


Communicating mega-projects in the face of uncertainties: Israeli mass media treatment of the Dead Sea Water Canal

Public Understanding of Science
2015, Vol. 24(7) 794–810
© The Author(s) 2013
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0963662513512440
pus.sagepub.com


Itay Fischhendler, Galit Cohen-Blankshtain and Yoav Shuali

Hebrew University, Israel

Max Boykoff

University of Colorado–Boulder, USA

Abstract

Given the potential for uncertainties to influence mega-projects, this study examines how mega-projects are deliberated in the public arena. The paper traces the strategies used to promote the Dead Sea Water Canal. Findings show that the Dead Sea mega-project was encumbered by ample uncertainties. Treatment of uncertainties in early coverage was dominated by economics and raised primarily by politicians, while more contemporary media discourses have been dominated by ecological uncertainties voiced by environmental non-governmental organizations. This change in uncertainty type is explained by the changing nature of the project and by shifts in societal values over time. The study also reveals that ‘uncertainty reduction’ and to a lesser degree, ‘project cancellation’, are still the strategies most often used to address uncertainties. Statistical analysis indicates that although uncertainties and strategies are significantly correlated, there may be other intervening variables that affect this correlation. This research also therefore contributes to wider and ongoing considerations of uncertainty in the public arena through various media representational practices.

Keywords

media, mega-projects, uncertainties, water

1. Introduction: “Frankly my dear, I don’t want a dam”¹

Over the past decades, research has shown that mega-projects such as airports and dams have come with heavy price tags as well as numerous environmental uncertainties which have profound detrimental implications felt for many years, often by local communities (e.g. Miller and

Corresponding author:

Itay Fischhendler, Hebrew University, Mount Scopus, Jerusalem 91905, Israel.

Email: fishi@mscc.huji.ac.il

Lessard, 2001; Flyvbjerg, 2005b: 18). Yet mega-projects have also shown themselves to cast a “powerful magnetic spell on ambitious politicians” (Priemus, 2010: 1023), despite immense uncertainties and risks with regard to their potential costs, benefits and duration (Flyvbjerg, 2007). Combined, these factors have contributed to spirited support and resistance by various government actors and non-nation-state actors (NNSAs) over time. Often, these ventures turn into battlefields between agencies fighting over power, budgets and jurisdiction and between supporters and opponents of the project (Flyvbjerg et al., 2003). In addition, a focus on risks and uncertainties often puts the likelihood of implementation, or of success in the case of implementation, in question (Altshuler and Luberoff, 2003). The raising of uncertainties regarding mega-projects is often used as a strategy to influence agenda setting. Uncertainty highlights the problematic aspects of projects, a necessary (but not sufficient) condition to raise public or administrative concerns (Kingdon, 1995).

To counter perceived risks, project initiators often develop strategies to address the effect of uncertainties on the likelihood of mega-projects to materialize and be successful. For example, the Southeast Corridor Transportation Project developed the ‘duologue’ strategy, which focused on issues about which stakeholders would want to know and on how stakeholders would feel at various stages of the project, as perceived by the promoters (Strategic Plan, 2001). Tactics like these have been increasingly undertaken in order to build (and fortify) cross-party support which can address political uncertainties (Hertogh et al., 2008), or prescribe mechanisms for dealing with conflicts about scientific uncertainties or new information as it becomes available (De Bruijn and Leijten, 2008). Often the mass media are relied upon as a forum where dimensions of uncertainties are deliberated, serving as the information canal between the public and the mega-projects (Clark et al., 2004). Recognition of the influential role of media representation in quelling public concern regarding risks and uncertainties, and in building public support, has led to many projects developing strong and sophisticated media strategies at the planning and implementation stages (Lefsrud and Meyer, 2012; Franzen and Vogl, 2013).

As such, the mega-project literature now recognizes that the success of any given mega-project and its likelihood of implementation depend not just on the quality of design and construction, but also on the message delivered to the public to address uncertainties along with how it is communicated and deliberated in the public sphere.

Given the potential effect of uncertainties on mega-projects’ implementation and performance, the aim of this study is to identify how mega-projects are communicated to the public through the use of the media. This study in particular asks: what types of uncertainties are raised and by whom? It also seeks to identify the different strategies used by project advocacy groups and opponents to defuse or intensify these uncertainties and finally to examine if and how these uncertainties and strategies to address them change with time, including the underlying reasons for such change.

This project – focused on the Dead Sea Water Canal – seeks to examine these nuanced considerations of uncertainty and risk as viewed through Israeli media treatment of project concerns over two time periods. We approached these analyses through synchronic and diachronic content analysis (van Dijk, 1988; Fairclough, 1995).

The Dead Sea Water Canal is an example of a mega-project that was envisioned 150 years ago and has long been discussed and debated, primarily along economic, political, social, and ecological dimensions. This project was once about energy production and now centers on desalination and ecological benefits. Despite this shift in emphasis, the project has yet to be built. During the intervening years it has been under intensive scrutiny due to its Israeli unilateral component, as well as its economic and ecological implications. These multiple factors of scrutiny have been fed by numerous uncertainties. Hence, evaluating how this past and present

project is deliberated through the lens of the influential Israeli media helps to understand the difficulties of communicating mega-projects and how these social barriers can be addressed by policy makers.

2. Mega-projects and their (dis)contents: (Un)certain times

Policy design and its implementation are often characterized by uncertainties. These come in many different forms. Peter Taylor and Fred Buttel (1992) have pointed out how dimensions of uncertainty in complex environmental issues – like environmental, social, and political effects from large projects – particularly give rise to politicized debate and disagreement. Unpacking these uncertainties is useful in the context of what Silvio Funtowicz and Jerry Ravetz (1993: 739) have characterized as the spaces of ‘post-normal science’, where “facts are uncertain, values in dispute, stakes high and decisions urgent”. Greater scientific understanding, in the face of uncertainty, can contribute to more complicated policy decision-making by offering up a greater supply of knowledge from which to develop and argue varying interpretations of evidence (Sarewitz, 2004).

A common feature of mega-projects is the amount and nature of uncertainty involved. While all policies bear different degrees of uncertainty, an examination of mega-projects reveals that uncertainty is a central characteristic, as it relates to both the costs involved and the expected social benefits. The British Major Project Association defines such a project as “any collaborative or capital project which requires knowledge, skills or resources that exceed what is readily or conventionally available to the key participant” (Sykes, 1990: 159). This definition highlights the inherent uncertainty of mega-projects as in many cases the decision to initiate such a project is not accompanied by the complete knowledge required to implement or to predict its outcomes.

Flyvbjerg (2005a) identifies the long-term planning and large number of actors involved as immanent characteristics of mega-projects that contribute to the uncertainty of the process. Mega-projects with large-scale implications and footprints (Gellert and Lynch, 2003) thus have the potential to affect a variety of sectors, groups and physical environments. Gellert and Lynch (2003) identify mega-projects as displacements, highlighting their potential large-scale physical and social effects and the potential stakeholders who may create broad discourse regarding the project’s uncertainties. The most recognized types of uncertainties regarding mega-projects relate to predicting the direct costs and benefits of the project. Underestimation of the costs and overestimation of the benefits are often reported, putting in question the overall utility of such projects (Flyvbjerg, 2005a).

In addition, mega-projects usually target more than one policy goal, aiming to offer a ‘big fix’, and are therefore associated with potential cross-sectoral externalities. Environmental/ecological uncertainties regarding project externalities are often multiple, including some whose type and magnitude may be unclear.

Mega-projects usually involve partnerships between the public and the private sector and various financing mechanisms such as build–operate–transfer (BOT) or franchising (Sykes, 1990). For example, financial support from more than 200 banks was allocated to the Channel Tunnel project while the new international airport in Hong Kong involved 155 companies from 19 countries (Hung et al., 2002). Dependency on so many crucial actors reduces flexibility, increases transaction costs and increases economic uncertainty regarding the process and its outcomes.

Often, a mega-project becomes a national, international or regional icon, or aims to become one. It is a visible manifestation of national power, of human progress or of both. Iconization bears

political risks and uncertainties regarding the desirability of the project since social values are not static and the values represented by the project may be subject to objections.

3. Mega-projects and their (dis)contents: (Un)certain strategies

Decision making and mega-projects inherently involve risk and uncertainty (Dror, 1986). Efforts are often made to promote the project in the face of these uncertainties based on the following identified strategies:

- a) **Reducing uncertainty** – strategies to reduce uncertainty call for further research based on existing data, or for the collection of more data. In particular, forecasting methods are employed to cope with uncertainty, including both statistical methods (Andrews et al., 2004) and more intuitive methods such as Delphi (Macphail, 2001) or scenario building (Peterson et al., 2003).
- b) **Disregarding uncertainty** – strategies to disregard uncertainty call for the promoting of uncritical and partial discourse in order to hide uncertainty and not react to uncertainty concerns raised by other actors. The underlying approach is that you have to ‘tell the truth, just the truth but not ALL the truth’. Suppressing uncertainty can lead to either the disregarding of unfortunate outcomes (Matlin and Stang, 1978), or the ignoring of findings or facts that do not support the project (Star, 1985).
- c) **Postponing uncertainty** – strategies to postpone uncertainty call for acknowledgment of the uncertainty but reliance on future capacity to cope with the uncertainty implications based on technological or political developments. This strategy is often based on incorporating flexibility into the process by postponing decision making to a future point based on the assumption that a solution will become available (Pahl-Wostl and Jeffrey, 2007). Furthermore, an incremental process for the project may be suggested as a strategy to postpone decisions, thereby postponing the challenges of uncertainty (Cartwright, 1991).
- d) **Focusing on certain aspects** – strategies that focus on certain aspects can be distinguished into two sub-strategies:

Stressing the certainty of benefits – this strategy seeks to minimize attention on a particular uncertainty by focusing on and emphasizing other, less problematic and more certain aspects of the project. By suggesting many other benefits of the project, the fact that there is uncertainty regarding one aspect of the project is less central.

Unquantifiable benefits – this strategy adds benefits to the project without quantifying these benefits. It can reduce the magnitude of uncertain aspects since the unquantifiable benefits have the potential to override the questionable costs (or benefits).

- e) **Defamation** – this group of strategies is used to harm the status of the NNSA who raised the uncertainty or to bias forecasts in favor of the project.
- f) **Cancelling the project** – this strategy, usually offered by the opponents, suggests that the uncertainties are so crucial and dramatic that the only strategy to cope with such uncertainty is to ‘do nothing’.

The next section examines the existence of these uncertainties and strategies in the case of the Dead Sea Water Canal as an example of a mega-project.

4. The Dead Sea Water Canal as a mega-project

A short history of the Dead Sea Water Canal

The idea of connecting the Dead Sea to either the Mediterranean Sea or the Red Sea has repeatedly come up on the policy maker's radar over the past 150 years. It was first brought up in the 1850s by British military officers William Allen and Charles Gordon, who found great potential in the topography of the Jordan Rift Valley. Their idea was to dig a navigable canal from the Red Sea to the Mediterranean Sea through the Jordan Valley (Al-Rubaiy, 2000). In 1883, a similar proposal was presented by Gordon who stressed the strategic need for redundancy by having an alternative to the Suez Canal. But both plans were withdrawn as they were considered economically unrealistic for that time (Al-Rubaiy, 2000). While the motivation for the first phase of the plans was naval transportation and trade, national development efforts and hydroelectricity potential motivated the second phase of the Dead Sea Canal plans (Scherr, 2007).

Plans for the Dead Sea Canal did not arise in a vacuum. In the early 20th century, conveyor and hydroelectric projects were built around the world. In the United States, the Tennessee Valley Authority (TVA), a federally owned corporation, was created in 1933 for power provision and for regional development. The TVA model inspired the Zionist movement and revived the Dead Sea Canal project (Powell, 2005). As a result, various new conveyor proposals were presented from the late 1930s onwards, including plans prepared by Michael G. Ionides in 1939 (Haddadin, 2006) and the plan for the World Zionist Organization by Walter Clay Lowdermilk (Powell, 2005). After the establishment of the State of Israel in 1948, new approaches were investigated in dealing with the Jordan Valley resources, including the Hays scheme which elaborated on Lowdermilk's study; the MacDonald and Partners study prepared for the Kingdom of Jordan in 1951; and the Chas T. Main study at the request of the TVA in 1953, later known as the Johnston Plan that was later rejected by all countries (Haddadin, 2006). During this time the Israeli government partly adapted these plans by deciding to build a national carrier to bring water from the Sea of Galilee to other parts of the country, but without connection to the Dead Sea.

During the 1970s oil crisis, Israel realized the importance of finding alternative energy sources. Major canal projects were to become economically feasible due to rising oil prices. The Israeli government therefore established the Mediterranean–Dead Sea Company Ltd. to lead further investigations. But in a period where formal relations between Jordan and Israel did not exist, the project's development had political consequences for Jordan who filed complaints to the U.N. that such a canal would reduce its potash production (United Nations General Assembly, 1981).

As part of the 1994 Peace Agreement between Israel and Jordan, both sides agreed to cooperate in activities and projects in the Dead Sea, especially with regard to environmental issues (Israel–Jordan Peace Treaty, 1999). This agreement together with the 1993 interim agreement between Israel and the Palestinians triggered the hiring of the Harza Group to conduct an extensive pre-feasibility study on the issue of integrated development in the Jordan Rift Valley (JRV). The Jordan Rift Valley Integrated Development Study published in 1996, which reviewed five different conveyor alignments, considered the Red Sea–Dead Sea Canal as the prominent alternative (Harza JRV Group, 1996). After two years of negotiations, an agreement was reached in 2005 between the Israelis, the Palestinians and the Kingdom of Jordan on the terms of reference for conducting a feasibility study on one particular route of the proposed Red Sea–Dead Sea Canal (Environmental Resources Management, 2010).

As opposed to the former plans to develop the Dead Sea Canal that focused on energy production, the current 2005 agreement and its accompanying feasibility studies have changed dramatically. The

new proposed project that centers on desalinization includes a significant environmental element for saving the Dead Sea from shrinking and examining the environmental implication of such a project. The present plans also emphasize and even try to quantify the peace dividend of such a cooperative project which until the 1990s was perceived as a unilateral Israeli plan with negative regional implications for cooperation.² The shift in focus in the aim of the Dead Sea Canal is a result of the decline in the Dead Sea water levels of over one meter a year due to Israeli and Jordanian upstream water abstractions³ and due to social changes which are elaborated in the discussion section.

The next section sketches the facets that constitute the latest proposed Dead Sea Canal as a mega-project and the uncertainties they create. A description of these facets shows that the Dead Sea Canal is indeed a mega-project that is characterized by uncertainties; furthermore, such description provides context that is critical for understanding the distribution of uncertainties by periods as is presented in the results section.

The Dead Sea Water Canal and its sources of uncertainties

Underestimation of costs. Three major parameters that influence the economic feasibility and uncertainty of the project in its various routes are the cost of capital, the cost of a cubic meter of desalinated water and the cost of a kilowatt of electricity created, all of which may be underestimated. It is argued that in the first phase of post Peace Process studies, the cost analysis conducted by Harza in 1998 underestimated the total cost of the project. For all three conveyor alternatives, the cost of capital, estimated at 5% to 8%, was too low. Also, the energy ‘saving’ was marginal, and the negative environmental externalities were not taken into account (Beyth, 2000).

Overestimation of benefits. Many NNSAs doubt the multiple benefits related to the canal according to the targets set by the 2005 Terms of Reference of the feasibility study. For example, the Israel Union for Environmental Defense, an Israeli environmental watchdog, has expressed concern that the conveyor project would not sufficiently cope with the decreasing level of the Dead Sea (Koren, 2012), thereby casting some economic and ecological uncertainties on the project’s feasibility. State officials, as well, doubt the degree of benefit from either power production or desalination (Scherr, 2007).

Externalities. A main change from the current natural state of the Dead Sea would be the massive inflow of seawater or brine reject from the desalination process. Mixing water of different qualities may change the components of the Dead Sea, and may result in a reordering of its stratification (Gavrieli et al., 2002). Microbial blooming of the diluted upper layer is expected (Gavrieli et al., 2003). Another example of the risk of environmental externalities, happening given the decline in the Dead Sea water levels, is sinkhole formation – a sudden depression of the surface occurring instantly, led by karst processes such as the dissolution of limestone layers.

Multiple interest groups. Different parties may have conflicting interests: for Jordan the main objective of the project is the creation of a new freshwater supply for its central and northern regions (Sherman, 2010), while for Israel the main objectives are the rehabilitation of the Dead Sea and the supply of water for the Arava region in the south. The Palestinian interest is mainly a political one: recognition of their share of the north of the Dead Sea. Internal conflicts are also likely within the national entities. In Israel strong resistance to the project has been demonstrated by environmental groups and researchers, for example the Society for the Protection of Nature in Israel declared the project to pose a major threat to nature in Israel.

The project as a symbol. As stated in the Terms of Reference of the feasibility study, the aim of the project is to promote national peace (World Bank, 2005). Yet, in the midst of a long-standing human conflict, immediate doubts are raised about whether the proposed canal can simultaneously serve as a national symbol for Jordan, Israel and the Palestinians, or function as a regional symbol, building a connection between the parties. Using the project as a national symbol for one party may erode the ability of the project to be used as a symbol for the other party. For example, the use of the project as a symbol for providing significant additional freshwater for Palestinians may be seen by others as a sign of ‘normalization’ with the Zionists (Environmental Resources Management, 2010).

Media representations of the Dead Sea Water Canal

The study focuses on representations of the Dead Sea project within Israeli discourse along two time periods. The first period is between June 1974 and June 1995 and the second is from 2000 to June 2007. The former period is characterized by Israeli unilateral moves of promoting the water canal in the context of several national events that brought the project to public attention. These include a government decision to approve a feasibility study and establish a government company to build the project, a state comptroller report on the project, and a decision to halt the project that lasted around a decade. The latter period is set in a cooperation mode as Israel signed a peace agreement with Jordan and began cooperative dialogue with Palestine. Hence, this period is characterized by trilateral negotiations on the feasibility studies for the Dead Sea Canal and several public hearings to discuss the implications of the project.

The two periods, although representative of attempts to promote the Dead Sea Water Canal, are different. The former one mostly represents a Mediterranean Sea–Dead Sea canal for energy production while the second period represents a Red Sea–Dead Sea canal for desalinization and is often framed as an attempt to save the Dead Sea from shrinking. Since the media, as in the Israeli case, often responds to events through ‘episodic’ treatments (Boykoff, 2011), the time span includes two temporal gaps that were not covered by this study. The first gap is between 1996 until 1999 and the second gap begins in 2007 until today. The former temporal gap is a result of Dead Sea multilateral negotiations between Israel, the Palestinians and Jordan, which started only in the early 2000s, while the second gap is a result of the World Bank’s feasibility studies that started around 2007 and only recently, with the exposure of the results to the public, came back under public scrutiny.

We sampled and analyzed media portrayals of the Dead Sea Water Canal from the Israeli national *Ha’aretz* newspaper along the two time periods. We then undertook synchronic (comparative simultaneous depictions) and diachronic (historically-sensitive sequences of representations) analyses to examine these portrayals within as well as across these periods. *Ha’aretz* is the oldest daily newspaper in Israel and the main stage for intellectual and policy debates in Israel (Viser, 2003). Its articles are commonly used when aiming at ‘elite’ or ‘quality’ press (Nossek, 2004) and therefore it serves our purpose to reflect the dominant discourse regarding policy issues. Moreover, the media outlet was selected in part due to the availability of news archives across the full period of study: from the 1970s to the present. It has been well documented and importantly cautioned elsewhere that the approach of analyzing newspaper articles carries several weaknesses and biases (e.g. Boykoff, 2011). Specific to this study, *Ha’aretz* newspaper is considered a liberal newspaper that may represent an agenda different from those of other national newspapers (e.g. Carvalho, 2007).

In each article we identified events in which uncertainties stemming from the water canal were raised and discussed more often than not. For each event the following information was coded: its affinity with one of the two time periods; the type of uncertainty raised (political, economic, technological, ecological); and the government actor or NNSA who gave voice to the uncertainty in the

media account. Among NNSAs, we further differentiated between political actors at various levels, media actors (e.g. reporters), researchers (e.g. scientists), business actors and non-governmental organizations (NGOs). The identification of these categories of actors is consistent with corollary work in these areas (e.g. Biermann et al., 2009). Our analyses span two time periods, each with its own character; thus in each event we also identified the objective of the project. The results were contrasted between the two periods and examined within each of the periods.

For the two periods, 257 newspaper articles dealing with the canal were identified, of which 82% raised and discussed notions of uncertainty. Coding these events allowed us to build two databases. The first comprises 334 events that include one of the five types of uncertainty for which the communication strategies to address the uncertainty could be identified. The second database comprises 227 events where we could identify one of the five types of uncertainty in addition to the NNSA raising the uncertainty.

Next, an analysis of bivariate nominal association was conducted using Cramer's V association coefficient ranging from 0 = non-association/independence to 1 = full associations. The Cramer analysis included four variables resulting in six possible examined combinations (Table 4). Subsequently, an analysis of the structure of the dependence among the variables was conducted using a log linear model.

5. Results: The Dead Sea Water Canal mega-project is dead, long live the Dead Sea Water Canal mega-project

Table 1 examines the distribution of strategies used to defuse uncertainties by uncertainty type (identified previously) and time period, using synchronic and diachronic analyses. Statistical analysis between various uncertainties and players or strategies was undertaken using a standard T test. The situation of multiple hypotheses testing was handled using the Bonferroni method since the number of uncertainties identified in this study was relatively small.

Our results indicate that uncertainties change over time and to a lesser degree, the distribution of strategies changes across the two time periods. In the first period, uncertainties were largely economic in nature, while in the second, the focus shifted to ecological uncertainties. 'Stressing the certainty of benefits' was a very common strategy in the first period, whereas the focus has shifted to 'project cancellation' in the second. In both periods the most common strategy used to deal with uncertainty was 'reducing uncertainty'. Yet in the second period this strategy was even more common, representing 51% of all strategies used to defuse uncertainties. Moreover, the tendency to use this strategy as a response to economic uncertainty (compared with 'ecological' or 'other' uncertainty types) is statistically significant by variation in the second period; this is unlike the first period, where the distribution among uncertainty type lacks statistically significant variation.

By examining texts in comparative-synchronic and historical-diachronic context, we found that whereas in the first period the strategy of 'reducing uncertainty' was often deployed to address economic uncertainties, in the second period it was used to defuse ecological uncertainties. The two other common strategies used were 'project cancellation' and 'stressing the certainty of benefits'. Although their frequency of use in both periods is similar, they appear to be used for addressing other uncertainties. For example, in the first period, 'project cancellation' was used largely to address economic uncertainties; this contrasts with the second period, where it was used to address ecological uncertainties. It is also clear that the strategies of 'disregarding uncertainties' and 'defamation' are less frequent today than during the first period.

Table 2 indicates through synchronic analyses that in the first period the most dominant uncertainty raised was economic, followed by political uncertainty, both raised primarily by political

Table 1. Strategies addressing uncertainties by uncertainty type and period ($N = 334$).

Strategy for dealing with uncertainty	Period	Uncertainty type					Total
		Political	Economic	Technological	Ecological	Other	
Transfer of responsibility	1974–1995	0%	12% ^a	0%	0%	0%	13%
	2000–2007	0%	8% ^b	0%	0%	0%	8%
Reducing uncertainties	1974–1995	5% ^a	16% ^a	3% ^a	4% ^a	6% ^a	35%
	2000–2007	3% ^{a,b}	7% ^b	0%	21% ^a	21% ^a	51%
Disregarding uncertainties	1974–1995	3% ^a	4% ^b	1% ^{a,b}	2% ^{a,b}	0% ^{a,b}	10%
	2000–2007	1%	0%	0%	1% ^a	0%	3%
Postponing uncertainties	1974–1995	0%	3% ^a	0%	0%	0%	3%
	2000–2007	0%	1% ^a	0%	1% ^a	0%	3%
Stressing the certainty of benefits	1974–1995	2% ^a	10% ^a	2% ^a	1% ^a	1% ^a	16%
	2000–2007	0%	4% ^a	0%	0% ^a	5%	10%
Unquantifiable benefits	1974–1995	0%	3% ^a	0%	0%	0%	3%
	2000–2007	0%	1% ^a	0%	0%	0%	1%
Defamation	1974–1995	0%	4% ^a	0%	0%	0%	6%
	2000–2007	0%	0%	0%	0%	0%	0%
Project cancellation	1974–1995	2% ^{a,b}	6% ^b	1% ^{a,b}	1% ^{a,b}	4% ^a	15%
	2000–2007	4% ^a	5% ^a	0%	12% ^a	3%	25%
Total	1974–1995	13%	59%	8%	8%	12%	100%
	2000–2007	8%	27%	0%	36%	29%	100%

Cells with ^a compared with cells with ^b (in the same row) differ significantly at the .05 level.

Cells with the letters ^{a,b} did not differ significantly from cells with letter ^a or letter ^b.

Cells without superscript letters are empty cells that may or may not differ significantly and therefore were not calculated.

In "Total" there may be a deviation from the sum of the row or column because the numbers were rounded.

actors. In the second period, the most dominant uncertainty raised was ecological, raised typically by NGO actors. In both periods, political actors were the most vocal in raising uncertainties. The first period shows that the proportion of political and economic uncertainties raised by politicians differed significantly from technological uncertainties raised by the same such actors. In the second period, however, no statistically significant difference was established between uncertainty types raised by politicians.

Moreover the role of academic researchers seemed to remain steady in the second period, while the role of NGOs and business actors increased. In both periods, media actors themselves did not appear to play a major role in addressing the uncertainties.

For both periods, diachronic analyses revealed that the monetary cost of the project, dependent on a host of variables – such as interest rates and energy prices in global markets – best represented major economic uncertainties (Figure 1b). However, the data showed that nowadays there is less concern over the economic implications of damage to land use and property rights and greater interest in uncertainties related to the cost of the project. The findings also showed that at present ecological uncertainties in media accounts are more prominent (Figure 1c). What is more, in the past the impact on groundwater was articulated through the media as a major concern; in recent years actors voiced their objections to water abstraction in the Red Sea and the potential detrimental effect of mixing water from different sources as primary considerations. While the results did not indicate much change in the intensity of political uncertainties over time, diachronic analysis

Table 2. Uncertainties raised by non-nation-state actor, uncertainty type and period (N = 227).

Agent	Period	Uncertainty type					Total
		Political	Economic	Technological	Ecological	Other	
Political actor	1974–1995	14% ^a	30% ^a	4% ^b	4% ^{a,b}	7% ^{a,b}	60%
	2000–2007	2% ^a	15% ^a	0%	8% ^a	6% ^a	31%
Media actor	1974–1995	0%	1% ^a	1% ^a	1% ^a	1% ^a	4%
	2000–2007	0%	1% ^a	0%	1% ^a	1% ^a	3%
Academic researcher	1974–1995	4% ^{a,b}	8% ^b	2% ^{a,b}	4% ^a	6% ^{a,b}	22%
	2000–2007	4% ^a	0%	0%	10% ^{a,b}	4% ^{a,b}	18%
Business actor	1974–1995	1% ^a	7% ^a	3% ^b	0% ^a	2% ^{a,b}	14%
	2000–2007	1% ^a	9% ^a	0%	7% ^a	13% ^a	30%
NGO actor	1974–1995	0% ^a	0%	0%	0%	0%	0%
	2000–2007	0%	0%	0%	12% ^a	6% ^a	18%
Total	1974–1995	19%	46%	9%	10%	17%	100%
	2000–2007	7%	25%	0%	38%	30%	100%

Cells with ^a compared with cells with ^b (in the same row) differ significantly at the .05 level. Cells with the letters ^{a,b} did not differ significantly from cells with letter ^a or letter ^b. Cells without superscript letters are empty cells that may or may not differ significantly and therefore were not calculated. In “Total” there may be a deviation from the sum of the row or column because the numbers were rounded.

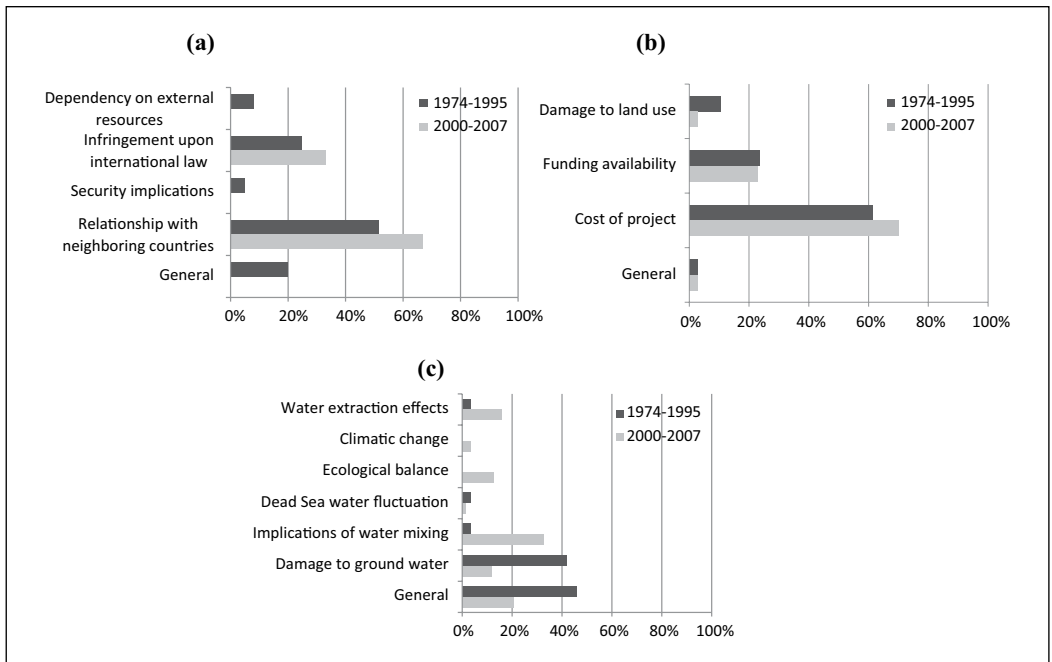


Figure 1. Distribution of sub-uncertainties by periods.

of content showed interesting change: dependency on external resources and security implications were minor concerns in the earlier period, but are absent from concerns in the later period. In the more recent period the focus shifted to the role of international law and Israel’s relationship with its neighbors (Figure 1a).

Since the objective of the mega-project changed between the two time periods (see Table 3), this may explain why differences existed in the uncertainties that were raised, the strategies that were assigned and the actors addressing them. While the major objective in the first time period was energy production and regional development, in the second period saving the Dead Sea and desalination became more prominent. Moreover energy production was more associated with economic implications and their uncertainties. This was most often conveyed by politicians, while saving the Dead Sea was more associated with ecological uncertainties and communicated mostly by environmental NGOs. The Zionist ethos in both periods did not seem to play a major role in shaping either project objectives or project uncertainties.

Table 4 shows analyses as to whether the correlations between the four major variables of this study are significant. Through synchronic and diachronic analyses, the findings show that all six associations among the variables are medium or weak, but significant. However, these correlations do not show how the dependency is structured.

Log linear analysis was performed in order to reveal how the dependency was structured between the variables. The findings indicate that there is a conditional independence between the period and the strategy variables. They are independent given a certain uncertainty type variable.

Therefore, given uncertainty type, period and strategy are independent and uncorrelated. For example, given exposure to political uncertainty, the distributions of the period and the strategy are not correlated. Since there are differences in the distribution of uncertainty type, there are also differences in the distribution of strategies (and not because the period is different). Given the structure that was discovered, the correlation between period and strategy that is evident in Table 4 may have misleading interpretations. Strategy to deal with uncertainty is conditioned by uncertainty type, regardless of the period examined. However, since the uncertainty type distribution changes between periods, the distribution of strategies also varies with period type. The goodness of fit statistics are: a significance of 0.618 to the model and Pearson's chi-squared test with a significance of 0.829.

Table 3. Project objectives by period ($N = 408$).

	Project objective					Total
	Energy production and security	Dead Sea water level recovery	Regional development	Desalination	Zionist ethos	
1974–1995	53%	10%	27.5%	6%	3%	100%
2000–2007	13%	49%	17%	19%	3%	100%

In the "Total" column there may be a deviation from 100% because the numbers were rounded.

Table 4. Correlations between variables via bivariate association analysis.

Interacting variables	Cramer V	Association significance
Period and Uncertainty type	0.462	<0.001
Period and Strategy	0.257	0.003
Period and Actor	0.470	<0.001
Uncertainty type and Strategy	0.275	<0.001
Uncertainty type and Actor	0.254	<0.001
Actor and Strategy	0.206	0.002

6. Discussion

The inability to implement a mega-project, including the Dead Sea mega-project, without addressing its uncertainties justifies the main purpose of this study: to examine how uncertainties change through time and which strategies are needed to deal with uncertainties. Hence, this study attempts to address these elements by considering whether dependency between actors, uncertainties and strategies exists through time.

The results indicate that uncertainties and concerns that are manifested in newspaper articles significantly change with time as a function of the changing nature of the project and the social context; the decline in political uncertainties in the second period, for example, may be associated with the move from a unilateral Israeli project to a trilateral project facilitated by the World Bank. A cooperative project by definition infringes less upon international law (although its importance did increase in the second period) and raises fewer sovereignty and security concerns. The shift from a unilateral to a cooperative project also affected project concerns and aims, specifically from concerns that can be addressed unilaterally (like energy production), to concerns that require deep cooperation on common pool resources, much like the concern over water-level recovery. Moreover, the availability of information and technology has also affected the distribution of uncertainties between the two periods. Indeed technological uncertainties in the second period have become less of an issue as excavation technology has improved. The growing importance of ecological uncertainties in the second period may also reflect the growing number of multiple interest groups, reflecting the societal values and NNSAs of that period, including environmentalism and environmental movements in Israel (Tal, 2002). While in the first period environmental concerns were embedded, to some limited degree, in the existing Zionist establishment (Katz, 2004), the Zionist ethos was a developmental one (De-Shalit, 1995) in which environmental considerations were perceived as a luxury (Lijphart et al., 2000). It was only during the late 1990s that the emergence of non-partisan political environmentalism in Israel created an environmental lobby (Karassin, 2011) along with the establishment of several vocal NGOs. In our case, it was these NGOs that often voiced the multiple uncertainties associated with externalities that have become more dominant in the second period.

The different context characterizing each period shaped not only the dominant uncertainties raised but also the involvement of NNSAs that conveyed these uncertainties. A prime example is the current role of NGOs and academics in delivering ecological concerns in the second time period of the project as opposed to the role of politicians and academics voicing political and economic concerns (respectively). Additionally, the greater involvement of the business sector in addressing uncertainties in the second time period is in line with the observation of Lehrer and Laidley (2008) that new mega-projects are often undertaken by state actors operating in collaboration with private interests, as seen in the contemporary Red–Dead initiative.

Changes in dominant uncertainties and the involvement of NNSAs are also coupled with changes in strategies to address these uncertainties. An increase in the use of the ‘reducing uncertainty’ strategy in the second period is an example of how strategies change with time. This strategy allows for the adjustment of projects without their cancellation. The growing use of this strategy may be explained by the improved modeling of projects and the perception of the inevitability of mega-projects among the public. Hence, project opponents are geared to project modification, whereas in the past NGOs were more focused on uncompromising opposition, as documented in the Garb study (2005) on the Trans-Israel Highway. The role of the inevitability of mega-projects in the Israeli context may also explain why the percentage of ‘project cancellation’ strategies remains a minority strategy.

Not only do strategies change, but also their role in addressing uncertainties. One example is the change in the role of the 'reducing uncertainties' strategy (used to quell concerns in the public arena) to better fit the shift from the defusing of economic uncertainties that was dominant in the first period to the resolving of ecological uncertainties that dominates the second period.

This nexus between changing societal values over time and raised uncertainties implies that temporal analysis is a good indicator for expected uncertainties and the NNSAs that are likely to raise them. This is supported by the log linear analysis. Nevertheless, the fact that the log linear analysis indicates independence between the time period and the strategy used to address uncertainty type implies that the strategy (prescribed to address uncertainties) is not a good indicator or proxy for predicting changes in time in societal values. Thus, while we can associate distribution in uncertainty type with different time periods, we cannot find similar relationships between strategies and time periods. In other words, given a particular time period, a certain distribution of uncertainty can be characterized; given uncertainty type, a certain distribution of strategy can be distinguished.

These findings are supported by the general literature that stresses the vestiges of flawed information-deficit model thinking, as well as failed linear logic to resolve questions of risk and uncertainty (Moser and Dilling, 2007; Hulme, 2009).

The case study of the Dead Sea Water Canal clearly shows the intersecting social, political, economic, cultural and ecological factors that shape how uncertainty is communicated to the public, a complexity that poses a serious challenge to both mega-project supporters and opponents in their attempt to bring such projects to the public sphere.

7. Conclusion

Despite the fact that in the 1980s and 1990s we witnessed a decline in mega-projects throughout the world, we now see a revival of large and ambitious projects (Swyngedouw et al., 2004) such as mega-projects connected with tourism and sports (Díaz Orueta and Fainstein, 2009). Mega-projects are still on the agenda also in other fields like energy and water infrastructure or in the form of dam-building and transportation (e.g. Lehrer and Laidley, 2008). Common in many of these mega-projects is the abundance of uncertainties that can potentially lead to civic mistrust and require widespread social and political support. The Dead Sea is no exception: for the last forty years the Dead Sea as a mega-project has been the source of extensive debates centered on its many uncertainties.

Given this civic mistrust and the detrimental implications of uncertainties, in mega-projects in general, and in the Dead Sea Water Canal in particular, the expectation of the public is to be sure that decision makers make rational decisions based on knowledge and analysis. In other words, the trustworthiness of the government or of project promoters is based on (among other things) their perceived competence and their ability to make such decisions (Rousseau et al., 1998). The media is often used as a venue to convey these distrusts by mega-project opponents who try to amplify uncertainties in the hope that these uncertainties will be an excuse for inaction. The media is also a possible venue for policy makers to address these uncertainties in the hope of gaining support. Unsurprisingly, it is often press coverage that acts as a battlefield for these uncertainties as seen through this case study – often by the construction of frames that use uncertainties to strengthen prevailing ideologies (Antilla, 2005). Therefore, in this analysis we look to the role of media representational practices of uncertainties as they have been found to significantly influence agenda-setting processes and risk perceptions amidst stakeholders as well as other NNSAs in the public sphere (Boykoff, 2011).

As this study has shown, uncertainty was and still is an inherent feature of contemporary feasibility studies, scientific inquiry and policy as well as everyday decision making. At the interface of

science, policy and politics, the uncertainties identified and examined in this study were the focal point for attention and served as a battlefield for meaning and policy outcome. By placing uncertainty's use (and mis-use) into historical, political, social, economic and ecological context through synchronic and diachronic content analysis of the Dead Sea Water Canal, we were able to provide some insights on why and how these uncertainties and the strategies to address them changed over time. This may enhance further considerations of institutional and contextual factors that give rise to oversimplification, reductionism, omission and amplification of uncertainty as well as the strategies needed when deliberating mega-projects in the public sphere. Future research should include additional media sources (e.g. newspapers) to test potential differences in uncertainty and strategy representations according to underlying ideologies or political inclinations of the media.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Notes

1. This was the slogan from a détournement-natured bumper sticker campaign developed in the spirit of the early culture-jamming campaigns of the Paris-based Letterist Society in the 1950s. It drew from the famous line "Frankly, my dear, I don't give a damn" in the popular 1939 film *Gone with the Wind*.
2. For example see the 1981 United Nations General Assembly's ordering of Israel to stop the unilateral project due to its implications on neighboring countries.
3. The Jordan River, despite its relatively small water discharge, represents an important component in the water budget of the riparians. As such, in 1964, Israel integrated all the country's water resources into a comprehensive countrywide network called the National Water Carrier, which diverted water away from the Jordan River. Jordan irrigates the Jordan Valley by channeling a tributary of the Jordan River (Yarmouk) into a canal 75 km long (the Ghor Channel, later called the Abdullah Canal). As a result, less than 10% of the natural flow remains in the river.

References

- Al-Rubaiy S (2000) *Water Security, and the Concept of Sovereignty and Peace in Jordan River Valley States*. Damascus, Syria: Dar al Hasad [in Arabic].
- Altshuler A and Luberoff D (2003) *Mega-projects: The Changing Politics of Urban Public Investment*, first edition. Washington DC: Brookings Institute.
- Andrews CJ, Hassenzahl DM and Johnson BB (2004) Accommodating uncertainty in comparative risk. *Risk Analysis* 24(5): 1323–1335.
- Antilla L (2005) Climate of skepticism: US newspaper coverage of the science of climate change. *Global-Environmental Change: Human and Policy Dimensions* 15: 338–352.
- Beyth M (2000) Project of the seas: The Mediterranean Sea–Dead Sea and the Red Sea–Dead Sea. *Water Engineering* 37–44 [in Hebrew].
- Biermann F, Betsill M, Gupta J, Kanie N, Lebel L, Liverman D, Schroeder H and Siebenhuener B (2009) *Earth System Governance: People, Places, and the Planet. Science and Implementation Plan of the Earth System Governance Project*. Earth System Governance Report 1, IHDP Report 20. Bonn: International Human Dimensions Programme on Global Environmental Change.
- Boykoff M (2011) *Who Speaks for the Climate? Making Sense of Media Reporting on Climate Change*. Cambridge, UK: Cambridge University Press.
- Cartwright TJ (1991) Planning and chaos theory. *Journal of the American Planning Association* 57(1): 44–56.
- Carvalho A (2007) Ideological cultures and media discourses on scientific knowledge: Re-reading news on climate change. *Public Understanding of Science* 16: 223–243.

- Clark RL, Ehikhamenor V, Hanumanthu K, Muth L, Short C and Zietlow M (2004) *From Community Involvement to the Final Product: Marketing Mega Projects and Public Trust*. Course: TMAN 671. Instructor: Jay Shattuck. May 3. University of Maryland University College Graduate Study.
- De Bruijn H and Leijten M (2008) Mega-projects and contested information. In: Priemus H, Flyvbjerg B and van Wee B (eds) *Decision-Making on Mega-Projects: Cost-Benefit Analysis, Planning and Innovation*. Cheltenham, UK: Edward Elgar, pp. 84–102.
- De-Shalit A (1995) From the political to the objective: The dialectics of Zionism and the environment. *Environmental Politics* 4: 70–87.
- Díaz Orueta F and Fainstein SS (2009) The new mega-projects: Genesis and impacts. *International Journal of Urban and Regional Research* 32(4): 759–767.
- Dror Y (1986) *Policymaking Under Adversity*. New Brunswick: Transaction Books.
- Environmental Resources Management Ltd. (2010) *RSDSC Study Program, Environmental and Social Assessment*. Initial Assessment Report.
- Fairclough N (1995) *Media Discourse*. London, UK: Edward Arnold.
- Flyvbjerg B (2005a) Design by deception: The politics of megaproject approval. *Harvard Design Magazine* No. 22: 49–59.
- Flyvbjerg B (2005b) Machiavellian megaprojects. *Antipode* 37(1): 18–22.
- Flyvbjerg B (2007) Policy and planning for large-infrastructure projects: Problems, causes, cures. *Environment and Planning B: Planning and Design* 34(4): 578–597.
- Flyvbjerg B, Bruzelius N and Rothengatter W (2003) *Mega-Projects and Risks: An Anatomy of Ambition*, first edition. Cambridge, UK: Cambridge University Press.
- Franzen A and Vogl D (2013) Two decades of measuring environmental attitudes: A comparative analysis of 33 countries. *Global Environmental Change* 23(5): 1001–1008.
- Funtowicz SO and Ravetz JR (1993) Science for the post-normal age. *Futures* 25: 739–755.
- Garb Y (2005) Constructing the trans-Israel highway's inevitability. *Israel Studies* 9(2): 180–216.
- Gavrieli I, Lensky N, Gazit-Yaari N and Aharon O (2002) *The Impact of the Proposed "Peace Conduit" on the Dead Sea*. Report GSI/23/2002, Geological Survey of Israel (GSI).
- Gavrieli I, Bein A and Oren A (2003) The expected impact of the "Peace Conduit" project (the Red Sea–Dead Sea pipeline) on the Dead Sea. *Mitigation and Adaptation Strategies for Global Change* 10: 759–777.
- Gellert PK and Lynch BD (2003) Mega-projects as displacements. *International Social Science Journal* 55(175): 15–25.
- Haddadin MJ (ed.) (2006) *Water Resources in Jordan*. Washington DC: Resources for the Future.
- Harza JRV Group (1996) *Red Sea–Dead Sea Canal Project: Draft Prefeasibility Report*. Jordan Rift Valley Integrated Development Study.
- Hertogh M, Baker S, Staal-Ong PL and Westerveld E (2008) *Managing Large Infrastructure Projects: Research on Best Practices and Lessons Learnt in Large Infrastructure Projects in Europe*. Baam, The Netherlands: AT Osborne BV.
- Hulme M (2009) *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge, UK: Cambridge University Press.
- Hung ALW, Naidu GM, Cavusgil ST and Yam RC (2002) An exploratory study of project based international joint ventures: The case of Chek Lap Kok Airport in Hong Kong. *International Business Review* 11: 505–522.
- Israel–Jordan Peace Treaty (1999) Annex 4, Environment D.2.2.
- Karassin O (2011) Environmentalism in Israeli party politics. The Open University of Israel Papers. Available at: <http://www.openu.ac.il/policy/download/maamar-13.pdf>
- Katz Y (2004) To stop the bulldozer: Establishing institutions for the preservation of nature and the historical heritage of Israel. Bar Ilan University.
- Kingdon JW (1995) *Agendas, Alternatives, and Public Policies*. New York: Addison, Wesley Longman.
- Koren O (2012) Israel, Jordan and the Palestinian Authority have agreed to advance the Red Sea–Dead Sea conveyor project. *The Marker* [in Hebrew], 29 January. Available at: <http://www.themarker.com/dynamo/1.1628275>

- Lefsrud LM and Meyer RE (2012) Science or science fiction? Professionals' discursive construction of climate change. *Organizational Studies* 33(11): 1477–1506.
- Lehrer U and Laidley L (2008) Old mega-projects newly packaged? Waterfront redevelopment in Toronto. *International Journal of Urban and Regional Research* 32(4): 786–803.
- Lijphart A, Bowman PJ and Hazan RY (2000) Party systems and issue dimensions: Israel and thirty-five other old and new democracies compared. In: Hazan RY and Maor M (eds) *Parties, Elections and Cleavages: Israel in Comparative and Theoretical Perspective*. London: Frank Cass, pp. 29–51.
- Macphail A (2001) Nominal group technique: A useful method for working with young people. *British Educational Research Journal* 27(2): 161–170.
- Matlin MW and Stang DJ (1978) *The Pollyanna Principle: Selectivity in Language, Memory and Thought*. Cambridge, MA: Schenkman Publishing.
- Miller R and Lessard DR (2001) *The Strategic Management of Large Engineering Projects: Shaping Institutions, Risks, and Governance*, first edition. Cambridge, MA: MIT Press.
- Moser S and Dilling L (eds) (2007) *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*. Cambridge, UK: Cambridge University Press.
- Newell P and Mulvaney D (2013) The political economy of the 'just transition'. *The Geographical Journal* 179(2): 132–140.
- Nossek H (2004) Our news and their news: The role of national identity in the coverage of foreign news. *Journalism* 5(3): 343–368.
- Pahl-Wostl C and Jeffrey P (2007) Adaptive water management: How to cope with uncertainty. *NeWater* 4: 1–7.
- Peterson GD, Cumming GS and Carpenter SR (2003) Scenario planning: A tool for conservation in an uncertain world. *Conservation Biology* 17(2): 358–366.
- Powell JM (2005) The empire meets the new deal. *Geographical Research* 43(4): 337–360.
- Priemus H (2010) Mega-projects: Dealing with pitfalls. *European Planning Studies* 18(7): 1023–1039.
- Rousseau DM, Sitkin SB, Burt RS and Camerer C (1998) Not so different after all: A cross-discipline view of trust. *Academy of Management Review* 23(3): 393–404.
- Sarewitz D (2004) How science makes environmental controversies worse. *Environmental Science and Policy* 7: 385–403.
- Scherr T (2007) Not dead yet: 150 years of Dead Sea. M.A. Dissertation, King's College, UK.
- Sherman EJ (2010) Fresh water resource development as a result of the Red Sea–Dead Sea conduit: A case study of the Central Arava Valley. M.Sc. Thesis, Ben Gurion University of the Negev, Israel.
- Star SL (1985) Scientific work and uncertainty. *Social Studies of Science* 15(3): 391–427.
- Strategic Plan (2001) Transportation Expansion Project Public Information. Available at: [http://tychousa5.umuc.edu/TMAN671/0402/9041/class.nsf/cd82d384f31ec5f885256e2f00075719/776a6f903845c26a85256e5300790fb5/\\$FILE/TREX%20PI%20Plan%20Final.doc](http://tychousa5.umuc.edu/TMAN671/0402/9041/class.nsf/cd82d384f31ec5f885256e2f00075719/776a6f903845c26a85256e5300790fb5/$FILE/TREX%20PI%20Plan%20Final.doc)
- Swyngedouw E, Moulaert F and Rodríguez A (2004) Neoliberal urbanization in Europe: Large scale urban development projects and the new urban policy. In: Brenner N and Theodore N (eds) *Spaces of Neoliberalism: Urban Restructuring in North America and Western Europe*. Oxford, UK: Blackwell.
- Sykes A (1990) Macro projects: Status, prospects, and the need for international cooperation. *Technology in Society* 12(2): 157–172.
- Tal A (2002) *Pollution in a Promised Land: An Environmental History of Israel*. Berkeley, CA: University of California Press.
- Taylor P and Buttel F (1992) How do we know we have global environmental problems? Science and the globalization of environmental discourse. *Geoforum* 23(3): 405–416.
- United Nations General Assembly (1981) Israel's decision to build a canal linking the Mediterranean Sea to the Dead Sea. Agenda Item: 136-137.
- Van Dijk TA (1988) *News as Discourse*. Hillsdale, NJ: Laurence Erlbaum.
- Viser M (2003) Attempted objectivity: An analysis of *The New York Times* and *Ha'aretz* and their portrayals of the Palestinian–Israeli conflict. *International Journal of Press/Politics* 8(4): 114–120.
- World Bank (2005) Terms of reference. *Red Sea–Dead Sea Water Conveyance Project: Feasibility Study – Environmental, Technical and Economic and Environmental and Social Assessment*. Washington DC: World Bank.

Author biographies

Itay Fischhendler serves as the Head of the Environmental Planning and Policy program at the Hebrew University. His research interests focus on environmental conflict resolution, natural resources governance and decision making under conditions of political and environmental uncertainties.

Galit Cohen-Blankshtain is a Senior Lecturer at the Department of Geography and the School of Public Policy at the Hebrew University. Her main research interests regard public policies in various fields such as transport, urban policy and environmental policy. She is interested in policy processes and examining different societal, institutional and political aspects of transport policy.

Yoav Shuali received his Master's degree from the Geography Department at the Hebrew University. This research is based on his Master's thesis data collection. He teaches history at high school.

Max Boykoff is Fellow in the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado, and an Assistant Professor teaching in Environmental Studies, while serving as Adjunct Faculty in Geography. Max's ongoing interests include climate adaptation, cultural politics and environmental governance, and science-policy interactions.