

Flood-risk adaptation strategies of modern global deltas

Sanne Hol¹, Jaap Nienhuis² & Marjolijn Haasnoot²

¹ Master Earth Surface and Water, Utrecht University, Utrecht, The Netherlands
² Department of Physical Geography, Utrecht University, Utrecht, The Netherlands

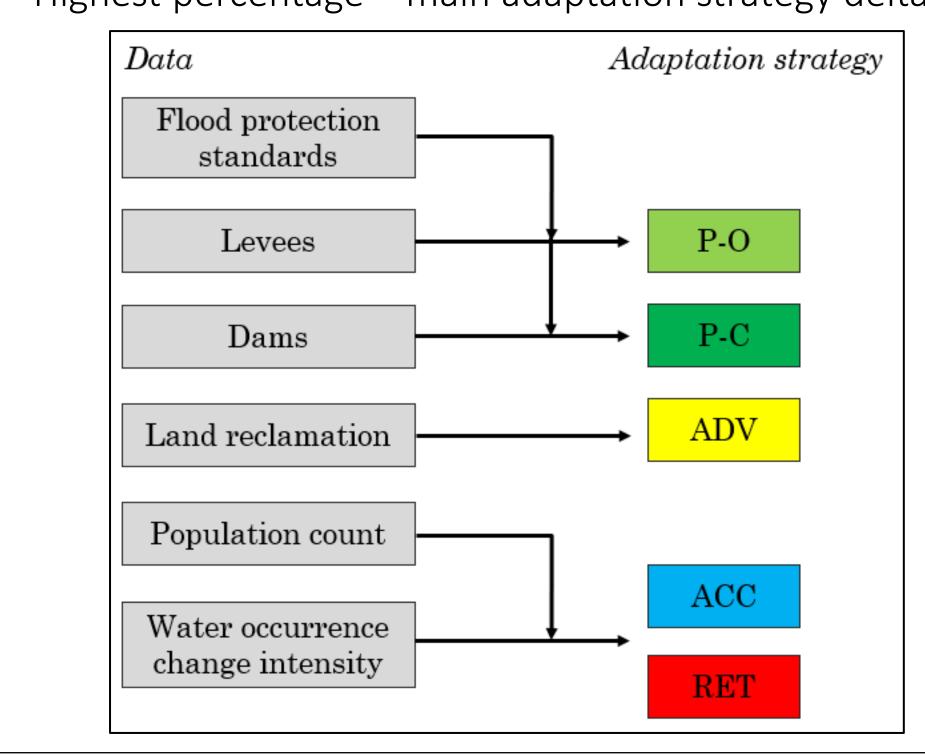
Van Alphen, J., Haasnoot, M., & Diermanse, F. (2022). Uncertain Accelerated Sea-Level Potential Consequences, and Adaptive Strategies in The Netherlands. *Water, 14*(10), 152 Haasnoot, M., Diermanse, F., Kwadijk, J., de Winter, R., & Winter, G. (2019). Strategieën adaptatie aan hoge en versnelde zeespiegelstijging: Een verkenning | Hydrotheek. Deltar

Introduction

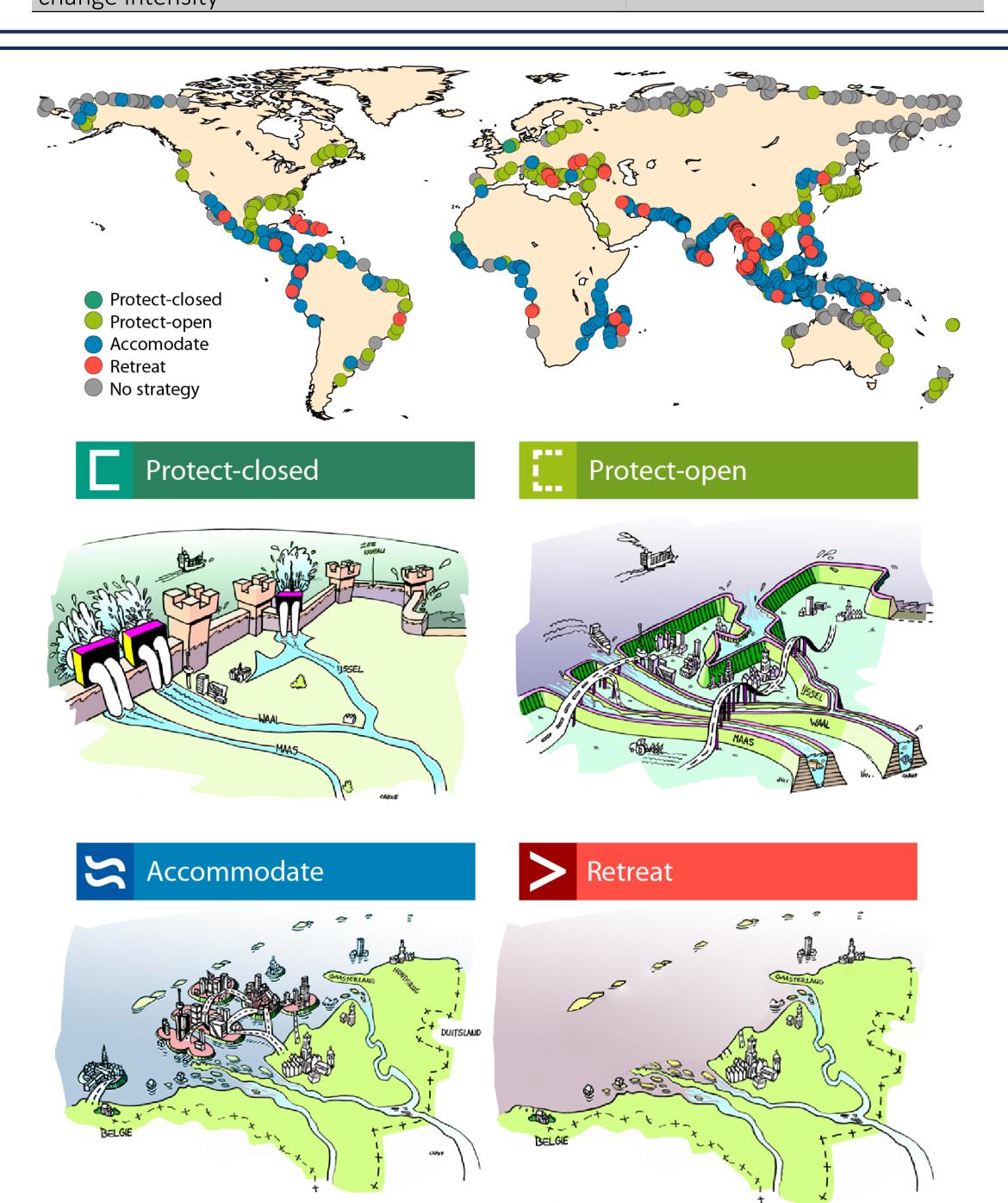
Sea-level rise imposes large challenges to delta communities, one of which is flood-risk. This risk can be mitigated but it requires a dedicated commitment to delta adaptation. Deltas can adapt through 5 distinct adaptation strategies: protect-closed (P-C), protect-open (P-O), advance (ADV), accommodate (ACC), and retreat (RET). While specific studies, delve into flood-risk adaptation strategies for individual deltas, there is an absence of a global overview. In this research, the focus is on presenting an overview of the current state of coastal flood-risk adaptation strategies for 810 deltas.

Method

- Multiple datasets are analyzed using GIS and clipped with each delta
- For each delta, the percentage of surface area dedicated to each adaptation strategy is determined
- Highest percentage = main adaptation strategy delta



Data	Source
Delta polygons	(Edmonds et al., 2020)
OpenDELve: levees	(Nienhuis et al., 2022)
FLOPROS: flood protection standards	(Scussolini et al., 2016)
GRanD v1.3: dams (flood-control)	(Lehner, et al., 2011)
Coastal land reclamation 21st century	(Sengupta et al., 2023)
GPW, v4: population count	(CIESIN - Columbia University., 2018)
Global Surface Water Explorer: water occurrence change intensity	(Pekel et al., 2016)

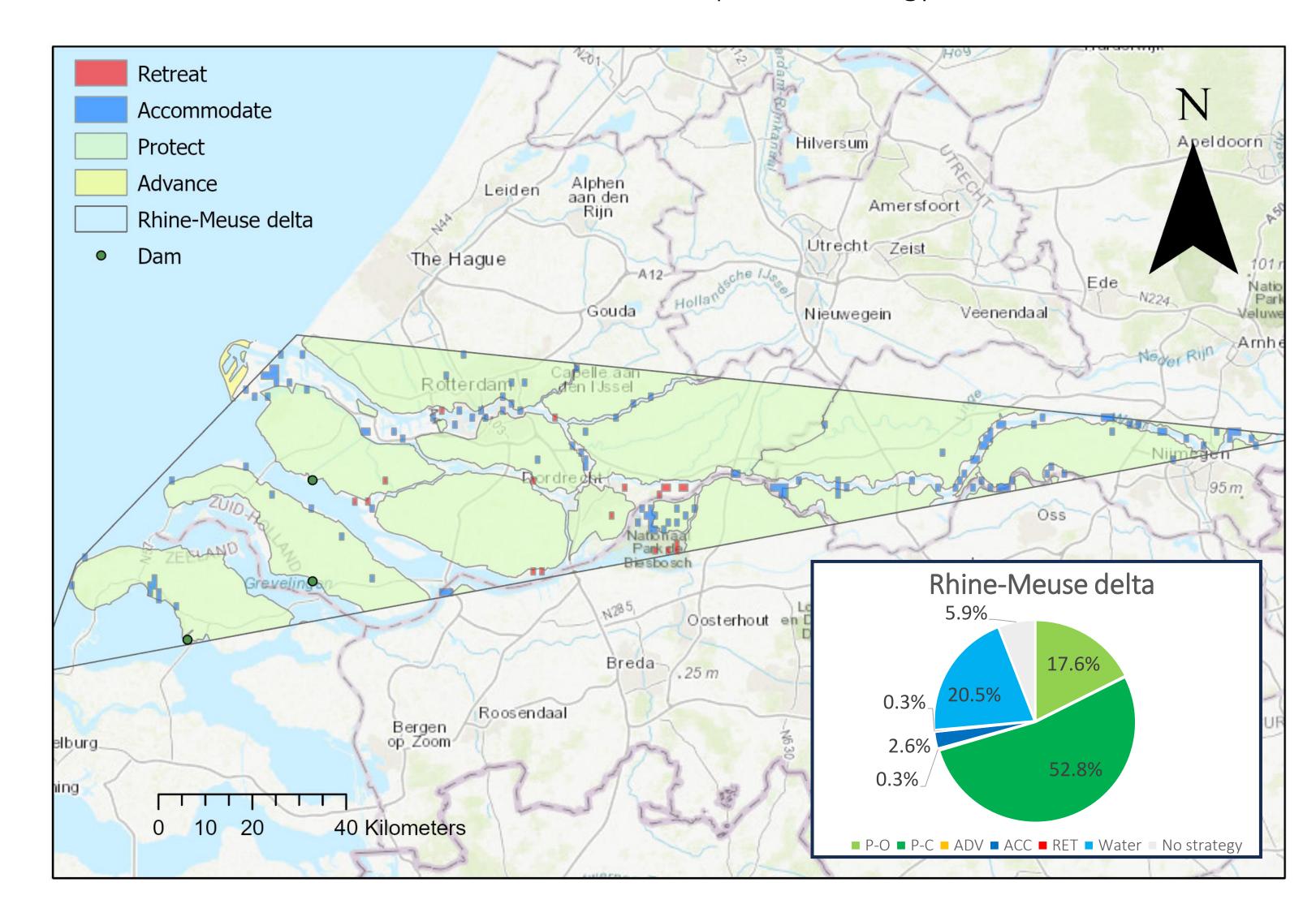


Advance

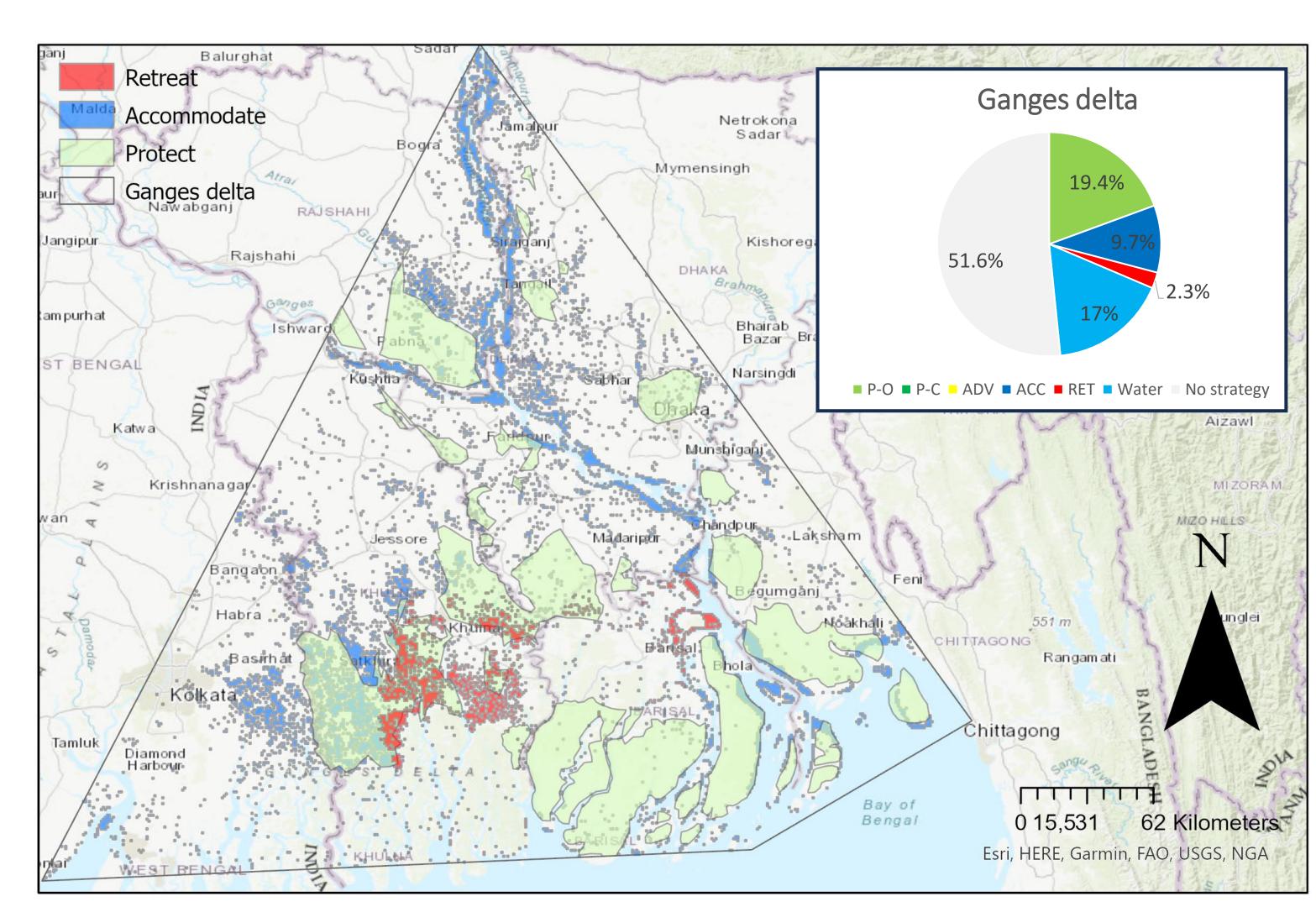
Global Distribution

Results

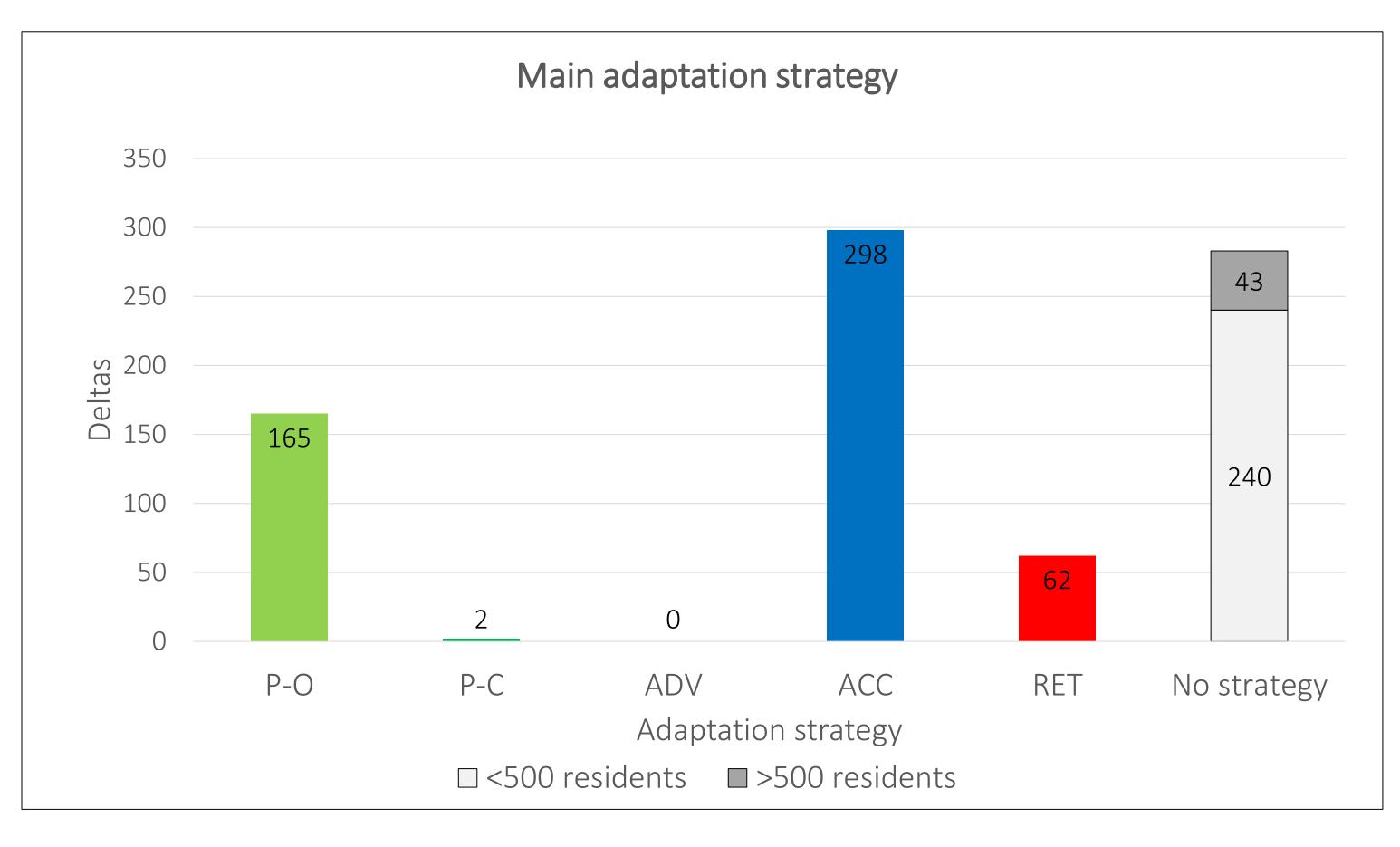
• Rhine-Meuse delta: has a main flood-risk adaptation strategy of P-C and P-O



• Ganges-Brahmaputra-Meghna delta: has a main flood-risk adaptation strategy of P-O



• 810 deltas:



Conclusion

- Most deltas adopt ACC and P-O
- RET and P-C are also used as main adaptation strategies in deltas, but their prevalence is lower
- ADV has not yet emerged as the main adaptation strategy, but is implemented in conjunction with other strategies
- 34.9% of the deltas has **not adopted any strategy,** with 5.3% of them having a significant population
- Regional variations in adaptation preferences are evident
- In Europe & Central Asia, the main adaptation strategy is P-O, whereas in the Americas, Africa and the Asia-Pacific region, there is a greater inclination towards the ACC strategy