LIÈGE université
Arlon Campus Environnement

Socio-ecosystemic analysis of the 2018 drought in Wallonia (Belgium) and possible recommendations for a transversal and sustainable risk management

Kevin Thibaut
University of Liege, Research Unit SPHERES, Department of Environmental Sciences and Management
Avenue de Longwy, 185, 6700 Arlon, Belgium - Mail: kevin.thibaut@uliege.be

1. Context and purposes

Drought is an extreme climatic event caused by an abnormal rainfall deficit. With its slow dynamics, broad scope and numerous cumulative and multidisciplinary impacts (Wilhite & Glantz, 1985; Sthal et al., 2016), this complex phenomenon has the potential to cause both a simple environmental disturbance and a major socio-economic crisis. Moreover, it is now certain that ongoing global warming will increase the frequency and intensity of droughts (IPCC, 2021). The consecutive rainfall deficits of 2018 and 2019 in Europe are already considered to be unprecedented in the last 250 years (Hari et al., 2020).

Water deficits are not new in Wallonia (southern part of Belgium) but they have multiplied in an almost structural way over the last twenty years. They are further accentuated by high average annual temperatures and by a growing demand for water. Wallonia must therefore prepare for this new climatic challenge in order to limit - in the short, medium and long term - the often costly and destructive impacts. In this context, this study aimed to build and develop an original and innovative tool - the chrono-systemic timeline - in order to better understand the interdisciplinary process of droughts and to highlight recommendations for a sustainable and transversal management of this risk.

2. Data and methodology

A chrono-systemic timeline is an interdisciplinary instrument for analysing change processes in a territory (Bergeret et al., 2015). This tool contributes, through a socio-ecosystemic analysis of an experience, to improve the management of similar future situations. In the context of a drought during which the consequences are extremely varied, whether sectorally, spatially or temporally, the timeline allows us to combine the key events of the crisis and the logical links between them in a single and synthetic diagram.

The timeline is constructed in six stages :

Choice of case study and spatial scale → Choice of time scale → Choice of systems (multidisciplinary components) → Integration of milestones (data and important facts) → Laying down logical links → Process sequencing

Skeleton of the timeline (stages 1–3) — Heart of the timeline (stages 4–6)

The case study selected is the 2018 drought in Wallonia due to exceptional weather conditions marked by much higher than normal sunshine and temperatures, as well as exceptionally low precipitation in frequency and quantity. This event is also recent and therefore in phase with the current climatic reality. With regard to temporality, the chrono-systemic timeline is constructed over a full calendar year using a linear time scale.

The contexts considered are the environmental conditions (climate and hydrology), the economic and social context (water production, agriculture, natural environments, energy, navigation, tourism) and the political and administrative decisions. The data used for each of these contexts comes from the meeting reports of the "drought cell" of the Regional Crisis Centre of Wallonia (CRC-W) and from the monthly climate reports of the Royal Meteorological Institute of Belgium (RMI).

3. Results and discussion

The chrono-systemic timeline of the 2018 drought in Wallonia (figure below) is analysed by category of system studied.

8 months with higher than normal average temperatures

7 months with more than 20% less rainfall than normal

Critical situation of water resources from August to November

Strong pressure on the distribution of drinking water with the use of alternative supplies (tanker trucks, requisition of private wells, ↗ surface water withdrawals)

↘ crop yields and severe degradation of grasslands with major financial and health impacts

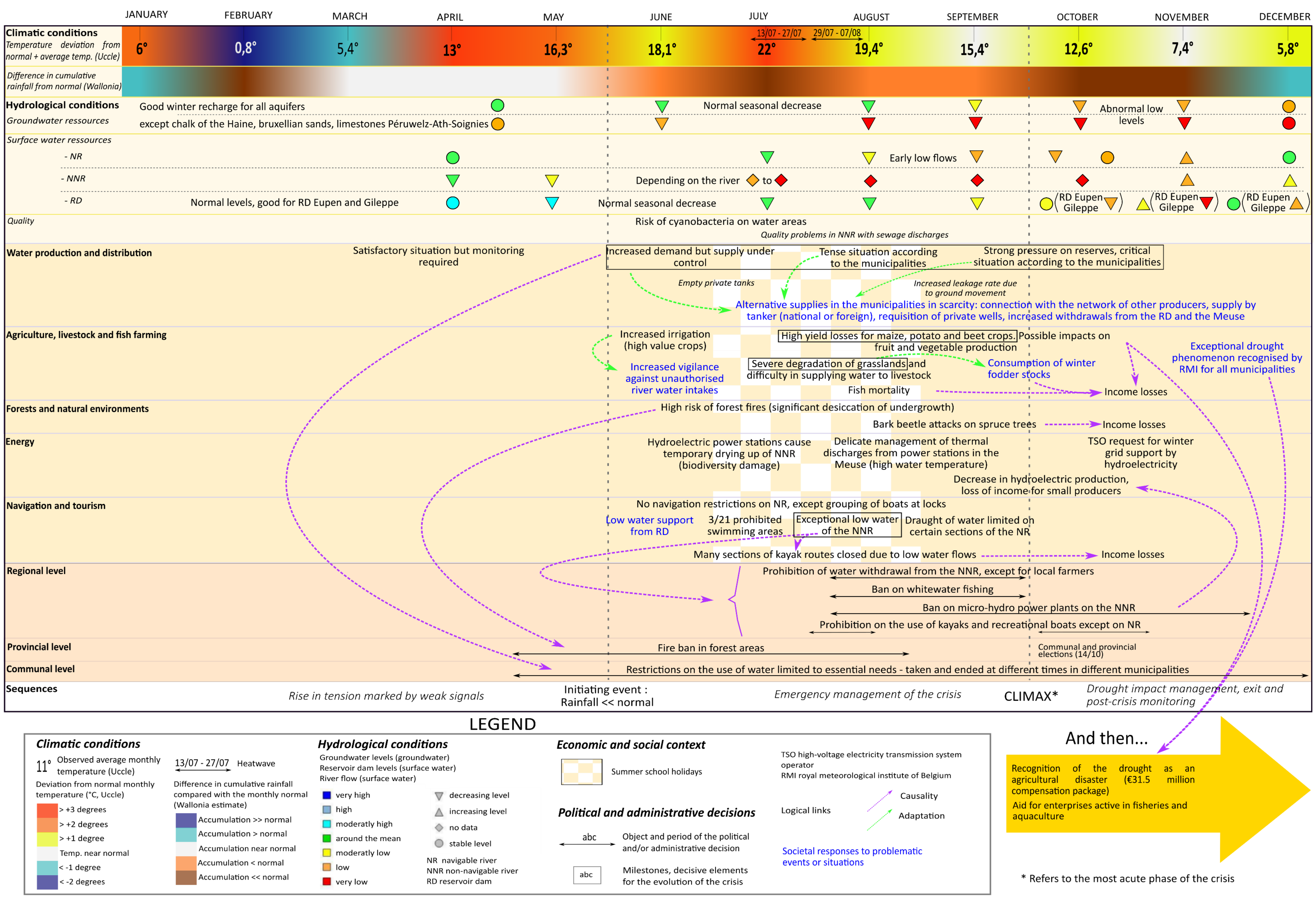
↗ mortality of forest species and bark beetle attacks (*Ips typographus*); social and recreational functions of natural areas impacted by access restrictions

high risk of forest fires and excess workload of rescue services

Stopping or ↘ production by hydroelectric power plants; adapting performances of thermal and nuclear power plants (rational management - withdrawals and discharges - of cooling water)

Regrouping of boats at locks on navigable rivers and limiting draught of water

Numerous water sports (fishing, kayaking, swimming, water-skiing, tourist boating) forced to stop or prohibited



The Belgian institutional complexity does not facilitate the management of a crisis with multi-sectoral impacts and requires increased cooperation between the levels of governance. The decisions taken by authorities during the 2018 drought in Wallonia are:

- at regional level → bans on water extraction, fishing, hydroelectric micro power plants and tourist navigation; drought recognised as an agricultural disaster allowing compensation
- at provincial level → ban on fires in forest areas from May to August
- at communal level → restrictions on water use for essential needs (30 communes affected from several weeks to several months between 2017 and 2019)

The sequencing of the chrono-systemic timeline delimits the most severe period of the drought between June and mid-September, when the climax of the crisis occurs. From October onwards, the difficulties tend to decrease due to less pressure on water resources. Nevertheless, the situation remains problematic for certain sectors of activity for which a return to a more favourable situation will only be achieved in 2019 after normal winter rainfall levels.

4. Conclusions

The chrono-systemic timeline of the 2018 drought in Wallonia highlights an often long period of major impacts, a slow return to a so-called normal situation and a form of crisis management described as reactive (decisions taken by the authorities mostly at the time the crisis is established). The tool also shows the presence of a water stress situation in all the socio-ecosystems of the territory. The study therefore concludes that it is necessary to better consider the risks linked to water deficits in public policies and to set up an anticipatory and adaptive management of these risks. Nature-based solutions (large or small scale) that promote sustainable water, soil and forest management are efficient future strategies for integrated adaptation to water scarcity (European Environment Agency, 2021). In conclusion, drought is not only a climatic issue because, even if the origin of this phenomenon is linked to meteorological factors, its consequences and their magnitude strongly depend on the environmental and societal context of the affected territory (Thibaut & Ozer, 2021).

References

European Environment Agency. (2021). Nature-based solutions in Europe policy, knowledge and practice for climate change adaptation and disaster risk reduction. Publications Office of the European Union. https://data.europa.eu/doi/10.2800/919315

Hari, V., Rakovec, O., Markonis, Y., Hanel, M. & Kumar, R. (2020). Increased future occurences of the exceptional 2018-2019 Central European drought under global warming. Scientific Reports, 10, 12207. https://doi.org/10.1038/s41598-020-68872-9

IPCC, 2021. Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

Stahl, K., Kohn, I., Blauhut, V., Urquijo, J., De Stefano, L., Acácio, V., ... & Van Lanen, H. A. (2016). Impacts of European drought events: insights from an international database of text-based reports. Natural Hazards and Earth System Sciences, 16(3), 801-819.

Thibaut, K. & Ozer, P. (2021). Les sécheresses en Wallonie, un nouveau défi du changement climatique? Quelques pistes pour améliorer la gestion de ce phénomène. Geo-Eco-Trop: Revue Internationale de Géologie, de Géographie et d'Écologie Tropicales, 45(3), 517-527.

Wilhite, D. A. & Glantz, M. H. (1985). Understanding the Drought Phenomenon : The Role of Definitions. Water International, 1985, 10:3, 111-120. https://digitalcommons.unl.edu/droughtfacpub/20/

This poster was supported by the French Community of Belgium under a FRIA grant (FNRS) and by the Research Unit SPHERES of the University of Liege under an Impulse grant. The author thanks the Regional Crisis Centre of Wallonia (CRC-W) and the Royal Meteorological Institute of Belgium (RMI) for the data.

LIÈGE université SPHERES