Developing Resource Management and Marine Policy for the Eastern Mediterranean Sea

40

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Abstract

Man's ability to exploit marine resources has improved in recent decades and as expected, efforts of exploitation have intensified. To avoid conflicts and support ecosystem-based principles, determination of pro-active marine policy based on an understanding of current and future uses of the marine environment is essential. This chapter highlights major uses of the marine and near shore environment of Israel. I relate trends in marine uses in this part of the Mediterranean Sea to corresponding past policy developments in coastal and near-shore management. Current policies fail to address new and increasing uses, especially those that are exclusively marine and/or beyond the country's territorial waters. The lack of marine policy in Israel is particularly worrisome when one considers the value of the country's offshore resources and the pressures on its terrestrial resources. Approaches such as marine ecosystem based management, integrated coastal zone management and mechanisms for the pro-active mediation of develop and conservation interests, such as marine spatial planning, are discussed in terms of their potential contribution for the management of evolving and emerging uses of the sea.

Keywords

Coastal zone management • Conflicting uses • Ecosystem-based management • Exclusive economic zone • Marine policy • Marine resources • Territorial waters

Introduction

In the past few decades, man's ability to exploit resources of the sea has improved and as expected, efforts to make use of this improved ability have intensified. Today, for example, in contrast to 50 years ago, electronic devices aid fishermen in locating and tracking schools of wild fish; as another example, newly developed synthetic materials enable the operation of offshore wind turbines at depths and at distances from shore that were impossible just a decade ago. The Mediterranean, like other seas, bears the brunt of much intense development, not only from maritime activities but also from increased development on land. Studies have indicated that most of the sea's pollutants are land-based (see Talitman et al. 2003). As an enclosed sea with a long and complex history of human exploitation, impact and intervention, the Mediterranean provides an important case study in the development of marine policy and resource management.

The marine environment engenders many valuable uses including those for energy production, food, water supply, mineral mining, transport of goods and people, the provision of raw materials for construction (i.e., sand) and substances for the pharmaceuticals industry. The value of the world seaborne trade (measured in transport tariffs[1]) was estimated to

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[1] This amount is approximately 5 % of total global trade. It is difficult to quantify the volume of marine trade in monetary terms because traditionally, maritime trade is reported in tons or ton-miles of goods transported.

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be approximately 380 billion dollars in 2009. The international trade in fish products from the sea was estimated at around 90 billion dollars in 2008.[2] Despite the declining state of the region's fisheries, fish products exported from the Mediterranean Sea's riparian countries were estimated to be worth $ 2.1 billion in 2008.[3] Mediterranean coasts in particular are important sites for recreation and tourism, attracting visitors from all corners of the globe.

Beyond the value of their goods and other direct uses, the Mediterranean Sea and coasts also have great value as providers of myriad ecosystems services (Costanza et al. 1997). They provide climate regulation through the absorption of CO_2 and maintain sea grass meadows that serve as fishery breeding grounds. Some coasts contain natural barrier islands that protect developed areas from floods and hazardous storms. Man is invariably dependent on the well-being and continuous functioning of all elements of marine ecosystems in order to maintain the very resources to be exploited; for example, clean beaches, or fish and or marine water for desalination.

Not all marine uses are detrimental to ecosystem health and well-being, however, based on experience with environmental issues related to land policy, we know that it is essential to understand use trends, identify and mitigate conflicts before they become unmanageable, and work proactively to develop appropriate management regimes for marine and coastal areas. To some extent, biogeography dictates the uses of the sea and country contexts determine regulation and juridical frameworks. Therefore, to inform about resource management and marine policy we need to differentiate between sub-regions within the Mediterranean basin. We also need to be cognizant of regional and national planning and regulatory frameworks that pertain to the sea that are already in existence in these areas or that have a realistic potential of being adopted in the future.

Spalding et al. (2007) provide a prominent classification for the world's coastal and shelf areas that helps distinguish between particular biogeographic characteristics. They developed a topology, called the Marine Ecoregions of the World, based on physical conditions and representation of ongoing ecological processes. The topology uses a nested system of 12 realms, 62 provinces and 232 eco-regions worldwide (Spalding et al. 2007). Due to its relatively high spatial resolution compared to earlier global classifications and practical utility, the topology has been used in many previous studies including some involving spatial distribution of human impacts (e.g., Abdulla et al. 2009; Halpern et al. 2008). The Mediterranean Sea is part of the Temperate Northern Atlantic Realm; it is characterized as a province with seven ecoregions identified within: the Adriatic Sea, Aegean Sea, Levantine Sea, Tunisia Plateau/Gulf of Sidra, Ionian Sea, and the Western Mediterranean and Alboran Sea (Spalding et al. 2007).

The riparian countries of the Levantine Sea are Egypt, Lebanon, Israel, Syria, Turkey, and a relatively small portion of Libya (Fig. 40.1). The independent Gaza Strip also has a small part of the most eastern part of the coast. Today and historically this is an area of high geopolitical tension. In addition to the isolation of the central country, Israel, whose borders with three out of five of its neighbors have resulted from cease fire agreement rather than peace accords, internal political events in the early years of the new millennium in Lybia, Egypt, Syria and to a less extent in Lebanon, coined "the Arab Spring", will undoubtedly leave their mark on governance regimes in the region.

This chapter focuses mostly on the marine resource management and policy of Israel, at the extreme eastern side of the Levantine Sea (see Fig. 40.1). As a country with a relatively stable and growing economy, yet with significant geopolitical challenges related to the environment, use of resources and security concerns, Israel's management of the sea may epitomize the promise and perils of the region. In any case, there are signs that its relationship with the sea, both from public and policymaker's perspectives, is likely to change rapidly within the coming decades, making the country an interesting and important case study.

Marine Uses Past, Present and Future

Beyond Israel's shoreline, within the territorial sea[4] which extends to 12 nautical miles (22.2 km) seaward and also beyond it, many important natural resources can be exploited for public benefit: fish, water for desalination and cooling power plants, and sources of energy including large recently-discovered natural gas reserves. The size of Israel's Exclusive Economic Zone (EEZ),[5] although not officially declared through United Nations Convention on the Law of the Sea (UNCLOS), at 27,317 km^2 in size is much greater than its terrestrial area and over 6 times greater than its territorial sea; the territorial sea measures about 4,200 km^2. As opportunities arise, it is clear that business interests as well as the

[2] ftp://ftp.fao.org/fi/stat/summary/default.htm

[3] FAO Yearbook of Fishery and Aquaculture Statistics 2008 at ftp://ftp.fao.org/FI/CDrom/CD_yearbook_2008/navigation/index_content_commodities_e.htm

[4] Territorial waters, or territorial sea, is a boundary limitation stipulated by the United Nations Convention on the Law of the Sea (UNCLOS) indicating a belt of coastal water area regarded as sovereign territory of the adjacent coastal nation. It extends, in most cases, to 12 nm from the baseline, usually the mean low-water mark.

[5] The EEZ is a seazone which according to UNCLOS stretches from the outer territorial sea boundary to 200 nm from the base shoreline of the adjacent coastal nation. The coastal state/nation has special rights in this area over the exploration and use of marine resources, including for energy production.

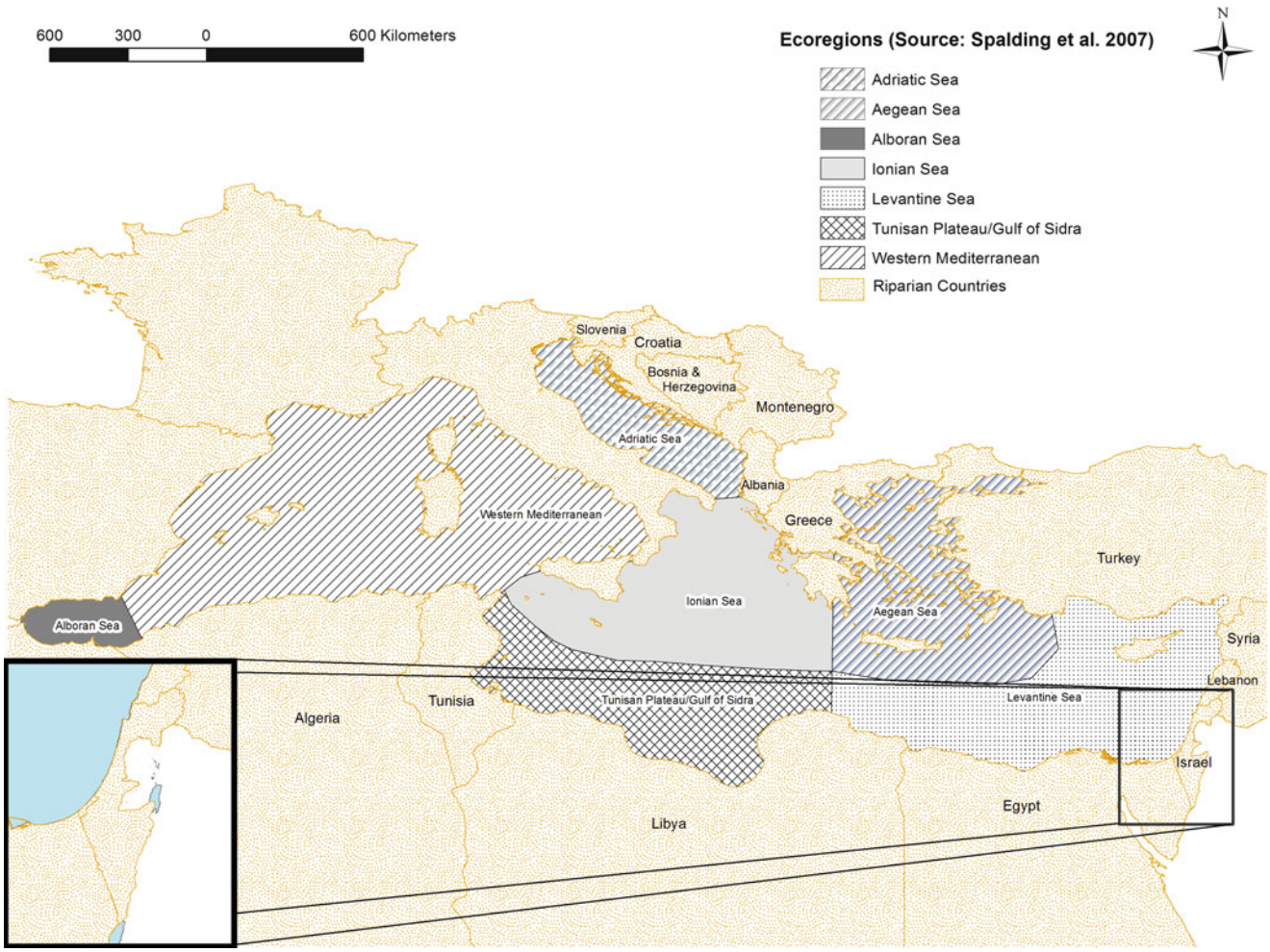

Fig. 40.1 Ecoregions of the Mediterranean Sea (According to Spalding et al. 2007). *Inset*: Israel on the eastern edge of the Levantine Sea

public-at-large will wish to further exploit adjacent marine resources, both in the territorial sea and in the EEZ.

Ocean space is likely to prove the most valuable of all marine resources for this relatively crowded country with limited and highly exploited terrestrial resources. Population density in Israel is already one of the highest in the world, at 332 inhabitants per square kilometer in 2010. Its population is growing at a rate of approximately 1.6 % annually (Israel Central Bureau of Statistics 2011). Waters off the coast of Israel, including those past the 12 nm territorial sea boundary will no doubt prompt great interest on the part of planners, policy makers and society as competition for ocean space increases and conflicts arise.

Marine space off the coast of Israel is already used for vast systems of underground communication cables, shipping lanes, military purposes (training and operational), dumping of dredge materials and extraction of materials including natural gas and sand. Marine sites are being proposed for locating relatively new uses and activities considered undesirable on land, e.g., offshore liquid natural gas (LNG) terminals and locations for the discharge of concentrated waste from desalination. Dumping of wastes from sewage water treatment out at sea has been going on for years.

Simultaneously, as knowledge of the marine environment improves, policy makers and planners realize that marine waters and the seabed are made up of fragile ecosystems full of rich life and diversity that must be preserved so that the continued existence and well-being of resources that humans currently exploit and will exploit in the future are guaranteed. Ecosystems off the shores of Israel include hundreds of fish species, invertebrates, underwater vegetation, reptiles (endangered sea turtles) and marine mammals (Yahel 2011). As for most marine ecosystems throughout the Mediterranean basin, a history of intensive use by Israel and its neighbors have put ecosystems of the Levantine Sea in jeopardy. There are numerous political tensions between neighbors throughout the Levant that perpetuate a lack of cooperation between countries and therefore the inability to approach marine planning and management on a regional basis. Another

aggravation is the relatively low public awareness in these countries (and others in the Mediterranean basin) about environmental protection and sustainable development principles (Laubier 2005). Capacity to deal with environmental problems is also low. For example, due to the lack of proper sewage collections infrastructure, 60 % of the sewage from coastal cities along the coast with population over 100,000 inhabitants flows directly into the sea.

In contrast to other Mediterranean peoples such as the Greeks or Portuguese, Israelis, and the Jewish people in general, lack a maritime history. During biblical times, Jews settled and governed the mountain regions while others, such as the Philistines, controlled coastal areas (Firestone and Han 1998). Other than for limited uses, mostly local fishing operations and the military, the marine area and its resources has not been part of the national public dialogue. The sea does play a role, however, in the national historic narrative in that hundreds of thousands of immigrants came to the country by sea during the British mandate period, many illegally, and in the early years after the birth of the nation in 1948. To this day, as for many countries of the Mediterranean, Israel is highly dependent on seaborne transport of goods with approximately 99 % of its international trade passing through its seaports in Haifa, Ashdod and Eilat (on the Red Sea) (Israel Ports 2008).

Despite the marine environment's low profile, the country's approach to planning and management of marine and coastal areas has changed significantly over the past 15 years. Shifts in policy were first articulated in an important document, the Coastal Waters Policy Paper (CWPP) published in 1999 (Coastal Waters Committee 1999; Alfasi 2009). The publication of this policy was followed by the passage of groundbreaking legislation in 2004, the Law for the Protection of the Coastal Environment (LPCE). But these policy and regulatory changes transpired as a response to increasing development occurring along the terrestrial coast; they involved on-shore uses, tangentially related to the marine environment. By and large, the general public has been unconcerned and unaware of what goes on at sea. It is considered far away, unknown and irrelevant to daily life. This perspective on ocean resources appears to be quite common (e.g., Steel et al. 2005).

Although perhaps not as prominent in day-to-day political discourse as terrestrial issues, the uses of marine areas away from shore are important to Israel with all its geopolitical and environmental challenges. Israel's most important marine uses are energy production, fishing, shipping and recreational boating. Emerging uses are very place-based (stationary as opposed to transient): the potential for fill land expansion, protection from coastal hazards (e.g., the construction of break waters), the construction of offshore islands and terminals, infrastructure needs (including for desalination and outfalls), and marine protection. The following sections describe important uses in further detail with their relevance for the country.

Energy Production

A major existing and expanding use of Israel's sea area is natural gas production. Private exploration companies confirmed the existence of more than 37 trillion cubic feet (TCF) off the coast of Israel in 2010. This includes the Tamar Reserve (8.5 TCF), Leviathan Reserve (16 TCF) and in the Noah Reserve located in the Tethys Sea area (about 12.25 TCF). Seismological surveys conducted at the end of 2010 estimated a 90 % probability of an additional 6.2 TCF at a distance of about 40–70 km from shore in three additional tracks: Shimshon, Mira and Sara. All these offshore deposits are beyond Israel's territorial sea and therefore Israeli law and environmental regulations do not apply.

While these new natural gas discoveries bring opportunities for the country, they also have sparked deep debates in Israeli society. The country's archaic Gas Law of 1952 and other legislation regulating the extraction of offshore resources, supports exploration activities more than extraction activities. Fiscally, the laws favored the gas company conglomerates, leaving a very small cut of profits to the public from extraction. According to comparative research conducted in 2009 at the behest of Israeli policy makers on the public income from offshore gas and oil production between western countries, Israel ranked among the last. By law, only 24 % of revenues went to benefit the public as taxes or royalties paid to the government.[6]

Following public outcry, the government appointed a commission in early 2010, named the Shashinksy Commission after its leading member, to review fiscal policy (integrating taxes, commission and fees) related to gas production. Public advocacy groups took great interest in the commission and rallied to influence outcomes to the greatest extent possible. The Shashinsky Commission found that the existing fiscal policies were indeed relics of earlier times, reflecting outdated geopolitical conditions, some dating back as far as the time of the British Mandate when the price of oil was all of $2 a barrel. In 2011, recommendations of the Shashinsky Commission were largely adopted by the government. The outcome was a new law, the Fees on Gas Revenues Law of 2011. Even though the call of activists for a split of 20 % to the corporations and 80 % to public coffers failed, the government cut went up to 52–62 % of gas revenues (see Shashinsky Commission 2010).

Extraction of conventional fuels from new sources offshore of Israel, and other countries in the Levantine Sea (e.g., Cyprus), contrasts with what is transpiring in other western countries, mostly in Europe, with regards to development of

[6]For the sake of comparison, in 2009 gas exploration companies offshore of Australia paid between 53–56 %, those subject to Norwegian fiscal policy between 75–84 % and companies drilling in areas neighboring to Israel – offshore of Egypt – paid royalties (including taxes) of around 79–82 % of their production revenues.

marine renewable energy. Siting of facilities for the generation of renewable energy offshore is in fact driving pro-active marine planning in territorial waters. In some cases, such as in Germany and the UK, these uses are the motivations for marine planning farther offshore in the EEZ (Portman et al. 2009). A recent report found that marine spatial planning is driven in US states by entrepreneurs' interest in having policy makers proactively designate areas suitable for offshore wind farms and thus ensure greater security of investment (Eastern Research Group 2010). Although most of these energy infrastructure projects are wind farms, at least on the east coast of the US, marine renewable energy makes use of various technologies: hydrokinetic exploitation of wave, tidal and current power. Even ocean thermal energy conversion is being explored (Portman 2010).

European interest in reducing dependence on foreign, unstable sources of fossil fuels and commitments to cut emissions of green house gases has motivated new emphases on renewable energies including those offshore. European countries are committed to generating 20 % of the electricity consumed from renewable sources by 2020. In the next 10 years, 30,000 new wind turbines are expected to be constructed in the North Sea, offshore of countries such as Denmark and Germany. Offshore wind is the favored source of marine renewable production in Europe, but there are other projects as well, such as hydrokinetic energy, currently offshore of Ireland and the UK. Whether any of these types of energy production technologies are suitable for conditions in the Mediterranean Sea and particularly offshore of Israel, is as yet unknown (Laster 2011). In any case, it is clear that energy production, conventional, renewable and alternative, is one of the uses that will play a major role in the future in determining marine policy in Israel and the region.

Artificial Islands and Offshore Infrastructure

The idea of constructing artificial islands off the coast of Israel was first proposed in the 1970s. Feasibility and planning studies were conducted in the 1990s. In 2004, the National Planning and Building Commission (NPBC) ordered the preparation of a policy document on the subject (by the Interior Ministry) followed by a physical planning survey (by the Ministry of the Infrastructure). The policy document, which the NPBC published in 2007 based on surveys, determined that the islands would be used for infrastructure alone and that a number of different technologies for construction the islands would have to be tested. The first stage of development would consist of the creation of a small "pilot" island of several hundred square kilometers that would serve various infrastructure needs, particularly those unwanted on land, e.g., airports, storage for hazardous chemicals or fuels, power plants, military testing, recycling of construction and demolitions materials, etc. (Aviv Ltd. 2007).

Unfortunately, this approach consisting of siting undesirable land uses out at sea perpetuates rather dated approaches that view the oceans as the backyards of terrestrial areas. The locating of a conglomeration of 'threshold' uses that relieve the NIMBY pressures[7] on land neglect to consider widely accepted approaches to coastal and marine management that call for integration among sectors at a regional scale (see section "Ways forward for Israel" of this chapter). In some places where artificial islands have been constructed, they are seen as mistakes that severely altered the natural environment and would not be permitted today, or they are in areas where costs and environmental trade-offs are not fully understood or considered.

Aquaculture and Fishing

Compared to other marine eco-regions of the Mediterranean, the Levantine is poor in nutrients and as such, it makes for relatively unproductive fishing grounds. More commercial fishing occurs in the Western part of the Mediterranean, although landings have decreased in recent years throughout the entire sea. Fishing in international waters is the exception; small coastal fisheries are by far the majority throughout the Mediterranean (Laubier 2005). In Israel in 2009, the landings of wild fish were only around 3,000 tons. This contrasts with 19,400 tons of fish raised in mostly inland fish farms (FAO 2009). Today there are three mariculture enterprises in the Mediterranean Sea; two close to shore and one located in deep waters (Policy Research Corporation 2011).

There are about 30 trawl fishing boats operating offshore of Israel. These vessels are responsible for about 40 % of the landings from Israeli waters. Otherwise, the Israel Department of the Agriculture issues about 400 fishing permits to smaller fishing vessels of various types and there is some 'pirate' (unlicensed) fishing for commercial purposes occurring as well.

Aquaculture is rapidly developing in Israel as a solution to the rise in demand for fish products and the decreasing wild fish stock however, most of it occurs on land. Fish production is well suited to the country's arid climate especially since fish ponds don't require fresh water (Rosen 1999). However, inland fish ponds do impact the sea as the most commonly-used technology involves the disposal of waste water, some of it going into rivers and the sea. A relatively large enterprise existed in the Northern Gulf of Aqaba, in the Red Sea, until public outcry about the impact of the fish cages on the sensitive coral reefs resulted in a national government decision in 2005 to remove them within the course of 3 years (Portman 2007).

[7]NIMBY: Not In My Back Yard.

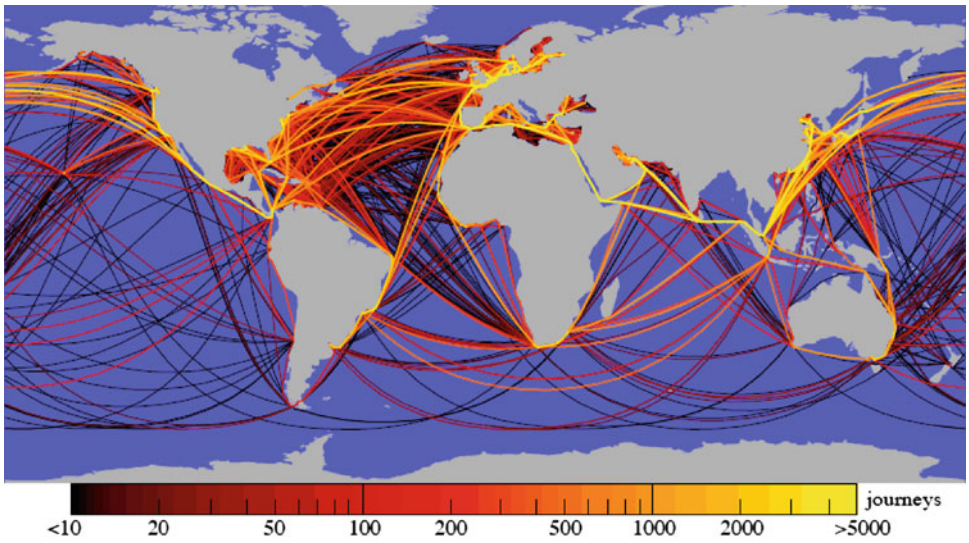

Fig. 40.2 The global marine transport network. The *bottom ruler* illustrates the number of trips by color for the year 2007 (Kaluza et al. 2010)

Despite its potential, in the near to medium time horizon of 20 years, aquaculture is unlikely to greatly influence activities in Israel's Mediterranean waters far from shore. Due to the high cost of operation, maintenance and transport of fish beyond the territorial waters and the competition for space closer in to shore, aquaculture's contribution to Israel economy will likely remain marginal (Rosen 1999).

Unless trends change, wild fishing for commercial purposes will steadily decrease in coming years. Not only are the numbers of fish caught falling from year to year, but other negative trends are observed such as smaller and smaller individuals are caught by trawlers during the summer months (Spanier and Sunin 2008). The fishing sector is regulated by anachronistic laws dating back to the time of the British Mandate. Although updated from time to time, fishermen claim that the amendments to the laws are insufficient and fail to reflect the changing realities in an accurate and timely manner.[8] Compliance and enforcement is almost nonexistent and therefore, it is likely that commercial fishing off the Israeli coast will not be an important marine use in future unless these trends are reversed or halted.

Marine Transport

Transportation networks play an essential role in human travel, commerce and trade and also in the transmission of invasive species. Ninety percent of world trade is transported by sea and cargo ship routes are among the most important channels of transit the world over (Fig. 40.2). Most cargo vessels are one of three types: bulk dry carriers, container ships and oil tankers. These three categories do not only differ in the ships' physical characteristics, but also in their mobility patterns. Container ships follow regularly repeating paths whereas bulk dry carriers and oil tankers move less predictably between ports.

As mentioned ninety-nine percent of Israel's international commerce is transported by sea. Foreign trade has the potential to grow at about 5–8 % annually, an increase that will double the container traffic in Israel's ports in 10 year (Israel Ports 2008). The country has three main seaports and seven marinas. Official navigational right-of-ways are indicated on nautical maps and updated from time to time with the extent of these lanes and the traffic they handle being a function of container volume and trade. The Israel Shipping and Port Authority estimates a rise in work capacity from 900 to 3,000 TEUs (20 ft equivalent units) per meter dock space by 2055, based on the expected improved stacking efficiency (i.e., improved structural container technology) and therefore anticipated shorter storage time on wharfs and piers. This represents about 2.5 % annual increase in capacity.

Passenger travel by sea to and from Israel is limited. About 500 tourists entered the country by sea in 2010 (<0.2 % of total arrivals). However, close to 170,000 cruise ship passengers visited the country. This constitutes about 2.5 times the amount in 2009 (Israel Ministry of Tourism 2010). The Ministry of the Transportation licenses about 16,000 boats registered as small fishing vessels or sports and recreation boats and the number is growing from year to year. This increase in seafaring vessels for myriad private uses indicates a need for marina expansion. Similarly, the expected increase in trade and cruise ship travelers makes port expansion an important coastal planning issue in the

[8]See http://www.israelfishingforum.co.il/

country. However, expected impacts are mostly to developed urban and industrial areas adjacent to existing port facilities and close in to shore.

Military Uses

With Israel's security concerns, the history of conflict in the region, and the current geopolitical volatility of the region, military activities are among the most important offshore uses for the nation. At times this use is uncompromising and inflexible. The territorial sea boundary of the country is its western border and relative to other borders of Israel, there is constant traffic coming and going across it. Like on land, military activities in the sea are varied in that some occur underwater, some over water (airspace) and some on the surface. Like with other uses, as Israel continues to be isolated, and the geopolitical situation remains tense, military uses of Israel marine areas will likely increase and intensify, reinforcing the need to work out compatibilty or at least coordination between uses.

According to international law, military forces of riparian countries have mobility rights and operational rights in the adjacent sea. Only movement rights, which include all rights associated with the mobility of seaborne forces, were codified in the UNCLOS. This was largely a result of the reluctance to address operational precedent among countries.

Despite the potential conflict of uses that can arise between military and civilian uses, one advantage could be for nature protection. One submerged area along the central coast of Israel to which entrance is prohibited for military reasons (Atlit) has served as a site for comparative research on species of fish targeted for consumption. Spanier and Sunin (2008) found clear evidence of greater fish biomass (i.e., larger individuals) within the military 'protected' zone. This suggests that the nature protection authorities, marine conservationists and the military could perhaps all benefit from further partnerships.

Desalination

Although desalination plants are located on the coast and do not take up marine space, they do extract a major resource from the sea: water. Israel is making desalination the mainstay of its solution to the shortage of fresh water, a long-standing problem now further exacerbated by population growth and the effects of climate change. At the extent planned, production of approximately 720 million cubic meters of water by 2020 (Feitelson and Rosenthal 2012), desalination plants that require coastal locations will undoubtedly have numerous impacts on the marine environment. Although the scope of the likely impacts of desalination on the marine environment is unclear, main influences will be from physical construction jutting into submerged areas, the discharge of waste streams contaminated with spent cleaning solution and consisting of a high salt concentrate (Khan et al. 2009).

Today there are three central desalination plants operating on the coast (in Hadera, Palmachim and Ashkelon) and three more in advanced planning stages (Ashdod, Soreq and for the Palestinian Authority in Hadera). These plants are designed to use reverse osmosis technology. The impact of desalination effluents will be different from place to place depending on bathymetry, tidal flows, sediment flows, currents and flushing. However, in general, as an enclosed sea, the flushing and recharge rates in the Mediterranean are comparatively low (Hinrichsen 1998) and Israel is not the only Mediterranean coastal country interested in desalination. Therefore its future influence on the Levantine Sea may be great.

Nature Conservation

As for much of the global ocean, the Mediterranean marine ecosystems are severely threatened by over-exploitation of natural resources, pollution and climate change. The limited marine protected areas (MPAs) provide the proverbial 'drop in the sea' for conservation and are very likely to be insufficient and unable to reverse trends. A recent analysis of protected areas within which human activities are limited, regulated and/or prohibited indicates that only 3.8 % of the sea has some level of protection. Most of the protected areas (51 %) are in marine parks or reserves located less than 2 km from continental or large island shorelines; seventy percent of these are smaller than 100 km^2 and almost half (48 %) include terrestrial shore lands within them (Portman et al. 2012b). Some experts contend that the main reasons for such a dismal level of effective protection (which may be as low as 2 % of the Mediterranean Sea) are the fragmented nature of maritime governance, the poor enforcement of existing regulations and the difficult harmonization between the European Union (EU) and non-EU countries in the Mediterranean basin (CIESM 2001).

As directed by the Barcelona Convention, MPAs should safeguard natural ecosystems in danger of disappearance, including areas most vital to habitat and species survival, by ensuring that endangered species, endemic flora and fauna, and sites with scientific, ecological and cultural value are protected. Principles for the establishment of MPAs recommend that they be large enough to protect marine life throughout their range of existence. There should also be a significant measure of connectivity between reserves with a priority for protecting large portions of rare habitats over the protection of plentiful ones. The difficulty in implementing these ideal

principles is observed throughout the Mediterranean; Israel is no exception.

There are six reserves established along the coast of Israel that include some portions of submerged lands. Their total area is less than a quarter percent of the territorial waters of the country and they extend at most only several hundred meters out to sea from the shore. To improve the situation, the Israel Nature and Parks Authority (NPA) is working to enlarge the protected area along the coast of Israel by expanding existing reserves and proposing new ones. This work is justified based on the Israel Coastal Waters Policy Paper (1999) stipulating that between 10–20 % of the territorial waters' area should be protected and as much as possible protection should implement the principles of the Barcelona Convention mentioned in the previous paragraph (Yahel 2011).

Expanded large MPAs are planned that will extend from the shoreline to the seaward limit of the territorial waters and will include representative deep habitats (from 1 km depths in the north to 150 m opposite Ashkelon beach in the south). New reserves – (from north to south) at Bustan HaGalil, the Carmel headland, the Sharon, and the Nitzanim area – will protect unique seascapes with valued benthos including those with unique geological formations and habitat for rare or endangered bottom-dweller species. Additionally, NPA plans to gain approval for marine national parks that will protect antiquities such as the submerged remains of ancient coastal cities, ports and underwater heritage sites.

Although significant resources have been spent on data collection (surveying, inventorying, evaluating, etc.) to indentify the most suitable areas for protection, it is unclear what the legal framework will be for their management. Recognizing the limited space available for all activities in the territorial sea, the NPA is committed to allowing as much human activity as possible within the MPAs (Yahel 2011). The farther away from shore the MPAs are, the more difficult it may be to ensure compliance and enforcement of restrictions on activities within them. National authorities in the country, including the NPA, have jurisdiction only to the limits of the territorial waters. Activities occurring in the adjacent EEZ, past the territorial limit beyond the oversight of the NPA and other regulators may impact efforts, leaving managers without recourse unless new types of protection policies are pursued.

Conflicts, Competition and Compatibility as Policy Drivers

There are basically four types of conflicts expected in the marine environment related to human exploitation (Miles 1991). First there are conflicts expected from competition over ocean space. The second type consists of conflicts resulting from negative externalities of one use on another, (for example, mining for materials from the seabed will impact ground fish habitat). Thirdly, there are conflicts that arise from the disruption of natural processes that support and ensure continued health and functioning of ecosystems (e.g., ecosystem services). The fourth type of conflict includes those resulting from activities conducted far from the shore that engender competition for space on shore (such as increased recreational boat traffic requiring enlarged marinas or a rise in international seaborne trade that requires port expansion in intensely developed urban areas where competition with other water-dependent industries is rife).

By and large, conflicts or the potential for conflict drives the formulation of policy. A good policy process will include assessment, evaluation, proactive planning, public participation and adaptive management such that some conflicts are mitigated or avoided altogether. Some uses will be compatible, reconcilable or only temporarily at odds. Clear, well thought-out marine policy will aid all those involved in the long term. In the short-term much time and effort needs to be invested to "get [policy] right".

Vallega (1995) was one of the first marine policy analysts to use a matrix to describe 29 different marine activities occurring in the Mediterranean. Douvere and Ehler (2009) suggest using a similar, albeit simplified, matrix for sorting out existing and planned uses as an initial step in a marine spatial planning process (see section "Ways forward for Israel"). Vallega's matrix grouped the 29 uses into 8 overarching categories: navigation and communication, mineral resources, biological resources, waste disposal and pollution, defense, research, recreation, and protection. Using the matrix, he showed that all of the 29 "use" pairs can be categorized as reciprocally beneficial, conflicting, reciprocally hazardous, or singularly beneficial or hazardous to one use or the other. This type of understanding of the interaction between resource uses in the Mediterranean basin within their economic contexts could lead to the establishment of a continental shelf-based maritime jurisdictional framework that would replace or complement the Barcelona Convention (Vallega 1995).

Such a framework has not yet become a reality. However, interestingly enough, over the last 30 years the Mediterranean Sea is considered to be the marine area whose protection has brought about extraordinary international co-operation (Talitman et al. 2003; Laubier 2005; European Commission 2010). Great progress has been achieved, but it is generally admitted that these efforts have not yet achieved their potential. Conflicts in the region, between Israel, the Palestinian Authority and its Arab neighbors, as well as between other peoples, including in the West Balkans, Turkey, Greece and Syria, has intensified in recent years. This has slowed adoption and implementation of some regionally promoted policies impacting marine use.

International Efforts

Before reviewing approaches to marine policy that should be considered by policy makers in Israel, it is worthwhile to provide a brief history of international and regional efforts that the country has been party to. These efforts have influenced Israel's activities, as it has that of other countries in the region, particularly regarding marine pollution abatement. Despite, Israel's lack of a coherent articulated national marine policy and the effects of other countries on its adjacent waters, significant strides have been made in the country to improve marine water quality. These improvements have occurred mostly through land-based infrastructure improvements and effective monitoring programs.

In June 1973, the UN Environmental Programme (UNEP) expaned the monitoring of marine pollution and its impact on marine ecosystems, paying particular attention to problematic water bodies, such as semi-enclosed seas. The coastal countries of the Mediterranean, recognizing the grave degradation of the neighboring marine environment, called for global action at both national and regional levels and initiated the Mediterranean Action Plan (MAP) within the framework of the UNEP regional seas program in 1975. The plan includes three different parts: an initiative focused on socio-economic aspects of development (known as Blue Plan), a scientific directive (known as MED POL) and a legal initiative (leading to the Barcelona Convention, see below). MAP has contributed to Integrated Coastal Zone Management through its Coastal Area Management Program (CAMP), which has been oriented towards practical coastal management projects in selected countries, including Israel. The Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution was signed a year after MAP began, in 1976, by the same 16 countries that adopted the MAP.

In regards to pollution abatement, two protocols of action were initially adopted: the first deals with the prevention of pollution by dumping operations from ships and aircraft (Dumping Protocol) and the second one with pollution by hydrocarbons and other noxious chemicals (Protocol Concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and other Harmful Substances in Cases of Emergency). Subsequently the countries adopted protocols against land-based pollution in 1980 (Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources), on Specially Protected Areas of Mediterranean Importance (SPAMI) in 1982, against pollution of the sea floor and subsoil resulting from continental shelf exploration and exploitation in 1994 and on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal in 1996 (Talitman et al. 2003).

Around the same time, the UN Environment Conference in Rio de Janeiro, held in 1992, adopted several global concepts such as sustainable development and the precautionary principle. To act on these new concepts, the EU launched an important program for development of Mediterranean third-world countries, called MEDA in 1995. This was followed by the European Union member states and the European Commission joining the Barcelona Convention, which was revised accordingly and renewed. A Euro-Mediterranean partnership was established with the aim of guaranteeing peace, stability, and prosperity in the region through enhanced dialog, free trade, and cooperation. A new Mediterranean Action Plan, MAP II, was also adopted. A special advisory body to the contracting parties of the Barcelona Convention – the Mediterranean Commission for Sustainable Development (MCSD) – was established. The MCSD produced recommendations and proposals for actions on water demand management, coastal zone management, tourism, industry, urban development and more (Laubier 2005).

Since 2007 the European Neighborhood and Partnership Instrument, known as ENPI, has replaced MEDA that was supporting the Euro-Med Partnership. It is a cooperation instrument managed by DG EuropAid through which political decisions taken at all levels of government are turned into actions on the ground. One of its main programs, the Horizon2020 Initiative related to the Mediterranean, was an outcome of the 10th anniversary of the Barcelona Convention. The project was also endorsed under the Union for the Mediterannean (UfM) in 2008.

Horizon2020 aims to build on existing institutions and results, filling gaps and operating within the framework of existing and developing policy instruments. A major component is aimed at reducing pollution. It also has a capacity building project within it that is coupled with its Mediterranean Environmental Program (Horizon2020 CB/MEP) that works to develop programs and initiatives that integrate policy, science, and education in many fields. In general, the project supports the implementation of the commitments undertaken within the framework of the Barcelona Convention, particularly those launched by the MCSD and MAP's Strategic Action Programme (SAP). The project also supports other European initiatives that will impact southern Mediterranean countries, such as the EU Marine Strategy Framework Direction and the EU Communication on Integrated Coastal Zone Management described in the next section of this chapter.

Ways Forward for Israel

In 2002, during her tenure as head of Israel's Planning Authority within its national Ministry of the Interior, Architect Dina Rachevsky wrote: "Attention of the authorities is no longer turned only toward land…Planning

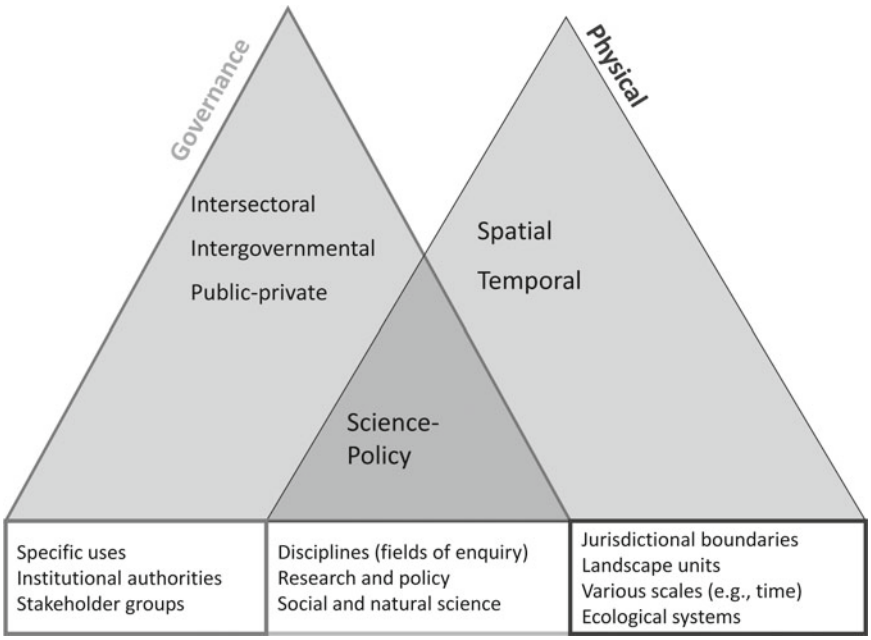

Fig. 40.3 Common dimensions of integration. The *bottom boxes* indicate what could be integrated within each dimension in more detail (Source: Portman 2011)

authorities understand that there is a need to preserve open spaces at sea, areas for which there was no fear of losing due to aggressive development in the past" (Rachevsky 2002). Rachevsky was referring to the new protection status bestowed on open (terrestrial) landscapes throughout the country by its newest National Outline Scheme (No. 35) suggesting that such consideration be given to seascapes as well. In the decade since those words were written, Israeli policymakers have done little to address either protection or development of the marine environment. Part of the problem is the lack of a clearly defined and articulated national marine policy.

Israel should begin developing a national marine policy that coincides with international frameworks, addresses uses occurring or expected to become relevant in the next few decades, and builds on past efforts within the country to promote wise use of coastal resources. Policy makers would be wise to learn from management approaches adopted and implemented in other parts of the world. Many of these incorporate principles of integration, ecosystem-based management and use new tools for marine spatial planning. Some have simultaneously developed new institutions dedicated exclusively to marine management.

Integrated Coastal Zone Management

One of the earliest articulations of the importance of integrated environmental and resource management is in the report of the Brundtland Commission, published in 1987. Not long after in 1992, the text of Agenda 21 adopted at the UN's environmental summit in Rio de Janeiro established integration as a sought-after principle of sustainable resource management. The failure of traditional approaches for management of the fragile coastal and marine environment, particularly those applied to manage commercial fisheries and for coastal conservation, led to the adoption of integrated coastal zone management (ICZM) by many countries the world over. The fundamental concept of this management approach revolves around principle of integration, a widely-practiced (or at least desired practice) for resource management fields such as energy, water and general environmental policy (Portman and Fishhendler 2011).

Integrated management is distinctly different from sectoral management that addresses one species or one use sector or one specific geographical unit or activity. Integration in the coastal zone specifically addresses management challenges related to the interface of land and sea (Cicin-Sain and Knecht 1998), among other dimensions of integration (Fig. 40.3). Successful ICZM will also involve the bringing together of myriad disciplines (science-policy integration), the consideration of future generations (temporal integration), stakeholders from many sectors of government (intergovernmental) and more.

European Union countries are obligated to adopt and implement ICZM. In 2002 the EU ratified the "Recommendations concerning the implementation of ICZM in Europe (2002/413/EC)" (European Parliament 2002). Among the most important contributions of the recommendations is the establishment of eight principles to guide member states in ICZM projects and the requirement that countries report at set intervals on the progress in ICZM. In the US, ICZM has been implemented for some time through the national Coastal Zone Management Act of 1972. Many

past studies and a wealth of literature are available on the benefits and challenges of various ICZM plans and programs.

In Israel ICZM has been an accepted approach to planning and development along the coast since the 1980s. It is realized through most of the country's regulatory guidance pertaining to the coast: the National Outline Scheme 13 (NOS 13–1983), the Coastal Waters Policy Paper (1999), and the Law for the Protection of the Coastal Environment (2004). A recent study conducted as part of a large EU-funded eight-country study on coastal development, explored the different mechanisms used for ICZM including those used in Israel. The study identified and evaluated the effectiveness of the following mechanisms: statutory regulatory commissions, setback lines, environmental impact assessment and the planning hierarchy, as these are required by various laws and plans, including but not limited to those mentioned above (Portman et al. 2012a).

Despite the many achievements of these and other mechanisms for ICZM in Israel, as one moves farther out to sea the tendency is still towards sectoral planning and management. For example, the siting of LNG terminals offshore is being debated within the framework of the National Outline Scheme 37 for Natural Gas as opposed to being considered as part of a comprehensive ocean plan. The difficulty in implementing ICZM corroborates with findings of progress reports on EU member country implementation. Reviewers identified three salient impediments to implementation: difficulties addressing land and sea resources together simultaneously; translating ICZM into practical action, and integrating policy and science on the ground (Rupprecht Consult 2006).

Israel has yet to adopt the ICZM protocol of the Barcelona Convention proposed in 2009, perhaps indicating its reluctance to commit to the actions specified within. More importantly, while Israel's planners and spatial managers are focused on coastal development and near-shore submerged areas, its seascapes are largely neglected. Development in the marine environment is addressed largely on a case-by-case basis.

Ecosystem-Based Management

This approach to development has evolved over the years from the knowledge that the well-being of the marine environment is necessary to guarantee the well-being of nearby human populations and their continued use of marine resources. Central to ecosystem-based management (EBM) is the need to develop a common vision of healthy and resilient seas that considers the ecosystem, society, and the economy. To be EBM-focused, the regional vision should strive to maintain the full suite of ecosystem services upon which humans rely, both in the short and long term (Mengerink et al. 2009).

The Millennium Ecosystem Assessment conducted by a large interdisciplinary cadre of experts, defined the following four types of ecosystem services: product services, regulatory resource services, those with cultural purposes and those providing support services (Millennium Ecosystem Assessment 2005). Product services from the marine environment are those that provide consumer goods. They include food, minerals, clean water and generally all extractable goods. Regulatory resource services are those derived from natural processes that benefit human populations. These could be flood control, or even atmospheric processes that maintain the earth's environment. Cultural services are non-material resources such as aesthetic values or heritage sites that represent and preserve historic knowledge or experience. Supporting services consist of those processes that guarantee the continued functioning of all the other services. Today, it is clear that many of these services provided by ocean ecosystems are disrupted or endangered due to human intervention. It is hoped that ecosystem-based management applied to the marine environment can help remedy or improve the situation while maintaining some level of development and exploitation.

Marine policy experts are aware of the need to incorporate principles of marine EBM (MEBM) into development approaches pertaining to the Mediterranean Sea. An advantage in the Levantine Sea is that it is relatively well-studied (e.g., Abdulla et al. 2009; Coll et al. 2010) which makes it possible to identify services that must be protected. The hope is that a MEBM approach will balance conservation measures with development (Ehler and Douvere 2007). These can best be achieved through a comprehensive marine spatial planning process guided by an MEBM perspective. Marine spatial planning efforts in other countries have already implemented MEBM, such as the Massachusetts Ocean Management Plan and Netherlands' Integrated Management Plan for the North Sea 2015[9] (Douvere and Ehler 2009), thus acquiring experience that can be replicated elsewhere.

Marine Spatial Planning

The intense and growing competition among uses of the marine environment in Israel is similar to what is happening in other countries that have already embarked on planning processes. These processes, commonly referred to as marine

[9]In 2005, the EU Marine Thematic Strategy (Marine Strategy), which is the environmental pillar of the EU's Maritime Policy, introduced the principle of ecosystem-based marine spatial planning and provided a supportive framework for national initiatives toward spatial planning designed for improving the health of marine environments.

spatial planning (MSP), will determine the spatial distribution of uses and activities in the marine environment. Numerous countries, many in Europe and North America, are initiating MSP due to the lack of clear marine regulation and public sector planning, as well as problems of fragmented governance. MSP attempts to gain consensus, identify potential conflicts and possible solutions in a proactive manner. It has the potential, depending on goals and objectives, to balance both protection of the environment and development. In many respects there is a mutual, respective relationship between MSP and MEBM. Ideally, MEBM should guide management decisions made about uses of the sea within a MSP process which constitutes a tool for implementation.

Marine spatial planning is "a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process" (Ehler and Douvere 2009). Some scholars and practitioners have related MSP to terrestrial planning and zoning that have been used for decades on land, calling it "analogous to land use planning" (e.g., Turnipseed et al. 2009). Although there are some similarities, most aspects of the marine environment are structurally and functionally distinct from those of the terrestrial environment. These different attributes pose both challenges and opportunities for policy makers and planners working on the marine environment and for those attempting to transfer well-established planning tools, institutional constructs and conservation approaches from terrestrial to marine applications.

By and large, the resources of the sea are public. Resources at sea are more dynamic, fluid, and transient than those on land. Agardy (2000) provides a comprehensive and useful description of the differences between marine and terrestrial systems: nebulous versus clear boundaries, large versus small spatial scales, fine versus coarse temporal scales, three-dimensional versus two-dimensional living space, unstructured versus structured food webs, and non-linear versus linear system dynamics. Additionally, marine resources are less understood and, by and large, they hold open access and/or common property goods. The ocean is three-dimensional in that the depth of ocean resources determines the characteristics and interactions among organisms and elements of the environment. Use technologies are frequently limited by depth factors. Human constructs, such as property rights, will be different when applied to the oceans. Resource use rights are well established on land, but less so in the sea.

Recognizing grave problems in the health and well-being of ocean systems and resources, such as overfishing and pollution, marine policy experts in the US have called for a comprehensive marine policy, ocean zoning and integrated marine management at the national level for decades (Underdal 1980; Stokstad 2009; Lubchenco and Sutley 2010). Following the catastrophic "Deep Horizon" oil spill in the Gulf of Mexico that occurred in April of 2010, President Obama signed the Executive Order for Stewardship of the Ocean, Coasts, and the Great Lakes. This Order, signed in July 2010, created the National Ocean Council to coordinate the work of the multiple federal agencies already involved in marine conservation and planning. It also established advisory committees for the development of regional coastal and marine spatial plans (CMS Plans). Efforts are now ongoing to prepare these plans on a regional basis.

Following a series of communications about the marine environment (such as the Thematic Strategy on the Protection and Conservation of the Marine Environment and an Impact Assessment on the proposed Marine Strategy Directive in 2005), the European Commission published its guidelines for integrated marine policy in June 2008 (European Commission 2008a). The Roadmap for Maritime Spatial Planning: Achieving Common Principles in the European Union followed in November 2008 (European Commission 2008b). EU member countries immediately began implementing the roadmap, but over varying schedules. The Directorate-General for Maritime Affairs and Fisheries has sponsored a study on the prospects for MSP in the Mediterranean. The country reports (see Policy Research Corporation 2011), covering all littoral countries of the Mediterranean Sea including Israel, indicate EU interest in capacity building for non-EU member countries to promote the use of this tool.

It is very likely that an MSP initiative will be undertaken in the near future in Israel. A first step in such a process would be the development of a clear marine policy along the lines of the CWPP, but that explicitly addresses marine uses and characteristics of the marine environment. An ocean plan could be a non-statutory master plan. As such it would have the advantage of being longer-term and more suitable to incorporate adaptive management (i.e., an iterative process that involves frequent adjustment as time goes on). In any case, the public nature of resources of the sea, anticipated effects of climate change on the marine environment and the growing national importance of maintaining ecosystems of the sea, particularly as terrestrial resources become scarce, will likely drive a MSP process in Israel. Policy makers and planners would be wise to take advantage of lessons learned by other countries.

Conclusions

While the marine environment of the Mediterranean clearly engenders increasing economic and social value, it is only recently that the public and policy makers have acknowledged that the health and well-being of marine ecosystems are essential for continued exploitation. Using this knowledge for the development of appropriate policies

thus laying the foundation for significant institutional changes is the next challenge for the littoral countries of the Mediterranean Sea.

Policy makers are faced with challenges in the realm of marine policy the world over as use patterns change and intensify. However, the lack of marine policy in Israel is particularly worrisome when one considers the value of its offshore resources and the limitation of terrestrial resources in the country, including land (space). The Mediterranean Sea is Israel's western border, a fact that impacts national goals of social, environmental, economic, security and geopolitical importance.

The Israeli ocean advocacy association, Zalul (in Hebrew: clear water), in their 2011 Annual Report on the Status of the Sea, call for the creation of a national ocean management agency. They based this call on an inventory of threats to the country's fragile marine environment, listing offshore drilling for gas, port expansion, land-based effluents and solid waste, coastal development and seawater desalination (Gidron et al. 2011). It is unlikely that such an agency would completely curb impacts to the marine environment resulting from development, but the fact that such an advocacy group and others, are pressing for new institutions and the extension of existing regulations to areas beyond territorial waters is a sign of public concern and interest in action destined to make their mark.

In the past, public controversy over proposed mega developments slated for construction along the coast threatening the remaining open and publically accessible areas of the shore (including at most about 13 km of bathing beaches from a total coastline of almost 200 km (Papay 2007)) proved the impetus for significant regulatory changes, such as the LPCE of 2004. Increasingly conflicting uses of the submerged areas of sea have yet to be addressed, but they will be. When they become high-profile concerns in the public's mind, likely only a matter of time, Israel would do well to be a regional player, to continue to act according to agreed-upon principles for marine and coastal development such as ICZM and MEBM, and to incorporate lessons learned from successful experiences in marine spatial planning.

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