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The Technopolitics of Desalination in Saudi Arabia

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Abstract

Despite its location in one of the most arid regions worldwide, Saudi Arabia is the third largest water consumer per capita. Desalination technology turns seawater into the main source for drinking water, fuelled by petroleum in order to provide its population with water. Besides, control over water infrastructure contributes to the state's distributive power within the Saudi Arabian rentier economy. However, increasing demand for water on the one hand and scarcity of and declining demand for oil on the other hand urge the government to reconceptualise its water and energy policies as illustrated in the reform program Vision 2030. With reference to the concept of technopolitics, it will be illustrated how Saudi Arabia attempts to maintain the power while its commitment to environmentally friendly water supply remains rather superficial.

Keywords: desalination, technopolitics, Saudi-Arabia, Vision 2030, water scarcity

Introduction

Saudi Arabia is located in one of the most arid areas worldwide. Concurrently, the oil-based economy is booming, and the daily water consumption peaked at 263 litres per capita in 2019 (Water Politics 2019). Today, desalination plants situated along the Saudi's coastline provide 50% of the country's water requirements and 70% of its drinking water, making Saudi Arabia the largest producer of desalinated water (Ouda 2014: 347). Given the global climate crisis, the extraordinary high amount of water use is alarming. As a growing population demands increasing amounts of the resources water and oil, the government presented several political readjustments in their development program Vision 2030. It aims, broadly speaking, for the diversification of the Saudi Arabian economy in order to terminate the oil dependency and to engage in the renewable energy market. Desalination technology gains importance in the country's non-conventional water sources, thereby playing a crucial role at the intersection of water and energy supply. Its management exemplifies how Saudi Arabia intends to tackle water scarcity and its dependency on hydrocarbon. The following analysis will explore how the water policies of the Saudi state reflect its strategies to maintain power in times of scarcity and climate change. Additionally, I will point to the limits of the rentier state whose legitimacy is based on the unrestricted availability of oil and other natural resources.

With respect to a more comprehensive understanding of Saudi Arabia's water and desalination policies, the concept of technopolitics provides an analytical tool considering the intersection of technology and political power. I argue that technopolitics not only helps to understand the intersection between desalination and political power. It also reveals strategies of the Saudi Arabian rentier economy to address economic and environmental pressures in times of scarcity and climate change.

First, I will discuss the concept of technopolitics in light of the Saudi rentier economy. Second, I will outline the emergence of desalination technology in the country in order to contextualise the water policies in Vision 2030. Third, it will be examined how Vision 2030 facilitates the commodification of water against the background of growing privatisation and diversification of the national economy. Finally, environmental consequences of desalination and shortcomings of water policies will be discussed. In short, desalination technology underpins the legitimacy of the Saudi Arabian state which attempts to alleviate growing pressure to reform as well as environmental damage through technopolitical short-term solutions.

Technopolitics in Saudi Arabia

The term technopolitics describes how technology is used to pursue political goals and to express the manifestation of power (von Schnitzler 2016: 10). Referring to water infrastructure, Obertreis et al. state that "the main thrust in the neoliberal era is the use of market mechanisms and technological fixes as a solution to environmental problems." (Obertreis et al. 2016: 171). As a result, infrastructure policies may not only reflect the developmental needs of a country but also include cultural norms, governance patterns, or funding mechanisms (Obertreis et al. 2016: 172). In the case of Saudi Arabia, water supply and the control over resources define political authority as governing and policing of the nation-state's territory strengthen the sovereignty and power of the Saudi state (Jones 2010: 10).

These features are echoed in the rentier state theory that was formulated by Hossein Mahdavy in the 1970s and remains prominent to describe state-society relations in oil states. The social contract demands obedience and political passivity from the population in exchange for wide-ranging subsidies and the redistribution of wealth that is accumulated through rents of export revenues (Faudot 2019: 95). However, a major criticism emerges out of the simplistic dichotomy between the state as political, and civil society as private realm. As Hanieh points out, the theory misses the interconnection between the ruler – in this case the Saudi royal family – and a bourgeoisie with exclusive access to oil rents (Hanieh 2015: 2-3). Consequently, this elite profits from client-patron relationships that channel distribution and depict the power base of the authoritarian state (ibid). Given the insufficient data available on how clientelism shapes the desalination industry, I will rather focus on how scarcity impacts both state-society and state-market relations.

Most importantly, the rentier state theory does not only ignore other socio-economic factors but also loses ground in times of declining oil demand. As I will show with reference to the technopolitics of water, Saudi

Arabia exhibits the internal complexity and dilemmas of rentier economies in the 21st century.

To begin with, the state's power foremost depends on the ability to provide basic resources such as water which is heavily subsidised and integrated in the welfare state services. Following the revenues of the oil boom, the state was able to subsidise water generously when the demand increased due to intensive wheat cultivation (Jones 2010: 229). As a so-called technostate (Jones 2010: 14), the social contract between ruler and ruled is based on technology, science and expertise: the state improves the living conditions through technical innovation and the citizens accept the constraints of the authoritarian system. Beginning in the early period of Saudi Arabian statehood, rulers have used scientific knowledge and technology for nation-building purposes and the establishment of social order (ibid.). Information has been generated by foreign, mainly American scientists such as the geologist Karl Twitchell and resulted in administrational and infrastructural structures spread across the country in order to achieve a strong power base for the Saudi Arabian government (Jones 2014: 35).

Turning to desalination, Jones points out: "it [desalination] was, foremost, a political enterprise, one that served to secure political authority. In the heyday of the oil boom, finding, making, and providing water came to serve as a form of political patronage" (Jones 2010: 5). It becomes evident that water resources were embedded in the rentier economy, thereby complexifying the access to power that does not exclusively rely on the oil industry. However, the Saudi Arabian government not only aims at managing and distributing water as a crucial resource in an arid region, but also at controlling its population, preventing upheavals, and maintaining the authoritarian system.

Water infrastructure, therefore, serves as an important instrument to legitimise power and to reproduce the self-image of a state (Obertreis et al. 2016: 171). The latter will be examined later by analysing the goals of Vision 2030. Furthermore, the multidimensionality of this resource provokes different perspectives on water. Not only does water sustain the population but it can also be treated as a tradable commodity (Obertreis et al. 2016: 170-71). Given that Saudi Arabia has, to a limited extent, implemented neo-liberal policies including the privatisation of public goods which is being enforced in Vision 2030, the market value of water plays a crucial role. This aspect gains importance given the prospective declining demand of oil resources and the pressure on the regime to maintain the costly Saudi lifestyle. In addition, water is linked to ecology and environmental issues as Saudi Arabia's water reservoirs are limited, and the high demand threatens a sustainable and environmentally friendly supply. The upcoming global discourse around ecological sustainability also affects desalination technology. However, the approaches to environmentalism remain minimal and are tied to economic interests as the following chapter will demonstrate.

Desalination

The modern desalination industry in Saudi Arabia launched in 1965 when the Saline Water Conversion Company (SWCC) was established as a branch of the Ministry of Agriculture and Water (Ouda 2014: 3). One of the first major plants was planned in Jeddah in 1969 by the United States' Department of Interior's Office of Saline Water and constructed by a subsidiary of Coca-Cola (Jones 2010: 3). The trend to involve foreign companies as well as the functional differentiation between the planning and construction process remain in place today. For instance, the Al-Khair plant in Jubail was built between 2011 and 2014 by two Greek firms and supervised by the Finnish company Poyry (Water Technology 2020). This suggests that Saudi Arabia is dependent on foreign expertise and business, as asserted by Jones. However, the ownership often lies either within the SWCC as a national agency or with Saudi companies. In 2014, most desalination plants were state-owned, but new projects such as the first solar plant in Al Khafji or the Rabigh plant reflect the ongoing privatisation trend of water supply (Smart Water Magazine 2019). While the overall control over water remains, the pressure on the national revenue demands a mixed approach of outsourcing and state management which illustrates that the conventional rentier economy is descending.

Today, thirty-one plants are operating in seventeen locations as shown in the map below (Al-Ghalayini 2018 & Fig. 1). Based on a network of pumping stations and pipes, desalinated water is transported to the cities where the water is mostly consumed for domestic use. The largest plant in Jubail was commissioned in 2009 and serves to supply the Saudi capital Riyadh with water.

In the aftermath of the 1980s oil boom, the Ministry of Agriculture built several new desalination plants and ordered the decommissioning of old, less efficient plants. In contrast, the date of decommissioning was put backward due to the rapid growth of both the economy and the population, which contributed to increased water demand (Ouda 2014: 4). Desalination was, therefore, seen as a solution for Saudi Arabia's limited natural water resources, and the public regarded its development and management a political responsibility (Jones 2010: 5).

Given that seawater will remain available in nearly unlimited amounts, it is tempting to classify desalinated water as a renewable water resource without considering environmental consequences. Still, desalination technology is not only costly but also environmentally problematic as the preferred osmosis technology requires high amounts of energy the majority of which is generated out of petroleum. Facing the declining demand of oil resources and the growing awareness of potential ecological consequences, solar power slowly becomes more important on the Saudi energy market.

As a result, the first solar plant was Al Khafji, constructed in 2015 by the Spanish company Abengoa and

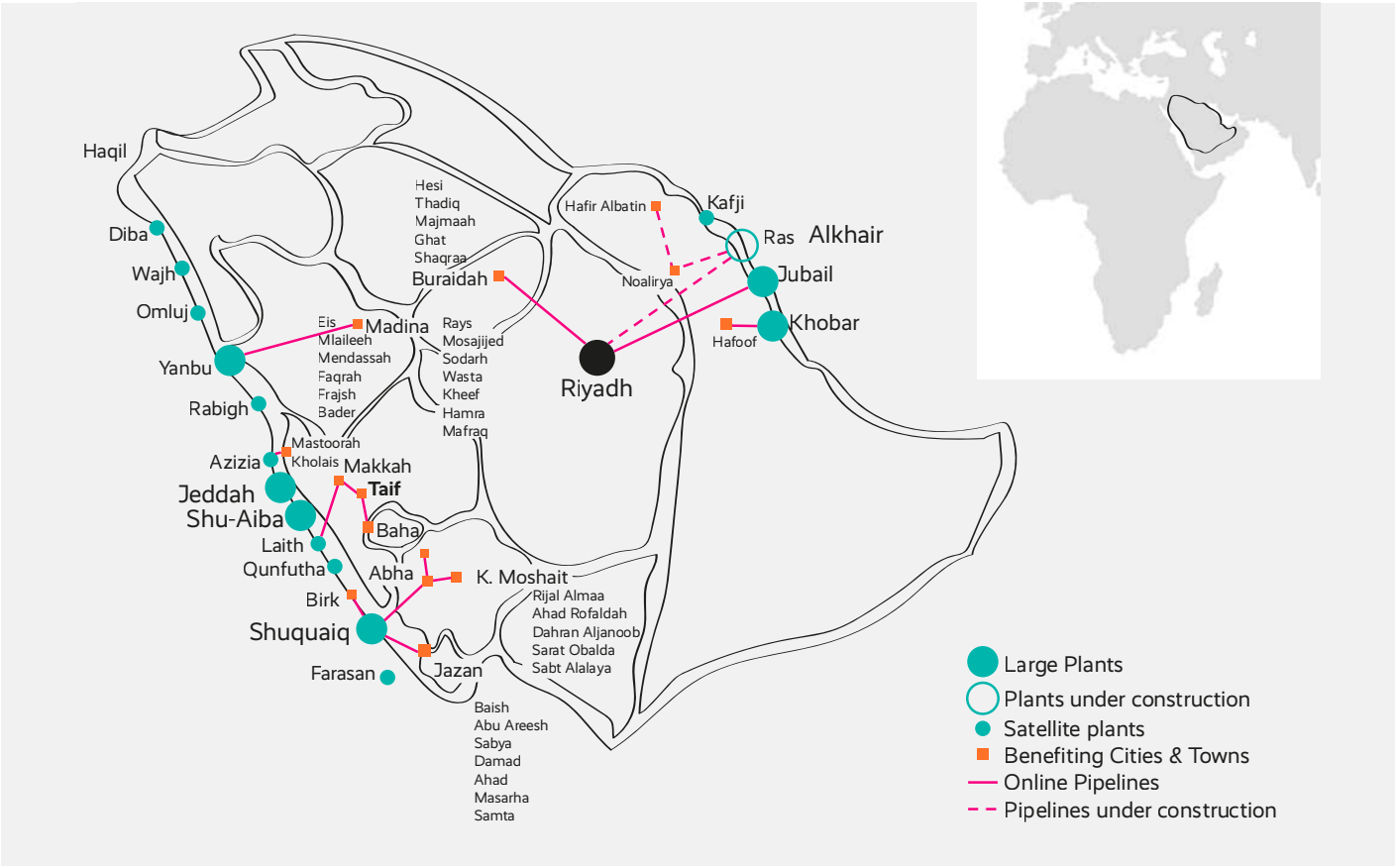

Fig. 1: desalination plants on Saudi coasts (Abdul Latif Jameel 2019).

Advanced Water Technology (AWT), the commercial branch of the Saudi King Abdulaziz City Science and Technology (KACST) and was supposed to produce 60,000m3 of water a day. Interestingly, the original contractor failed to combine the reverse osmosis approach with photovoltaics (PV) solar panels and nearly went bankrupt. Consequently, SWCC hired two different contractors for each the desalination and the solar-PV, not guaranteeing that the plant will rely on solar instead of the grid. Because of the delay, Al-Khafji plant is unlikely to be in operation before 2021 or 2022 (Laursen 2018).

To sum up, the brief overview of desalination in Saudi Arabia underlines how technology has been used to support the political and economic goals of the government. On the one hand, water supply is perceived as a welfare duty of the state that uses the control over infrastructure as a power asset. The state commands the associated network of distribution and can therefore regulate who receives how much water. On the other hand, growing pressure on the national revenue due to scarce resources forces the government to outsource the management of some desalination plants to private companies, as reflected in the reforms of Vision 2030. The turn towards renewables like solar energy, however, is deficient, slow, and closely tied to economic profit, as the closer examination of Vision 2030's premises will delineate.

Vision 2030

The drop of oil revenues has accelerated the development plan Vision 2030 that Crown Prince Muhammad bin Salman presented in 2016. This reform program is supposed to enable a controlled transition to a diversified economy that depends to a lesser extent on oil. The rationale behind seeks to prevent future loans and rigid changes of living standard (Faudot 2019: 99). Under the three pillars that refer to the Saudi self-image ("[recognising] the status as the heart of Arab and Islamic worlds", "become a global investment powerhouse" and the transformation into a "global hub connecting three continents" (Vision 2030a: 6)), the plan combines policies of privatisation, liberalisation and self-proclaimed improvement of lifestyle of Saudi citizens. At the same time, there are only a few general references to protect natural resources (see Vision 2030a: 23).

The diversification of the Saudi Arabian economy also encompasses the extension of the energy market. Aramco, the national oil company, will be transformed into "a global industrial conglomerate" (Vision 2030: 7) and 60% of the GDP should be provided by the private sector (Khashan 2017). Water and electricity are supposed to be privatised in order to reduce public spending (ibid.). SWCC, as a major regulator of desalinated water supply, is included in the privatisation trend and an

increased production capacity of 5 million cubic meter per day is forecasted (Al-Ghalayini 2018). Given the decreased share of SWCC to only 60% of the national water supply in 2013, firms such as Jubail Water and Power or Shuaibah Water and Electricity are ready to step in (Water Politics 2017). Furthermore, 92% of the population is supposed to get access to water services as part of the measure to guarantee the "sustainability of vital resources" (Vision 2030b). The following examples of Vision 2030's water policies illustrate the understanding and framing of sustainability by the Saudi government.

For instance, the measures to tackle water scarcity can be categorised in two ways: the first aim is to reduce the water consumption, as Saudi Arabia is the third largest water consumer per capita worldwide after the United States and Canada (Water World 2019). Accordingly, the Qatrah programme, launched in March 2019, seeks citizens to decrease their water use to 200 litres per person per day by 2020 and 150 litres by 2030 (Water Politics 2019). Furthermore, agriculture should be limited to areas with natural and renewable resources, inverting the water-demanding agricultural policies of the 1970s as mentioned above. Given the fact that 80% of water is consumed by the agricultural sector, the government starts to expand the regulation and prefers to depend on food import instead of domestic production (DeNicola et al. 2015: 346).

Second, a more efficient use of renewable water sources and treated water is planned. For this purpose, the Saline Water Desalination Research Institute (SWDRI) was established by SWCC, cooperating with national and international companies in order to optimise the desalination process and enhance the investment in renewable energy sources (Ouda 2014: 8). Against the background of the fact that 15% of Saudi Arabian oil production is used for desalination, it can be concluded that the economic well-being of the country rather than environmental concerns drives the reliance on alternative energy resources. This is also apparent in the framing of the renewable energy sector as an investment opportunity, enhanced through public-private partnerships and liberalisation (Vision 2030a: 49). The gradual opening of the rentier economy is grounded in the belief that "free market prices shall, in the long term, stimulate productivity and competitiveness among utility companies and open the door to investment and diversification of the energy mix in the Kingdom" (Vision 2030a: 51). Given the extension of desalination technology that involved foreign private companies over the recent years, they might well be included in this calculation.

Turning to the relation between state and energy market, the outsourcing of water supply to private companies can be observed through regulated competition on the one hand and reduced administration on the other. Aiming for an increase in competitiveness, eligibility criteria for subsidies in the energy and water sector should be established (Vision 2030a: 51). Vision 2030 seeks to downscale the total number of ministries, subsuming the Ministry of Water and Electricity with the Ministry of Agriculture into the Ministry of Environment, Water and Agriculture (Vision 2030b). This measure implies not only a changed perception of the interplay of these three variables but also a less direct involvement of the state.

To conclude, the initiatives of Vision 2030 reveal a mixture of deregulation and the privatisation of the water and energy sectors. Sustainability is linked to economic growth and less to ecological responsibility and environmentally friendly water consumption as no coherent and ambitious projects tackle the risks of climate change and shrinking water sources. The Saudi Arabian government rather relies on the improvement of a sparsely modified status quo through the optimisation of desalination, as expressed by the founding of ECRA. Therefore, a technological solution is preferred over the fundamental reconsideration of natural resources. Following the multidimensionality of water defined by Obertreis et al., Saudi Arabia increasingly discerns water as an economic asset which is provided by the market instead of a public good distributed by the state. As the three pillars imply, the government foremost aims to maintain and increase investment opportunities in order for the economy to thrive. Consequently, the current living conditions and its legitimacy towards the Saudi Arabian population are supposed to be sustained. At the same time, damaging long-term consequences of water policies in general and desalination in particular are neglected for the sake of stability as the following chapter illustrates.

Environmental Risks and Discussion

The reforms of Vision 2030 react to the consequences of decades of mismanagement and unsustainable water use in the Kingdom, especially in the agricultural sector (DeNicola et al. 2015: 346). The growing pressure on natural resources – and the government – can be traced back to wasteful consumption but also to the consequences of climate change that threatens to provoke heavy droughts more frequently (Bodetti 2019). As most of the region and neighbouring countries will face similar challenges, Saudi Arabia turns to desalination for several reasons: in one of the most arid places in the world it is a priority (one might assume even a raison d'état) to guarantee the access to water across the country given the limited natural resources. Moreover, the associated technology needs to be improved through greater investments in renewable energy sources such as solar power in order to replace the shrinking oil resources. The regional hegemony of Saudi Arabia in the Middle East relies on its economic power that it aspires to maintain. Besides, water is linked to national security in Saudia Arabia because a lack of water is likely to lead to social turmoil and, consequently, endanger the authoritarian regime. Finally, desalinated water can potentially contribute to the Saudi Arabian export revenues as a result of the water scarcity in neig-

hbouring countries who cannot afford the expensive and energy-intensive production process (Bodetti 2019).

However, desalination comes with environmental risks of which high-energy consumption is just one. Different stages in the process jeopardise the ecological balance in the Gulf in various ways. At the beginning, water is transported from the sea to the plant via intake pumps that absorb small animals such as algae that are important for a functioning marine ecosystem (DeNicola 2015: 347). After the reverse osmosis of seawater, the desalinated product is transported to the cities, whereas the chemical-laced brine gets disposed of into the sea. Tirone highlights: "For every litre of potable water produced, the UN estimates about 1.5 litres of liquid polluted with chlorine and copper are created. When pumped back into the ocean, the toxic brine depletes oxygen and impacts organisms along the food chain" (Tirone 2019). Every day, 31.5 million cubic meters of contaminated water re-enter the ocean (ibid.). The increased salinity in coastal areas does not only affect the ecological balance but also raises the energy consumption as more effort is required to remove salt from the seawater (Wiedmann 2012: 263). In addition, the emissions of oil-fired plants contribute to air pollution and greenhouse gas emissions, exacerbating climate change (DeNicola 2015: 348).

Referring to the idea that technopolitical actions are supposed to tackle challenges of political significance such as water scarcity, desalination technology can barely be described as a meaningful short-term solution. Even if the shift to solar power is pursued seriously, desalination aggravates water scarcity in the country and the wider Middle East due to its negative impact on the environment and the reinforcement of climate change. The current performance of a greener energy production is deficient, as demonstrated in the temporal failure of the solar-powered plant Al-Khafji and the exceeded decommissioning date of fossil-fired power plants.

Despite a certain awareness about environmental risks – as plant Al Khafji exemplifies – there are only loose commitments to environmental preservation and sustainability in Vision 2030 (Vision 2030a: 23). This can be traced back to the inherent power structure in the Saudi state. Its model is built on a rentier economy that upholds authority through the maintenance of a high living standard that prioritises comfort over environmental responsibility. Moreover, regulations in favour of comprehensive environmentalism would oppose the self-image of an investor's paradise as proclaimed by the Vision 2030. The high pressure to privatise and diversify the economy to secure revenues is grounded in the imminent loss of power and stability. Consequently, the economy is prioritised over environmental concerns.

The example of desalination in Saudi Arabia helps to understand the broad significance of technopolitics as a theoretical concept to understand complex intersections between political power and water supply. Vision 2030 exemplifies the prioritisation of the Saudi government to maintain the social contract based on consumerism and unsustainability. It may be countered that current trends reflect an increased awareness and willingness to preserve natural resources. However, these plans remain modifications on the surface and do not generally question the way water and energy are handled. Still, the firing of the Minister of Water and Electricity in 2016 who cut subsidies on water and thereby caused public objection, illustrates the dilemma and domestic pressure on the Saudi government (Wang et al. 2019). The social contract of providing good living conditions as a quid pro quo for obedience and loyalty dates back to the time of the oil boom in the 1980s. The social contract's requirements the current Crown Prince needs to balance with prospective challenges.

Conclusion

In an arid country such as Saudi Arabia with hardly any rainfall and shrinking groundwater supplies but two stretched coasts, desalination of seawater seems to be a reasonable solution to provide (drinking) water. This article presented a more critical approach to current trends in Saudi Arabian water supply as exemplified in the national development program Vision 2030. The application of the technopolitics concept highlighted the significance of water infrastructure for regime stability. Furthermore, it helped to deconstruct socio-economic and environmental shortcomings of desalination technology that can be traced back to the growing pressure on the declining rentier economy. Therefore, desalination and its management are a useful lens to analyse elementary goals of the Saudi Arabian government.

This can be extended to foreign policy objectives such as the export of desalinated water or national security. I decided to focus on Vision 2030 because it provides insights to the inner reorganisation of a state that faces a fundamental threat to its socio-economic order as the country was built on oil resources whose demand is now declining. The situation reveals the emerging contradictories in the self-understanding of the Saudi government: On the one hand, regulation and control of water sources have been centralised for decades and, thus, have been sustaining the authoritarian power model. On the other hand, Saudi Arabia starts to surrender or, at least, loosen its power over desalination plants by privatising the water supplies. This tension is reflected in the self-image of being an important "economic powerhouse" that seeks to expand and invest in substitutes of oil. The profit and diversification of the national economy conversely may help to maintain the living conditions of the population and stabilise the social order.

Given the fact that the state prioritises an economic perspective on desalination, the environmental sustainability of this infrastructure is widely neglected. Due to the massive energy consumption of the desalination process, attempts to fuel them with solar power

remain a challenge as the Al-Khafji project indicates. Notwithstanding the rising awareness of alternative, greener energy resources, desalination heavily affects the marine ecosystem by increased salinity and chemical pollution caused by disposed brine. Combined with the imminent consequences of climate change, desalination rather "technologises" and compounds the complex problem of water scarcity. An innovative and truly sustainable reform of water supply is impeded by reluctant actions of the Saudi Arabian government and the resistance of the population against a less wasteful consumption. Instead, environmental risks are subordinated to a steady water supply for the sake of political stability. However, the long-term survival of the modern Saudi Arabian state will depend on its ability to deal with both socio-economic and environmental challenges. The example of water policies illustrates the limits of flexibility of an authoritarian state whose power mainly relies on finite resources.tions between political power and water supply. Vision 2030 exemplifies the prioritisation of the Saudi government to maintain the social contract based on consumerism and unsustainability. It may be countered that current trends reflect an increased awareness and willingness to preserve natural resources. However, these plans remain modifications on the surface and do not generally question the way water and energy are handled. Still, the firing of the Minister of Water and Electricity in 2016 who cut subsidies on water and thereby caused public objection, illustrates the dilemma and domestic pressure on the Saudi government (Wang et al. 2019). The social contract of providing good living conditions as a quid pro quo for obedience and loyalty dates back to the time of the oil boom in the 1980s. The social contract's requirements the current Crown Prince needs to balance with prospective challenges.

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