4. WHERE TO PRIORITISE ALIEN PLANT CLEARING? A CASE STUDY FROM REUNION ISLAND

4.1. INTRODUCTION

Biological invasions threaten global biodiversity and the delivery of ecosystems services worldwide (Pyšek et al., 2020). Despite the constant increase of number of alien species, there are no sign of saturation in the accumulation of these species worldwide (Seebens et al., 2017). Invasive species can cause several damages, to community structure and assembly (Pearson et al., 2018), to survival of native species (Bellard et al., 2016a) and to human well-being (Pejchar and Mooney, 2009). The ecological impacts of these species can be so severe that they are considered as one of the major drivers of biodiversity loss worldwide. Invasive plants species cause damage to biodiversity but also constitute an important barrier for conserving and restoring native ecosystems (D'Antonio and Meyerson, 2002). The management of invasive plant species in natural ecosystems is an expensive and complex task for managers.

Managing biological invasions in biodiversity-sensitive areas is a challenging task given the numerous factors to consider which include the biodiversity value of the area, the impact of invasive species, the spread of invasive species in space and time, and the likelihood of intervention success. Managing biological invasions also require a multi-prongs approach involving a wide range of decision-makers, managers and scientists. How do decision-makers allocate funding for managing invasive species? Which areas, species managers choose to implement control? All these questions suggest the need for a strategic approach to deal with invasive species management and guide priorities for intervention (Pejchar et al., 2020).

Obtaining accurate guidelines for prioritising conservation and restoration actions is possible using conservation planning strategies that include the assessment of potential threats posed by invasive alien plants (Carwardine et al., 2012; Rouget et al., 2004; Tobón et al., 2017; Wilson et al., 2011). Conservation planning is "the process of locating, configuring, implementing and maintaining areas that are managed to promote the persistence of biodiversity and other natural values (Pressey et al., 2007). Addressing biological invasions in conservation planning is possible but have been largely overlooked; only 3.2% of conservation planning papers considered alien species in shaping their conservation plans (Mačić et al., 2018). Even if theoretically it would be necessary to intervene throughout a territory, due to limited resources, in practice it is impossible. Invasive species and invaded areas have to be prioritised in terms of management, so the resources could be allocated where they are likely to be most cost-effective (Krug et al., 2009). The prioritisation studies need to identify where clearing operations should be realised; but the financial resources limit the number and surface of sites that can be actually cleared.

Conservation planning strategies may not have an actual impact and not lead to concrete actions if collaboration between scientists, managers and decision-makers is not optimal. Reducing the research-implementation gap has been recognised as a challenge by several conservation scientists (Knight et al., 2008b; Sunderland et al., 2009). The value of collaboration between managers and scientists is no longer to be demonstrated, but its implementation requires rethinking the conceptualisation of projects and including all stakeholders from the start (Gonzalo-Turpin et al., 2008; Matzek et al., 2015). Managers should not be passive recipient of information but active participant (Dubois et al., 2020) because “conservation is a social process that engages science, not a scientific process that engages society”(Toomey et al., 2017).

In this study, we combined the expertise of managers, decision-makers and scientists working on environmental issues of Reunion Island. Such collaborative approach allowed the identification of biodiversity priority areas in order to prioritising invasive plants species clearing. Reunion Island which is subject to many threats including invasive alien species (Macdonald et al., 1991) is a good case study for spatial prioritisation. Many introduced species are largely naturalised with some highly invasive (Macdonald et al., 1991; Vilà et al., 2011), colonising and threatening the long-term persistence of the biodiversity within the national park (E. Osipova et al., 2017). In this study, we first established the foundations of the partnership and the conceptual framework. We then gathered all spatial data available in a decision-support system to identify plant clearing priority areas based on biodiversity and implementation criteria.

4.2. MATERIAL AND METHODS

4.2.1. Study area

Reunion Island (2,512 km²) is a volcanic island in the Mascarene archipelago (Figure 4.1). Among these islands, Reunion retains the largest proportions of natural areas, untransformed by human activities, which still cover one-third of the island. The persistence of intact ecosystems at the Mascarene scale depends on their effective conservation on Reunion (Strasberg et al., 2005). The average annual rainfall shows an important dissymmetry between the eastern and western parts on the island due to its high reliefs. On the leeward coast (i.e. western side), annual precipitation ranges from 500-1,500 millimetres and can reach 5,000 millimetres on the windward coast. At intermediate altitudes, annual precipitation approaches 12,000 millimetres. The average annual temperature ranges from 26°C at the coast to 11°C at the top. This large range of temperatures and precipitations leads to a very heterogeneous vegetation landscape ranging from tropical forest to alpine meadow (Cadet, 1977), with an important endemism rate. Since 2007, a national park covers 40% of the island and the UNESCO World Heritage designation (Mittermeier et al., 2005), partly due to these particularities, appeared in 2010. In 2017, the UNESCO calls for caution in the management of alien plant species on the island, noting that the situation is deteriorating and alien plant invasions threaten the long-term conservation of this world heritage site.

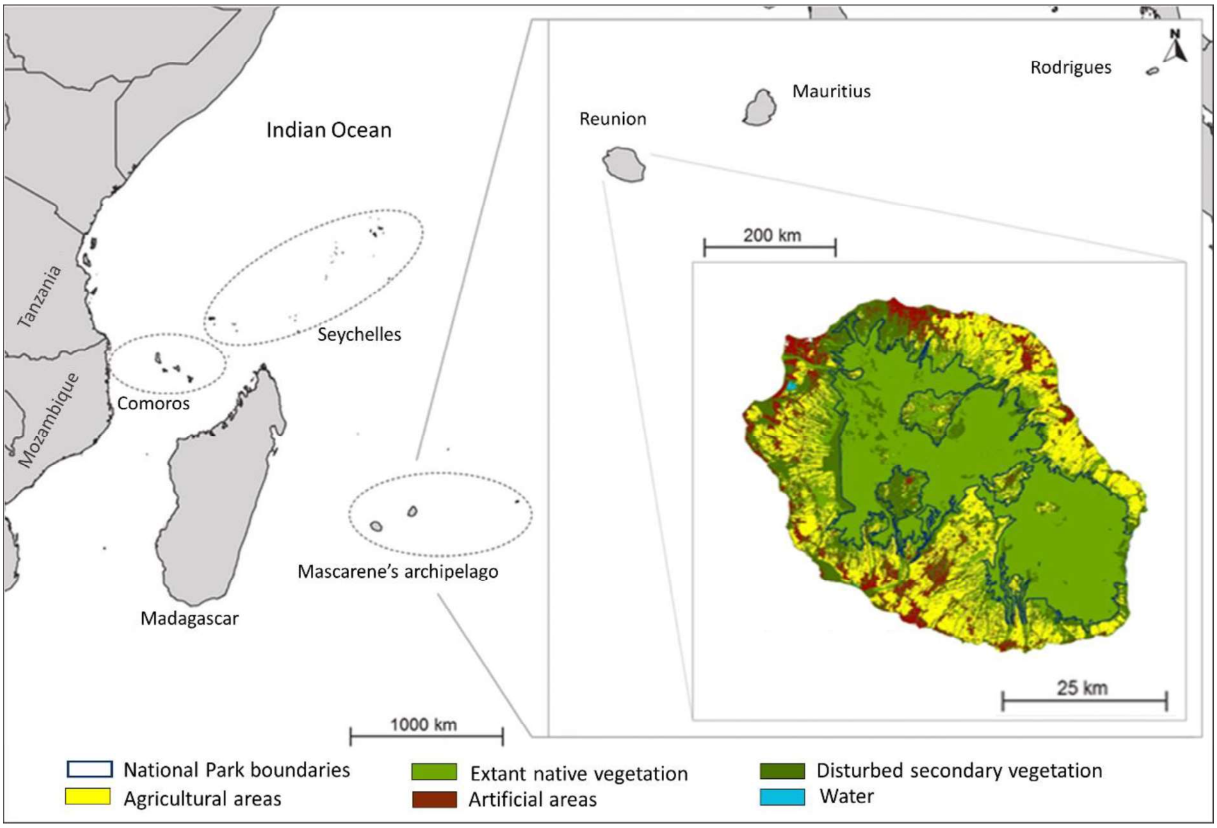

Figure 4.1: Reunion Island localisation and main land-cover types (modified from Dupuy and Gaetano, 2019). Extant native vegetation represented native vegetation comprising of indigenous species with varying degree of invasion by alien plants). Disturbed secondary vegetation included old fields, completely invaded areas or forestry plantations of alien trees.

4.2.2. Project design and conceptual framework (stage 0)

In December 2018, The Department of Reunion Island, the local administrative authority, established a steering committee to guide the identification of biodiversity priority areas and alien plant clearing areas. The steering committee included all major decision-making, implementation and scientific agencies on the island. In total, eight agencies were involved (Table 4.1). A conceptual framework was co-developed to guide the research-action process with clear steps identified for scientific and management input (Figure 4.2). Our research-action process included four stages, from conceptual framework to results. The case-study presented here used a transdisciplinary approach to produce user-useful solutions based on scientifically-sound decisions.

Table 4.1: Role of the different agencies involved in the research-action process.

Agency	Category	Role in this process
Department of Reunion Island	Decision-making, Funding	Governance, review, input into approach
DEAL	Decision-making, Funding	Governance, review, input into approach
National Park of Reunion	Implementation	Review, input into approach, data
National Forestry Office	Implementation	Review, input into approach, data
Botanical Institute	Scientific	Review, input into approach, data
SPL-EDDEN	Implementation	Review, input into approach, data
CIRAD	Scientific	Review, input into approach, analysis
University of Reunion Island	Scientific	Review, input into approach, analysis

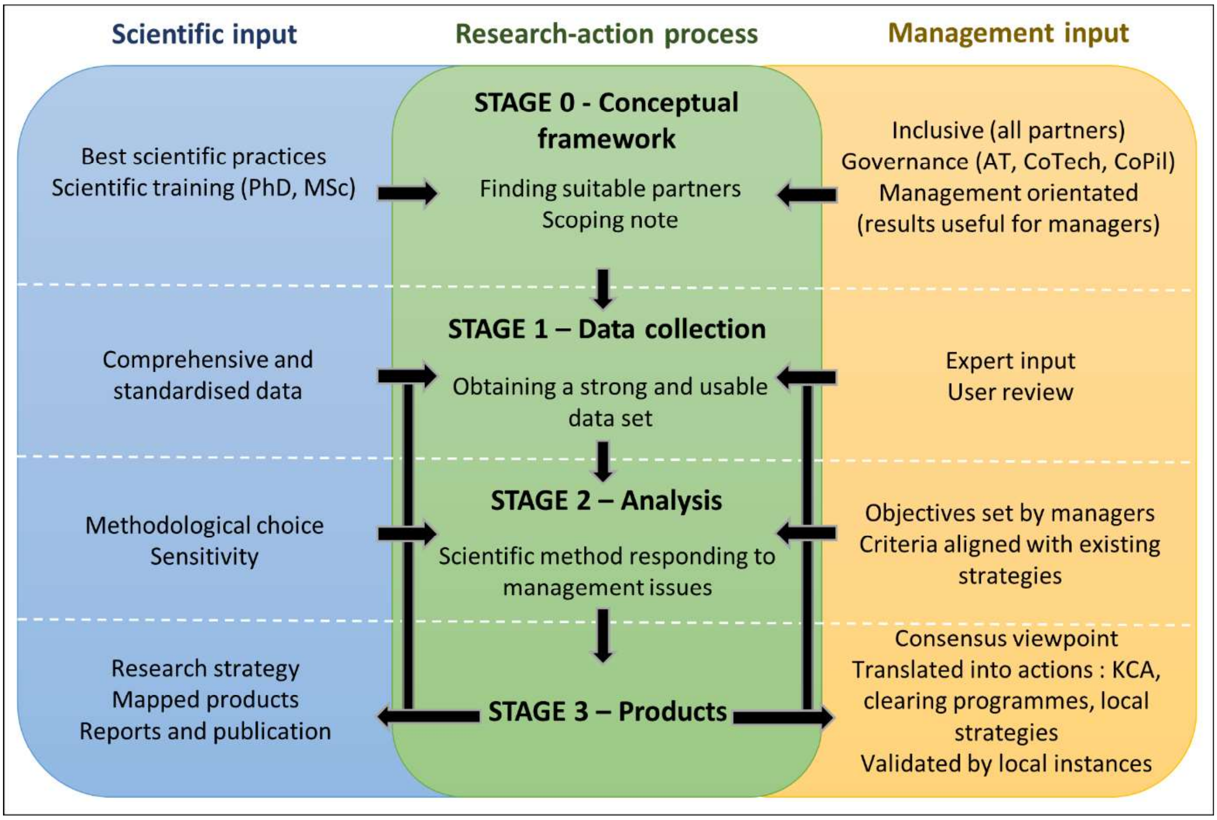

Figure 4.2: Different stages of the research-action process highlighting key scientific and management inputs.

This process was adapted from Cockburn et al. (2016) who used a similar research-action process to guide biodiversity implementation in local municipality. Transdisciplinarity results in knowledge creation and decision-making through collaborations between scientists and stakeholders (Swilling 2014). For the purpose of this study we use the following definition of transdisciplinarity (Lang et al. 2012): "Transdisciplinarity is a reflexive, integrative, method driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge."

Key elements of such research-action process include the co-production of a shared conceptual framework, regular consultations between scientists and managers/decision-makers, feedback loops throughout the process, production of user-useful knowledge (Hirsch Hadorn et al., 2008).

The framework established the objectives and the way to achieve them by working with all key agencies. Throughout the project, regular consultations between the working committee and the steering committee resulted in timely feedback of the progress made so far and approval of the approach among all the different agencies. Decision-making and implementing agencies were crucial in ensuring that research products were developed at a scale useful for managers and translated into decision-making tools. Scientists ensured that best data and state of the art analytical tools were used to inform decision-making (Figure 4.2).

We adopted a generic framework of systematic conservation planning to identify biodiversity conservation priority areas (Groves, 2003). This included the compilation of all available data on the spatial distribution of biodiversity features (see section 3.1), threats to biodiversity (see section 3.2) and the use of conservation planning software, Zonation (see section 4.1) to identify biodiversity conservation priority areas. We then co-developed criteria for spatially identifying alien plant clearing priorities. In lines with current management practices on the island, the overall aims were to (in order of priority) 1) maintain uninvaded areas within biodiversity priority areas; 2) target invasion fronts adjacent to uninvaded biodiversity priority areas) and 3) clear invaded biodiversity priority areas.

4.2.3. Data collection on the spatial distribution of biodiversity and threats (stage 1)

4.2.3.1. Species and vegetation identification

Spatial data of key biodiversity attributes (native species and vegetation types) were derived from a variety of sources. In terms of flora, known records of endemic, threatened or protected vascular plants were included in the analysis. This resulted in 62,568 points localities for 563 vascular species from the *Conservatoire Botanique National de Mascarin* (CBNM) database and 125 points localities for 26 bryophytes species from field surveys from Reunion University. In terms of fauna, know records of four species of conservation concern Reunion Island were selected (2,774 point localities from the National Park of Reunion Island).

Regarding the spatial pattern of vegetation, we used the latest vegetation map developed by the National Forestry Office for this project. Before the project launch, broad habitat distribution and land use maps existed on Reunion Island (Strasberg et al., 2005). For this project, we needed a more detailed vegetation map at a scale useful for managers on the ground. The National Forestry Office, which was in charge of vegetation mapping, produced a new map based on Strasberg et al. (2005) with significant updates on vegetation boundary and classification. The extant native vegetation map produced consisted of a two-level hierarchical classification. The first level, which represented broad vegetation types, was composed of 7 units of extant vegetation and the second level, more precise, 34 vegetation units. As an ecosystem-level biodiversity surrogate, we used the spatial distribution of the 34 vegetation units.

4.2.3.2. Mapping the degree of invasion by alien species

Among all pressures on biodiversity occurring on Reunion Island, plant invasion was considered by managers and decision-makers as the single most important threat to map and include in the identification of biodiversity priority areas. In Reunion Island, alien plants records and distribution data have been gathered for years from different sources (herbarium records, plant surveys and managers' records) but were never compiled in a map representing the different levels of plant invasions until recently. These data were recently compiled and combined with an expert-driven process to develop the first 250 x 250 m map of invasion degree at the island scale (Fenouillas et al., 2021; see Chapter 1). Three sources of data were used: field survey data, expert knowledge and modelled data. Results showed high levels of invasion in some places; most invaded areas being located in the lowland and the leeward coast. All types of vegetation are affected. Nevertheless, more than 50% of the extant vegetation is not invaded or slightly invaded. We used the data from Fenouillas et al. (2021) to inform the selection of biodiversity priority areas and alien plant clearing priorities.

4.2.4. Analysis to identify biodiversity priority areas and plant clearing priorities (stage 2)

The Figure 4.3 present the general approach put in place to identify the biodiversity priority areas and the plants clearing priorities.

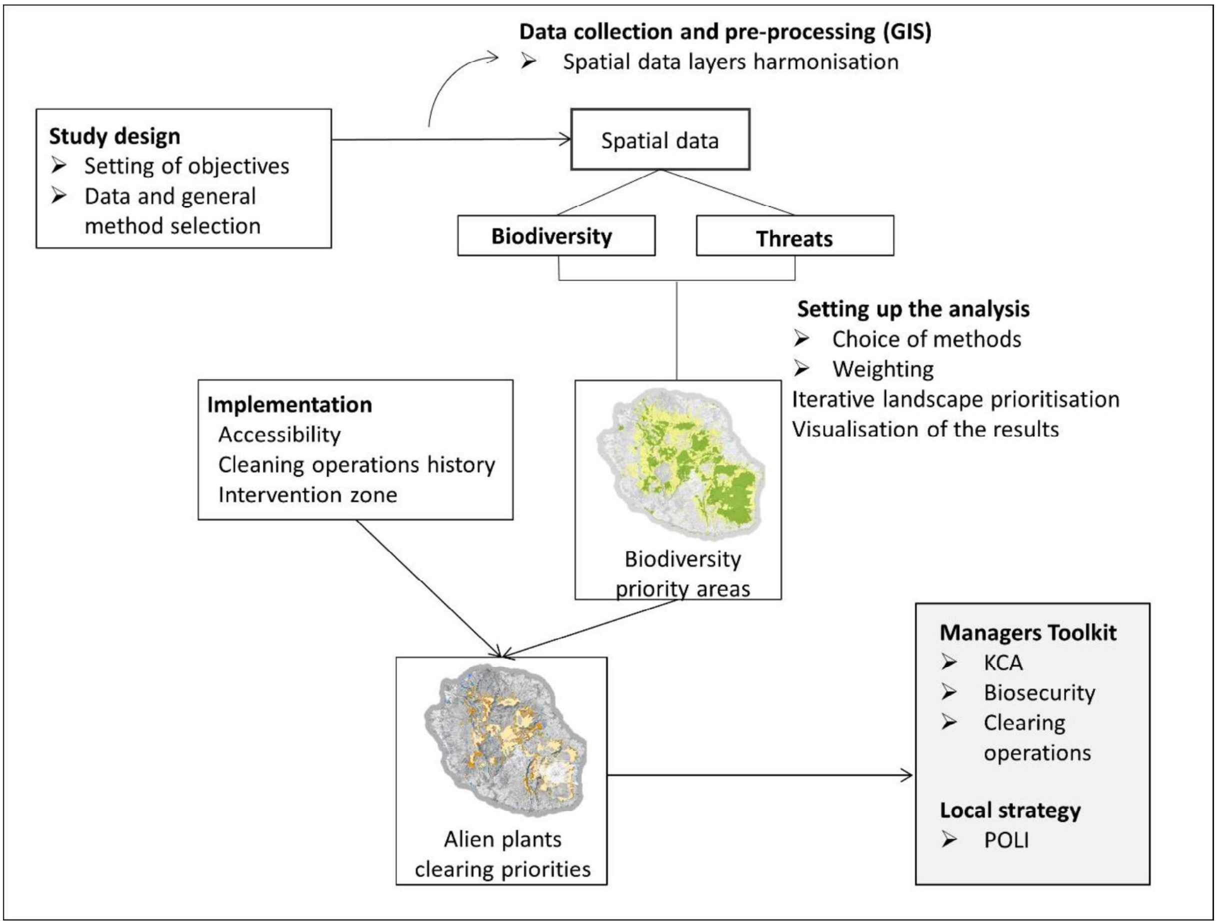

Figure 4.3: General approach put in place to identify the biodiversity priority areas and the plants clearing areas. KCA : Key Control Area. POLI: Operational Action Plan against Invasive Species.

4.2.4.1. Identification of biodiversity priority areas

Zonation v4.0 (Moilanen et al., 2005, 2014), a publicly available software have been used to spatially identify biodiversity priority areas. The Zonation meta-algorithm prioritises the areas of a landscape which seem the most suitable for biodiversity conservation. These areas are selected because of higher biodiversity levels (species, habitats) or because of higher habitat quality (here the least invaded). The Zonation algorithm begins with the full landscape then proceeds to iteratively rank sites by removing at each step the spatial unit (i.e. grid cell) which lead to the smallest aggregate loss of conservation value. At the end of the process, each grid cell is assigned a value: the most valuable areas for biodiversity receive the higher values (close to 1.0) and the least useful ones the lowest values (close to 0.0).

Here, Zonation was used to determine the biodiversity priority areas using 34 habitats types and 593 species distribution maps. Each of these habitats and species information is included into Zonation as a separate raster layer, constituting the biodiversity features.

- **Zonation core approach and removal function**

Several functions are available in Zonation to define the order of cells to remove. We decided to use all three functions of Zonation: Additive Benefit Function (ABF), Target-Based Planning (TBP) and Generalised Benefit Function (GBF) as removal rule. These functions provide different approaches to value biodiversity and were considered equally important by managers and decision-makers within the team. The ABF and the TBP are conceptually different from each other, but the GBF is a generalisation of the ABF. ABF gives higher importance to grid cells with many biodiversity features; retaining a higher proportion average of feature distributions (i.e. ABF spotlights the diversity and not the rarity). TBP is very different in that a given representation level (a target) is explicitly requested for each biodiversity feature. When one feature approaches the target level, the algorithm stops removing cells that contain that feature. GBF is a generic function, which allows a more gradual removal of areas as we approach the target value.

As a precautionary principle, we finally decided to conserve all the areas identified by any of the three functions to identify the overall biodiversity priority areas. These biodiversity priority areas were selected as the top 66% of any function.

All our analysis was based on grid cells of 100 x 100 m and prioritisation were run with the "edge removal" function of Zonation. This function forces the program to remove cells from the edges of remaining landscape, increasing the connectivity of priority and protected areas in the landscape (Moilanen et al., 2014). In addition, Zonation's warp factor was setting as default (warp factor = 10). See Appendix 4.1 (pp 199-205) for a more detailed description of our use of Zonation software.

- **Biodiversity features weights**

Zonation allows for each biodiversity feature (i.e. habitat or species layers) to be assigned a weight, which is used to prioritise a biodiversity feature relative to the others. In this study, we decided to weight habitats. We did not weight species as the species included in the analysis have already been selected according to criteria of importance (endemic or protected or threatened species). In order to align the identification of biodiversity priority areas with existing conservation strategies on Reunion, two approaches were initially considered: 1) to prioritise the large preserved and functional habitats or inversely 2) to focus actions in the rarefied and largely invaded habitats. Maintaining in a good state of conservation areas that are still well preserved offers a cost-effectiveness ratio greater than intervening in the dense foci of invasion. In consultation with all stakeholders (managers, decisions-makers and scientists), we retained the first strategy and decided to assign a higher weight to the most preserved habitats rather that the highly degraded ones. The strategy put in place aims to preserve the large functional habitats of the island. The habitats were therefore weighted according to their level of invasion, more precisely according to the percentage of intact and slightly invaded areas:

$$W_i = p0_i + \frac{50 \ \times p1_i}{100},$$

in which $p0_i$ is the proportion of intact habitat i and $p1_i$ is the proportion of slightly invaded habitat i. Weight values ranged from 0.25 and 1. We included a minimum selection size of 100 ha for habitats, therefore, habitats with a total area below 100 hectares were assigned a weight of 1 in order to select the full range of these small habitats.

- **Condition layers**

We added a "condition layer" in the analysis. These condition layers are needed when landscape condition is included in the analysis to account for past habitat loss or degradation (Moilanen et al., 2014). The condition values can vary between 0 and 1; a value of 1 indicates pristine condition with maximum habitat suitability. In our study, the condition layer represented the invasion level of the entire landscape. We attributed to each grid cell, a value depending on their level of invasion. We assigned a value of 1 to uninvaded areas and a value of 0.5 to heavily invaded ones.

4.2.4.2. Identification of plant clearing priorities

The last step of our approach consisted of identifying alien plant clearing priorities. The steering committee debated how to prioritise alien plant clearing sites. As many factors could influence the selection of priority areas for clearing. These factors could include the site accessibility, the identity of invasive species, the cost of clearing, etc. Based on managers' experience, we considered four site-level criteria to inform our selection: 1) the biodiversity importance, 2) the clearing importance, 3) the accessibility by clearing teams, and 4) the location and history of previous clearing efforts. Biodiversity importance was calculated as the average of the three Zonation scores obtained above (see section 4.1). The clearing importance was identified by managers based on the invasion degree in and around the site. The objective was to prioritise invasion fronts and to maintain intact areas free of invasions. Hence, heavily invaded areas close to intact ones were assigned the top priority; slightly invaded areas, medium priority; and heavily invaded areas, low priority because of the high cost and lower restoration success rate of heavily invaded areas (see Appendix 4.1, pp 208-211 for details). Accessibility by clearing teams was estimated by a travel cost model, using topography, distance to the near nearest road, and vegetation-dependent walking speed. Flat areas, near the road in open vegetation had a lower accessibility time than steep areas, far away from roads in dense vegetation (see Appendix 4.1, pp 212-213 for details). Finally, the history of previous clearing efforts was considered because it is easier to expand an existing clearing operation rather than start a new one.

Each criterion was rescaled from 0 to 100 with 0 being the lowest priority and 100 the top one. The use of criteria weight was discussed and managers agreed on the following: a weight of 6 for biodiversity importance, 3 for clearing importance, 2 for accessibility and 1 clearing history. This weighting choice reflected equal importance for biodiversity (criterion 1) and operational aspects (all other criteria).

The final priority map consisted of grids of 100 x 100m with a clearing priority score between 0 and 100; giving higher priority to accessible invaded biodiversity important areas close to non-invaded biodiversity priority areas.

4.3. RESULTS

4.3.1. Transdisciplinary process

The close interactions between managers, decision-makers and scientists resulted in 25 meetings (Figure 4.4). Year 1 was devoted to co-development of the framework, Year 2 to analysis and preliminary output, and Year 3 to implementation of the prioritisation outcomes into management actions. Regular feedbacks loops between the three levels of governance (steering committee, technical committee and working group) enabled direct uptake of the prioritisation outputs into implementation actions on the ground (Figures 4.3 and 4.4). Table 4.2 lists the various uses and implementation actions resulting from this process.

In addition to the outcomes initially envisaged, the results of this project have been widely used by managers. The identification of conservation and control priorities served as a working basis for other projects related to the conservation of biodiversity.

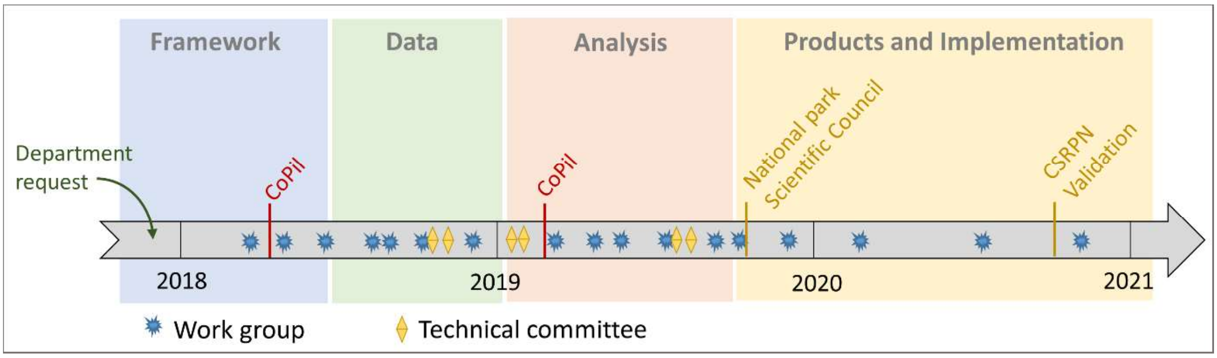

Figure 4.4: Timeline delimiting the main stages of the project. The main meetings and scientific validations are also indicated. CSRPN : Conseil Scientifique Régional du Patrimoine Naturel.

Table 4.2: Products and outcomes of the project

Products	Beneficiary	Description
Creation of a large research-action working group	Management / Research	Regular meetings of this working group to guide alien plant management through research partnerships
Revision of the Key Control Areas (KCA)	Management	KCAs are priority intervention zones used to guide alien plants clearing of the National Forestry Office. All the KCAs have been revised to include the identified clearing priority areas.
Areas identification for planting rare and endangered species	Management	Choice of sites for rare and endangered species plantation depending on the identification of the biodiversity priority areas
Programming of new cleaning operations	Management	Decision on the new cleaning sites (continuation of the work, cancellation, new site, etc.) according to the identified clearing priority areas
Validation by scientific councils	Research	Method validated by the scientific council of the national Park and the CSRPN
Scientific publications and training	Research	2 scientific articles, 1 PhD thesis, 1 MSc

4.3.2. Biodiversity priority areas

The biodiversity priority areas integrated the prioritisation outputs from the three different functions of the Zonation software (see Appendix 4.1, pp 218-219 for outputs of each function). The biodiversity priority areas identified have been divided into two priority levels. Level-one priority corresponded to high priority (identified as priority by at least one of the three Zonation analyses) (Figure 4.5). Level- two priority corresponded to intermediate priority-level and included all remaining invaded natural vegetation. The level-one priority, which included all vegetation types and species considered in the analysis, covered 60,303 hectares out of the 128,723 hectares of natural vegetation remaining on the island. Level-1 biodiversity priority areas did represent the least invaded areas. Nearly 80% of the level-1 biodiversity priority areas were slightly invaded. Respectively 13% and 4% of biodiversity priority areas were moderately invaded and heavily invaded. This mainly concerned coastal and semi-dry areas, which were all invaded habitats.

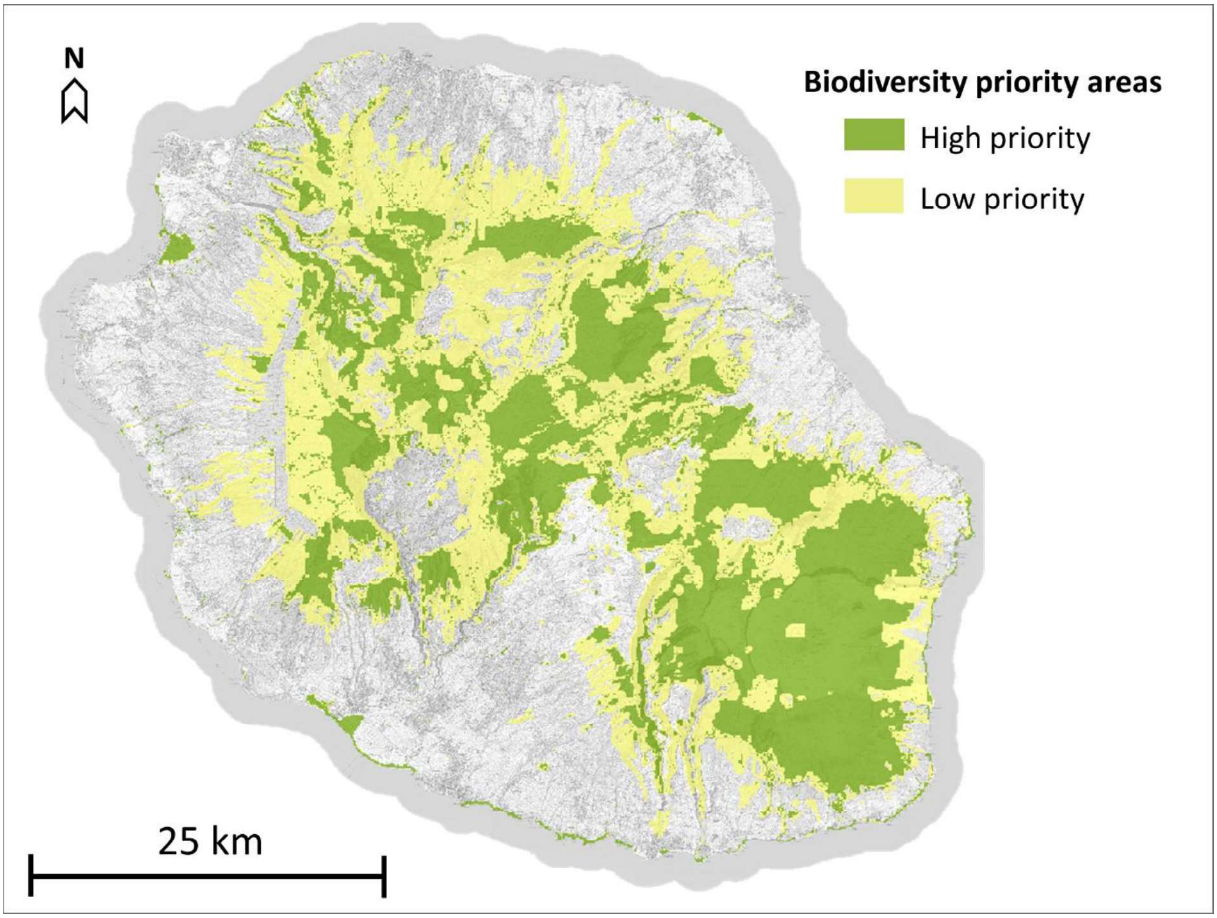

Figure 4.5: Biodiversity priority areas

4.3.3. Alien plant clearing priorities

Alien plant clearing priorities were identified through a prioritisation score ranging from zero (low priority) to 100 (high priority) (Figure 4.6). Due to the criteria and scores used, this map highlighted the “invasion fronts”. These were accessible invaded areas close to slightly (or not at all) invaded biodiversity priority areas. In total, 4,392 ha of high priority (score greater than 75) have been identified. This priority map was declined by major vegetation type in order to better identify the priorities within each type.

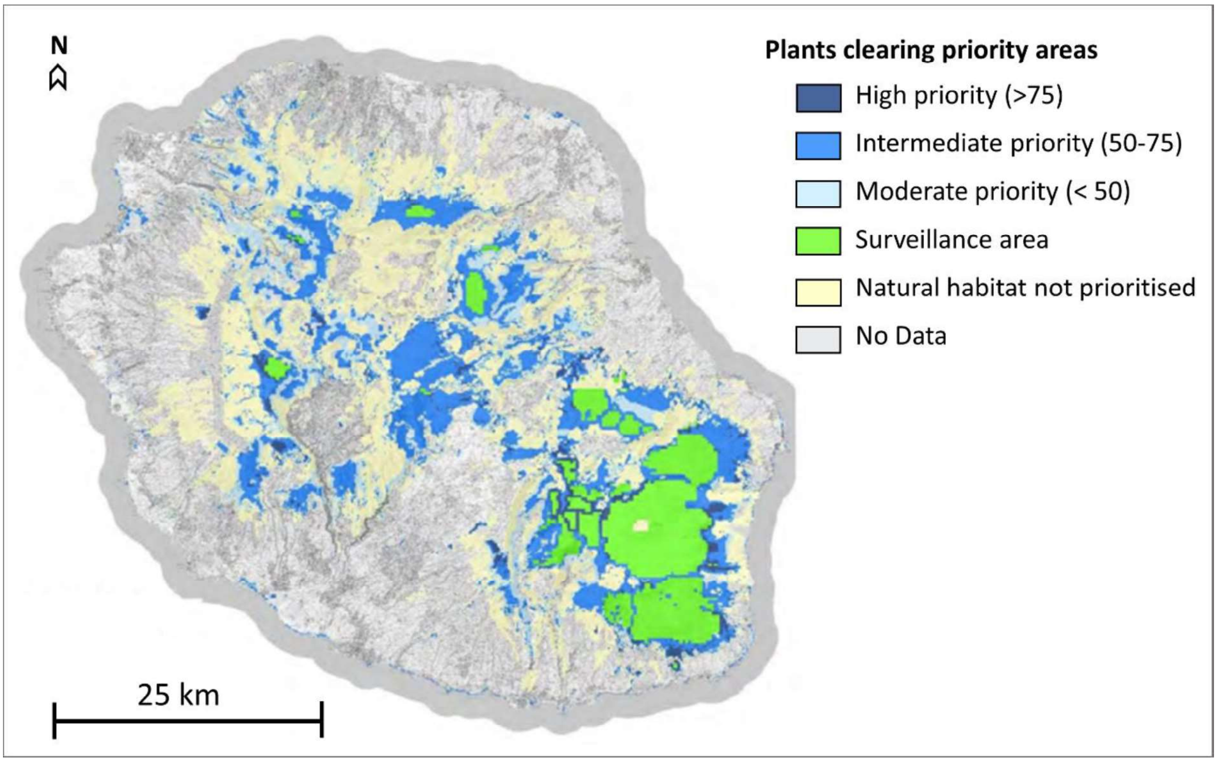

Figure 4.6: Plants clearing priority

4.4. DISCUSSION

Biological invasions have long been a concern and have been largely studied on Reunion Island (Baret et al., 2006; Macdonald et al., 1991; Strasberg et al., 2005). Controlling the spread of these species appeared as a priority objective in several strategic documents on nature conservation. This study jointly conducted by managers, decision-makers and scientists has allowed the identification of biodiversity and plant clearing priority areas at the island scale. Thanks to a large collaborative effort, the degree of invasion was previously identified at the Island scale (Fenouillas et al., 2021, see Chapter 1) allowing the identification of 60,303 hectares of biodiversity priority areas and 4,392 hectares of high priority plant clearing. This map identified plant clearing priorities but not the total surface area of the clearing operations necessary to put in place to fight effectively against invasive species. Such results were possible thanks to the great mobilisation of all stakeholders working on biodiversity conservation in Reunion Island.

4.4.1. The use of systematic conservation planning to improve decision-making and implementation of alien plants clearing programme

In cases where biodiversity pressures show no decline and that resources for conservation actions are limited, conservation planning is a useful tool to define priority areas for these actions (Margules and Pressey, 2000). Although not often used in the context of alien plant clearing (see Januchowski-Hartley et al., 2011; Mačić et al., 2018 for a case study), conservation planning can help to improve decision-making and implementation of priority areas for alien plant clearing. The use of decision support software, such as Zonation (Moilanen et al., 2009), provide varied and extensive tools for conservation planning and management(Schwartz et al., 2018). These software enable compliance with key concepts of conservation planning, priorities identified are representative, complementary, persistent and efficient (Margules and Pressey, 2000).

Systematic conservation planning provides a systematic framework with clear steps: from identifying problems and opportunities to implementing the plan (Groves, 2003; Watson et al., 2011; USDA < https://www.nrcs.usda.gov >). The first step (goal-setting) is very important. The definition of explicit goals, preferably translated into quantitative and operational target (Margules and Pressey, 2000), provides the basis of all the other steps. This have been stressed in the literature, both in science and practice (Corsair et al., 2009; Marttunen et al., 2019) because, when objectives are not well-defined, data acquisition can become an end in itself (Vos et al., 2000) and slow down the implementation of management plan. Despite the wide use of systematic conservation planning in the literature, the last step "implementing the plan" is not often reported and many conservation assessments do not result in real conservation actions on the ground. Here, by working together with implementing agencies, the plan has been directly translated into a clearing programme on the ground.

4.4.2. Lessons learned from implementing the invasive plant clearing priority areas

In implementing the invasive plant-clearing plan, we learned many lessons on the scale of implementation and the different roles of stakeholders.

The first lesson was that the spatial scale considered in biodiversity conservation studies is very important and define the type of management which can be implemented. While plant clearing operations are set on a relatively fine-scale (few hectares), we found here that a clearing plan at the island-scale was essential to guide the whole strategy (including funding level) around alien plant clearing operations. In other words, there is a need for a large-scale assessment and implementation plan (which was done here), followed by a fine-scale translation of this plan in site-level clearing operations. Our study supports the view that public authorities should set priorities at a landscape scale (Meier et al., 2014).

The second lesson we learned is the importance of stakeholders and the need to consider the different roles they play. It is widely recognised that a lack of collaboration and cohesion between stakeholders can impact the implementation of management plans (Andreu et al., 2009; Sutherland et al., 2004; van Wilgen et al., 2012). Involving different stakeholders from the start can help avoid conflicts in the implementation of project results (Crowley et al., 2017; Novoa et al., 2018).

In our study, three different types of stakeholders have been involved: decision-makers, managers and scientists. Each stakeholder type played a different role but they have been involved at each step of the project: from the setting of objectives to the implementation on the ground (Figure 4.2). It have been shown in previous studies that the level of stakeholder engagement in the process will determine the relative value and success of the methodology used for guiding decisions in conservation (Ferraz et al., 2021). Decision- makers had a crucial role in this study because they initiated and provided the opportunity for this process to unfold. As key funders of alien plant clearing operations in Reunion Island, the decision-makers had a major influence in this process. Because they were involved from the start of the project, they enable the translation of the plan into local policy and action. When decision-makers are not involved in the process, it will be much more difficult to implement the plan are they are not sensitised or even aware of the process taking place. The impetus given by the local decision-makers allowed this project to be effectively launched.

Working in collaboration with managers from the onset of the project allows for better integration and use of results by managers on the ground. Our results are already used on Reunion Island to inform the location of alien plants cleaning operations. The National Forest Office in charge of most clearing operations have redefined their geographic implementation areas according to the results described in this study.

4.4.3. Study limits and perspectives

We found several ways to improve such study, especially concerning the involvement of civic societies and the use of species-level data.

Firstly, the lack of involvement of civic societies or people who benefit in any way from invasive species may constitute a limit to our study and to the success of its implementation. Some invasive species have multiple uses, including economic value, on Reunion Island. Not including a broad range of stakeholders could lead to social conflicts between stakeholders (Crowley et al., 2017). Management actions can imply restrictions on trade, the use of chemicals or biological control agents or the elimination of exotic species that had hitherto been valued (Novoa et al., 2018).

Secondly, with 145 invasive plants species present, Reunion Island hosts the most important number of recorded invasive species within the western Indian Ocean biodiversity hotspot (GISD, 2021), representing an important invasion debt (Rouget et al., 2016). While the new maps produced can help planning of alien plants cleaning areas, the information on which species invades where is missing. Additional information on the extent and abundance of key invasive species in each priority identified area would be essential to guide the type of management to be carried out. It is therefore important to map invasion at species-level and to quantify invasive alien species richness, abundance and biological type.

Lastly, the partnership work initiated during this study, initiated by the local government, has proven its value and will continue. Discussions with the different stakeholders are already underway to lead to a new iteration of the map of biodiversity priority areas and management priorities. These new versions could include dynamic aspects, functionality of habitats, cost and benefit analyses and will characterise invasion at species-level.