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Winter Flooding – The New Risk?



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Introduction

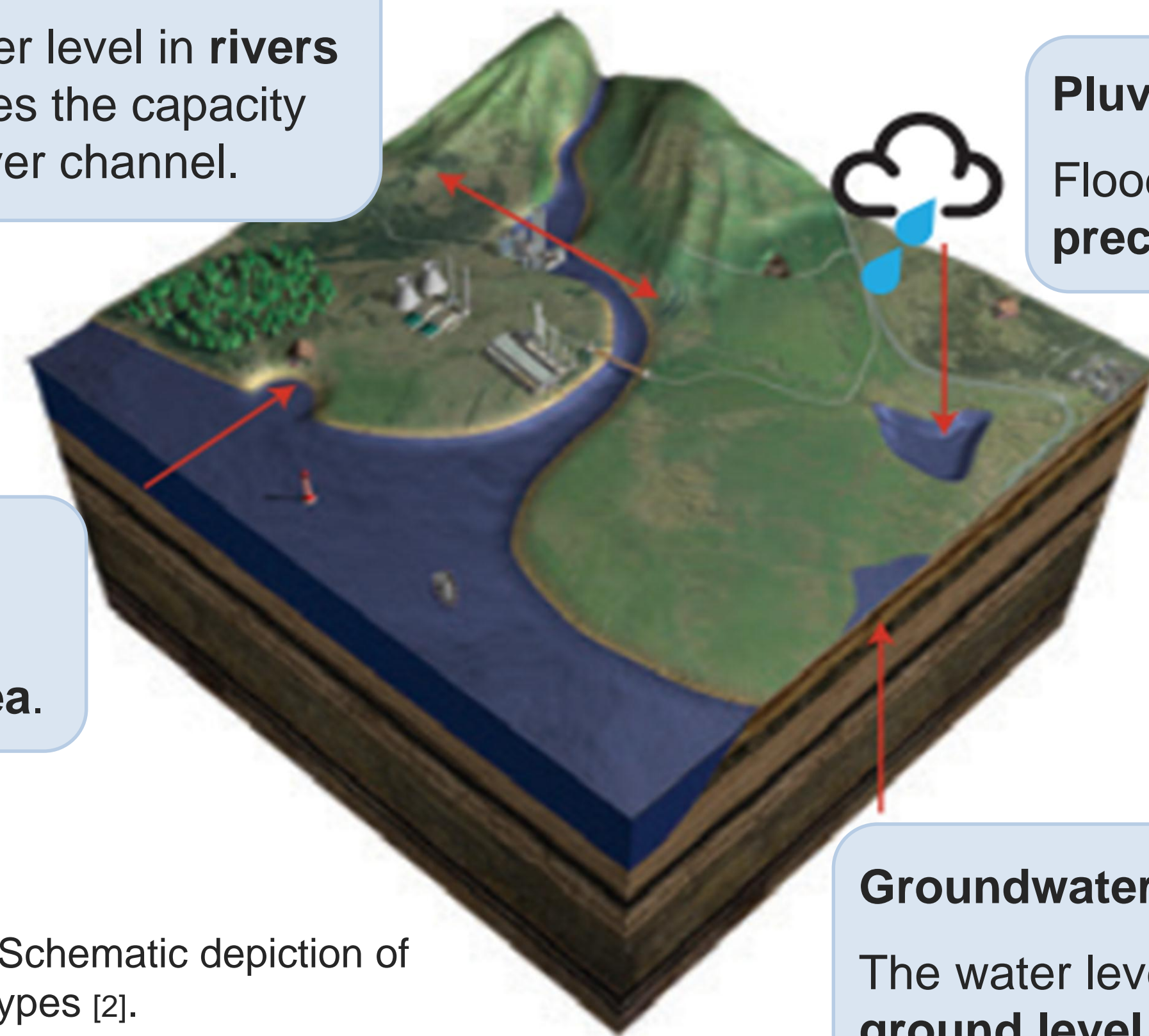
- In the last decades, winter flooding has **increased** in Europe.
- There are **4 main types** of flooding. (see Figure 1)
- Floods cause drastic **catastrophes** with **destruction and death**, but also lead to some **benefits**. (see boxes below)

Fluvial Flooding

The water level in **rivers** surpasses the capacity of the river channel.

Pluvial Flooding

Flooding caused by **heavy precipitation**.



Coastal Flooding

Part of the land is inundated by the **sea**.

Groundwater Flooding

The water level rises **above ground level**.

Fig. 1: Schematic depiction of flood types [2].

Risks of Flooding

- **Injuries and deaths**.
- **Socioeconomic losses** (e.g. 2012 in the UK & IR → 1.2 billion euros) [4].
- **Destruction** [9].
- If it increases, **even usually flooded regions suffer too** (e.g. Aqua Alta in Venice) [9].
- Increase of **heavy metal concentration** in soils → threat to human health [5].
- **Disturbance and loss of species**.

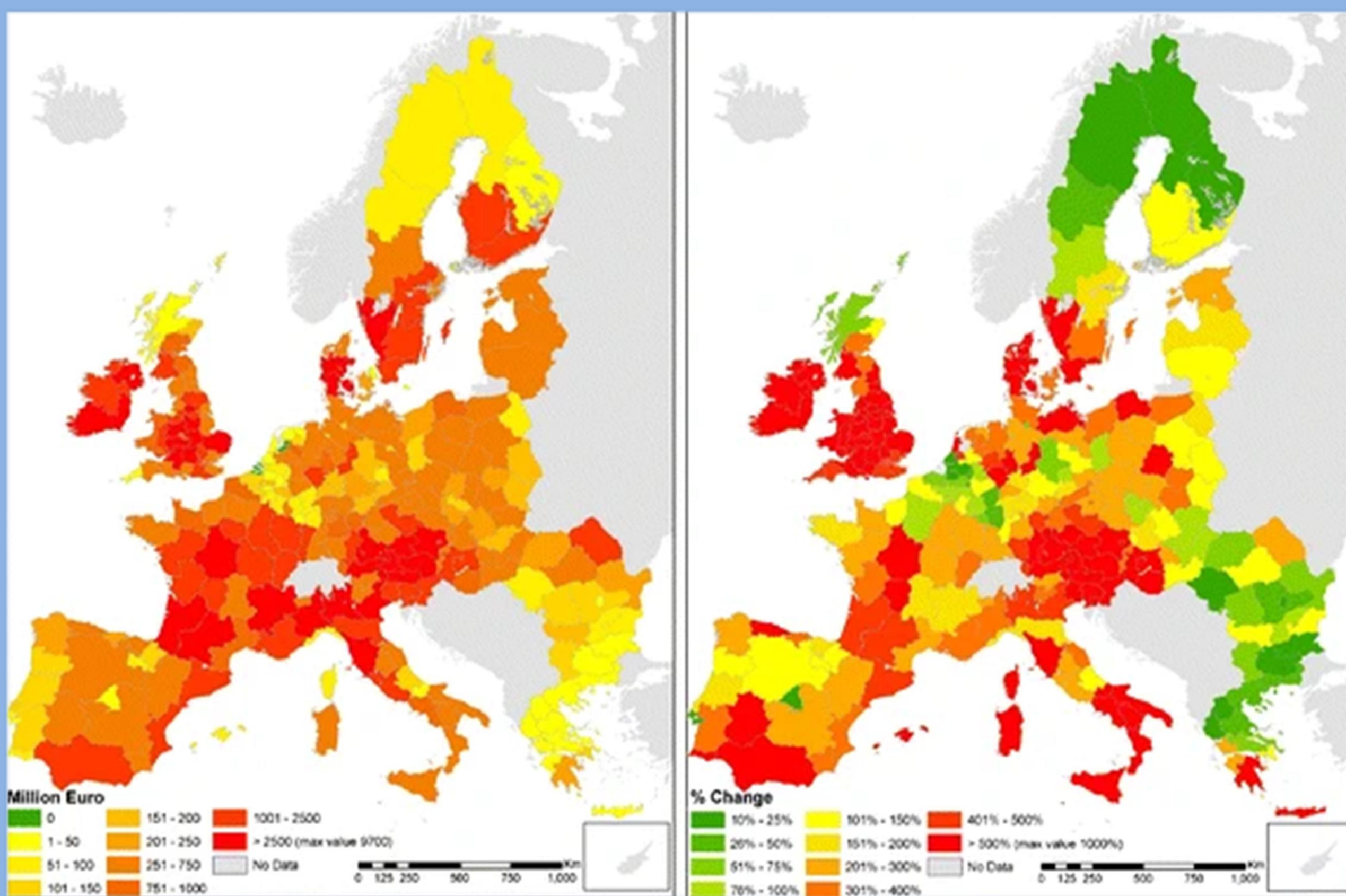


Fig. 2: (Left) Projected damages through floods for the years 2071-2100 (absolute values). (Right) The change of flooding events with respect to the years 1961-1990 (relative values). The maps are based on calculations and assumptions and are only projecting possible changes in a future and warmer climate [9].

Benefits of Flooding

- Increases the **nitrogen availability** in plants [1].
- Raises **waterbird species richness and density** [3] (see Figure 3&4).
- Enhances **straw decomposition** [7].
- Reduces the abundance of **pest species** [7].
- Contributes to **deeper dormancy in rice plants** [7].
- **Naturally, flooded wetlands**: diverse ecosystems [6], water & carbon storage, stabilization of shorelines [3], wintering areas for waterfowl [2].

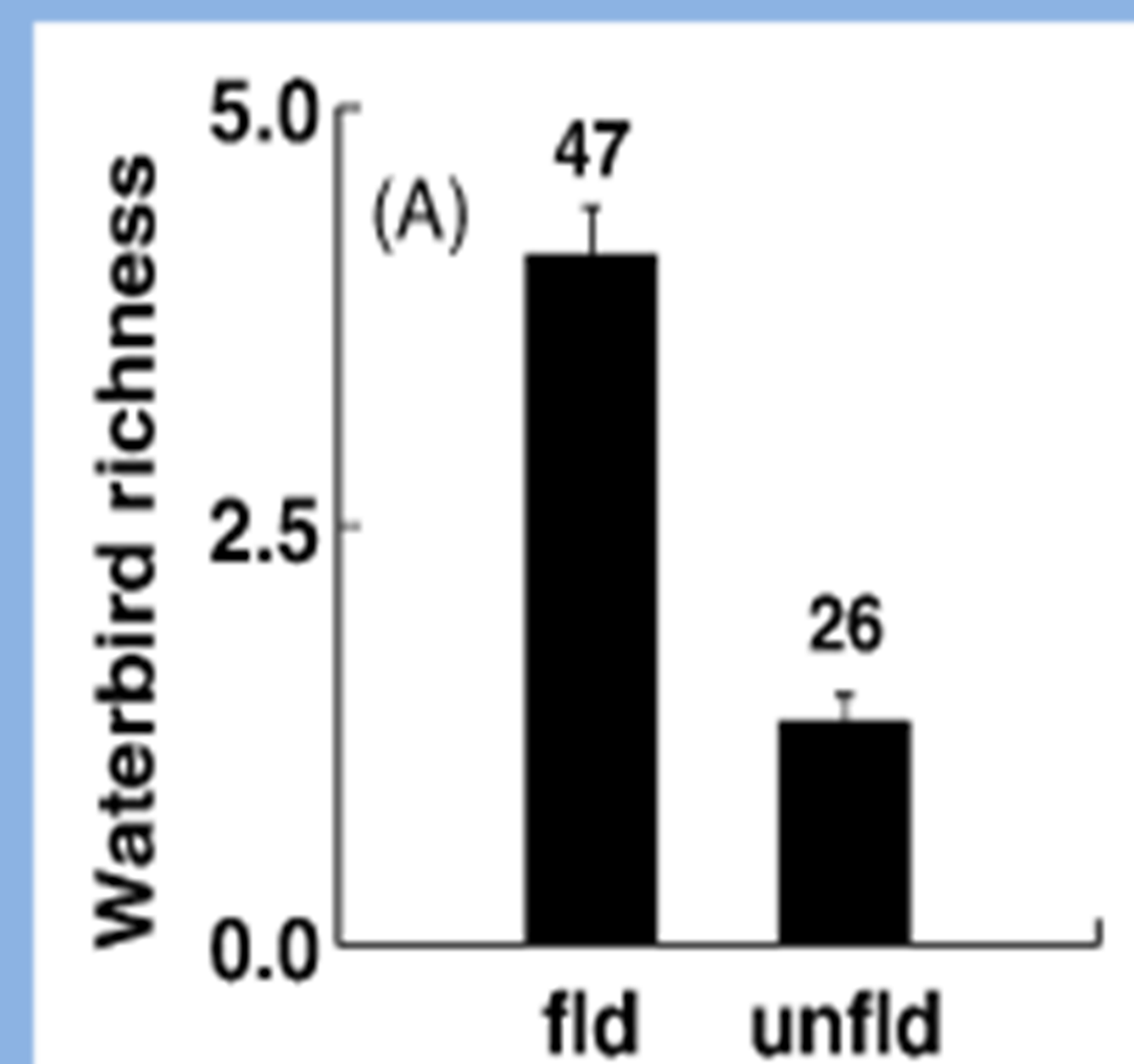


Fig. 3: Mean species richness of waterbirds in flooded and unflooded rice fields in the Sacramento Valley, USA [3].

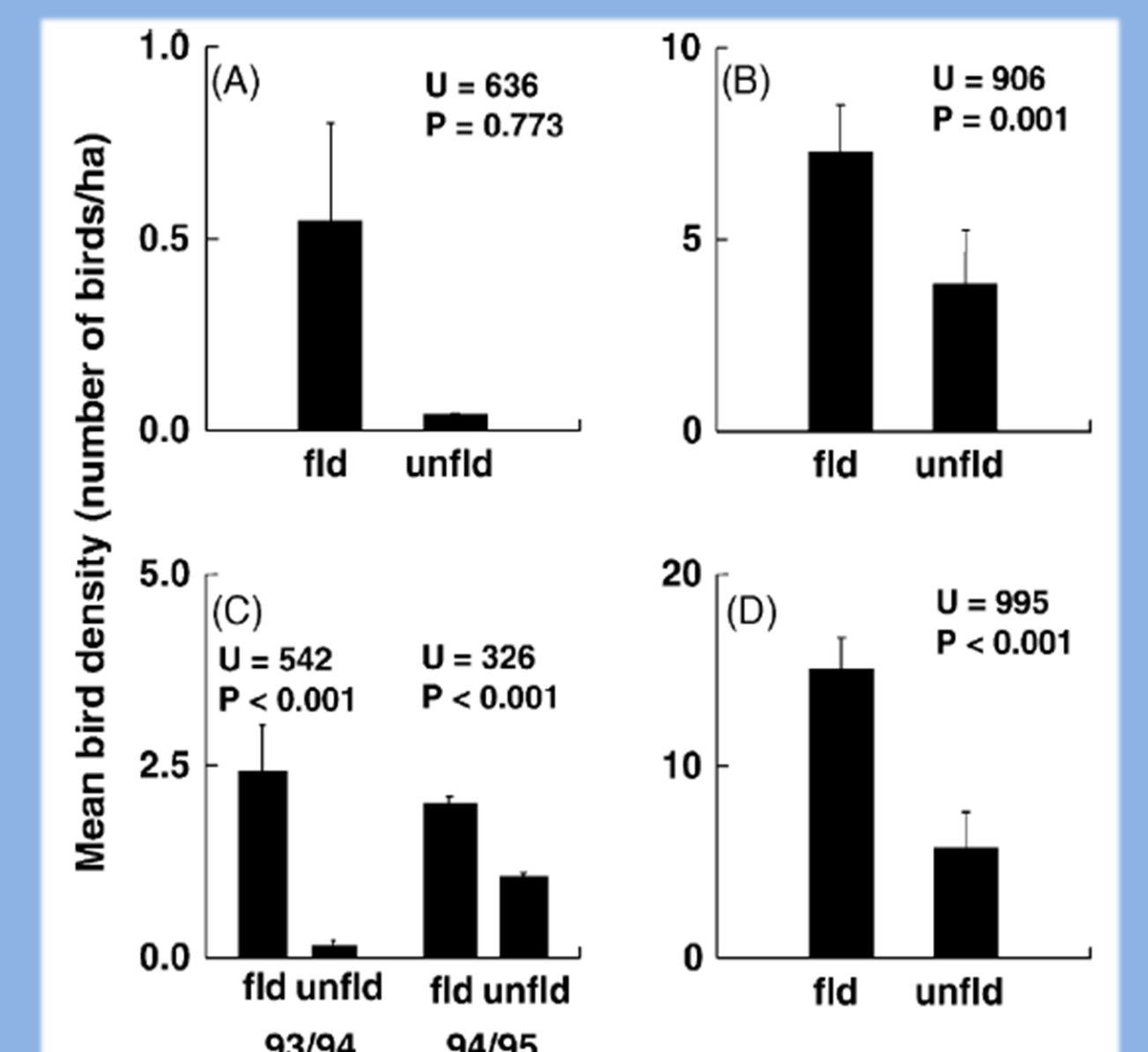


Fig. 4: Mean species density in unflooded or flooded rice fields in the Sacramento Valley, USA. (A) Wading birds, (B) waterfowl, (C) shorebirds, (D) all waterbirds combined [3].

The New Risk?

Winter flooding in Europe **may increase in future**, due to climate change, increasing temperatures, the human influence on rivers and water drainage, surface sealing and the deconstruction of wetlands. However, by **reducing climate change** and **renaturing wetlands**, winter flooding can be better controlled and weakened [8].

References

- [1] A.J., EAGLE et al. (2001): Nitrogen Dynamics and Fertilizer Use Efficiency in Rice following Straw Incorporation and Winter Flooding. Published in Agron. J. 93:1354–1361 (2001).
- [2] C., HUNTINGFORD et al. (2014): Potential influences on the United Kingdom's floods of winter 2013/14. Nature Clim Change 4, 769–777.
- [3] C.S., ELPHICK, L.W., ORING (2002): Conservation implications of flooding rice fields on winter waterbird communities. Agriculture, Ecosystems and Environment 94 (2003), 17–29.
- [4] D.A., LAVERS et al. (2013): Future changes in atmospheric rivers and their implications for winter flooding in Britain. Environ. Res. Lett. 8 034010.
- [5] H.J., ALBERING et al. (1999): Human health risk assessment: A case study involving heavy metal soil contamination after the flooding of the river Meuse during the winter of 1993-1994. Human health risk assessment: A case study involving.
- [6] M.E., HEITMEYER (2006): The importance of winter floods to mallards in the Mississippi alluvial valley. The Journal of Wildlife Management 70(1), 101-111.
- [7] S., FOLIATTO, F., VIDOTTO, A., FERRERO (2010): Effects of winter flooding on weedy rice (*Oryza sativa* L.). Crop protection 29 (2010) 1232-1240.
- [8] S., FOLLMER (2018): Hochwasser: Das sind die Ursachen. URL: https://praxistipps.focus.de/nochwasser-das-sind-die-ursachen_94633. [28.06.2020]
- [9] Z.W., KUNDZEWICZ et al. (2010): Assessing river flood risk and adaptation in Europe—review of projections for the future. Mitig Adapt Strateg Glob Change 15, 641–656.

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