



Cross-cultural perceptions of ecosystem services: A social inquiry on both sides of the Israeli–Jordanian border of the Southern Arava Valley Desert



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ABSTRACT

This research explores local resident perspectives on ecosystem services (ES) in the hyper-arid Arava Valley/Wadi Arava, which spans across both Israel and Jordan. Identifying and characterizing ES, an increasingly popular precursor for crafting sustainable natural resource management and land use policy, is an inherently multi-disciplinary endeavor. Our goal is to apply social research tools, in particular in-depth interviews with local residents, to understand their perspectives concerning ES. Since the research is conducted on two sides of an international border, it also illuminates the potential role of culture, nationality and economics in formulating perceptions on ES in deserts.

The results show that, although deserts are often considered to be lacking in ES, local residents feel that their environment is abundant in services, particularly cultural services. Furthermore, although they live in a nearly identical ecosystem, local residents from two sides of the border showed distinct differences, as well as some shared patterns, in how they use and value ES. The study highlights the importance of applying social methods for ES identification and characterization in tandem with other disciplinary approaches, in order to avoid common problems including disregard of the importance of social and cultural perspectives, leading to undervaluing of intangible cultural services.

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1. Introduction and literature review

Ecosystem services (ES) are characteristics of ecosystems that provide benefits that have either a utilitarian (monetary, biological) or non-utilitarian (esthetic, spiritual) value to humans (UK National Ecosystem Assessment, 2011). They have emerged as a prominent conceptual link between environment and society (Collins et al., 2011; Vihervaara et al., 2010) and in the past decade, have become a dominant theme in sustainable natural resource management and land use policy. The Millennium Ecosystem Assessment (MA) suggests viewing ecosystems through the lens of the services and benefits that they provide to society, thereby understanding the scope of human dependence on healthy ecosystems and the

potential negative impact of human actions altering those ecosystems and the services they provide (Carpenter et al., 2009). The political ramifications of studying ecosystem services are described by Haines-Young and colleagues: “By making the link to human wellbeing, the initiative [MA] forcefully demonstrated that arguments about the protection of species and ecosystems... can also be made in terms of the role of ecological systems in sustaining people’s livelihoods and quality of life” (Haines-Young et al., 2008: 29).

Ecosystem services are commonly categorized into four types: supporting, regulating, provisioning and cultural services (Millennium Ecosystem Assessment, 2005). The UK National Ecosystem Assessment (UK NEA) re-categorized these into intermediate (supporting) services, final services and goods. The latter category embodies the specific elements that humans take from nature (UK NEA, 2011). For the current research we adopt the earlier conventions of the Millennium Assessment. ES (and/or the goods and benefits they provide) can be valued in ecological, economic or social terms (De Groot et al., 2002). Due to this diversity in valuation, ES scholars call to integrate diverse disciplinary approaches in the assessment of ES (Burkhard and Muller, 2008;

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Collins et al., 2011; Daily et al., 2009; Haberl et al., 2006; Kumar and Kumar, 2007; O'Farrell et al., 2011). Yet, the overwhelming amount of research on ES has been conducted by ecologists and economists (Ohl et al., 2007), leading to a gap in our understanding of the social value of particular ES.

Numerous scholars have emphasized the importance of filling the knowledge gap (particularly with regard to cultural services) using social ES assessments as a crucial step toward successfully operationalizing the ES concept in policy (Menzel and Teng, 2010). Swinton et al. (2007) assert that understanding how humans perceive and value ES is as fundamental to ecosystem management as understanding how ecological functions generate these services. De Groot et al. (2002) add that the analysis of ecosystem functions and services involves different scales that don't necessarily correspond: the physical scale of the ecosystem function on the one hand, and the scale at which humans value the goods and services, on the other. Jax (2010) states directly that "to assess ES in a particular region, we have to work our way backwards from society and its specific needs to ecosystem processes – and not vice versa, as scientists mostly do."

Yet, despite the clear demand for social assessments, very few studies have assessed ES using a social (non-economic) approach (but see Gee and Burkhard, 2010; Sodhi et al., 2010; Vejre et al., 2010). The potential advantages of using such an approach (e.g. sociological and anthropological theory and methods) to assess ecosystem services include: 1) Understanding the importance of ES for the local population; 2) Assessing ES in developing countries where scientific knowledge is missing; 3) Assessing spiritual and cultural meanings and values as reflected in ES; 4) Gaining perspectives of marginal groups, and 5) Providing policy makers with information regarding preferences and perspectives of their constituents vis-à-vis their natural environment (Christie et al., 2008). Without stakeholder participation and consultation, decision makers cannot prioritize management decisions toward the needs of the public (Clark, 2002; Jeffrey, 2000; Lipchin et al., 2005).

Desert ecosystems are ideal case studies for exemplifying the importance of social valuation of ES. Drylands are characterized by scarcity of water, which constrains their two major interlinked services – primary production and nutrient cycling. This potential water deficit affects both natural and managed ecosystems, constraining the production of crops, forage, and other plants and thus impacting livestock and humans (Safriel et al., 2005). Compared to other global ecosystems, desert regions have relatively low priority with regard to biodiversity and ecosystem services (Naidoo et al., 2008).

While desert regions are relatively poor in provisioning ES, they may be rich in cultural ES. Although cultural ecosystem services are frequently cited in the ES literature, relatively little research has focused on them (Gee and Burkhard, 2010). It is important to note that we refer specifically to the ES literature; the subject of human use and appreciation of the natural environment has a rich history in the literatures of environmental psychology, landscape architecture, anthropology and sociology, to name a few of the disciplines that address cultural ES without calling them such.

Cultural services, which include tourism, spiritual, religious, recreational, and educational services, among others, tend to be assessed on a fine scale in small local studies (Gee and Burkhard, 2010), because the data required for these assessments is not typically available on a broad scale and because of the culture-specific, intangible, and sometimes sensitive nature of these services. Gee and Burkhard (2010), who provided one of the only non-economic social assessment for ecosystem services, find that the importance of provisioning services (e.g. water, medicinal plants, wood for fuel, and food) are well emphasized in the literature. On the other hand, landscapes also provide spiritual and mental

wellbeing to local people. The value of such services, which are difficult, if not impossible to value in monetary terms, has traditionally been overlooked and underestimated in ES research in the absence of comprehensive social assessments (Frank et al., 2012).

Often people from the poorest nations, lacking access to technology and markets, have the greatest dependency on their immediate ecosystem. Thus, gaining a better understanding of the role ecosystem services play in these people's lives is fundamental for securing their livelihoods and wellbeing (Christie et al., 2008). The Arava Valley, which includes rural populations from Jordan and Israel, provides a unique setting in which it is possible to examine the differences in perceptions of ecosystem services among communities who are very different in their culture and level of economic development.

In this research, we employ anthropological research methods, in particular semi-structured in-depth interviews and field observations, to explore how local communities use and perceive ES. As a hyper-arid ecosystem, the Arava provides an excellent opportunity to explore the ES concept, and, as we discovered in this research, the provision of cultural ES in particular. The political border dividing the Arava allows us to conduct comparisons between two cultural settings that, as we elucidate in the research, utilize their environment in very different ways. We ask the following questions: 1) How do local communities in hyper-arid environments perceive and utilize ecosystem services? 2) How do these uses and perceptions change according to cultural and economic differences? 3) How can qualitative research methodologies enrich our understanding of ES?

2. Site description

The Arava valley (Fig. 1) lies in the southernmost region of Israel and Jordan and is part of the Great Rift Depression, which is approximately 6000 km long, running from northern Syria in southwest Asia to central Mozambique in East Africa. The valley is a hyper-arid region with an average annual rainfall of 25 mm. In the summer the temperature can reach a maximum of 47 °C, while in

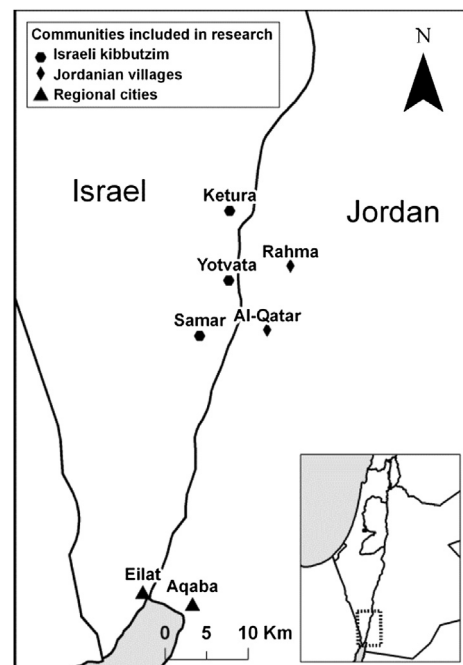


Fig. 1. Study site – the Southern Arava Valley with five target settlements.

winter it varies around 13–16 °C. Plant cover is sparse and limited by low rainfall, elevated temperature and high soil salinity (Pen-Mouratov et al., 2010).

The Arava Valley is divided by the political border between Israel and Jordan. Although there is a peace treaty between Israel and Jordan (signed in 1994), the border is still demarcated by security fences and patrol roads. Permanent settlement in the area has steadily increased since the 1950's. The present study focuses on the rural settlements lying on both sides of the border of the Southern Arava Valley, which are separated by approximately 10 km (as the crow flies). Due to the border, the communities have little contact with one another.

The Israeli Southern Arava region is under the jurisdiction of the Hevel Eilat Regional Council and includes ten kibbutzim (plural for kibbutz) and two community settlements (Cohen et al., 2009). A kibbutz is a collective community that combines socialist and Zionist principles, and guided by the Marxist communist principle that money is collectively earned “from each according to his abilities” and distributed “to each according to his needs”. Historically, the prominent economic activity was agriculture, which is still carried on today, along with a variety of newer industrial and service activities. The settlements of the Arava were founded by ‘Nachal’ settlement groups (a government sponsored program combining mandatory military service with pioneering agricultural settlement), comprised of North American Jewish immigrants, young adult graduates of Zionist youth movements, and descendants of other Kibbutzim in Israel. These individuals are generally characterized as having a patriotic, pioneering spirit, motivated by Ben-Gurion, Israel's first prime minister, and his ideology of “redeeming the desert” and “making the desert bloom” (Miles, 2007). These communities received significant economic aid from government agencies and non-governmental Zionist organizations (Strom, 2004).

The main economic activities of the Israeli Arava are agriculture (especially date orchards), dairy production, mariculture, tourism and small businesses. In recent years, the Hevel Eilat Regional Council has also initiated a series of entrepreneurial renewable energy projects. Education level in the kibbutzim is high by national standards. More than 50% of the adult population continued studies beyond high school (27% in university and the rest in professional studies) (Central Bureau of Statistics (CBS) Israel, 2011). The current research focuses on three kibbutzim; Yotvata, Ketura and Samar (established in 1957, 1973 and 1976, respectively). In contrast to the general trend of privatization among Israeli kibbutzim, all three kibbutzim continue to practice the original kibbutz ideology.

The Jordanian Southern Arava Valley is under the jurisdiction of the Wadi Araba District, and is settled by eight Bedouin villages. In Jordan, 80% of the land area is called “el badiya” – the desert. From the word “el badiya” comes the word “el badu” or “the Bedouins,” which means the people who live in the desert (Heidtmann, 2001). The Bedouin population is Muslim and most Jordanian Bedouins are descendants of migrants from the Arabian Peninsula, who populated the area between the 14th and 18th centuries. Throughout their history, Bedouins were semi-nomadic pastoralists, raising sheep, goats and camels while moving in annual cycles in the desert according to the seasonal availability of pasture and water (Dinero, 2004), in addition to some level of orchard/crop cultivation, trade and employment outside pastoral activities (Avner, 2007; Abu Rabi'a, 1991). Bedouin hold detailed knowledge of the desert environment, such as: local names of plants, their morphological characteristics, auto-ecology, habitat characteristics and their main uses. This knowledge allows them to manage their environment and survive within it (Ahmed, 2010; Belal et al., 2009).

In the past century, the Bedouins have gone through processes of sedentarization and social modernization, in part due to pressure

by national governments in various Middle Eastern countries (Berman-Kishony, 2008). The Bedouin population of the Wadi Araba region, also undergoing sedentarization, is characterized by high poverty rates, in part due to these processes. Despite current attempts to improve education, the region suffers from a 28.7% illiteracy rate (JRF – Sustainability Report, 2008). The main economic activities of Wadi Araba residents are employment in the public sector (government or the military), sheep and goat herding, agriculture and handicrafts. One of the main challenges hindering economic development in the region is the long history of disputes about resources and land between the clans, and between clans and the local government (JRF – Sustainability Report, 2008). The current research focuses on two Bedouin villages: Rahma and Al-Qatar, which were settled in 1957 and 1984, respectively.

The total population of the studied settlements on each side of the border is approximately 1,400 people. The settlements that were chosen for this study are situated directly opposite one another (see Fig. 1) and therefore share a common environment. Rahma and Al-Qatar are the only Jordanian villages in the Southern part of the Arava Valley. On the Israeli side, Yotvata, Ketura and Samar were chosen, because together they contain a similar population size to the two villages on the Jordanian side. This research is a part of the Arava LTSE (Long Term Socio-Ecological Research) platform belonging to the international LTER network.

3. Methodology

A qualitative anthropological approach was chosen for assessing the residents' perceptions of the environment and the ecosystem services they receive from it. During the research, the lead author spent a year living in the Israeli Southern Arava Valley, and visited the villages on the Jordanian side of the border ten times to conduct observations and interviews. In addition, documents, reports and social artifacts about the communities and populations under study were collected.

Sixty-four semi-structured, open-ended interviews took place, 32 on each side of the border, involving randomly selected residents over the age 18, living in the area 15 years or more. There was a fairly equal distribution among the different settlements under study, as well as among sex and age (Table 1). The interviewees comprised approximately 7% of the population over 18 which had lived more than 15 years in the Arava at the time of the research. Open-ended questions were used to allow the conversation to flow beyond the set of questions asked. Christie et al. (2008) explain the advantages of using qualitative methods (such as in-depth interviews) for the assessment of ES: “Qualitative approaches provide opportunities for the researcher to probe more deeply into people's preferences... Further, the insights gained... may provide important supplementary information that might be useful to help understand the reasons underlying people's values” (Christie et al., 2008: 15–16).

Table 1
Distribution of interviewees among each locality under study.

	Yotvata	Ketura	Samar	Rahma	Al-Qatar
Population	640	438	264	1200	225
Adult population over 18 ^a	440	314	164	700	125
Number of interviewees	11	11	10	22	10
Gender	6-men 5-women	6-men 5-women	5-men 5-women	11-men 11-women	5-men 5-women

^a Only individuals over the age of 18 who had lived in the region for 15 years or more at the time of the research were included in the study.

The interview questions were developed based on both the current research focus and the scientific literature (Christie et al., 2008; Hummon, 1992; McCurdy et al., 2005). In order to encourage the respondents to speak about their cultural worlds (McCurdy et al., 2005), the first two questions of the interviews were descriptive, asking about how the subjects experienced their environment. The following questions attempted to reveal residents' sense of place (Hummon, 1992), the way they use their environment and the services provided by the ecosystem (Christie et al., 2008), what are the most important aspects of the environment to the subject and what changes they would make to the environment, if they could, and, finally, their opinions on agriculture (Appendix A).

In addition to the 64 interviews, ten additional interviews on each side of the border were conducted with key leaders within the region, such as the head of the Hevel Eilat Regional Council, agriculture managers, businesspeople, and others. These interviews provided supplementary "expert" opinions on the ways their communities use the environment and their perceptions of current and future regional development vis-à-vis the natural environment (Appendix B).

Early in the research, we discovered that the term "ecosystem services" was unknown to interviewees (found also by the UK NEA, 2009), and that explaining the concept in the midst of interviews proved difficult and disrupted the flow of the interview. In the general interviews with the broader stakeholder resident group, we formulated proxy questions that did not query about ES directly, but asked about them in an indirect way. For example, we asked "how do you use your environment in your daily lives?" or "how does the environment serve you?" In the interviews with experts, we defined the term "ecosystem services" for them, and then proceeded to ask them directly about the ecosystem services of their area.

Both questionnaires were used as part of a broader research on the Arava residents' sense of place and perceptions of the environment and agriculture. For the scope of this paper we only used the responses concerning perceptions on ecosystem services.

The interviews and observations were analyzed qualitatively according to Strauss and Corbin's (1998) grounded theory analysis framework. This approach is inductive and encourages generation of theory from data in the process of conducting research. Key-points from the gathered data were coded to categories and sub categories; and eventually core categories were identified and related to other categories.

4. Results

The first goal of the research was to elucidate how residents use and perceive their environment and its ecosystem services. Already during the interview stage, it became clear that the environment itself was perceived differently on each side of the political border. The Israelis often described their environment as an "oasis", including the green areas of their communities; the ornamental plants, grass, agricultural fields and date orchards, in the midst of the surrounding desert (Figs. 2 and 4). A woman from Yotvata describing her environment provided a typical response: "I'm surrounded by grass and trees, in the outer circle there is a desert landscape."

In contrast, Jordanians perceived their environment as a desert and made no distinction between their village and the rest of the desert. Indeed, there are no fences around their villages, ornamental plants are scarce and the few agricultural fields that exist are not seen in the view (Fig. 3). Moreover, while describing the ES of their environment, the Israelis included those services provided



Fig. 2. Kibbutz Ketura and its agricultural fields (Photography by: Yonatan Chesler).

by the agricultural fields, while the Jordanians mentioned mainly the services of the desert environment.

The services that were mentioned by the respondents appear in Table 2. For the purpose of comparison, we divided the table between the services that have been mentioned by Israelis alone, by residents from both countries, and by Jordanians alone. The results have been tabulated according to the Millennium Ecosystem Assessment's division to types of ES and sub-categories of each (Millennium Ecosystem Assessment, 2005). The interviewees described mostly cultural services (non-material benefits that they obtain from ecosystems) and provisioning services (products obtained from ecosystems). Two other types of services, which do not provide humans with direct benefits, but rather are necessary for the production of provisioning and cultural services, namely, supporting services and regulating services, were hardly mentioned by the interviewees (except for water, which is considered as both a provisioning service and a supporting service, when it supports primary productivity) and have therefore been left out of the table.

While most of the ES literature (in particular from more mesic environments) treats ES as a product of biodiversity, we note that respondents described ES as the products of geodiversity. Geodiversity supports the provision of basic raw materials, provides esthetic landscapes and is the physical and chemical foundation upon which ecosystems are based. The UK National Ecosystem Assessment (2011) is helpful in addressing the role of geodiversity in the provision of ES: "...geodiversity, like biodiversity, is



Fig. 3. Jordanian village Rahma (Photography by: Hila Sagie).



Fig. 4. Israeli Kibbutz Ketura (Photography by: Roni Biller).

a good in itself and underpins some important cultural final ecosystem services" (UK NEA, 2011:16). Residents did not seem to make a distinction between the services stemming from geodiversity and those from biodiversity, and we have followed their lead.

4.1. Provisioning services

Despite a few similarities, the provisioning services noted by residents of the Arava Valley were found to be very different on each side of the border (Table 2). Among Israelis, provisioning services cited most frequently are sand, water from the local aquifer, sun (source of energy production) and aridity (we included "sun" and "aridity" in Table 2 as they were repeatedly mentioned by interviewees, although they are usually considered climate conditions defined as environmental services rather than ES). These are associated with productive uses such as agriculture, renewable energy and algae-farms. In contrast, Jordanians use provisioning services mainly for their basic needs and the resources cited most often were trees and bushes (for shade and as forage for their livestock), spring water (for their livestock) and animals (for hunting).

Residents on both sides of the border mentioned the use of fine grain sand and aquifer water for agriculture and raising livestock and cited the importance of aridity for date farming (Fig. 5). However, the frequency of respondents mentioning these varied, and reflected the different economies. Israelis spoke more often of using their environment for agriculture (two thirds of the respondents), especially for growing "Majhul" dates (a sweet and fleshy species; the most popular type of dates grown in the Southern Arava, which accounts for most of the income from date farming). The importance of agriculture as a provisioning service was mentioned by a 60 year old Kibbutz member: "The fact that we managed to do agriculture in the Arava is one of the main reasons that we are able to survive here and live here...". In contrast, in Jordan three-fourths of the respondents spoke of using the environment to raise livestock (Fig. 6). The type of livestock raised in the two countries differs, with cows being the dominant livestock in Israel, while goats and sheep are more prevalent in Jordan.

There are also notable differences in use of provisioning services for fuel. While both Israeli kibbutzim and Jordanian villages are connected to their respective national electricity grids (although not all individual homes in the Jordanian villages are connected), several respondents from each country cited using additional energy sources from the local environment. In Jordan, dry wood from bushes and trees is used for cooking and heating, while in Israel various types of renewable energy, such as, solar energy, wind power and bio-diesel, are now being introduced.

4.2. Cultural services

A significant common denominator between Jordanians and Israelis was their perception of cultural services (Table 2). Respondents from both countries referred to these services in far greater detail than to the provisioning services; the Israeli respondents even more so than the Jordanians. The shared cultural services were mainly expressed in terms of esthetic enjoyment of the landscape (two-thirds of respondents on both sides), the quiet and the calm that the desert provides (mentioned by slightly more than half of the Israeli respondents and slightly less than half of the Jordanian respondents) and the vast open spaces (about a third of respondents on both sides).

The landscape, as an esthetic cultural service with components of both biodiversity and geodiversity, was a prominent and recurring theme throughout the interviews. For example, an Israeli man matter-of-factly quipped, "The pleasure I get from nature and the landscape compensates for my boring job." A Jordanian woman shared this sentiment, explaining, "I love the mountains early in the morning, they make me feel good and my problems become small."

For both Jordanians and Israelis, the natural environment, including the landscape, climate and biological components of the ecosystem, create a strong sense of place, sense of being at home and an attachment. According to Hummon's (1992) typology of sentiments to place, 63% of Israeli respondents and 53% of the Jordanian respondents were ideologically rooted in their environment. Those "ideologically rooted" include people who hold strong feelings of satisfaction, attachment and home combined with self-conscious identification with place. This theme surfaced repeatedly in interviews, as when an Israeli woman in her 50's who had lived on her Kibbutz for 32 years noted, "My connection to this environment is very strong, here is my home; I don't see myself leaving it. I see myself as a desert 'kibbutznickit' [female Kibbutz member]." Ten kilometers to the east, a 60 year old woman from Jordan, who had lived in the village for the past 40 years, shared a similar attachment to place, noting that: "I would like to live my whole life here until I die. There is no other piece of land to build my home. Here is my region. I wouldn't move anywhere else."

Residents of both countries also spoke of the spiritual force and powerful feeling of the desert. A third of the Israelis mentioned spiritual experiences in the desert; some specifically mentioned feeling the presence of God, as did an Israeli man, who said, "I love the fact that I can climb the mountain and be there alone with God." An Israeli woman explained the logic that the desert served as the backdrop for the development of the major monotheistic religions: "The landscape here is very inhuman, it isn't a soft view, it is powerful. Why do you think the Torah was given in the desert?" Jordanians didn't specifically speak about God, but spoke of the rewarding experience of being alone in the desert. A Jordanian man described how "many people go with a donkey to the desert for a few days to change, to relax, to think..."

Both Jordanians and Israelis spoke often of the recreational activities that are particularly suited for their environments. While both cited enjoying activities such as mountain climbing, camping, desert hikes, gardening, star-gazing, and watching floods and wild animals, each side emphasized specific activities. Jordanians mentioned hunting, picnics and barbecues, smoking a nargila (water pipe) outside and riding camels and donkeys. Israelis mentioned playing in the sand dunes, birding, jeep excursions and bicycling or horseback riding in the desert or in the agricultural fields.

In Jordan, activities in the desert were often prohibited for women depending on how traditional their families were. Some women mentioned hiking in the desert together with their families,

Table 2

Southern Arava residents' perceptions of the ecosystem services of their environment.

Final services		Israel	Shared	Jordan
Provisioning services	Food	<ul style="list-style-type: none"> • Cow farm, dairy plant • In the past raising fish – “Ardag” fish factory • Growing fodder for the cows 	<ul style="list-style-type: none"> • Use of the fine grain sand and aquifer water for vegetable agriculture and mainly date orchards • Advantages of the weather – yield to markets early in the season and high quality dates (esp. ‘Majhul’) • Raising sheep and goats for milk and meat (more in Jordan) 	<ul style="list-style-type: none"> • Hunting local animals such as: gazelles, rabbits, crows and spiny tailed lizards
	Energy	<ul style="list-style-type: none"> • Sun and dryness used for solar energy, desert cooler and for drying clothes • Attempts for developing wind power and biomass • Castor oil-plant (Ricinus) project in Yotvata for bio-diesel/bio-ethanol 		<ul style="list-style-type: none"> • Trees and bushes used for heating and cooking
	Raw material	<ul style="list-style-type: none"> • Mud for building structures • Parts of the date trees for decoration • Sand mining from the dunes 	<ul style="list-style-type: none"> • Trees and bushes for shade 	<ul style="list-style-type: none"> • Wood for building domestic animal shelters • Local plants as forage
	Water	<ul style="list-style-type: none"> • Aquifer water are used for all domestic water needs and desalinated for drinking. • Use of treated waste water for irrigation 	<ul style="list-style-type: none"> • Local aquifer water used for irrigation 	<ul style="list-style-type: none"> • Spring water used for domestic animals
	Pharmaceuticals & cosmetics	<ul style="list-style-type: none"> • Production of algae • Cultivation of Hudya – cacti used for losing weight • Green clay for facial masks 		<ul style="list-style-type: none"> • Traditional use of local plants for relieving pain
Cultural services	Spiritual/tradition	<ul style="list-style-type: none"> • Inspiring for music & art • Enables to focus the attention inside • Feeling the presence of god • Spiritual equanimity 	<ul style="list-style-type: none"> • Powerful nature • Easy to be alone in • The view and the quietness allow to contemplate about life 	<ul style="list-style-type: none"> • The space allows to preserve the Bedouin tradition of ‘honor’ and of raising sheep & goats
	Mental wellbeing	<ul style="list-style-type: none"> • Feeling safe • The agriculture and vegetation create an oasis which compensates for the hard desert conditions 	<ul style="list-style-type: none"> • The view and dry air create a feeling of inner peace • Relief of daily stress • Merging with the rhythm/slow pace of the desert • Affinity to nature 	
	Education/research	<ul style="list-style-type: none"> • The agricultural fields are important for teaching Kibbutz and Zionist values such as “working the land” • Research & development center for desert agriculture 	<ul style="list-style-type: none"> • Desert education about plants, animals and survival in the desert. • Working in agriculture teaches how to grow vegetables 	<ul style="list-style-type: none"> • Bedouin heritage
	Recreation/sports	<ul style="list-style-type: none"> • Sustainable desert agriculture research • Riding on horses, bicycles and jeeps • Playing in the sand dunes • Walking, running and riding in the agricultural fields • Organized field trips in the desert with family, community, school and daycare • Photography 	<ul style="list-style-type: none"> • Climbing on the mountains • Observing animals • Camping mostly in the mountains • Swimming in the red sea • Meteor shower gazing • Flood watching, playing in the mud 	<ul style="list-style-type: none"> • Hunting • Riding camels, donkeys and cars in the desert • Picnics outdoors • Smoking Hookah outdoors
	Aesthetics	<ul style="list-style-type: none"> • Edom Mountains in the sunset/sunrise • The beauty of the green orchards and fields that create an oasis 	<ul style="list-style-type: none"> • Amazement from the view • Enjoyment of the vast open space 	
	Tourism	<ul style="list-style-type: none"> • Eco-tourism: mud building, environmental education, renewable-energy-visitor center, Hai Bar (desert animals' park) and bird watching • Archeological and geological tourism (Timna park) • Theme tourism: Judaism, Zionism • Road services 		
	Sense of place	<ul style="list-style-type: none"> • Ideological sense of belonging: “redemption of the land”, “conquering the Negev”, “protecting the borders” 	<ul style="list-style-type: none"> • Strong sense of place and nostalgia • Strong connection and attachment to the environment • Sense of home • Identification of self with place 	<ul style="list-style-type: none"> • Rooted sense of belonging to the land where their forefathers were born

and there were others who said that they were not allowed to go on desert hikes. A girl from Al-Qatar said that, except for going to and from school, she isn't allowed to leave her home. In the absence of such alternatives, some of the women's recreational use of the environment was expressed in cultivating gardens near their homes.

In the context of cultural ES, Israeli respondents noted that agricultural fields provide such services and emphasized their role in the lives of the Arava residents. Agricultural areas were noted with reference to aesthetics, sense of home, recreation, education and ideology. The agricultural fields were often mentioned as an inseparable part of the landscape which gives residents their sense



Fig. 5. Cow farm and date orchards on the Israeli side (Photography by: Roni Biller).

of home and esthetic pleasure. The passion displayed by a woman from Yotvata was not atypical:

“The best thing for me is to go out of my house and see the Edom Mountains with the vegetable fields! The combination of fields in the desert is amazing...When I see the agricultural fields I know that I am home.”

A fifth of the Israeli respondents specifically attributed the esthetic value of the green of the agriculture to their mental well-being and their need of it, as a young man from Ketura expressed, “If there wasn’t green here I don’t know if I could be in a desert environment all the time...”

The ideological value of agriculture for Israelis was often linked to Zionist principles that are a cornerstone of Kibbutz ideology, just as is the sanctity of “manual labor” (A.D. Gordon), “connection to the land” and “settling the borders” (Sternhell, 1995). A third of the respondents, mostly from Kibbutz Yotvata, spoke specifically of the ideological importance of agriculture. A female respondent reported:

“Agriculture (not including the date orchards) is a large Kibbutz sector that doesn’t make much money but we keep it anyhow for ideological reasons, for our connection to the land, and so that the claim to our right to settle here will be based without any doubt.”

A young female member of the kibbutz also mentioned the ideological importance of agriculture:



Fig. 6. Goat herding on the Jordanian side (Photography by: Hila Sagie).

“I think that agriculture is what makes us a Kibbutz, what maintains our connection to the land and to this area.”

The educational value of agriculture was mentioned as well. A young woman said:

“I think it is important to develop agriculture so that it stays part of the Kibbutz... It is something moral; it teaches children work-values and manual labor.”

In contrast, in Jordan, no ideological value was associated with agriculture. There is only one farm functioning in the Southern part of the Arava (Al Haq farm) and in a research conducted in 2001, it was found that this project as well as several other agricultural projects in the region have failed to improve the residents’ living conditions because few Bedouins agreed to work in agriculture (Heidtmann, 2001). In addition, the Jordanian residents cannot use the agricultural fields for recreation since they are fenced and entry is prohibited for non-workers.

A notable difference between the narratives of Jordanians and Israelis was regarding tourism. Israelis utilize cultural ES for a rapidly growing tourism industry. These include ecotourism (e.g. “Hai Bar” wildlife refuge and reintroduction center and a bird watching center), archeological and geological tourism (“Timna park” and theme tourism), and educational seminars about the desert environment, Judaism and Zionism. In the southern Jordanian Arava, in contrast to other areas of the country (including the nearby archeological site of Petra and the port city of Aqaba), there are neither tourists nor attractions. Nonetheless, Jordanian respondents often mentioned tourism as an economic activity that they would like to develop.

4.3. Ecosystem disservices

While searching for the services of the environment, many of the respondents found it easier to describe negative services, lack of services, or the disservices of their environment. “Ecosystem disservices” is a relatively new concept in the ecosystem service literature (Agbenyega et al., 2009; Dick et al., 2011a; Swinton et al., 2007; Zhang et al., 2007). Ecosystem disservices are either a result of ecosystem functions or are environmental “bads” that result from human actions (Agbenyega et al., 2009). The harsh conditions of the desert are responsible for many disservices that make it hard for humans to live there; where even the services needed for basic existence, such as wood, drinking water and plants, are of lower quality than in other environments (Safriel et al., 2005).

Many of the residents mentioned their dissatisfaction with specific environmental conditions, including sand/dust storms, heavy heat, intensive solar radiation, insects, aridity, saline soil, paucity and low quality of the water and the lack of vegetation. Jordanian respondents spoke mainly of the salinity of the soil, the poor quantity and quality of the water, wild animals attacking their livestock and the lack of plants to feed their animals. A man from Al-Qatar, for example, described how they tried to farm the land but failed due to the salinity of the soil which caused the fruits of the trees to dry. Many Jordanian respondents mentioned that they would like to grow more plants, for shade and food, but cannot because of the lack of water. A man from Rahma described a decline in the provision of some services in the recent past, and the unfortunate outcome:

“In the last 12 years we have had no rain, so there are not enough plants to feed our animals. This caused people to lose their animals. Today we need a job with a salary.”

This quote suggests that the Jordanian residents of the Arava Valley villages remain highly dependent on the scarce provisioning services of the desert for their basic livelihood.

Concern for water (quantity and quality) was mentioned by half of the respondents in each country, but was expressed in completely different ways on each side of the border. On the Israeli side, the majority spoke of changing the water situation in the sense of improving the aesthetics of the desert or for recreation such as: having more rain, having springs or lakes nearby and having more floods. In contrast, on the Jordanian side, the emphasis was on improving livelihood and living standards such as: having more drinking water, more water for growing plants in the gardens or in the village, more water for agriculture, and improving water quality.

Israeli respondents also spoke of health risks, such as exposure to intense solar radiation, inhaling dust particles, being exposed to the West Nile Virus and the health effects of showering with saline water and drinking it for many years before the introduction of the desalination plants. Others spoke of the psychological difficulties arising from living in a desert without green around them.

A long-time resident of Yotvata, who works in agriculture and the Research and Development Center, spoke of the difficult struggle they have in order to survive in such an arid environment:

“We are in a horrifying struggle to live all the time ... It's only because the people here are tough, ambitious, pioneers and Zionists that we survived here ... in an extreme arid-barren-desert with salty water.”

He described the high cost of the various disservices of the environment:

“The life here is expensive. It is hot so we use lots of energy for cooling, and that causes pollution. When we do agriculture, transporting the harvest is expensive and since our water is saline, all of our trees give fewer yields. Our disadvantage here is enormous. In order to grow cows we need to water them to cool them down and we found out that if our cows hadn't been drinking saline water they would have been producing two additional liters of milk per day.”

4.4. Turning ecosystem disservices into services

On both sides of the border, especially the Israeli side, a shift in outlook has taken place. It was suggested that instead of trying to overcome the disservices with respect to agriculture (infertile soil, saline soil and water, high evapo-transpiration rate, etc.) the region should invest more in the development of cultural services such as recreational, educational and esthetic services. In an interview with the head of the Hevel Eilat Regional Council, it was explicitly stated that today there is an attempt to shift the economy of Hevel Eilat from agriculture to tourism and renewable energy. He explained:

“We have gone from mostly doing agriculture to a huge emphasis on education and tourism. Now as a Kibbutz, we use the environment for bringing tourists here, for people to stay here for educational seminars and hikes.”

The head of the regional council spoke of renewable energy and mud building as two fields which the council is currently promoting. As he explained, both of these target clientele for eco-tourism. He mentioned a plan to build the first visitor's center in the world for renewable energy. He called this new type of tourism “theme” tourism. Theme tourism uses not only the aesthetics and recreational services of the local environment, but also its resources to produce renewable energy and ecological buildings, which are used for education as well. For example, Kibbutz Lotan of the Southern Arava has a center for creative ecology which includes courses in mud-building. Meeting these regional development

goals are also assisted by the fact that the ES of the region are of importance to a broader group of beneficiaries, e.g. tourists and electricity consumers.

5. Discussion

The findings of this research reveal a wide range of provisioning and cultural services that the local residents in the Southern Arava use for their economic, physical and social wellbeing. The interviewees on the whole described provisioning and cultural services (final services) and hardly mentioned intermediate services: supporting and regulating services. This finding supports the conclusions of other researchers, who note that while cultural and provisional services are directly affecting human wellbeing, supporting and regulating services, which are indirectly affecting human wellbeing, are harder for locals, and even scientific experts, to identify (Dick et al., 2011b; Mäler et al., 2008).

While some similarities exist in the ways the environment is perceived by the two populations residing on either side of the border, there are also significant differences. Emerging from our analysis using grounded theory, these differences are explained by two main underlying forces: economy and culture. There are two aspects of economy that influenced perceptions toward ecosystem services. First, the differences in levels of economic development between Israel and Jordan played a major role, and second, the difference between the relative positions of the two populations within their national socio-economic context. The Southern Arava Jordanians are among the poorest in Jordan (JRF – Sustainability Report, 2008), while the Israeli Arava residents are found within the highest socio-economic clusters (CBS Israel, 2011).

Three aspects of culture were especially significant, including: 1) ideology (including Zionist-Kibbutz ideology and environmental ideology), 2) Bedouin tradition, and 3) origin (native/non-native to the desert environment). Zionist-Kibbutz ideology includes Ben-Gurion's vision of “making the desert bloom”, “settling the Negev” and A.D. Gordon's vision of “connecting to the land through manual labor”. These ideologies encouraged the settlers in the Arava to create Kibbutzim of farmers in the desert, cultivating crops and raising livestock (i.e. cows) (Strom, 2004). Environmental ideology, according to our research, is more recent, and includes aspects such as care for the quality of the environment, the promotion of environmental initiatives, such as renewable energies, and an aspiration to preserve the open space and biodiversity of the area. This ideology is growing in importance for the Israeli residents of the Southern Arava.

In the Jordanian Arava, the desire to maintain Bedouin traditions was emphasized in their narratives. Such tradition includes activities such as goat and sheep herding, cooking customary food on open fire and hunting.

The characteristic uses of provisioning services vary across the border mainly due to economic differences, but also due to cultural ones. In Israeli kibbutzim, ES are not necessary for immediate survival, but are used for producing income. Provisioning services are used for agriculture (mainly date orchards), livestock and small industries (such as the dairy and algae farms). In the Jordanian villages, provisioning services are used for agriculture, date orchards and livestock as well, but are also needed to support more basic life needs, including wood for cooking and heating, animals for hunting, and bushes and trees used for fodder and shade. This corroborates the assessment by Christie et al. (2008) that residents in developing countries often have greater immediate dependency on ES. Moreover, in the Israeli Kibbutzim, cultural services are exploited for producing income from tourism and education, while in the Jordanian villages cultural services are enjoyed by the residents, but are currently not utilized for tourism.

The type of livestock raised is affected by ideology and origin of the residents. In Israel, cows are raised in the Arava despite their incompatibility with the desert environment. Cows are the customary type of livestock raised in most Kibbutzim in Israel; when the Arava kibbutzim were founded, there was no milk available in the Arava, and, according to a long-time resident, cow milk was the natural choice for a population of mostly European and American origin or ancestry. The Jordanians largely raise goats, which are more suitable to the environment and are the traditional type of livestock raised by pastoral Bedouins in the desert.

The residents' perceptions of agriculture and the level of agricultural development on each side of the border differ as well for economic and ideological/traditional reasons. For instance, Israelis came to the desert, imbued with 'Zionist-Kibbutz' ideologies to build agricultural communities in the Arava, and received financial aid from the state in order to do it. Bedouin society in this area, on the other hand, was originally based on livestock herding (Darmame et al., 2011; Perevolotsky, 1981), though modern agriculture has been introduced to them in order to encourage sedentarization and improve their living conditions, it failed to do so as many of them refused to work in agriculture (Heidtmann, 2001).

Similarities in the perceptions of ES were found between respondents from either side of the border as well. In terms of cultural services, both Jordanians and Israelis had a similar perception of the grandeur of the landscape, the wide open views and the quiet that contribute to recreation, spiritual experiences, sense of place and psychological wellbeing. However, culture affected how similar types of services were used. For example, while the Israelis enjoy bird-watching (a cultural service provided by the fact that the Rift Valley is a major bird migration route), several Jordanian respondents noted that they hunt birds (provisioning and recreational cultural service). Whereas the Israelis noted that they enjoy horseback riding, Bedouins noted that they ride camels and donkeys.

In some cases externally imposed limitations affect differences in recreational activities. Israelis often use the agricultural fields and the sand dunes for recreation (e.g. family walks and exercise), while agricultural areas and sand dunes on the other side of the border are not accessible to the Jordanian residents. Gender differences also impacted the perception and utilization of ES; while Israeli men and women engage in similar activities in their environment, in Bedouin culture women are often restricted from outdoor activities that men engage in, but have their own activities such as taking care of their home gardens.

Both Jordanians and Israelis are concerned with the ecosystem disservices that make it difficult to grow plants and practice agriculture, particularly the salinity and lack of the water. However, Israelis put an emphasis on disservices that affect their physical comfort and the quality of their lives such as heat and health risks. Jordanians are more concerned with the worsening of the natural conditions of their environment, such as less rain resulting in fewer plants to feed their livestock. In addition, Jordanians are highly concerned with the paucity and low quality of the water available to them for drinking, domestic use and growing plants (water is distributed to them by the Aqaba Water Company only every other day). The Jordanian women are more concerned with the disservices of water than the men, as traditionally it is the role of the women to be in charge of the domestic use of water (Abu-Lughod, 1990).

The ecosystem disservices reveal the hardships of living in such a hyper-arid environment. The analysis shows that ideology and tradition were the main cultural forces that aided residents in overcoming the ecosystem disservices in order to continue to live in the area. In the words of one of the Israeli interviewees: "The Arava environment is an extreme arid environment where humans would

have probably not been able to survive without a strong ideology or tradition of many years."

Looking at the future of the area in terms of development, our grounded theory analysis suggests that environmentalism is influencing a shift in the economy. A new and growing vision for regional development is to depend less on agriculture and more on developing the tourism and education potential (taking advantage of local environmental conditions), as well as developing renewable energies. The Jordanians are struggling to adjust to a modern-sedentary lifestyle, while continuing to adhere to their traditions. The focus for the local (Jordanian) economy continues to be on developing the agricultural sector, but in addition the residents are aspiring for government and NGOs' help in developing tourism that will be based on Bedouin culture and the desert environment.

6. Conclusions

Using the framework of social ecosystem assessment, this research contributes to the cross-cultural analysis of environment–behavior relationships. The importance of studying these relationships was emphasized by UNESCO in the Man and the Biosphere Program, which suggested that such studies would increase the efficiency of natural resource management and ecosystem conservation (UNESCO, 1973) by better defining the unique needs of various stakeholder groups vis-à-vis natural resource policy (Fraser et al., 2006; Maynard et al., 2010). Policy requires, in part, both social acceptance and a careful balancing of multiple interests in order to meet its goals (Clark, 2002; Cohen, 2006). Assessments of local people's perceptions of ES and in particular cross-cultural assessments, such as conducted in this research, adds to the growing body of policy-relevant knowledge (López-Hoffman et al., 2010; Menzel and Teng, 2010). This theme, cross-cultural research, re-appears in the more recent ES assessment literature, in which social approaches to biodiversity and ES research assist in elucidating the diverse perceptions of equally diverse stakeholder groups (Christie et al., 2008; Gee and Burkhard, 2010; López-Hoffman et al., 2010). By understanding that ES are valued differently by different cultures and in different contexts it points to the importance of weighting the value of a resource or a system differently for each culture or context. Moreover, the rationale for conservation of what may seem otherwise an ES-poor environment can be enhanced by factoring in the cultural services – which can also be, to some degree, quantified economically.

The research adds to the field of ecosystem service assessment in five ways: 1) It demonstrates the importance of using social research methods to assess the awareness of ES and their importance to the general public; 2) It emphasizes the importance of cultural services, particularly the intangible benefits that are hard to monetize, and are difficult to capture using other methods (Gee and Burkhard, 2010); 3) The findings indicate that deserts do provide some ES, particularly cultural services, despite the fact that they are often considered to be lacking in them (Naidoo et al., 2008); 4) This study contributes to the growing international research of trans-boundary assessments of ES, whose goal is to enhance the development of improved management strategies in shared ecosystems (see López-Hoffman et al., 2010), and; 5) The analysis shows that although different cultures sharing the same ecosystem use and value its services differently, in the context of their respective socio-economic and cultural milieus, they share many perceptions of the landscape. This has important policy ramifications: on one hand development plans made for one culture may not be suitable for the other (Gee and Burkhard, 2010; López-Hoffman et al., 2010; Zube and Pitt, 1980); but the strong shared appreciation for the landscape, and shared attachment to

the environment can be a point of departure for joint efforts to protect it from harmful development projects.

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Appendix A. Local residents – questionnaire

Name: Age: Work: Residence: Previous residence: How long have you lived in the area? Education: Family status: If relevant – when did your parents arrive here and from where?

1. Describe your environment. Define your environment (What do you see in your imagination when you think of your environment?).
2. How do you relate to your environment? Which feelings and emotions do you have toward it?
3. How do you “use” your environment in your daily life? How does the environment “serve” you?
4. If you could, what would you change in your environment (in a theoretical sense)?
5. Tell me of a significant experience you had in your environment.
6. Would you be willing to move from this environment (landscape) to a different one?
7. How attached are you to this environment?
8. What is most important for you in your environment?
9. What do you think about agriculture in the Arava?

Appendix B. Key leaders – questionnaire

Goal – open ended interviews with community leaders and decision makers to define their concerns regarding ecosystem services and to learn from them how their constituents perceive ecosystem services.

Introductory questions:

1. Describe your environment. Define your environment (What do you see in your imagination when you think of your environment?).
2. How do you relate to your environment? Which feelings and emotions do you have toward it?
3. How do you “use” your environment in your daily life?
4. If you could, what would you change in your environment (in a theoretical sense)?
5. How do you feel about areas in the Arava that are defined as open spaces?
6. Have you heard of the term “ecosystem services”? If so, what does it mean to you?

Read selected ES definition; *can read examples beneath if the idea is not clear – but preferably not.*

7. What ecosystem services do you derive from the natural environment around your community?

8. What components of the natural environment are responsible for providing these services? That is, if those components disappeared you would lose the service.
9. Can you place a monetary value on them? If so, how?

Explain that now I'd like to speak to you as a community representative

10. Do you think your answers above and your relationship with the environment are representative of the broader community?
11. Could you classify different groups with regard to their relationship to the environment?
12. Is there anything else you can add regarding how your community/customers/constituents perceive and/or value ecosystem services of the region?

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