thus, the *conflict and resolution* categories are essential to remove the remaining ambiguity if we considered only *who* took part in the narrative but not *how* they act.

3.1.4 Cultural stories

Policy narratives as framing devices not only communicate literal information (=what the characters did in relation to the conflict) but also evoke a wider set of concepts, associations and judgements which already exist in the audience's perception (Scheufele and Scheufele, 2010). Social studies which examine narratives as social constructs (Thompson, 2018) assert that in order to do so, a narrative must **map to one of four cultural stories** which define to what degree our actions are controlled by external factors and by the sense of belonging to a particular group (Douglas, 2007).[3] Depending on the combination of these two factors, a policy narrative can be fatalist, hierarchical, individualistic, or egalitarian (Figure 2). In the context of climate change policies, this amounts to the following (Jones, 2014):

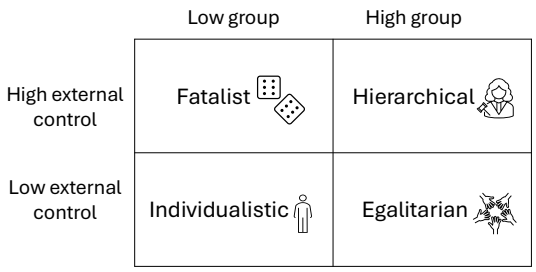

Figure 2: Cultural stories across dimensions of **external control** (grid) and belonging to a **group**

Fatalist: Nature is random and we as individuals are victims that can do nothing to control it.

Hierarchical: nature can be controlled but we need to be bound by tight social prescriptions. The villain is mismanaged society which led to excessive growth. We need intervention from heroes such as scientists or government.

Egalitarian: nature is fragile and there is limited opportunity to correct mistakes. We need to take collective action against profit-driven corporations and governments who support status quo to achieve fundamental changes.

Individualist: nature is resilient and will return to equilibrium. Markets should be allowed to move naturally as individuals compete to create innovative technologies and more sustainable lifestyle.

Cultural stories allow to differentiate between two narratives with the same actors and actions but different cultural implications. For example, "12 years to save the world" and "Victim blaming" are both criticising unconscious consumers (GENERAL_PUBLIC) for the environmental damage, they both focus on the `villain`, and both try to prevent further damage (*prevent conflict*). How-

[3]Thus, all policy narratives are "stories", i.e. contain some elements of narrativity such as characters and plot, reduced to conflict and resolution. However, not all "stories" that can be potentially created out by combining characters in a particular way, are policy narratives which can be used for framing: in order to be such, they need to map to one of cultural stories.

ever, the approach implied by them is different: "12 years to save the world", which originates from IPCC's Special Report on Global Warming (Bevan, 2020), implies the need for stricter society regulation (*hierarchical*), while "Victim blaming", a famous examples of which is British Petroleum's initiative called "Know your carbon footprint" (Lamb et al., 2020), plants the idea that the problem can be solved by individual efforts (*individualistic*).

3.2 Resulting policy narratives

We apply the process described above to manually analyse 100 articles randomly selected from the Narrative Framing data set (Frermann et al., 2023) which contains English news stories on the topic of climate change, originating from outlets across the political spectrum. Then, we grouped articles with identical narrative structure, and mapped the clusters to known narratives in the literature (Fløttum and Gjerstad, 2017; Bushell et al., 2017; Bevan, 2020). This process resulted in defining 16 structurally distinct narratives, which are described in detail in Appendix D.

As we discovered the narratives in an inductive, bottom-up way, we cannot claim that our dataset contains a complete set of most prominent narratives in the climate discourse. However, we note that it is (1) parsimonious as a small, generalizable set; (2) comprehensive, i.e. it covers the majority of narratives mentioned in social studies literature, and (3) is linked to a formalism that underpins automatic narrative detection.

3.3 Generalizability

Though we introduced our taxonomy in the context of narratives in climate change news, it generalizes to other topics.

The `hero`, `villain`, `victim` **character triad** is probably the most fundamental aspect in storytelling and the respective roles are shared across topics and issues (the Hero resolves a conflict, the Villain exacerbates it, while the Victim suffers under it). Our broader stakeholder categories are domain-specific and will need to be defined per domain. Regardless, our method of determining the main characters is general and can improve the reliability of such annotation irrespective of the domain. Similarly, the **Focus** character is determined by the discourse structure and stylistics of the article rather than its topic.

The 4-way classification of **conflict and resolution** implies either actively performing some actions to resolve conflict or exacerbate it, or passively hindering and criticising the actions of the opposite side. These distinctions of activity vs passivity and acting in favour vs against conflict resolution can be generalized to other narrative domains. The definition of what constitutes a conflict in that domain, of course, needs to be adapted. Finally, **cultural stories** have been applied to multiple social issues, and its abstract dimensions of control and group cohesion are domain-agnostic.

4 Dataset annotation

We present an example analysis of an article to identify its narrative components. Then we describe the annotation process which ensures the high quality of the resulting dataset. Finally, we show that our annotation process, where an annotator identifies the four structural components, is more reliable than a more traditional approach, where an annotator directly labels an article for its narrative based on its description.

4.1 Annotation process

Using the example article in Figure 1, we outline the steps of the annotation process.

First, we identify candidate entities for the `hero`, `villain`, and `victim` roles, and follow the process in Section 4.1 to select at most one main character per role. In our example, since `hero`, `villain`, and `victim` should align with the article's perspective, we remove potential victims like *animals* since the author believes they actually benefit from higher temperatures; we group similar characters (e.g., denialist scientists and sceptics) and choose the most specific stakeholder type to represent them (here, SCIENCE_EXPERTS). Thus, we arrive at SCIENCE_EXPERTS as `hero` and ENV_ACTIVISTS as `villain`. Since the title highlights the role of SCIENCE_EXPERTS, and much of the article's content is devoted to describing the study, we determine that the focus is on the `hero`. Next, since the article explicitly promotes bad science harmful for climate (rather than criticising actions of climate activists), it employs the *fuels conflict* framing. Finally, as the article implies that nature is resilient and no actions are necessary, it corresponds to *individualistic* cultural story. Overall, this structure points to a denialist narrative "Debate and scam".

4.2 Quality and Agreement

We conduct annotation in two stages. First, four annotators (three external ones, who specialize in

social science, and one author of this paper with expertise in linguistics, discourse and framing) label all 100 articles with their main characters (Hero, Villain, Victim). We achieve a moderate agreement for Hero (0.76) and Villain (0.67) and strong agreement for Victim (0.81) among all 4 annotators in terms of Krippendorf's α, as well as strong (for Hero and Villain) to almost perfect (for Victim) average agreement of each of the annotators with the expert (the author) in terms of Cohen's κ (Appendix C). In a second stage, one annotator labeled the whole set of articles with of Focus, Conflict/Resolution framing, and Cultural story, on the basis of the adjudicated Hero, Villain, and Victim annotations from stage one. Then, to confirm the reliability of this annotation, a random sample of 30 articles was annotated by a second annotator, achieving high to very high agreement for Conflict (Cohen's κ=0.82), Cultural story (0.80) and Focus (0.78). The full statistics, annotation instructions, and further details about the annotation process are provided in Appendix C.

4.3 Annotation with vs without narrative structure

We have stated repeatedly that structural components help to differentiate between narratives. In this section, we empirically quantify this effect. Specifically, we compare agreement in narrative detection when using a structure-based annotation approach (bottom-up; as described above) vs using a more traditional approach where the annotators are asked to classify narratives top-down based on their descriptions.

For the structure-based approach, we estimate the agreement based on the sample of 30 articles we used for Stage 2 annotation (see Appendix C). In particular, we assume that both annotators agree on a particular narrative if they choose exactly the same values for all its components. For the traditional approach, we ask two annotators who took part in Stage 1 of annotation (and thus did not classify any elements of the narrative except for its `hero`, `villain`, and `victim`) to choose a narrative for each article based on its description only (as listed in Appendix D).

We find that annotation based on our narrative taxonomy resulted in 63% agreement, while top-down annotation based on the narrative descriptions resulted in a substantially lower 37%. Thus, we can tentatively conclude that structure-based analysis improves narrative detection and understanding. In the following section, we observe similar effects when testing large language models (LLMs) on narrative prediction.

5 Narrative understanding with LLMs

5.1 Task definition

We use the resulting dataset of 100 articles to test narrative understanding capabilities of LLMs. We consider the following prediction tasks, given the full article text as input:

Hero, 10 classes: choose the stakeholder type for the main `hero` given 10 stakeholder categories with short descriptions (GENERAL_PUBLIC, GOVERNMENTS_POLITICIANS, . . . , see Section 3.1.1).

Villain, 10 classes: choose the stakeholder type for the main `villain` out of the same 10 categories.

Victim, 10 classes: choose the stakeholder type for the main `victim` out of the same 10 categories.

Focus, 3 classes: decide if the focus of the narrative is on `hero`, `villain`, or `victim` (see Section 3.1.2).

Action, 4 classes: choose the phrase which best describes how the article relates to climate crisis (either fuels or prevents conflict or resolution, see Section 3.1.3).

Story, 3 classes[4]: choose the cultural story that best reflects the article based on their descriptions (see Section 3.1.4).

Narrative, 16 classes: choose the main narrative of the article out of 16 provided categories with short descriptions (see Section 3.2).

5.2 Prompting with basic task description

Base models We use the prompts in Appendix F to test the ability of four different classes of models, in particular, GPT4, Mixtral, Llama, and Gemini[5], to understand the elements of narratives and classify narrative types in zero-shot mode based only on their descriptions.

As Table 1 shows, Gemini, Llama and Mixtral in general perform worse than GPT-4 which achieves better results in the character-level classification tasks (i.e. identifying stakeholders representing

[4]Though in Section 3.1.4 we say that there are 4 cultural stories, in our dataset (and generally in media, see Jones (2014)) fatalist story is not present, so we exclude it from experiments for fairness of evaluation.

[5]Versions used: gpt-4o-2024-08-06, Mixtral-8x7B-Instruct-v0.1, Llama-3.1-8B-Instruct, gemini-1.5-pro. We set temperature=0 (or equivalent settings) in all experiments to ensure deterministic outputs. Model sizes are provided in Appendix E.

	Hero	Villain	Victim	Focus	Action	Story	Narrative
Baseline	0.079	0.08	0.135	0.231	0.135	0.19	0.021
GPT4	**0.419**	**0.397**	**0.381**	**0.623**	0.301	**0.485**	0.219
Mixtral	0.268	0.061	0.372	0.561	0.333	0.418	**0.249**
Llama	0.274	0.161	0.277	0.431	**0.376**	0.253	0.185
Gemini	0.291	0.194	0.142	0.473	0.260	0.245	0.240

Table 1: Zero-shot performance in terms of macro- averaged F1 across 7 narrative understanding tasks

the main characters), and tasks requiring more general interpretation of the narrative flow (Focus) and its similarity to the description of a cultural story (Story). Its performance is also more stable across tasks compared to other models (such as Mixtral which has decent performance for some of the tasks but lower than baseline results for `villain`, where it predicted INDUSTRY_EMISSIONS for almost all of the samples). However, GPT-4 surprisingly struggles on harder tasks that require distilling the conflict and resolution (Action) or recognizing the overall narrative (Narrative). Other models, however, do not perform substantially well on these tasks either, and tend to over-predict a subset of classes, such as "All talk no action" (25% of predictions fot GPT-4, 20% for Mixtral, only 3% in our dataset) or "We are all going to die" (35% for Gemini, 7% in our dataset). Another surprising observations is that Gemini is the worst performing model, despite having the largest parameters size.

The difficulty of the Narrative task is of course confounded by the number of classes that need to be distinguished (16). To test if the performance would increase if the model is asked to choose between a small number of classes, we select a sample of three frequent, but similar narratives - "12 Years to save the planet", "We are all going to die", and "Gore", and modify the Narrative prompt to include descriptions only of these three classes. However, this allows to increase performance only minimally (from F1 of 0.22 to 0.27 for GPT-4) and nowhere near the level for other 3-class tasks such as Focus and Story. Moreover, even for this simplified task there is a tendency to predict one class, and one of the classes is never chosen correctly (Figure 3).

Few-shot learning We examine if the strongest model (GPT-4) improves with multiple examples. We use 5 randomly selected samples from our dataset for 5-shot learning; and then use the same samples for a DSPy program (Khattab et al., 2023) to automatically generate and optimize reasoning steps for Chain-of-Thought (Cot) Prompting. Figure 4 shows that, except for Hero and Victim identification, the performance gains are minimal, which shows the limit of automatic learning for more difficult tasks such as Narrative or Story classification.

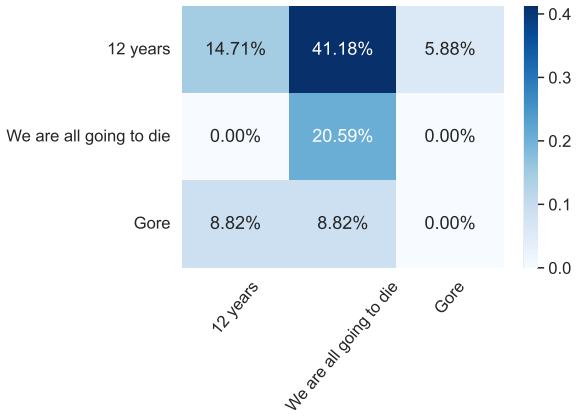

Figure 3: Confusion matrix for zeroshot prediction of only 3 narratives with GPT-4.

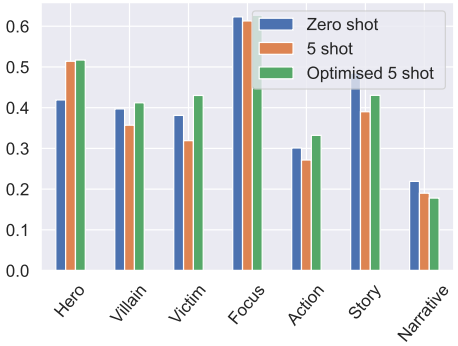

Figure 4: Performance of GPT-4 with 0- and 5-shot prompting and 5-shot CoT prompting optimized using DSPy as macro-averaged F1.

LoRA fine-tuning Next, we examine if fine-tuning a LLM on our set of tasks will improve the performance (we choose Llama as having the most stable performance across the task among the open-source models). Due to the small size of our dataset, we use Low-Rank Adaption (LoRA) fine-tuning (Hu et al., 2021) and perform 5-fold fine-tuning with 20% holdout set (the finetuning

details are provided in Appendix E). However, despite performance increases in classifying Hero and especially Story, the overall performance drops (see Appendix H). We notice that the fine-tuned model tends to predict only several most prominent labels, overfitting to them and completely discarding minor classes. Thus, simple fine-tuning does not seem to be a valid approach to these tasks, at least without collecting a large number of samples, which is not realistic considering the difficulty of annotation.

Reasoning abilities Finally, we compare the latest GPTo model with the newly released GPT4o1 model (o1-preview-2024-09-12) which is claimed to have significantly improved reasoning abilities. Interestingly, the performance of GPT4o1 actually drops for some of the tasks such as Hero and Story prediction (see Appendix I). However, it does significantly increase in tasks that require more reasoning, such as Focus, Action, and Narrative prediction. However, even this model only achieves the macro-averaged F1 score of 0.35 on Narrative classification.

5.3 Prompting with narrative taxonomy

In Section 4.3 we showed how deriving narratives from their structure helps to distinguish them better. Here, we explore if using structure can improve the model's understanding of larger discourse units such as narrative and cultural story (Narrative and Story tasks).

We run these experiments in zero-shot for GPT-4o. For each of the classes definitions we add an informal description of characters involved in a story or narrative (`hero`, `villain`, `victim`); for narratives, we also explain who the narrative is focusing on (Focus), and how it relates to the climate policy or climate change (Action) (see Appendix G).

Lines 1–3 in Table 2 show that this strategy increases performance by 0.10 for both the (3-class) Story task and the hardest (16-class) Narrative task. Next, for each input article we add corresponding labels that denote `hero`, `villain`, and `victim` stakeholder category, as well as *focus*, to explicitly represent the structure of the narrative. With *oracle* (manually-annotated) labels the performance improves substantially for both tasks, which shows that explicit structure is a more reliable cue for predicting the narrative than its descriptor. Expectedly, *predicted* HVV and focus labels from zero-shot prompting do not lead to such significant gains.

	Story	Narrative
Basic prompt, GPTo	0.485	0.219
+ HVV	0.570	0.241
+ Focus and action	-	0.316
Zero-shot HVV labels	0.536	0.371
Oracle HVV labels	0.728	0.718
Basic prompt, GPTo1	0.471	0.348

Table 2: Macro-averaged F1 scores for Narrative and cultural Story classification, GPT4. + *HVV* refers to adding hero, villain and victim descriptions, + *Focus and action* is the addition of focus and action descriptions. The next two lines refer to the structured prompt and also zero-shot or oracle HVV labels for each sample. We also provide the results of GPTo1 for comparison.

However, for the Narrative task predicted labels still lead to clear improvement, indicating that improving the classification of structural elements can potentially lead to better narrative prediction. Another significant result is that such models with structure outperform a model with advanced reasoning capabilities (GPT4o1).

Finally, we inspect the narratives that the model with the oracle prompt failed to classify, to determine which aspects apart from characters and focus can be at play. Interestingly, the vast majority of errors was due to confusion between "All talk no action" and "12 years to save the earth". Both focus on vilifying politicians who fail to support climate goals; however, while in the first narrative the politicians *deny* the necessity to implement measures, in the second they promise to *support* them. Thus, these narratives differ in the villain's action towards the climate policies, which shows that it is also important to consider that aspect of structure.

6 Conclusion

We present a rigorous formalization and taxonomy of policy narratives. Our method allows to inductively detect narratives in news articles in terms of their character types and focus, and actions in relation to climate policy into 16 comprehensive types. A high-quality data set of 100 labelled articles serves as a benchmark and basis for future annotation bootstrapping. We showed that our framework results in promising performance of automatic narrative prediction with LLM, laying a foundation for the important research agenda of large-scale studies of the manifestation and effects of climate narratives.

7 Limitations

We acknowledge the small size of our data set relative to NLP benchmarks, but emphasize the difficulty of annotating news articles at this level. We prioritize depth over breadth, and our data set can serve both as a benchmark and a high-quality starting point for bootstrapping other story annotations.

Because our approach is inductive / bottom-up we cannot guarantee that the narratives we found cover all possible active narratives or reflect the true narrative distribution. However, since our inductive narratives overlapped with a large part of narratives described in the literature, we are confident that they are representative and comprehensive.

Additional LLM experiments, with larger example pools or advanced optimization techniques may lead to further improvements but are outside the scope of this work. We showed that incorporating narrative structure into prompts improves performance without the need for computationally expensive fine-tuning or models with advanced reasoning abilities. Future work, however, may want to combine it with such models and techniques.

References

Mohammad Ali and Naeemul Hassan. 2022. A survey of computational framing analysis approaches. In *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing*, pages 9335–9348.

David Bamman, Ted Underwood, and Noah A. Smith. 2014. A Bayesian mixed effects model of literary character. In *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 370–379, Baltimore, Maryland. Association for Computational Linguistics.

W Lance Bennett and Murray Edelman. 1985. Toward a new political narrative. *Journal of communication*.

Luke D Bevan. 2020. Climate change strategic narratives in the united kingdom: emergency, extinction, effectiveness. *Energy research & social science*, 69:101580.

John Boswell. 2013. Why and how narrative matters in deliberative systems. *Political studies*, 61(3):620–636.

Amber E Boydstun, Justin H Gross, Philip Resnik, and Noah A Smith. 2013. Identifying media frames and frame dynamics within and across policy issues.

Simon Bushell, Géraldine Satre Buisson, Mark Workman, and Thomas Colley. 2017. Strategic narratives in climate change: Towards a unifying narrative to address the action gap on climate change. *Energy Research & Social Science*, 28:39–49.

Anabela Carvalho and Jacquelin Burgess. 2005. Cultural circuits of climate change in uk broadsheet newspapers, 1985–2003. *Risk Analysis: An International Journal*, 25(6):1457–1469.

Nathanael Chambers and Dan Jurafsky. 2009. Unsupervised learning of narrative schemas and their participants. In *Proceedings of the Joint Conference of the 47th Annual Meeting of the ACL and the 4th International Joint Conference on Natural Language Processing of the AFNLP*, pages 602–610, Suntec, Singapore. Association for Computational Linguistics.

Sara M Constantino and Elke U Weber. 2021. Decision-making under the deep uncertainty of climate change: The psychological and political agency of narratives. *Current opinion in psychology*, 42:151–159.

Deserai A Crow and Andrea Lawlor. 2016. Media in the policy process: Using framing and narratives to understand policy influences. *Review of Policy Research*, 33(5):472–491.

Stephen Daniels and Georgina H Endfield. 2009. Narratives of climate change: introduction. *Journal of Historical Geography*, 35(2):215–222.

Mary Douglas. 2007. A history of grid and group cultural theory. *Toronto, Canada: University of Toronto*.

Robert M Entman. 1993. Framing: Toward clarification of a fractured paradigm. *Journal of communication*, 43(4):51–58.

Walter R Fisher. 1984. Narration as a human communication paradigm: The case of public moral argument. *Communications Monographs*, 51(1):1–22.

Kjersti Fløttum and Øyvind Gjerstad. 2017. Narratives in climate change discourse. *Wiley Interdisciplinary Reviews: Climate Change*, 8(1):e429.

Lea Frermann, Jiatong Li, Shima Khanehzar, and Gosia Mikolajczak. 2023. Conflicts, villains, resolutions: Towards models of narrative media framing. In *Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 8712–8732. Association for Computational Linguistics.

Kai Sebastian Gehring and Matteo Grigoletto. 2023. Analyzing climate change policy narratives with the character-role narrative framework. *SSRN Electronic Journal*, 10429.

Jochen Hinkel, Diana Mangalagiu, Alexander Bisaro, and J David Tàbara. 2020. Transformative narratives for climate action.

Edward J Hu, Yelong Shen, Phillip Wallis, Zeyuan Allen-Zhu, Yuanzhi Li, Shean Wang, Lu Wang, and Weizhu Chen. 2021. Lora: Low-rank adaptation of large language models. *arXiv preprint arXiv:2106.09685*.

Mohit Iyyer, Anupam Guha, Snigdha Chaturvedi, Jordan Boyd-Graber, and Hal Daumé III. 2016. Feuding families and former Friends: Unsupervised learning for dynamic fictional relationships. In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, pages 1534–1544, San Diego, California. Association for Computational Linguistics.

Anne Jerneck. 2014. Searching for a mobilizing narrative on climate change. *The Journal of Environment & Development*, 23(1):15–40.

Michael D Jones. 2014. Cultural characters and climate change: How heroes shape our perception of climate science. *Social Science Quarterly*, 95(1):1–39.

Michael D Jones, Aaron Smith-Walter, Mark K McBeth, and Elizabeth A Shanahan. 2023. The narrative policy framework. In *Theories of the policy process*, pages 161–195. Routledge.

Omar Khattab, Arnav Singhvi, Paridhi Maheshwari, Zhiyuan Zhang, Keshav Santhanam, Sri Vardhamanan, Saiful Haq, Ashutosh Sharma, Thomas T Joshi, Hanna Moazam, et al. 2023. Dspy: Compiling declarative language model calls into self-improving pipelines. *arXiv preprint arXiv:2310.03714*.

William F Lamb, Giulio Mattioli, Sebastian Levi, J Timmons Roberts, Stuart Capstick, Felix Creutzig, Jan C Minx, Finn Müller-Hansen, Trevor Culhane, and Julia K Steinberger. 2020. Discourses of climate delay. *Global Sustainability*, 3:e17.

Effi Levi, Guy Mor, Tamir Sheafer, and Shaul Shenhav. 2022. Detecting narrative elements in informational text. In *Findings of the Association for Computational Linguistics: NAACL 2022*, pages 1755–1765, Seattle, United States. Association for Computational Linguistics.

Stephanie Lukin, Kevin Bowden, Casey Barackman, and Marilyn Walker. 2016. PersonaBank: A corpus of personal narratives and their story intention graphs. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC'16)*, pages 1026–1033, Portorož, Slovenia. European Language Resources Association (ELRA).

Mithra Moezzi, Kathryn B Janda, and Sea Rotmann. 2017. Using stories, narratives, and storytelling in energy and climate change research. *Energy research & social science*, 31:1–10.

Yulia Otmakhova, Shima Khanehzar, and Lea Frermann. 2024. Media framing: A typology and survey of computational approaches across disciplines. In *Proceedings of the 62nd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 15407–15428, Bangkok, Thailand. Association for Computational Linguistics.

Molly Patterson and Kristen Renwick Monroe. 1998. Narrative in political science. *Annual review of political science*, 1(1):315–331.

Andrew Piper, Richard Jean So, and David Bamman. 2021. Narrative theory for computational narrative understanding. In *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*, pages 298–311, Online and Punta Cana, Dominican Republic. Association for Computational Linguistics.

Dominique Robert and Shaul Shenhav. 2014. Fundamental assumptions in narrative analysis: Mapping the field. *The qualitative report*, 19(38):1–17.

Miquel Rodrigo-Alsina. 2019. Talking about climate change: the power of narratives. In *Climate Change Denial and Public Relations*, pages 103–120. Routledge.

Eyal Sagi, Daniel Diermeier, and Stefan Kaufmann. 2013. Identifying issue frames in text. *PLoS one*, 8(7):e69185.

Bertram T Scheufele and Dietram A Scheufele. 2010. Of spreading activation, applicability, and schemas: Conceptual distinctions and their operational implications for measuring frames and framing effects. In *Doing News Framing Analysis*, pages 126–150. Routledge.

Elizabeth A Shanahan, Michael D Jones, and Mark K McBeth. 2018. How to conduct a narrative policy framework study. *The Social Science Journal*, 55(3):332–345.

Mike Shanahan. 2007. Talking about a revolution: climate change and the media.

Jocelyn Shen, Maarten Sap, Pedro Colon-Hernandez, Hae Park, and Cynthia Breazeal. 2023. Modeling empathic similarity in personal narratives. In *Proceedings of the 2023 Conference on Empirical Methods in Natural Language Processing*, pages 6237–6252, Singapore. Association for Computational Linguistics.

Shaul R Shenhav. 2005. Thin and thick narrative analysis: On the question of defining and analyzing political narratives. *Narrative inquiry*, 15(1):75–99.

IV Skrynnikova, TN Astafurova, and NA Sytina. 2017. Power of metaphor: cultural narratives in political persuasion. In *7th International Scientific and Practical Conference" Current issues of linguistics and didactics: The interdisciplinary approach in humanities"(CILDIAH 2017)*, pages 279–284. Atlantis Press.

Dominik Stammbach, Maria Antoniak, and Elliott Ash. 2022. Heroes, villains, and victims, and GPT-3: Automated extraction of character roles without training data. In *Proceedings of the 4th Workshop of Narrative Understanding (WNU2022)*, pages 47–56. Association for Computational Linguistics.

Michael Thompson. 2018. *Cultural theory*. Routledge.

A Stakeholder types

We use the following 10 stakeholder types borrowed from (Frermann et al., 2023):
GOVERNMENTS_POLITICIANS: governments and political organizations
INDUSTRY_EMISSIONS: industries, businesses, and the pollution created by them
LEGISLATION_POLICIES: policies and legislation responses
GENERAL_PUBLIC: general public, individuals, and society, including their wellbeing, status quo and economy
ANIMALS_NATURE_ENVIRONMENT: nature and environment in general or specific species
ENV.ORGS_ACTIVISTS: climate activists and organizations
SCIENCE_EXPERTS_SCI.REPORTS: scientists and scientific reports/research
CLIMATE_CHANGE: climate change as a process or consequence
GREEN_TECHNOLOGY_INNOVATION: innovative and green technologies
MEDIA_JOURNALISTS: media and journalists

B Deriving main characters

As we explain in Section 3.1.1, not all entities in an article represent its main `hero`, `villain`, or `victim`. To be able to reliably and consistently identify the main characters, we adhere to the following process:

(1) We consider only the entities which are consistent with the overall stance of the article. In particular, journalists often cite the opposing view, and thus can mention a set of characters which is different from the one aligned with stance. For example, in the article in Figure 1, melting ice is a `victim` of rising temperatures, according to the viewpoint of climate activists. However, while the author cites this viewpoint, they do not agree with it, so the corresponding entities are not considered as potential `hero`, `villain`, and `victim`. To summarise, the main characters are the ones framed so by the author/narrator.

(2) We discard characters that either form the backdrop of the story or are used to illustrate a minor (often competing) idea within the main narrative.[6] For example, in the narrative in Figure 1 ANIMALS_NATURE_ENVIRONMENT stakeholders such as melting ice or Artic animals are only used as a battle ground between the climate activists and denialists; the true characters are the parties expressing their opinion regarding them.

(3) The same character can be referred to several times and be represented with several stakeholders. For example, it is common for news stories to mention both climate change regulations (LEGISLATION_POLICIES) and the politicians that propose them (GOVERNMENTS_POLITICIANS. In such cases, instead of adding multiple stakeholders for a character, we choose the one which was more prominent in the context or could be inferred from the other (i.e. LEGISLATION_POLICIES).

(4) We only consider those characters that are active in the narrative plot, rather than references to potential or past heroes, villains, and victims. For example, a news story that paints Republicans as a `villain` for not implementing climate change measures[7] concludes with the following sentence:

> For 2020 and beyond, climate justice will have to become the most animating issue for Democrats.

Since the positive impact of Democrats is only hoped for or predicted to happen in the future, Democrats (or GOVERNMENTS_POLITICIANS) are not an active `hero`, and, overall, the `hero` in this news story is absent. It is important not to assign extraneous entities to the character slots, even if they are otherwise empty, as it will later help to differentiate between narratives. For example, here it allows us to distinguish a narrative criticizing the `villain` from alternative narratives which depict an active conflict between `hero` and `villain`.

(5) For the same reasons, we do not add stakeholders that are only implied but not directly referred to in the text. For example, we do not add ANIMALS_ENVIRORNMENT as a `victim` unless it is specifically mentioned, though it can

[6] We are well aware that news stories are complex in terms of interplay of narratives within them and most of them contain what Fløttum and Gjerstad (2017) refers to as narrative polyphony. We intentionally restrict the task to identification of the main narrative only as the first step in disentangling narrative complexity.

[7] Narrative 512 in our dataset.

be inferred from the majority of pro-climate action news stories. Similarly, though the stories warning about the dangers of climate inaction are usually inspired by scientific evidence, SCIENCE_EXPERTS_SCI.REPORTS are not a `hero` in them unless they have an active role, as in here[8]

> Climate report warns of extreme weather, displacement of millions without action

This allows to differentiate between a narrative which appeals to authority of scientists (so called "Gore" narrative) from a similar but often more emotionally charged and less "objective" alarmist narrative ("12 Years to save the world").

C Annotation details

The annotation was performed in two stages:

C.1 Stage 1: annotating Hero, Villain, and Victim

During stage 1, we employed three external annotators, all specializing in social sciences and familiar with Narrative Policy Framework, and one of the authors of the article, who is an expert annotator with knowledge of media discourse and framing. All four annotators were asked to read a set of articles, specify who they think are the main Hero, Villain, and Victim in each of them, and provide some explanations (see an example in Figure 5).

The external annotators were expected to spend around 10 minutes per article, and were compensated at a competitive rate of 35 USD per hour. Each of the 100 articles in the dataset was annotated at least by two external annotators, and all of them were annotated by the internal expert annotator. Since the annotators were asked to specify entities for Hero, Villain, and Victim in free form, their annotations were not directly comparable (e.g. "Biden" vs "Joe Biden" vs "Democrats"). Thus, to evaluate the annotation agreement, as well as to convert the data to a more abstract and useful structure (see Section 3.1.1), the expert annotator mapped the specific characters mentioned by each of the annotators to their character classes (Appendix A).

We evaluate the agreement between all four annotators using Krippendorf's α, and report the averaged agreement of each of the three external annotators with the expert. For the latter, we use the standard metrics of agreement rate (=accuracy), Cohen's κ, and the less commonly used Gwet's AC1, which compensates for the high imbalance in data distribution. The resulting inter-annotator agreement statistics can be found in Table 3. Overall, we observe acceptable to strong levels of agreement between all four annotators, as well as very high average agreement of each of the annotators with the expert (as judged based on Gwet's AC1). A relatively lower agreement for Hero and Villain in comparison to Victim is explained by the fact that the annotators sometimes chose entities belonging to different stakeholder types to represent the same event. For example, a particular climate initiative can be represented both by a parliamentary bill such as New Green Deal (LEGISLATION_POLICIES), and by the group of people behind it (GOVERNMENTS_POLITICIANS).

	Hero	Villain	Victim
Krippendorf's α	0.757	0.673	0.812
Agreement rate	0.852	0.855	0.927
Cohen's κ	0.783	0.745	0.876
Gwet't AC1	0.837	0.843	0.914

Table 3: Inter-annotator agreement for Hero, Villain, and Victim annotation

C.2 Stage 2: annotating Focus, Conflict, and Culture story

In the second stage, the expert annotator annotated all 100 articles in terms of their Focus, Conflict, and Culture story. Next, a random sample of 30 articles was annotated by another internal annotator who is also an expert in Narrative Policy Framework and framing analysis. The instructions for the annotation and an example of an annotated article are shown on Figures 6 and 7 respectively. To ensure a high quality of the resulting dataset, all disagreements were discussed and adjudicated, and then the corresponding changes were reflected in the samples beyond this calibration study, if necessary.

Table 4 shows the agreement statistics between the two annotators in Stage 2, using the same metrics as for Stage 1. We observe high agreement rates for all three classes, with other scores varying slightly due to number of classes and class distribution, but all being within the strong or very strong agreement range. Disagreement analysis revealed that there were disagreements on Focus between Villain and Victim, when both were discussed at similar length and depth in the article.

[8] Narrative 537 in our dataset.

Which entity did you identify as the HERO of the article (if any)?	Which entity did you identify as the VILLAIN of the article (if any)	Which entity did you identify as the VICTIM of the article (if any)?	Explanation (1-3 sentences)
None	Political Inaction, Italian apathy / lack of concern for climate change	People and City of Venice	public and a politician as essentially blaming a lack of serious climate change action for the floods. It's not clear the prime minister, Conte is being potrayed as HERO, as per the annotated article, maybe it is even portraying him as a villian for not taking sufficient action. Climate change, global warming, and the extreme floods are not
Climate Action, Those taking climate change seriously	Trump	Society/Nature	Article is criticizing politics, specifically the US president Donald Trump for his climate denial or at the very least climate inaction and prioritization of other political agendas. Article quotes leading scientists who warn about the devestating effects of climate change and there call for decisive action.
Other National leaders taking climate change seriously, UN Secretary	Trump	nature/society	Article heavily criticizes Trump for pretending to take climate change/action seriously, while actually not doing very much about it because he is actually a climate sceptic. Article also indicates other world leaders take climate change more seriously and implies Trump should follow suit

Figure 5: Example of stage 1 annotations (Hero, Villain, Victim

	Focus	Conflict	Cultural story
Krippendorf's α	0.780	0.820	0.801
Agreement rate	0.867	0.867	0.867
Cohen's κ	0.776	0.817	0.800
Gwet't AC1	0.810	0.824	0.801

Table 4: Inter-annotator agreement for Focus, Conflict, and Culture story annotation

For Conflict and Cultural story, the disagreement were more systematic (such as confusion between Fuel Resolution and Prevent Conflict, or between Hierarchical and Egalitarian stories); the insights arising from the discussion were reflected in the final labels and allowed us to refine the definitions of these concepts for the prompts used in LLM experiments.

D Narratives structures and description

In this section we provide a list of discovered narratives, their structures, references to the literature sources where they are mentioned, and definitions taken from that source.

D.1 Narratives focusing on Hero

D.1.1 You're destroying our future

Hero: ENV.ORGS_ACTIVISTS
Villain: GOVERNMENTS_POLITICIANS
Victim: <optional>
Action: POLITICAL_ACTION
Cultural story: EGALITARIAN
Description: The political stasis around climate change means that we cannot rely on politicians to create the change necessary. With collective action, even the politically weak can make a difference and secure a future for generations to come. This can manifest as anything from protests (school strikes) to non-violent civil disobedience.
Source: Bevan (2020)

D.1.2 Technological optimism

Hero: GREEN_TECHNOLOGY_INNOVATION
Villain: INDUSTRY_EMISSIONS, CLIMATE_CHANGE
Victim: <optional>
Action: INTRODUCE
Cultural story: INDIVIDUALISTIC
Description: We should focus our efforts on current and future technologies, which will unlock great possibilities for addressing climate change.
Source: Lamb et al. (2020)

D.1.3 Officials declare climate emergency

Hero: GOVERNMENTS_POLITICIANS
Villain: INDUSTRY_EMISSIONS, CLIMATE_CHANGE, GOVERNMENTS_POLITICIANS
Victim: <optional>
Action: PROPOSE, ENFORCE
Cultural story: HIERARCHICAL
Description: The climate crisis is sufficiently severe that it warrants declaring a climate emergency. This should occur at different levels of government as climate requires action at all levels, from the hyper-local to the global.
Source: Bevan (2020)

D.1.4 Every little helps

Hero: GENERAL_PUBLIC
Villain: GENERAL_PUBLIC
Victim: <optional>
Action: CHANGE_BEHAVIOUR
Cultural story: INDIVIDUALISTIC
Description: This narrative presents a society which has transitioned to a sustainable 'green' way of life. Could be by portraying individuals as the protagonists of stories that propose solutions to climate change.
Source: Bushell et al. (2017)

D.2 Narratives focusing on Villain

D.2.1 12 Years to Save the World

Hero: <optional>
Villain: GOVERNMENTS_POLITICIANS

Annotation Instructions

You will be given a full text of an article about climate change and asked to identify some elements of its narrative structure according to Narrative Policy Framework (NFP).

In NFP, a narrative contains at least one of the following characters: **Villain**, who is creating some conflict/problem; **Hero**, who is trying to resolve a conflict or problem; or a **Victim**, who is negatively affected by a conflict or problem. Not all of these characters need to be present in a narrative at the same time.

Each article can contain a mixture of narratives and thus have multiple villain-hero-victim sets. However, we can derive the overarching narrative of the article by determining its main hero, villain, or victim. For each of the articles you will see, we have already annotated the main hero, villain, and victim, so that you can focus on the main narrative characters when you do your annotation.

You will be asked three questions:

1. **Focus**: narratives can have the same characters (hero, villain, victim) but focus on different ones of them. For example, a narrative about negative effects of pollution on environment can focus either on the villain (criticise policies, governments, industries that cause pollution while mentioning its negative effects), or on the victim (describe negative effects on people or nature in detail while also mentioning the culprit).
   Which of the characters (Hero, Villain, or Victim) is the focus of the narrative?

2. **Conflict and Resolution**: apart from their characters, narratives in NFP are defined by the conflict/problem or its resolution described in them. In our case, the conflict/problem is climate change, and resolution is measures against climate change. Thus, a particular narrative can:

   FUEL RESOLUTION: propose or describe specific measures, policies, or events that would contribute to the resolution of the climate crisis.
   FUEL CONFLICT: propose or describe specific measures, policies, or events that would exacerbate the climate crisis.
   PREVENT RESOLUTION: criticise measures, policies, or events that contribute to the resolution of the climate crisis; or deny the climate crisis
   PREVENT CONFLICT: criticise measures, policies, or events that exacerbate the climate crisis; or provides the evidence of climate crisis.

   Please be mindful that the perspective of the author/narrator and the characters in the story regarding the conflict and its resolution can be different; identify and annotate the main perspective which corresponds to the author's/narrator's intention.

   Does this narrative fuel conflict, fuel resolution, prevent conflict, or prevent resolution?

3. **Cultural story**: narratives of climate change are aligned with the following cultural stories, which capture the ideas of the necessity of top-down control vs self-regulation, and the idea of group responsibility vs individual responsibility.

   HIERARCHICAL: this story assumes that the nature can be controlled but we need to be bound by tight social prescriptions. The villain is mismanaged society which led to excessive growth, and heroes are impartial scientists or government intervention.
   INDIVIDUALISTIC: this story assumes that the nature is resilient and will return to equilibrium. Villains here are people who try to control climate change or seek policy changes, and the heroes allow markets to move naturally as individuals compete to create innovative technologies.
   EGALITARIAN: this story assumes that the nature is fragile and there is little opportunity to correct mistakes. The cause of climate change is overconsumption; villains are profit-driven corporations and anyone who supports status quo, and heroes are groups who seek fundamental changes.
   FATALIST: the story assumes that the nature cannot be controlled, and climate change is inevitable whatever efforts we make.

   Which of the cultural stories (Hierarchical, Individualistic, Egalitarian, or Fatalist) does the narrative align with?

Figure 6: Instructions for stage 2 annotation (Focus, Conflict, Culture story

ID: 225

Article:

E.P.A. Plans to Get Thousands of Deaths Off the Books by Changing Its Math Want climate news in your inbox ? Sign up here for Climate Fwd :, our email newsletter. WASHINGTON — The Environmental Protection Agency plans to change the way it calculates the health risks of air pollution, a shift that would make it easier to roll back a key climate change rule because it would result in far fewer predicted deaths from pollution, according to five people with knowledge of the agency 's plans. The E.P.A. had originally forecast that eliminating the Obama - era rule, the Clean Power Plan, and replacing it with a new measure would have resulted in an additional 1,400 premature deaths per year. The new analytical model would significantly reduce that number and would most likely be used by the Trump administration to defend further rollbacks of air pollution rules if it is formally adopted. The proposed shift is the latest example of the Trump administration downgrading the estimates of environmental harm from pollution in regulations. In this case, the proposed methodology would assume there is little or no health benefit to making the air any cleaner than what the law requires. Many experts said that approach was not scientifically sound and that, in the real world, there are no safe levels of the fine particulate pollution associated with the burning of fossil fuels. Fine particulate matter — the tiny, deadly particles that can penetrate deep into the lungs and enter the bloodstream — is linked to heart attacks, strokes and respiratory disease."

Questions:

Considering that in this article the **Villain** is politicians, and the **Victim** is general public, answer the following:

1) Which of the characters (Hero, Villain, or Victim) is the focus of the narrative?

Hero **Villain** Victim

2) Does this narrative fuel conflict, fuel resolution, prevent conflict, or prevent resolution?

Fuels conflict Fuels resolution
Prevents conflict Prevents resolution

3) Which of the cultural stories (Hierarchical, Individualistic, or Egalitarian) does the narrative align with?

Hierarchical Individualistic Egalitarian Fatalist

Figure 7: An example of stage 2 annotation (Focus, Conflict, Culture story

Victim: ANIMALS_NATURE_ENVIRONMENT, GENERAL_PUBLIC, CLIMATE_CHANGE
Action: PREVENT CONFLICT
Cultural story: HIERARCHICAL
Description: Past and present human action (or inaction) risks a catastrophic future climatic event unless people change their behaviour to mitigate climate change.
Source: Bevan (2020)

D.2.2 Gore

Hero: SCIENCE_EXPERTS_SCI.REPORTS
Villain: GOVERNMENTS_POLITICIANS, GENERAL_PUBLIC, INDUSTRY_EMISSIONS
Victim: ANIMALS_NATURE_ENVIRONMENT, CLIMATE_CHANGE
Action: FUEL RESOLUTION
Cultural story: HIERARCHICAL
Description: This is a narrative of scientific discovery which climaxes on the certainty that climate change is unequivocally caused by humans.
Source: Bushell et al. (2017)

D.2.3 The collapse is imminent

Hero: ENV.ORGS_ACTIVISTS
Villain: GOVERNMENTS_POLITICIANS
Victim: <optional>
Action: FUEL RESOLUTION
Cultural story: EGALITARIAN
Description: The climate crisis is such that some kind of societal collapse is near inevitable. Due to the inaction of the negligent or complacent politicians the social contract has broken down and it is incumbent upon individuals to engage in non-violent civil disobedience to shock society into urgent action.
Source: Bevan (2020)

D.2.4 Climate solutions won't work

Hero: <optional>
Villain: LEGISLATION_POLICIES, GREEN_TECHNOLOGY_INNOVATION
Victim: GENERAL_PUBLIC, ANIMALS_NATURE_ENVIRONMENT
Action: PREVENT RESOLUTION
Cultural story: INDIVIDUALISTIC
Description: Climate policies are harmful and a threat to society and the economy. Climate policies are ineffective and too difficult to implement.
Source: Lamb et al. (2020)

D.2.5 No sticks just carrots

Hero: LEGISLATION_POLICIES
Villain: LEGISLATION_POLICIES
Victim: GENERAL_PUBLIC
Action: PREVENT RESOLUTION
Cultural story: INDIVIDUALISTIC
Description: Society will only respond to supportive and voluntary policies, restrictive measures will fail and should be abandoned.
Source: Lamb et al. (2020)

D.2.6 All talk little action

Hero: <optional>
Villain: GOVERNMENTS_POLITICIANS
Victim: <optional>
Action: PREVENT RESOLUTION
Cultural story: EGALITARIAN
Description: This narrative emphasises inconsistency between ambitious climate action targets and actual actions.
Source: Lamb et al. (2020)

D.2.7 Victim blaming

Hero: <optional>
Villain: GENERAL_PUBLIC
Victim: GENERAL_PUBLIC
Action: PREVENT RESOLUTION
Cultural story: INDIVIDUALISTIC
Description: Individuals and consumers are ultimately responsible for taking actions to address climate change.
Source: Lamb et al. (2020)

D.2.8 Debate and scam

Hero: <optional>
Villain: GOVERNMENTS_POLITICIANS, LEGISLATION_POLICIES, ENV.ORGS_ACTIVISTS, MEDIA_JOURNALISTS
Victim: <optional>
Action: PREVENT RESOLUTION
Cultural story: INDIVIDUALISTIC
Description: The heroes of this narrative are sceptical individuals who dare to challenge the false consensus on climate change which is propagated by those with vested interests.
Source: Lamb et al. (2020)

D.2.9 Others are worse than us

Hero: GOVERNMENTS_POLITICIANS
Villain: GOVERNMENTS_POLITICIANS
Victim: <optional>
Action: PREVENT RESOLUTION

Cultural story: INDIVIDUALISTIC
Description: Other countries, cities or industries are worse than ourselves. There is no point for us to implement climate policies, because we only cause a small fraction of the emissions. As long as others emit even more than us, actions won't be effective.
Source: Lamb et al. (2020)

D.3 Narratives focusing on Victim

D.3.1 Endangered species

Hero: <optional>
Villain: GOVERNMENTS_POLITICIANS, LEGISLATION_POLICIES, INDUSTRY_EMISSIONS
Victim: ANIMALS_NATURE_ENVIRONMENT
Action: PREVENT CONFLICT
Cultural story:HIERARCHICAL
Description: Endangered species (like polar bears) are the helpless victims of this narrative, who are seeing their habitat destroyed by the actions of villainous humans.
Source: Bushell et al. (2017)

D.3.2 We are all going to die

Hero: <optional>
Villain: CLIMATE_CHANGE, INDUSTRY_EMISSIONS
Victim: GENERAL_PUBLIC
Action: PREVENT CONFLICT
Cultural story: EGALITARIAN
Description: This narrative shows the current or potential catastrophic impact of climate change on people.
Source: Shanahan (2007)

D.3.3 Carbon fueled expansion

Hero: <optional>
Villain: LEGISLATION_POLICIES, GREEN_TECHNOLOGY_INNOVATION
Victim: GENERAL_PUBLIC, INDUSTRY_EMISSIONS
Action: PREVENT RESOLUTION
Cultural story: INDIVIDUALISTIC
Description:The free market is at the centre of this narrative which presents action on climate change as an obstacle to the freedom and well-being of citizens. The narrative can stress social justice or well-being of individual citizens.
Source: Bushell et al. (2017)

E Model sizes, costs and parameters

Mixtral-8x7B-Instruct-v0.1 (Mixtral): 46.7B params

gemini-1.5-pro (Gemini): 1.5T params

Llama-3.1-8B-Instruct: 8B params

Approximate experiments costs: 300 USD.

Hyperparameters for Llama LoRA fine-tuning:

max seq length = 4000
r = 16
target modules = "q_proj", "k_proj", "v_proj", "o_proj", "gate_proj", "up_proj", "down_proj"
lora alpha = 16
lora dropout = 0
batch size = 2
gradient accumulation steps = 4
warmup steps = 5
learning rate = 2e-4
optim = adamw8bit
weight decay = 0.01

F Basic prompts

In tables below we show the basic prompts used for the classification: Table 5 for Hero, Villain, Victim and Focus classes, Table 6 for Story classes, and Table 7 for Narrative classification.

G Modified prompts with structure descriptions

In tables below we show the modified prompts used for Cultural stories (Table 8) and Narratives (Table 9).

H LoRA results for LLama

In Table 10 below we report the macro-averaged F1 scores for zero-shot LLama model compared with the same model after LoRA fine-tuning.

I GPT4o vs GPT4o1 comparison

In Table 11 we report the macro-averaged F1 scores for zero-shot GPT4o and GPT4o1 models, as well as for GPT4o with 5 shot and GPT4o with CoT and DSPy optimization.

You are a social scientist specializing in climate change. You will be given a newspaper article and asked who is framed as a hero, villain or a victim in it. For each of these categories, you will be also asked to specify the corresponding word or phrase, and to classify it into the following classes: GOVERNMENTS_POLITICIANS: governments and political organizations; INDUSTRY_EMISSIONS: industries, businesses, and the pollution created by them; LEGISLATION_POLICIES: policies and legislation responses; GENERAL_PUBLIC: general public, individuals, and society, including their wellbeing, status quo and economy; ANIMALS_NATURE_ENVIRONMENT: nature and environment in general or specific species; ENV.ORGS_ACTIVISTS: climate activists and organizations SCIENCE_EXPERTS_SCI.REPORTS: scientists and scientific reports/research CLIMATE_CHANGE: climate change as a process or consequence GREEN_TECHNOLOGY_INNOVATION: innovative and green technologies MEDIA_JOURNALISTS: media and journalists Finally, you need to detect which of the characters (hero, villain, or victim) the news story is focusing on. Please return a json object which consists of the following fields: hero_class: a label for the hero from the list above, or 'None' if the hero cannot be identified. villain_class: a label for the villain from the list above, or 'None' if the villain cannot be identified. victim_class: a label for the victim from the list above, or 'None' if the victim cannot be identified. focus: one of the following - HERO, VILLAIN, VICTIM

Table 5: Basic prompt for Hero, Villain, Victim, and Focus classification

You are a social scientist specializing in climate change. You will be given a newspaper article and asked what is the cultural story reflected in it. You should choose one of the following classes: HIERARCHICAL: this story assumes that the nature can be controlled but we need to be bound by tight social prescriptions. INDIVIDUALISTIC: this story assumes that the nature is resilient and will return to equilibrium. EGALITARIAN: this story assumes that the nature is fragile and there is little opportunity to correct mistakes. Please return a json object which consists of the following field: story: a label from the classes above.

Table 6: Basic prompt for Story classification

You are a social scientist specializing in climate change. You will be given a newspaper article and asked what is the main narrative in it. You should choose one of the following classes: 12_YEARS: 12 Years to save the world - Past and present human action (or inaction) risks a catastrophic future climatic event unless people change their behaviour to mitigate climate change. ALL_GOING_TO_DIE: We are all going to die - This narrative shows the current or potential catastrophic impact of climate change on people ALL_TALK: All talk little action - This narrative emphasises inconcistency between ambitious climate action targets and actual actions. CARBON_EXPANSION: Carbon-fuelled expansion - The free market is at the centre of this narrative which presents action on climate change as an obstacle to the freedom and well-being of citizens. CLIMATE_SOLUTIONS_WONT_WORK: Climate solutions won't work. Climate policies are harmful and a threat to society and the economy. Climate policies are ineffective and too difficult to implement. COLLAPSE_IS_IMMINENT: The climate crisis is due to the inaction of the negligent or complacent politicians, and it is incumbent upon individuals to shock society into urgent action DEBATE_AND_SCAM: The heroes of this narrative are sceptical individuals who dare to challenge the false consensus on climate change which is propagated by those with vested interests. ENDANGERED_SPECIES: Endangered species (like polar bears) are the helpless victims of this narrative, who are seeing their habitat destroyed by the actions of villainous humans. EVERY_LITTLE_HELPS: This narrative presents a society which has transitioned to a sustainable 'green' way of life. Could be by portraying individuals as the protagonists of stories that propose solutions to climate change. GORE: This is a narrative of scientific discovery which climaxes on the certainty that climate change is unequivocally caused by humans. NO_STICKS: No sticks just carrots - Society will only respond to supportive and voluntary policies, restrictive measures will fail and should be abandoned. OFFICIALS_DECLARE_EMERGENCY: Officials declare a climate emergency - The climate crisis is sufficiently severe that it warrants declaring a climate emergency. This should occur at different levels of government as climate requires action at all levels, from the hyper-local to the global. OTHERS_ARE_WORSE: Others are worse than us - Other countries, cities or industries are worse than ourselves. There is no point for us to implement climate policies, because we only cause a small fraction of the emissions. As long as others emit even more than us, actions won't be effective. TECHNOLOGICAL_OPTIMISM: We should focus our efforts on current and future technologies, which will unlock great possibilities for addressing climate change. VICTIM_BLAMING: Individuals and consumers are ultimately responsible for taking actions to address climate change. YOURE_DESTROYING_OUR_FUTURE: The political stasis around climate change means that we cannot rely on politicians to create the change necessary. With collective action, even the politically weak can make a difference and secure a future for generations to come. Please return a json object which consists of the following field: narrative: a label from the classes above.

Table 7: Basic prompt for Narrative classification

You are a social scientist specializing in climate change.
You will be given a newspaper article and asked what is the cultural story reflected in it.
You should choose one of the following classes:

HIERARCHICAL: this story assumes that the nature can be controlled but we need to be bound by tight social prescriptions. The villain is mismanaged society which led to excessive growth, and heroes are impartial scientists or government intervention.
INDIVIDUALISTIC: this story assumes that the nature is resilient and will return to equilibrium. Villains here are people who try to control climate change or seek policy changes, and the heroes allow markets to move naturally as individuals compete to create innovative technologies.
EGALITARIAN: this story assumes that the nature is fragile and there is little opportunity to correct mistakes.
The cause of climate change is overconsumption; villains are profit-driven corporations and anyone who supports status quo, and heroes are groups who seek fundamental changes.

Please return a json object which consists of the following field:
story: a label from the classes above.

Table 8: Prompt for Cultural story classification with Hero, Villain, and Victim specified

You are a social scientist specializing in climate change. You will be given a newspaper article and asked what is the main narrative in it. You should choose one of the following classes: 12_YEARS: 12 Years to save the world - Past and present human action (or inaction) risks a catastrophic future climatic event unless people change their behaviour to mitigate climate change. The villain here is government or industry pollution, and the victim is environment, people, or climate change. The narratives focuses on villain and shows how they deny climate change or abandon climate policies. ALL_GOING_TO_DIE: We are all going to die - This narrative shows the current or potential catastrophic impact of climate change on people. The villain here is climate change or industry emissions, and the victim is general public. The narrative focuses on victim and raises the alarm. ALL_TALK: All talk little action - This narrative emphasises inconcistency between ambitious climate action targets and actual actions. The villain here is government and politicians, and the victim is often climate change. The narrative focuses on villain who reneged on their promise to support climate policies. CARBON_EXPANSION: Carbon-fuelled expansion - The free market is at the centre of this narrative which presents action on climate change as an obstacle to the freedom and well-being of citizens. The villain here is climate policies or green technologies, and the victim is general public or old industries. The narrative focuses on victim and advocates for abandoning climate policies. CLIMATE_SOLUTIONS_WONT_WORK: Climate solutions won't work. Climate policies are harmful and a threat to society and the economy. Climate policies are ineffective and too difficult to implement. The villain is here climate policies or green technologies, and the victim is usually general public. The narrative focuses on villain and criticizes them. COLLAPSE_IS_IMMINENT: The climate crisis is due to the inaction of the negligent or complacent politicians, and it is incumbent upon individuals to shock society into urgent action. The heroes here are environmental activists, and the villain is government. The narrative focuses on villain and advocated for taking action such as protests or disobedience. DEBATE_AND_SCAM: The heroes of this narrative are sceptical individuals who dare to challenge the false consensus on climate change which is propagated by those with vested interests. The villains are governments, activists, journalist and policies that support climate measures. The narrative focuses on villains and exposes them. ENDANGERED_SPECIES: Endangered species (like polar bears) are the helpless victims of this narrative, who are seeing their habitat destroyed by the actions of villainous humans. The villain here can be government, legislation, industry, and the victim is environment and nature. The narrative focuses on victims and shows how they are endangered. EVERY_LITTLE_HELPS: This narrative presents a society which has transitioned to a sustainable 'green' way of life. Could be by portraying individuals as the protagonists of stories that propose solutions to climate change. The heroes here are individuals and common people, and it is implied that they are also a villain. The narrative focuses on hero and shows how they change their consumption. GORE: This is a narrative of scientific discovery which climaxes on the certainty that climate change is unequivocally caused by humans. The heroes here are scientists, the villain is government, general public, or industry pollution, and the victim is environment or climate change. The narrative focuses on villain and raises alarm. ... Please return a json object which consists of the following field: narrative: a label from the classes above.

Table 9: Prompt for Narrative classification with Hero, Villain, Victim, Focus, and Action specified (abbreviated)

	Hero	Villain	Victim	Focus	Action	Story	Narrative
Without LoRA	0.274	**0.161**	**0.277**	**0.431**	**0.376**	0.253	**0.185**
With LoRA	**0.338**	0.118	0.221	0.351	0.231	**0.393**	0.077

Table 10: Macro-averaged F1 performance of Llama 3.1 with vs without LoRA fine-tuning for 7 narrative understanding tasks

	Hero	Villain	Victim	Focus	Action	Story	Narrative
GPT4o zero-shot	0.419	0.397	0.381	0.623	0.301	0.485	0.219
GPT4o 5-shot	0.514	0.357	0.319	0.613	0.272	0.390	0.190
GPT4o 5-shot with CoT	0.517	0.412	0.430	0.627	0.332	0.430	0.178
GPT4o1	0.310	0.500	0.438	0.776	0.561	0.471	0.346

Table 11: Macro-averaged F1 performance of Llama 3.1 with vs without LoRA fine-tuning for 7 narrative understanding tasks