How to select drought adaptation measures for a resource-efficient and circular economy

Stijn Reinhard, Nico Polman and André Wooning

Introduction

Even a water rich country such as the Netherlands does not have enough freshwater available of the right quality at the right place at the right time in drought years. Towards 2050, these problems are expected to occur more frequently and more severely as a result of climate change and increasing water demand.

To deal with climate change, the Dutch Delta programme analysed measures to reduce water shortage for different water users, based on a long list of measures that have been elaborated by the Dutch government, water boards and provinces.

Objective

How to develop and implement a resilient investment portfolio of measures to reduce the impact of more frequent freshwater scarcity in future.

Methods

The freshwater scarcity adaptation hierarchy is based on economic literature (incentives, management, innovative potential, and cost effectiveness) and case studies covering Dutch policies that include private or collective problems and private of public measures.

Table 1 Case studies: lessons for selecting measures

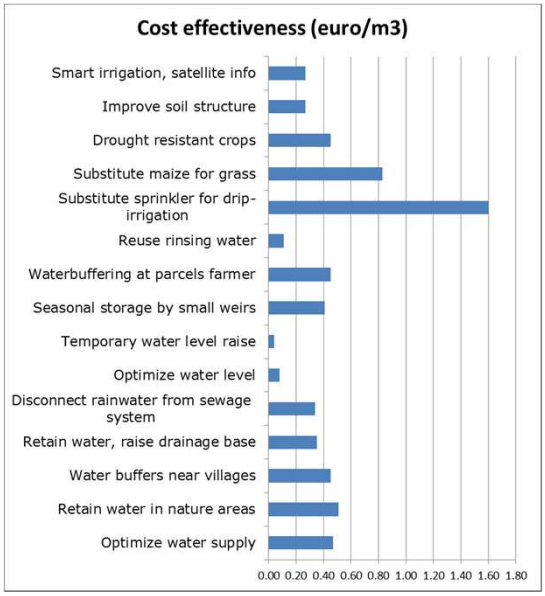
Policy category	Perceived problem	Measures	Lessons learnt
Water supply	Private & public	Private & public	
Flood	Private	Public	Economies of scale: protection of private goods can be arranged publicly
Surface water pollution	Public	Private	Innovation and adaptation of water users at firm level prevent large scale public measures
WFD	Public	Private & public	Three requirements for a CEA approach (transparent, pragmatic, sound results)
Waste	Public	Private	Waste hierarchy is straight forward ranking potential measures according to environmental impact

Figure 1 The freshwater scarcity adaptation hierarchy

Table 2 Criteria for water scarcity adaptation hierarchy

	Supply hierarchy	Demand reduction or supply	Management	Innovation	Costs	Example
1	Save	Demand	Private	++	+++	More advanced drought measurement
2	Substitute	Demand	Private	+++	+	Substitute water for capital (drip irrigation)
3	Reuse wastewater	Supply/ demand	Private	+++	--	Greenhouse
4	Store locally	Supply	Private	+	-	Water basin
5	Store regionally	Supply	Public	--	--	Reservoir
6	Supply other region	Supply	Public	---	-	Canal

When we rank the Delta programme measures according to the water scarcity adaptation hierarchy, it becomes clear the three lowest categories contain more measures than the highest three categories.



Conclusions

- Evaluation of Dutch water policies shows that for cost effective measures in the long run, adaption of measures by the water user is most important, but most difficult to evaluate ex ante.
- Water scarcity adaptation hierarchy facilitates the process of ranking measures. It can be easily understood by hydrologists, economists and water users.
- Advantages are (i) stimulates innovation (ii) facilitates sustainable development (iii) stimulates resilient solutions because it provides water saving incentives at every level (iv) prevents that large-scale public investments may be become obsolete.

LEI Wageningen UR
Alexanderveld 5, 2585 DB The Hague
Contact: stijn.reinhard@wur.nl
T + 31 (0) 70 3358210, M +31 (0)6 51832827
www.wageningenur.nl/nl/Personen/dr.ir.-AJ-Stijn-Reinhard.htm

Rijkswaterstaat
Zuiderwagenplein 2, 8224 AD Lelystad
Contact: andre.wooning@rws.nl
T + 31 (0)6 20490576
www.rijkswaterstaat.nl