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The Role of Emotions in Drinking Recycled Water

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Abstract: As global freshwater supplies shrink, recycled drinking water (RDW) has become an increasingly important source of water supply. However, RDW remains an underinvested resource despite being a safe and reliable source of water. The dominant hypothesis is that RDW has been rejected on emotional grounds of disgust, a visceral psychological reaction known as the "yuck" factor. This paper investigates the role of emotions in technical decision-making and applies it to RDW implementation. It tests two specific hypotheses. First, that negative emotions affect the policy process through a negative "goal definition" of the problem, making it unattractive to stakeholders. Second, the emotional quality of policies can be manipulated by policy entrepreneurs. These hypotheses are tested on two cases of RDW—one failed and the other successful. It finds that narratives in the former are relatively low in emotional intensity, with themes such as sustainability and governance, whereas the second case displays narratives charged with anger, social injustice, and disgust. This emphasizes the role of narratives, especially when visceral reactions such as disgust and anger interact with larger social and political discourses. Finally, we offer policy implications on how understanding the role of emotions can help in the implementation of RDW.

Keywords: emotions; public policy; recycled water; Q methodology; water governance

1. Introduction

The need for sustainable water sources has never been more urgent. By 2030, the world will face a 40% water deficit under the business as usual scenario [1]. Aside from the over usage of water, climate change is also predicted to exacerbate water shortages as more frequent extreme weather events may reduce the availability of freshwater [2,3].

Given these realities, the sustainability of water sources has become a matter of increasing concern. Gleick [4] regards sustainability as the "maintenance of a desired flow of benefits to a particular group or place, undiminished over time". Specific to water, Kennedy and Tsuchishashi [5] argue that a sustainable water supply is one which provides adequate water in sufficient quality and quantity to meet societal needs, and importantly, avoids shifting environmental burdens to other geographic areas or future generations.

Within these parameters, recycled drinking water (RDW) can be regarded as a sustainable water source. First, recycling is economically efficient as wastewater is often found at source of use, reducing transport costs [6] especially if the cities are far inland. Second, there are savings in the urban water supply and wastewater systems as costs of diversion structures, drought storage and treatment and nutrient removal costs for discharging to sensitive waters [7]. Third, although the cost of desalination has decreased considerably over the years, water reuse is still generally cheaper than desalination [8], which is generally thought to be more energy-intensive [9,10].

Aside from economics, water recycling allows water suppliers and policy-makers in charge of water to reorganize and manage water resources better [6], as suppliers are able to match water of appropriate quality to various uses. Water reuse therefore grants flexibility in the alleviation of water

scarcity, which is defined not just as the absolute amount of water present, but also takes into account its marginal value [11]. This, in turn, is a function of biophysical conditions, human values and actions as well as other technology, infrastructure and institutions. Recycled water can therefore be thought of as addressing scarcity in a nuanced way. For example, lower quality treated water can be used for green buildings, flushing of toilets and irrigation [6,12]. High quality and potable water can be redirected to other uses such as drinking or industrial purposes [10]. An example of such reorganization and management is seen in the Los Angeles Department of Water and Power (LADWP) [8]. Los Angeles is an arid, coastal city that has developed a Master Plan that meets its water needs through recycling highly treated wastewater. Its wastewater treatment facility (Edward C. Little Water Recycling Facility) produces five grades of water which care for the diverse needs of local industries.

Given these economic and environmental advantages, water has been increasingly reused in irrigation, recharge of aquifers, seawater barriers and for industry; the increase in its use has been dramatic, at times doubling or quadrupling [13].

However, recycled drinking water is still very rarely implemented. The first large-scale project in RDW was implemented in 1968 in Windhoek, Namibia. Since then, technology to treat wastewater to drinking standards has become much cheaper while the need for clean drinking water has become increasingly urgent due to increasing population, urbanization and industrialization. As demand increases, supply is dwindling because of water degradation due to human activities and extreme weather events.

Despite this, Windhoek remains the only case of Direct Potable Reuse (DPR), whereby potable water consists of 25% recycled water mixed with natural sources of water [14]. Altogether, there are fewer than 15 large-scale Indirect Potable Recharge (IPR) projects in the world [15] compared with some 3300 non-potable reuse projects [16]. Many IPR projects are in the United States with half of these projects implemented before the 1980s. In the US, California has the highest number of IPR projects with the largest and most successful water purification project, the Orange County Groundwater Replenishment System serving 2.2 million residents [17].

Some of the other successful planned IPR projects worldwide include the Atlantis Water Recharge Management Scheme in Atlantis, Western Cape, South Africa, which was launched in 1979 and comprises 25%–40% recycled effluent [18]. In Singapore, recycled water is pumped back into reservoirs [15] serving a total of 5.5 million people [17].

Overall, although RDW has been proven to be a safe option, findings continue to indicate that there is an emotional aversion to the policy [11]. For example, Dolnicar et al. [19] found that while 92% of Australian respondents would use recycled water for garden watering, only 36% would drink it. In Australia, the IPR scheme has been operationalized for Perth (Western Australia), Goulburn (New South Wales) and South East Queensland, and many have been met with severe opposition [20–23].

Implementation of RDW can therefore be considered a policy with a negative emotional signature. The "yuck" factor has been found to be the only statistically significant factor in empirical studies [24] variously defined as "psychological repugnance", "disgust", or "profound discomfort" [23].

What then are the differences in emotions—both in content and intensity—between the many cases of failure and the very rare instances of success? Is there a role for learning—that is, not merely the cognitive dimension of scientific and technical understanding, but a mastery of emotional and environmental awareness [25] that is required in today's ecologically complex reality?

2. Emotions and Ecological Policy-Making

The role of emotions in ecological policy-making has been explored for the past two decades but increasingly so as the salience of ecological and climatic changes rises. For example, MacDonald et al. [26] have outlined the emotions that youths experience relating to climate change, including, anger, fear and depression. Marshall et al. [27] finds that field research in Africa, Asia and Oceania tend to be skewed towards areas where there are great apes, which he attributes to the "charisma of great apes" rather than any explicit research agenda.

Within this body of work, there is also a link with policy implementation and behavior—for example, Hine et al. [28] shows how messages with strong negative emotions increase intention. In ecological management, Vasileiadou and Botzen [29] have found that it is not merely experience that moves individuals to actions, but the emotions attached to such experiences and the intensity of the felt emotions—the more intense the emotions felt, the more likely the policy population will be moved to action, that is "individuals who have experienced an intense, life-threatening event have a significantly higher level of concern than those without such an experience".

Meanwhile, Roeser's [30] comprehensive review of behavioral change identifies an intriguing paradox of climate change—even as more people accept the facts about climate change, very few do anything to change their behavior in response. She argues that emotions are the missing link in climate policy communication. Since emotions are intrinsically "motivating states", integrating emotions in the debate about climate change can lead to a more thorough understanding of how climate change impacts are being perceived and processed by the public, and serves as a more reliable source of motivation than (pure) rational knowledge.

There is little doubt that emotions impact policy making and outcomes; but to understand their role in policy change, they need to be studied not just as a psychological phenomenon (that is of "raw emotions") but as elements that require interpretation, understanding and application in "one unified process" [31] within policy-making. That is to say, to understand behavior as not just being affected by the agent's own emotional and normative state but also by his experience with others in a particular setting, as well as underlying social norms [32,33].

Traditionally, such arguments about agency and policy change have been made within the scholarship of cognitive and institutional factors such as institutional frictions [34] and policy drifts [35], which are the dominant explanatory variables of the policy process. The role of emotions has been relatively under-researched [36]. There is, however, growing research in the role of factors such as emotions and moral sentiment on decision making as well as policy outcomes. Such scholarship comes from the fields of decision sciences [37], behavioral economics [38] and, more recently, policy sciences [39–41].

This paper employs an integrative framework which regards the role of emotions in policy making as part of current research on "policy bubbles", analogous to economic bubbles of irrationality. Jones et al. [40] developed the concept primarily to address the issue of sustained overinvestment wherein governments invest in policy instruments above their instrumental value in achieving a goal.

Under this conception, positive policy feedback results in policy bubbles [36], or a perceived policy overreaction; conversely, intense negative emotions may lead to systematic undersupply of policy, a "negative policy bubble" [41]. This line of argument conjoins with a rising wave of research on the role of emotions in policymaking, including the important contribution by Cox and Béland [39] on valence, or the emotional quality of an idea.

Maor and Gross' [41] hypothesis add to this by positing that the reverse is also true—that negative policy bubbles exist when an area which is emotionally unattractive suffers from systematic underinvestment. Such bubbles have been foreshadowed in the work on Punctuated Equilibrium Theory [42], where sustained under-investments see sudden corrections. Maor and Gross [41] further argued that such under investments are due to self-reinforcing processes interacting with the "contagion of negative emotions"; together, they systematically undermine confidence in policies. Their ideas are captured in H1 below:

- H1 Goal Hypothesis: Negative emotions drive systematic undersupply of policies, or government underinvestment in a policy area ("Negative Policy Bubble").

This process is reversed when the severity of the policy escalates to such a point that the general public or political elite becomes aware of it and of the need to immediately address it. H1 speaks directly to the first of Lasswell's five "intellectual tasks" of "goal clarification; trend description analysis of conditions; projection of future developments; invention, evaluation and selection of

alternatives" [43]. While the dominant interpretation of Lasswell's model is one of policy-making as a cognitive technocratic process, goal clarification is actually a value-laden endeavor [44]; what Lasswell calls the normative (the "preferential" or "imperative") dimension of a social act.

In addition, emotions and social values influence not just what we think policy goals are but also how we achieve these goals. Cox and Béland [39] argued thus: "Ideas with a negative valence are repulsive and are likely to generate opposition to the policy proposal associated with them". Valence is defined as "the emotional quality of an idea", which can be high or low in intensity and negative or positive in character. Valence can change with time, context, and intensity; most intriguingly, they argue that "the skill of policy entrepreneurs" helps them detect and manipulate the valence of ideas. This is also argued by Maor [36], who postulates the existence of "emotional entrepreneurs".

- H2 Valence Hypothesis: Emotions can be manipulated or influenced by policy entrepreneurs through an act of creative orientation.

The role of emotions in public life has been provided for as an expression of policymaker's personality or, more explicitly, H1 within the problem orientation and H2 within the contextual orientation [43].

H1 is outlined in Lasswell's [45] question: "By what procedures can the mind be made most fit for rational clarity?" Clarity requires that we understand, elucidate and provide for a dialog between expert and public opinions.

Lasswell's answer has been commonly thought to lie in a psycho-analysis of stakeholder values, historical contexts and situations [45,46]; what is less well-known is that the problem orientation also suffers from what he derisively calls "propaganda" and what we might call "lobbying" in public life today. In his scathing "The Person: Subject and Object of Propaganda", Lasswell [47] wrote of propaganda as the "manipulation of collective attitudes by the use of significant symbols (words, pictures tunes)"; concerned with "attitudes of love and hate... "

Locating the role of emotions within a general Lasswellian conception of policymaking allows us to understand and explain the role of the modern bureaucrat and his interaction with politics (including with civil society) and politicians more deeply. This is generally studied under the literature on policy entrepreneurs from Kingdon [48] to Baumgartner and Jones [49] to Mintrom [50].

Lasswell [47] himself had proposed "an act of creative orientation", where the analyst embeds himself deeply within the policy context in the conduct of his inquiry, acquiring an interpretive, critical understanding of the public narratives that inform each policy. Those who practice propaganda, Lasswell [47] said, have learned something about the "emotional requirements of men in the mass" or as Brouwer and Bierman [51] put it "human beings with emotions, values, and ideas". By influencing the emotions which open (or close) policy windows, such entrepreneurs direct policy change.

This argument has been made more recently on the apparent divide between traditional and modern knowledge, or between "scientific" and "everyday ways of knowing" [52]. While scientific communication is largely objective and neutral [53,54], it is emotional and normative narratives that enable people to make meaning out of science-based realities such as climate change, and environmental degradation.

H1 and H2 therefore have great impact on the actions that people perceive they need to take to either adapt to or mitigate environmental change [55–57]. There remains, however, one methodological difficulty—the notion of policy undersupply or under-reaction risks being entirely post facto—how is an "underinvestment" defined? Is there an "optimal" level of policy supply objectively defined?

In response, Maor [36] proposes an empirical test. On the appropriate level of investment, he suggests a rigorous 50-year review of the changes in levels of "true and observed" policy investments to establish a baseline of the appropriate level. By this measure, he would determine where there has been underinvestment, and then investigate the sources of such underinvestment and the link with negative emotions. This design is premised on the notion that there is some level of "true" or optimal

investment—a very difficult task since there is often no accepted notion of what this level is. Instead, this paper proposes a research design based on the paucity of instances of RDW.

3. Case Studies

This study proposes a simpler test using two cases of RDW. Implementation of RDW is still rare, despite its existence for more than 40 years, and despite policy makers and international agencies lauding it as a sustainable option for water supply. This undersupply of policies has been thought to be caused by the emotional "yuck" factor of disgust and repulsiveness—i.e., negative emotions. This paper uses a natural experiment to investigate the role of emotions in RDW in two different countries: one, the first successful large-scale recycled drinking water in Windhoek, Namibia and the other, a failed implementation in East Valley, United States.

3.1. Windhoek, Namibia

In 1968, RDW was implemented in Windhoek, a town, located in the central highlands of Namibia, sandwiched between the Kalahari Desert and the Namib Desert. The climatic conditions are dry with an annual rainfall of 370 mm. Droughts are long [58,59], rainfall uncertain and the nearest river is in Kavango, some 750 km away. A significant amount of the water supply is lost to evaporation—at times twice the amount used by consumers.

In the middle of a severe drought in April 1956, the idea of reclaiming wastewater was mooted. From 1960 to 1968, various tests were conducted [60].

A reclamation plant that was used to treat water from one of the dams was upgraded to treat water from the city's Gammams wastewater treatment plant [60]. After successful tests, treated wastewater was blended with dam water and added directly to the city's potable water supply [60].

Upon the initial commissioning of the plant, the city faced challenges caused by technical difficulties, health risks and adverse public reaction [60]. However, the municipality of Windhoek was successful in getting consumers to use treated wastewater for potable needs. This success was attributed to the maintenance of stringent quality and health standards, a policy of transparency and accountability and perhaps, the fact that the reclaimed water accounted for an average of only 4% of the total potable needs of the city from 1968 to 1991.

The technical processes of continuous monitoring of the treated water, introduced in 1968, accounted for 20% of the total cost of treating wastewater. As the plant capacity has increased, monitoring cost fell to 8% [60]. The Government was also quick to address any safety issues relating to water—for example, in 1968, a rumor about an outbreak of typhoid was quickly countered. The Government released results to show that the quality monitoring at the reclamation plant was consistently safe [60].

Strong institutions, tight monitoring and the strong safety record were thought to have been useful in overcoming initial disapproval of recycled water [58]. However, in outlining the reasons for the apparent public acceptance of recycled drinking water, it must be remembered that, in 1968, Namibia was not an independent country but a colony of South Africa.

In the era of apartheid, the black majority may have had little say in the decisions made by the Government; correspondingly, the Government at the time may have felt it could afford some risk. The country eventually gained independence from South Africa in 1990.

Over the years, as the population of the city increased rapidly to 350,000, all sources of potable water supply within a radius of 500 km became fully exploited [58]. The city decided to develop an integrated water demand management program in 1994, which included new policy, legislation, technical and financial reforms. As part of the program, a new reclamation plant was commissioned funded by a loan from the European Investment Bank [61].

Commissioned in 2002, the new plant is responsible for at least 35% of the city's potable requirements today. The water is also used for irrigation and aquifer recharge. The other 70% of its water is supplied from reservoirs fed by ephemeral rivers [61].

Although it has been 47 years since implementation, almost no studies on public perceptions of RDW in Namibia have been done. This study addresses this gap.

3.2. East Valley, Los Angeles, USA

The same water shortages and harsh conditions are present in the East Valley, in Los Angeles (LA), California. The reaction to implementing RDW, however, was quite different. LA, which is located near a desert, receives its water mainly from the LA Aqueduct system, as well as the San Fernando groundwater basin and the Colorado River. As the population in LA increased, so did tensions with Owens Valley residents as they competed for water. In the 1970s, when a second aqueduct was opened, Owen Valley residents set dynamite to the project. As more water was diverted to LA, Mono Lake, which relies on Owens Valley for water, dried up completely [62].

Clearly, an alternative had to be found.

In 1991, the LADWP explored the option of RDW seriously. The plan was to take 50,000 acre feet per year of reclaimed water from the Donald C. Tillman Water Reclamation Plant (Tillman Plant) and blend it with existing groundwater in the northeastern part of the San Fernando Valley area for recharge.

An environmental impact report for the East Valley Water Reclamation Project (EVWRP) began. In 1995, the US Environmental Protection Agency and the City Council approved the project and five years later, the DWP announced that the EVWRP was complete and had been running on a trial basis. It had cost $55 million and could supply enough water for 120,000 new families.

Immediately after DWP's presentation to City Council, members questioned how and why the project had been approved. Homeowners, too, opposed. On 16 April 2000, a newspaper published an article with the title "Tapping Toilet Water"—shortly after, a "toilet-to-tap" label stuck to the project. Soon, other homeowners and neighborhood groups voiced their opposition. The DWP shelved the project.

It has, however, been recently revived. In 2013, the construction of an Advanced Water Purification Facility (AWPF) as part of the Groundwater Replenishment (GWR) project was proposed. This facility would conduct cutting-edge treatment of wastewater from the Tillman Plant, and this purified water would be used for groundwater replenishment. The project already has financial support. According the Los Angeles Daily News, a $7.5 billion water bond measure was approved by state legislators. It has been reported that the DWP plans to spend $400 million on the Tillman–GWR project [63]. The project is currently in the planning and environmental analysis stage.

4. Q Methodology: View from the Inside

The Q method allows us to appreciate the role of emotions in these two cases, not just as raw feelings such as disgust, anger and revulsion but as part of a larger narrative of water. The Q methodology was introduced for the first time in 1935 in a letter to Nature by William Stephenson, a psychologist cum physicist [64]. Since then, it has been increasingly used in policy studies to uncover narratives strands and discourse coalitions. In studies of water polices in particular, the Q has been operationalized in studies as diverse as perspective analysis of policy on river watershed management [65] and exploring environmental perspectives in lowland agriculture [66], and empirically tested in countries such as the United States and the United Kingdom.

It is employed in this study for two reasons. First, Q methodology is concerned with both quantitative and qualitative analysis. The qualitative analysis is emphasized through the subjectivity of the statements in the concourse that are used in the Q-sample. The quantitative analysis is used for analyzing the Q-sample using factor analysis and correlation. Q methodology helps us identify both the similarities and differences in individual viewpoints—this is especially useful in this comparative study of narratives. As a method that distills the complex mixture of "views, opinions and ideas" [67] into a set of basic positions and narrative theme or discourse coalitions, the Q method allows us to study the mix of the cognitive and the emotional, as required by H1 and H2.

Second, the Q allows us to "to discover different subsets of individuals within the entire group that hold similar and dissimilar views" [68]. Hence, the use of the Q reveals an "insider's" view, with subjective viewpoints, but studied with a systematic and rigorously quantitative method. As pointed out by van Eeten [67]: "Q methodology condenses the variation of views, opinions and ideas into a set of basic positions, problem definitions or dimensions underlying the debate". Unlike other correlation analysis, Q methodology can be carried out with a limited sample set [69]. Q methodology is useful for a number of research fields such as psychology, environment and natural resource issues, human resource development, ecological policy, energy policy, human geography and public policy.

Using Q methodology in the field requires sharing a series of statements (called Q-sample) with the responder and asking her how she feels about each of the statements. Her opinion can range from extreme agreement to extreme disagreement. These statements are opinions, not facts. The Q-sample is arranged in a systematic order, termed the Q sort. Respondents are expected to rate each statement in the Q sort in comparison to other statements. There are no right or wrong answers—only points of agreements or disagreements. In order to collect the statements for the Q-sample, the researcher is expected to delve into the communications around the relevant topic among the relevant stakeholders. This flow of communication is called "concourse" [64]. A researcher can obtain concourse through interviews, newspaper and magazine articles, online websites and other media. The concourse can consist of viewpoints on attitudes, beliefs and values [70].

For Namibia, the text was aggregated mainly from newspaper articles published between 2010 and 2013. These news stories were obtained by searching in Google and the Google scholar database for the search terms "Windhoek", "recycled water", "water reuse" and "drinking water in Namibia". We obtained 190 statements, which were parsed to 50 non-repeating statements. These 50 statements were each tagged with an identification number for reference. Data for the Q-sort were collected from 25 face-to-face interviews in Windhoek between July and August 2015.

In the East Valley study, the analysis was based on text aggregated from newspaper articles, both online and in print as well as magazines, technical bulletins, or newsletter publications. Most of the data were produced just prior to the DWP's decision in 2000 to shut down the project due to public pressure. These news stories were obtained by searching in the LexisNexis database for the search terms "Tillman plan", "recycled water", and others. These were supplemented by online searches of several news story outlets. Data for this study were collected from 31 face-to-face interviews in East Valley between January and May 2015. These responses were correlated in a 31 by 31 matrix.

In the original research design, 35 interviews were carried out for both research sites. However, some of these interviews could not be used as the interviewees did not comply with the instructions and the data could not be used. We had 25 for Namibia and 31 for East Valley but as the Q does not turn on a specified number of returns, the narrative factors are still useful and comparable.

The matrix was factor analyzed using the PQMETHOD software which determines factor loadings. Varimax rotation was used and resulted in eight identifiable factors.

For the case of Windhoek, a total of eight factors had eigenvalues greater than 1.00 (5.2176, 2.2447, 2.1754, 1.6700, 1.5608, 1.4133, 1.2113 and 1.1999). The eight factors are detailed in Appendix A.

1: Water can be recycled safely
2: I am comfortable with drinking recycled water
3: This technology ensures our water supply for the future
4: We need to recycle water
5: Technology turns wastewater into a resource
6: A strict regime ensures high quality
7: RDW is a sustainable option
8: Technology can improve lives

The factors can be seen to cluster around three main themes:

1. Governance: Factors 1 and 5
2. Trust: Factors 7, 6, 4, 2
3. Sustainability: Factors 8, 3, 5

In the governance narrative, two main factors were related to safety and technology. The notion of "safety" is echoed in the psychology underlying the trust narrative, reflecting the high willingness to drink recycled water. Meanwhile, the theme of technology runs through all three narratives. These linkages reinforce and provide greater coherence to the narrative as a whole. For example, the governance narrative was linked to trust—with good technical standards leading to higher trust, which in turn speaks to the sustainability narrative (Factor 8).

Trust is a complex narrative and is not just related to trust in the governance regime (Factor 6) and technology (Factor 5) but is also a matter of personal experience and years of non-eventful use. Unlike the narratives of governance and sustainability, which appear to be possible in communities that have not yet introduced RDW, this form of trust narrative could only have come about after RDW is introduced without incident for a period of time. This is perhaps unhelpful for the policymakers in East Valley, where the narratives are higher in valance and emotionally hostile to RDW as described in the following section.

Of the 31 respondents in East Valley, five clustered on Factor 1, three on Factor 2, one on Factor 3, two on Factor 4, two on Factor 5, two on Factor 5, three on Factor 7, and one on Factor 8. The eight factors are detailed in Appendix B.

1: There is a great need for water in East Valley
2: There are alternative sources of water
3: Water is a matter of social justice
4: Water is a matter of politics and fairness
5: People do not trust the quality and source of water
6: People need more information about water
7: There may be good reasons other places have recycled water
8: There are risks to use recycled water for drinking

In East Valley, the key narratives were as follows:

1. Disgust and "yuck": Factors 2, 3, 4, 5 and 6
2. Social injustices/fairness: Factors 4, 3 and 5
3. Urgent need for water: Factors 6, 7, 2 and 1

The East Valley narrative has a far higher valence, with disgust and anger at unfairness dominant in almost all eight factors. Statements such as the three below show a sense of betrayal, anger and a salience of the "yuck" factor that were absent in the Namibian narrative.

"The prospect of drinking former toilet water, no matter how much it has been purified by artificial and natural processes, generates the yuck factor". (13)

"'Toilet to tap' is yet another example of unfair treatment to Valley residents, as they would drink toilet water while the Westside would get the 'good' water". (5)

"Elected officials and homeowners are angry with water officials for not holding another round of public forums on the project as it was nearing completion and about to start treating wastewater for household use". (33)

The "yuck" factor in East Valley is illustrative of how different factors reinforce and cohere with one another—much like the trust narrative in Namibia. As the "yuck" factor was perceived as something that only poorer people were subjected to (5), the "disgust and yuck" narrative reinforce the "social injustices and unfairness" narrative.

Hence, we find that although the human visceral urge, i.e., the "yuck" factor, is present in both countries, the emotions of fear, disgust and hostility are woven into very different narratives about RDW. The contrast in narratives illustrates Cox and Béland's [39] ideas of valence in Table 1.

Table 1. Comparisons of emotional quality.

	East Valley	Namibia
Policy Goals (H1)	Immediate, concrete: Access to water in case of drought.	Long-term, ecological sustainability.
	Framed in terms of social justice: "Everyone should have access to 'good' water."	Framed in terms of climate change, geographical location: "Given where we are, and the state of the environment, recycling is a good option."
Valence (H2)		
1. "Yuck" factor	Intense and high valence	Negative but low intensity
2. Anger	Tied up with sense of fairness and social justice. Evident in Factors 3, 4, and 5.	Largely absent
3. Mistrust	High in mistrust of officials and technology	Trust in technology and governance systems.

A comparison of the two different sets of emotions shows how the negative policy bubble arose. Emotions impact narratives, which in turn affects plans of action. Cox and Beland [39] ties valence up with ideas and agency—emotional entrepreneurship is an act by those with the "intuitive sense" and "skill". Blyth [71] brings this ideational turn further by arguing that ideas cause change because they are closely linked to interests, and represent a "cluster" concept that includes beliefs and desires.

Ideas therefore allow people to "diagnose" the situation and pick the institutional form which best reduces their uncertainty. In that sense, interests are necessarily ideationally-bound, particularly in situations of Knightian uncertainty such as periods of economic crisis" [71].

Valence therefore affects the supply of policies by affecting the construction of narratives. Blyth [71] sees narratives as a cognitive device to weave ideas together into a plan for action. He says "... ideas do not merely reduce uncertainty for agents with pre-existing interests. Instead, they change and reconstitute those interests by providing alternative narratives through which uncertain situations can be understood". These "causal stories" account for a certain state of affairs.

The emotional differences between the two cases result in two very different narratives—the first, intense, highly negative, tied up with notions of unfairness and injustice. The second, although not wholly positive (with lingering concerns about the "yuck" factor), was ultimately supportive of the need for RDW because of climate and ecological realities.

Both cases share the basic cognitive idea that there is an urgent need for water—East Valley from the severe increase in demand, and Windhoek due to its dry climate. The difference lies in the other two, more emotional ideational strands.

One key limitation of this study lies in the large time gap between the implementation of RDW in the two cases studies. For Namibia, this investigation is carried out nearly 50 years after a successful implementation, whereas in East Valley, it has been 25 years since the first failed implementation. Given the time difference, the lower salience in Namibia is to be expected. However, 25 years is still a considerable number of years—given this time lapse, the highly emotional content of the narratives in East Valley therefore is still significant.

5. Conclusions

This paper aimed to show how emotions can be a part of the social ecology of institutional change. Its main contributions are first, to reveal the empirical dynamics of a negative policy bubble from the case of RDW and how it influences an underinvestment in the policy. By doing so, it provides support for the argument that policy entrepreneurship can be conceived of as a matter of narrative change due to the quality and intensity of the emotions invoked by the policy issue. This fits into Lasswell's conception of the role of emotions in public life as part of problem orientation (H1) and the contextual orientation (H2) of the policy sciences framework.

Another contribution this article makes is to answer one key question in ideational research. As Cox and Béland [39] note, ideas matter—but how? "Why do some good ideas fall by the wayside while others somehow make the mark?" This question is especially salient in issues of global environmental change, where, as Howlett [72] points out, policies tend to be undersupplied. He argues that that such under-reaction is not just the result of the blame adverse nature of governments, but also the low intensity of public concern. With this coupling, governments can choose strategies of denial and to attack opponents instead of making substantial efforts to address problems. However, while the blame-averse nature of governments can be traditionally attributed to the bureaucratic need for self-preservation, the low intensity of public concern on important environmental issues requires explanation. The notion of valence—the emotional quality of ideas—gives us the conceptual vocabulary to do so; this article provides proof that valence not only has explanatory force but can also be empirically tested.

This is only the first step toward testing the possible roles that emotions can have in influencing policy change. Conceiving of emotions as being embedded in cognitive elements within a larger narrative allows us to make stories count. It provides an explicit role for advocacy, political entrepreneurship and other stimuli for policy investments in areas which may otherwise suffer from negative policy bubbles.

One immediate policy implication from this study is the impact on implementation of RDW. In light of increasing uncertainty and variability, water recycling and reuse continues to be the most sustainable option because of its weather resilience, availability in urban settings and the possibilities of environmental, energy and financial savings. Understanding the dynamics of its emotional dimensions will allow policy makers to react and manage implementations of RDW, which will become increasingly salient in the future.

Finally, while this paper is limited to RDW, its arguments could apply equally to the role of emotions in other ecological issues, especially within the important puzzle of under-reaction and lack of public concern about climate change.

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Appendix A. Windhoek

For brevity, only the top five statements for each factor is presented.

Number of statements	8	10	14	10	8
Statement scores	−2	−1	0	1	2
	D	SWD	N	SWA	A

Factor Scores for Factor 1		**Factor**							
Factor 1: (Governance) Water can be recycled safely		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Access to clean drinking water should be protected by legislative and institutional guarantees. (34)	2	−1	−2	1	2	1	1	2
2.	Waste water can be treated up to the appropriate standard for every type of reuse. (49)	2	2	2	2	−1	0	−1	2
3.	This plant was necessary because of Windhoek's growing population, increasing water stress and an outdated treatment facility at Ujams. (40)	2	−1	−1	2	−1	1	−2	1
4.	Transferring this knowledge and these technologies can lead to sustainable improvements in the population's living conditions. (44)	2	1	2	1	2	0	0	2
5.	Water reuse, particularly in arid areas, is the answer to looming water shortages and will gain increasing prominence in the decades to come. (37)	2	−2	0	−1	1	−1	0	0

Factor Scores for Factor 2					**Factor**				
Factor 2: (Trust) I am comfortable with drinking recycled water		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Most people are comfortable to use the water for all domestic purposes including drinking. (22)	0	2	−1	1	−1	−2	−1	1
2.	The government has made it a high priority to provide secure access to clean water for all Namibians and for the country's economic growth and development. (28)	1	2	−2	−2	0	0	1	0
3.	Waste water can be treated up to the appropriate standard for every type of reuse. (49)	2	2	2	2	−1	0	−1	2
4.	The citizens have simply become accustomed to the idea of using water that has been recycled. (17)	0	2	−1	1	−2	1	0	−1
5.	We need to institute water saving mechanisms both at a personal consumption and institutional level and protect our environment. (20)	1	2	−1	2	1	0	2	1
Factor Scores for Factor 3					**Factor**				
Factor 3: (Sustainability) This technology ensures our water supply for the future.		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Transferring this knowledge and these technologies can lead to sustainable improvements in the population's living conditions. (44)	2	1	2	1	2	0	0	2
2.	Optimal use of available resources is an important pillar on which the future must be built. (31)	1	0	2	1	1	0	2	2
3.	Waste water can be treated up to the appropriate standard for every type of reuse. (49)	2	2	2	2	−1	0	−1	2
4.	The water shortage situation is no longer about affordability but the availability of water from the sources. (47)	1	−1	2	0	−1	−2	0	2
5.	The practice of recycling water for drinking has become the City's medium term solution for water supply. (36)	1	0	2	0	1	1	1	−1
Factor Scores for Factor 4					**Factor**				
Factor 4: Trust (We need to recycle water)		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Eighty percent of the population does not have a clue where the water comes from (maybe more). (10)	−2	−1	1	2	2	−2	−2	−2
2.	If Windhoek experiences low rainfall, it will lead to a serious water shortage crisis. (26)	0	1	1	2	0	−1	−2	−2
3.	I have been drinking it for 23 years now, and my children and I are still alive and happy. (5)	0	1	1	2	−1	2	2	0
4.	We need to institute water saving mechanisms both at a personal consumption and institutional level and protect our environment. (20)	1	2	−1	2	1	0	2	1
5.	This plant was necessary because of Windhoek's growing population and increasing water stress and an outdated treatment facility at Ujams. (40)	2	−1	−1	2	−1	1	−2	1

Factor Scores for Factor 5					**Factor**				
Factor 5: Governance (Technology turns waste water into a resource)		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Waste water should no longer be viewed as a waste product, but similar to sea water, and be seen as a special resource, which with special treatment can supply in the ever growing needs of humanity. (46)	2	1	1	0	2	−2	−1	−2
2.	Access to clean drinking water should be protected by legislative and institutional guarantees. (34)	2	−1	−2	1	2	1	1	2
3.	Transferring this knowledge and these technologies can lead to sustainable improvements in the population's living conditions. (44)	2	1	2	1	2	0	0	2
4.	Windhoek is exemplary in showcasing the benefits of water reuse within a dry country with a growing population. (50)	1	0	0	−1	2	−2	−1	0
5.	Eighty percent of the population does not have a clue where the water comes from (maybe more). (10)	−2	−1	1	2	2	−2	−2	−2
Factor Scores for Factor 6					**Factor**				
Factor 6: Trust (A strict regime ensures high quality)		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Most of my friends and other people whom I know buy water, e.g., purified water, from the store. (2)	−1	2	0	−1	1	2	0	0
2.	I have been drinking it for 23 years now, and my children and I are still alive and happy. (5)	0	1	1	2	−1	2	2	0
3.	If you have a good sample regime, quality checking regime, at the end of the day, you produce quite good and potable water. (6)	−2	−1	−1	1	1	2	1	−1
4.	I believe that in the very near future, we will probably see more direct potable reuse. (9)	0	−2	0	1	1	2	−2	1
5.	We do not skip any steps or provide water that is not properly treated. Our water is perfectly safe for drinking. (15)	0	0	2	−2	−2	2	0	0
Factor Scores for Factor 7					**Factor**				
Factor 7: Sustainability (RDW is a sustainable option)		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	I have been drinking it for 23 years now, and my children and I are still alive and happy. (5)	0	1	1	2	−1	2	2	0
2.	No independent laboratory is willing to test the quality and safety of the water, and we do not have sufficient funding to test the water ourselves. (14)	−2	−2	−2	0	−2	−1	2	0
3.	By not using recycled drinking water, we are doing it a disservice, and we are doing the next generation a disservice. (18)	1	0	1	0	−2	−1	2	−2
4.	We need to institute water saving mechanisms both at a personal consumption and institutional level and protect our environment. (20)	1	2	−1	2	1	0	2	1
5.	The single biggest challenge that the informal settlements have is the low affordability of water for communities. (29)	0	0	0	−1	−1	0	2	1

Factor Scores for Factor 8								
Factor 8: Sustainability Narrative (Technology can improve lives)	1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)								
1. Optimal use of available resources is an important pillar on which the future must be built. (31)	1	0	2	1	1	0	2	2
2. Transferring this knowledge and these technologies can lead to sustainable improvements in the population's living conditions. (44)	2	1	2	1	2	0	0	2
3. Access to clean drinking water should be protected by legislative and institutional guarantees. (34)	2	−1	−2	1	2	1	1	2
4. The water shortage situation is no longer about affordability but the availability of water from the sources. (47)	1	−1	2	0	−1	−2	0	2
5. Wastewater can be treated up to the appropriate standard for every type of reuse. (49)	2	2	2	2	−1	0	−1	2

Appendix B. East Valley

The opinion continuum for the Q-sort.

Number of statements	6	10	18	10	6
Statement scores	−2	−1	0	1	2
	D	SWD	N	SWA	A

Factor Scores for Factor 1								
Factor 1: There is a great need for water in EV	1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)								
1. Water reuse is a good idea as Southern California had depended for too long on water imported from other parts of the state. (18)	2	1	−2	0	−2	−2	0	−1
2. The term "toilet to tap" not only carries a negative connotation, but it is very misleading as well because it does not consider all of the processes in between. (22)	2	0	2	−2	0	1	0	−1
3. Decreasing and water supplies, coupled with increased demand, are the reasons why many cities and municipalities pursue innovative water supply projects. (3)	2	1	1	0	2	1	2	2
4. The possibility of a drought could lead to the governor declaring a water emergency and state-wide water rationing. (6)	2	2	1	−2	1	2	2	0
5. If people are given the opportunity to reframe their understanding of the water cycle, they gain a sense of confidence in water reuse technology. (50)	2	−2	2	2	−1	−2	0	0

Factor Scores for Factor 2								
Factor 2: There are alternative sources of water	1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)								
1. Gaining public approval and trust is crucial for success of water reuse projects. (1)	2	2	2	2	1	0	2	0
2. The possibility of a drought could lead to the governor declaring a water emergency and state-wide water rationing. (6)	2	2	1	−2	1	2	2	0
3. The prospect of drinking former toilet water, no matter how much it has been purified by artificial and natural processes, generates the "yuck" factor. (13)	0	2	0	2	0	2	2	1
4. While desalination or importing water were alternatives to treating wastewater, those options would be much more expensive. (27)	0	2	0	−1	−2	−1	−1	0
5. While reusing wastewater for human consumption appears to be safe, it should be considered "a solution of last resort." (19)	−2	2	0	−2	0	−1	1	0

Factor Scores for Factor 3					**Factor**				
Factor 3: Water is a matter of social justice		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Gaining public approval and trust is crucial for success of water reuse projects. (1)	2	2	2	2	1	0	2	0
2.	It is 'disgusting' that the wealthy enclaves of Bel-Air, Pacific Palisades and Brentwood were initially excluded from the program. (9)	1	1	2	1	0	0	−2	0
3.	Legal and scientific evidence had revealed in similar project proposals for the San Gabriel Valley and San Diego is that returning reclaimed sewer water into the drinking water system makes the water unsafe. (11)	−1	0	2	0	0	0	0	−2
4.	All water—at one time or another in its long, long history—was dirty, but the important thing is the purification process. (14)	1	−1	2	−2	2	2	−1	1
5.	The term 'toilet to tap' not only carries a negative connotation, but it is very misleading as well because it does not consider all of the processes in between. (22)	2	0	2	−2	0	1	0	−1
Factor Scores for Factor 4					**Factor**				
Factor 4: Water is a matter of politics and fairness		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	"Toilet to tap" is yet another example of unfair treatment to Valley residents, as they would drink toilet water while the Westside would get the "good" water. (5)	−1	0	−1	2	−1	1	−2	0
2.	In the attempts to introduce recycled water, it was clear that a pattern had emerged whereby the Department of Water and Power intentionally and unequivocally misled people. (15)	0	0	−2	2	−2	0	1	0
3.	If people are given the opportunity to reframe their understanding of the water cycle, they gain a sense of confidence in water reuse technology. (50)	2	−2	2	2	−1	−2	0	0
4.	Gaining public approval and trust is crucial for success of water reuse projects. (1)	2	2	2	2	1	0	2	0
5.	The prospect of drinking former toilet water, no matter how much it has been purified by artificial and natural processes, generates the "yuck" factor. (13)	0	2	0	2	0	2	2	1
Factor Scores for Factor 5					**Factor**				
Factor 5: People do not trust the quality and source of water		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Many people said they would not even drink tap water now because they consider it unsafe or of poor quality, so drinking recycled water is out of the question. (4)	−1	0	0	1	2	2	0	0
2.	While city officials have said the project was environmentally safe, residents do not want to live next to large repositories of sewage, no matter how many times it has been treated. (34)	1	−1	0	0	2	1	−1	−1
3.	Decreasing and water supplies, coupled with increased demand, are the reasons why many cities and municipalities pursue innovative water supply projects. (3)	2	1	1	0	2	1	2	2
4.	Reused water is still human waste at the end of the day. (31)	−1	1	−1	−1	2	−2	−1	−1
5.	Orange County's five-year-public-education campaign is the determining factor in overcoming the inherent "yuck" factor in toilet-to-tap systems. (49)	−2	−2	0	0	2	−1	−1	−2

Factor Scores for Factor 6					**Factor**				
Factor 6: People need more information about water		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	All water—at one time or another in its long, long history—was dirty, but the important thing is the purification process. (14)	1	−1	2	−2	2	2	−1	1
2.	It was one thing to use reclaimed water and pump it to Forest Lawn to water the grass, but it is another thing to take that water and put it into the drinking system—even with a five-year lag. (48)	−2	−1	1	0	0	2	−1	0
3.	Many people said they would not even drink tap water now because they consider it unsafe or of poor quality, so drinking recycled water is out of the question. (4)	−1	0	0	1	2	2	0	0
4.	The better informed the public is, the better it can understand the feasibility and sensibility of the project. (39)	1	−2	1	−1	−1	2	2	2
5.	The possibility of a drought could lead to the governor declaring a water emergency and state-wide water rationing. (6)	2	2	1	−2	1	2	2	0
Factor Scores for Factor 7					**Factor**				
Factor 7: There may be good reasons other places have recycled water		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	The better informed the public is, the better it can understand the feasibility and sensibility of the project. (39)	1	−2	1	−1	−1	2	2	2
2.	The possibility of a drought could lead to the governor declaring a water emergency and state-wide water rationing. (6)	2	2	1	−2	1	2	2	0
3.	The prospect of drinking former toilet water, no matter how much it has been purified by artificial and natural processes, generates the "yuck" factor. (13)	0	2	0	2	0	2	2	1
4.	Decreasing and water supplies, coupled with increased demand, are the reasons why many cities and municipalities pursue innovative water supply projects. (3)	2	1	1	0	2	1	2	2
5.	The project had been in development for 10 years, but there has been little public involvement. (32)	0	−1	0	−1	0	−2	2	1
Factor Scores for Factor 8					**Factor**				
Factor 8: There are risks to use recycled water for drinking		1	2	3	4	5	6	7	8
Statements (Original statement numbering in parentheses)									
1.	Public outcry against reuse has largely been a result of inaccurate and exaggerated language in the media. (2)	1	0	0	0	1	0	1	2
2.	Decreasing and water supplies, coupled with increased demand, are the reasons why many cities and municipalities pursue innovative water supply projects. (3)	2	1	1	0	2	1	2	2
3.	While Department of Water and Power officials have said numerous studies prove that treated wastewater is safe, and it is used effectively elsewhere in the country, studies are flawed, and there is a possibility of hazardous material getting into the water. (20)	−1	0	−1	0	−1	0	0	2
4.	The safety of the project was questionable, as the Valley was not in a crisis that warranted a project in which drinking water would contain unknown contaminants. (29)	−1	2	1	0	0	−1	0	2
5.	A plan to ease the city's water shortage problem by turning toilet water into drinking water may pose a threat to human health because detecting and filtering chemical and biological contaminants is too difficult. (30)	−2	0	1	1	1	−1	1	2

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