

Drivers of multiple pollutants in Ukrainian rivers

Vits Strokal¹

¹Agrosphere Ecology and Environmental Control of Department, Faculty of Plant Protection, Biotechnology and Ecology, National University of Life and Environmental Sciences of Ukraine, Ukraine

Associate professor
Vita Strokal



Background

- Water quality is suffering from multi-pollutant problems (nutrient pollution, micro- and microplastics, and heavy metals, pathogens).
- The three main drivers of multiple pollutants in Ukrainian rivers are:
 - human activities (agriculture and urbanization);
 - climate change;
 - military actions.

Objective

- Better understand the drivers of multiple pollutants in Ukrainian rivers today and in the future;
- Explore strategies for sustainable development and clean water in Ukraine.

Dnipro Basin (explorative study)

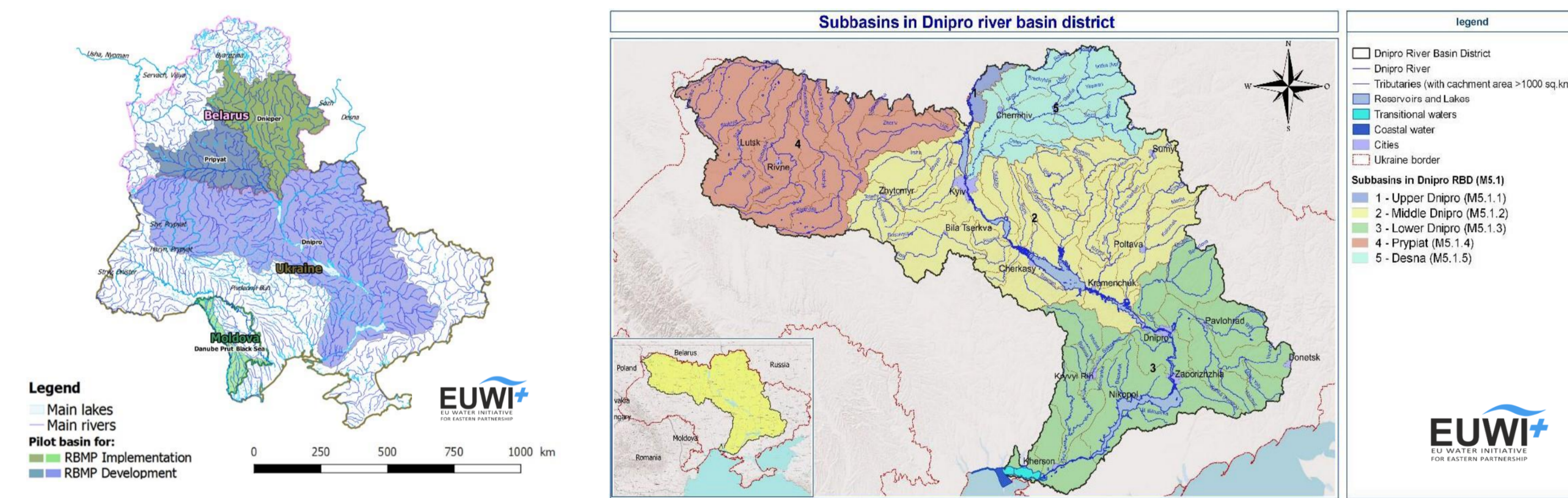


Figure 1. River basin management plan in Ukraine (<https://www.euwipluseast.eu/en/partners-countries-activities-ukraine/ukraine/river-basin-management-plan>)

Driver 1: Climate change

- Global warming scenario
- North: more precipitation and risk for floods
- South: less precipitation and risk for droughts

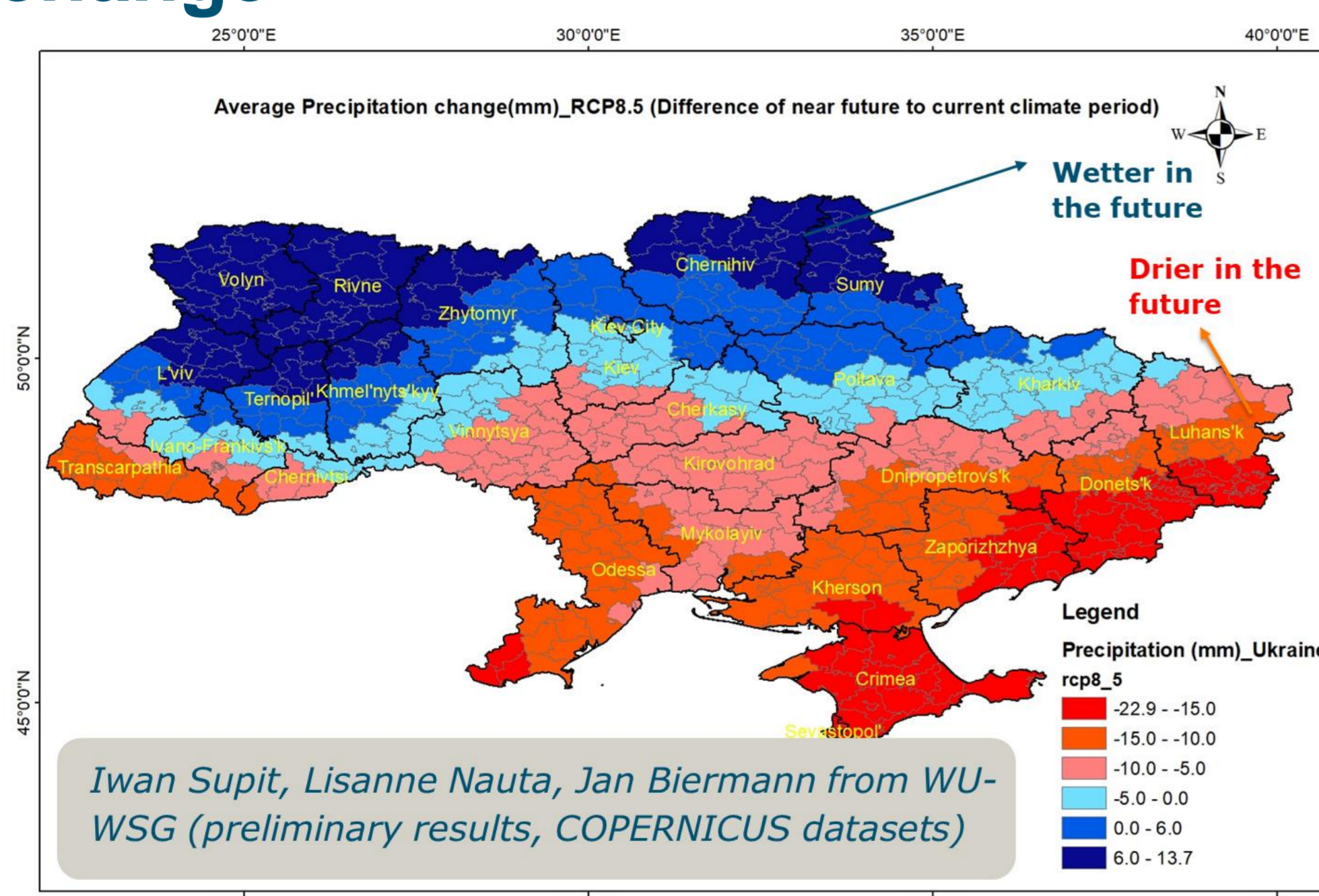


Figure 2. Climate change will impact clean water availability in the future

Driver 2: Human activities

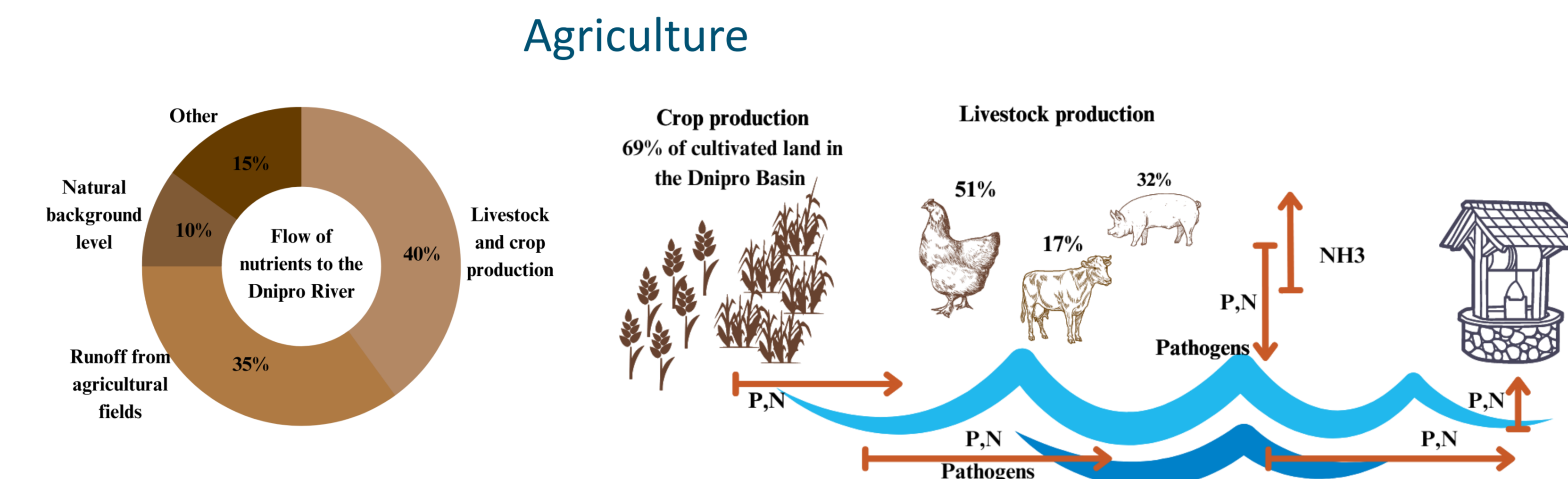


Figure 3. Impacts of agriculture on water quality in the Dnipro Basin (Strokal and Kovpak, 2021; Strokal, 2022)

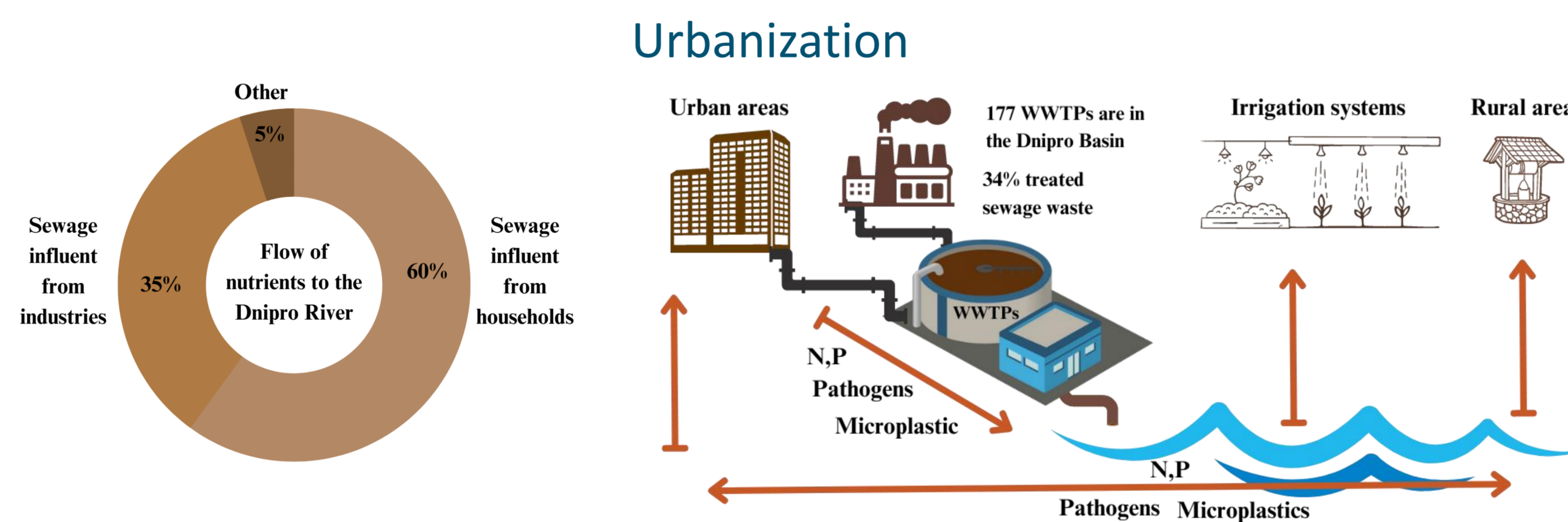


Figure 4. Impacts of urbanization on water quality in the Dnipro Basin (Strokal and Kovpak, 2021; Strokal, 2022)

Driver 3: Military actions

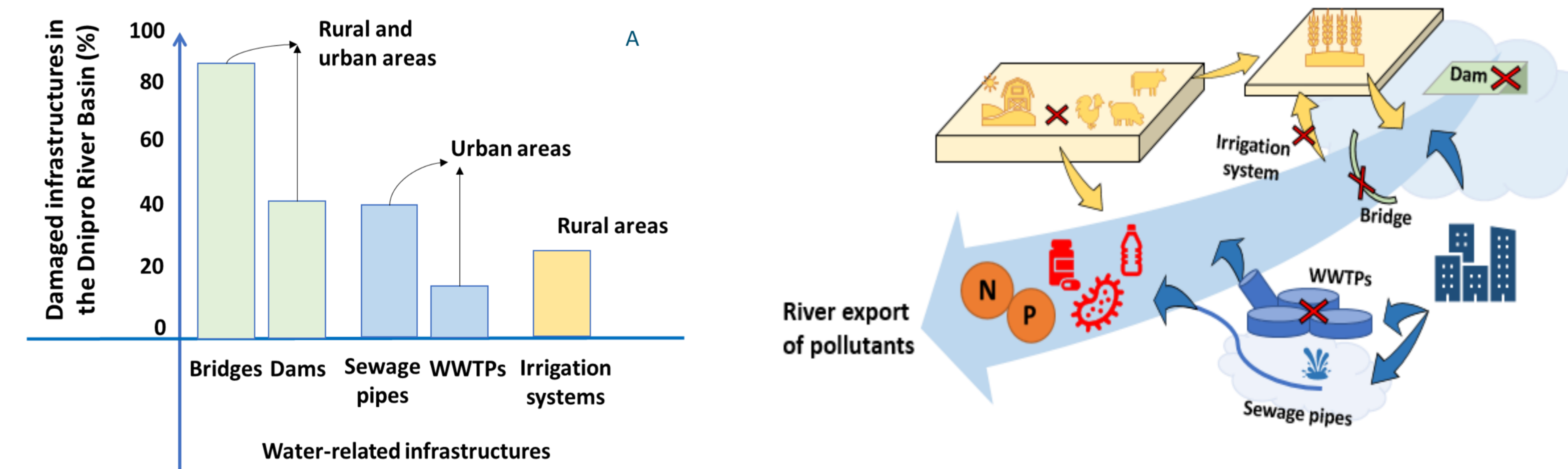


Figure 5. Russian-Ukrainian War (military actions) has many threats on water pollution: A: 30-90% of damaged water infrastructures in the Dnipro Basin (data for the year 2022); B: During the war: more point (untreated) waste coming to rivers (Vita Strokal et al., article under review)

Solutions: example



By 2050: >70% less microplastics in the Black Sea (results of the MARINA water quality model)

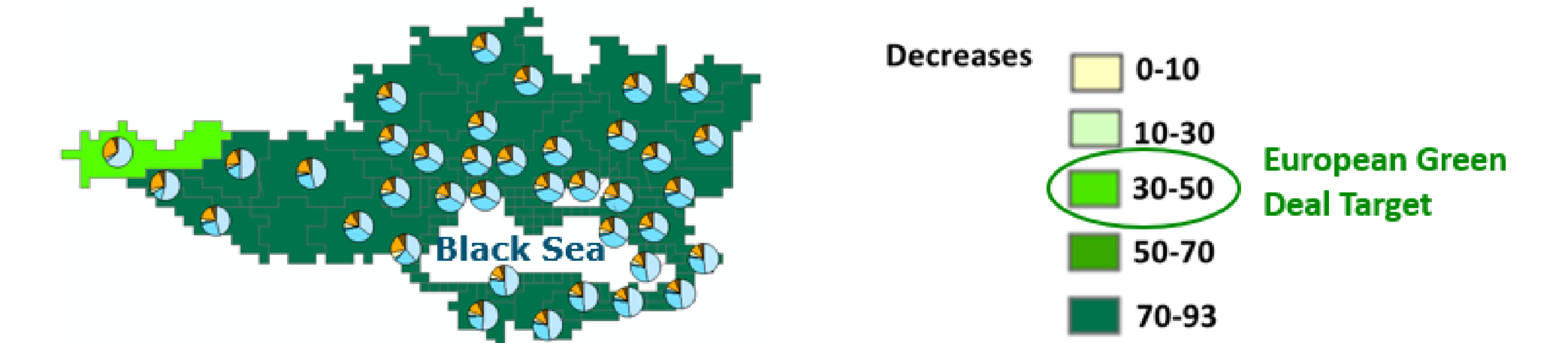


Figure 6. Overview of transboundary rivers flowing through Ukraine and river pollution sources (Strokal et al., 2022)

For the post-war recovery

- New pathways for future sustainable food production
- Novel modeling tools for assessing the crisis resilience of Ukrainian agricultural performance and land use, and water pollution
- New scenarios for the post-war recover
- Knowledge exchange
- Capacity building and networking

Economic Resilience

Governance

Decarbonisation

Water Systems

Figure 7. The CLIMAGRI4Ukraine project 2022-2024 for developing new pathways for the sustainability of food production in Ukraine

References

- Strokal, V. (2021). Transboundary rivers of Ukraine: perspectives for sustainable development and clean water. *Journal of Integrative Environmental Sciences*, 18(1), 67-87. DOI: <https://doi.org/10.1080/1943815X.2021.1930058>
- Strokal, V., & Kovpak, A. (2021). Causes of nutrient pollution in the Dnieper River basin: theoretical syntheses. *Scientific Journal of "Ecological Sciences"*, 2, 35, 37-44. URL: <https://doi.org/10.32846/2306-9716/2021.eco.2-35.6>
- Strokal, V. (2022). Causes of water pollution of the Dnipro basin. International conference (Odesa city, 22-23 July 2022), *Young Scientist*. 100-101.
- Strokal, V., & Kovpak, A. (2022). Military conflicts and water: consequences and risks. *Scientific Journal of "Ecological Sciences"*, 5(44). DOI: <http://www.ecoj.dea.kiev.ua/archives/2022/5/14.pdf>
- Strokal, V., Kuiper, E. J., Bak, M. P., Vriend, P., Wang, M., van Wijnen, J., & Strokal, M. (2022). Future microplastics in the Black Sea: Rive. exports and reduction options for zero pollution. *Marine Pollution Bulletin*, 178, 113633. <https://www.sciencedirect.com/science/article/pii/S0025326X22003150>
- Strokal, M., Strokal, V., & Kroeze, C. (2022). The future of the Black Sea: More pollution in over half of the rivers. *Ambio*, 1-18. <https://link.springer.com/article/10.1007/s13280-022-01780-6>

