

# Modeling the cycles of attention of a social problem - the case of pesticide use in France

*Controversy mapping, Text Analysis, Network Analysis, Frame Analysis*

## Extended Abstract

According to the seminal work on the public arenas model by Bosk and Hillgartner (1988), social problems are competing for public attention. They rise and fall according to the limited carrying capacities of the social arenas they occupy. Because of this competition, social problems are expected to be relatively short-lived. They emerge thanks when individuals or groups make claims about social conditions they consider problematic (Dewey, 1927), but also, when specific events open opportunities for the media to report newsworthy stories (Kepplinger and Habermeier, 1995). The complex interplay between an ecological model of issue dynamics with the (mostly) unpredictable irruption of events which may derail public attention explains why the empirical observation and quantitative measure of cycles of attention is still so challenging (Castaldo et al. 2022). Pragmatist sociologists have shown how nonlinear the trajectory of public issues is: they can suddenly appear in the media agenda thanks to an exogenous event, disappear when the public attention gets bored, and rebound at a later stage (Chateauraynaud, 2011).

The ambition of this article is to use massive data collection and text and network analysis to empirically tackle the question of the dynamics of one specific public problem that is the use of pesticides in France over the last 10 years. If the media remains a reliable source of information to get an overview of social movements and political debates contributing to the framing of public problems, conversation and disputes on online social media have played an increasing role on the dynamics of controversies. We then analyze the evolutions of those public issues in three public arenas : the traditional media space, Twitter and Facebook public pages and groups. While the access to the traditional media is controlled by journalists, Twitter is an open digital public arena where people can easily take part in discussions, and Facebook public pages and groups make visible the work of stakeholders to make their mobilisations alive.

Using a simple search queries listing a series of chemical substances<sup>1</sup>, we pull an original dataset composed of 414 023 Facebook posts, 1 354 688 tweets and 47 260 news articles<sup>2</sup>. The corpus covers 12 years of uninterrupted debates about pesticides in the French digital public space. However this debate is composed of the succession of particular issues which are addressing different aspects of the larger problem such as pesticides in food and groundwater, Farmers' occupational diseases or pollinators' decline. To identify these issues, we automatically extract the most pertinent multi-terms from the corpus using traditional NLP tools in order to map the overall semantic network of the corpus (Rule et al, 2015). Our map reveals 20 different clusters which organize the debate (see figure 1) according to the various problematic chemical substances (neonicotinoids, Chlordecone, SDHI, etc.) or to the type of victims of the pesticides (whether they are humans (e.g. Dewayne Johnson) or non humans (bees and biodiversity at large)

---

<sup>1</sup> pesticide\* OR fongicide\* OR glypho\* OR roundup OR herbicide\* OR SDHI OR chlordécone OR insecticide\* OR néonicotinoïde\* OR desherbant\* OR phyto\*

<sup>2</sup>We use three different APIs to obtain the data: Facebook Crowdtanlge API, Mediacloud and the Twitter API

The temporal analysis of each of those issues exhibits two typical shapes. We distinguish between “episodic” and “chronic” issues. We use the term “episodic”<sup>3</sup> to characterize issues that suddenly and briefly arise in the public space, such as Fipronil (an insecticide) in contaminated eggs that were topical during the scandal and then disappeared. On the contrary, the term “chronic” refers to issues regularly discussed in public arenas because they deal with political questions such as ecological transition or are involved in the routine of policy-making. For instance, the European Commission assesses the glyphosate license every five years.

We then capture the framing of those different issues using a dedicated dictionary, allowing us to measure whether the focus of the post/tweet/article is environmental or sanitary. We use a dedicated French thesaurus created by the pragmatist sociologist Chateauraynaud (2003). We compare the dictionary-based scores with the metrics obtained using a word embedding approach called microframes (Kwak et al. 2021) but only report results from the dictionary-based methods, which seem more robust after a close qualitative examination. The scatterplot figure 2 shows how the 20 topics distribute on the 2d space of the environmental and sanitary frames. We observe how health-related topics are more likely to trace an episodic trajectory in the public space because these particular issues are often linked to juridical episodes with a closed temporal extension.

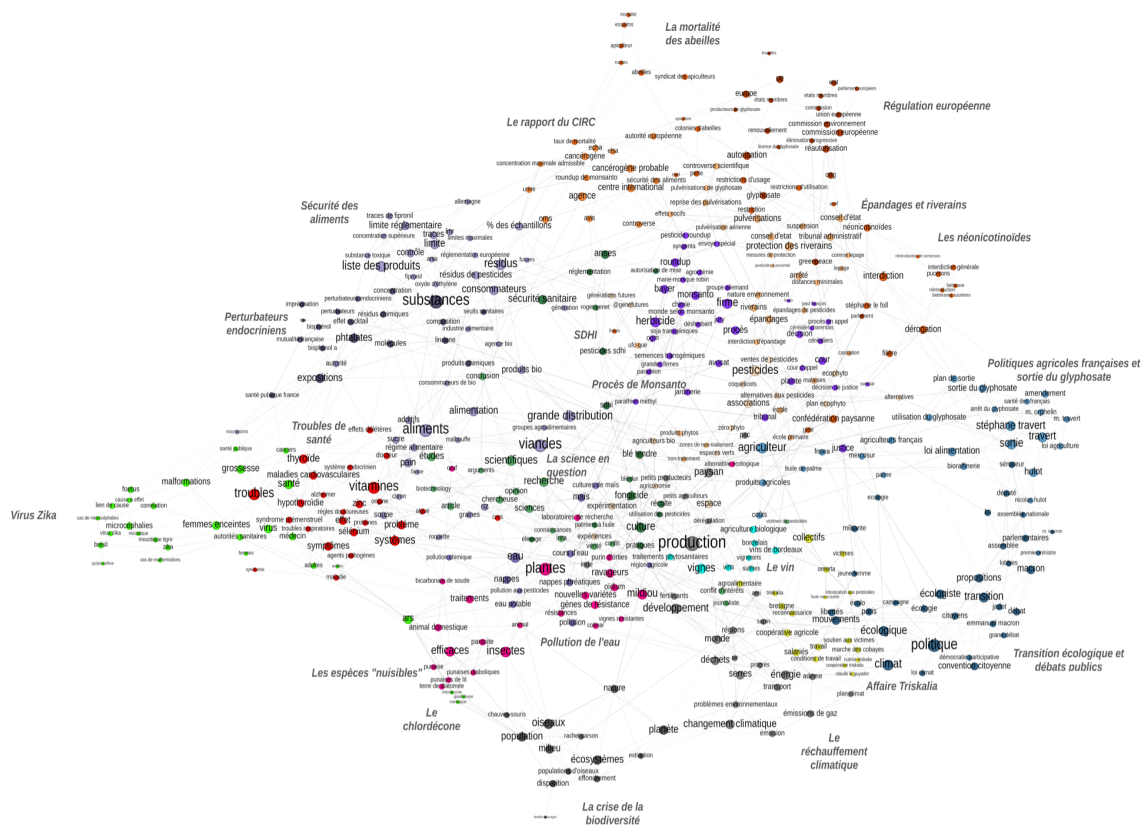
Finally, we compute the average level of the salience of the sanitary and environmental frames of all the documents in our corpus pertaining to the 20 issues. Strikingly, when we plot these two indexes over time, we observe that the environmental and sanitary frames are in opposition of phase. In line with Hill and Hilgartner model, when the environmental frame is leading, the sanitary one loses momentum and conversely. It is also interesting to observe how the environmental framing has superseded the sanitary frame since the mid-2019. We argue this alternation of sanitary and environmental frames may be necessary to sustain the attention of public opinion around the larger question of pesticides.

## References

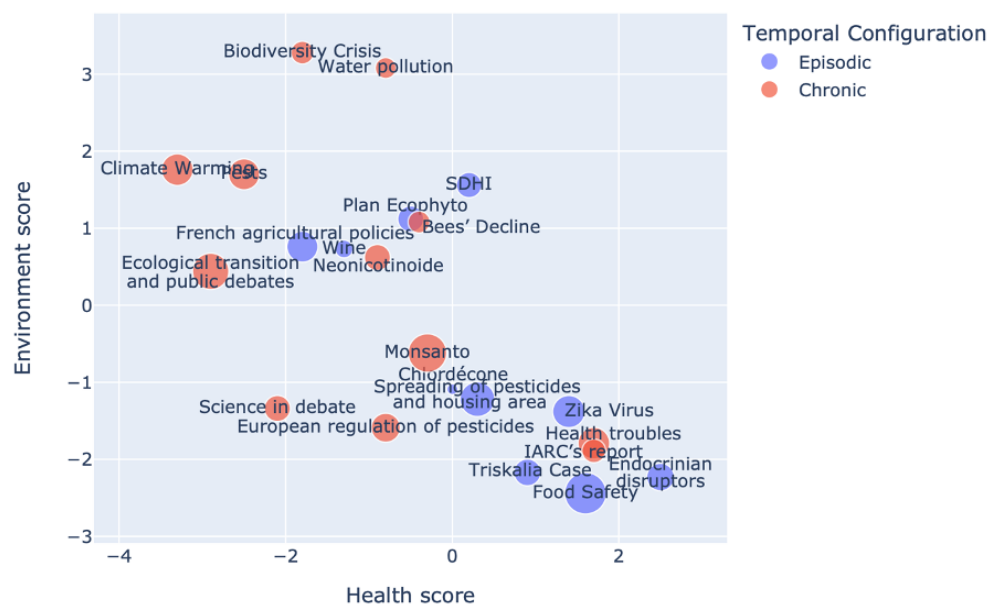
- Castaldo M, Venturini T, Frasca P, Gargiulo F. Junk news bubbles modeling the rise and fall of attention in online arenas. *new media & society*. 2022 Sep;24(9):2027-45.
- Francis Chateauraynaud, Prospéro. *Une technologie littéraire pour les sciences humaines*, 2003
- Francis Chateauraynaud, *Argumenter dans un champ de forces. Essai de balistique sociologique*, Éditions Petra, Paris, 2011, 482 p.
- Dewey, J. *The public and its problems*, 1927
- Hilgartner S, Bosk CL. The rise and fall of social problems: A public arenas model. *American journal of Sociology*. 1988 Jul 1;94(1):53-78.
- Kepplinger HM, Habermeier J. The impact of key events on the presentation of reality. *European journal of communication*. 1995 Sep;10(3):371-90.
- Kwak H, An J, Jing E, Ahn YY. FrameAxis: characterizing microframe bias and intensity with word embedding. *PeerJ Computer Science*. 2021 Jul 22;7:e644.
- Rule A, Cointet JP, Bearman PS. Lexical shifts, substantive changes, and continuity in State of the Union discourse, 1790–2014. *Proceedings of the National Academy of Sciences*. 2015 Sep 1;112(35):10837-44.

---

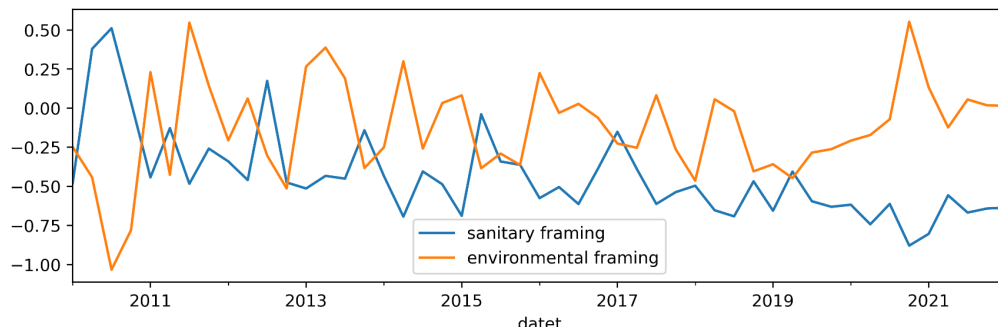
<sup>3</sup> According to the Oxford Dictionary, “episodic” means “happening occasionally and not at regular intervals.”



**Figure 2:** Semantic network map based on the observed cooccurrences between nearly 500 salient terms in our text corpus



**Figure 2:** Distribution of the 20 main issues according to the health and environmental frames



**Figure 3:**Opposing cycles of sanitary and environmental framing over 12 years.