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“Management of the Wadi Khalil/Nahal Besor Environmental Borderscape”

Lead Investigators: S. Hamburg (Environmental Studies, E&EB, and Watson Institute), Brian O'Neill (Watson Institute), R. Morello-Frosch (Environmental Studies and Community Health), Jeff Albert (Geological Sciences and Environmental Studies), and Calvin Goldscheider (Sociology and Judaic Studies).

Summary of Relevant Background Literature: Although there exists a large number of bilateral and multilateral treaties, guidance documents, and memoranda of understanding on the subject of transboundary environmental *governance*, there is a distinct paucity of published research in the area of transboundary environmental *assessment*, let alone material specific to Israel and Palestine¹. The published work largely addresses transboundary air pollution in Europe. For example, Helmis et al (2003) have developed a methodology for estimating transboundary air pollutant flux by incorporating existing measurements of NO_x and SO₂ with meteorological data into a numerical model. Eloy (2000) produced a digital, spatially-explicit forest inventory in order to generate a quantitative apportionment of transboundary air pollutant sources and effects in Belgian forest ecosystems.

Three regionally-relevant studies include: an analysis of sources of nonlocal lead deposition in Jerusalem using a radionuclide model (Erel et al., 2002); a model of ground-level ozone concentrations in central Israel and the West Bank based on the emission of ozone pre-cursors along the Mediterranean coast (Ranmar et al, 2002); an ecological investigation of the interaction of grazing regimes and different physical and administrative border types along the Israel-Egypt Sinai border (Meir and Tzoar 1996).

Even in those areas where a well-developed institutional structure for performing transboundary environmental assessment exists, there appear to be significant international legal obstacles to its implementation (Furlop, 1998). Still, there is precedent: In 1997, the US Council on Environmental Quality concluded that the American National Environmental Policy Act (NEPA) requires U.S. agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States.

There is one study documenting efforts to produce a genuinely cooperative transjurisdictional environmental assessment (Keating and Farrell, 1999) which has some generalizable lessons. Still, this particular report focuses on the coordination among American states, rather than among people who have been engaged in varying forms of military conflict for roughly a century.

For some time environmental assessment has taken place more or less independently within Israel and Palestine. Best known of these are a series of reports issued by the Israeli Ministry of the Environment, the Technion Institute in Haifa, and the Applied Research Institute in Jerusalem, and the recent United Nations Environment Programme (UNEP) Desk Study on the environment of the West Bank. However, integration of domestically collected environmental data has occurred only sporadically (see Rishmawi and Albert (2001)).

The ongoing political conflict, combined with asymmetry in Israeli and Palestinian institutional capacities for environmental assessment, has further limited the independent integration of data and information by Israeli and Palestinian scientists on transboundary environmental matters. *The shared Israeli-Palestinian ecoregion constitutes an environmental “borderscape” and many of its components cannot be understood without integrated, transboundary environmental analysis.*

Although some very noteworthy Israeli-Palestinian scientific research collaboration does persist (Giles, 2003), nearly every component of the research proposed herein is without precedent in the Israeli-

¹ Benvenisti (2003) writes generally about the legal prospective transboundary environmental resources, and Fietelson and Haddad (2001) offer policy proposals on cooperative management of the Mountain Aquifer, but in neither study is jointly conducted quantitative environmental analysis a component.

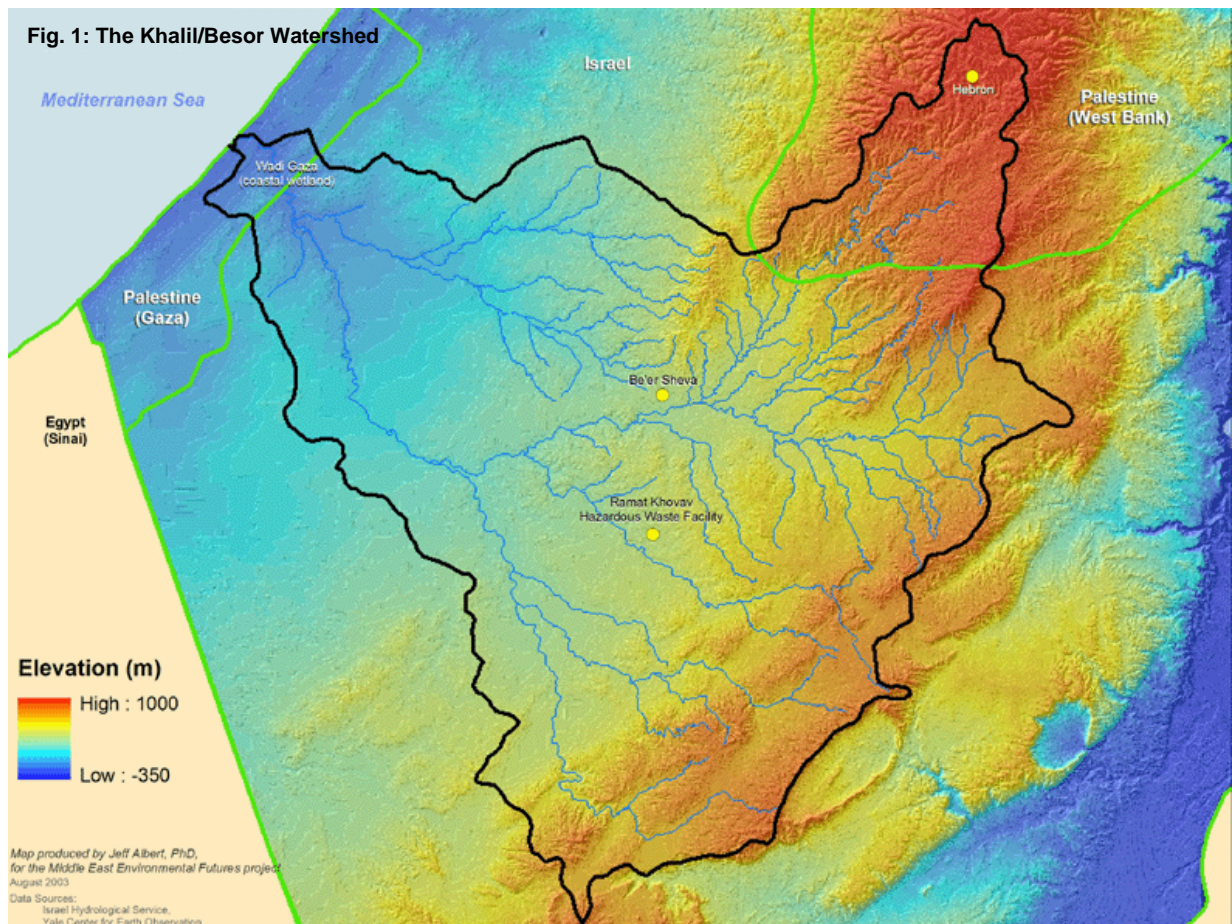
Palestinian context (indeed several components are without precedent generally). As discussed in section 5 above, no genuine assessment of transboundary environmental matters – performed jointly by Israeli and Palestinian scientists – has occurred to date, and any transboundary environmental assessment, cooperatively conducted, is rare outside of the air pollution realm. The nearest approximation of such joint Israeli-Palestinian environmental analysis is a recent paper promoting an economics-informed set of solutions to the water dispute among Israel, Palestine, and Jordan (Fisher et al., 2002), but this was an optimization model rather than the cooperative collection and synthesis of environmental data.

The notion of the borderscape is a fairly recent conceptual formulation (Harbers, 2003), and the decision to anchor our joint environmental research in the context of a borderscape, to our knowledge, the first attempt to apply the concept to environmental analysis.

Description of the Proposed Research Project: We propose a bona fide joint Israeli-Palestinian environmental assessment of a segment of the shared borderscape: the roughly 3,400 km² Wadi Khalil/Nahal Besor transboundary watershed, which spans significant portions of the southern West Bank, Israel proper, and the Gaza Strip (Figure 1). Approximately 450,000 people reside within the watershed boundaries, divided among Israelis and Palestinians, urban and rural dwellers, settled/semi-settled farmers and semi-nomadic Bedouin pastoralists. This watershed is the focus of our research for several reasons: first, it is an example of a truly transboundary watershed – both the ethnic populations of the basin and the threats to environmental quality within it are divided between Israel and Palestine; second, the direction of influence of environmental impacts runs in both directions - Israeli settlements influence Palestinian cities in the West Bank downstream, which in turn influence Israeli cities further downstream, which in turn influence Palestinian resources in Gaza; third, the environmental challenges faced by the human inhabitants and ecological resources of the watershed are severe, ranging from habitat loss to water scarcity and pollution to exposure to toxic materials; fourth, there is the potential for synergistic improvements in environmental quality and human welfare resulting from transboundary cooperation.

This assessment will consist of quantitative analyses of water scarcity/impairment, solid and hazardous waste management, land use and land cover change, and plant/wildlife habitat. The physical assessment will be complemented by two novel components to environmental assessment research: (1) a cooperative Israeli-Palestinian study of public perceptions of environmental problems (environmental narratives) among the regions various sub-populations, and (2) construction of demographic-economic-political scenarios that will be integrated into environmental assessment forecasts for the region.

With respect to *water scarcity/impairment*: we will combine Palestinian and Israeli data to generate a water balance for the Besor/Khalil, including both natural inputs and outputs (precipitation, evapotranspiration, surface runoff, and groundwater recharge) and anthropogenic inputs and outputs (including imports and exports of freshwater, reclaimed wastewater, and sanitary sewage). This will require integration of existing meteorological, water allocation, and wastewater discharge information from both Israeli and Palestinian agencies, including the Israel Hydrologic and Meteorological Services and the Palestinian Water Authority. On the impairment side, collaborative assessment of pollutant sources, fate, and behavior will be coupled with the water balance estimation to generate assessments of total pollutant loadings in different sub-basins of the watershed with rudimentary apportionment estimates.



With respect to *solid and hazardous waste management*: we will examine the complex role of the Ramat Hovav facility, the central hazardous waste management facility serving Israel (and ostensibly Palestine), situated within the Khalil/Besor watershed. Over 65,000 tons of toxic materials were processed at Ramat Hovav via landfilling, incineration, and recycling in the year 2000, according to the Israel Ministry of Environment. Our analysis will consist of two parallel efforts: first, an assessment of pollutant transport volumes and pathways from the facility to surrounding communities, and second, an inquiry into the failure to process hazardous wastes at the facility. Proper transport and disposal of hazardous materials at Ramat Hovav can be quite expensive and is frequently circumvented by illegal dumping both within Israel and within the West Bank. Palestinian wastes are officially required to be processed at Ramat Hovav, but for a variety of political and economic reasons this has not occurred. We propose to map “unofficial” waste sites within the Besor/Khalil watershed and assess their impact on water, soil, and air quality. We will also consider an emergent environmental challenge within the watershed; the new Israeli national solid waste disposal site at Duda'im.

With respect to *land use/land cover change analysis*: we will utilize both photo-interpreted survey data and satellite imagery (Landsat MSS, TM, ETM+, IKONOS, and SPOT) to generate land use/land cover change estimates throughout the watershed from the mid-1970s to the present. We will combine objective, spectral-based pixel classification with building-density trend analysis to generate two independent estimates of change, so as to quantify both extent and location of land use/land cover conversion. Present-day estimates will be complemented by a significant field-verification (“groundtruthing”) component.

With respect to *plant and wildlife habitat*: we will generate a comprehensive plant and wildlife survey of the watershed, with a focus on habitat and ecosystem health. Many important plant and wildlife communities in the watershed straddle the Green Line dividing Israel proper from the West Bank and Gaza,

respectively. We will integrate and update existing data with field surveys, and build the results into the land use/land cover change component of the project.

The four subject areas above comprise what can be thought of as an “expert” assessment of the current state of the Khalil/Besor environmental borderscape. These assessments will be conducted by Palestinian-Israeli teams utilizing well-honed hypotheses and agreed upon research methodologies.

This assessment approach will be complemented by an effort to gauge *human perceptions of this borderscape*. Quantitative survey instruments and qualitative narratives techniques will be merged to gain an understanding of how different Israeli and Palestinian publics within the borderscape relate to and think about their physical environment. Israeli and Palestinian project participants will cooperatively develop the specific quantitative and qualitative methodologies, and though the actual data gathering will necessarily be performed largely independently, the teams will return to analyze results together. Further more, the interim results of the human perceptions study will inform the environmental assessment research, facilitating modifications such that issues of particular community concern can be integrated into the research program.

Following the conclusions of the environmental assessments, we will initiate a *scenario-building exercise*, in which we generate multiple forecasts of environmental response in the Khalil/Besor borderscape to multiple political, socioeconomic, and demographic outcomes. Community views will be incorporated into the construction of the scenarios, using information gathered from the human perceptions study. Re-calculations of freshwater and pollutant balances, land use/land cover change forecasts, and estimates of habitat loss and its impacts, will be included in scenario predictions.

One unique aspect of this region is that it lacks a separation barrier that has come to represent much of the Israeli-Palestinian borderscape. The recently constructed fences and walls create a potentially significant impediment to wildlife and ecosystem structure and function. Because our study region does not currently have such a barrier, and whereas its construction is a distinct possibility, we will conduct parallel research in the northern Israeli-Palestinian borderscape. This study site will span the area between Nablus and the Gilboa mountain range. The research here, conducted by the same team, will focus on floral and faunal communities, and the specific impact of the separation barrier on their habitats. The results of the northern study will bear directly on the future scenarios of the Khalil/Besor Watershed.

The final product of the research will be translated into Hebrew and Arabic and presented to regional stakeholders. We will convene a regional conference to present the findings and facilitate civil discourse on the environmental management priorities within the watershed. Feedback from stakeholders will be integrated into the final project publication and used in the implementation phase of the research findings.

Synergy: In addition to the fact that the proposed research is simply impossible without an array of both research disciplines and national backgrounds, the complementarity of the collaborating researchers is substantial. We bring together specialists in ecosystems studies, land use change, water resources management, environmental health, and sociology to help oversee a broad environmental analysis. Each discipline fits in a very clear and indispensable role.

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