

Imagining Climate Futures

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As climate change worsens, measures that take into account the visions for the future of those affected are crucial. Research conducted in the waterlocked Dutch city of Dordrecht prompted stakeholders to imagine climate futures, leading to rich insights into possible developments caused by climate change, how to tackle it and its effects. While climate change poses a challenge for the future of various cities across the globe, the case study of Dordrecht lets four imagined futures emerge and is blueprinting a way to achieve climate resilience in a participatory way.^[1]

Sinking city, rising water

With climate change accelerating, cities are increasingly affected by various extremes, their populations increasingly challenged. Various futures for their livelihoods can be imagined. Research conducted in the city of Dordrecht, an island in the south-western Dutch Delta which has a long and painful history with water, let various old challenges re-emerge which are likely to worsen with ongoing climate change. The Netherlands are generally facing increasing climate challenges, among others the threat of sea-level rise for this low-lying country. Dordrecht is particularly vulnerable, situated at the meeting point of the sea's tidal influence and the surrounding rivers. The city is located in part below sea level and is made partly of clay, making the penetration of rainwater into the soil more difficult. Moreover, drainage of large parts of the Netherlands to make the land arable is causing areas made of peat to shrink, releasing carbon emissions and lowering the surface even further. While this is also happening in Dordrecht, the city's challenge, surrounded as it is by one dyke ring and in parts below sea level, is significantly increasing with climate change and sea-level rise. Climate induced extremes are another source of disruption in the city, with extreme rain events causing local flooding and other problems, as well as heat stress, which is generally a problem for any highly urbanised area.

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Historic disasters are particularly significant for this port city. Dordrecht originated as a small riverside settlement in the 12th century. It controlled its stretch of river and the passing trade, which made it rich and successful and it received various rights only granted to cities. The surrounding areas were increasingly made arable and controlled through various drainage systems that consequently lowered the surface. This unfortunately coincided with political turmoil that led to poor maintenance of the dykes around the city, putting the city increasingly at risk of flooding. The St. Elisabeth flood of 1421 reclaimed vast areas of land back to the sea and made the city an island, which it remains today. This flood is engraved in the cultural memory of the city, and caused Dordrecht to experience relative decline in the following centuries. The combination of storm surge and high river discharges

that caused the 1421 flood reoccurred in 1953, flooding large parts of the Netherlands and leading to over 1800 people drowning. As a result, sophisticated flood protection schemes were constructed. However, recent decades were again marked by floods and extreme weather events caused by climate change, with the risk of such occurrences set to increase in the future.

A way out: narratives of change

With past disasters in mind, Dordrecht is aiming to safeguard its population of currently around 120 000 people through water safety measures and climate adaptation. The success of many climate resilience measures will depend upon both citizens and authorities being on board. In this context, imaginations of both desirable and undesirable futures that lead to participatory climate measures become ever more important. In response to this need, research carried out with local, regional and national authorities and organisations as well as citizens of a case-study area in Dordrecht explored perceptions and desires for a future shaped increasingly by climate change. Narratives – which are in principal stories around realities and futures – connect actors, events and different times, letting people organise experiences and make sense of the world, and turn “matters of fact” into “matters of their concern”. They explain past events and give an outlook for the future, while allowing the co-producing of climate resilient futures and including actors – and the lessons they bring – that are not always heard in policy debates, prompting them to actively participate in planning for the future of their city.

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Exploring the interviewees’ narratives and focusing initially on past and current events around weather and water, a colorful picture of various possible ‘climate futures’ that affect the city and its inhabitants emerges. Past disasters such as the St. Elisabeth flood of 1421 and the North Sea Flood of 1953 remain very much alive and are collectively stated as something that ought to be prevented from reoccurring in any climate future. Recent climate impacts such as heavy precipitation, particularly in 2015, were also discussed. History strongly shapes how a climate future is imagined and poses as a strong reference for why action to avoid such disasters is taken. Also mentioned was climate change, the common underlying stress factor for Dordrecht, and the various impacts it has on the city already and which are expected to become more severe and frequent in the future. A common outlook for a climate future was given by authorities and citizens, although there were differences when it came to specific issues of concern and actions to deal with these. From these conversations and gathered data, four scenarios for Dordrecht’s climate future emerge.

Doomsday Future

One possibility for Dordrecht is a ‘doomsday’ scenario evolving in the future, which is in principle a reoccurrence of the disastrous combination of a westerly storm approaching by sea, high tide and river discharge that leads to a complete failure of the surrounding dyke structure. In case such a future arises, narrations reveal that “[...] within the shortest time the entire area [is] under water [...]” and Dordrecht and potentially large parts of the South-Western Netherlands become submerged under several meters of water. Such a future is a possibility, especially when humanity is not tackling climate change and the Earth is in principal changing its systemic state with the transgression of planetary boundaries so severely that it “[...] threatens the very suitability of the planet for humans to thrive in the long run [...]”.

With increasingly severe and frequent disruptions, Dordrecht’s residents may move to higher areas in the Netherlands, being aware of the limited ability of any dyke structure to keep the city safe. Those most affected by

rising water levels and local firms may be first to leave, potentially leading to a rather rapid depopulation of Dordrecht. Interviewees emphasised that such a future ought to be prevented at all costs through climate action. One explicitly stated idea was to make sure that some people always remain present in Dordrecht, including in times of major flooding, since their capacity as “pioneers” is crucial for rebuilding the city after disaster strikes. However, interviewees also stressed ambiguity, especially since climate change needs to be tackled in a collaborative effort by actors at all societal levels across the globe.

Disruptive future

While the doomsday scenario is a real possibility the city is actively preparing for, recent research also shows that the dykes around Dordrecht are stronger than expected, making the complete inundation of the city possible but less likely than initially anticipated. Nevertheless, climate extremes are increasingly threatening the city and in another scenario will lead more often to floods due to heavy precipitation that the city cannot cope with, disrupting its functionality. In this future, pluvial flooding as well as heat stress causing bridges to malfunction are expected to disrupt life in Dordrecht and increasingly threaten its population. Stakeholders’ attempts to avoid the most severe effects through measures like increasing retention of rain water and creating more green areas to prevent heat stress limit impacts to some extent, but nevertheless the citizens of Dordrecht feel climate impacts in their lives due to the unpredictability of extremes.

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One idea that aims to reduce the most disruptive impacts of events in this future is to prepare the population around certain weak points in the dyke ring and to have evacuation facilities for the most vulnerable people in those areas on alert, especially during the generally riskier storm season during winter and autumn. However, in this future climate-mitigating actions are taken only by some people and cannot prevent the most severe impacts of climate change as more widespread efforts in tackling climate change are needed.

Challenged but bearable future

With the various climate challenges expected to cause disruptions for Dordrecht in mind, many implemented measures are effectively preventing the most severe disruptions, making climate change bearable under this future. Stakeholders invest in stronger protection and sewage systems so as to cope with climate extremes, and in many parts of the city they achieve a transition away from the to-date mainly fossil-fuel based heating and transport system, in line with large proportions of the world.

Both climate mitigation and climate adaptation are carried out, though climate extremes are nevertheless present and challenging the city since humanity realised rather late the importance of climate mitigation. While the sea level is still rising, in this scenario there is in general more room available for water in the Dutch Delta, allowing the city of Dordrecht to cope with arising extremes and Westerly storms in addition to having some parts of the newly built city areas elevated to prepare for a potential large-scale flooding. Giving water more room by removing dykes or widening the water-channel are among the measures mentioned by stakeholders, although these take a rather long time to be finalised. Adaptation measures in the city focus strongly on extreme rain, for example, and making neighborhoods like “a sponge” in order to keep excess water locally and temporarily stored so as to prevent any wider flooding of the city. Such measures may be implemented sooner rather than later and in parts are already happening today. With some systemic aspects being dealt with and mitigation under way, a strong focus in

this future is on adaptive measures. Yet due to the known limits of adaptation, climate mitigation is increasingly happening in addition to a transition away from fossil fuels, giving hope that the most extreme version of climate change can be avoided and that humanity can bear its effects.

Climate resilient safe future

This anticipated future is the one that has at its core successful climate action around both mitigation and adaptation, and as such offers the possibility that a good life for all becomes a reality and humanity collaboratively acts on climate change. Systemic and integral solutions are both implemented and under way, which means that any urban development affecting Dordrecht is tested for both its durability in case of climate extremes as well as its zero-carbon construction and life cycle. Climate extremes that are occurring – both heat and excess pluvial water – are reduced by a large array of stress-reducing measures. The citizens of Dordrecht know very well how to collectively deal with any potential large-scale inundation of the city due to breaches of the dykes. A voluntary brigade of people forms an array of local “climate change champions” that mainstream adaptation to extremes and take further climate-mitigative measures in the shift away from fossil fuels.

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Socio-economic factors that are currently negatively affecting the city are effectively dealt with; citizens have possibilities to attain their wishes for a safe and resilient future in Dordrecht, and both authorities and inhabitants are working together to achieve a climate-neutral and resilient city. Authorities collaborate actively with both each other and citizens and all actors carry out mitigative and adaptive measures together. By doing this, a carbon-free life in Dordrecht becomes a reality for all and the already occurring impacts of climate change are effectively tackled. Along the way, authorities and citizens verify that the path they are following is both in line with their anticipated future and effective in dealing with climate change. Within this future, humanity is collaboratively tackling climate change, achieving a good and sustainable life for all, and reaching carbon neutrality across the globe, which halts the most severe impacts of climate change and in turn allows a prosperous future for all to become a reality. Elements of this future – the most imaginative of them all – are expressed wishes; their realisation, however, depends on the determination of the acting stakeholders and decision-makers as well as those pioneers already now acting as front-runners on climate action.

New imaginaries

Imagining climate futures reveals a rich array of expectations and actively involves the various actors that have a stake in future-proofing the city. While the imaginaries shared some elements and diverged on others, co-created measures for climate resilience are more likely to gather the support of those involved. The stories reveal how climate change is already impacting the lives of the interviewees, and that climate measures – both adaptation and mitigation – will likely be met with support in any of the future scenarios. Currently, all four futures may become a reality; much hinges on the collective efforts of humanity to deal with climate change. While a doomsday future is a possible, the disruptive scenario appears likely if further measures are not taken. A common desire for a safe future and large collaborative action to keep the Dutch Delta safe would make a challenged but bearable future an achievable possibility. Nevertheless, the problems the city is likely to face within a challenged but bearable future will nevertheless be significant and are often overlooked. A climate-resilient and safe future, depending clearly on collaborative efforts both locally and globally, appears to be the most imaginative but also the most promising

future in the long run. However the future may unfold, all stand to be affected by climate change, meaning all should be involved in determining what action must be taken.

[1] This article evolved out of participatory action research which involved 24 semi-structured narrative interviews in a case study area of Dordrecht, the Netherlands. This research is part of the ongoing European project co-development of place-based climate services for action (CoCliServ). See Marschütz, B. & Wardekker, J. A. 'Narratives of Change for a Resilient Future City' in *Utrecht Conference on Earth System Governance* (2018), and Marschütz, B. 'Narratives for a future-proof city: The case of Dordrecht, The Netherlands', (Utrecht University, 2018).



Benedikt Marschütz has experience in ecosystem management and applied sustainability research that closely links with his increasing focus on collaborative governance of sustainability transformations and climate action.

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