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Assessing governability of environmental protected areas in Phetchaburi and Prachuap Kirikhan, Thailand

Suvaluck Satumanatpan[1*] and Ratana Chuenpagdee[2]

* Correspondence:
suvaluck.nat@mahidol.ac.th
[1]Faculty of Environment and
Resource Studies, Mahidol
University, Nakorn Pathom, Salaya
73170, Thailand
Full list of author information is
available at the end of the article

Abstract

Environmental degradation continues in Thailand, despite the establishment of several environmental protected areas (EPAs) since their inception in 1992. EPAs aim to promote the conservation and sustainability of natural resources through decentralization and improving the participation of local governments and communities. Not all EPAs are successful, however. The purpose of this paper is to examine factors affecting the implementation of the EPAs program in Thailand, using the Phetchaburi and Prachuap Kirikhan EPA, in southern Thailand as a case study. Following the governability assessment framework, natural, social, and governing systems associated with the EPA were first described in terms of diversity, complexity, dynamics, and spatial and jurisdictional scale. Next, we examined the extent to which the EPA, as a participatory regulatory tool, corresponded with the natural and social systems it aimed to govern. The analysis reveals that the EPA did not function as effectively as it should be, even though the governing system was well structured to deal with complex coastal ecosystems in the area. The deficiency in the function of the EPA was due largely to poor sectoral coordination, weak financial commitments, and uncoordinated governing interactions. Based on these findings, we suggest that the EPA should be situated in a broader context of land and marine spatial planning and that it needs to be attuned to existing policies in a way that collaboration between agencies and policy integration is possible.

Keywords: Governability; Interactive governance; Environmental protected area; Sustainability; Spatial planning

Introduction

Sustainable development of coastal areas is difficult to achieve (Chua 2006). In addition to high diversity, complexity and dynamics, and multiple interactions between natural and human systems (Chuenpagdee et al. 2008), many coastal zones around the world face rapid and unplanned development, population growth and demographic change, all of which contribute to loss of habitats, increased erosion and ecological deterioration (Kay and Alder 2005). Further, the cross-sectoral, cross-boundary and overlapping jurisdictional issues of coastal zones create a 'wicked' governance problem. As posited by Rittel and Webber (1973), wicked problems are those that are difficult to define, as stakeholders may disagree about the causes of the problems. Consequently,

wicked problems have no easy solution and attempts to solve them may lead to more problems in the future (Jentoft and Chuenpagdee 2009; Balint et al. 2011).

Several regulatory measures have been carried out worldwide to address the afore-mentioned concerns and to improve coastal governance. In Thailand, examples of these efforts include the designation of national parks, mangrove preservation areas and fishery conservation areas through legislative measures. The latest nationwide initiative in coastal conservation occurred in 1992 with the introduction of Environmental Protected Areas (EPAs) as a legislative tool to promote environmental sustainability, in line with the global movement towards sustainable development at that time (WCED 1987). While EPAs are government-led initiatives, they are not implemented as a top-down process but through decentralization mechanism towards provincial and district level governments and with the involvement of other local actors. In effect, the implementation of the EPA follows a process similar to co-management mechanisms, where management responsibilities are shared among governments, non-governmental local organizations and community members. Since their inception, a total of seven EPAs have been established in Maha Sarakham, Chonburi, Phetchaburi, Prachuap Kirikhan, Surat Thani, Krabi, Phang Nga and Phuket Provinces, all (except the first one) are in coastal areas. Each EPA is implemented for 5 years in the first phase and can be renewed every 5 years.

The implementation of the EPAs program in the last 20 years in Thailand has faced several challenges. For example, most EPAs take at least 4–5 years from the initial discussion to the official declaration, due mostly to the decentralized and participatory nature of the EPA implementation process, which takes time (Office of Natural Resources and Environmental Policy and Planning 2008). Several EPAs are under-performed, not only because of the unreasonably high expectations placed on them, but also because of the lack of financial and human resources to support their establishment (Satumanatpan et al. 2014). Nevertheless, the government continues to promote EPAs, hoping that they will help decelerate widespread unsustainable coastal development in the country, as did the designation of two early EPAs established in the highly populated tourism areas of Pattaya (Office of Natural Resources and Environmental Policy and Planning 2013b) and Phuket (Boonchai et al. 2011; Office of Natural Resources and Environmental Policy and Planning 2013a). Given the financial resources required in implementing the EPAs program, the expectation they raise among stakeholders, and in some instances, the conflicts they create, it is important to learn from the existing ones before establishing more. The similarity of EPAs to other area-based instruments implemented around the world, like marine protected areas (MPAs) and marine spatial planning, implies broader lessons to other natural resource governance efforts beyond Thailand.

As suggested by Chuenpagdee and Jentoft (2007), when dealing with complex resource governance problems, careful examination of the resource and governance situation is necessary before embarking on developing solutions. Interactive governance theory (Kooiman et al. 2005) posits that several factors and conditions may affect the overall governance quality, or 'governability', of the resource system. Some of these features are intrinsic to the systems that are being governed, while others arise from the kind of governing systems that are being instituted. Thus, elements of the governing system, whether at the structural design, principles,

institutions and actions, can also contribute to making the system more or less governable (Bavinck et al. 2013).

Informed by the governability assessment framework (Chuenpagdee and Jentoft 2013), we conducted a study of an EPA in the southern Thailand, Phetchaburi and Prachuap Kirikhan EPA (PB-PK EPA), and investigated how the traits of the associated coastal systems (i.e. diversity, complexity, dynamic and scale) affect the EPA implementation. Further, we asked what features of the governing system may affect the outcomes of the EPA and whether the instruments used were appropriate. Finally, we analyzed different types and quality of interactions that exist within the EPA, and examined the extent to which such interactions contribute to governability. Since the use of EPAs is one of several tools in environmental management, the analysis also included a look at how the EPA works within and in relation to the larger natural and socio-political context. In other words, we assessed whether the current structure of the EPA fits in with the larger agendas of the institutions that are responsible for its implementation.

The paper begins with an introduction of interactive governance and the governability assessment framework. Next, it presents a brief history of the EPAs and describes the study area. The research method is explained before discussing the results. The paper concludes with lessons learned from the study and recommendations.

Interactive governance and governability

Governance is not a new concept. It has been traditionally used in association with what governments do, i.e. to pilot or steer (Kjaer 2004). Recently, the term governance is understood to be a broader and more comprehensive concept, including other non-government actors, such as resource users and their associations, non-governmental organizations, and community groups (Olsen et al. 2006; Barbara 2011; Moore et al. 2011). Such an extension of the concept is particularly necessary when dealing with complex resource systems like oceans and coasts (Cicin-Sain and Knecht 1998; Ehler 2003). Participatory governance requires institutional changes that enable inclusive and collaborative approaches to deal with the increasingly complex or wicked societal problems (Rittel and Webber 1973; Balint et al. 2011; Berkes 2009). Designing appropriate institutions, as well as formulating principles that support the function of these institutions, are therefore key to governance (Ostrom 1990). According to Kooiman et al. (2005), understanding interactions that take place within the natural and social systems being governed, and the governing system, as well as the interactions between them, is fundamental to addressing environmental and societal concerns. The emphasis on interactions, and through them, the creation of opportunities and synergies for governance, offers a unique perspective worth pursuing, also in the examination of the effectiveness of instruments like EPAs.

The interactive governance approach uses a 'governability' concept as its analytical lens. Defined as "the overall governance quality of any societal entity or system" (Bavinck et al. 2013), governability is about the inherent and constructed properties of the system-to-be-governed and the governing system in the first instance: a system that is highly diverse, complex and dynamic is likely more difficult to govern than a simple one (Kooiman et al. 2008). But it also relates to how the governing system responds to

the needs of the system-to-be-governed and how it performs its function. In other words, even when the system-to-be-governed contains features that makes it difficult to govern, the overall governability might still be high, provided that the governing system is well designed and is very capable of performing its function. Finally, governability rests upon the type and quality of governing interactions and how they promote or constrain the entire system from achieving governance goals (Chuenpagdee and Jentoft 2013). Interactive governance pays particular attention to the interaction between the system-to-be-governed and the governing system, in assessing governability, acknowledging the key role it plays in fostering or inhibiting governance. On a whole, governability can be due to several factors related to any sub-system and their interaction, requiring therefore a systematic and comprehensive assessment of what could possibly cause the system in question to under-perform. The governability assessment framework has been applied to assess coastal and fisheries governance in several contexts, including illegal fishing in Lake Malawi (Song and Chuenpagdee 2011), a stewardship initiative in Thailand (Thaimmueang et al. 2012) and a governance reform in South Korea (Song 2015).

Background and the study area

In 1992, the government of Thailand introduced EPAs as legislative tools to be declared under the 1992 National Environmental Quality Act (NEQA). EPAs aim to help protect the environment and prevent further environmental degradation in coastal and terrestrial areas. In line with the sustainable development concept (WCED 1987), human activities are allowed in EPAs, provided that they do not cause environmental damages and that they are properly managed. There are two provisions for the declaration of EPAs. First, under Section 43 of the NEQA, EPAs can be designated to protect unique or fragile natural ecosystems, either vulnerable to the adverse impact of human activities, or are worthy of being conserved because of their natural or aesthetic values. Another option is under Section 45 of the same Act whereby EPA is applied to areas legally enforced by other conservation measures and restrictions but degradation continues. Since its inception, seven EPAs have been established; one upland EPA (north east of Thailand) and six coastal EPAs (five in the south and one in the east coast of Thailand).

One of the coastal EPAs covers two provinces in the west coast of the Gulf of Thailand, Phetchaburi (PB) and Prachuap Kirikhan (PK) (Fig. 1). The EPA was established in 2004 to address concerns about unplanned and harmful activities, including rapid build-up of hotels and light manufacturing factories, illegal fishing and the use of destructive fishing gears, and conversion of mangrove forests into shrimp ponds and salt farms (Office of Natural Resources and Environmental Policy and Planning 1998). Coastal degradation continues in this area despite having the Fishery Act (1972) to prohibit the use of trawls and push nets within 3 km from shore and the NEQA (1992) to control pollution. The Phetchaburi and Prachuap Kirikhan EPA (or PB-PK EPA) was therefore designated under Section 45 of the NEQA (1992) to cover about 850 sq. km, bordered by Phetchaburi River in the west and a sandy floodplain in the east. The area is under the jurisdiction of four districts (Ban Laem, Muang Phetchabuti, Tha Yang and Cha Am) in PB Province, and two districts (Hua Hin and Pran Buri) in

Fig. 1 PB-PK EPA covering five coastal zones (Zone 1–5), one marine zone (Zone 6) and one mangrove zone (Zone 7). Administrative boundaries cover 4 districts of Ban Laem, Muang Phetchabuti, Tha Yang and Cha Am in PB Province and 2 districts of Hua Hin and Pran Buri in PK Province (source: Ministry of Natural Resources and Environment Government Gazette, 2010)
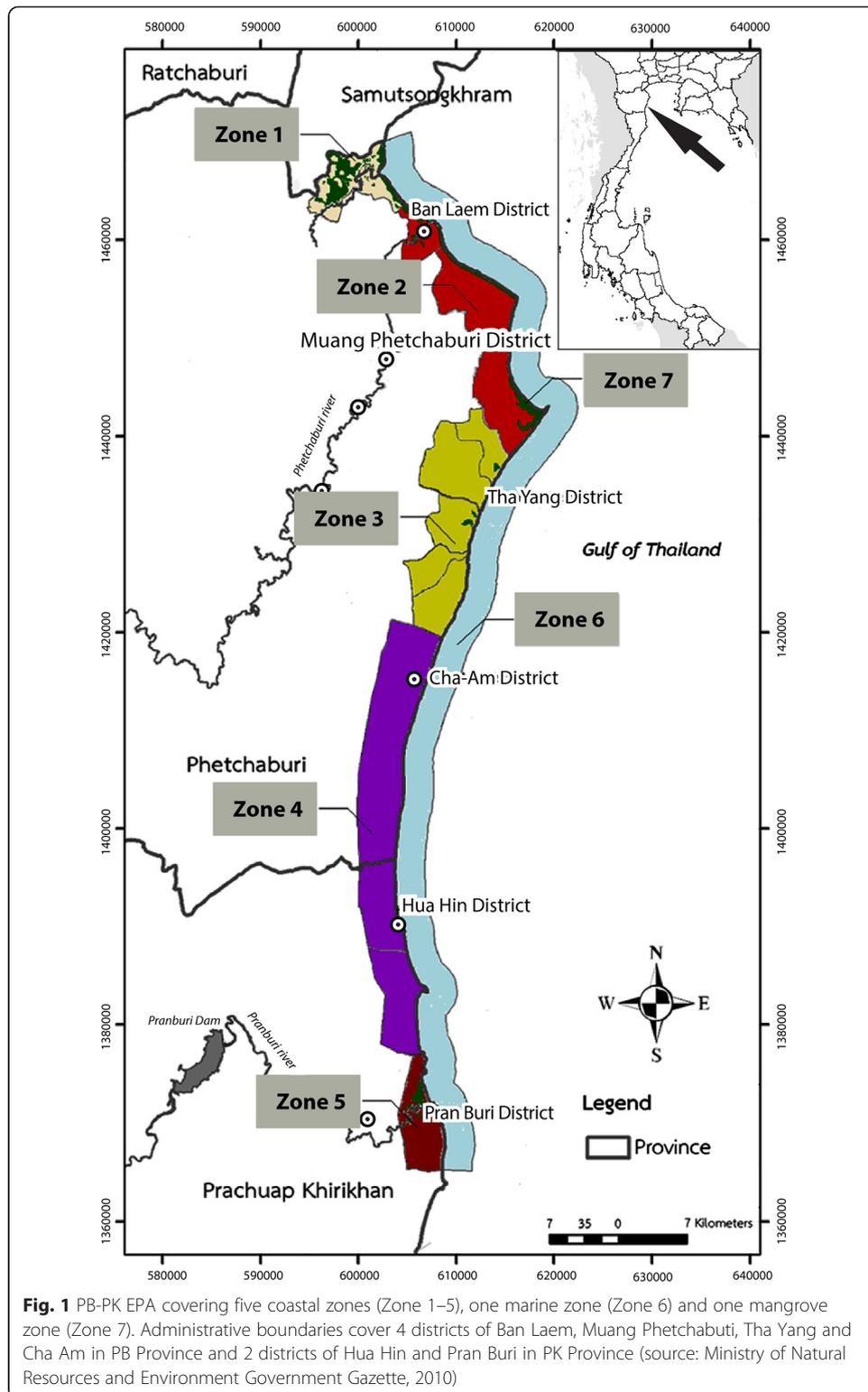
PK Province (Fig. 1), and has a population of 512,714 inhabitants (Department of Provincial Administration 2012).

Coastal ecosystems in the PB-PK EPA are rich in natural ecosystems, particularly mangroves and mudflats, which contribute to the productivity of the area. Fishing for

various fish species, shellfish and shrimps is one of the main economic activities (Department of Fisheries 2013). Certain sections of the coastline are lined with white sandy beaches, attracting both Thai and foreign tourists to the area. Tourism-related business, such as gift shops, boat tours, water-sport rental, food stalls and hospitality (hotels, bungalows, resorts), are also important revenue-generating activities in the area (Department of Tourism 2014). In addition to fishing and tourism, residents of the PB-PK EPA are engaged in aquaculture, agriculture, including salt and rice farming, and small trades.

The initial focus of the PB-PK EPA plan has been on preventing or mitigating impacts from coastal activities considered harmful to the environment. The EPA was originally zoned into five coastal and two marine areas and employed several tools as part of the regulatory measures. These included land use planning, restrictions on type and size of development projects, and standard control through environmental impact assessment (Satumanatpan et al. 2014). Specifically, an expansion of salt farms in mangrove forests and use of motorized fishing gears in some areas were prohibited. Environmental awareness raising program and rehabilitation programs to restore degraded lands, abandoned mangrove forests and damaged beaches were also in place.

The evaluation of the first phase of PB-PK EPA (2004–2009) revealed persistent significant environmental degradation, exemplified by coastal erosion, poor water quality and declining fisheries resources (see Satumanatpan et al. 2014; Office of Natural Resources and Environmental Policy and Planning 2013c). Minor adjustments on the EPA zoning were made by combining two marine zones into one and by adding a mangrove zone as shown in Fig. 1. Thus, this mangrove rezoning helped making conservation and rehabilitation of mangrove forests more effective. In addition, more rules and restrictions have been added, for instance, to control an excessive use of signage and poster boards (in order to reduce visual pollution) and to prohibit construction of built structures like jetty, groin, breakwater longer than 200 m. without proper environmental impact assessment. However, the successful implementation of these measures seems questionable. No provision to control beach tourism activities has been included.

Methods

The study began with the review of published and non-published materials, including the Government Gazettes produced by the Ministry of Natural Resources and Environment, the reports by the provinces, and other official documents related to the PB-PK EPA. These documents are in Thai, and they are mostly available on websites. Several field visits to the area were made in 2012–2013 in order to conduct key informant interviews, with approximately 60 people from relevant government officials, other local governing actors, members of local conservation groups, and individuals from user groups who were directly affected by EPA regulations, including small-scale fishers, shrimp farmers, salt farmers, hotel and resort owners and local residents. Individual interviews were conducted in Thai by the first author, who also took handwritten notes. No audio or video recording was used in the field data collection. On average, the interviews took about 30–45 min to complete. In

addition, the researcher participated as an observer in two formal EPA committee meetings held during the study period.

Key questions were formulated to guide the open-ended interviews and field observation in order to assess the EPA governability. For example, questions about how diverse, complex, and dynamic of the system-to-be-governed and the governing system and whether there were scale and boundary issues affecting their operations were asked (Table 1). Questions were also posed about the design of the EPA and the governing structures at the national, provincial and local level, in terms of how they were organized and how they function. For governing interactions, we asked probing questions about different types of relationships and forms of interactions between various stakeholders, along with personal observation during the field visit and at the EPA committee meeting. We paid particular attention to the quality of stakeholders' representation and their participation in decision-making process, how well information was communicated, the extent of coordination and collaboration between different government agencies, and whether learning and adaptation took place as part of governance. Thematic analysis (Attride-Stirling 2001) was used to organize interviews' responses into themes, and coding schemes were applied to the data, in order to describe the system-to-be-governed, governing system and governing interaction. The field data collection and the analysis followed the ethical protocol of the university where the first author is affiliated.

Results

System-to-be-governed

Natural system

The PB-PK EPA natural system-to-be-governed contains diverse ecological systems, supports complex marine life, and contributes a high level of ecosystem goods and services. The area is comprised of a range of habitats, with a mixture of river deltas, mudflats, sand and mud-mixed substrate, and sandy beaches, along with mangrove and terrestrial forests, and other vegetation (Office of Natural Resources and Environmental Policy and Planning 1998). Eleven species of mangrove are found along the coast (mainly *Avicinia* spp. *and Rhizophora* spp.), together with 18 benthic species, most abundantly blood cockle (*Anadara granosa*), hard shell (*Meretrix meretrix*) and razor clam (*Pharella javanica*) (Department of Marine and Coastal Resources DMCR 2012a). Economically important fish species include Indo-Pacific mackerel

Table 1 Examples of questions for EPA governability assessment based on four system properties

System properties	System-to-be-governed (Natural and social)	Governing system
Diversity	Type and size/number of habitats and species Resources users and other relevant stakeholders	Formal and informal institutions involved in EPA decision
Complexity	Linkages between habitats, species and system productivity. Relationships between stakeholders (conflict or compatible)	Relationships between the mandates and roles of the governing institutions
Dynamic	Seasonality and flux in the natural system. New resource users, new or changing type of activities	Changes in the governing structure, operations and mandates
Scale	Size and geographic range of EPA boundaries. Connectivity between activities within and outside EPA	Relationships between state, provincial and local governing actors; issues with jurisdictional and boundary overlap

(*Rastrelliger brachysoma*), treavally *(Selaroides leptolepis)*, threadfin bream *(Nemipterus hexodon)*, banana shrimp *(Penaeus merguiensis)*, school prawns *(Metapenaeus* spp., *Parapeneus* spp.), mangrove crab *(Scylla serrata)*, swimming crab *(Portunus pelagicus)*, squids *(Loligo* spp.), and cutlltlefishes *(Sepia spp.)* (Thaimmueang et al. 2012). According to DMCR (Department of Marine and Coastal Resources DMCR 2012b), several endangered marine mammals, including three species of dolphins *(Orcoella brevirostris, Neophocaena phocaenoides, Sousa chinensis)* and two species of whales *(Balaenoptera edeni* and *B. omurai)* can be found in the area. Finally, the area provides habitats to almost one hundred species of birds (Round and Kongthong 2010).

Social system

Corresponding with the rich natural system, the social system associated with the PB-PK EPA is diverse, complex and dynamic, with many stakeholders relating to each other in several ways, with changing activities and roles. The dynamism of the system is particularly striking with many of the activities causing changes in the ecosystem. For instance, salt farming, shrimp farming, rice cultivation, small-and large-scale fishing, and development of housing, hotels, resort and other tourism-related business have contributed to major coastal degradation. When the PB-PK EPA was announced, the expansion of salt farms became restricted to prevent further encroachment into the remnant mangrove areas. However, some residents and mangrove officials interviewed for the study reported invasion of small salt farms in areas adjacent to mangrove forests, causing many of them to die because of the long and constant exposure to concentrated salt water. Another pressure on the mangroves is the expansion of white leg shrimp farming (*Litopenaeaus vannamei*), due to high global market demand, replacing the previously popular giant tiger prawn (*P. monodon*) (Department of Fisheries 2008). According to the local residents interviewed for this study and the field observation, some of these farms also encroach into mangrove forests and other agricultural areas, such as rice fields and fruit orchards. Such developments have created tensions and complicated the relationships among various users, making the EPA difficult to govern.

Use of motorized trawling, push netting and dredging within the prohibited area of 3 km from the shore of PB-PK EPA has been reported by the small-scales fishers and the fishery government officials, who were the study key informants, adding pressure to the degraded fisheries resources, recorded at a low catch per unit effort of 9–15 kg/hr by the Department of Fisheries (Department of Fisheries 2013). The local residents and the government officials reported that vessels involved in destructive fishing operations came from other provinces outside the EPA.

The coastlines of Phetchaburi and Prachuap Kirikhan are modified and degraded with the advent of coastal urbanization and tourism development. A study by the Office of Natural Resources and Environmental Policy and Planning in 2013 (Office of Natural Resources and Environmental Policy and Planning ONEP 2013c) shows land use change in the PB-PK EPA during 2002–2012, with an increase in industry and urban areas of about 18 and 5 % respectively, while the areas of agriculture and upland forest decreased by 9 and 1 %. Tourism statistics (Department of Tourism 2014) show a steady growth of about 2–3 times in the number of tourists in the two popular destinations located in the EPA during 1998–2013; Cha Am (from 2.69 to 5.38 millions) and

Hua Hin (1.45–4.5 millions). These rapid and uncontrolled developments have led to poor water quality and pollution problems in the EPA (Satumanatpan et al. 2014). Finally, coastal erosion, caused by these various activities, as well as seasonal monsoons and other climate-related events, adds to the dynamics of the EPA system.

On the whole, the PB-PK EPA is a diverse, complex and dynamic area that is difficult to govern. The natural system-to-be-governed contains diverse ecological systems, supports complex marine life, and contributes a high level of ecosystem goods and services. The social system-to-be-governed involves multiple users whose activities are not always compatible, thus creating a high level of challenges to governance and management, such as in addressing conflicts between different users and preventing new developments in the area. The EPA is also not a closed system, as it is connected to other ecosystem and resource uses outside of the area. Scale and boundary issues therefore need to be considered in the discussion about EPA governability, along with the other natural and man-made characteristics.

Governing system

In line with how natural resources are generally governed in Thailand, the PB-PK EPA is governed under a decentralization system, with local government officials responsible for the day-to-day management and local decision-making processes. Co-management mechanism is followed, with involvement of non-governmental organizations (NGOs), business enterprises and local communities in a key committee and in key decision-making processes. The structure of the governing system is well defined and rather stable, despite the institutional reforms, which makes it highly governable. There are, however, many governing actors in all levels and types of organizations, including communities, which can be challenging to coordinate. The governability challenge faced in the EPA is related mostly to the system complexity and the need for good coordination of multiple actors within the governing system in the comprehensive planning process.

Coastal governance in Thailand has undergone several legal and institutional changes since 1997. Among them was the bureaucratic reform in 2003, which resulted in the establishment of the Ministry of Natural Resources and Environment, as the main agency responsible for protection and conservation of protected areas, water resources, mineral resources, marine and coastal resources and environmental quality (Reorganization of the Ministries Act 2002). Under this ministry, Thailand's natural resource policy has been set to promote the rights of individuals and local communities to participate in natural resources governance. All EPAs are the responsibility of this ministry, operated through the Office of Natural Resources and Environmental Policy and Planning (ONEP). Specifically, ONEP is in charge of site nomination, preparation of a management plan for the EPA and securing fund for its implementation. Previously, the nomination was purely a top-down process. According to the government officials who were key informants for the study, the development of more recent EPAs has been more participatory, with involvement from communities and local government authorities, especially in the discussion about where to locate the EPAs.
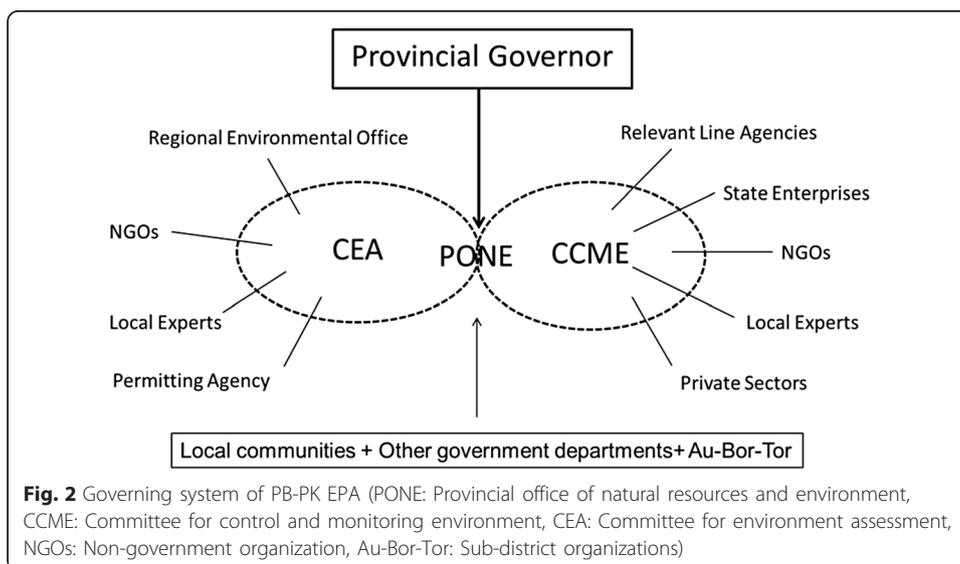
Through the decentralization process, the EPA is managed by the local governments and is regulated through two key committees: one is in charge of control and monitor environment (a formal multi-stakeholder Committee for Control and Monitor

Environment, or CCME) and another is a special committee responsible for evaluating the environmental assessment reports, Committee for Environmental Assessment (or CEA). Both committees have the Provincial Office of Natural Resources and Environment (PONE) as secretariat and the Governor as the chairman (Fig. 2) (Government Gazettes Ministry of Natural Resources and Environment 2010). The specific duties of PONE related to the EPA include making provincial environmental plans and monitoring natural resources and environment status. CCME members are comprised of representatives from relevant government agencies, local experts, private sectors, state enterprises and members of NGOs. CEA memberships are similar but instead of government agencies and state enterprises, it comprises regional environmental officers and permitting agencies.

In principle, CCME aims to have a broad spectrum of stakeholders in its composition. A question is raised, however, about the representativeness of CCME members because the process of selection and appointment is unclear, affecting thus the legitimacy of some of the agencies involved in the EPA governance. Several CCME and NGOs members interviewed for this study stated that the qualified persons from relevant agencies were not invited to be part of the CCME.

Other supporting governing actors in the EPA include line agencies, sub-district organizations (known locally as Au-Bor-Tor), NGOs and Natural Resources and Environmental Protection Volunteer Network. At the community level, Au-Bor-Tor, a decentralized administrative institution, is the main agency responsible for issuing construction permits in their sub-district. Many of the key informants emphasized the relationship and interaction among agencies (within the CCME and between CCME and other related agencies in the EPA) as one of the key factors determining success in the EPA implementation, as explained below.

Generally, the governing system of the EPA is well designed and structured, with clarity about roles and responsibility of different agencies. Some efforts to coordinate activities related to the EPA between the ONEP and the PONE were observed through review of official reports and interviews. Meetings between these two agencies were, however,

Fig. 2 Governing system of PB-PK EPA (PONE: Provincial office of natural resources and environment, CCME: Committee for control and monitoring environment, CEA: Committee for environment assessment, NGOs: Non-government organization, Au-Bor-Tor: Sub-district organizations)

infrequent. For example, ONEP joined the provincial meeting to disseminate EPA notification at the beginning of the project but did not show up again until the renewal process. At the local level, coordination between different agencies within the EPA governing system was also low, except for enhancing environmental awareness. According to the key informants, this was partly due to limited budget and human resources. The provincial staff reported, for instance, that no funding was made available for the first phase and only a small amount of funding is provided for the PB-PK EPA for the current phase. Such shortfall makes it difficult to properly implement the EPA, considering the involvement of several stakeholders from across sectors and at different levels, lowering thus the governability.

Summary result on the governability assessment of the system-to-be-governed and the governing system is provided in Table 2.

Governing interaction

The assessment of governing interaction, based on interviews and participant observation, revealed that the interactions between the system-to-be-governed and the governing system are limited. These interactions are described below using interactive attributes suggested by Chuenpagdee and Jentoft (2013), focusing particularly on: (i) information sharing and communication; (ii) integration and coordination with other governing measures; and (iii) learning and adaptation.

Success of the EPA requires effective dissemination of information. Unfortunately, little is happening to that effect. EPA regulations and boundary map were the only information disseminated from the central government in the form of a ministerial notification to the affected stakeholders. The review of the documents and archival materials resulted in few media and other form of communication being produced to help build awareness about the EPA. According to the community leaders who were the key informants of the study, information about the EPA was disseminated mostly by word of mouth in village meetings. It was therefore not surprising to learn from the interviews that many of the local residents had little or no knowledge about the EPA program and its purpose. However, the level of awareness about the EPA seems to have risen during the renewal process, which takes place every 5 years and was performed in the PB-PK EPA in 2009. The assessment was conducted by a third party contractor and involved consultation with all communities at the sub-district level, government and private agencies, and NGOs (Office of Natural Resources and Environmental Policy and Planning 2008).

Based on the review of the official documents produced by different line agencies in the area, most government units already have programs to support awareness building as part of their own regular activities, and not specific to the EPA. As such, integration and coordination of rehabilitation plans for long term EPA planning have never been prepared as part of their mandate. The one instance showing strong collaboration between governing actors and local stakeholders was related to the official announcement of a Fisheries Decree, a no-take area for bivalves fisheries (only allowed by hand-collection). Such collaboration was possible because of the support from small-scale fishers in the area and the Au-Bor-Tor, assisted also by the Provincial Fishery Office particularly in terms of close surveillance. While this announcement cannot be fully attributed to the capability of the EPA governing system, it is likely that the designation of a no-take area in an EPA is easier to do than in areas with no EPA. In other words,

Table 2 Summary results of the governability assessment of the system-to-be-governed and the governing system of PB-PK EPA

Properties	System-to-be-governed (Natural)	System-to-be-governed (Social)	Governing system
Diversity	- The natural system consists of diverse habitats including river deltas, mudflats, sand and mud-mixed substrate, sandy beach, mangrove and terrestrial forests.	Diverse users: small-scale fishers (SSF), large-scale fishers (LSF), farmers, (salt, shrimp and rice), hotel and resort owners and local residents	-Formal and informal institutions are set up to govern the EPA.
Complexity	- Diverse habitats support complex marine life, which are related to each other mostly through food web system.	- Complex relationships between mangrove official and agriculturists (salt farm, shrimp farm, rice farms), which often generate conflicts.	-PB-PK EPA is governed under a decentralization system, i.e. many roles have been devolved to the local government. Clear mandate and responsibility of governing actors are defined, following co-management governing mode.
		- LSF has poor relationship with SSF as the LSF often fish illegally in the restricted area (3 km from shore).	-Multi-stakeholders were appointed as the CCME, however with limitation on the representativeness.
		- Developers tend to avoid environmental impact study, generating conflict with the local authority and local residents.	
Dynamics	- Seasonal monsoons, human activities and climate change cause severe coastal erosion.	- Land use changes indicated the increasing areas of development (industry and urban) and decreasing of agricultural areas.	-Relationship and interaction among governing institutions in the EPA were limited based on weak coordination and integrations.
	- Salt farms and shrimp farms encroached into mangrove forests.	- Expansion of tourism can be seen through the increasing amount of tourists, especially in Hua Hin and Cha Am. This reflects to the growing of hotel/resorts and residential buildings.	-Very few meetings were called for governing EPA with partly due to limited budget and few personnel provided.
	- Illegal and destructive fishing and overfishing due to an open-access fishery regime degrade fishery resources.		
	- Coastal urbanization and tourism development degraded water quality.		
Scale	The boundary of the natural-system-to-be-governed is based on administrative jurisdiction. Coastal water quality would likely to be improved if expanding EPA boundary to cover the whole river of Phetchaburi in the upper part, in order to manage all point sources of pollution.	Resource users' conflicts can be generated either from users who live within or outside the EPA boundary. For instance, LSF who live outside the EPA boundary came to illegally fish in the EPA coast resulting in the large decline of fisheries in such area.	-At the national scale, ONEP is responsible for EPAs for the country. Locally, EPA is managed by local government and is regulated through the CCME and CEA.

the use of EPA in combination with other governance measures may help enhance the overall governability of the system.

Experiences from implementing EPA in the first phase (2004–2009) have provided lessons on how to improve governing mechanisms, especially those related to the organization and function of the CCME. The re-zoning of the EPA was also a result of this learning and adaptation. Unfortunately, the interviews with members of PONE responsible for the PB-PK EPA revealed that they had very little appreciation for the EPA. Shortfall of budget and personnel and heavy regular workload provide no inspiration to make the EPA more governable. Considering the weak interaction between agencies responsible for the EPA and the communities and resource user groups, coupled with weak coordination among EPA governing actors, effective operationalization of this EPA is doubtful, contributing thus to the low-to-moderate overall governability.

Discussion

Several implications can be drawn from the governability assessment, which can help improve EPA governance. First, the analysis revealed the importance of scale, related mainly to the natural system of the EPA but also to the social and governing systems. As shown in the study, delineation of boundary is a key challenge. The effort to improve coastal water quality in the EPA is an example of governability issue related to scale, since dealing with pollution requires addressing both point and non-point sources, some of which lie outside of the EPA boundary. In theory, management of the upper river area needs to be connected to that of the main river and tributaries and the estuaries in the EPA (Sorensen 1993; Agardy et al. 2011). However, expanding the EPA boundary to cover such a large area is not an easy task, and would face economic, social and political constraints (IUCN-WCPA 2008). Resource users raised several concerns during the stakeholder meetings, organized by the government, expressing disagreements with the proposed expanding areas. As suggested by McCleave et al. (2003), delineating physical or jurisdictional boundaries in environmental management projects is always controversial and must be considered carefully in the initial planning phase. Using watershed areas as physical boundary may work well in a well-defined multi-jurisdiction like in Atlantic Canada with the Atlantic Coastal Action Program (McCleave et al. 2003). There are cases, however, where working within one political jurisdiction is more effective, such as Xiemen in China (Chua et al. 1997)

In the context of MPAs, studies show that building a regional network of small MPAs would be more advantageous than a single large-scale MPA (FAO 2007). Applying this to the EPAs will be difficult, however, given the need for coordination and cooperation of several government agencies and local organizations. What might work is the creation of a 'conservation network', coupled with the strengthening of coordination mechanisms among relevant stakeholders inside and outside the EPA boundary, similar to what is done in the Caribbean (Mahon et al. 2005). Along with the MPA network, it may also be necessary to develop social networks among multiple institutions, as shown by Cárcamo and Gaymer (2013) in the case of an Islas Choros-Damas marine reserve in Chile.

The EPA is an open system that is exposed to several threats. Coastal erosion occurs naturally in the area because of the monsoon. At the same time, governance measures can have far-reaching negative externality (Stelzenmuller et al. 2008; Agardy et al. 2011; Stevenson et al. 2013). In this case, the restriction on the construction of residential buildings in the EPA has resulted into succession of development from one area to another. Until now there is no comprehensive analysis on the impact of the EPA implementation both to resource users within its boundary and beyond. This is not surprising, given that even for MPAs, which have been better promoted than EPAs, very few studies examine their socio-economic impact (Agardy et al. 2011; Thorpe et al. 2011; Voyer et al. 2015).

The interactive governance perspective emphasizes the importance of flexibility in the governing system, in order to deal with the dynamic social system, and to enhance thus the governability (Kooiman et al. 2005). This is contrary to adding more regulations and exercising more control by government agencies, which is a typical response to increasing governance challenges brought about by complexity and dynamics of the social system. Making the governing system more flexible is about making it more responsive to the need of the social system by facilitating and improving interaction between them, as was the cases with the Chilean MPA (Cárcamo and Gaymer 2013). Building the sense of ownership among stakeholders about their surroundings is another way to enhance governability (Jentoft et al. 2007). While lessons from MPA governance are applicable to EPAs, the added complexity and dynamics due to land and sea coverage of the EPA makes governance more challenging. In the case of PB-PK EPA, improving governability can build on the existing environmental awareness program, expanding from mangrove reforestation to other resources. This should be followed by better communication and information sharing, enhancing stakeholders participation in the EPA governance, including discussion about responsibility and benefit sharing in the EPA. Unless EPA funding is incorporated in the national budget, at least during the start-up phase, it will be difficult to properly implement.

The role of the social system-to-be-governed has generally been a neglected area of research. This is despite recognition of the importance of social factors in determining the success or failure of fisheries and coastal resources management and MPAs. Song et al. (2013) hold that governance challenges for fisheries could be lessened if stakeholders' value, image and principles (or meta-level) are made explicit, understood and articulated into the policy and decision-making process. Also, Jentoft et al. (2012) concluded in their study of the three MPAs in Spain that knowing what stakeholders think about the MPAs was essential for enhancing their governability. Similarly, understanding the social system-to-be-governed (e.g. coastal users of open coast beaches and headlands in the marine park) was greatly enhancing governance of marine resources in Australia (Voyer et al. 2015). By the same token, understanding stakeholders' image about the EPA, as well as their surroundings, could help improve the implementation of the EPA.

As mentioned previously, resource users conflicts occur widely in the EPA (such as between salt farmers and rice farmers, shrimp farmers and forest officers, hotel owners and local residents), which need to be dealt with in order to improve EPA governability. Thus, another area to emphasize for improving governance and governability is related to the second-order governance, which concerns the setting of institutions

(Kooiman et al. 2005). Rules and regulations set by different agencies are often not compatible, thus creating confusion and loopholes. An example in the PB-PK EPA is about a fisheries policy which aims to increase shrimp production, particularly white leg shrimp, by promoting farming expansion and lessening restriction on environmental quality. Such policy contradicts what Office of Natural Resources and Environmental Policy and Planning tries to do, which is to encourage sustainable resource management. This example illustrates the necessity of policy and sector integration, which is key to integrated management and other place-based initiatives (Sorensen 1993; Salm et al. 2000; Kelleher 1999; Christie et al. 2002; Ehler 2003, 2005; Cicin-Sain and Belfiore 2005; White et al. 2005; Fanning et al. 2007; IUCN-WCPA 2008).

Ostrom's concept of a 'nested system' (Ostrom 1990) may work well in the context of the EPA. Governing the EPA in association with existing land and marine spatial planning and ecosystem-based management efforts, as well as other terrestrial and marine protected areas (FAO 2007; Agardy et al. 2011; Olsen et al. 2011; Smith et al. 2011), would warrant long-term protection of the natural ecosystems within the EPA and help sustain human activities. A place to start could be a consolidation of environmental restoration plans from different line agencies in order to provide consistency in the overall and long-term goals. While such effort would likely add more complexity to its governability, regular meetings and other communication channels can help improve coordination among agencies. As shown elsewhere, effectively information dissemination and good communication contributes to successful management of coastal areas (Baird 1996; Van Trung Ho et al. 2014). To some extent, communication improvement has already been observed in this study with the participatory selection process and the renewal process of the EPA.

Finally, the EPA is a decentralized governing system whereby many governing roles have been devolved to local governments. Setting up an independent body, with an unbiased position, consisting of representatives of both state and non-state actors, professionals from different sectors including scientists, policy makers, policy enforcers, private sector and local communities, has been reported to enhance governance of MPAs (Berkes 2009; Van Trung Ho et al. 2014) or of marine and coastal resources (Henocque and Denis 2001; Sekhar 2005; Chua 2006). In the EPA governing system, CCME functions similar to the independent body suggested above, but it could not operate as anticipated. This is due partly to the lack of clarity and regularity in the EPA planning and management processes, coupled with low enthusiasm and limited leadership of the CCME secretariat (Satumanatpan et al. 2014; Wise 2014), and budget deficit. These issues have been raised in other similar studies (see Christie et al. 2005; Dearden et al. 2005; White et al. 2006). To strengthen CCME effectiveness, the issue of member representation needs to be investigated, as this would add more governing interaction between the governing system and the systems that are being governed, thus contribute to EPA governance. There are examples of successful local-level initiatives in Thailand, with good community participation and stakeholder representation that the EPA can learn from, such as the crab bank projects (Thaimmueang et al. 2012) and community-based fisheries management in the southern part of Thailand (Anuchiracheeva et al. 2003; Nasuchon and Charles 2010).

Collaborative and cooperative governance interactions in the fisheries sector encountered in the EPA boundary seem to contribute to making fisheries more governable in

Zone 2. Co-management initiated by identifying specific tasks to be carried out, then involving stakeholders directly in the governance process, result in more satisfactory governing measures, which in turn lead to higher management legitimacy and compliance (Kooiman et al. 2005). It is therefore worth researching on the mix of governance modes (such as a combination of decentralization and co-management) in improving the EPA governability (Jentoft 2007; Kooiman 2013).

Conclusion and recommendations

EPA is an integrated coastal management tool that has been used in Thailand since 1992, following the global movement towards sustainability, and implemented in accord with the national environmental policy. It aims to help protect and prevent the environment from further degradation. The assessment of the PB-PK EPA governability performed here recognizes the EPA as the system-to-be-governed or the object of governance, as well as the governing system. It also pays close attention to interactions between the EPA and the social-ecological environment. In order to understand what may affect the EPA governability and its performance, the inherent and constructed qualities, including diversity, complexity, dynamic and scale associated with each system, were examined.

The governing system of the EPA is well designed, with a multi-stakeholder coordination body, having clear roles and responsibilities. Yet, in practice, it faces several challenges. This is partly due to low interactions between government agencies and other actors in the governing system, and between the governing system and the system-to-be-governed such as fishers, shrimp farmers, hotel developers and tourist operators. Key areas where the overall governability of the EPA can be improved are related to the governing system. For example, the CCME would likely perform better if it has regular meetings, better communication and secure funding. We also suggest that the EPA should be designed with some flexibility, not with a rigid structure, in order to respond effectively and in a timely manner to the social dynamics in the area. We also call for an experiment into a mixed mode of governance, recognizing the success in co-management and community-based management in other areas, like fisheries.

Attempting to balance sustainable resource use and environmental conservation is an ongoing challenge in both developed and developing countries. Through the interactive governance perspective and the governability lens, the analysis of the EPA performance offers lessons that can be used to improve the effectiveness and sustainability of the existing and future EPAs, as well as to other similar place-based efforts like MPAs and marine spatial planning being promoted around the world. Although a legislative tool, the fixed-term feature of the EPAs (5 years cycle) enables reflection and adaptation in governance of the next phase of the EPAs, making it a powerful instrument to deal with the ever-changing challenges in coastal areas.

This research is an empirical application of interactive governance perspective in the context of marine and environmental conservation. While the framework was useful in directing questions that lead to a systematic and comprehensive understanding about the natural and social systems-to-be-governed, the governing system and their interactions, it provides little guidance about how to gauge the level of governability or severity of the governability challenges. Further, there may be a general tendency to consider any

system to be highly ungovernable, given that numerous elements of the system can lead to governability challenges. With more case studies in the future, it will be possible to conduct comparative analysis and draw broad lessons about what governing interventions and measures work best with certain features of the coastal and marine ecosystems.

Abbreviations

EPAs: Environmental protected areas; CCME: Committee for control and monitor environment; CEA: Committee for environmental assessment; MPAs: Marine protected areas; NGOs: Non-governmental organizations; ONEP: Office of natural resources and environmental policy and planning; PB: Phetchaburi; PK: Prachuap Kirikhan; PONE: Provincial office of natural resources and environment.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
SS and RC shared responsibility in conceptualization of research questions. SS carried out fieldwork, interviewing, data analysis and preparation of manuscript. RC provided input to the structure of the manuscript and helped read and revised it. All authors read and approved the final manuscript.

Author details
[1]Faculty of Environment and Resource Studies, Mahidol University, Nakorn Pathom, Salaya 73170, Thailand.
[2]Department of Geography, Memorial University of Newfoundland, St. John's A1B 3X9, Canada.

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