NETWORK ANALYSIS OF REGIONAL ACTORS IN THE EAST ASIA REGION
BASED ON A SURVEY OF ACTORS

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Introduction

Network analysis is a tool used to describe and examine the interactions among actors in a defined population, as well as to explore the patterns that may emerge from these interactions. This network analysis based on a survey of regional actors examines the patterns of interaction based on the types of relations between these actors and the actors that are important to their work. This analysis serves as an input to the Impact Evaluation of GEF Support to the South China Sea and Adjacent Areas.

Objective and focus questions

As GEF is only one of a myriad of actors operating in the South China Sea, it is important to analyze the larger institutional context through which the countries bordering the South China Sea generate global environmental benefits. This network analysis of regional actors sought to answer the following questions:

1) Which actors are perceived as important in the field of international waters, and what types of initiatives are they engaged in?
2) What is the nature of the relationships among these actors?
3) What role does GEF play for other regional actors, and how important is it?

Key Findings

- Most actors considered important to international waters efforts in the region are involved in knowledge and information initiatives, and serve a coordinating function. More than half of the relationships between actors are through some form of agreement, but only 26% are legally binding.
- Without GEF and its initiatives, some actors become less connected or are completely disconnected from the network. Other actors gain greater centrality in the absence of GEF, indicating fewer available paths for less-central actors to connect with the rest of the network. This shows how GEF initiatives provide opportunities for actors to interact with different parts of the network.
- PEMSEA functions primarily as a coordinator linking its non-country partners that tend to work with non-SCS global actors to the regional arena. No single actor functions as central coordinator among actors that are not PEMSEA partners, indicating that members of the network tend to interact with different, mostly non-overlapping groups of actors. Strong, mutual coordination links exist, however, among fisheries-related actors.

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Methodology

The survey aimed to collect information pertaining to the actors most important to the respondents' work in the field of international waters, and the types of services and initiatives exchanged relevant to this work (see Annex--- for survey questionnaire). Respondents could provide details of relations for a maximum of 10 actors, but were given the opportunity to list additional actors that were deemed equally important to the 10 already identified.

Two sets of respondents were targeted for the survey: 1) PEMSEA's 19 non-country partners and 2) the 15 most-connected regional actors (excluding GEF and PEMSEA) derived from the results of a previous network analysis based on a literature review. Three of the actors belonged to both sets, making the target population size 31. Of these, 26 responded (12 from the 15 most-connected actors, 14 from the PEMSEA partners).

To ensure that the results were relevant to the study, given that the analysis was at a regional scale, country-level actors identified by the respondents were grouped into sectors. These include ministries of national governments that were identified as important because they represented their respective countries as members in a respondent regional organization. In this case, the actors were grouped into the sector "national governments". National ministries and national research institutions were analyzed as regional actors when they did not represent their country as member, but rather functioned as service providers. Some actors identified were sectors in themselves (e.g. NGOs, local governments), and therefore were analyzed as such.

Microsoft Excel 2007 and the network analysis and visualization software UCINet 6.289 / NetDraw 2.097[2] were used to analyze actor relations and produce the graphs.

Scope and limitations

Efforts were made to identify the most appropriate contact person in the organizations to ensure that the responses reflected the institutional reality. However, it is inevitable that the responses would have been influenced by which organizations the responding individual was most in contact with at the time the survey was conducted. Furthermore, the responses represent actors that are important to the respondents, and do not reveal relationships with other regional actors that may also exist, but are not considered as important. Logistical constraints prevented the size of the survey population from being expanded. Obvious relationships that exist (e.g. between GEF and PEMSEA) are also not reflected in the analysis, as only ties identified by respondents have been included.

Results and Discussion

The 26 respondents identified 87 unique actors and sectors of actors as most important to their work in international waters. In this analysis, an "actor" is defined as an entity or group of entities identified by the respondents, regardless of its nature or legal personality. Of the 87, less than 30% were cited by at least two respondents, of which only 17 are individual institutions (i.e., not a sector of actors).

[2] Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

Responses from the 15 most-connected actors yielded 58 unique actors or sectors of actors, of which only 9 individual institutions are mentioned by at least two.

This indicates that actors in the network tend to have ties with very different sets of actors, with little overlap and no central actor dominating. However, the network is very well-connected such that given enough degrees of separation, each actor is connected to every other actor in the network through intermediary actors. This is supported by the results of several different network analysis measures[3]. The maximum similarity between any two actors in the network is 50%, and this is generally observed only between country-level actors. Also, 89.26% of all ties in the network are reciprocal, which again indicates that there is no one actor disproportionately influencing the other actors, as the majority both provides and receives services. Figure 4 shows the graph of respondents and actors important to their work in international waters. The actors are positioned in the graph optimally to achieve equal tie lengths, while maintaining distance as a function of similarity (i.e., actors that are farthest apart are the most dissimilar).

UNEP has the greatest number of ties, and has the most frequent occurrence in reciprocal clusters of actors or cliques[4]. The ASEAN Center for Biodiversity is present in almost half of UNEP's cliques, indicating that they tend to work with the same actors. PEMSEA is the second most frequently occurring actor in cliques. No interactions were identified, however, between UNDP and UNEP, or between SEAFDEC and UNEP, except through FAO.

Generally, actors work together through some or no form of agreement, and no formal commitment. This may indicate that actors in the region operate on an ad hoc basis, or through continuing but loose partnerships. Only 26% of the actors had legally binding commitments with the respondents. These were relationships with national governments, UN agencies, and with GEF. The bulk (30%) of relationships that were signed but non-legally binding commitments was with PEMSEA. No sufficient information was obtained to explain the other types of relationships that respondents had with some of the actors (9%), although many of these reflect the status of respondents as being sub-units of the identified actors.

Eighty-six percent of the actors were identified as being involved in knowledge and information initiatives in relation to the respondents' work. A majority (61%) also implements pilots and demonstrations. Less than 20% of the actors are cited as being involved in other types of initiatives, but these are also generally related to knowledge (e.g. training, capacity-building), and governance (e.g. coordination and policy advocacy activities). PEMSEA conducts knowledge and information initiatives for the greatest number of respondents, followed by UNEP. Governance initiatives are done mostly by PEMSEA, UNEP and national governments, followed by ASEAN. For pilots and demonstrations, PEMSEA

[3] Measures used were: density, clustering, Krackhardt's GTD, blocks and cutpoints, Jaccard similarity, reach centrality.

[4] A clique is defined as a sub-group with a minimum of three actors, each of which has ties to every other actor in the sub-group.

is again cited by the highest number of respondents, followed by national governments. Investment activities are undertaken mostly by national governments, followed by UNDP.

In terms of the actual resources and services exchanged, most of the actors considered important are involved in receiving and providing coordination. Actors providing or receiving financial resources numbered the least.

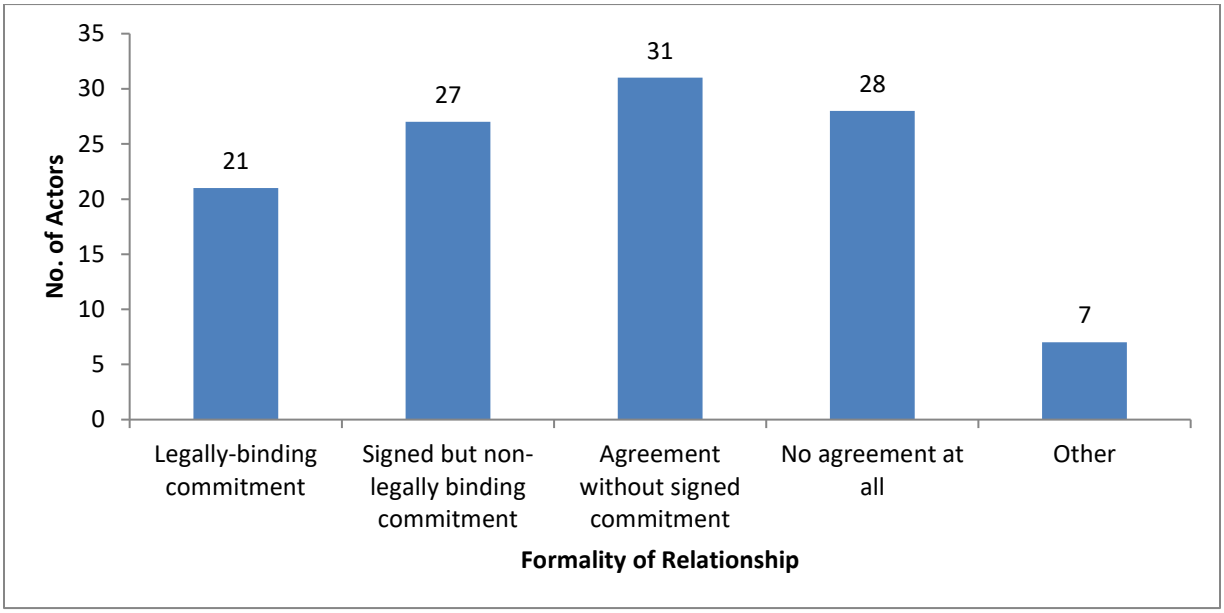

Figure 1. Degree of formality of relationships between actors and survey respondents

National governments receive financial resources from most number of respondents, followed by PEMSEA. PEMSEA also receives technical and coordination services from the highest number of respondents, followed by national governments and UNEP. Funding was received by the highest number of respondents from UNEP, followed by GEF and UNDP. UNEP and PEMSEA provided technical services to the greatest number of respondents, followed by FAO. Results show that several of those that receive technical services from UNEP are also PEMSEA partners. PEMSEA provides coordination for the highest number of respondents, all of which are its partners and GEF agencies. Other actors serving coordination functions for many of the respondents are national governments, UNEP, UNDP, FAO and ASEAN. All respondents receiving coordination functions from UNDP are PEMSEA partners as well.

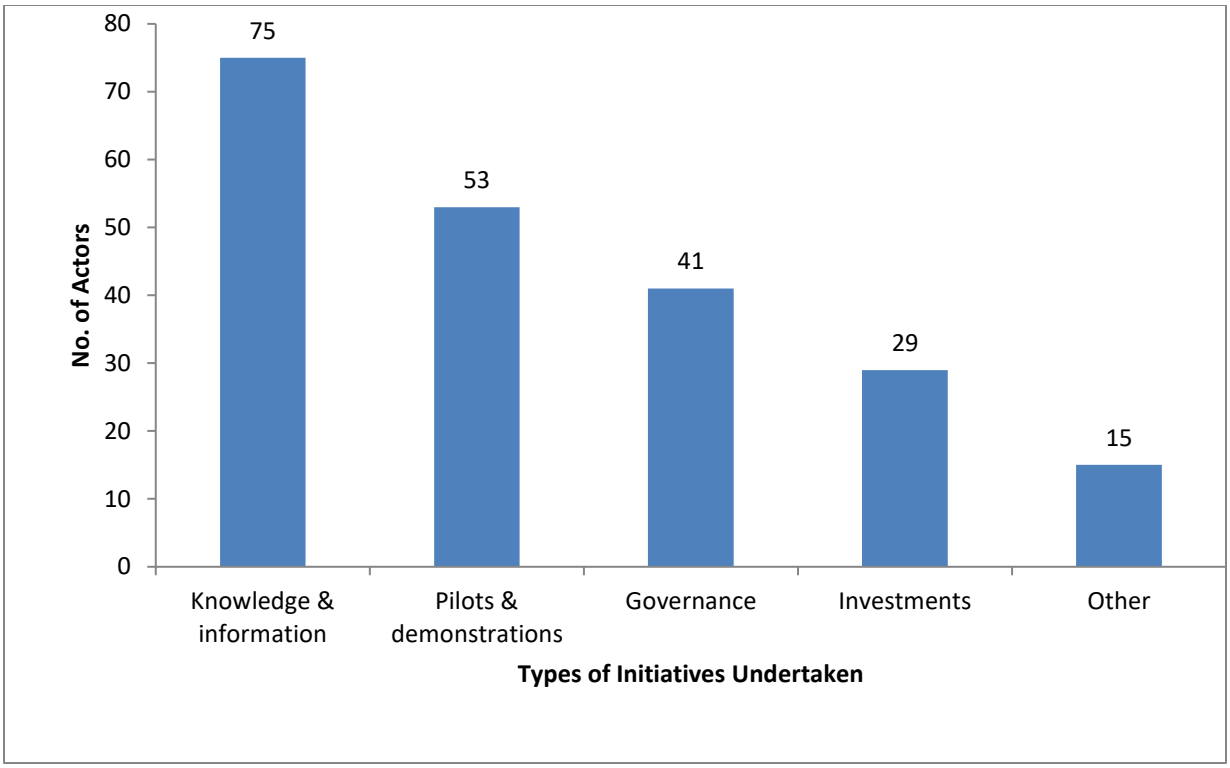

Figure 2. Types of initiatives undertaken by actors in their work with survey respondents

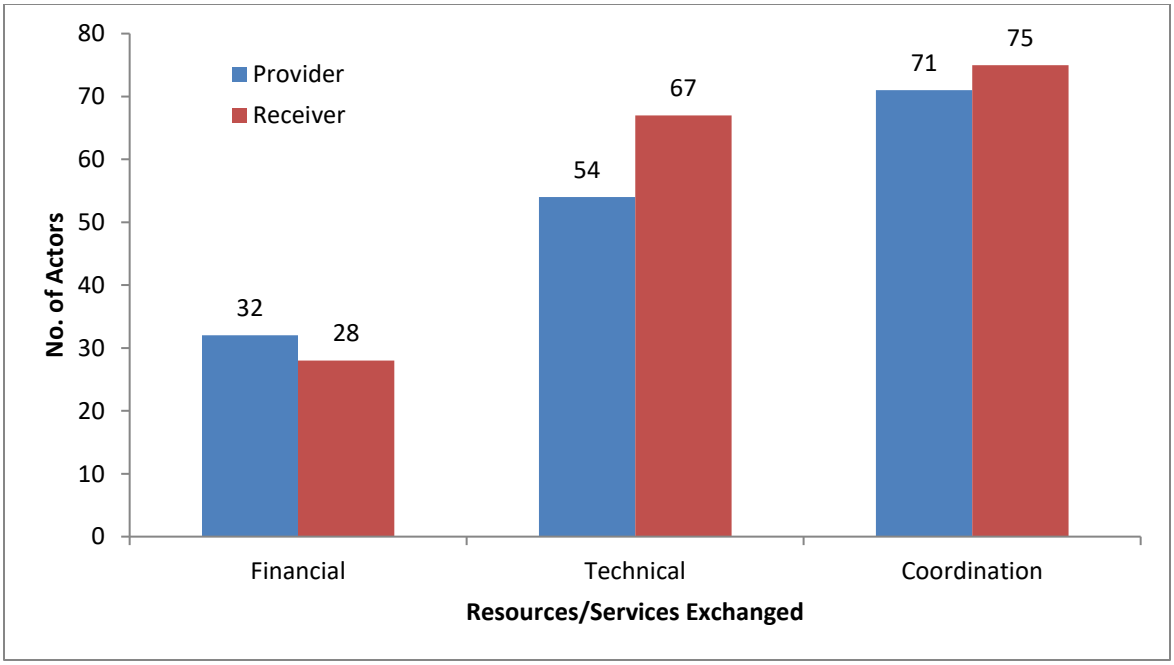

Figure 3. Types of resources/services provided and received by actors in their work with survey respondents

For the majority of the actors identified as important, providing coordination was considered their most important function in their relationship with the respondents. Actors that were primarily financial providers numbered the fewest, with only GEF, UNDP and UNEP being identified for this role. Table 1

shows which actors are most important to which types of services provided or received, as identified by at least two respondents.

Table 1. Services considered as most important in relation to work with actors identified by at least two respondents

	FINANCIAL	TECHNICAL	COORDINATION
PROVIDES	GEF UNDP UNEP	National academe & research PEMSEA NGOs (esp. WWF) UNDP	National Government PEMSEA ASEAN COBSEA Global Ocean Forum FAO SEAFDEC NOWPAP NGOs
RECEIVES	No dominant actor	Community-based organizations Local NGOs	National government

Role of GEF

Apart from GEF, six other actors in the analysis are GEF initiatives. These are BOBLME, PEMSEA, PNLG SCS Project, UNDP SGP and UNDP YSLME. A negative analysis was conducted to assess changes in the network structure as well as positions of individual actors in the network if GEF and its initiatives are not present.

No significant difference was seen in the density, clustering, reciprocity and hierarchy of the networks with and without the presence of GEF. However, the mean reach centrality of actors in the network without GEF is lower by 4% compared to the network with GEF present. Fifteen actors are either unreachable or unable to reach any other actor in the network in the absence of GEF and its initiatives, compared to only 7 in the presence of GEF. Four of these actors are completely disconnected from the network without GEF. These are the World Bank, World Water Forum, PML and the SCS Institute of Oceanology (Figure 4).

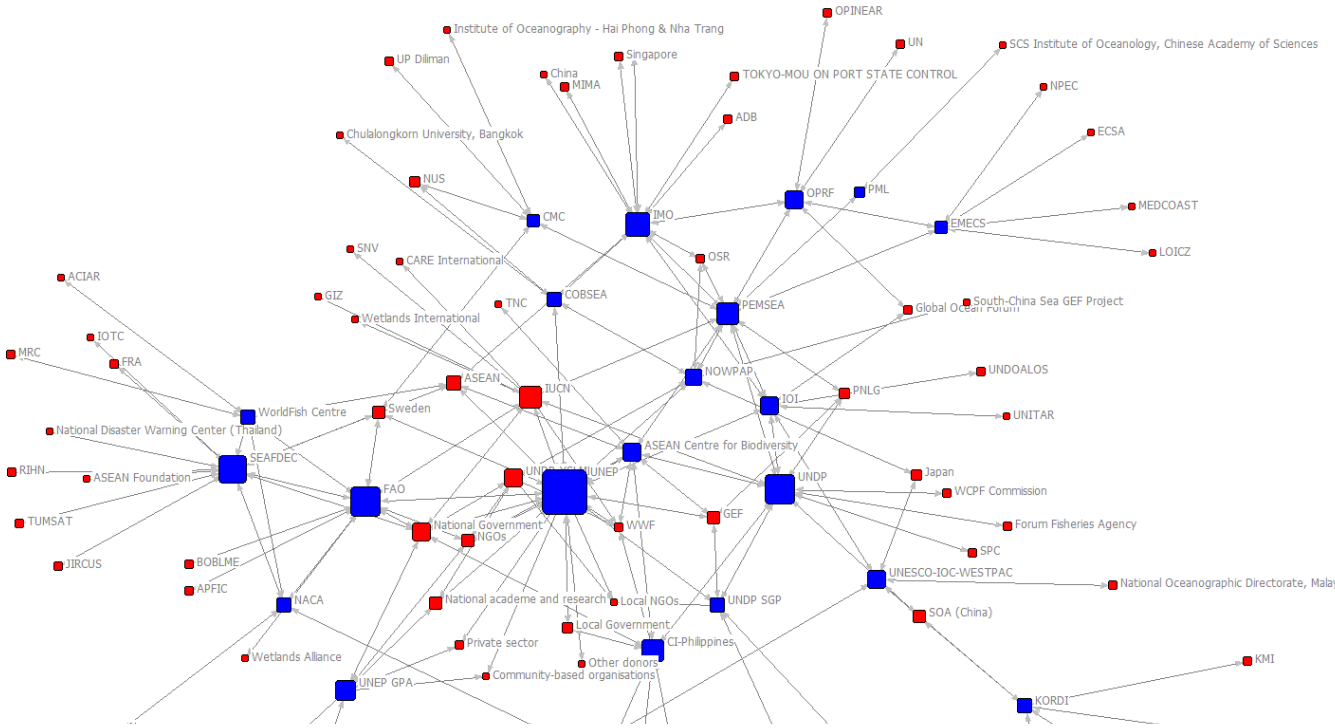

Figure 5. Network map of actors including GEF and its initiatives. Blue nodes indicate cutpoints. Sizes of nodes represent relative influence using Bonacich power as a measure of centrality.

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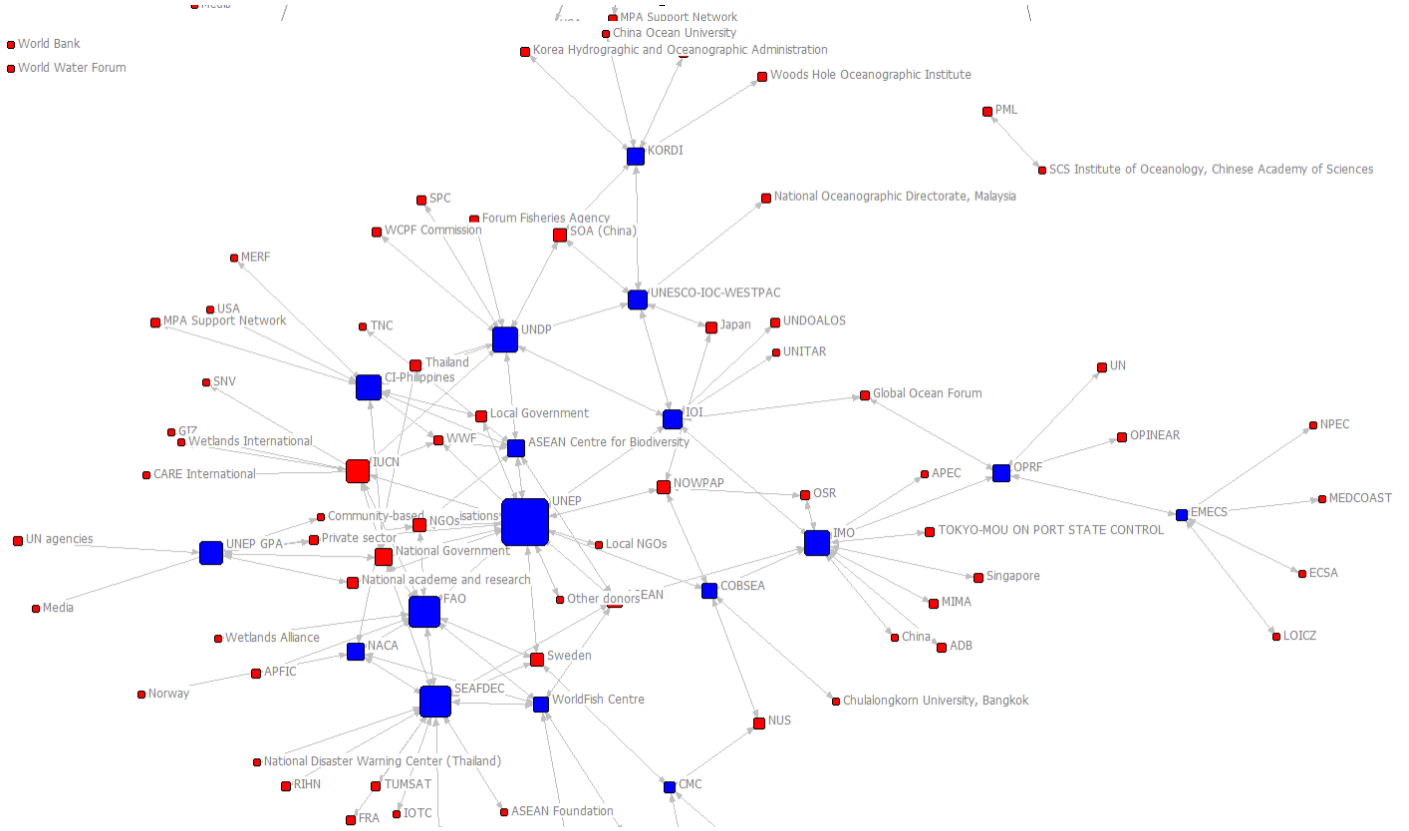

Figure 4. Network map of actors without GEF and its initiatives. Blue nodes indicate cutpoints. Sizes of nodes represent relative influence using Bonacich power as a measure of centrality.

Cutpoints are actors that, if removed, would result in parts of the graph being disconnected from all the others. Twenty-one cutpoints were identified in the network with GEF present (Figure 5). Two of these are PEMSEA and UNDP SGP. Without GEF, NOWPAP and PML--both PEMSEA partners--are no longer cutpoints as they themselves become isolated from the rest of the network.

A lambda set analysis shows that the network's over-all connectivity is maintained mostly through ties with PEMSEA and UNEP. Without GEF in the picture, relations between unrelated groups of actors take place mainly through the link between UNEP and FAO. Table 2 shows how the reach of key actors is greatly decreased in the absence of GEF, which means that they are less able to reach or be reached by actors elsewhere in the network. This indicates the coordinating function of GEF initiatives, linking less major actors that otherwise would not be as connected to the network.

Table 2. Actors with greatest reach, with and without GEF in the network

ACTOR	Outward Reach	Outward Reach w/o GEF	Inward Reach	Inward Reach w/o GEF
UNEP	51.33%	37.70%	47.07%	35.21%
PEMSEA	46.40%	NA	46.10%	NA
IUCN	45.83%	20.77%	38.65%	19.87%
UNDP	45.66%	30.04%	43.35%	28.31%
FAO	45.62%	40.38%	42.15%	37.89%
IOI	45.21%	1.15%	42.91%	26.10%
ASEAN Centre for Biodiversity	44.95%	26.42%	42.82%	24.98%
IMO	43.60%	28.51%	42.27%	27.07%
National Government	43.32%	24.10%	39.84%	23.03%
SEAFDEC	42.78%	37.26%	41.01%	34.77%
ASEAN	42.61%	31.38%	40.30%	29.66%

Without GEF, regional actors such as ASEAN, COBSEA and IMO have greater betweenness centrality, which means that more actors obtain access to the rest of the network only through them. This also supports the results of other measures, indicating how GEF initiatives provide opportunities for different groups of actors to interact across the network, further decentralizing the network. Actors that gain a greater intermediary or facilitative role for other actors in the presence of GEF initiatives are the ASEAN Center for Biodiversity, FAO, IUCN and NOWPAP.

Using Bonacich power[5] as a measure of centrality, however, several actors maintain high centrality regardless of GEF's presence in the network. This "power", however, is generally reduced slightly in the

[5] Bonacich power calculates each actor's centrality as a function of its neighbor's dependence on that actor, based on the existence of ties between them and other actors. It uses an algorithm to reconcile the contradictory concepts of centrality of an actor having well-connected neighbors, which expands the actor's reach yet makes its neighbors less dependent on it, and an actor having poorly-connected neighbors, which makes the neighbors more dependent on it as a direct source of resources or as an intermediary, but reduces its influence across the network.

absence of GEF. Exceptions are SEAFDEC, CI-Philippines, UNEP GPA, and UNESCO-IOC-WESTPAC, which have higher centrality in GEF's absence. On the other hand, UNDP's centrality is greatly reduced in this scenario (Table 3). Of the GEF initiatives, only PEMSEA and UNDP YSLME have relatively high centralities in comparison with these actors at 19.83 and 13.57 respectively.

Table 3. Actors with highest centrality, using Bonacich power as measure

ACTOR	WITH GEF	WITHOUT GEF
UNEP	46.97	46.84
FAO	29.22	27.88
UNDP	28.18	21.19
SEAFDEC	26.09	27.88
IMO	20.87	20.08
CI-Philippines	18.79	20.08
IUCN	18.79	17.84
UNEP GPA	16.79	17.84
IOI	14.61	13.38
National Government	14.61	12.27
OPRF	14.61	12.27
UNESCO-IOC-WESTPAC	13.57	14.50

Although, there is no high degree of similarity among the actors in the network, GEF is most similar (30%) in terms of types of services provided and actors interacted with to international NGOs, the World Bank, and the World Water Forum. PEMSEA, on the other hand, is most similar (20%) to UNEP and IMO.

Role of PEMSEA

Of the 17 PEMSEA non-country partners that responded, 7 consider PEMSEA important to their work in international waters primarily for its coordinating function, and 3 primarily for its technical inputs.

Partners that did not identify PEMSEA as important rely on national governments to facilitate their interactions with other actors that they work with. Moreover, the majority of the actors that were identified as important to this group of respondents serve a primarily technical function, with many of these providers being national research institutes or universities. This indicates that the initiatives of these respondents tend to be directly with countries or at the local level, as they do not consider any regional actors important to their work, except for UN agencies and donors. It may also be that these non-country partners themselves fulfill a coordinating role between the countries and the regional arena. Four of these 7 respondents are UN regional and global programs, while two are country-level organizations that may have regional initiatives. One is a bilateral donor.

For the 15 most-connected respondents, ASEAN, FAO and SEAFDEC come out to be most important for coordination, with a strong connection between these actors and WorldFish Centre, indicating that coordination is strong in the region for fisheries-related concerns. For PEMSEA partners, 21 actors were identified as important primarily for providing coordination, but of these only the Global Ocean Forum

and national governments were mentioned by more than one respondent. Actors that PEMSEA partners consider as important for coordination can be categorized as international NGOs, global networks, UN agencies, and country-level organizations and sectors.

Seventeen actors were identified as most important as technical service providers, but only PEMSEA, UNDP, and national academe and research institutions were mentioned by two respondents each. Again, this shows how there is no central actor with a technical provider function, and that members of the network tend to obtain technical services from unrelated groups of actors.