

# Science for Environment Policy

## Water management planning approach deals with deep uncertainties

**More adaptive approaches to planning** could help policymakers deal with deep uncertainties about the future of our planet. Researchers have developed a method for adaptive planning which they suggest could protect against failure when future predictions turn out to be inaccurate. They illustrate their approach using the case of water management in the Rhine Delta region of the Netherlands.

**It is difficult to know or predict** exactly what the world will be like in the future. Faced with uncertainty, policymakers often make plans based on the most accurate predictions available. However, if the future does not turn out as predicted, even the best plans for that future will fail. It might be better to incorporate flexibility into planning from the outset, to enable planners to deal with a range of futures.

In developing their method, the researchers began by describing two existing adaptive planning approaches. The first, the Adaptive Policymaking method, is a step-by-step process for developing a basic plan along with contingency plans that allow for adaptation as time goes on. The second method, Adaptation Pathways, involves creating a plan as a map of various actions that can be followed or introduced later depending on progress towards targets.

They integrated the two methods to create a new approach that they call 'Dynamic Adaptive Policy Pathways' for planning in situations of deep uncertainty. They illustrated how this approach could be used by developing a long-term water management plan for the Rhine Delta region which faces an uncertain future due to [climate change](#).

The first step in their process is to describe the current situation in the region, including constraints and uncertainties, as well as a definition of a successful outcome. For example, in the Rhine Delta region, they defined success as there being enough freshwater and no flooding for the next 100 years. Under the [Water Framework Directive](#)<sup>1</sup>, success would also depend on there being no negative impacts on nature.

Step two is a problem analysis. In the case of the Rhine Delta, they focused on coastal flooding, which causes saltwater intrusion and, during dry periods, a lack of water for purposes including irrigation. Due to uncertainties in climate predictions, it is not clear how serious these problems will become in the future and when this may occur. The researchers therefore considered future scenarios covering a range of different climate and population growth scenarios for the Netherlands.

In further steps, the researchers suggested ten potential actions and assessed their effectiveness. They gave the actions 'sell-by dates', which indicate when changes might be needed if targets are not met. For instance, they suggested using existing infrastructure to allow water levels to increase by 10 cm in the Rhine Delta. This is a low-cost option for dealing with flooding, but has a short sell-by date of 2050–2060. Meanwhile, increasing cultivation of salt- and drought-tolerant crops is costly, but has a sell-by date past 2100. In a fifth step, the researchers plotted the most logical pathways through these actions — each pathway is a series of different actions that should lead to success of the plan overall.

The next three steps involve selecting the preferred pathways, determining 'signposts' and 'triggers' that indicate that a sell-by date will be reached. The pathways specify a plan for initial actions, along with options to cover a range of future scenarios. Theoretically, the plan would be implemented along with a monitoring programme, which in the Rhine Delta case would monitor sea-level rise and changes in regional water demands.

According to the researchers, although their approach is complex, it encourages planners to consider adaptation over time at the outset. The plan they developed has been used as inspiration for Adaptive Delta Management in the Netherlands, which is the cornerstone of the climate adaptation strategy in the Dutch Delta Programme.

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1. [http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)