

# Chapter 30

## State-of-the-Art Beach Governance from the Tree of Science Platform

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**Abstract** A State-of-the-Art review of scientific literature related with beach governance is presented by utilizing the Tree of Science® tool – ToS. In a search conducted in November 2016, 47 papers were found in the Web of Science® with the combination of words ‘beach’ and ‘governance’. Papers were classified by ToS in *roots* (high input degree; n = 8), *trunks* (high intermediation degree; n = 9) and *leaves* (high output degree; n = 30). The *Ocean and Coastal Management Journal* was the most relevant journal, with 10 articles published (21,3%), and Elsevier was the most relevant publisher in this topic (n = 25; 53%). About authors, E. Ariza was the most relevant author, with articles in roots, trunks and leaves and participation in four of papers revised. Analysis by country of authors’ affiliation shows a leading by USA (n = 28; 18%), closely followed by the UK (n = 22; 14%) and Spain (n = 17; 11%). A general overview identifies a growing ToS in beach governance, with some strong references in trunks and leaves, and several other references receiving less attention by the scientific community. Finally, a prospective analysis from branches suggest that the scientific community is researching around four subtopics (Policy and legal framework, Participation/co-management, Resources Management, Public/Common Rights), which in the near future could be a new ToS in the forest of beach management theme.

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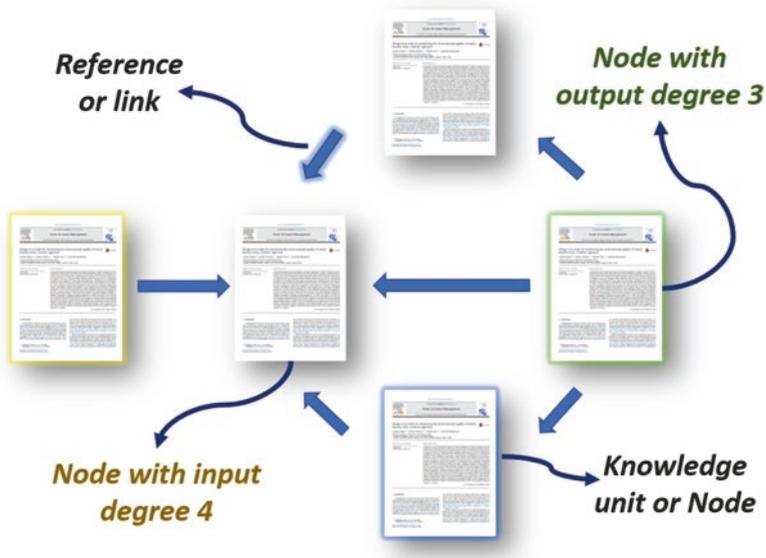
## 30.1 Introduction to Tree of Science Model

Tree of Science (ToS) is an application developed by researchers from the National University of Colombia, which uses a graphic methodology to identify the most relevant scientific articles on a particular topic. According to the creators (Robledo-Giraldo et al. 2013, 2014), the theory of graphs has great application in the social sciences, to analyze and calculate the structural properties of networks and to predict the behavior of their nodes. Specifically for ToS, the theory of graphs was applied from articles indexed in the Web of Knowledge (Thomson Reuters) and its different references, creating a network of knowledge. In this network the main items are identified through indicators such as the degree of input and output of each node.

The calculation is developed through the analysis of citation networks, where articles are evaluated according to three indicators: degree of entry, intermediation and degree of exit. The nodes represent units of knowledge (in this case papers) and the links indicate the connections between these papers (in this case the references that include these articles). Two indicators are considered to select the most important papers: the first indicator is the degree of input of each node, which shows the number of articles that are referencing a particular one. The second indicator is the degree of output, which shows the number of papers that refer to an article within the area of knowledge that is being investigated (Fig. 30.1).

Articles with high input and zero exit grade have been termed *roots*. These articles located at the root of the Tree of Science can be identified as researches that support the theory of the area of knowledge that is being revised. They are articles that describe, in a general way, the importance of the area of knowledge and that are cataloged as the base of the theory. On the other hand, articles with a high degree of intermediation have been called *trunks* and are interpreted as the documents that gave structure to the study area. Subsequently, the upper parts of trunks are the *leaves*, which present the different perspectives located within the area of knowledge of interest, at the moment of the search. The leaves show a higher density in the network structure, defining subtopics of the main theme of the ToS. Finally, there are articles that have a high output degree and a zero input degree, which are called sheets and are not visible in the ToS graph.

To develop this state of the art in Beach Governance, the Thomson Reuters' Web of Science -WoS database was used in a search of November 18th 2016, through the query: Title = ("beach") AND Title = ("Governance") Timespan = All years. Databases = SCI-EXPANDED, SSCI, A & HCI. As a result, .txt file was obtained, which was introduced to the ToS generator (<http://tos.manizales.unal.edu.co>) to obtain the definitive list of articles that make up the roots, trunks and leaves of the Beach Governance theme. Searching obtained a list of 47 papers forming the Tree of Science, ten in roots, nine in trunks and 17 in leaves.



**Fig. 30.1** Example of a knowledge network with input and output indicators. Nodes are articles and links are citations (Adapted from Robledo-Giraldo et al. 2013)

## 30.2 Patterns of the Beach Environmental Quality Tree

The Tree of Science formed by papers published with focus on governance of beaches shows a young scientific area, and supported in two main references on the trunk (Defeo et al. 2009; Ariza et al. 2014). Figure 30.2 shows a tree in which roots are very small, with only two articles before year 2005, and majority of them published between 2006 and 2008. On the other hand, the trunk has two very strong papers, already mentioned, and several articles with low level of intermediation, in a period of 9 years (2006–2014). Finally, leaves of the ToS is very wide, with 30 papers included, four of them with a medium output level (i.e. Kittinger and Ayers 2010; Ariza et al. 2012; O’Mahony et al. 2012; Prati et al. 2016).

Analysis of leaves allows researchers to identify branches on Beach Governance topics, which could be possible new topics on the future. This ToS has two big branches, one medium and another smaller. The first branch has ten papers related with policy and/or legal framework in which beaches are immersed. These papers discuss integrated coastal zone management and instruments to enforce it in areas with relevant beaches. Three of the four bigger leaves are included in this branch, demonstrating a strong topic which could be a new ToS in the near future; it is relevant to highlight that these papers are older than other leaves, starting from 2007 to 2014 (Fig. 30.3). The second branch is also composed by ten papers, all of them examples of participation or co-management of beaches. One of the leaves is one of the largest on the tree (i.e. Prati et al. 2016), which is a relatively new paper; all papers in this branch were published in 2015 and 2016. This branch shows a

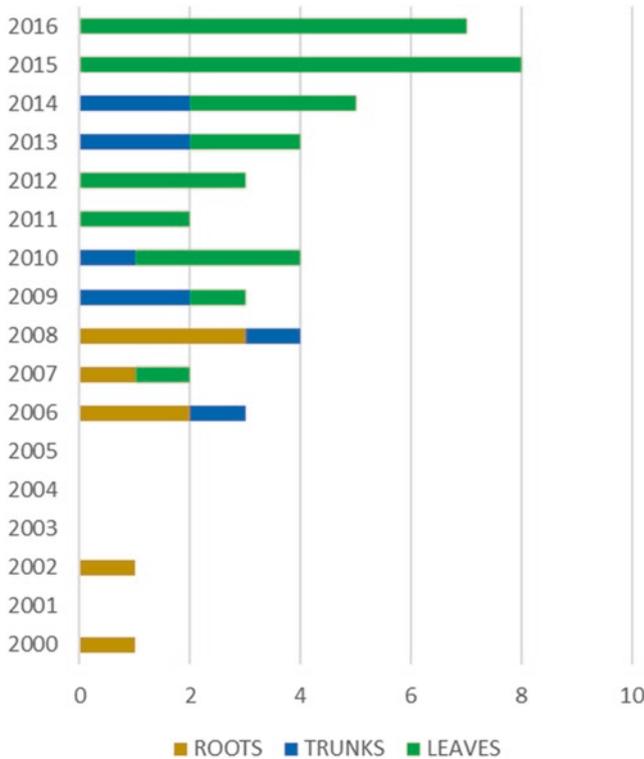


**Fig. 30.2** Tree of Science of beach governance

fast-growing pattern, which could be interpreted as a current popular topic, or as a near future ToS on the forest of beach management. It is interesting to note that first and second branch represent opposite management approaches: the first is a top-down perspective while the second is bottom-up. The third branch concerns resource management through a governance perspective. Seven papers formed this branch, and all of them studied the ecosystem or some specific species on the beach, although from different perspectives, from biological to economical. None of these papers have a high output level and they have been published in a long-time frame of 7 years (2010–2016). Finally, the fourth branch is the weakest, with only three leaves published in 2010, 2015 and 2016, however this topic is one of the most important in beach management. These three articles discussed conflicts between common resources, such as fisheries or beaches, against private interest in their economical profits; perhaps this branch is too weak nowadays to be a near future tree of science, but researches in this topic is highly needed. All references of the ToS of beach governance are included in Table 30.1.

### 30.2.1 Journals and Publishers

Channels used for researchers to communicate their investigations about beach governance are very wide, from very high citation journals, such as *Science*, to journals in languages different to English, such as the Brazilian journal of the Universidad do Parana *Desenvolvimento e Meio Ambiente*. Despite of high range of journals, 29 in total, very few have more than one paper in the topic of beach governance. At the same time, high concentration of papers is focused on just one journal, the *Ocean and Coastal Management*, which has 21,3% of researches about governance on beaches. The second relevant journal is *Coastal Management* (n = 5; 10,6%),



**Fig. 30.3** Year of publication of articles for beach governance

demonstrating a strong link between investigations in governance and journals in management. Analyzing journals on the roots of the ToS, three of five are still publishing papers about beach governance, meanwhile very well-known journal *Science* only published roots papers, which means a journal with null output level in beach governance. On the other side, 24 journals (83%) published papers on the leaves, which could be interpreted as a current wide interest to publish researches related with beach governance. About science areas, a majority of journals are related with ecology or environmental topics, and others are focused on marine sciences or tourism, showing a high influence of environmentalism approach on the basis of governance on beaches, when this topic should have more basis on policy and social sciences (Fig. 30.4).

Even the rate of 3.92 papers per publisher, concentration in few journals is also a trend about publishers. Elsevier has 53% of articles related with beach governance, with participation in roots, trunk and leaves. The next relevant publisher is Taylor and Francis, which has also papers in all parts of the tree, but less than a third part of contributions than Elsevier (n = 8; 17%). Except for these two publishers, only Springer has more than two papers of beach governance, although all Springer’s papers are leaves. Nevertheless, it is remarkable that 12 different publishers have a

**Table 30.1** Articles conforming the Tree of Science of beach governance

Policy and legal framework	Participation/ co-management	Resources management	Public/Common rights
Kittinger and Ayers (2010)	Prati et al. (2016)	Santana-Cordero et al. (2016)	Deepananda et al. (2016)
Ariza et al. (2012)	Evans et al. (2015)	Alexandrakis et al. (2015))	Keul (2015)
O'Mahony et al. (2012)	Boda (2015)	Groesbeck et al. (2014)	Wiber et al. (2010)
Turnipseed et al. (2009)	Bombana et al. (2016)	Medard et al. (2016))	
Vanden Eede et al. (2014)	Jones et al. (2016)	Hantanirina and Benbow (2013))	
(McLaughlin and Krantzberg (2011)	Barratt et al. (2015)	(Revuelta et al. (2014)	
Brännlund and Axelsson (2011)	Walker-Springett et al. (2016)	Campbell and Godfrey (2010)	
Huang and You (2013)	Razali and Ismail (2015)		
Hoagland et al. (2012)	Ferreira et al. (2015)		
Jacobs (2007)	Poumadère et al. (2015)		
Defeo et al. (2009)			
Ariza et al. (2014)			
Cinner et al. (2009)			
Wesley and Pforr (2010)			
Idier et al. (2013)			
Prezenza et al. (2013)			
Schmidt et al. (2014)			
Phillips and Jones (2006)			
Ariza et al. (2008a)			
Ariza et al. (2008a)			
Worm et al. (2006)			
Micallef and Williams (2002)			
Shipman and Stojanovic (2007)			
Halpern et al. (2008)			
Phillips and Jones (2006)			
James (2000)			
Cooper and McKenna (2008)			

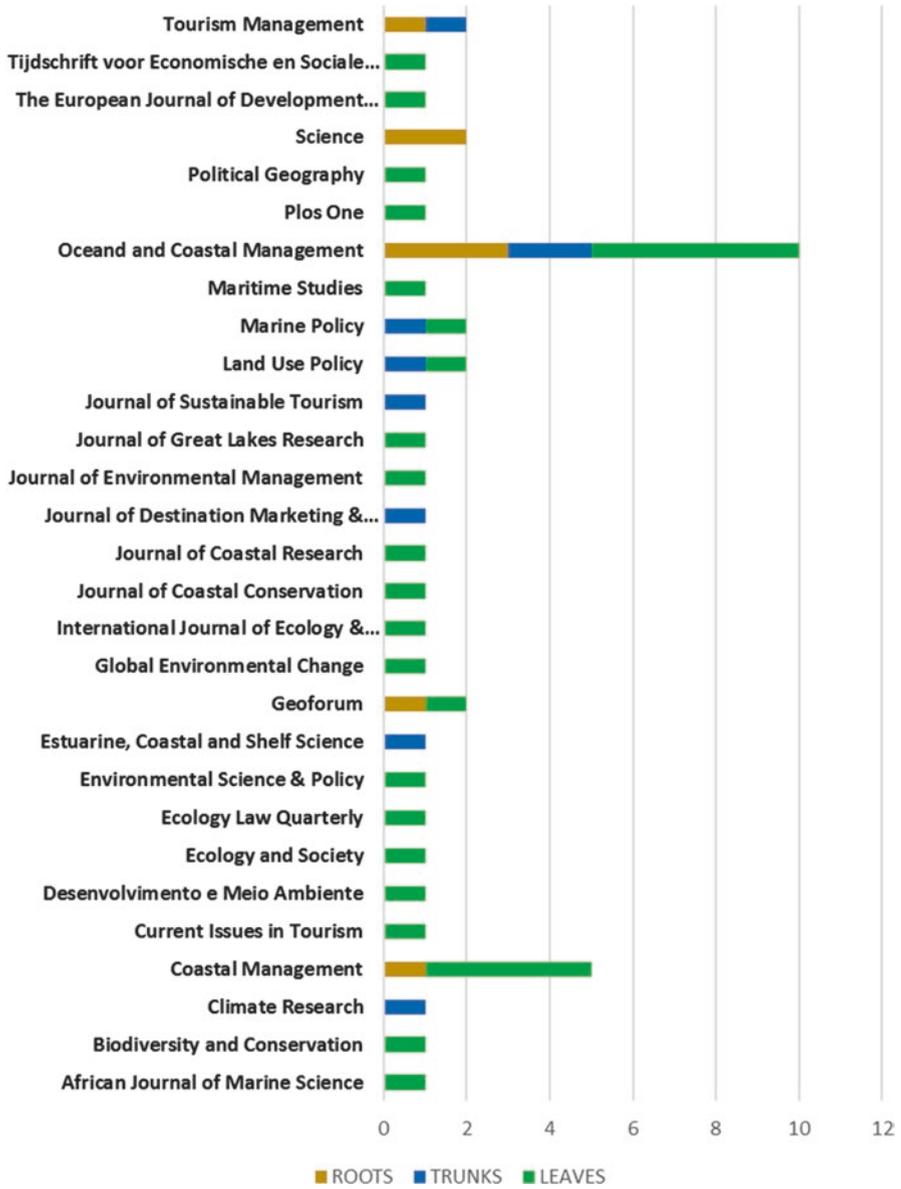


Fig. 30.4 Relevant journals for beach governance

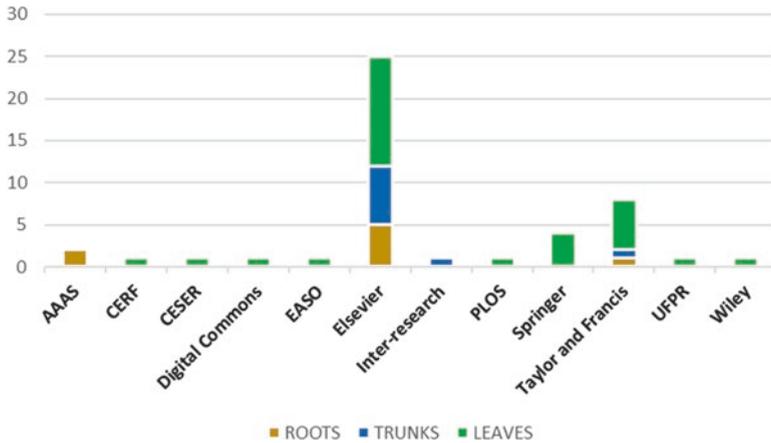


Fig. 30.5 Relevant publishers for beach governance

journal with papers in beach governance, with especial mention to University Federal do Parana (Brazil), which keeps the direct link from universities to dissemination of science (Fig. 30.5).

### 30.2.2 Authors and Countries

The Tree of Science of beach governance was composed by 157 authors, although some of them participated in more than one paper. However, only nine authors published at least two papers and just one, professor Eduard Ariza, published more than three papers related with governance in beaches (Fig. 30.6). Therefore, authorship in this ToS shows a high dispersion of efforts, which difficult to identify consolidated researchers in this topic. Moreover, the three authors with three or more papers are part of the same three references (Ariza et al. 2008a, b, 2012), showing a unique scientific group. Another pattern to highlight is about more relevant papers versus more frequent authors, because only the references by Ariza, E. are part of the big roots, trunks and leaves, which could be interpreted as the only relevant author in beach governance nowadays.

Analysis of countries researching about beach governance shows a clear dominance by the United States of America (n = 28; 18%), following by the United Kingdom (n = 22; 14%) and Spain (n = 18; 11%). Authors with affiliation to institutions of 27 countries were identified in the ToS, within a universe of 157 affiliations, which means 5.8 papers per country; however only eight countries had more than five authors publishing in the topic of beach governance (Fig. 30.7). Participation of countries in whole ToS shows five countries with papers in roots, trunks and leaves (USA, UK, Spain, Canada and Australia), although last two countries are weak in roots or trunks. In addition, three countries show a growing interest in beach gover-

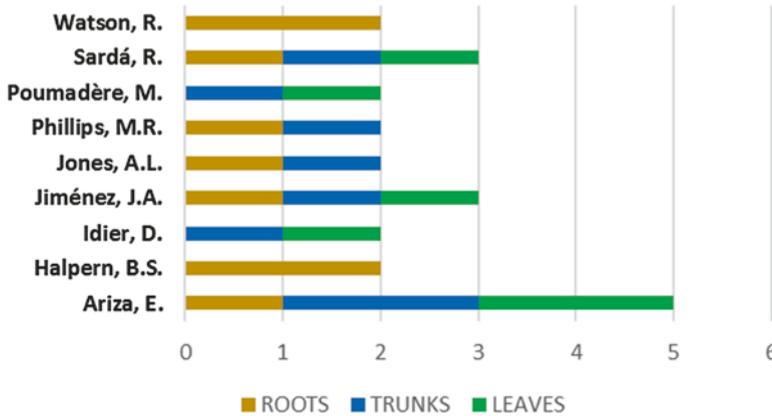


Fig. 30.6 Frequent authors for beach governance

nance, all of them from Western Europe (France, Portugal and Italy), with some papers in trunks and many others in leaves.

Number of authors per each paper is showed in Table 30.2, to identify if research in beach governance is done by working groups or by solitary or couples of researchers. Half of roots’ papers were written by couples of authors, meanwhile two articles were published by collective of more than four authors and only one paper by one author. Trunks’ papers have an opposite pattern, with the majority of papers published by big collectives of authors and only two by couples. However, leaves’ papers, where are 64% of contributions, have a very similar proportion of authors per paper; it does not permit the identification of a future pattern about size of working groups in beach governance.

On the contrary, international collaboration showed in Table 30.3 is very weak. Two third parts of papers published about beach governance were done by authors from the same country, which could signify some difficulty of researchers to understand governance outside of national frontiers or to apply foreign approach to specific study cases. This pattern is even deeper in leaves’ articles, where 73% of papers were published by authors of the same country, when it was expected more international collaboration in more recent papers; almost a quarter part of these papers from one country were written by researchers from United States, which explains part of the high number of authors from this country. Nevertheless, the most important find was than only two leaves’ papers have authors from more than two countries, which is concerning because it means almost no-international collaboration in investigations about beach governance; a pattern which should be changed in the near future.

In addition to a country perspective, analysis of authors per continent shows a concentration of efforts in North America and Europe. These two continents are responsible of 81% of articles related with beach governance, although it was expected more efforts to research governance from countries with medium and low levels of economic development. Some explanations could be restrictions to publish

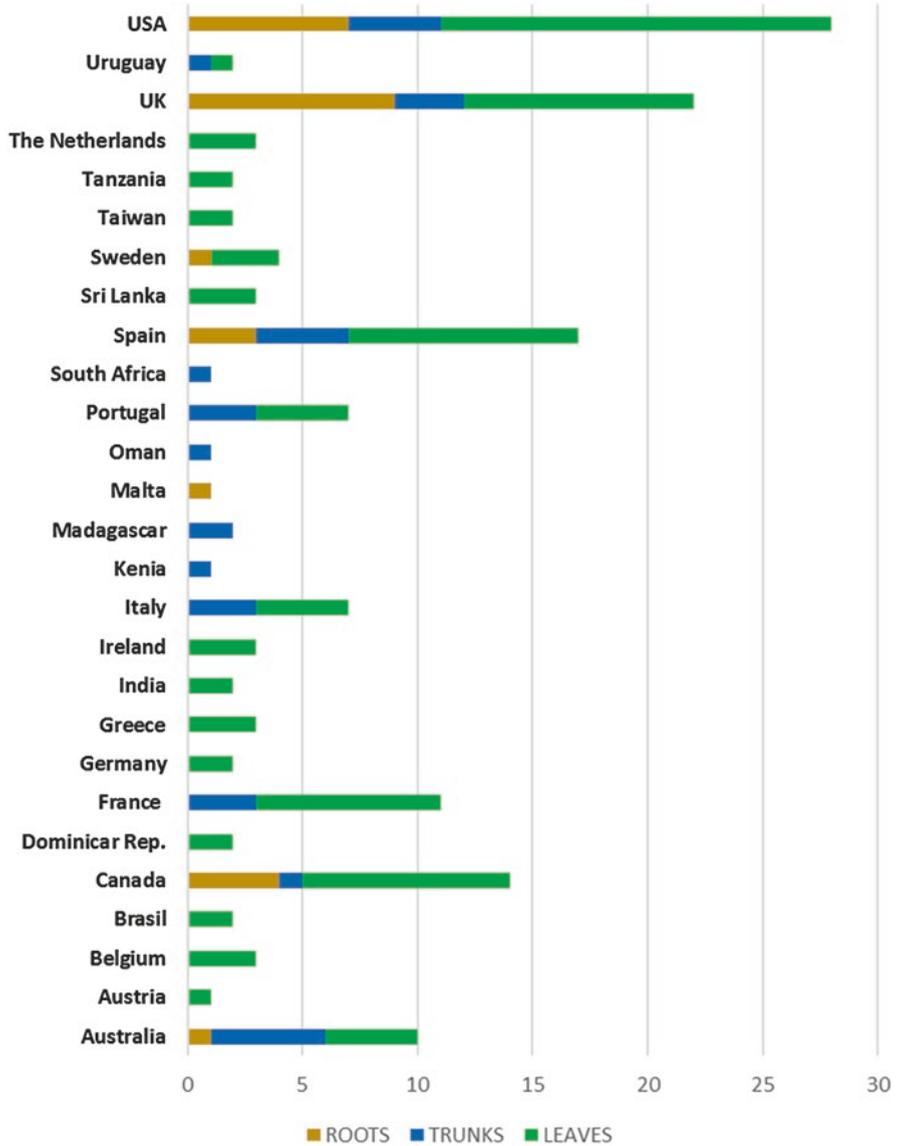


Fig. 30.7 Countries with beach environmental quality publications

Table 30.2 Proportion of authors per paper

N° Authors	Roots	Trunks	Leaves	Total
>3	2	4	9	15
=3	1	3	10	14
<3	5	2	11	18

**Table 30.3** Proportion of countries per paper

International group	Roots	Trunks	Leaves	Total
1 country	5	4	22	31
2 countries	1	3	6	9
>2 countries	2	2	2	7

**Table 30.4** Proportion of authors per continent

Continent	Roots	Trunks	Leaves	Total
Africa	0	5	2	7
America (North)	11	5	26	42
America (Central, South and Caribbean)	0	1	5	6
Asia	0	0	7	7
Europe	14	17	54	85
Oceania and Pacific	1	5	4	10

in indexed journals (e.g. difficulties with English language or access to payed journals), less maturity of disciplines related with governance or low knowledge of methodologies to study power relations on beaches; in any case, a vast part of beaches on the world need more attention about models, approaches and tools to improve their governance (Table 30.4).

Finally, it is interesting to note a pattern in four countries from Africa (Oman, Madagascar, Kenia and South Africa), which have only one or two authors, all of them in the trunk of the ToS. These references correspond to two papers, both of them with international collaboration with researchers from Australia (i.e. Defeo et al. 2009; Cinner et al. 2009). Perhaps, it could be interpreted as a cooperation projects from Australia to Africa to study governance in beaches; an interesting pattern for deeper analysis and transfer to other parts on the world.

### 30.3 Scientific Perspectives on Beach Governance

Governance is a wide topic, commonly used in several disciplines, from social to natural sciences, with thousands of papers including this term within titles, abstracts and keywords. However, when a detailed reading is done within manuscripts, it is difficult to find a definition of ‘governance’, even a general one. An example, just to show the point, is the article “*Marine Ecosystem-based Management in Practice: Scientific and Governance Challenges*” (Ruckelshaus et al. 2008) which turn around governance all over the paper: this reference includes the term ‘governance’ 17 times, including the title and abstract, but there is not a clear definition about what it means. A similar pattern was identified in the 30 papers included in the leaves of the Tree of Sciences of Beach Governance, reinforcing this weakness of conceptual basis of the term.

Therefore, to identify perspectives on beach governance, a first step is to conceptualize the term governance. From a general perspective, governance could be understood as a mechanism to make decisions with a wide participation and awareness of stakeholders involved in these decisions. This definition implies iterative negotiations among these stakeholders, including the decision-makers, in every stage of decision-making procedure (triggering, planning, implementation and evaluation). Moreover, governance could be done from top-down or from bottom-up approaches, which strongly defines the methods to use and the results to obtain. Top-down approaches are mainly based on institutional arrangements, often from governmental initiatives, such as coastal management programs, international projects or public policies. On the contrary, bottom-up approaches are based on initiatives led by organizations or collectives of stakeholders, which are at the same time the decision-makers and the benefited/affected of these decisions. Another important difference between top-down and bottom-up are geographic scale of implementation, where the former is commonly used to wide areas (national or regional) and the latter is more common in local and sub-local areas, such as beaches.

A quick analysis of the 30 papers located in the leaves of ToS, divided in the four branches of beach governance, shows these two perspectives. The 10 articles of the branch *Policy and Legal Framework* represents the top-down approach, with analysis of policies, laws and institutional arrangements in coastal areas or countries. On the opposite, the 10 papers of the branch *Participation/Co-Management* analyze decision-making on specific beaches or strategies to better involving of stakeholders in decision that affects their relations with the beach. The branch *Resources Management* is also referred to bottom-up approach, but those papers are more focused on the resource (sand, fisheries, tourism) than the decision-making mechanism. A very special analysis must be done to papers of the branch *Public/Common Rights*, because even they are only three, their topic spin around one of the most important characteristics of beaches: their public/common nature. This concept covers a legal perspective (public vs private areas) with deep consequences in economic and social interests, on an area of very high value (Houston 2013). It is surprisingly that only 10% of papers focused on this crucial topic, which was highlighted since 1968 by Garret Hardin (Hardin 1968) and touch the fame with the Nobel Prize Winner Elinor Ostrom (Ostrom 2008, 2010).

A review of patterns in each branch could explain some of its perspectives. First, papers from branch *Policy and Legal Framework* cover all contributions of the journal *Coastal Management*, showing a strong relation between this journal and top-down studies, although there is not enough evidence to conclude an editorial preference for this approach. This branch also represents the geographical concentration found in the ToS, where USA is the country with more papers and Europe the continent with more contributions. However, this topic could be defined as an old-branch, because it has the oldest papers (i.e. Jacobs 2007; Kittinger and Ayers 2010), therefore they could be leaves of another Tree of Science, such as Integrated Coastal Zone Management or Marine Policy.

**Table 30.5** Papers with inclusion of term ‘governance’ on the leaves of ToS

Section	Policy and legal framework	Participation/ co-management	Resources management	Public/Common rights
Title	1/10	2/10	1/7	0/3
Abstract	2/10	6/10	5/7	3/3
Keywords	2/10	3/10	1/7	0/3
Total	40%	60%	71%	100%

Second branch, *Participation/Co-Management*, is formed by young leaves’ papers, published in years 2015 and 2016, and wider participation of countries than other branches. Moreover, diversity of journals and publishers establishes a dynamic topic with bright perspectives in the near-future, with research initiatives in several parts of the world. The third branch, *Resources Management*, has a similar pattern than previous branch, but it is more focused on study cases in Europe or with European researchers. This branch will depend of future uses of beaches around the world and the predominance of tourism over other option less economic profitable, such as fisheries or biodiversity protection. Finally, the fourth branch, *Public/Common Rights*, due to is the weakest one, will need an increasing of theoretical basis to understand beaches as a common resource, not only from legal perspective, but also from sociocultural one.

To summarize, Table 30.5 shows the number of papers which include the word ‘governance’ in their title, abstract or keywords. As it can be seen, the first branch had the lowest quantity (40%) and proportion is rising through the other three branches with 100% of papers of fourth branch including the term ‘governance’ in some of the preliminary sections. Perhaps, future investigations related with beach governance should focus more in the public/common nature of the beach, than in initiatives to order beaches from external interest.

As a conclusion, there is no doubt about the importance of investigations of how governance could be applied to beaches, but questions remaining concern the approach to use, and the real need to mention the term ‘governance’ in order to avoid a vacuum slogan, used only to make papers more attractive. Also, a wider participation of researchers from Africa, Asia and Latin America is urgent to balance global knowledge of a topic that is deeply influenced by social and cultural basis. Last, but no least, a discussion about differences between management and governance in coastal areas is already pending, however a stronger theoretical basis are still needed.

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