Report on State of the Art of MAES in the participating regions

Acronym: MOVE

Title: MAPPING AND ASSESSING THE STATE OF ECOSYSTEMS AND THEIR SERVICES IN THE OUTERMOST REGIONS AND OVERSEAS COUNTRIES AND TERRITORIES: ESTABLISHING LINKS AND POOLING RESOURCES

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	04-2019	**Canarias Islands (Gran Canaria and Tenerife)**	R. Haroun; F. Otero (ABAS); M. Arbelo; L. Garcia & E. Casas (ULL)
	05-2019	**New Caledonia**	G. David & C. Sabinot (IRD)
	05-2019	**Azores**	J. Torres & J. Azevedo (FRCT)
	05-2019	**Martinique**	J.P. Maréchal (NBE)

Summary

Activity 2 of the MOVE Project aims to assess the state-of-the-art of MAES in the European Outermost Regions (ORs) and Overseas Countries and Territories (OCTs) and to mobilize stakeholders in the definition of the regional case studies and specific contributions to be made by the project. Eight territories have been identified as representative of the singular environmental, social and economic context of ORs and OCTs in Europe: New Caledonia, the United Kingdom (UK) Outermost Territories (OTs) in the South Atlantic and the Caribbean Netherlands as OCTs, and La Reunion, the Azores, the Canary Islands, French Guiana and Martinique, as ORs.

The study was carried out through a survey, engaging a thousand territorial stakeholders, which enabled the collection of nearly 200 testimonies regarding stakeholders' perception and relationship with ecosystems and ecosystem services. The detailed analysis of these surveys reveals that the experience and expectations of territorial stakeholders should be considered during the analysis and representation of MAES. In this context, the stakeholders' main concerns and expectations are related with (1) clarification of *Ecosystem Services* concept and, (2) needed for support for public action, formalized through dedicated funding and projects. The territorial specificities have been highlighted in these expectations. In general, the *Ecosystem Services* concept is still not fully integrated into uses, but territorial stakeholders are sensitive to its integration into the management of their environment.

Publishable Summary

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*APPENDICES 4 ARE NOT PRESENTED IN THE PUBLIC VERSION OF THIS REPORT SINCE THEY INCLUDE PERSONAL DATA PROTECTED BY THE EUROPEAN UNION REGULATION 2016/679.

Introduction

Carrying out a state of the art of the MAES approach (Mapping and assessment of Ecosystems and their Services) in the eight territories selected by the MOVE project, required an assessment of the involvement of territorial stakeholders in this process. This involvement is embodied by research, expertise and actions in which territorial stakeholders are involved or of which they are aware. The experience of these stakeholders related to proximity and/or investment in the study and application of the concept of *Ecosystem Services* is an essential component of their involvement in the assessment and mapping of ecosystems and their services.

Involvement in MAES related activities can be assessed through indicators: participation in research (SIEBER et al., 2018), or projects related to ecosystems and their services in the three OCTs and the ORs[1] studied in the MOVE project. To assess the current involvement in the different territories, a survey was conducted, involving 200 stakeholders in these eight territories (CILLAURREN and DAVID, 2019).

The results of this survey are presented at the territorial level. A comparison between territories will then highlight the constancy and specificities of the experiences and the stakeholders' perceptions of MAES. This spatial scope is an essential element of the challenge of assessing and mapping ecosystem services (BURKHARD et al., 2013).

The data collection for this report was tripartite: it applied face-to-face interviews, interviews by telephone or Skype, and online questionnaires.

The building of the questionnaire consisted out of:

- An appropriation model structuring the questionnaire;
- A collaboration between the partners of the eight territories integrated in the MOVE project;

[1] Article 349 of the Treaty on the Functioning of the European Union or TFEU applies the provisions of the Member States to Guadeloupe, French Guiana, Martinique, La Reunion, Saint Martin, the Azores, Madeira and the Canary Islands. Articles 198 to 204 of the TFEU confer the status of association on the European Union on the countries and territories listed in Annex II. New Caledonia, the Dutch Caribbean and the UK OTs in the South Atlantic, are indicated.

- A translation in to three languages;
- The development of a communication kit integrating the questionnaire.

Methods

This building and dissemination process led to the collection of 196 questionnaires.

1. An appropriation model structuring the questionnaire

For this report, a model of appropriation, following MARRAST (2010) and adapted from the FERNBERG model (2004), is carried out by the actor who submits the technique to his environment and takes initiatives from it. The appropriation by territorial stakeholders of the assessment and mapping of ecosystems and their services is modeled (Figure 1) by a process that integrates:

- The proximity of stakeholders to Ecosystem Services,
- Areas of activity and actions related to ecosystems,
- Spatial context of ecosystems,
- Areas of activity and action in relation to Ecosystem Services,
- Spatial context of Ecosystem Services.

The modeling hypothesis assumes that an investment in the study of ecosystem services integrates an awareness of the existence of ecosystem services and experience working with ecosystems. The question of the purpose of this investment depends on the ecosystems concerned, the activities concerned, the methods of analysis and representation and, ultimately, the obstacles encountered in identifying, assessing and spatial Ecosystem Services.

This model is the framework for the common questionnaire that was distributed in the eight territories. The level of technicality increases as the questionnaire progresses and ends with an inventory of projects relating to ecosystem services in which the actor is involved or of which he is aware. This approach is part of a need to collect information from local stakeholders

whose expertise and experience are essential for an assessment of ecosystem services (M.V. BALSAN et al., 2018).

The development of this questionnaire was carried out in a collegial manner and resulted in a consensus product.

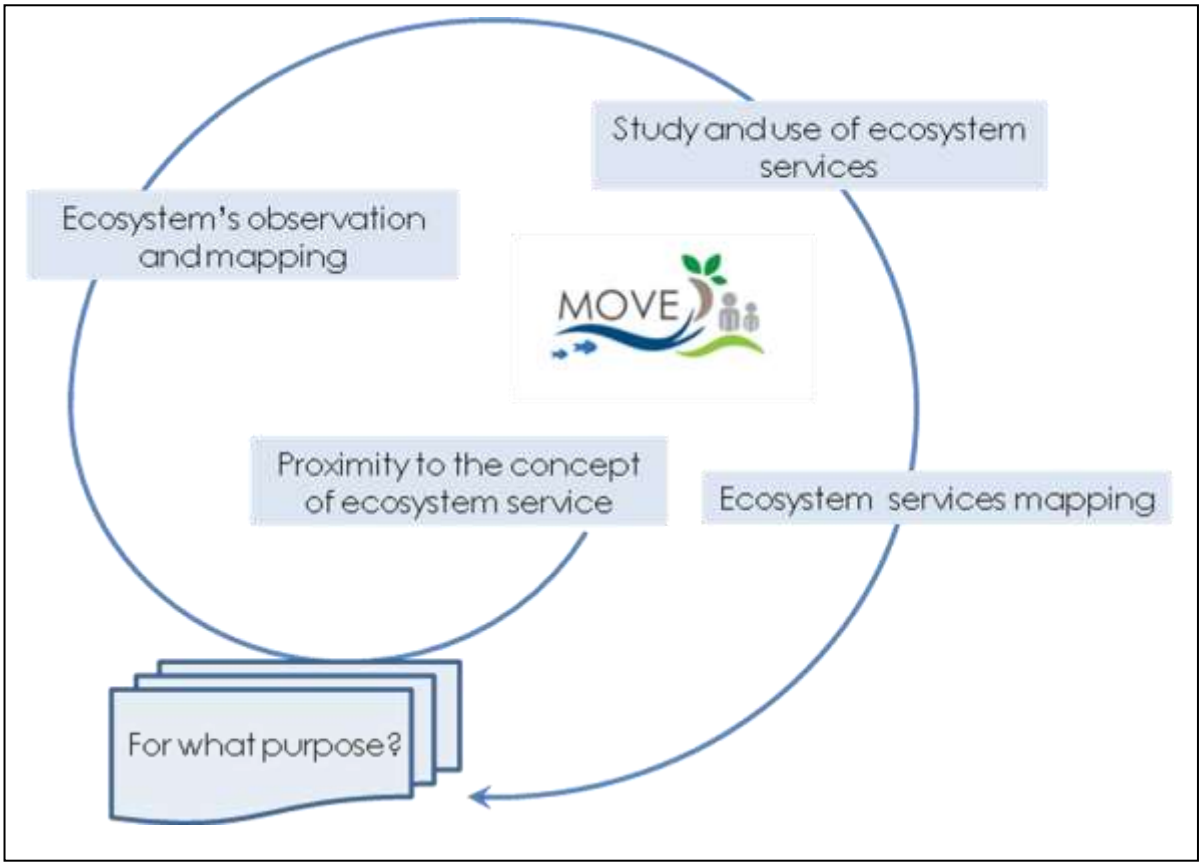


Figure 1 - Appropriation model for the assessment and mapping of Ecosystem Services.

2. A collaboration between the partners of the eight territories integrated in the MOVE project

Based on an initial proposal submitted to the partners representing the eight territories selected in the MOVE project and a three-month dialogue, the construction of the questionnaire was divided into three versions (Table 1).
Appendix 1 provides details of the comments and requests for changes.
Appendix 2 presents the completed questionnaire. It is adapted to suit the specificities of the territory and the partner representing that territory. The questionnaire contains 23 questions divided into four parts dealing with:

a) Degree of familiarity of the actor with ecosystem services and the frequency with which he/she hears about them,
b) The activity of stakeholders in relation to ecosystems,
c) The actor's activity in relation to ecosystem services,
d) Projects relating to the assessment and mapping of ecosystem services in which the stakeholder is involved or of which he is aware in his region.

Table 1 – Chronology of the questionnaire building.

Dates mm/dd/yy	Steps
10/16/18	Guideline proposal.
11/2/18	Elaboration of a first questionnaire integrating the guideline's comments.
From 11/6/18 to 12/6/18	Comments and changes requested on the first version.
12/12/18	Second version of the questionnaire.
From 12/12/18 to 01/11/19	Comments and changes requested on the second version.
03/11/19	Final version of the questionnaire.

The stakeholders and partners of the eight territories studied in the MOVE project speak five languages, including French (New Caledonia, Reunion Island, French Guiana, Martinique), Spanish (Canary Islands), Portuguese (Azores), English (UK OTs in the South Atlantic) and Dutch and/or English (Caribbean Netherlands). The survey was translated into French and Spanish.

3. Translation in to three languages

A first study focused on the effectiveness of the formulation in English. Secondly, it appeared that some concepts expressed in English such as "bottleneck" lack clarity when translated into French and Spanish. In these languages, the term "Ecosystem Services" is rarely used; rather, stakeholders talk about the services provided by ecosystems (Appendix 1).

The English, Spanish and French versions of the questionnaire were uploaded online, according to a Lime Survey questionnaire· Furthermore, adjustments were required in the wording of the questions with a simplification to keep the attention of the stakeholder filling the questionnaire.

The distribution of the questionnaire, whether on paper or online must be accompanied by information on the project and an invitation letter. All these elements together make up the "communication kit".

4. The development of a communication kit integrating the questionnaire

Activity 6 of the MOVE project, which concerns the graphic identity, produced a factsheet presenting the project[2], which was translated into French and Spanish. It presents the framework of the project and its objectives. An invitation letter was attached to the factsheet, introducing the consultation to territorial stakeholders in the form of a questionnaire to be filled in. Finally, these three documents, factsheet, invitation letter and questionnaire were sent by e-mail to each person with an individual message referring to their skills and their usefulness for the consultation (Appendix 3).

PART I – The results of the survey conducted in the eight European overseas territories monitored by the MOVE project

The interview is the most effective way to assist in completing the questionnaire. Each questionnaire completed by interview was saved online by the administrator in a second time. All consulted questionnaires (1003) and completed questionnaires (200) were recorded in the online database (Table 2, Appendices 4). The overall response rate was 20%.

In the three OCTs, New Caledonia differs from Caribbean Netherlands and the UK OTs in the South Atlantic. Indeed, in the latter two territories, the questionnaires were mainly completed online, while in New Caledonia, most of the data was collected through interviews. A very significant dissemination effort was made in the other two territories and the results obtained show that the work is being solicited and reactivated in a sustainable way.

[2] MOVE Factsheet – Activity 6 – MOVE Project- **Grant Agreement n°** 07.027735/2018/776517/SUB/ENV.D2

Table 2 – Number of questionnaires visited and filled in the eight territories followed by the MOVE project.

Territories	Number of questionnaires distributed	Number of questionnaires filled
NEW CALEDONIA	94	28
UK SOUTH ATLANTIC TERRITORIES	329	20
CARIBBEAN NETHERLANDS	118	24
LA REUNION	142	29
AZORES	35	31
CANARY ISLANDS	184	31
FRENCH GUIANA	53	31
MARTINIQUE	48	6

Among the five ORs, the Azores and French Guiana provided information to the database mainly through interviews. La Reunion and the Canary Islands recorded about a third of surveys filled in directly online, the rest coming from interviews. In Martinique, all the surveys collected were directly filled in online.

An initial analysis of the questionnaires focused on the institutional and/or organic representation of the stakeholders who completed the survey (Appendix 5). Figures 2 and 3 show the distribution of legal entities in the three OCTs and the 5 ORs respectively.

The diversity of legal entities appears to be well represented in the sample of stakeholders who contributed to the consultation in the Overseas Countries and Territories (Figure 2). Nevertheless, the predominance of stakeholders working in private companies (environmental consulting or natural resource

exploitation) was dominant in the consultations carried out in the Caribbean Netherlands and in the UK OTs in the South Atlantic.

In New Caledonia, the predominant legal entity that contributed to the consultation were the research institutes. Non-governmental organizations, on the one hand, and general and regional administrations, on the other hand, are the entities that are secondarily present in the consultations carried out in New Caledonia and in the UK OTs in the South Atlantic. In the Caribbean Netherlands, funding agencies are also represented.

In the other outermost regions, the presence of stakeholders working in research institutes is essential. In La Reunion and in the Canary Islands, academics are also well represented in the survey. Finally, private sector stakeholders have a remarkable participation in the Azores, in the Canary Islands and in French Guiana. The administrations' investment comes mainly from the regional administrations in the Azores and the General Administration in French Guiana. In four territories (La Reunion, Azores, the Canary Islands and French Guiana), non-governmental organizations participated in the consultation at a lower rate than that posted by other legal entities.

GTA : General Territory Administration

RA : Regional Administration

GO : Government Administration

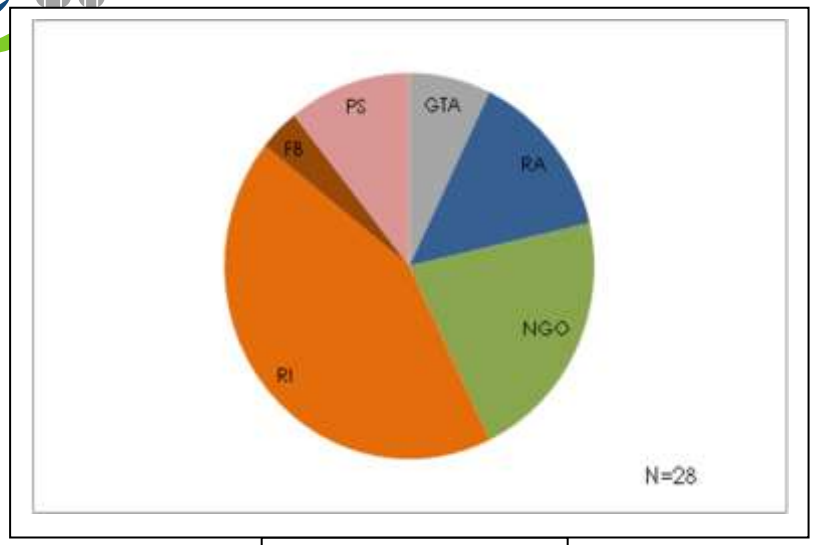
NGO : Non Government Administration

RI : Research Institutes

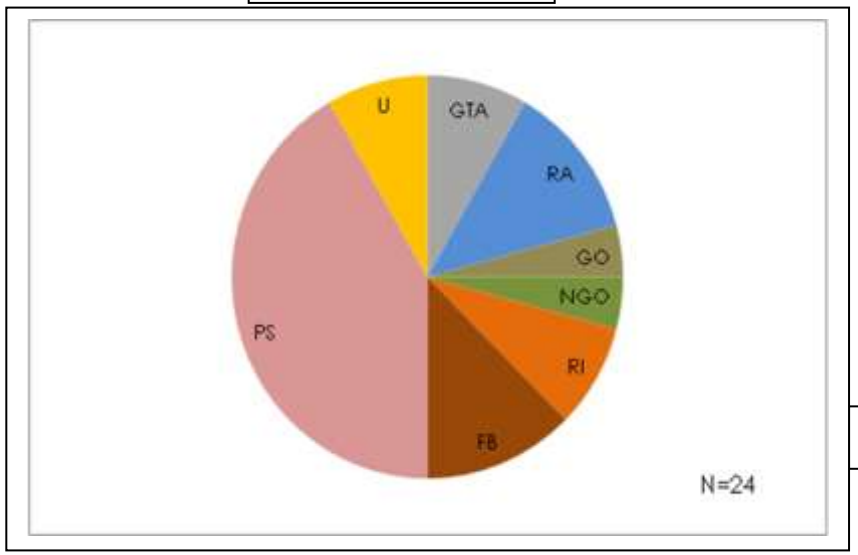
FB : Funding Bodies

PS : Private Sector

U : Universities

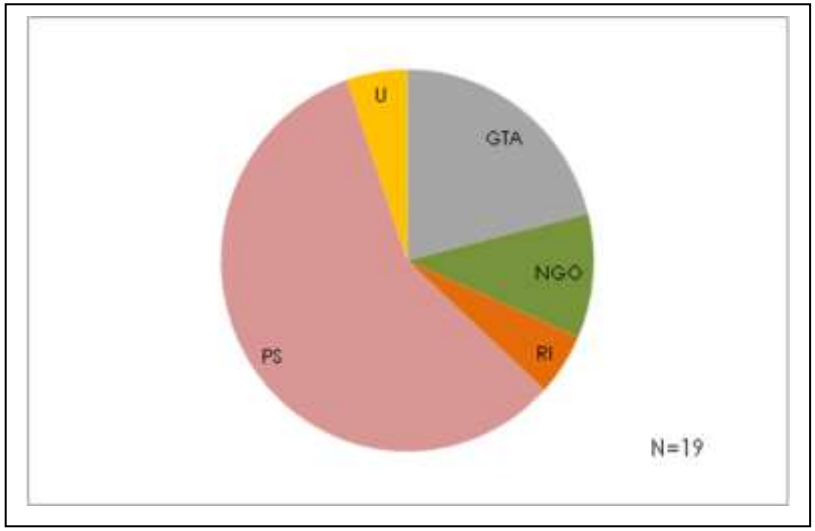


NEW CALEDONIA

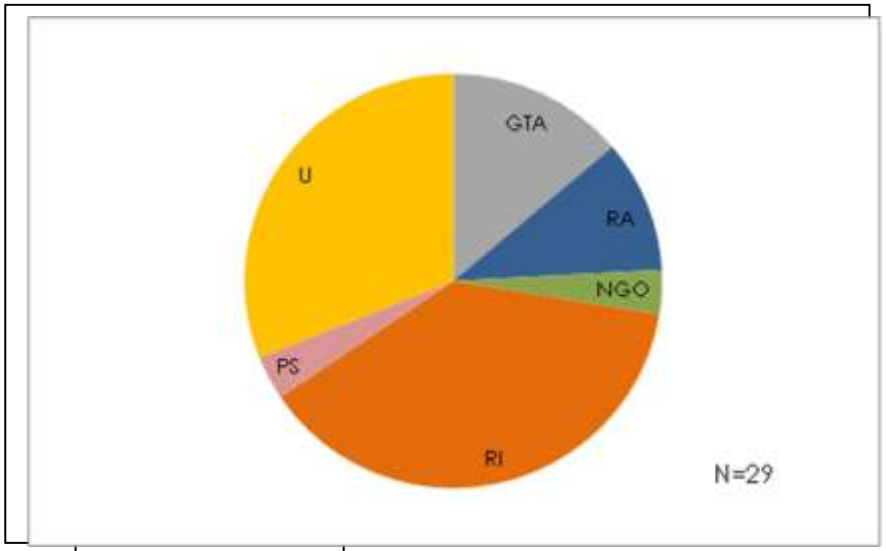


CARIBBEAN NETHERLANDS

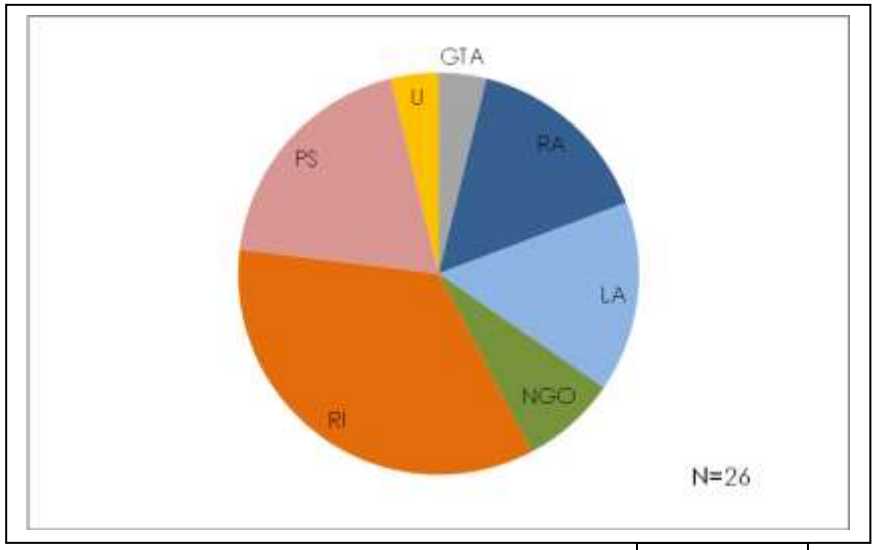
Figure 2 – Legal entities in OCT's filled questionnaires



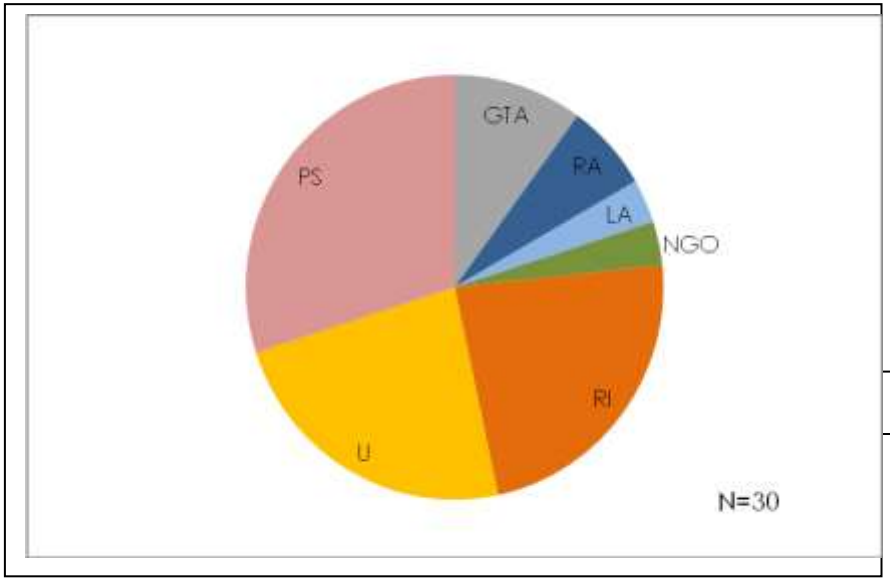
SOUTH ATLANTIC UK TERRITORIES



LA REUNION

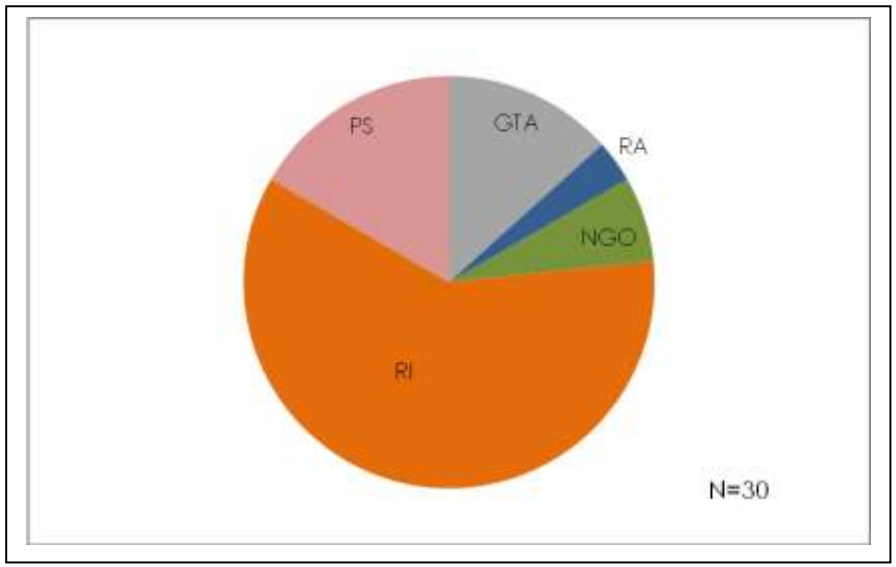


AZORES



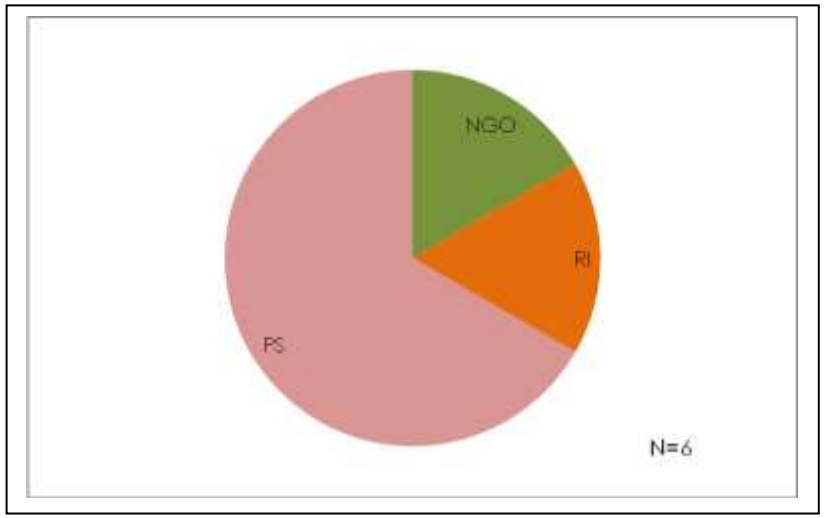
CANARY ISLANDS

Figure 3 – Legal entities in ORs filled questionnaires



FRENCH GUYANA

Figure 3 – Representing legal entities in ORs filled questionnaires



MARTINIQUE

PART II – The proximity of territorial stakeholders to the concept of the Ecosystem Service and its use

The proximity to the concept of Ecosystem Service was assessed with three parameters:

1) The quotation of a list of words referring to *Ecosystem Services* and the intensity of the link between these words and the ecosystem service's meaning,
2) The frequency with which the stakeholder is dealing with the notion of ecosystem service
3) The assessment of the use of *Ecosystem Services* concept in the territory.

1. The evocation of words initiated by the term "Ecosystem Service"

A first approach to this proximity was assessed by the proportion of words or expressions[3] considered to have a strong, medium or a weak link with the concept of *Ecosystem Services* (Annexes 6). It is a participatory method that allows a rapid assessment of the stakeholders' representation of the concept of Ecosystem Service (REY-VALETTE et al., 2017). Figure 4 compares the evocation expressed in the eight territories. It thus appears that the stakeholders have a predilection for evocations with a strong *Ecosystem Services* link. New Caledonia is home to a majority of evocations. A comparable figure is observed for the evocations estimated to have a moderate link with *Ecosystem Services*.

Whatever the intensity of the link between the words referring to ecosystem services, the proximity of the stakeholders to this concept can also be assessed by the diversity of key words (Appendix 6a) expressed in the references to these services. Figure 5 shows for each territory the number of these words and the frequency of their use.

[3] Although the actors are asked to give evocative words about Ecosystem Services, many actors have transmitted this evocation through expressions, or even explanations.

Generally, words are used only once or twice. However, in the Canary Islands, Azores, and the Caribbean Netherlands, some words can be quoted by different stakeholders four to ten times. The diversity of evocations is therefore likely to vary from one territory to another.

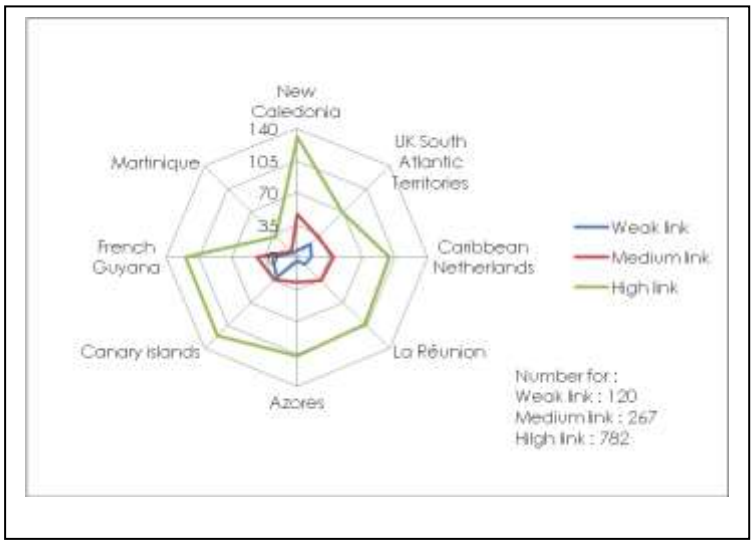


Figure 4 – Words or expressions with a strong, medium and weak link to the concept of *Ecosystem Services* in the eight territories.

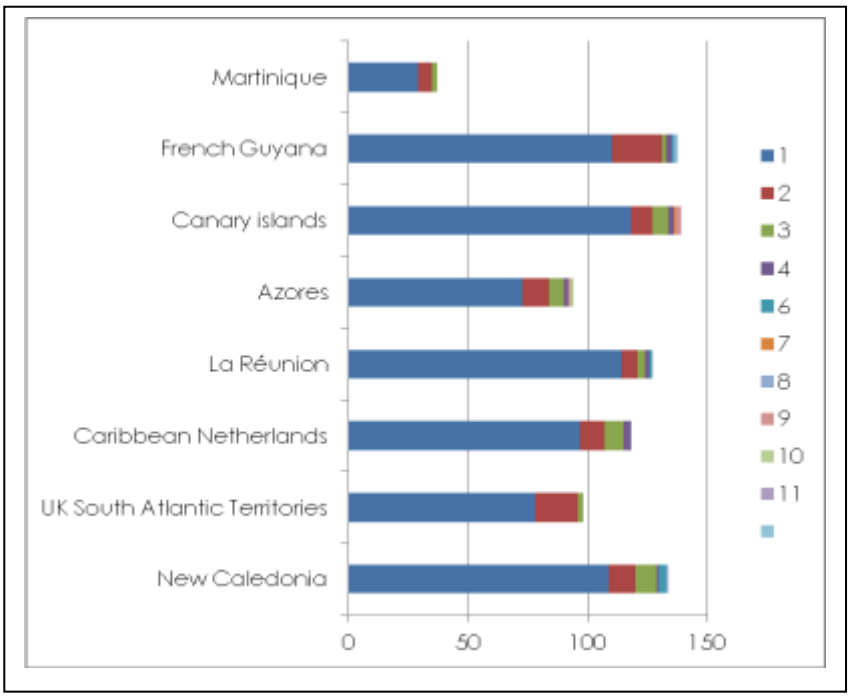


Figure 5 – Use's frequency of keywords referring to ecosystem services in the eight territories.

If we consider that the diversity of the words used to refer to *Ecosystem Services* is an indicator of the cognitive proximity of stakeholders to the concept of ES, then it is necessary to evaluate this diversity with an appropriate indicator.

We have chosen to apply specific indicators to lexical analysis with the calculation of the HERDAN index (1966) recommended by the University of Lyon team[4] (CHENU, 2003).

Lexical diversity is assessed by the relationship between logarithms of words or "Types" of words on the total number of words or "Tokens" used in a speech. If we estimate that in a territory, the words reported by the people who provided information for the survey compose a common discourse, then the lexical diversity according to the HERDAN index is estimated by the following relationship:

D = LOG (Σ (Number of words/Frequency of use))/LOG (Total number of words)

where:

- D is the lexical diversity
- The ratio between the Number of words and their frequency of use is the "Type"
- The total number of words is the "Token".

Table 3 presents (for the eight territories) the assessment, thus calculated, of lexical diversity

These results indicate for all territories, a diversity close to 1, i.e. a near equality of the occurrence of the terms used by all stakeholders. This lexical equivalence is an indication of the weak rooting of the concept of Ecosystem Service in uses.

[4] http://theses.univ-lyon2.fr/documents/getpart.php?id=lyon2.2003.chenu_f&part=73726#Noteftn241

Table 3 - Words' diversity related to ecosystem services meanings

Territories	Types	Tokens	Diversity
NEW CALEDONIA	118,38	185	0,91
UK SOUTH ATLANTIC TERRITORIES	87,67	120	0,93
CARIBBEAN NETHERLANDS	105,42	153	0,93
LA REUNION	118,50	150	0,95
AZORES	81,21	138	0,89
CANARY ISLANDS	125,70	187	0,92
FRENCH GUYANA	122,88	189	0,92
MARTINIQUE	32,67	47	0,91

2. The frequency with which the actor deals with the ecosystem service's concept

In an introductory way, the stakeholders are called upon to assess the frequency of their dealing with the concept of Ecosystem Service (Annex 6b), either related to a project and/or work in the actor is involved or to a simple reference of the concept made during meetings or projects of which the actor becomes aware.

Figure 6 presents the stakeholders' assessment of this dealing in the eight territories. The results obtained in Martinique should be considered with caution because the number of responses is much lower (only 6 responses) than in the other territories.

In general, occasional and scarce uses are predominant. The Azores stands out by having a high proportion of stakeholders who are not familiar with the concept of ES. Occasional uses are predominant in New Caledonia, the Caribbean Netherlands, the Azores and French Guiana. Rare uses were reported in the UK OTs in the Atlantic Ocean, Reunion Island and the Canary Islands.

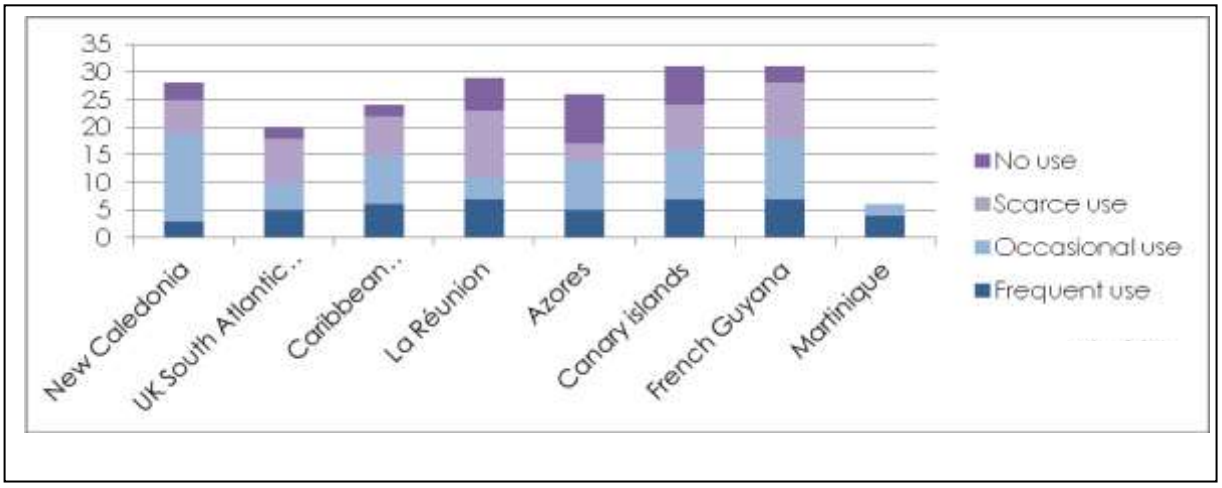


Figure 6- Use's frequency of the *Ecosystem Services* concept in the eight territories monitored by the MOVE project.

The frequent use of the *Ecosystem Services* concept appears to be less present in New Caledonia.

The application of the test assessing the effect of territory on these variations is significant[5]. It makes it possible to distinguish the Azores where the *Ecosystem Services* concept was unused or rarely used and New Caledonia as the territory for occasional use of *Ecosystem Services*.

3. Ecosystem service's use in the territory

Beyond a globalizing approach to the actor's relations with the *Ecosystem Services* concept, he is being asked during the consultation to clarify his position regarding the consideration of ecosystem services in his work and his opinion on the use of this concept in his territory (Annex 6b).

Figure 7 shows the declarations for this use. The use of the *Ecosystem Services* concept is reported as the most important in the Caribbean Netherlands. On the other hand, New Caledonia has a low use rate; but this assessment needs

[5] The application of the Chi 2 test (Assess the independence of variables) evaluates a Chi 2 of 34.042 for 21 degrees of freedom; the hypothesis of independence of the variables is rejected with a probability of 95%.

to be considered regarding the low answers rate to this question. The Reunionese's stakeholders are distinguished by the declaration of a low use of ecosystem services on their territory. In the other territories, opinions are divided between the involvement of the actor and an assessment of the low use of ecosystem services.

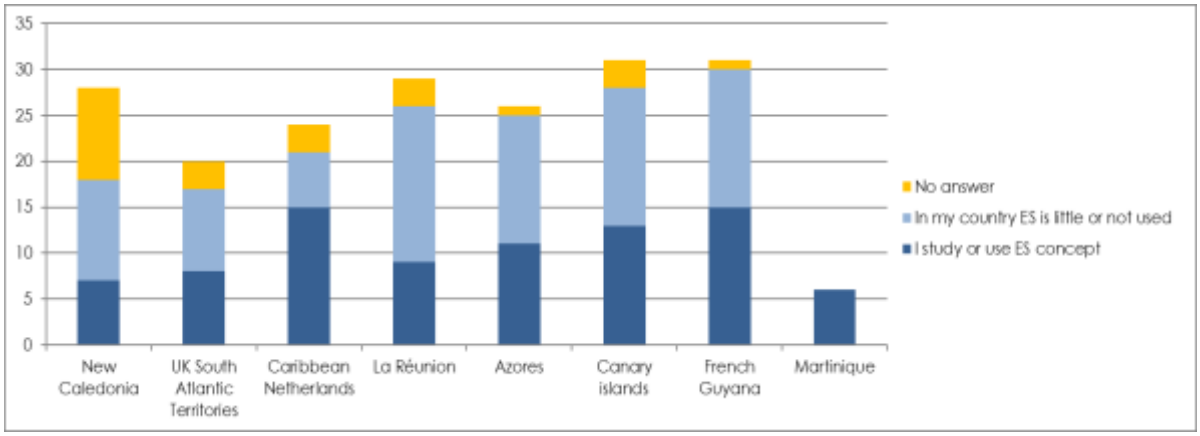


Figure 7- Use's frequency of the *Ecosystem Services* concept in the eight territories monitored by the MOVE project.

The independence between the variables has been tested and confirmed: it indicates a significant effect of territorial location[6].

For the eight territories studied by the MOVE project, the proximity of the stakeholders to the concept of *Ecosystem Services* is marked by a great diversity of words referring to these services, their rare or occasional use and, except in the Caribbean Netherlands, a rather moderate involvement by the territories in their study. It thus appears that the concept of Ecosystem Service seems to have still a little place in the relationships between stakeholders and ecosystems. This relationship is nevertheless the foundation of a move towards taking into account the services provided by nature.

[6] The application of the Chi 2 test evaluates a Chi 2 of 34.046 for 14 degrees of freedom; the hypothesis of independence of the variables is rejected with a probability of 99.5%.

PART III – The involvement of territorial stakeholders in the study, exploitation and management of ecosystems.

The investment of territorial stakeholders in ecosystems has been assessed (Appendices 7) according to:

- Species and habitat types,
- Areas of activity related to species and/or habitat types,
- Fields of action related to species and/or habitat types,
- Methods of observing and studying ecosystems according to the fields of action,
- Spatial analysis of ecosystems with the use of satellite images and the production and/or use of geographical maps,
- The needs and constraints in mapping ecosystems.

According to the proposed appropriation model (Figure 1), these points are steps that describe the construction of expertise in the observation, study, and representation of ecosystems with the objective of their preservation, rational use and management.

1. Species and habitats concerned by ecosystems' works

Some stakeholders have a broad spectrum of skills that adapt to terrestrial and aquatic ecosystems. In the context of the eight European overseas territories studied by MOVE, the diversity of geographical, climatic, geo-morphological, biological and socio-economic contexts provides an orientation of interest for certain ecosystems.

Thus, French Guiana, a continental territory, has an environmental problem linked to the forest that occupies most of its territory. In another context, the Caribbean Netherlands, an archipelago of small islands, coastal species and habitats are the more represented.

Figure 8 presents the comparative involvement of stakeholders for the eight territories in terrestrial and coastal and/or marine ecosystems, detailing whether they are species or habitats.

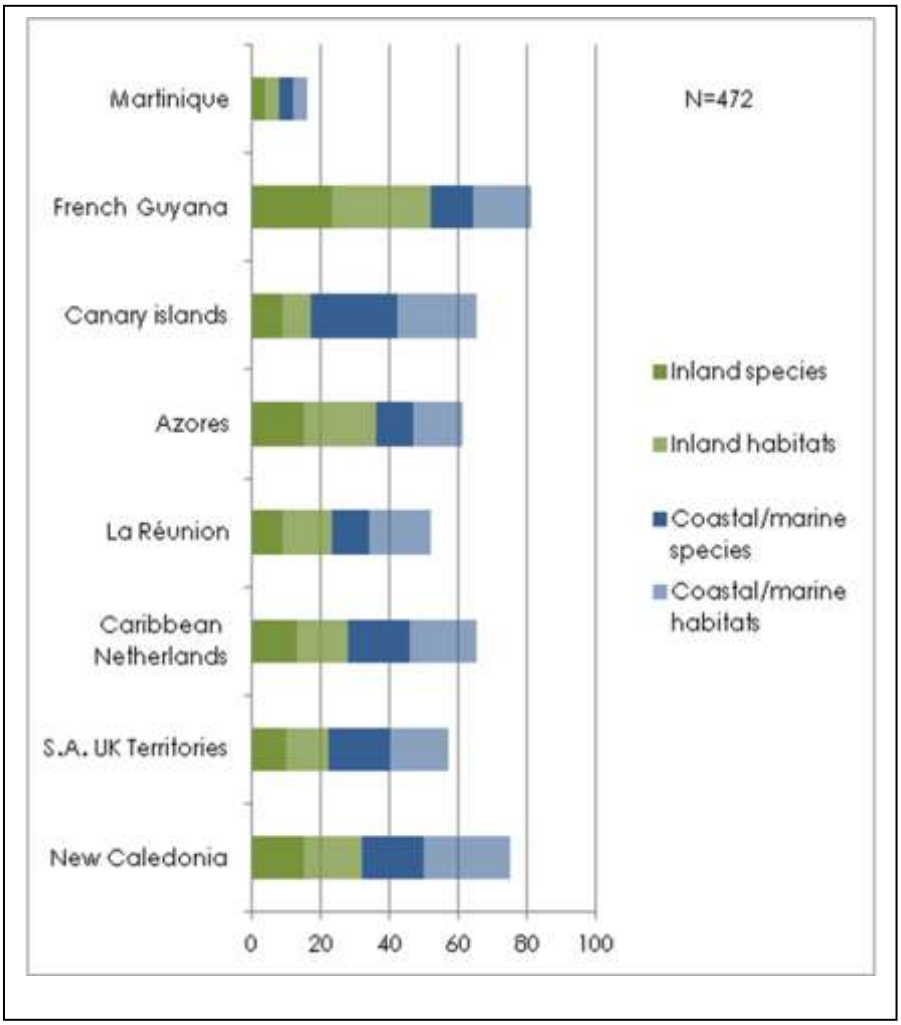


Figure 8 - Territories' involvement in terrestrial or coastal and/or marine ecosystems.

French Guiana and the Azores stand out from other territories by their investment in terrestrial ecosystems. On the other hand, the Canary Islands stand out due to the interest developed for coastal and/or marine ecosystems. In the other territories, skills for terrestrial and/or marine environments appear comparable, although a certain predominance for maritime ecosystems is evident in New Caledonia and in the UK OTs in the South Atlantic. In each ecosystem type, a specific focus on species or habitats is not apparent.

The application of the Chi2 test indicates that the variations observed according to the territories are significant[7]. The interest of stakeholders in ecosystem types is therefore linked to the territory.

2. Domains of activity related to ecosystems

The stakeholders' links with ecosystems have been first assessed according to their involvement in domains of activity. These related to ecosystems are:

- Biodiversity conservation including the implementation of protected areas,
- Exploitation of natural resources,
- Management and planning of environmental issues,
- Acquisition of knowledge coming from material, spiritual activities and the observation of natural environments.

Figure 9 shows, for the eight territories studied, the involvement declared by the stakeholders in these domains of activity.

In the Caribbean Netherlands, stakeholders give a priority to the protection of biodiversity and the exploitation of resources. In La Reunion and in New Caledonia, they are mainly dedicated to environmental management and planning issues and the acquisition of knowledge. In La Reunion, ecosystems concerned are impacted by the omnipresent natural risks linked to volcanic activity, the increase in shark attacks, coral bleaching, and the development of invasive plants. In the other territories, the distribution of domains of activity seems to be constant.

The involvement variation in the domains of activity appears to be significantly related to the type of territory[8]. Contributions to this variation are mainly made by the exploitation of resources in Reunion Island and French Guiana, which is also involved in their management.

[7] The application of the Chi2 test on the matrix crossing the territories with the ecosystem type indicates a rejection of the independence hypothesis with a probability of 90%(Khi2 = 31.23 with 21 degrees of freedom)

[8] Chi 2 is 30.43 for 21 of freedom and the independence hypothesis is rejected with a 90% probability.

Within the framework of these fields of activity, the stakeholders have fields of action relating to the description of species and habitats, knowledge based on traditional knowledge, assessment of the state of the ecosystem, its monitoring, modeling, economic evaluation and mapping.

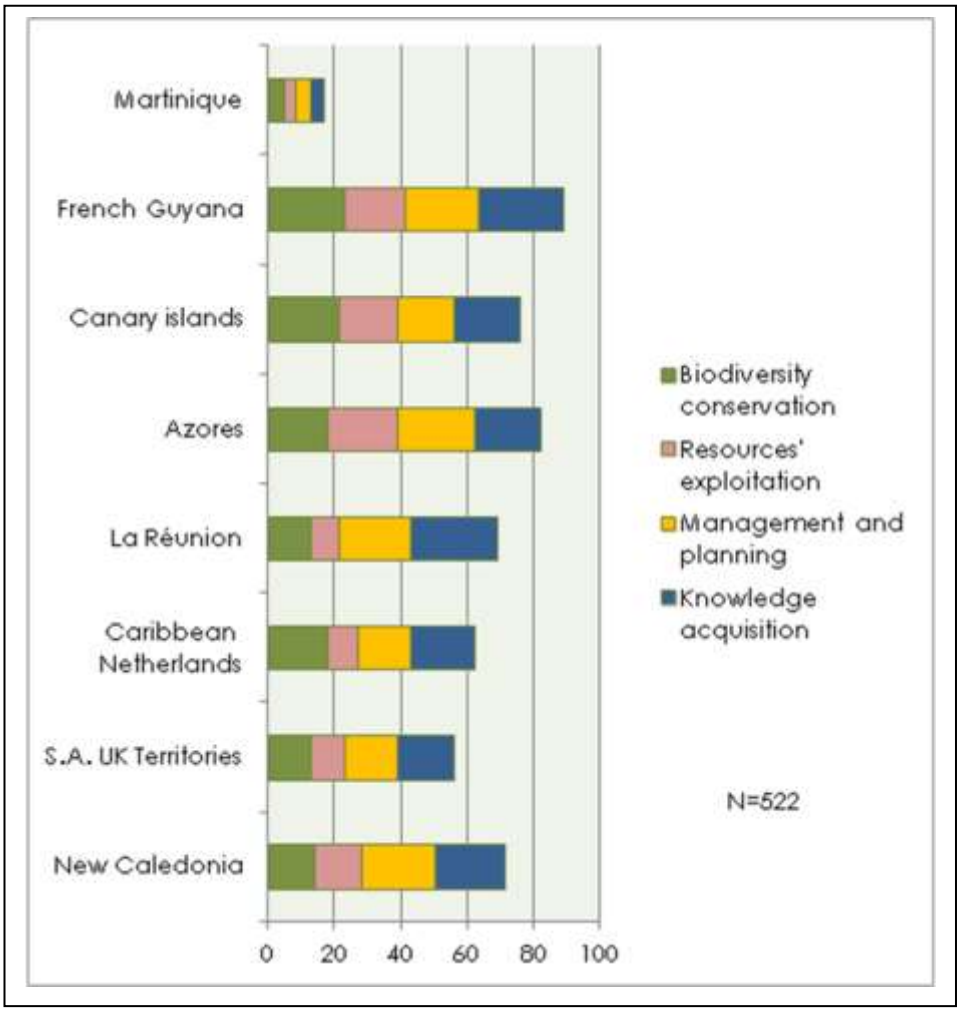


Figure 9 - Territories' stakeholders' involvement in domains of activity related to ecosystems.

3. Fields of action related to ecosystems

A comparative examination of the fields of action exercised in the eight territories does not allow us to distinguish any significant variations (Figure 10). Except in Martinique where the lack of data is likely to affect the significance of the variations, the stakeholders' statements show a balanced distribution of the seven fields of action listed. However, it appears that New Caledonia and Reunion Island seem to have a specific investment for ecosystem assessment and monitoring. French Guiana, the Azores, the Canary Islands, Reunion Island and New Caledonia declare an investment in ecosystem and landscape mapping. The application of the independence test confirms the absence of territorial variations[9]. The main contribution to the variation is made by the actions identified as other.

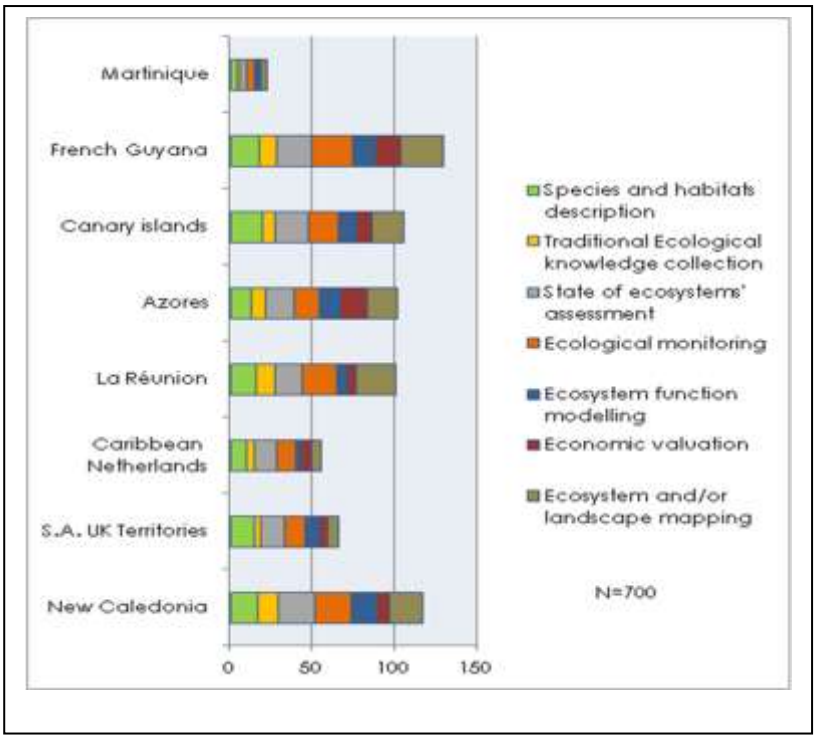


Figure 10 - Distribution of fields of action related to ecosystems in the eight territories studied in the MOVE project.

[9] For 49 degrees of freedom, Chi2 is 53.38 with a probability of rejection of the independence hypothesis of less than 75%, which is poorly significant; the variations from one territory to another are independent.

The stakeholders involved in the analysis and monitoring of ecosystems are also interested in spatial representation in order to help the view of natural environments and it's dynamic. The geographical map is a basic tool that is enriched with satellite data and is evolving towards geographical information systems.

Spatial measurement acquired by a set of tools that includes fieldwork, radiometric data analysis, information collection from populations and/or ecosystem users is an indicator of a competence that will also be useful in identifying, monitoring and mapping ecosystem services.

4. Ecosystem observation and measurements' tools and methods

A complete range of tools for collecting and analyze spatial information is subject to be used of stakeholders. These include data collection with field measurements, airborne and fixed camera photography, radiometric reception with satellite images, radar and Lidar, collection of pre-existing databases, production of maps and geographical information systems, and information provided by users through interviews, questionnaires and focus groups.

Figure 11a presents the comparative statements between the eight territories on the uses of these different methods for observing, measuring and analyze ecosystems.

The range of methods proposed is used almost completely in all territories. French Guiana appears, by the number of declarations, as a predominant territory in terms of measurement and observation methods, particularly with the use of satellite images. Other methods that stand out are the collection of data in the field and the use of databases, the implementation of geographic information systems and associated mapping, and the collection of representations of ecosystem users through interviews, questionnaires and focus groups.

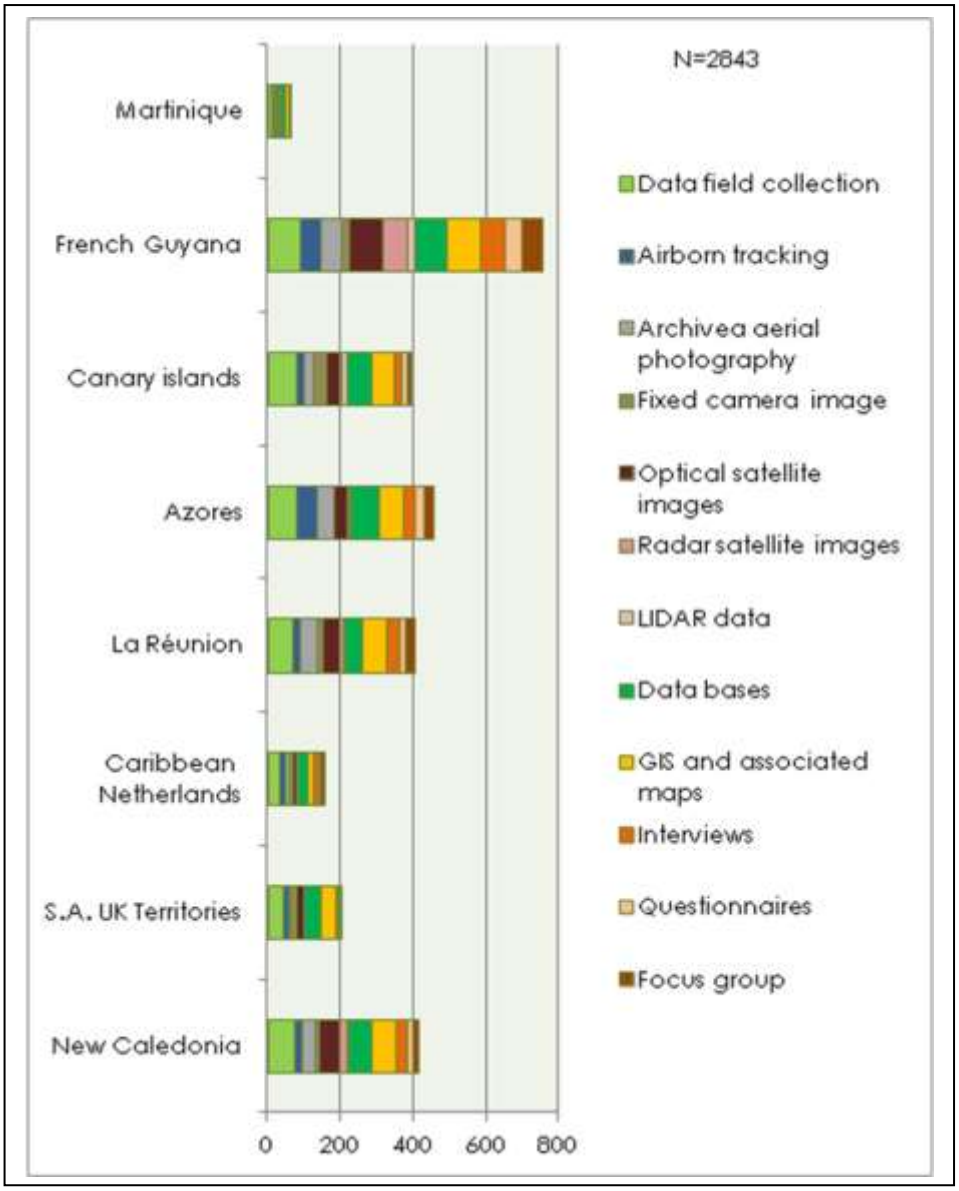


Figure 11a - Territorial comparison of methods for observing, measuring and analyze ecosystems.

A synthetic analysis can be provided by combining these tools and means into six groups consisting of data, aerial images, LIDAR data, satellite images, cartography and data collected from users. Figure 11 b presents the distribution of these groups or classes of tools by territory.

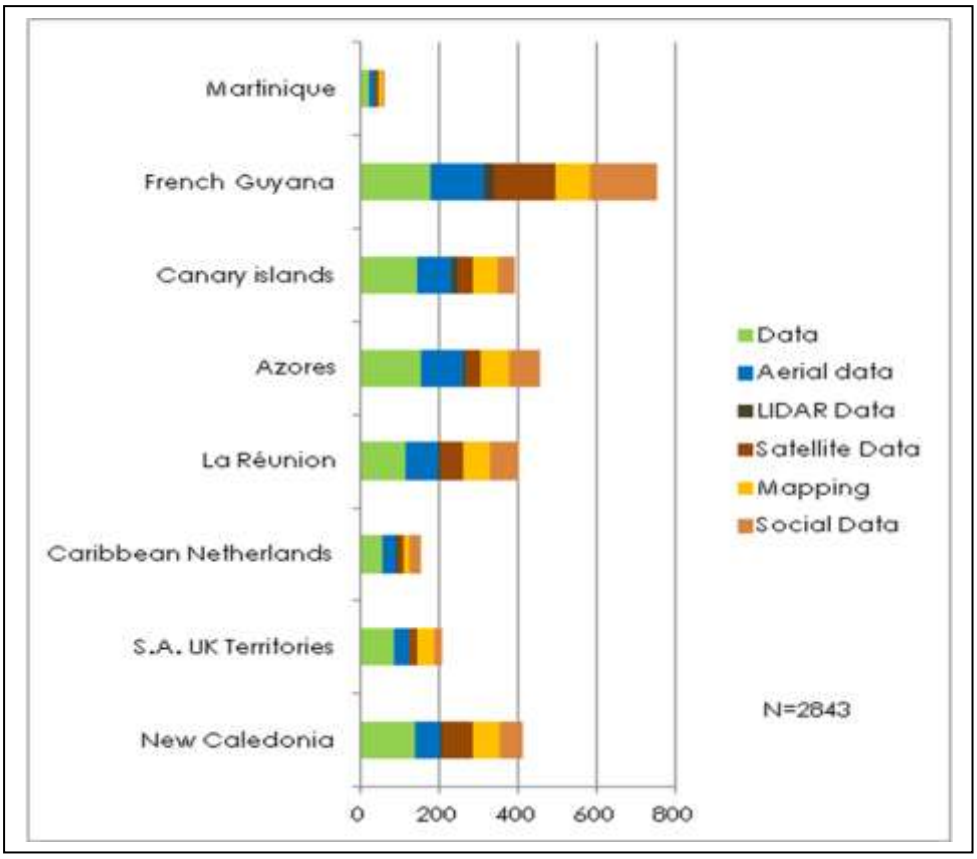


Figure 11b - Territorial comparison of groups of methods for observing, measuring and analyze ecosystems.

Analysis of the variability in the use of these methods between territories indicates that the choice of methods is significantly influenced by the territory[10]. The examination of the contributions to total variability identifies for each territory, the preferential or deficit uses of the methods (Appendix 6b).

The data suggest that:

- The use of data is significant in all territories,
- The use of aerial photos is significant in French Guiana and the Azores, and is significant in New Caledonia, Reunion Island and the Canary Islands; they are less used in the UK OTs and the Caribbean Netherlands,

[10] The application of the independence test indicates a Chi 2 of 281.38 for 77 degrees of freedom; the independence of the use of methods according to territory is rejected with more than 95.5% probability.

- French Guiana and New Caledonia have a higher rate of satellite image use than other territories; La Reunion, the Azores and the Canary Islands have, however, remarkable uses,
- The use of mapping seems comparable between territories except in the Caribbean Netherlands,
- The use of data collected from populations and/or users is significant in all territories with a preferential rate in French Guiana and a minimum observed in the UK OTs in the South Atlantic.

French Guiana is a key territory for collecting information in the field, observation methods and mapping. In other territories, the spatial information is a common concern with the use of specific methods.

5. Spatial figures of ecosystems

A preliminary assessment of the stakeholders' involvement in map using and production is given in Figure 12. Maps' users report mainly in New Caledonia, Reunion Island, the Azores, the Canary Islands and French Guiana. They are also present in the Caribbean Netherlands and the UK OTs in the Atlantic in a proportion comparable to other territories given the size of their sample.

In French Guiana and in La Reunion, the number of maps' users and producers is equivalent. The two functions naturally combine in the activity declared by their stakeholders. This trend is also observed in the UK Territories where the number of stakeholders reporting the production of maps is close to those using them. In the other territories, there are fewer map producers than users. Their proportion is comparable except in the Caribbean Netherlands where maps' users are predominant.

At first glance, the need for maps is obvious in the Caribbean Netherlands, the UK Territories in the South Atlantic and the Canary Islands. In the Caribbean Netherlands, the preferred cartography transcribes small areas (less than or equal to 1/40,0000 corresponding to 400 m for 1cm on the map). In the UK Territories, the request is for the representation of distances greater than 3km (scale greater than 1:300,000). In the UK Territories, the need

appears to be more balanced between the different scales than in previous territories.

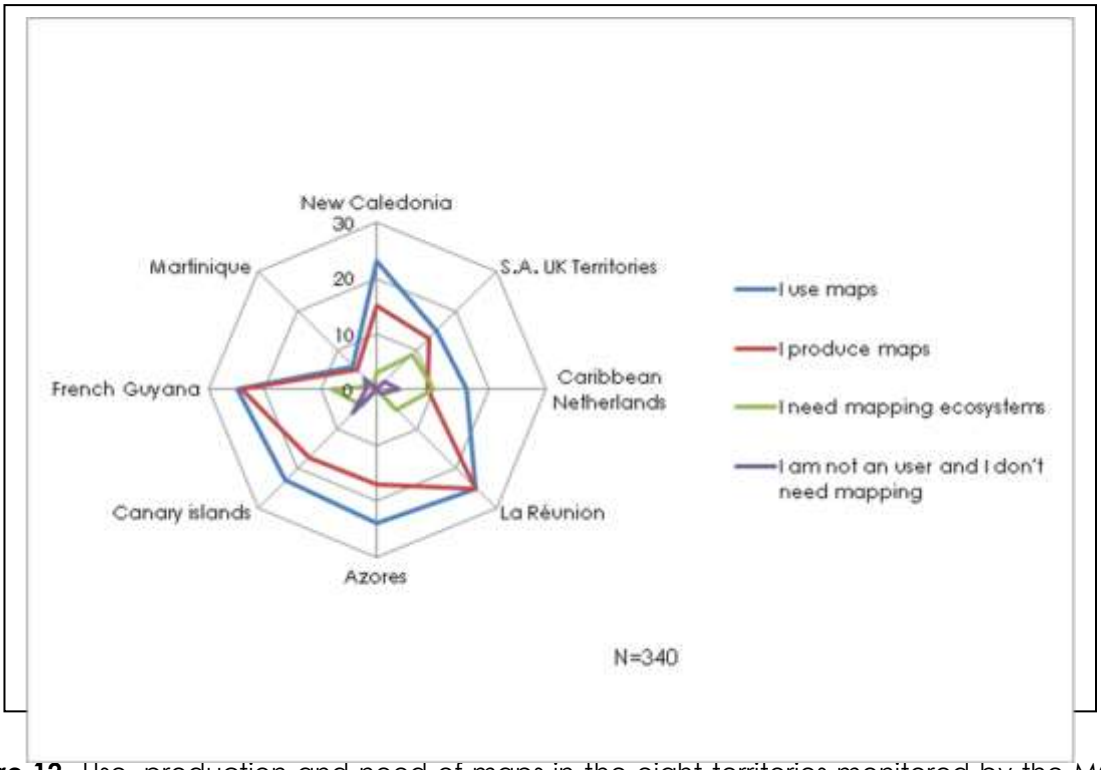


Figure 12- Use, production and need of maps in the eight territories monitored by the MOVE project

Figures 13 present, for the eight territories, by geographical scale, the declarations of use, production and need for maps.

Maps' use is predominant in French Guiana, Azores, the Canary Islands, La Reunion and New Caledonia. The Azores and the Canary Islands use large-scale maps (representation of small distances). In La Reunion, the scales' range is diversified.

Declarations for map production are required in French Guiana, La Reunion, the Azores and New Caledonia. In French Guiana, the range of map scales appears to be balanced. The trend towards the production of large-scale maps (small areas) has nevertheless begun; it is becoming more pronounced in the other three territories (Figures 13).

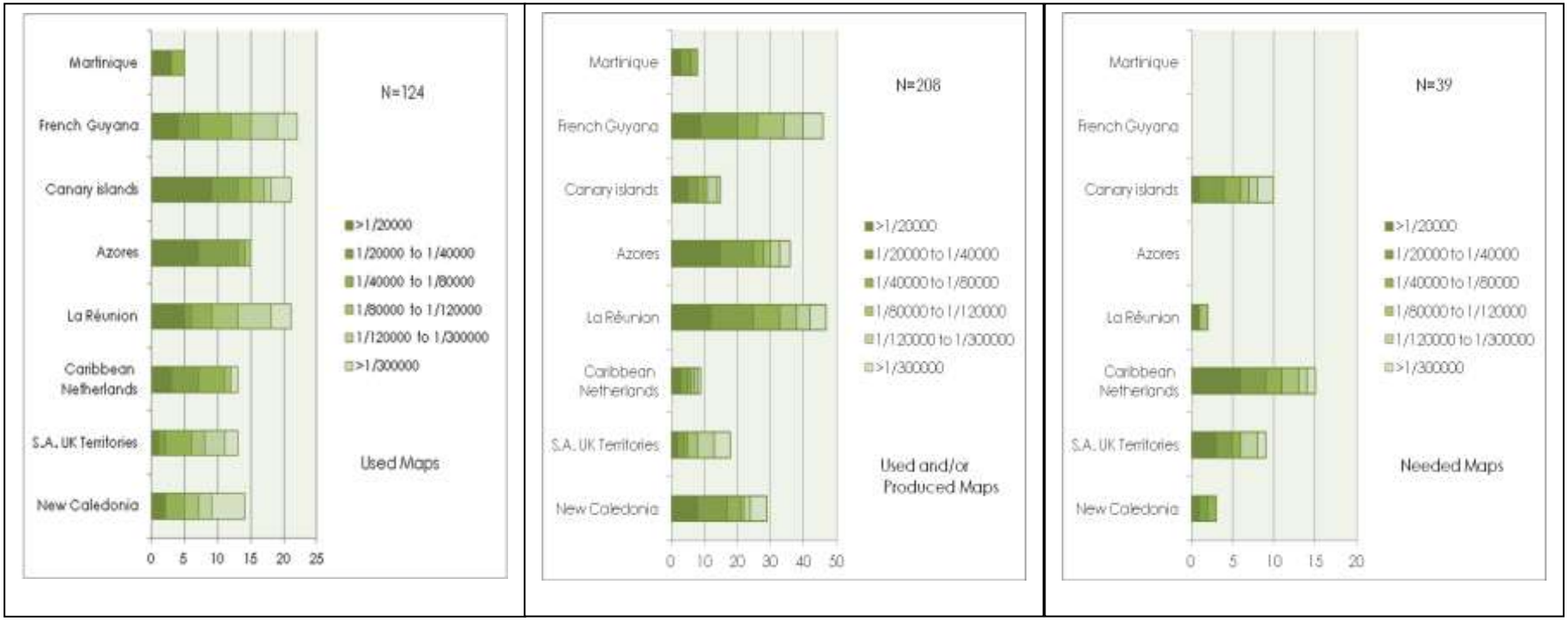


Figure 13 - Maps' scales used, produced and needed in the eight territories monitored by the MOVE project.

Since the 1980s, resource and landscape mapping at different scales has used observation satellites (DESBOIS, 2015). They detect radiometric emissions (reflectance) over several wavelength spectra. The choice of image resolution is one of the essential stakeholders in the choice of sensors.

The stakeholders in the eight territories communicated their choice of image resolution, expressed by the pixel or the smallest detectable area. Figures 14 present the statements of use and resolution requirements for images.

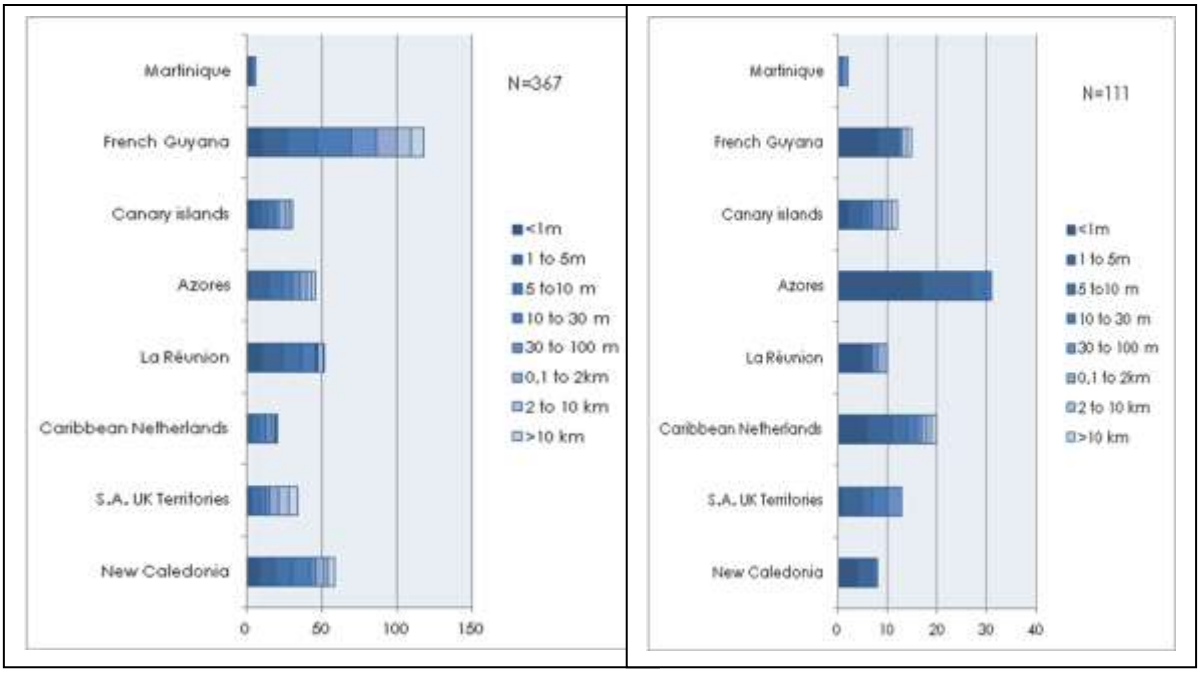


Figure 14a - Images' use. **Figure 14b - Images' need.**

Figures 14 - Use (Figure 14a) and need (Figure 14b) for satellite images in the eight territories monitored by the MOVE project.

According to the statements, the main users of images are located in French Guiana, New Caledonia, La Reunion and the Azores. Instead, high and medium resolution images (From less than 1 m to 30 m) produced by conventional sensors such as SPOT and LANDSAT are preferred. The UK Territories in the South Atlantic users were more inclined towards medium resolutions. Stakeholders in the Canary Islands seem to prefer high resolutions, as in the Caribbean Netherlands.

The needs are mainly for very high or high-resolution images (From 1 to 5 m). This need is particularly expressed in the Azores and the Caribbean

Netherlands. Only Canary Island stakeholders express a balanced demand in the range of resolutions.

According to a global approach to the material and human resources needed to map ecosystems, territorial stakeholders are called upon to decide on the need for these resources and the constraints due to their lack.

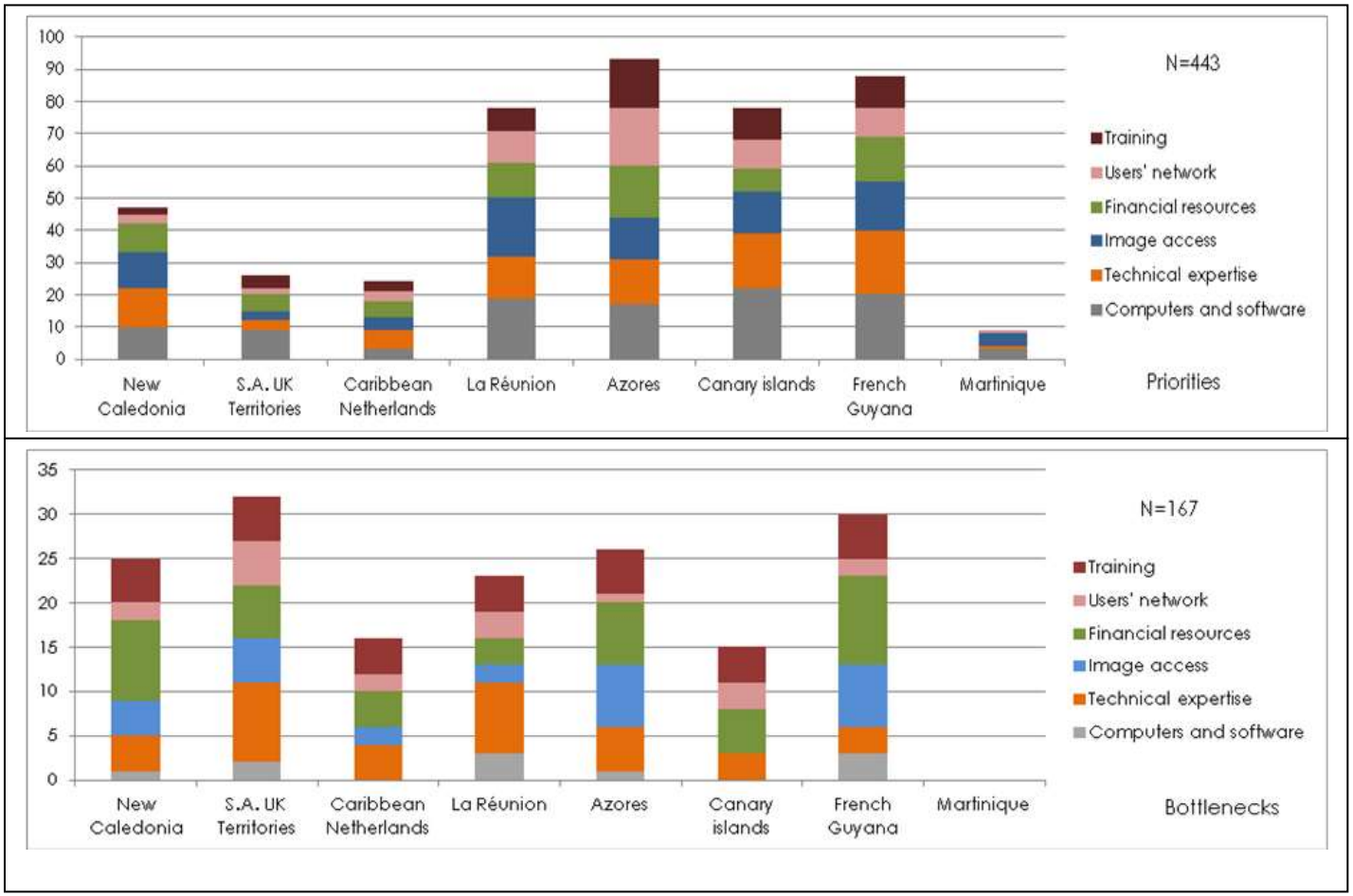
6. Material and human resources considered as priorities

Six groups of resources requested by ecosystem mapping have been submitted to territorial stakeholders for assessment. These are hardware (Computers and software), technical expertise, access to aerial and satellite images, funding, the existence of a user network and training. They were asked to assess the priority, availability without priority, absence and bottlenecks caused by this absence.

Figure 15 presents these contexts in the eight territories studied. The profiles identified show an association of resources that varies according to priority, non-priority needs, the context of absence and the constraint constituted by their absence.

The resources declared as priorities (Figure 15a) are:

- The combination of computer equipment (computers and software), technical expertise and access to images in New Caledonia, La Reunion, the Canary Islands and French Guiana;
- The financial resource associated with computer equipment in the UK OTs in the South Atlantic, technical expertise in the Caribbean Netherlands, and user network and training in the Azores
- The whole constituted by financial resources, the network of users and training in the Azores, Reunion Island and French Guiana with access to images;



Figures 15- Resources considered as priorities (Fig. 15a) and whose absence is a bottleneck (Fig. 15b.

The resources whose absence is declared a bottleneck (Figure 15b) are:

- Technical expertise in the UK OTs in the South Atlantic, the Caribbean Netherlands and La Reunion;
- Access to images in the Azores and French Guiana;
- Financial resources in most territories;
- Training in New Caledonia, the Canary Islands and La Reunion.

The skills and needs of the stakeholders lead to the identification of certain resources as priorities on the one hand and available but not priority on the other. This is the case for computer equipment, which is an essential and common resource, which explains why some stakeholders may determine it as available but not a priority. Access to satellite imagery is also identified according to the two categories, particularly in New Caledonia and French Guiana, which have historically used this data source for ecosystem observation and management.

Few statements were made about the lack of resources (Appendix 7). The lack of financial resources perceived by almost all territories as a bottleneck for ecosystem mapping is associated with the absence of:

- Training in New Caledonia and the Canary Islands;
- Technical expertise in the UK Territories in the South Atlantic and the Caribbean Netherlands;
- Access to images in the Azores and French Guiana.

La Reunion is the only territory that does not identify the lack of financial resources as a "bottleneck". This is constituted by the combination of technical expertise and training's lacks.

The independence test is not rejected in the context of priority resources and the absence of bottleneck resources[11]. This means that there is no effect of territory on the observed variations. This result does not invalidate the observations observed for each territory. It leads to an assessment of the influence of need according to the type of resource.

[11] The application of the independence assessment test estimates Chi2 at 30.49 (35 degrees of freedom) and 22.33 (for 30 degrees of freedom) for priority resources and the absence of resources constituting a bottleneck, respectively. The probability of rejecting the independence assumption is less than 0.5.

Figure 16 shows the availability and need expressed for each resource category.

Computer equipment (Computers and software), technical expertise, access to images and funding are the resources mainly recognized as priorities. Resources whose absence may constitute a bottleneck include technical expertise, financial resources and training. The user network has a poorly identified context since this resource is declared available but not a priority and absent.

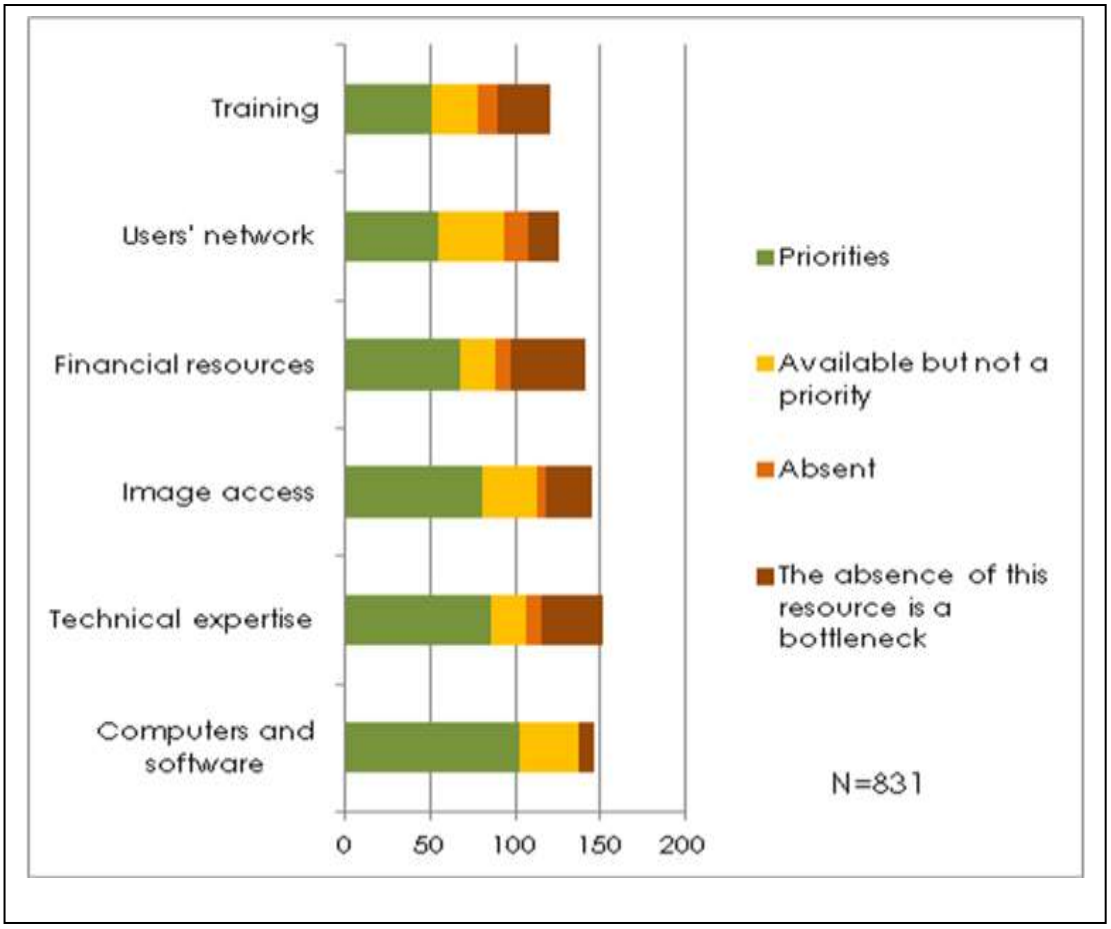


Figure 16 - Priority and availability of resources useful for ecosystem mapping in all the territories monitored by the MOVE project.

The independence hypothesis is rejected[12]. The variables that contribute to Chi2 are, apart from computer equipment, priority training, available and/or

[12] The application of the independence evaluation test indicates a Chi2 equal to 68.87 for 15 degrees of freedom. The probability of rejection of independence is greater than 99.5%.

absent user network, and financial resources whose absence is perceived as a bottleneck (Appendix 7b). The latter is recognized as necessary for the implementation of a communication platform between stakeholders that integrates the products resulting from projects dedicated to ecosystem services and natural capital (M. PEREZ-SOBA et al., 2018).

The analysis of the declarations relating to the links between ecosystems and stakeholders in the eight territories monitored by the MOVE project makes it possible to highlight specificities and common points. The type of habitat and/or ecosystem and the fields of activity are linked to the territories. The fields of activity, fields of action and resources required are not dependent on the territories, probably because they refer to the intrinsic modalities of ecosystem analysis.

The analysis of ecosystem services is likely to be based on the achievements and uses established by territorial stakeholders in their work with ecosystems.

PART IV – Involvement of territorial stakeholders in the identification, analysis and mapping Ecosystem Services.

The territorial stakeholders' involvement in the identification, study and use of ecosystem services (Annexes 8) is carried out by the declarations relating to:

- Fields of action related to ecosystem services according to habitats and/or ecosystem types;
- Domains of activity concerned by the fields of action related to ecosystem services;
- Expected results of the ecosystem services analysis;
- Constraints and bottlenecks inhibiting ecosystem services mapping;
- Resources needed to map ecosystem services;
- Reasons for a rare or non-existent use of the *Ecosystem Services* concept.

1. Fields of action related to Ecosystem Services by habitat and/or ecosystem type

Five fields of action related to the analysis and use of ecosystem services have been identified and proposed for territorial stakeholders to choose. It is about:

- The identification of ecosystem services according to the benefits they bring to the environment and societies;

- Monitoring the activity of ecosystem services;
- Modeling the impact of ecosystem services;
- The economic evaluation of ecosystem services;
- Ecosystem services mapping.

For each of these fields of action, the territorial actor is invited to specify the habitats and/or ecosystem types concerned.

Figures 17 show the ecosystems concerned (habitats and species) by the work on ecosystem services in each territory (Figure 17a) and according to the fields of action related to ecosystem services (Figure 17b).

Terrestrial habitats appear to be the most concerned by studies and work on ecosystem services in French Guiana, the Azores and Reunion Island (Figure 17a). Coastal and/or marine ecosystems appear to be more targeted in the Canary Islands, the Caribbean Netherlands, New Caledonia, Martinique and the UK OTs in the South Atlantic. The choice made by territories in ecosystems is significant for work relating to ecosystem services[13].

On the other hand, actions on ecosystem services do not show significant variation according to ecosystem types are concerned (Figure 17b)[14].

[13] The independence test applied to the investment of territories according to ecosystems indicates the rejection of the independence hypothesis (Chi2 is 90.257 for 21 degrees of freedom) with a probability of 99.5%.

[14] The independence test applied to the fields of action affiliated to ES according to ecosystems for all eight territories confirms the independence hypothesis (Chi 2 is 3.158 for 12 degrees of freedom) with a 1% probability of independence rejection.

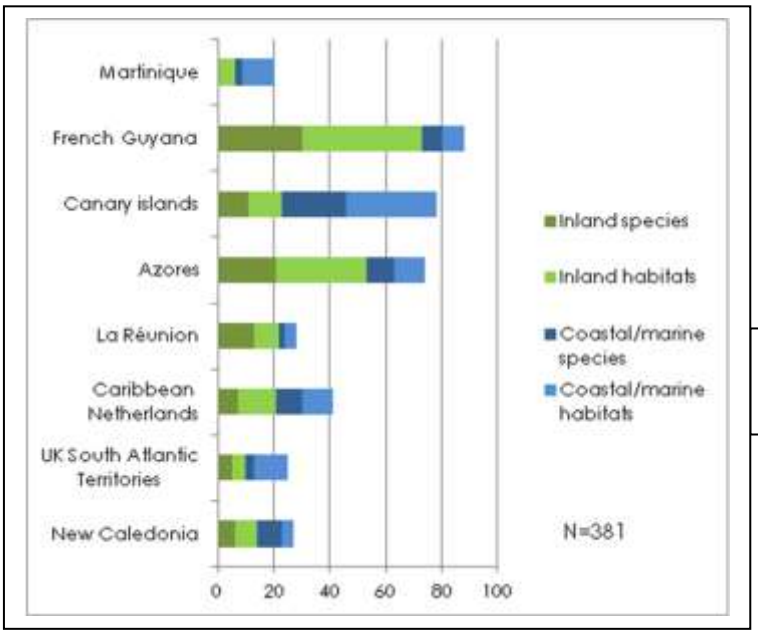


Figure 17a

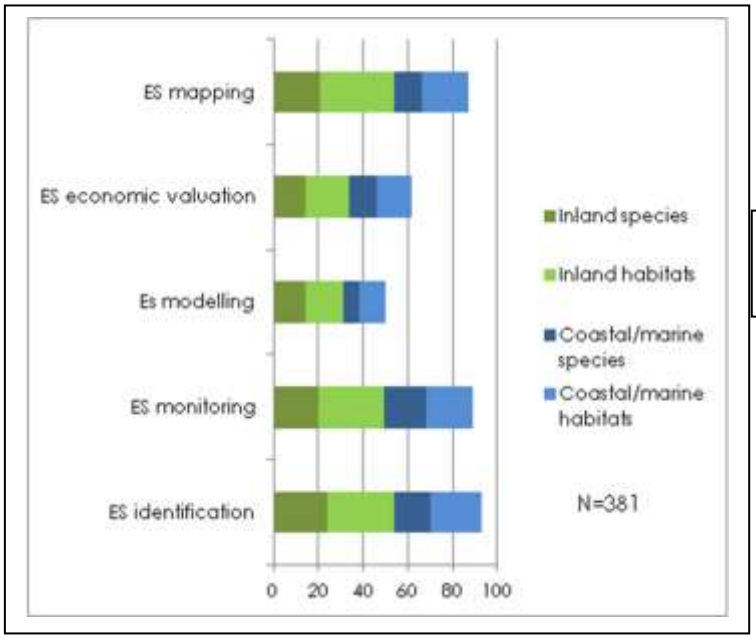


Figure 17b

Figures 17 - Ecosystems concerned by the analysis of ecosystem services in the eight territories monitored by the MOVE project: ecosystems (Figure 17a) and fields of action for all territories (Figure 17b).

Figure 18 shows the distribution of reported shares in each of the eight territories.

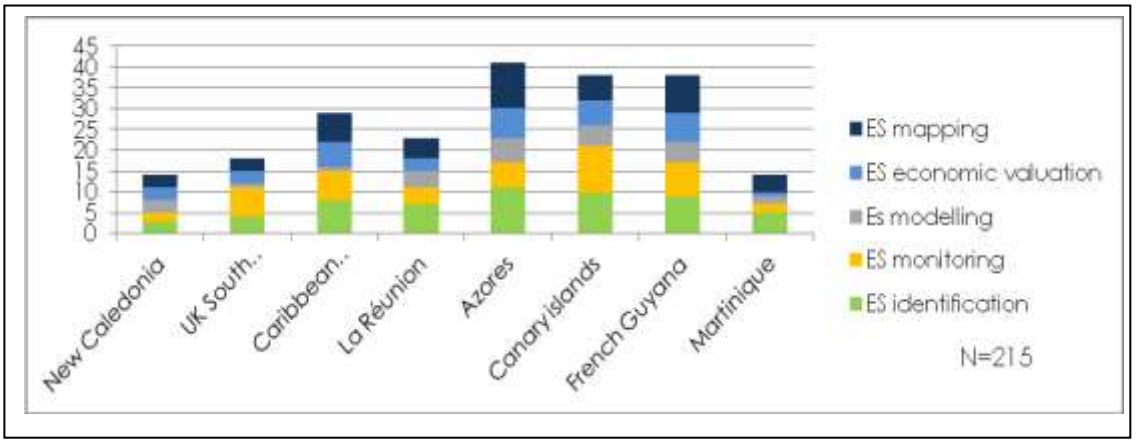
The largest number of declarations is provided by stakeholders from the Azores, the Canary Islands and French Guiana. The stakeholders are mainly involved:

- In the Azores, and in French Guiana in the mapping, economic evaluation and modeling of Ecosystem Services;
- In the Canary Islands, and in the Caribbean Netherlands in the identification, and monitoring of Ecosystem Services.

In New Caledonia, except for the modeling of ecosystem services, the declarations of other actions are equivalent. In the other territories (UK Territories in the South Atlantic, Caribbean Netherlands, Reunion Island, Martinique), the action profile focuses on the identification, monitoring and mapping of ecosystem services. These observations are targeted on the territory. There is no significant effect of the territory on the types of actions concerning work on ecosystem services[15].

Except for ecosystems, the assessment of the independence of actions on ecosystem services regarding the territories' locations is confirmed by the low probabilities of rejection of the independence hypothesis. This result suggests a context of non-specific treatment of the service concept by territorial stakeholders.

However, the absence of an effect related to territorial location does not diminish the significance of the results observed in each territory.



[15] The independence test applied to the fields of action affiliated to ES according to ecosystems for all eight territories confirms the independence hypothesis (Chi 2 is 13.54 for 28 degrees of freedom) with a 5% probability of independence rejection.

Figure 18 - Investment of territorial stakeholders in the fields of actions of the study of ecosystem services in the eight territories monitored by the MOVE project.

2. Domains of activity related to Ecosystem Services

Domains' of activity, such as conservation, exploitation, management and planning and knowledge acquisition, are related to work on ecosystem services. Figure 19 shows the distribution of domains of activity benefiting from the fields of action (identification, monitoring, modeling, evaluation and mapping) related to ecosystem services.

The Azores and French Guiana account for half of the declarations. The main areas of activity are on a territorial scale:

- Conservation in the Caribbean Netherlands, the UK Territories in the South Atlantic, and the Canary Islands;
- Management and planning in New Caledonia and the Azores;
- Knowledge acquisition in Reunion Island, French Guiana and the UK Territories in the South Atlantic.

The variation in the domains of activity according to the territories is not significant[16]. However, it is possible to identify at the scale of each territory the predominant issues. Furthermore, the Azores and French Guiana show a predominant investment in conservation, management and planning and knowledge acquisition.

Additionally, territorial stakeholders were asked to communicate the expected results of a management work integrating the concept of *Ecosystem Services*. This is perceived as a contribution to economic approaches to environmental valuation (E. COSTANZA et al., 2017).

[16] The application of the test for the independence hypothesis rejects it with a probability of 50% (Chi2 is 19.467 for 21 degrees of freedom).

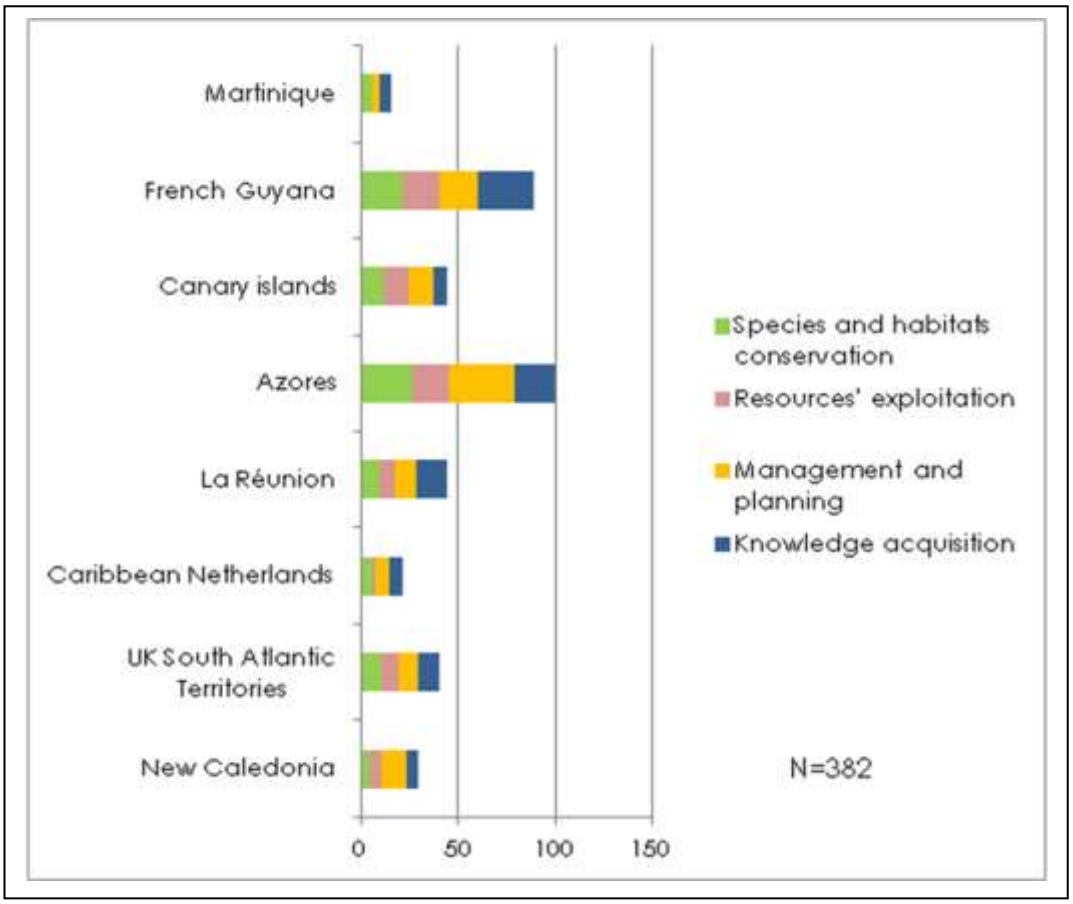


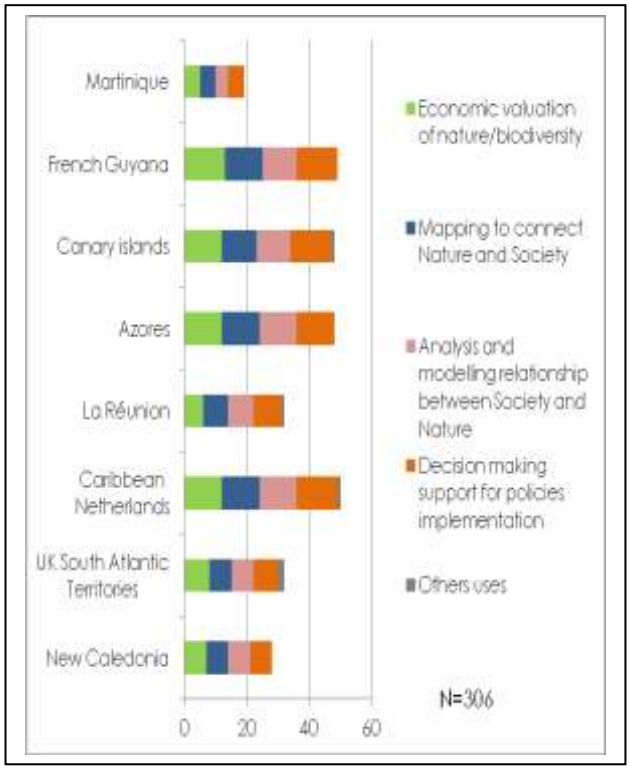
Figure 19 - Domains of activity concerned by ecosystem services actions in the eight territories monitored by the MOVE project.

3. The results expected by a management integrating the concept of ecosystem services

Territorial stakeholders are asked to assess the level of relevance of four results from an analysis of ecosystem services. These expected results or outputs are:

- Economic valuation of Nature and biodiversity,
- A mapping of the links between Nature and Society;
- Modeling the links between Nature and Society;
- An aid to public decision-making in environmental management.

Figures 20 present the representation of stakeholders with regard to these outcomes and/or objectives for all degrees of relevance and for the high degree of relevance.



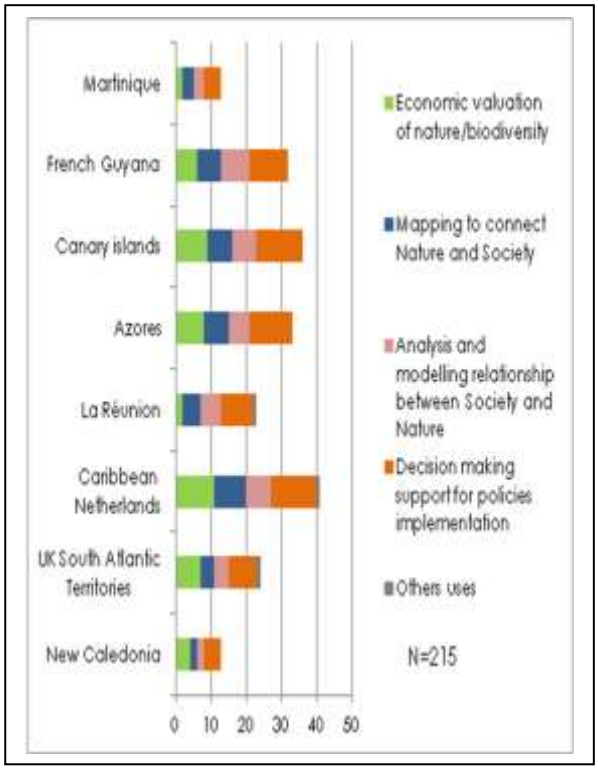


Fig.20a - All degrees of relevance **Figure 20b- High degree of relevance**

Figures 20 - Relevance of the products resulting from an ecosystem services analysis in the eight territories monitored by the MOVE project: all degrees of relevance (Figure 20a) and high degree of relevance (Figure 20b).

In general, all degrees of relevance combined, French Guiana, the Canary Islands and the Caribbean Netherlands are required by the rate of declarations. At the level of each territory, the number of reports varies little according to the expected products. Nevertheless, decision support for the implementation of public policies seems to be the predominant product.

Representations that are highly relevant also indicate a predominance of responses for a product that supports public policy decision-making. This observation is an expression of the need to incorporate the concept of Ecosystem Service into public policies (G. SERPENTIE et al., 2012). The need for

an economic evaluation is expressed predominantly in the Azores and the Caribbean Netherlands.

Between territories, variations of ecosystem services results expected are not significant (Appendix 8b). On the other hand, the choice of products according to the level of relevance, for all territories combined, significantly indicates the preferential choice of all stakeholders for public decision-making support (Figure 21)[17].

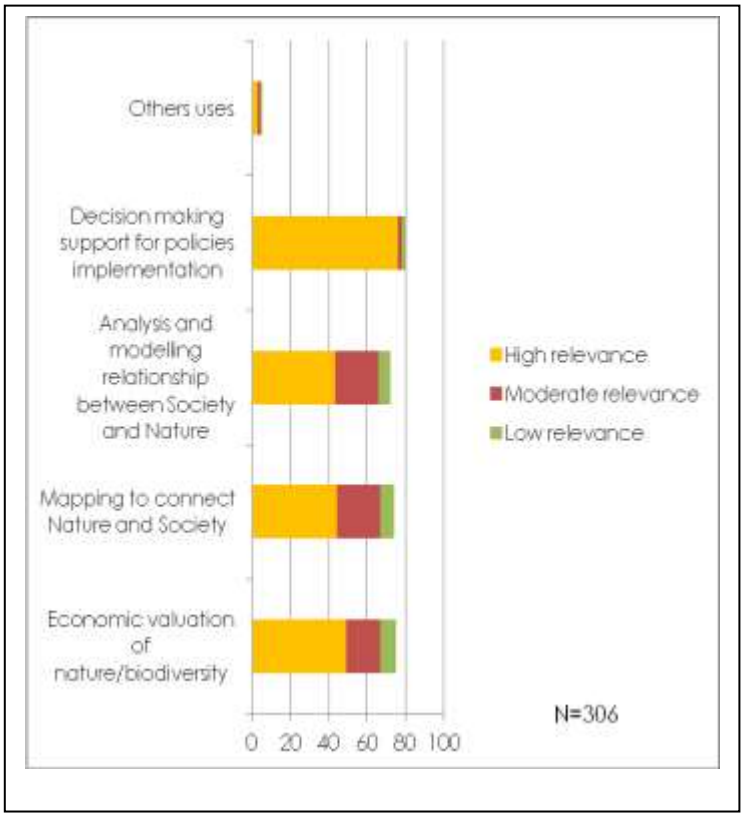


Figure 21 - Expected products by the stakeholders involved in the work on ecosystem services in all eight territories studied by the MOVE project.

The achievement of useful results and/or products from ecosystem services analysis depends on material and human resources. Their absence constitutes

[17] The application of the Chi2 test to the comparison between expected results and level of relevance leads to rejecting the independence hypothesis with more than 99.5% probability (Chi 2 is 34.63 for 8 degrees of freedom)

a constraint and, for some, obstacles considered as "bottlenecks" for the ES's assessment and mapping.

4. Constraints and bottlenecks initiated by the lack of resources

Six groups of resources have been identified and proposed for the choice of territorial stakeholders called upon to decide on the constraints and obstacles or bottlenecks initiated by their absence. It is a lack or absence of:

- Technical expertise;
- Computers and software;
- Financial resources;
- Access to data and images;
- User network;
- Dedicated projects.

Figure 22 presents, by territory, the number of reports assigned to each category of resources whose lack is a constraint (Figure 22a) and, further on, a bottleneck (Figure 22b)

Declarations of constraints initiated by a lack or absence of resources mainly recorded in the Canary Islands and Azores (46% of the total number of declarations). The Caribbean Netherlands, the UK Territories in the South Atlantic and French Guiana have a smaller but still significant number of declarations (36% of the total number).

The Caribbean Netherlands and Azores have a similar profile. The absence of the most constraining resource is constituted by the combination of a lack of hardware (Computers and software), funding and access to data and/or images. The Canary Islands stakeholders have a representation of the constraints linked to the lack of resources comparable to that of the Guyanese stakeholders. In either territories, the lack or absence of technical expertise, funding and dedicated projects are decisive. These territorial variations have been tested as significant[18].

[18] The application of the Chi2 test leads to rejecting the hypothesis of independence with 90% probability (Chi 2 is 52,972 for 35 degrees of freedom)

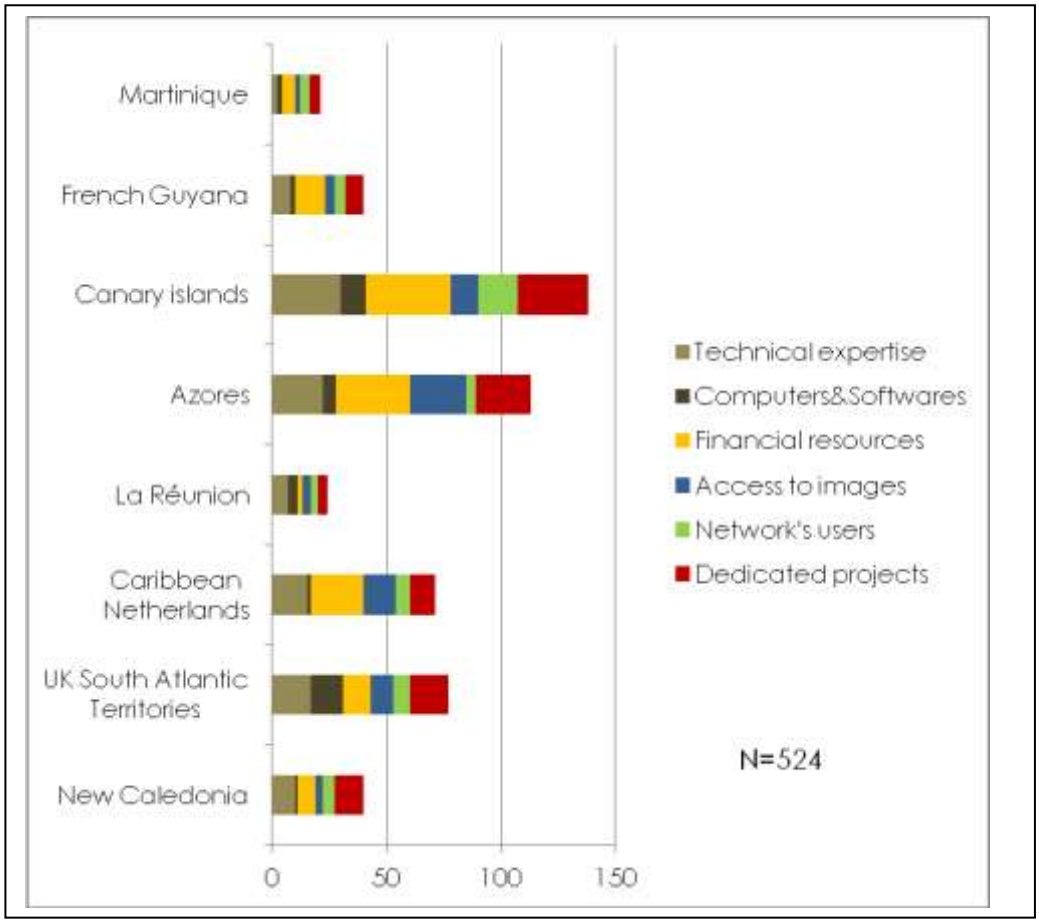


Figure 22a - Territories' assessment of resources whose lack is perceived as a constraint.

In the other territories, the constraints for the ES's assessment and mapping are the lack or absence of:

- Technical expertise in New Caledonia, the UK OTs and La Reunion,
- Computer equipment in the UK Territories in the South Atlantic,
- Financial resources in New Caledonia and Martinique,
- Projects dedicated to New Caledonia, the UK Territories in the South Atlantic, Reunion Island and Martinique.

Figure 22b- Territories' assessment of resources whose lack is perceived as a bottleneck.

Figures 22 - Constraints and bottlenecks caused by the lack of resources in the territories monitored by the MOVE project.

French Guiana, the Canary Islands, La Reunion and the UK Territories in the South Atlantic record 90% of resource shortages as bottlenecks for ecosystem services assessment and mapping. In French Guiana, the lack of technical expertise, financing and dedicated projects is crucial. In the Canary Islands, this is complemented by access to data and images and the existence of a user network. This is also decisive in La Reunion. In the UK Territories in the South Atlantic, the lack of computer equipment and dedicated projects is a bottleneck. These variations are not significantly related to the territory's location[19].

[19] The application of the Chi2 test (24.952 for 30 degrees of freedom) to the lack of resources perceived as a bottleneck leads to reject the hypothesis of independence with 25% probability.

In order to better assess the needs of territories' stakeholders to assess and map ecosystem services, they are asked to assess the degree resources' needing to achieve this objective. This question completes their assessment of the constraints related to their absence and helps to ensure the consistency of the representations.

5. Resource's requirements for the assessment and mapping ecosystem services

Figures 23 present respectively the needs of seven categories of resources (computer equipment, expertise, data and/or images, funding, user networks, dedicated projects and others) assessed as high and medium or low, respectively.

For all eight territories studied by the MOVE project (Figures 23a and 23b), the additional financial resources and the existence of dedicated projects are considered as priority resources. Technical expertise, access to data and images and the existence of user networks are also cited, to a lesser extent, by territorial stakeholders. These three resources are with computer hardware (computers and software) rather considered to be of medium or low necessity.

The resources assessed as priorities are mainly declared (Figures 23c) in the Canary Islands, Azores, Caribbean Netherlands and French Guiana. Additional financial resources, technical expertise and dedicated projects are declared a priority. In Azores, the need for access to data and images is also perceived as essential.

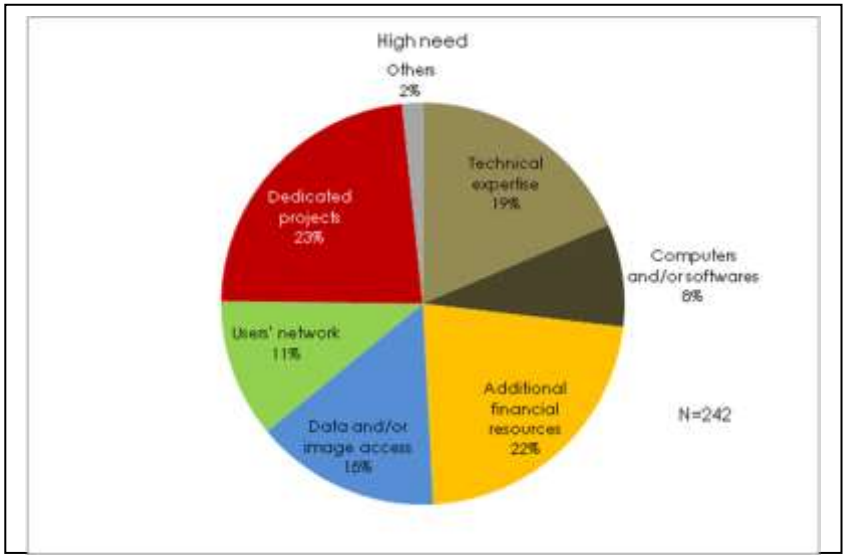


Figure 23a - Priority needs across the eight territories monitored by the MOVE project

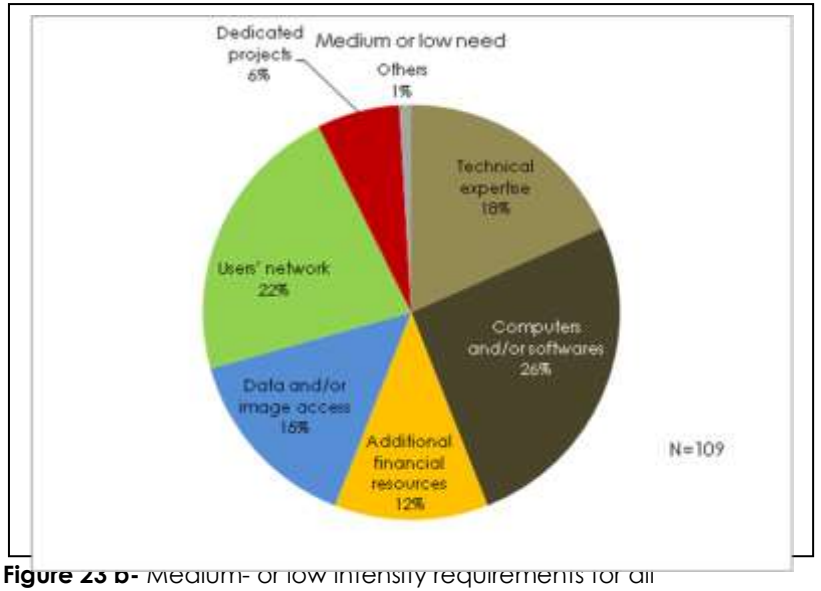


Figure 23 b- Medium- or low intensity requirements for all eight territories monitored by the MOVE project

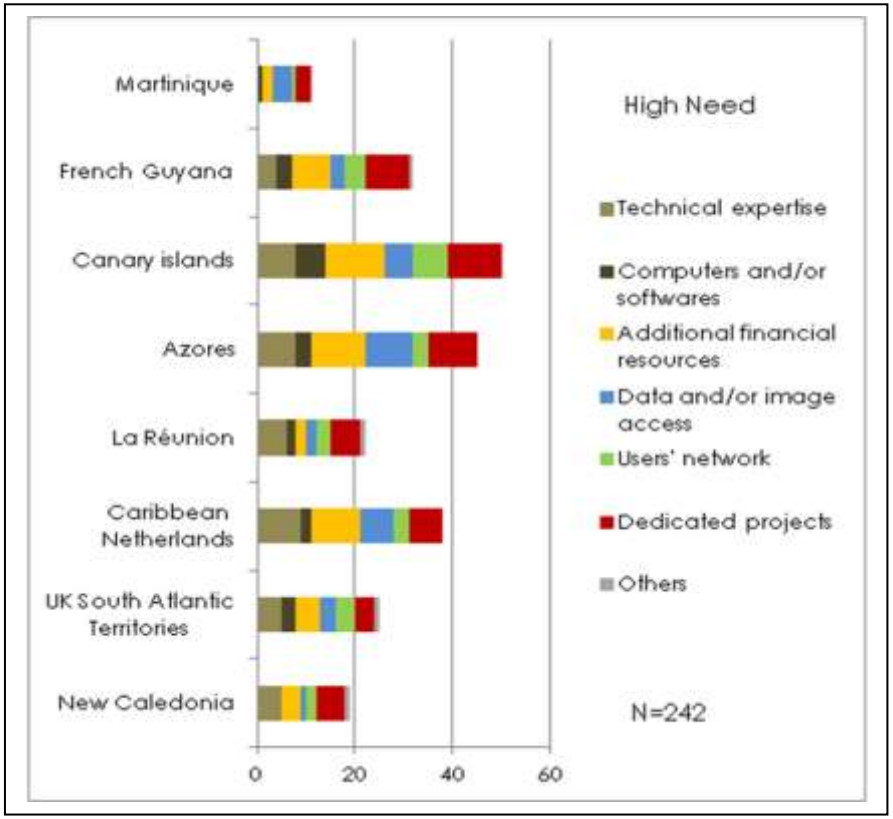


Figure 23 c - Priority needs by territory.

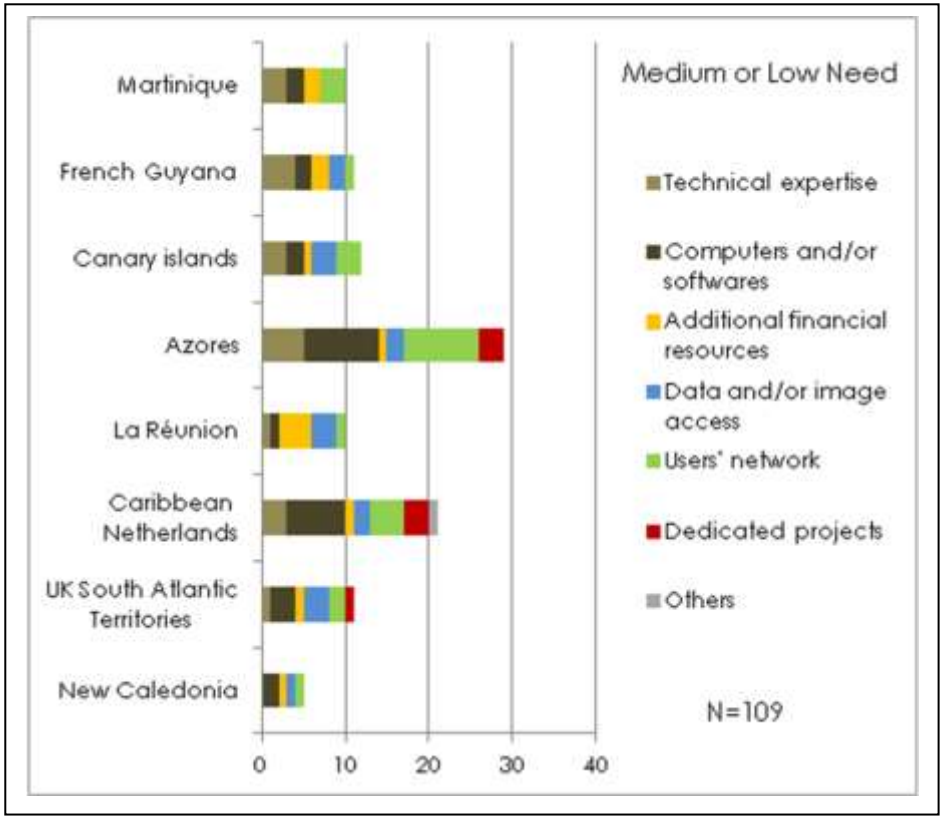


Figure 23 d - Low- or medium intensity needs by territory.

Figure 23 - Resource requirements to assess and map ecosystem services in the eight territories monitored by the MOVE project.

Azores and the Caribbean Netherlands are the territories where the expression of medium or low needs is predominant. In these territories, computer resources (computers and software) are perceived, because of their availability, as a non-urgent need. This is legally the case in the UK OTs in the South Atlantic. This situation also applies to the availability of user networks in Azores.

In La Reunion, the additional financial resources are not declared as essential. In New Caledonia, financial resources, technical expertise and dedicated projects are cited as a predominant need.

The application of the test for assessing the independence of declarations by territory confirms that the territory has no influence on the expression of priority resource needs[20]. On the other hand, the territory has an influence in the expression of needs considered as medium or low intensity[21]. In this context, stakeholders express significant preferences for certain resources. The variability appears to be impacted by the existence of dedicated projects identified as a priority resource and the availability of IT equipment perceived as a medium or low need due to its omnipresent presence. At the territorial level, the Azores and the Caribbean Netherlands express in a preponderant but non-priority way the need for computer equipment, user networks and dedicated projects.

The evaluation of the involvement of territorial stakeholders is also measured by the expectations expressed regarding the mapping and usefulness of the ecosystem services.

[20] The application of the test for assessing the independence of the territories with regard to priority need confirms the independence hypothesis (Chi2 is 29,589 for 42 degrees of freedom).

[21] The application of the test for assessing the independence of the territories with regard to the need for medium or low intensity establishes the rejection of the independence hypothesis at 99.5% probability (Chi2 is 70.24 for 42 degrees of freedom).However, the application of the independence evaluation test between the degrees of need (high and medium or low) establishes the rejection of the independence hypothesis at 99.5% probability (Chi2 is 39.02 for 6 degrees of freedom).

6. Stakeholders' expectations regarding the mapping and assessment of Ecosystem Services

Figures 24 present the opinion of territories' stakeholders regarding the incentive role of mapping on the interest and use of the concept of *Ecosystem Services* for territorial management.

The vast majority of the stakeholders surveyed (94%) believe that mapping helps the study of ecosystem services and their use in the management of natural environments and further into the territory. However, French Guiana and, to a lesser extent, Reunion Island, have certain opposing points of view. In French Guiana, some stakeholders involved in agriculture consider maps to be of little use in describing and evaluating the services provided by the forest cover that occupy most of the country. The motivations of the Reunionese stakeholders are less clear and would rather focus on the merits of mapping marine environments.

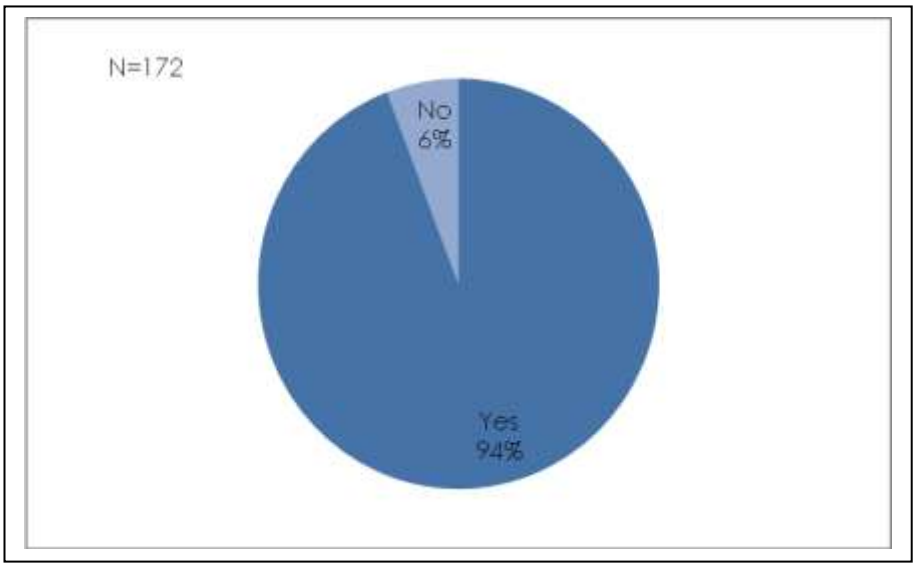


Figure 24 a - Stakeholders' opinion in the eight territories monitored by the MOVE project.

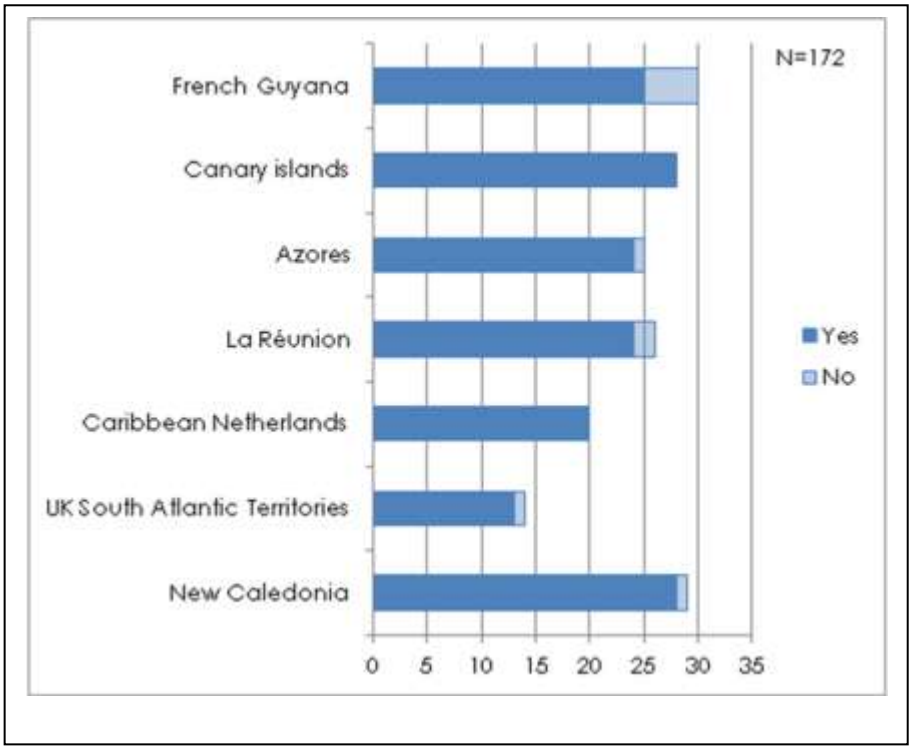


Figure 24 b - Stakeholders' opinions on each of the eight territories monitored by the MOVE project.

Figures 24 - Position of territorial stakeholders with regard to the incentive role of mapping in the use of ecosystem services.

Figures 25 present the views of stakeholders (as a whole and in each territory) on the usefulness of assessing and mapping ecosystem services.

For all eight territories, the majority of stakeholders expect decision support and the acquisition of new technical skills. Their opinion on attracting the interest of the European Union to their territory and on the monetary valuation of services is more mixed (Figure 25a).

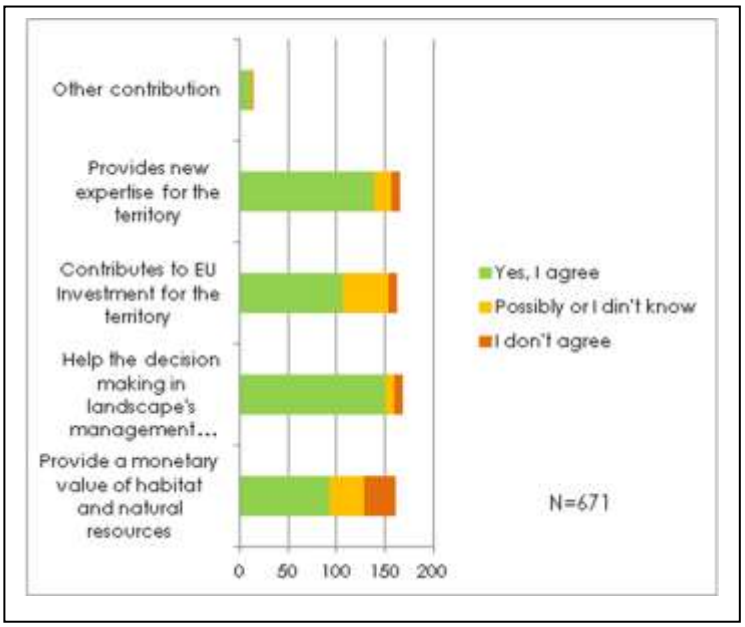


Figure 25 a - Overall view of the outputs expected by the stakeholders for all eight territories monitored by the MOVE project.

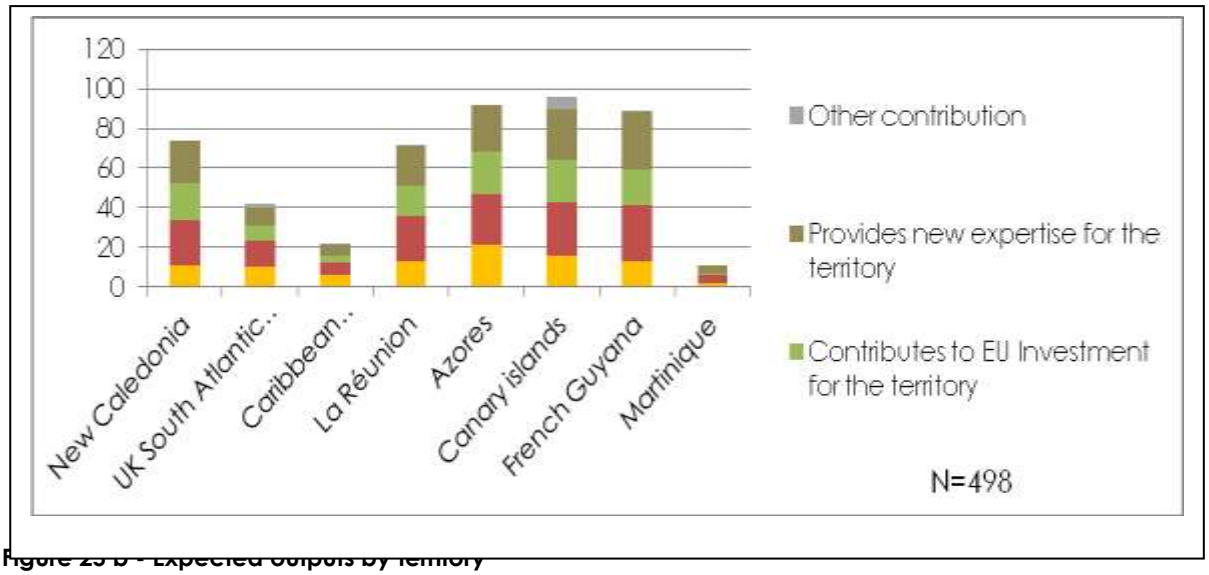


Figure 25 b - Expected outputs by territory

Figures 25 - Expected outputs by stakeholders for the evaluation and mapping of ecosystem services.

At the territorial level, the general expectation of stakeholders regarding decision support and the acquisition of new expertise is confirmed. However, the Caribbean Netherlands and the UK OTs, the stakeholders namely expect

that the mapping and assessment of ecosystem services can provide a monetary estimate of the value of habitats and natural resources. New Caledonia, Reunion Island, French Guiana and the Canary Islands declare an expectation of European Union investment in their territory.

The application of a test assessing the independence of the territories with regard to the objectives sought, significantly estimates this independence[22]. On the other hand, for all territories combined, the test indicates a significant variation in the expectation of these objectives[23]. The monetary valuation of the services provided by Nature significantly influences the opinion that refuses this output resulting from the assessment and mapping of Ecosystem services. The role of the European Union in involving the territory in the assessment and mapping of Ecosystem Services, is also a source of variability initiated by the uncertainty of stakeholders regarding the EU's investment.

Stakeholders were also asked to name work and/or research projects related to or directly related to Ecosystem services. These are works in which these stakeholders are directly involved and projects outside their field of action, but they have knowledge in their region. This information provides an overview of local stakeholders' involvement in Ecosystem services.

[22] The application of the test for assessing the independence of territories with regard to the expected objectives of the work on Ecosystem Services confirms the rejection of independence at 10% probability (Chi2 is 21.518 for 28 degrees of freedom).

[23] The application of the independence evaluation test between the acceptance levels (confirmed, uncertain or invalidated) establishes the rejection of the independence hypothesis at 99.5% probability (Chi2 is 81.589 for 8 degrees of freedom).

PART V – Overview of projects related to Ecosystem Services identified by territories stakeholders

The analysis of the territorial landscape of works related to or directly related to ecosystem services (Appendices 9) makes it possible to evaluate:

- The comparative proportions of projects invested and known projects;
- The progress of all projects;
- The distribution of the domains of activity according to the type of ecosystem.

Figure 26 shows, for the eight territories, the comparative proportions of projects related to Ecosystem services, directly invested or known by local stakeholders.

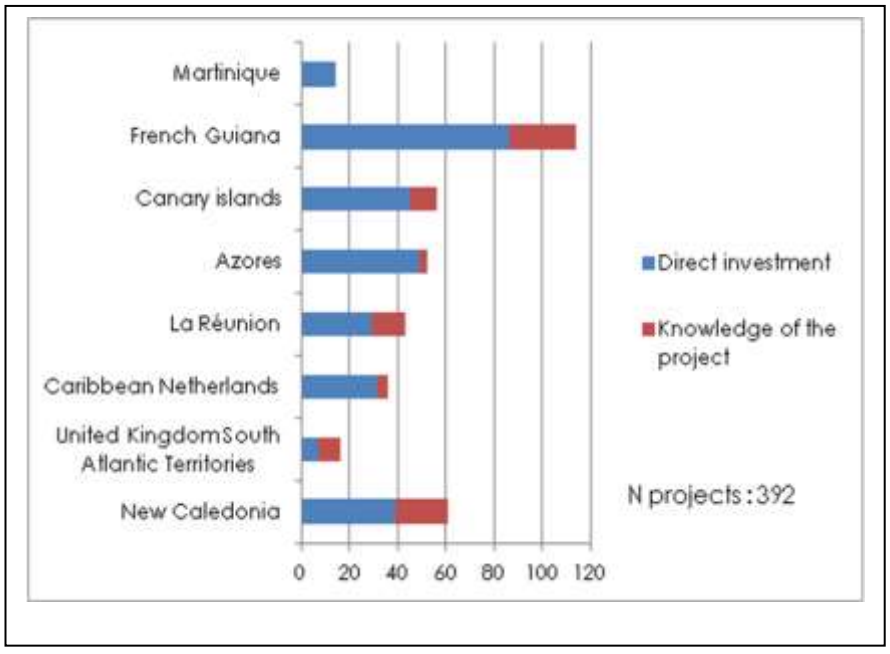


Figure 26 - Territories' stakeholders' Involvement in projects related to Ecosystem services.

French Guiana, New Caledonia, the Azores and the Canary Islands account for more than half of the projects declared. For the eight territories, the projects directly invested by stakeholders informing the survey are predominant. French Guiana, New Caledonia and, to a lesser extent, the

Canary Islands and La Reunion, have a significant level of knowledge of the stakeholders involved in other projects.

Figure 27 shows the status of projects at the time of the survey.

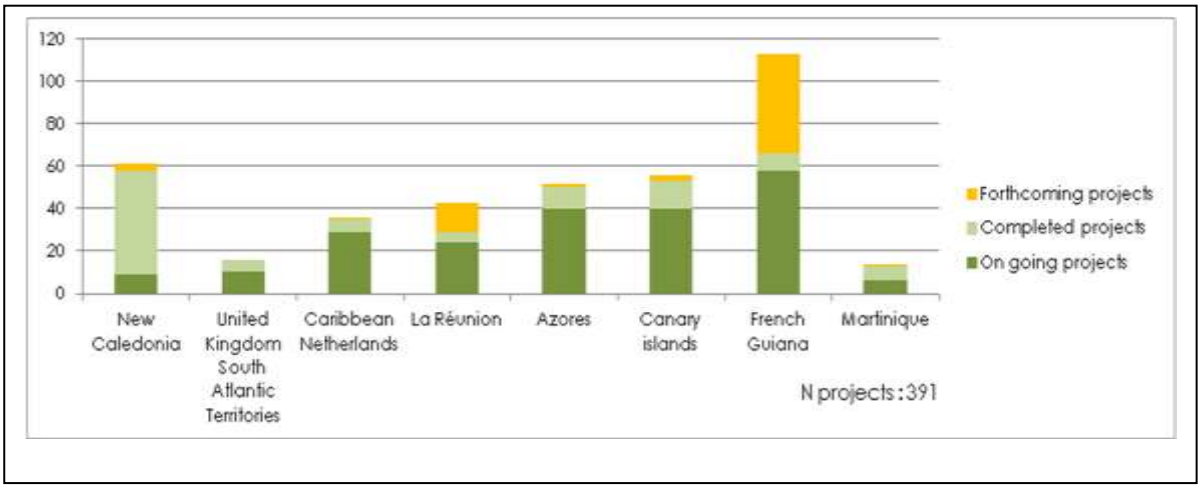


Figure 27 - Status of projects related to Ecosystem services.

In almost all of the eight territories, the number of projects in progress exceeds the number of completed or future projects. However, in New Caledonia, the ratio is reversed with a majority of projects completed. In French Guiana, the number of future projects is close to the number of ongoing projects. Future projects are also mentioned in significant proportion in La Reunion.

Three groups of territories stand out in terms of investment in projects related to ecosystem services:

- A proven experience for New Caledonia and French Guiana that shows a strong investment in the future;
- An investment in development in the Canary Islands, Reunion Island and the UK OTs in the South Atlantic with a strong projection of Reunion Island for future projects;
- An investment limited to the project by the stakeholders on the concept of service in the Caribbean Netherlands, Azores and Martinique.

The description of the projects makes possible to identify their field of activity and the ecosystems or parts of ecosystems concerned (Appendices 9).

Figures 28 present, for each territory, the distribution of the fields of activity deployed in four parts of the ecosystem.

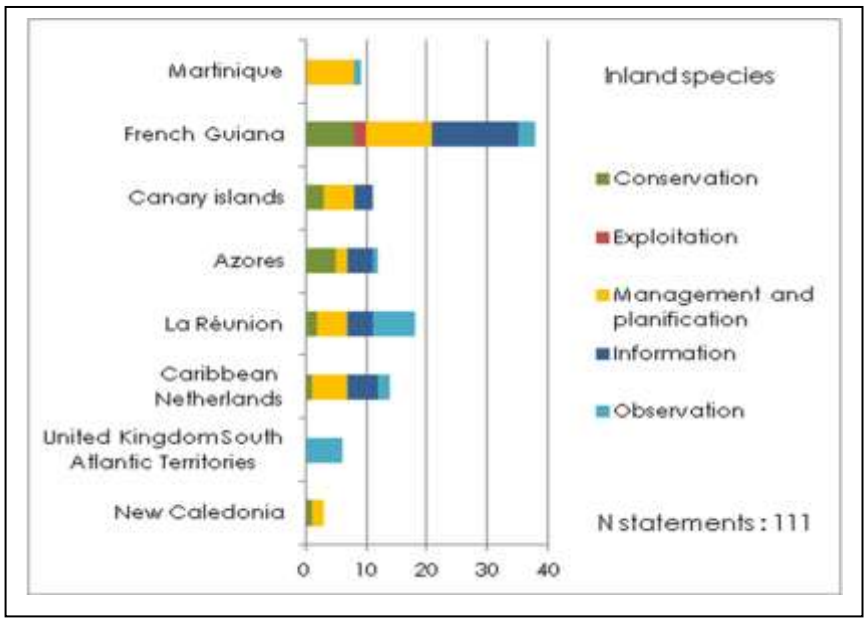


Figure 28 a - Domains of activity in terrestrial species' projects.

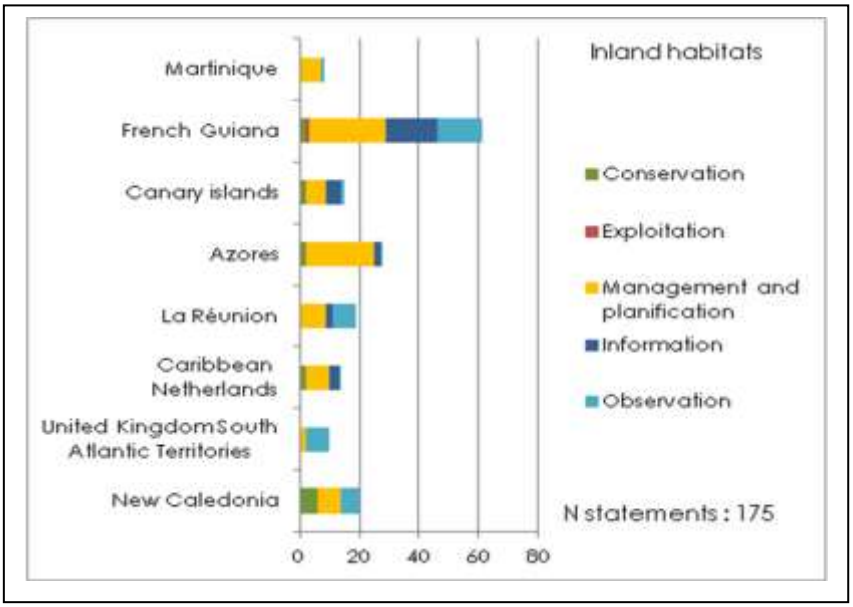


Figure 28 b - Domains of activity in terrestrial habitats' projects.

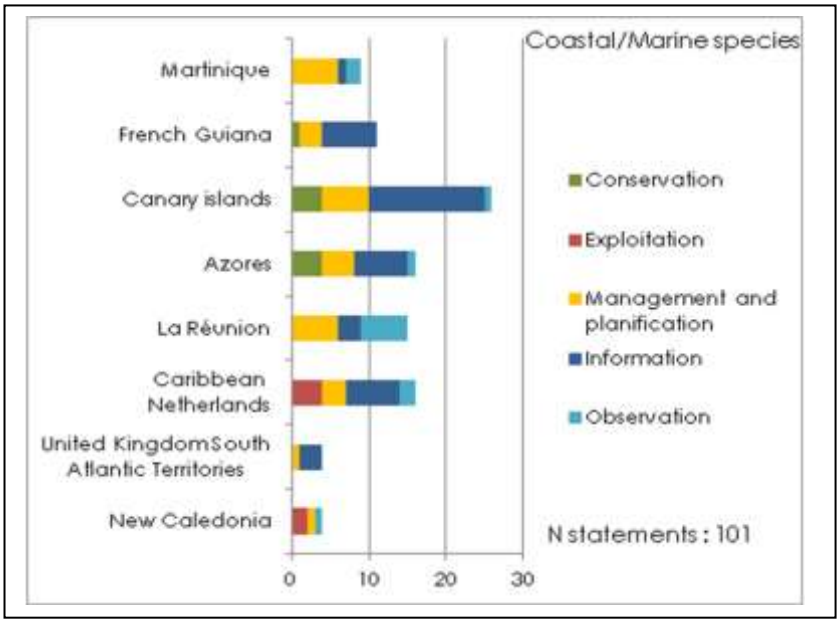


Figure 28 c - Domains of activity in projects devoted to coastal or marine species.

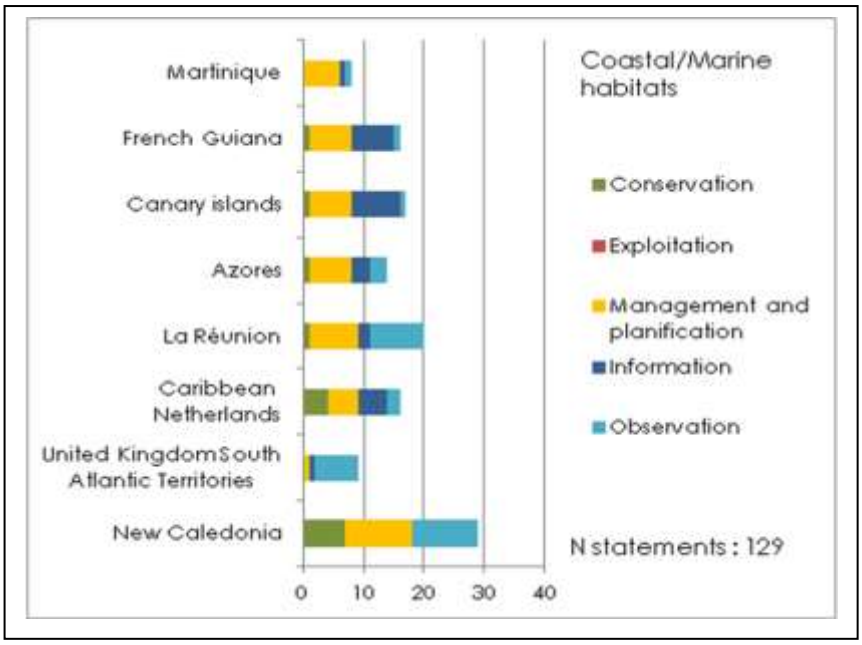


Figure 28 d - Domains of activity in projects devoted to coastal or marine habitats.

Figures 28 - Domains of activity in projects related to terrestrial, coastal and/or marine species and habitats.

In terrestrial ecosystems, the main domains of activity for fauna and flora species are conservation, management and planning, and the collection of information acquired through monitoring that integrates direct measurements and spatial observations. In terms of terrestrial habitat, the main domains of activity deployed are management and planning, and the collection of spatial information.

French Guiana, Reunion Island and the Caribbean Netherlands report a preponderant number of projects devoted to terrestrial species. French Guiana is particularly invested in conservation and has projects dedicated to exploitation. With French Guiana, the Azores and New Caledonia declare projects mainly dedicated to terrestrial habitats. New Caledonia invests in conservation, management and planning projects and in spatial observation of territories.

In coastal or marine ecosystems, projects that focus on fauna and flora species are concerned with conservation, management and planning and, for the most part, the acquisition of knowledge through spatial measurements or observations. The Canary Islands, the Azores, the Caribbean Netherlands and, to a lesser extent, La Reunion, report a significant number of projects (73% of the total number). Conservation is integrated by the Canary Islands and the Azores. The Caribbean Netherlands is developing projects on resource exploitation.

For coastal or marine habitats, New Caledonia, La Reunion, the Canary Islands, French Guiana and the Caribbean Netherlands account for 73% of the projects identified in the eight territories. Conservation is the main field of activity in New Caledonia and in the Caribbean Netherlands. In the other territories, the main domains of activity remain management and planning, and the acquisition of spatial information and observations.

After this inventory of projects carried out in relation to ecosystem services, the stakeholders were asked to express their expectations of the MOVE project, which offers expertise and training in the evaluation and mapping of ecosystem services.

PART VI – The expectations of territories' stakeholders regarding the offer proposed by the MOVE project.

The question about the stakeholders' expectations to the MOVE project is open. It allows for any expression relating to the constraints encountered by the stakeholders, their questions relating to the validity and application of the concept of *Ecosystem Services* and, ultimately, to a precise request in terms of the means and objectives necessary to apply and develop the use of the concept of service. The diversity of the 131 opinions collected in the eight territories requires a method of codifying the themes addressed (Appendix 10).

The opinions examined in all their extension are summarized. In each summary notice, one or more keywords are identified. Fifty-eight keywords were evaluated and 194 uses were made of them in the eight territories.

The 58 keywords have been classified into eight fields of activity whose expression is ensured by these keywords. Table 4 presents these fields of activity, to which are associated the keywords explaining the stakeholders' requests for the MOVE project.

Each keyword thus expresses an expectation of the MOVE project. An opinion can express several expectations and it is then logical to consider that the number of keywords' use (194) exceeds the number of opinions (131). Figure 29 shows, for all eight territories, the distribution of thematic groups identifying stakeholders' expectations.

The request for clarification of the concept of *Ecosystem Services*, the expectation of resources following the application of the MOVE project and the hope of applications of economic scope are expressed by more than half (54%) of the opinions. The other themes are addressed in a comparable way, with a minimum for a request relating to the link between Man and Nature. This is an observation that indicates a lack of integration of the socio system into a strategic framework for action based on an operational socio-ecological system for the ecosystem services' approach (K. VEIDEMANE et al., 2017). From a global point of view, the stakeholders of the overseas European

territories are in the process of implementing the concept of *Ecosystem Services* and, consequently, are in need of resources and practice.

Table 4 - Keywords codifying the stakeholders' expectations with regard to the MOVE project.

Key words explaining the stakeholders' expectations to the MOVE project	Domains of activities referred to the stakeholders' expectations stated to the MOVE project
Actions and decisions	**Education- Restoration- Sensitization-To early (to act)- Actions/Activities-Extend-Decision (Help the decision)**
Data and knowledge acquisition	**Knowledge- Base- Database**
Economy application	**Cost- Economy- Integration-Investment-Products- Results-Sustainable-Application-Development-Valuation/Value-Management-**
***Ecosystem Services* concept's clarification**	**Acceptance- Do not know (what is ecosystem services) - Ecosystem Services assessment- Nothing (waiting for ecosystem services) - Identification-Understand/Understanding- Ecosystem Services concept- Information-Clarification.**
Expected resources	**Geomatic Images- Modeling-Collaboration- Training-Network/Networks- Expertise-Funding/Funding's.**
Link Man and Nature	**Connect (Man and Nature) - Man and Nature- Link/Links.**
Methods and tools acquisition	**Indicators- Tools- Method/Methods.**
Spatial analysis	**Areas- ecosystem services mapping-Spatial/Spatial-Mapping/Maps.**

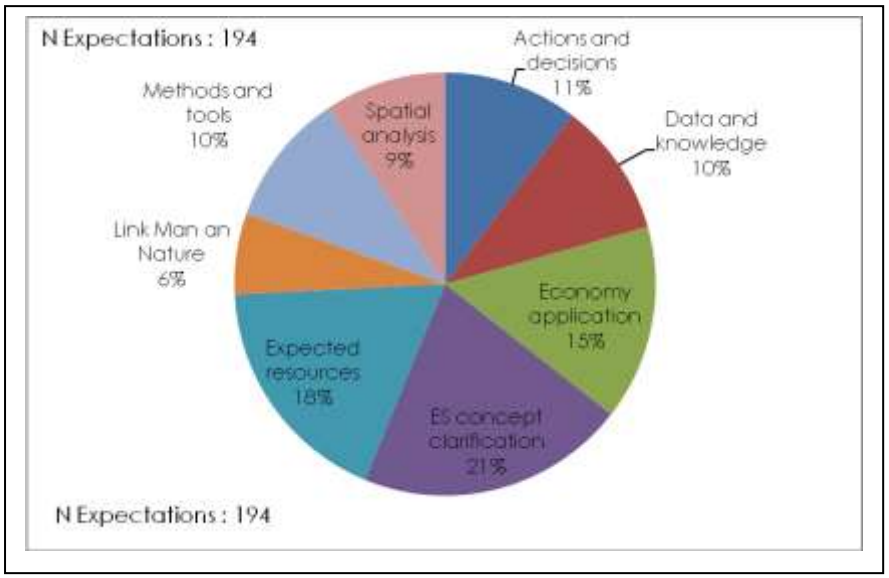


Figure 29 - Themes expected by all the territories studied in the MOVE project.

The analysis at the territorial level (Figure 30) shows a variation in this demand.

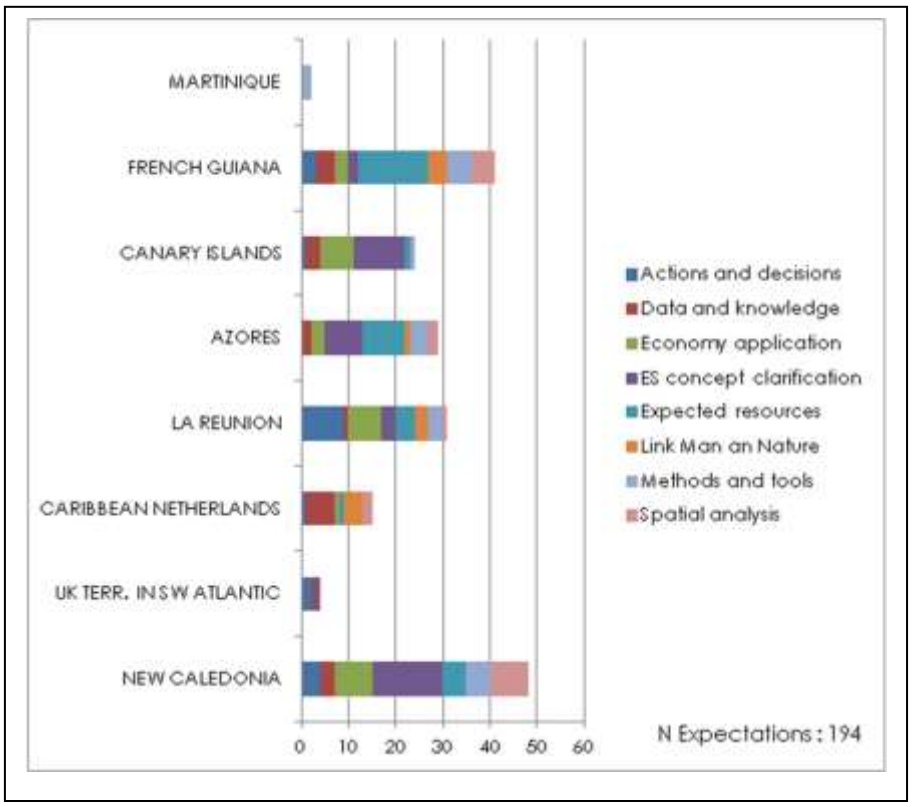


Figure 30 - Themes expected by stakeholders in the eight territories studied by the MOVE project.

Priority requests indicate:

- A need for clarification of the concept of *Ecosystem Services* in New Caledonia and the Canary Islands;
- A request for resources in French Guiana and the Azores;
- The concern for economic applications in New Caledonia, Reunion Island and the Canary Islands;
- Data collection and knowledge acquisition in the Caribbean Netherlands;
- The usefulness of spatial analyses in French Guiana and New Caledonia.

This first observation should be tested to confirm the significance of the observed variations[24]. The application of the Chi test indicates that these are related to the territory. The analysis of Chi2 by territory and theme (Appendix) provides more information on the specificities of territorial requests (Table 5).

The request for clarification of the concept of Ecosystem Service (New Caledonia, Canary Islands and French Guiana) and for decision support (UK OTs in the South Atlantic, La Reunion and Azores) are the two most referenced themes. To a lesser extent, the demand concerns the need for resources (Azores and French Guiana) and the need to link environmental issues with the needs of societies (New Caledonia and the Caribbean Netherlands). The demand for methods and tools (Martinique), data and knowledge acquisition (Caribbean Netherlands), and economic applications (Canary Islands) are themes that are only required by one territory.

[24] The application of the independence evaluation test between the themes relating to the actors' requests establishes the rejection of the independence hypothesis at 99.5% probability (Chi2 is 127.823 for 49 degrees of freedom).

Table 5 - Significant specificities of territorial requests for the MOVE project

	New Caledonia	UK Ter. In SW Atlantic	Caribbean Netherlands	La Reunion	Azores	Canary islands	French Guiana	Martinique
Actions and decisions								
Data and knowledge acquisition								
Economy application								
Ecosystem Services concept clarification								
Expected resources								
Link Man and Nature								
Methods and tools acquisition								

All these results from the analysis of potential and/or actual users of the ecosystem service concept indicate a global context and territorial specificities. The latter, tested as significant in the investments of stakeholders in ecosystems and their services, make it possible to identify groups of territories. The objective is to facilitate the MOVE project's actions in the assessment and mapping of ecosystem services in the European overseas territories.

PART VII – Analysis of territorial specificities.

The application of a test evaluating the independence of observations made in each of the territories led to the identification of a territorial effect in the process of ownership of MAES by the stakeholders. Appendix 11 lists the results of the independence test carried out at each stage of the investment analysis and the expectations of stakeholders in the assessment and mapping of ecosystems and their services. These three types of action have been identified in the work on ecosystems and ecosystem services. A summary of these results is presented in Table 6

The assessment and mapping of ecosystems and their services is guided by a territorial specificity that applies to the choice of ecosystem types. In the field of work dedicated to ecosystems, territorial choices are marked in terms of tools, methods and mapping. In the field of work on ecosystem services, territorial stakeholders have specific positions in terms of using the concept, representing constraints and expectations with regard to the MOVE project.

Table 6 - Identification of a territorial effect in stakeholder involvement

Topics	Significant variation according to territory location
Ecosystems services uses' frequency	Significant variation according to territory location
Ecosystems services 's use	
Ecosystems	
Tools and methods for ecosystem	
Maps' use and need	
Maps' scale	Possible variation according to territory location
Priority resources	
Constraints for ecosystem services work given by the resources' lack	Significant variation according to territory location
Stakeholders' expectations for the MOVE project	

Conclusion

This state of the art in the assessment and mapping of ecosystems and their services in the European overseas territories, aims to go beyond the observation to identify the dynamics of territorial stakeholders in terms of the use of the concept of Ecosystem Service in their management of the natural environment and its resources. This is why the survey, carried out on the three OCTs and the five ORs, offers a path of appropriation of the concept of *Ecosystem Services*. This approach is primarily materialized by the communication of involvements made in the study, monitoring, management and exploitation of ecosystems. Based on this observation, the stakeholder is called upon to express his opinion on its proximity, its use and its expectations with regard to ecosystem services.

For all eight territories, the survey was consulted by 1003 stakeholders; it was informed by 200 stakeholders who make up an initial network formed around the issue of assessing and mapping ecosystems and their services in overseas Europe. This community is an anchor of the MOVE project in these territories.

The distribution of the types of institutions and bodies to which the respondents to the survey belong offers a diversity between the private sector, administrations, research institutes, universities and non-governmental organizations. The latter are more prevalent in the OCTs than in the ORs, where research institutes and universities have responded predominantly.

The proximity of stakeholders to the concept and use of *Ecosystem Services* is impacted by a great diversity of words expressing the concept, a predominance of occasional and/or rare use except in the Caribbean Netherlands, where the stakeholders who informed the consultation claim to use the concept of systemic ecosystem service. Interest in this concept is significant in the European overseas territories, but its use remains secondary, even peripheral to ongoing projects and work.

Ecosystem work and studies are understood as a basis of experience and knowledge useful for the appropriation and use of the concept of ecosystem service. In this context, it appears that French Guiana and Azores concentrate their activities on terrestrial ecosystems; the other territories appear to be more dedicated to marine and/or coastal ecosystems. In the

work on ecosystem services, French Guiana and Azores are joined by Reunion Island in a preference for terrestrial ecosystems. For ecosystem services, the Canary Islands show a strong interest in coastal and marine ecosystems.

The main domains of activity in ecosystem work are biodiversity conservation and the exploitation of natural resources in French Guiana and in Azores. Nevertheless, the most important domains of activity remain the acquisition of knowledge particularly in French Guiana. The stakeholders in Azores emphasize the usefulness of environmental management and planning. In the other territories, the domains of activity seem to be represented in an equivalent way.

The fields of action in ecosystem work do not vary significantly from one territory to another. Within each territory, certain choices seem to be preferred, such as mapping (French Guiana, Canary Islands, Azores, La Reunion, New Caledonia), estimating economic value (French Guiana, Azores) and monitoring the state of ecosystems (French Guiana, Canary Islands, La Reunion, New Caledonia). The work on ecosystem services does not show significant variations between territories. At the territorial level, priority choices are made in terms of mapping (Azores, Caribbean Netherlands), economic value estimation (Azores, Caribbean Netherlands, UK OTs in the South Atlantic), and decision support (French Guiana, Canary Islands, Azores and Caribbean Netherlands).

Mapping is a skill used by the majority of the territories studied. French Guiana and La Reunion report an equivalent rate of maps' users and producers. Rather, use and needs are on large scales and resolutions.

The resources whose lack is perceived as a bottleneck for ecosystem work are financial resources (French Guiana and New Caledonia), access to images (Azores) and technical expertise (UK Territories in the South Atlantic and Reunion Island). In terms of work on ecosystem services, the lack of financial resources (French Guiana, Canary Islands), access to images (La Reunion), technical expertise (French Guiana, Canary Islands) and dedicated projects (French Guiana) gives a representation of bottlenecks close to that perceived in the study of ecosystems.

Variations between territories occur when stakeholders express their needs to assess and map ecosystem services. All the territories highlight the priority of

technical expertise, financial resources and dedicated projects. The influence of the location of the territory is expressed by the demand of the Azores and the Caribbean Netherlands for computer equipment and user networks, which are nevertheless considered as non-priority. Overall, the stakeholders' expectations relate to decision-making support and technical expertise. In addition, the vast majority considers mapping likely to help integrate the concept of *Ecosystem Services* into uses.

Projects referring to ecosystem services are mainly projects in which the stakeholders are directly involved and which are in the process of being implemented. However, the majority of completed projects are in New Caledonia and the proportion of projects in the making is remarkable in French Guiana. In terrestrial ecosystems, management and planning apply to habitats and species for which knowledge is being developed. In coastal and/or marine ecosystems, projects aimed at acquiring information are dedicated to species and projects devoted to management concern habitats.

Stakeholders expect the MOVE project to help clarify the concept of Ecosystem Service and contribute to decision-making and concrete actions. To a lesser extent, they also expect material and human resources and the implementation of projects combining environmental and social issues, thus clarifying the link between Nature and Man.

All these results constitute a landscape of representation and ownership of territorial stakeholders with regard to the assessment and mapping of ecosystems and their services. The territorial variations of this representation are likely to propose specific themes according to the territories or municipalities in the eight territories. It thus appears that territorial location has a significant effect on the demand for resources and products resulting from work on ecosystem services.

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