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DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY

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Subject: Report of the Task force on the control of pine wood nematode in Portugal and Spain operating between November 2014 and October 2015

Please find herewith the report of the Task Force for the control of pine wood nematode operating between November 2014 and October 2015.

The pine wood nematode Task Force has produced this report and recommendations to provide technical support in the control of Pine wood nematode. It does not necessarily reflect the position of the Commission services or the Commission.



Ladislav MIKO

REPORT OF THE TASK FORCE
ON THE CONTROL OF PINE WOOD NEMATODE IN PORTUGAL AND SPAIN
OPERATING BETWEEN
NOVEMBER 2014 AND OCTOBER 2015



Disclaimer: The PWN Task Force have produced this report and recommendations to provide technical support in the control of Pine wood nematode. It does not constitute a legal or binding standard and does not necessarily reflect the position of the Commission Services or the Commission

Executive summary

Pine wood nematode (Bursaphelenchus xylophilus - PWN) was first detected in the European Union in 1999, in continental Portugal. Since then, despite control measures implemented by the Competent Authorities, the pest has steadily spread within mainly the central part of the Portuguese territory, causing the wilting and death of pines. So far, intensive annual surveys have demonstrated the pest freedom of the 20 km Buffer Zone established along the border with Spain. However, infested trees were recently repeatedly found in the vicinity of the Buffer Zone, in the district of Castelo Branco. This indicates an increased risk of spread into the Buffer Zone and beyond the limits of the demarcated area of continental Portugal. At the same time, since 2008, in Spain, four findings or outbreaks of a limited extent have been detected close to the border with Portugal, and were or are being eradicated.

In this context, in Autumn 2014, Commission services set up a Task Force for the control of PWN, geared at supporting Portugal and Spain in controlling the pest. The Task Force is a technical group coordinated by Commission services which comprises thirteen experts from eleven Member States including Portugal and Spain, nominated for their expertise in pre-determined fields and involvement in recent scientific studies on PWN and its insect vector.

Between November 2014 and October 2015, the Task Force held two meetings in Brussels and undertook four missions (three to Portugal and one to Spain), which included meetings with relevant stakeholders, visits of a range of forest sites and meetings between experts. This intensive programme of work enabled the Task Force to understand the local situation and difficulties faced by Portugal and Spain in implementing control measures, and to propose tailor-made solutions to overcome these problems and gain effectiveness and efficiency in controlling the pest.

Recommendations made to both Member States are based on the Task Force expertise and latest scientific development, in particular the EU funded REPHRAME project. Most of these recommendations are only applicable to Portugal and adjacent parts of Spain and aim at refocusing attention on risk and measures giving greatest prospect of success as well as maximising the use of resources.

The recommendations imply changes of varying degrees to the existing situation in the Member State concerned and some will be challenging to implement. Portugal and Spain have been supportive of these recommendations and commenced, already in 2015, work for their implementation. However, the rapid implementation of the new strategy of the "Active Containment Zone", within the Infested Zone, and the in-depth changes recommended for the forestry sector in Portugal, are expected to raise technical but also financial difficulties. It is therefore essential that continued attention is given by the Task Force and the Commission, together with Portugal, in order to address these difficulties.

Some recommendations should be assessed and decided on in the framework of the forthcoming review of the applicable EU legislation, in particular Decision 2012/535/EU¹ and could only be implemented if new legal provisions were adopted.

¹ Commission Implementing Decision of 26 September 2012 on emergency measures to prevent the spread within the Union of *Bursaphelenchus xylophilus* (Steiner et Buhner) Nickle et al. (the pine wood nematode), OJ L 266, 2.10.2012, p.42.

Table of Contents

1. Introduction.....	1
2. Task Force Experts	1
3. Objectives of the Task Force	2
4. Activities and work methods of the Task Force	2
5. Continental Portugal	3
5.1. Evolution of the situation of PWN.....	3
5.2. Conclusions of the review of the situation of PWN.....	5
5.3. Infested Zone - Recommendations.....	8
5.4. Buffer Zone - Recommendations	14
5.5. Overcoming obstacles linked to the forestry sector - Recommendations	18
5.6. Increasing the efficiency of services in implementing PWN control measures – Recommendations.....	20
6. Spain	22
6.1. Evolution of the situation of PWN.....	22
6.2. Conclusions of the review of the situation of PWN.....	23
6.3. Contingency plan - Recommendations	24
6.4. Surveillance of the territory - Recommendations	25
6.5. Eradication measures following confirmation of a finding - Recommendations.....	26
7. Conclusions of the review and recommendations on issues relevant to both Portugal and Spain	29
7.1. PWN outbreaks identified in the vicinity of the border between Portugal and Spain 29	
7.2. Infested Zone - Implementation of a clear-cut zone	29
8. Overall Conclusions.....	33
Annex 1- Short Guidelines for forest owners and forest managers for sustainable pine forest management with special attention to Pine Wood Nematode within the infested area in Portugal (Draft).....	34
Annex 2- Overview table of Task Force recommendations	37

Abbreviations and definitions used in this report

AC	Autonomous Community
Action plans	Documents submitted by Portugal and Spain for the communication of containment and eradication measures respectively, as required in Article 9 of Decision 2012/535/EU
Active Containment Zone	Parishes located along the outer limits of the Intervention Zone, infested by PWN or at serious risk of being infested, set up in order to contain the natural expansion of the disease towards the Buffer Zone.
Buffer Zone	The part of the demarcated area, which surrounds the Infested Zone, of no less than 20 km width and where PWN is not known to occur. Since all of continental Portugal is demarcated, the Buffer Zone is in practice a belt along the land border with Spain.
Declining trees	Trees that are in poor health or situated in fire- or storm- affected areas
Decision 2012/535/EU	Commission implementing Decision of 26 September 2012 on emergency measures to prevent the spread within the Union of <i>Bursaphelenchus xylophilus</i> (Steiner et Buhner) Nickle et al. (the pine wood nematode)
Delayed expression of symptoms	Wilting of PWN infested pines occurs in the year following the year of infestation.
Demarcated area	Area demarcated in accordance with Article 5 of Decision 2012/535/EU comprising both the Infested Zone and the surrounding Buffer Zone.
ICNF	<i>Instituto de Conservação de Natureza e das Florestas</i> - Institute for Nature Conservation and Forests
Infested Zone	The part of the demarcated area defined pursuant to Article 5(2) of Decision 2012/535/EU. In mainland Portugal, the Infested Zone covers the whole territory except the Buffer Zone. It is sub-divided into an Intervention Zone, where PWN was found or suspected to be present, and the remaining area where PWN is not known to be present.
Intervention Zone	Parishes in the Infested Zone listed and publicised on the ICNF website and at the respective parish offices, where PWN is known to be present or where the ICNF has recognised that there is a risk of the establishment and spread of the organism.
Latency	Wilting of PWN infested pines occurs on the second year following the year of infestation or later. Latency can be expected in humid climate or in high altitudes. The presence of PWN is very difficult to detect when infestation is latent.
Parish	Smallest administrative unit in Portugal.
PWN	<i>Bursaphelenchus xylophilus</i> – pine wood nematode
REPHRAME	EU funded research project: Research Extending Plant Health Risk And Monitoring Evaluation
Susceptible material	Susceptible plants, wood and bark as defined in Article 1 of Decision 2012/535/EU.
Vector	The vector of the pine wood nematode in Portugal and Spanish territories along the border with Portugal, <i>Monochamus galloprovincialis</i> - Pine sawyer beetle.

ZIF	<p><i>Zona de Intervenção Florestal</i> - Forest Intervention Zone. Zone of joint management of private forests pursuant to Portuguese National Legislation. Its main objectives are to promote appropriate and efficient sustainable management of forest areas as well as the resilience of the territory to forest fires and forest health problems.</p> <p>"Intervention zone" in this context is different to the specific Intervention Zone set up for PWN control.</p>
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1. INTRODUCTION

The Task Force for the control of pine wood nematode (hereafter "the Task Force") is a group set up in September 2014 with a view to supporting Portugal and Spain in controlling the pest and preventing it from spreading by means of its insect vector within the European Union (EU) territory. It is coordinated by the European Commission Directorate for Health and Food Safety, (Health and Food, audits and analysis), and is composed of a number of Member States' experts. Between November 2014 and October 2015, the Task Force reviewed the situation of pine wood nematode (PWN) and control measures in place for mitigating risks of natural spread of the pest, in Portugal and Spain. Following this review, the Task Force made a number of proposals to Portugal and Spain aimed at overcoming difficulties faced by the Competent Authorities and increasing the effectiveness and efficiency of PWN control measures. This report presents the outcome of this work.

2. TASK FORCE EXPERTS

Task Force experts were nominated by their own Member States, based on their specific expertise in pre-determined fields.

Name	Organisation (Country)	Field of expertise
Hugh Evans	Forest Research (UK)	Pest Risk Analysis; Integrated Pest Management
Jean-Luc Flot	Ministry of Agriculture, Agro-Food and Forestry (France)	Forest Health Survey and Management
Vladimir Gaar	Diagnostic laboratory - Central Institute for checking and testing in agriculture	Nematology
Jean-Claude Grégoire	Biological Control and Spatial Ecology laboratory - Université Libre de Bruxelles	Insect Ecology, Risk Assessment
Boris Hrasovec	University of Zagreb (Croatia)	Entomology and forest health
Gunnar Isacson	Swedish Forest Agency (Sweden)	Silviculture, Entomology, Forest Health, Forest Management
Päivi Lyytikäinen-Saarenmaa	University of Helsinki (Finland)	Forest Entomology, Forest Health Survey, Remote Sense and GIS Applications, IPM
Hugo Mas i Gisbert	Forest Health laboratory of Generalitat Valenciana (Spain)	Forest Entomology, Forest Management
José Manuel Rodrigues	Institute for Nature Conservation and Forests (Portugal)	Forest Entomology, Forest Health Management
Gerardo Sanchez	Ministry of Agriculture, Food and environment (Spain)	Forest Health
Thomas Schroeder	JKI, Federal Research Centre for Cultivated Plants, Institute for National and International Plant Health (Germany)	Forestry Quarantine, Forest Entomology, Pest Risk Analysis and Management
Edmundo Manuel P. Sousa	National Institute of Agrarian and Veterinary Research (Portugal)	Forest Entomology, Forest Health Management
Marek Tomalak	Institute of Plant Protection –National Research Institute (Poland)	Nematology, Entomology, Biological Pest Control

3. OBJECTIVES OF THE TASK FORCE

The objectives of the Task Force, as laid down in the Terms of Reference, were to:

1. Carry out a review of the Portuguese and Spanish strategies and measures for controlling the natural spread of PWN;
2. Identify opportunities for improvement and propose changes and ways of overcoming constraints, in order to achieve the goal of effective containment of the PWN within the Infested Zone of Portugal and effective eradication in other areas.

Following this first phase, the Task Force should provide support to Portugal and Spain for the implementation of its recommendations.

4. ACTIVITIES AND WORK METHODS OF THE TASK FORCE

In pursuit of these objectives, the Task Force performed four missions and held two meetings between November 2014 and October 2015 in order to understand the local situation and difficulties faced by Portugal and Spain, and to propose solutions to overcome these problems and increase the effectiveness and efficiency of PWN control measures. The scheduling and programme of each visit was established by the Task Force, based on non-compliances with EU legislation identified during previous audits and on proposals from experts or the Member State concerned (Portugal and Spain). A detailed itinerary was then established with the support of the Portuguese or Spanish Competent Authorities.

Three of the missions took place in Portugal (in November 2014, March and May 2015) during which the Task Force examined the situation both in the Infested Zone, where PWN is spreading, and in the Buffer Zone. The programme of these visits included:

- Meetings with representatives of Competent Authorities at national, regional and local level as well as relevant stakeholders (operators, municipalities, forest owners associations and pine forest industry);
- Field visits to a range of managed and non-managed forest sites, including forests affected by fires, in both the infested and Buffer Zone of Portugal.

The Task Force carried out one mission to Spain in June 2015. The programme included a meeting with national and regional Competent Authorities on contingency planning and a visit to the demarcated areas of Sancti-Spiritus and Valverde del Fresno, in two Autonomous Communities (ACs), Castilla y Leon and Extremadura.

Two meetings were also held in Brussels in which all experts were invited to participate. The first in February 2015, addressed gaps of knowledge related to PWN and its vector, as well as sustainable forest management. The second, in October 2015, aimed at consolidating Task Force recommendations and taking stock of progress made by Portugal and Spain in the implementation of these recommendations.

Depending on the objective and programme of each mission, the whole Task Force, or on occasions, only some experts were invited to participate. However, all experts were involved with the review of the situation and control measures in Portugal and Spain and they were also consulted for the preparation of visits as well as the reporting on conclusions and recommendations following each visit.

5. CONTINENTAL PORTUGAL

5.1. Evolution of the situation of PWN

PWN was first detected in continental Portugal in 1999, in the Setubal peninsula, 20 km south of Lisbon. Subsequently, control measures including a 3 km preventative felling area around the outbreak, were implemented. In 2008, a new outbreak was detected in the Centre Region (Coimbra area) and intensive monitoring of the territory was performed, revealing that PWN was already present in a number of different parishes. The demarcated area was therefore extended to the whole of continental Portugal and a Buffer Zone of at least 20 km width was delimited along the border with Spain. Since then, control measures have been implemented, focused on the Buffer Zone and, within the Infested Zone, on Intervention Zones, where PWN is known or likely to occur. These measures, largely based on EU requirements, have been progressively modified, based on the evolution of the situation and scientific knowledge of the pest and its vector *Monochamus galloprovincialis* (hereafter the vector). Since 2012 and the adoption of Commission implementing Decision 2012/535/EU (hereafter Decision 2012/535/EU), which differentiates between control measures for outbreaks under containment and those under eradication, more focus has been given to measures in the Buffer Zone, even though national requirements to forest owners in the Infested Zone have been maintained. In 2014, with the recurrence of positive findings close to the Buffer Zone, actions were stepped up in parishes of the Intervention Zone adjacent to the Buffer Zone in order to mitigate risks of natural spread of PWN into the Buffer Zone (see Figure 1). Control measures currently implemented in continental Portugal are set out in the national legislation (Decree law n°95/2011) and outlined in a national action plan for the control of PWN for the period 2013-2017 (latest version July 2014).

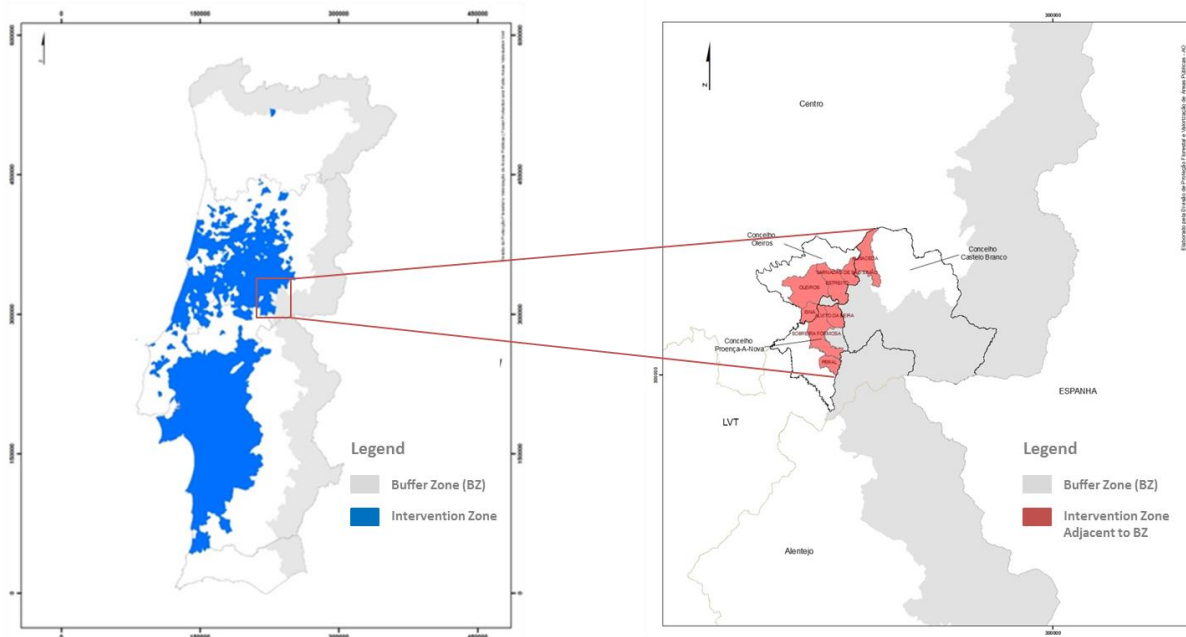


Figure 1 – Demarcated area of continental Portugal (Infested Zone (white and blue), Intervention Zones (blue), Buffer Zone (light grey)) in 2014, and Intervention Zones adjacent to the Buffer Zone (red) (Source ICNF)

The results of annual surveys for the presence of PWN conducted in continental Portugal from 2012 to 2014 show a progressive spread of PWN to new parishes, and consequently an extension of Intervention Zones as illustrated in Figure 2. At the beginning of 2015, with the exception of the area close to Castelo Branco where 8 infested parishes were adjacent to the Buffer Zone (see figure 1), the Intervention Zone was located at a distance of 20 to 50 km from the Buffer Zone in the East, and a minimum of 70 km in the North (excluding the parish

in the North classified as an Intervention Zone since 2008 although no more positive cases have been found since then and the original case is now thought to have been a false positive).

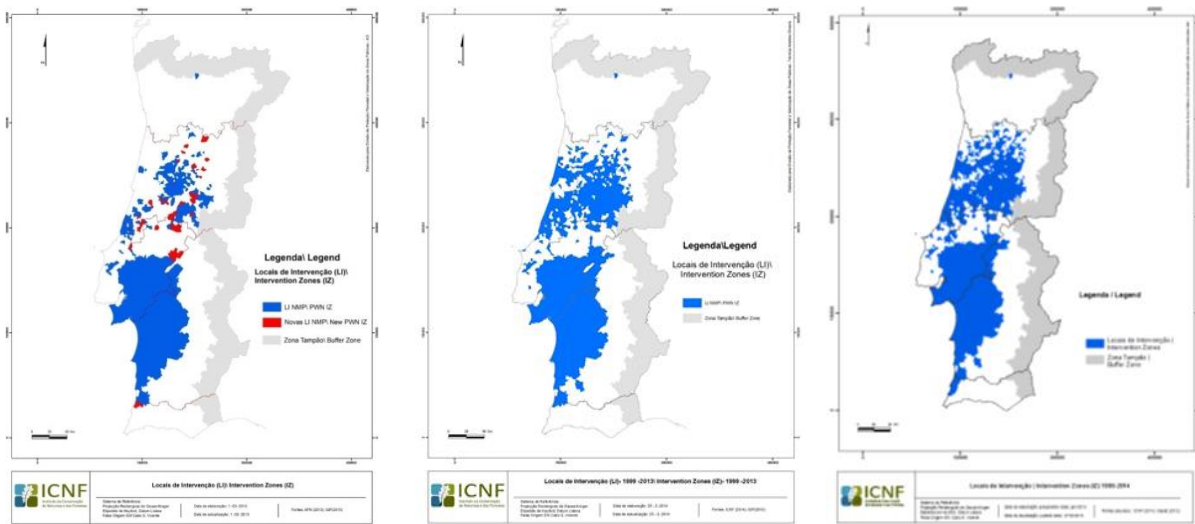


Figure 2 – Demarcated area of continental Portugal (Infested Zone (white and blue), Intervention Zone (blue/red (used in 2013 for new parishes in the Intervention Zone)) and Buffer Zone (light grey)) in 2013, 2014 and 2015 (Source ICNF)

In Mid-October 2015, an updated map of the Intervention Zones was produced by the Portuguese Competent Authority, based on the first results of the 2015 surveys which showed further progression of PWN towards the East of the country, in the Centre and Alentejo regions, as shown on the map in Figure 3.

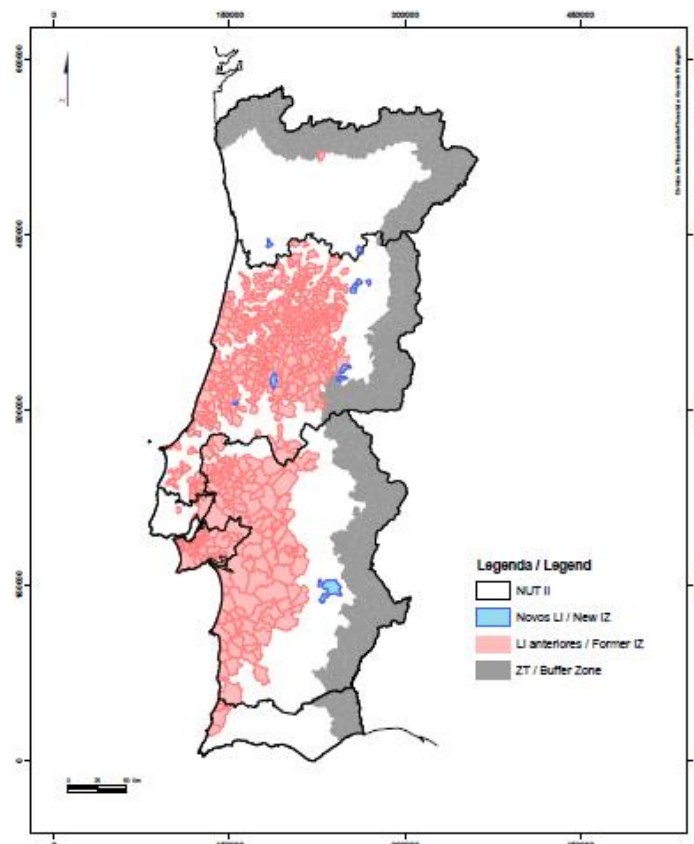


Figure 3 – Municipalities in Intervention Zones in 2014 (in red) and added in October 2015 (blue) (Source ICNF)

The origin of the infestation in the new infested parishes is unknown. As some of these parishes are far from those already in the Intervention Zone, spread by transport of infested wood cannot be excluded.

5.2. Conclusions of the review of the situation of PWN

Following the review of the situation and control measures in continental Portugal, the Task Force drew the following conclusions:

1. To be effective, a containment strategy has to rely on both the control of pest populations in the Infested Zone and the maintenance of a pest free Buffer Zone in its surroundings, the Buffer Zone being the last physical barrier preventing the pest from spreading to pest free territories outside the demarcated area.

In continental Portugal, as demonstrated by the results of annual surveys, control measures implemented in the Intervention Zone are not effective in controlling the pest population in that area and consequently in preventing the overrun of the Buffer Zone.

The importance of maintaining the outer limits of the actual infestation (i.e. outer limits of the Intervention Zone) is reinforced by the following elements:

- Recent scientific results² indicate that the vector has a flight capacity which significantly exceeds the Buffer Zone width;
- The ETpN model of pine wilt expression, developed during the REPHRAME project, indicates that the infestation might have reached some areas where wilting of trees is expected to be delayed to the year following the infestation (i.e. symptoms of infestation are expected to appear in the following Spring/Summer instead of in the Autumn of the year of infestation). It is likely that if PWN spreads into areas with delayed expression of symptoms, its containment will be more difficult;
- The continuous spread of PWN within the Infested Zone endangers biodiversity in particular in protected forest areas such as Natura 2000 forests, located beyond the current PWN infestation limit.

Conclusion 1: It is important to place emphasis on actively containing PWN in the area where it is known to be present (current delimitation of the Intervention Zone).

2. Annual surveys show that, in most cases, new infested parishes are adjacent to parishes already in the Intervention Zone which suggests that PWN continues to spread naturally i.e. by means of vector dispersal in those areas. However, in certain cases, it cannot be excluded that PWN spread within the Infested Zone is linked to human activities.

Conclusion 2: Because the current continuous spread of PWN appears to be mainly through vector dispersal but could also include human-assisted dispersal, the strategy for preventing PWN from spreading to new areas should be based on 1) the control of populations of the vector in areas where they are actively breeding and are likely to contain PWN, 2) the prevention of dispersal flights of infested vectors to non-infested areas and 3) maintenance of strict control of movement of potentially infested timber through transport routes.

² REPHRAME – www.rephrame.eu

3. Susceptible forest is mainly privately owned (92%) and divided into very small plots (less than 0.5 ha on average). The vast majority are non-managed and therefore tree mortality is higher than in managed forests. This creates favourable conditions for the development of populations of the vector and is likely to favour dispersal flights of infested vectors to non-infested areas.

Most forest owners do not implement PWN control measures although these are required by the National Decree throughout the demarcated area. However, in the absence of a forest land registry, forest owners cannot be (easily) sanctioned for such non-compliance. After ten years of public support (national and EU) for the creation of Forest Intervention Zones (ZIF) and the implementation of PWN control measures, no more than 28% of susceptible forests are in ZIFs and only a small proportion of these are managed in line with the PWN national legislation. This means that, in practice, PWN control measures are almost exclusively implemented under the responsibility of the Competent Authority and at public expense (100% of costs incurred are covered by Portuguese and EU public funds). These costs are increased by the non-management of forests.

Conclusion 3: The ownership and management situation in the private forestry sector is currently an impediment to the strengthening of control measures in the Infested Zone and, in the longer term, to the containment of PWN within the demarcated area of continental Portugal. It is therefore appropriate to make recommendations concerning the forestry sector so that these obstacles can be overcome.

4. Public financial and human resources dedicated to the control of PWN are substantial and could be difficult to increase. On the other hand, the containment of PWN will certainly become more and more challenging due to the progressive extension of areas affected (e.g. increase of Intervention Zones adjacent to the Buffer Zone) and to the scope of measures to be implemented (e.g. if PWN spreads into the Buffer Zone and needs to be eradicated). It is therefore important to ensure an efficient use of public resources and involve resources other than public.

Conclusion 4: It is necessary to identify measures which are effective in containing PWN in its current geographical area and to propose solutions to ensure that the forestry sector contributes actively to their implementation and/or their financing.

5. The early detection of PWN in areas of continental Portugal where it is not known to be present is crucial for the success of its containment (if detected in the vicinity of the Intervention Zone) or eradication (if detected in the Buffer Zone or far from the Intervention Zone). The quality of annual surveys is therefore paramount. The Task Force recognised that the organisation of the surveys in both the Infested and Buffer Zones, combining a grid based and risk based approach and their performance from September to December, when the majority of symptoms appear, was appropriate. However, years of experience both in Portugal and Spain indicates that the detection of PWN in healthy-looking susceptible trees is extremely unlikely. This was also confirmed by the results of sampling in the Infested Zone of the outbreak of Sancti-Spiritus (Spain), where all samples taken from different parts of asymptomatic trees including the crown, tested negative³.

³ Plant Protection Service Spain (unpublished) - <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN>

Økland, B., Skarpaas, O., Schroeder, M., Magnusson, C., Lindelöw, Å., Thunes, K., 2010. Is Eradication of the Pinewood nematode (*Bursaphelenchus xylophilus*) likely? An evaluation of current contingency plans. Risk Analysis 30(9), 1424–1439.

In the Buffer Zone, the sampling of healthy trees is required in point 3(a) of Annex II to Decision 2012/535/EU. The Task Force considers that the pest freedom of the Buffer Zone is already demonstrated by a high level of testing on declining trees. The early detection of PWN will be more difficult in areas where trees may be latently infested and have nil or delayed expression of symptoms based on the predictions from the ETpN model of pine wilt expression.

Conclusion 5: It is appropriate to firstly focus the surveillance and in particular the sampling, on symptomatic trees in order to improve the effectiveness of the surveys. In areas where latent infestation and delayed expression of symptoms are expected, the surveys should be complemented by analysing for the presence of PWN in the vector. Focusing the sampling on symptomatic trees in the Buffer Zone could only be implemented if it were to give rise to new legal provisions following the forthcoming review of relevant EU legislation.

6. The main objective of the activities of identification, sampling and elimination of dead or declining trees in the Buffer Zone of Portugal is to 1) mitigate the risk that PWN spreads by means of its vector to other EU territories and 2) confirm by intensive surveys that control measures implemented in the Infested Zone are effective in containing PWN. The elimination of dead trees and those in poor health or situated in fire- or storm- affected areas required by Decision 2012/535/EU, aims at mitigating risks of attracting potentially infested vectors from the Infested Zone into the Buffer Zone as well as eliminating trees at risk of being infested. Given the scale of the Buffer Zone and the resources required for the implementation of these measures, it is important to focus on measures which are effective in fulfilling these objectives and to ensure that the design of measures and timing of their implementation is maximised.

In particular, point 3(b) (ii) of Annex II to Decision 2012/535/EU requires the immediate elimination of susceptible trees in fire-affected areas when identified during the flight period of the vector. The Task Force stressed that a forest fire occurring during the flight period of the vector, would attract vectors from long distances immediately and for some time after the fire. The Task Force considers that immediate elimination of trees in the fire-affected area would not effectively mitigate this attractiveness and would trigger a risk of further dispersal of vectors already attracted.

Conclusion 6: It is necessary to adapt the management of fire-affected areas in the Buffer Zone in order to ensure that it effectively contributes to PWN containment. It is also appropriate to provide guidance on the most efficient way to implement other control measures in the Buffer Zone. These recommendations could only be implemented if they were to give rise to new legal provisions following the forthcoming review of relevant EU legislation.

7. Portugal has, over the years, developed tools and organised services in order to implement consistently measures throughout continental Portugal. Despite the many strengths of this system, the scale of the intervention makes it difficult to ensure that measures are always implemented in an effective way, i.e. in an appropriate and timely manner, notably in the areas most at risk for the spread of PWN.

Conclusion 7: The system in place needs to be strengthened by restructuring and developing existing tools (FITO database), investing in new technology (equipment of field teams, use of remote sensing for complementing ground surveys), prioritising the work and developing staff capacity (training, supervision), in order to increase the efficiency of official services in implementing PWN measures and to contribute to a better management of deadlines.

Recommendations made by the Task Force to Portugal aim at addressing difficulties identified during the review, and are based on the latest scientific knowledge. They are detailed in sections 5.3 to 5.6 and outlined in an overview table presented in Annex 2.

5.3. Infested Zone - Recommendations

5.3.1. Overall Strategy for the Infested Zone

The following measures are recommended:

- Establish an Active Containment Zone along the outer edges of the area where PWN is known to be present (Intervention Zone), concentrating on reducing populations of vectors by the removal of trees likely to be infested by vectors, whether containing PWN or not, before their life cycle can be completed. This may be achieved by setting up a network of baited traps throughout the Zone in order to identify sites presenting PWN infested vector activity. Ideally, in all such sites, wood presenting a risk of being already infested by immature stages of the vector should be eliminated before the emergence of new beetles. However, if resources are limited, efforts should be concentrated on sites with the highest populations of vectors, identified every year by intensive monitoring of vector activity, hereafter referred to as "priority sites". These sites are those presenting the highest risk for PWN spread where specific management measures should be implemented with the highest priority. They are also sites where returns for the effort expended will be the highest. (See also section 5.3.2)

It is recommended that the Active Containment Zone should be set up without delay to initiate the monitoring of the vector from mid-June to mid-August 2016 and to perform the work of elimination of wood at risk from September/October 2016 until March 2017, at least in the priority sites. In the following years, the delimitation of the Active Containment Zone should be confirmed or amended based on the results of the annual surveys (see next bullet point), and the work in the Active Containment Zone performed every year as previously described.

- Maintain a strict control on movements from the Intervention Zone to the areas where PWN is not known to be present, of wood from felled symptomatic trees with a view to limiting risks of PWN human-assisted spread. (see section 5.3.3)
- In areas where PWN is not known to be present (i.e. anywhere outside the Intervention Zone), confirm the absence of PWN by a risk based survey to be performed on trees and vectors with a view to ensuring appropriate delimitation of the Intervention Zone and delimitation of the Active Containment Zone. In addition, forest management practices should be implemented throughout the zone with a view to protecting susceptible forest from PWN infestations by improving forest health and limiting the presence of declining trees as breeding resources for vectors. This would strengthen the measures implemented in the Active Containment Zone and Buffer Zone. (See section 5.3.4)
- In the core area of the Intervention Zone which is not included in the Active Containment Zone, raise awareness and promote the implementation of forest management practices to reduce the presence of wood attracting the vector and likely to be used by the vector for breeding and thereby limit the populations of vectors and associated PWN. (See also section 5.5 and Annex 1)

5.3.2. Active Containment Zone - Recommendations

5.3.2.1. Delimitation of the Active Containment Zone

It is recommended that the Active Containment Zone is set up by straddling the limit between known infested areas and areas where PWN is not known to occur in order to ensure that actions are taken on the outermost known infested areas. It will also reduce the pressure for

expansion beyond the known edge of infestation because there will be fewer beetles and, hence, less risk of spread. It is recommended that the width of the infested part of this zone should reflect the pine forest cover, being at least 1 km wide in continuous pine forest and 5 km wide in areas with fragmented tree cover. The non-infested part of the Active Containment Zone should at least be 5 km wide, provided that the monitoring of the vector and surveys of trees are intense and there is confidence that infested trees are being identified efficiently to ensure that this outer area of the Active Containment Zone remains free from PWN.

5.3.2.2. Establishment of a network of traps in the Active Containment Zone

The Task Force recommended that a network of baited traps should be deployed in both the infested and non-infested areas of the Active Containment Zone. It was acknowledged that this would not pose a risk of attracting infested vectors into areas not known to be infested as the attractiveness of baited traps is limited to approximately 500 m⁴. Analysing, using molecular techniques⁵, for the presence of PWN in vectors caught in the traps would provide information on the possible presence of PWN in areas so far not known to be infested and could also give an additional indication of the extent of PWN spread (sites with high populations of infested vectors). The locations of traps in the Active Containment Zone should be based on proximity to known PWN-infested sites, tree density and other stand characteristics as well as local topography. This would be determined based on local assessment of sites.

Since the main purpose of the network of traps is to provide a reliable comparative measure of vector presence, the trap characteristics, their placement and management would need to be standardised. They should be placed so that it is as easy as possible to service the traps and collect samples.

Teflon coated traps (either cross-vane or multi-funnel) and containers for captured beetles should be used, with a design preventing vector escape and a size adapted to avoid saturation of traps. Such traps should also be adapted to avoid the capture of large quantities of small non-targeted insects such as *Orthotomicus erosus*, the decay of which would repel *Monochamus*. Small holes at the collector cup of the traps would allow such insects to escape. This problem can also be solved by using insecticides in the collector cup and frequent collection of the catch. Traps should be baited with a lure known to be effective in attracting the beetles (currently GALLOPROTECT 2D is recommended). These lures are effective for two months. In order to reduce the costs of the monitoring, the Task Force proposed to use only one lure per trap to be placed during the period the most appropriate to monitor PWN infested vectors (mid-June to mid-August)⁶. It is recommended that traps should not be placed close to the trunk and preferably at two meters above ground level. In dense forest, traps should be placed near the edge of the stand (e.g. along tracks or roads) or a gap/clearing area.

⁴ Etxebeste, I., E. Sanchez-Husillos, G. Álvarez, H. Mas I Gisbert y J. Pajares (2015). Dispersal of *Monochamus galloprovincialis* (Col.: Cerambycidae) as recorded by mark-release recapture using pheromone traps. *Journal of Applied Entomology*: In press.

⁵ Cardoso, J M. S., Fonseca, L and Abrantes, (2012) Direct molecular detection of the pinewood nematode, *Bursaphelenchus xylophilus*, from pine wood, bark and insect vector. *Eur J Plant Pathol* 133:419–425

⁶ Naves et al (2009). Biology of *Monochamus galloprovincialis* (Coleoptera, Cerambycidae) in the Pine Wilt Disease Affected Zone, Southern Portugal (*Silva Lusitanica*)

Naves et al (2007). Transmission of the pine wood nematode *Bursaphelenchus xylophilus* through feeding activity of *Monochamus galloprovincialis* (Col., Cerambycidae) (*Journal of applied Entomology*)

Traps should be monitored every two weeks in order to collect and count vectors trapped and to analyse as many of them as possible for the presence of PWN.

5.3.2.3. Selection of priority sites in the Active Containment Zone

The Task Force recommended that priority sites throughout the Active Containment Zone should be selected in the Autumn of every year based on results of the monitoring of the vector from mid-June to mid-August. The capture data will provide information on the presence of PWN and its vector at each capture location as a basis for the selection of priority sites. The precise criteria for selecting priority sites should be developed on the basis of experience, especially if the monitoring reveals consistent results throughout the Active Containment Zone. The location and number/extent of priority sites may change from year to year within the Active Containment Zone.

5.3.2.4. PWN forest management in priority sites of the Active Containment Zone

The Task Force recommended that the specific management to be implemented consists of identifying trees suitable for vector breeding and eliminating their crowns (wood parts of a diameter of less than 25 cm), by chipping or burning, from September until the start of the flight period of the vector (1 April).

Trees dead for two years or more do not need to be eliminated as they no longer present a risk of vector presence and their elimination constitutes a waste of resources and time. These can be identified by absence of needles, absence of “branchlets” (new growth) and at least partial absence of bark on the lower part of the tree trunk. Exit holes from *Monochamus* (round holes at least 5 mm across) are also indicators of trees that have been dead for longer than the life cycle of *Monochamus* spp. vectors. During the first identification exercise, trees dead for two years or more should be marked in a distinctive way (e.g. a white cross) in order to make it clear to felling operators that they can be ignored. The surroundings of these dead trees, however, should be more intensively surveyed for the presence of declining trees.

Trees to be eliminated are those likely to be used by vectors for breeding. These tend to be dominant or subdominant trees with symptoms of ill-health such as wilting, fire-damage, wind damage, etc. Clear indicators of early declining symptoms, regardless of cause, are defined in order to help operators to select trees to be eliminated: discolouration and loss of needles (yellowing, browning and, especially, rapid reddening (a classic symptom of pine wilt disease)), loss of resin pressure combined with at least one other symptom (this can be tested by making a small hole in the bark and observing resin flow; healthy trees have rapid resin flow, whereas weakened trees have little or no resin flow), trees presenting signs of bark beetle attacks.

Areas where a forest fire has occurred and affected the crowns of susceptible tree species, are attractive to the vector. In these areas, trees showing any damage to the crown that could enable egg laying by the vector need to be felled. The presence of only black trunks, but with green healthy-looking needles, indicating that it was only a rapid moving ground fire not materially affecting the tree, is not necessarily sufficient for considering specific trees as being affected by fire for this purpose.

5.3.2.5. Costing of measures in the Active Containment Zone

The Active Containment Zone could be delimited on the basis of administrative boundaries, consistent with other PWN related zones. This presents advantages notably for the notification of forest owners and managers, the acquisition of specialised services and awareness raising campaigns. However this could unnecessarily extend the zone beyond the

minimum width required (see section 5.3.2.1) and constitutes a drawback when resources are scarce.

An Active Containment Zone established with one parish on both sides of the outer limit of the Intervention Zone would fulfil the minimum width specified in sections 5.3.2.1 and would include the parishes where PWN-related measures have been stepped up when infested trees are detected less than 5 km from the border with the Buffer Zone.

The map, table and rough costing presented hereafter are related to an Active Containment Zone focusing on the northern and north-eastern part of the Intervention Zone. However, based on the first results of the survey performed in Autumn 2015, the Task Force recommended that the Active Containment Zone should be established all along the outer limits of the Intervention Zone, from its north-western part down to its southern part. An updated map and cost estimation will have to be prepared by the competent authority in Portugal to reflect this. The Active Containment Zone presented in Figure 3, extends over a significant territorial surface of around 624 500 ha, of which around 106 300 ha are occupied by susceptible forest.

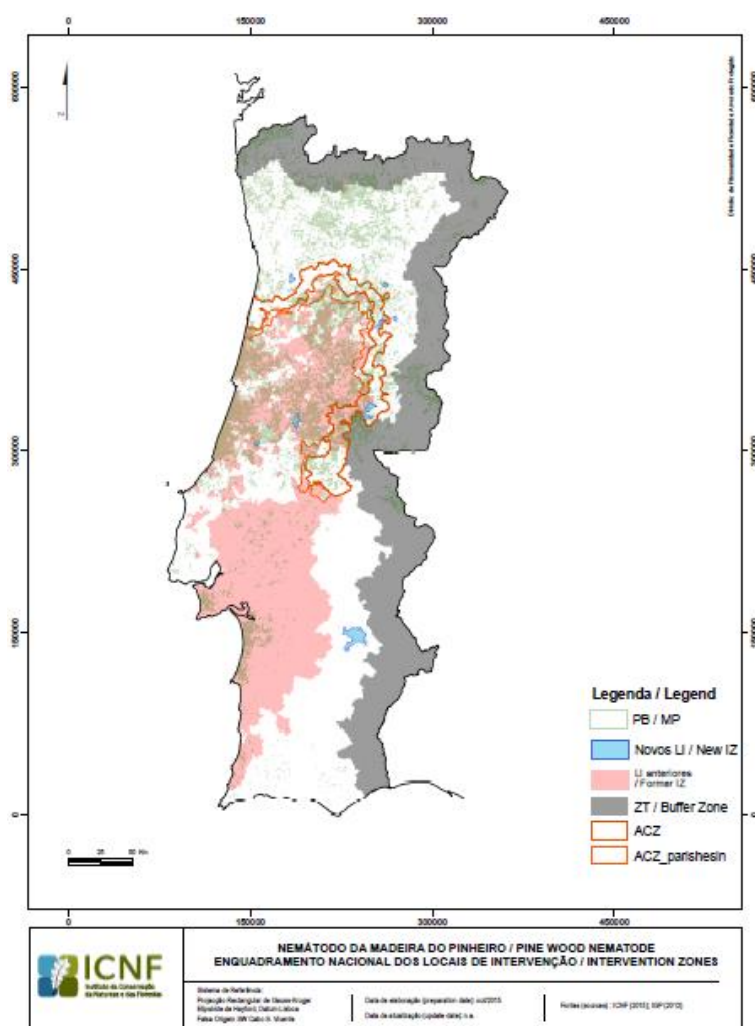


Figure 3 – Proposal of delimitation of an Active Containment Zone along the outer limit of the northern and north-eastern part of the Intervention Zone (based on 2014 survey results)

Table 1 presents an estimation of the territorial surface and area in susceptible forest included in the original Active Containment Zone as shown in Figure 3. It also provides an estimation of the susceptible forest currently under management which includes areas under Forest

Management Plans, Communal land Plans, ZIFs and other areas known to be managed (Source ICNF).

Table 1– Estimation of the territorial area and susceptible forest areas under management or not, included in the Active Containment Zone

Active Containment Zone (ACZ)	Territorial area			Susceptible forest area		
	"Managed" Area	Area without active management	Total	"Managed" Area	Area without active management	Total
PWN-free part of the ACZ (Parishes intersecting a 5km buffer to the Intervention Zone)	105 000 ha	320 200 ha	425 200 ha	16 500 ha	52 700 ha	69 200 ha
	25%	75%	100%	24%	76%	100%
Infested part of the ACZ (Parishes in the Intervention Zone)	75 400 ha	123 900 ha	199 300 ha	14 800 ha	22 300 ha	37 100 ha
	38%	62%	100%	40%	60%	100%
Total Active Containment Zone			624 500 ha			106 300 ha

Rough estimation of annual costs related to the implementation of the Active Containment Zone as represented in Figure 3:

- Establishment of a network of traps
Costs of traps: 1600 traps (placed in a 100 ha grid, 1 km x 1 km – Territorial Unit) x 25 €/trap = 40,000 €
Costs of lures: 1600 traps x 25 €/bait = 40,000 €
- Trap monitoring: 20 €/trap x 1600 traps x 5 times/trap = 160,000 €
- Insect vector analysis 25 €/analysis x 1600 traps x 5 samples/trap x 25 % of samples submitted to analysis = 50,000 €
- Identification of trees likely to be used for vector breeding (assuming that 25 % of the territorial area in the infested part of the Active Containment Zone will be selected for intervention – 25% of 199,300 ha)
1.5€/ha of Territorial Area x 50,000 ha = 75,000 € (without sampling of trees)
- Elimination of trees likely to be used for vector breeding
40€/ha* x 50,000 ha = 2 M€ (* average cost for the elimination of entire trees in the Buffer Zone)

Total: 2.36 M€ for the first year and similar for the following years

The exact delimitation of the Active Containment Zone could be adjusted based notably on the characteristics of susceptible forest areas (presence/density of susceptible forest) as indicated in section 5.2.1.

5.3.3. Movement restrictions on susceptible wood potentially infested originating in the Intervention Zone and moving into the rest of the Infested Zone

The Task Force recommended that:

- Existing national measures to control potentially infested wood moving from the Intervention Zone to other parts of the Infested Zone are maintained. These include compulsory declaration to the Competent Authorities prior to felling and moving wood of conifers in an intervention zone as well as specific conditions for moving wood from felled symptomatic trees to the other parts of the Infested Zone during the flight period of the vector. These conditions are aligned with those implemented in the Buffer Zone (wood

debarked or covered with insecticide drenched nets or treated with insecticides after felling and at destination).

- Perform checks in order to ensure that these restrictions are respected.
- Raise awareness of stakeholders and the public on the risks and restrictions related to susceptible wood.

5.3.4. Annual surveys in the Infested Zone

Although maintaining annual surveys throughout the Infested Zone including in the Intervention Zone would provide relevant information on the development of the pest population, the Task Force acknowledged that this was not essential for containment. It is therefore recommended that these surveys be focused on areas of the Infested Zone where PWN is not known to be present (i.e. outside the Intervention Zone) as described in section 5.3.4.1.

5.3.4.1. Survey of trees in the Infested Zone (outside the Intervention Zone)

The following recommendations were made in order to effectively focus the surveys on trees showing possible symptoms of pine wilt or trees which are suitable for vector breeding:

- **Grid based survey:**
As mentioned in point 5 of section 5.2, the grid based approach is appropriate. However, at each grid point, the survey should cover a sufficient area (a minimum radius could be defined at national level) with a view to identifying and sampling symptomatic trees. Spatial risk analyses could be used to support these activities. In the case where only healthy looking susceptible trees are observed, this information should be recorded.
- **Risk based survey:**
These types of surveys should cover areas considered at higher risk for the spread of PWN i.e. parishes adjacent to the Intervention Zone, places where susceptible wood of various origins are transported, stored and/or processed, such as points of entry, sawmills and wood processing industry, as well as fire-, drought-, or wind-affected areas. Spatial risk analyses based on GIS applications could be carried out to map the risk areas to be surveyed.

The survey should consist of inspecting the nearest neighbouring susceptible trees or group of trees present in all directions in or around the risk area. Sampling should be targeted to symptomatic trees identified and samples taken should preferably be composite (up to 5 trees). In addition, samples should be taken in susceptible wood present in the facilities, focusing on parts with symptoms of vector activities (e.g. galleries).
- Instructions to staff on how to perform the surveys should be sufficiently detailed in order to ensure their appropriate implementation.

5.3.4.2. Survey of the vector in the Infested Zone (outside the Intervention Zone)

The Task Force recommended that the survey of the vector could be focused on risk areas. Baited traps should be placed in the vicinity of wood storage as well as in the surroundings of the facilities. The types of traps and lures to be used are as recommended in section 5.3.2.2. A number of baited traps ("sentinel traps") should be placed as appropriate from April to monitor the start of the flight period while the whole network of traps could be placed from June to September/October. Traps should not be placed close to the trunk and preferably at two meters above ground level. In dense forest, traps should be placed near the edge of the

stand (e.g. along tracks or roads) or a gap/clearing area. Traps should be monitored every two weeks in order to collect and count vectors trapped and analyse as many as possible for the presence of PWN.

5.3.5. *Intervention Zones adjacent to the Buffer Zone - Specific measures*

In areas where PWN has been detected very close to the Buffer Zone, there is an increased risk of PWN spread by means of its vector and by unintentional movement of wood infested with PWN and vectors into the Buffer Zone, despite restrictions in place on movement and the checks on movement performed by the Competent Authorities. In order to mitigate these risks, the Task Force recommended the following measures:

- To continue implementing specific measures in the surroundings of infested trees when found at less than 5 km from the border with the Buffer Zone.
- The placing of a “label” by the Competent Authority on dead or declining trees identified and/or sampled, to help increase owners' awareness of the risk and restrictions related to susceptible wood. A website and telephone number to get further information could be mentioned on the label. This could also be done in the part of the Buffer Zone close to the intervention zone.
- To further support the awareness campaign, the placing of signposts along the borders (especially as these are permanent) informing persons of entry into the Buffer Zone and of the restrictions of bringing in coniferous wood.

5.4. Buffer Zone - Recommendations

5.4.1. *Annual surveys in the Buffer Zone*

5.4.1.1. Surveys of trees in the Buffer Zone

Recommendations made for the survey of the Infested Zone (see section 5.3.4.1) are also valid for surveys of trees in the Buffer Zone insofar they comply with Decision 2012/535/EU. Focusing the sampling on symptomatic trees in the Buffer Zone could only be implemented if it were to give rise to new legal provisions as part of the forthcoming review of relevant EU legislation.

The Task Force agreed that the sampling scheme currently implemented in the Buffer Zone (up to 6 composite samples taken and 30 declining trees sampled per location) should ensure that declining trees are evenly sampled throughout the Buffer Zone. The overall number of samples should meet the level of sampling required in Decision 2012/535/EU. It was recommended however, to increase the intensity of sampling in areas presenting a higher risk of being infested with PWN, in particular:

- In fire-affected areas (defined in section 5.4.4.1 of this report), additional trees should be sampled if signs of activity of the vector are noticed (e.g. galleries of the vector). Sampling and testing of trees for the presence of PWN should be performed at the time of felling and elimination of trees, with a view to being able to detect a possible incursion of infested vectors in the Buffer Zone (see section 5.4.4.2);
- In parts of the Buffer Zone included in demarcated areas of outbreaks detected in Spain, in the vicinity of the border with Portugal. This is the case for the demarcated areas of Valverde del Fresno (Extremadura) and As Neves (Galicia). It implies that the Portuguese authorities should sample susceptible trees identified for elimination in the area concerned, with the same intensity as in the Spanish part of the demarcated areas, in accordance with point 7(b) of Annex I to Decision 2012/535/EU. The Task Force recommended that Spain and Portugal liaise to establish a framework for ensuring that

information on measures implemented and their results are recorded consistently so that they can be aggregated and communicated as appropriate to the Commission and to other Member States.

The Task Force also recommended that Portugal starts taking samples from different parts of symptomatic trees, especially the crowns (both the stem and branches in this zone), i.e. the thin-barked parts of the tree where the vector beetles breed, with a view to mitigating risks of false negatives. This should be implemented as a precautionary principle while awaiting the results of the planned EU co-financed scientific study on efficacy of sampling at breast height⁷.

5.4.1.2. Surveys of the vector in the Buffer Zone

Recommendations made concerning traps and their management in the Infested Zone (see section 5.3.3.2) are also valid for the Buffer Zone.

In addition, the Task Force made the following recommendations:

- In the part of the Buffer Zone where, according to the preliminary results of the REPHRAME project, there is a risk of latent infestation, the survey of the vector should be performed in order to confirm the absence of infestation. The exact mapping of such areas should be confirmed in the context of a co-financed scientific study to be conducted in 2015-2017.
- In other parts of the Buffer Zone, the placing of traps for the survey of the vector was not considered necessary to demonstrate the pest freedom of the zone. However, the use of traps and testing of vectors trapped was still recommended in high risk areas such as:
 - Places where susceptible wood of various origins are transported, stored and/or processed, such as points of entry, sawmills and wood processing industry;
 - Areas affected by fire during the flight period, before the elimination of trees, as well as during the following two flight periods (see also section 5.4.4.2).

5.4.2. Organisation of the work of identification of dead or declining trees

The Task Force recommended that:

- The identification of declining trees should be conducted in the Autumn (from October), after the period where most of the wilting symptoms appear and should be repeated in early Spring (March/April) in order to detect possible late expression of wilt symptoms following late infestation the year before.
- The identification followed by the elimination of declining trees should be performed throughout the Buffer Zone in a timely manner. This work should be performed starting with areas at most risk of the spread of infested vectors (priority areas) so that, if there are delays in the completion of the work in the Buffer Zone, these do not concern areas where it is of utmost importance that the work is completed before the start of the flight period of the vector (1 April). A third identification exercise could take place during the Summer particularly in the risk areas.
- A plan for the regional services, defining clear priorities for the performance of the work, could be developed based on the risk for the natural spread of PWN which is not the same throughout the Buffer Zone. Priority should be given to parishes adjacent to the

⁷ Section 2.3 of the Annex to Commission Implementing Decision of 30.6.2015 concerning the amendment of the work programme 2015 covered by Commission Implementing Decision 2014/C 410/ 04 and the adoption of the work programme and the financing for the year 2016 of activities in the food and feed area to ensure the application of the food and feed legislation - Support to scientific activities to enhance the efficiency and reliability of surveillance for Pine wood nematode in particular in the Buffer Zone in Portugal

Intervention Zone, parishes where there is a continuity of pine stands between the Infested and Buffer Zones as well as between the Buffer Zone and Spain, parishes with wood processing industries in the area, parishes with stands with high mortality of declining trees in the previous years, including fire and storm-affected areas, parishes situated where the Portuguese/Spanish demarcated areas overlap and within parishes, and those stands that present the highest number of declining trees.

- The use of modern tools for the systematic identification of declining trees to be investigated to complement the identification from the ground. This would help to increase the effectiveness of the identification. The use of a helicopter, the acquisition and photo-interpretation of very high resolution aerial photography over such areas or the use of Unmanned Aerial Vehicles (UAV) with aerial photography (hyperspectral and RGB) could also offer good means on limited areas.

5.4.3. Definition of trees in poor health

Decision 2012/535/EU, in point 3(b) of Annex II, requires that, throughout the Buffer Zone, susceptible trees in poor health are identified and eliminated. In order to increase the efficiency of the identification work and avoid, in areas with high tree mortality such as old fire-affected areas, that new trees in poor health appear quickly after the identification in the area of trees to be eliminated, the Task Force recommended that:

- Clear indicators of early declining symptoms should be defined in order to help operators to select trees to be eliminated. Clear indicators include discolouration and loss of needles (yellowing, browning and, especially, rapid reddening (a classic symptom of pine wilt disease)), loss of resin pressure combined with at least one other symptom (this can be tested by making a small hole in the bark and observing resin flow; healthy trees have rapid resin flow, whereas weakened trees have little or no resin flow), trees presenting signs of bark beetle attacks, etc.
- In addition, the possibility of eliminating weakened dominated trees in the vicinity of declining trees could be considered with a view to increasing the efficiency of felling teams in eliminating the declining trees (use of machinery rather than men for pulling trees outside plots).
- Staff in charge of the identification of trees to be eliminated be trained and have to hand clear instructions to help them to perform this identification work.

5.4.4. Definition and management of fire-affected areas

5.4.4.1. Definition of fire-affected areas

Point 3(b) of Annex II to Decision 2012/535/EU requires all susceptible trees to be eliminated in fire-affected areas. A fire-affected area should be defined as the area where susceptible trees are present and weakened sufficiently by the fire to allow egg laying by the vector. A good indicator of such trees is the presence of any damage to the crown that would enable vector breeding. Another good indicator is any evidence of successful breeding by bark and other wood-boring beetles in the trunk. The presence of only black trunks, but with green, healthy-looking, needles, indicating that it was only a rapid moving ground fire not affecting the tree, is not necessarily sufficient for considering an area as being affected by fire for this purpose.

5.4.4.2. Management of fire-affected areas

Based on the conclusions of the review (Point 6 of Section 5.2), the Task Force made the following recommendations for the management of fire-affected areas.

- The elimination of susceptible trees in areas affected by fire during the flight period could be postponed to the end of the flight period. This would encourage vectors attracted by the smoke volatiles to remain in the fire-affected areas or its immediate vicinity, to feed and oviposit. In the meantime, it is recommended to place baited traps in these areas near still living fire-affected trees (likely to be very attractive to the vector), with a view to catching vectors attracted to the general area. These should be analysed for the presence of PWN. In addition, for the following two years, baited traps should be placed in fire-affected areas and the susceptible trees in the surroundings of fire-affected areas should be intensively surveyed. This recommendation could only be implemented if it were to give rise to new legal provisions following the forthcoming review of the legislation – in particular a revision of Decision 2012/1535/EU.
- Sampling and testing of trees for the presence of PWN should be performed at the time of felling and elimination of trees, in all cases in different parts of the trees especially the crown, with a view to being able to detect a possible incursion of infested vectors in the Buffer Zone.
- Intensity of sampling: According to the last paragraph of point 3(b) of Annex II to Decision 2012/535/EU, felled susceptible trees completely destroyed by forest fires are exempted from sampling and testing for the presence of PWN. The Task Force proposed that this exemption be interpreted as concerning trees in fire-affected areas which are not suitable for maturation feeding or breeding of the vector due to the extent of damage caused by the fire. As mentioned in section 5.4.1.1., the sampling scheme implemented in the Buffer Zone (up to 6 composite samples taken and 30 declining trees sampled per location) could be implemented in fire-affected areas, and the sampling intensity increased if signs of activity of the vector are noticed (e.g. galleries of the vector). Sampling should be focused on trees and parts of trees presenting signs of activity of the vector, as these present the highest probability of being infested with PWN. In very large fire-affected areas, efforts of sampling could be concentrated on the trees with obvious signs of vector activity.

5.4.5. Buffer Zone - Elimination of trees identified

5.4.5.1. Hygiene protocol for machinery

In the Buffer Zone of Portugal, the elimination of declining trees has been delegated to private companies, The Task Force recommended that:

- In the absence of reference to the Hygiene protocol for machinery⁸ in the contract, clear instructions are given to the contractor on this point, and their implementation is checked in the context of supervision.
- Reference to the Hygiene protocol for machinery is included in the manifest in order to raise awareness of all operators and forest owners felling or moving susceptible wood.

5.4.5.2. Elimination of susceptible trees by chipping

In the Buffer Zone of Portugal, the elimination of dead or declining trees delegated to private companies is performed by chipping systematically on the site the entire trees. The Task Force recommended that:

- The chips be retained as close as possible to the stump of the felled tree in order to mitigate risks of contamination by possible PWN infested chips⁹;

⁸ "Hygiene protocol for all vehicles and machinery transporting and/or using timber from felled host conifers from the demarcated area", issued by the Portuguese Competent Authority as required by Point 4 of Annex II to Decision 2012/535/EU

⁹ REPHRAME – www.rephrame.eu

- For mitigating safety issues raised by the chipping of felled wood with diameter of more than 25 cm, the use of specific equipment for reducing the size of logs to the capacity of the chipping equipment. This should be required in the delegating contract.

The Task Force considered that logs with diameter of more than 25 cm with brown inner bark would not present any risks for the spread of infested vectors or the development of bark beetles if left on site. This would also contribute to preserving the biodiversity. However this practice could have several drawbacks, in particular increasing the risk that logs are moved away by forest owners. In Natura 2000 or other high value forests, leaving such logs on-site could be proposed to forest owners or managers subject to a specific commitment to maintain such logs on sites. Such logs should be marked after the felling of the tree e.g. with a white cross. This recommendation could only be implemented if it were to give rise to new legal provisions following the forthcoming review of the legislation –in particular a revision of Decision 2012/1535/EU.

5.5. Overcoming obstacles linked to the forestry sector - Recommendations

The characteristic of the forestry sector and its lack of involvement in the application of forestry practices required for the control of PWN might jeopardise, in the medium/long term, the containment of PWN in Portugal. It is therefore urgent to initiate actions in order to lift this obstacle.

5.5.1. Ensuring the involvement of forest owners or their associations in the implementation of PWN control measures in forests containing host trees

The Task Force recommended that a mechanism be established at National level to enable the enforcement of forest management practices for the containment of PWN by forest owners or their associations instead of by the Competent Authority. This should concern at least all areas where measures are currently required or recommended with a view to reducing the spread of PWN (the Active Containment Zone, the Buffer Zone and area between these two zones).

This mechanism should enable identification within a reasonable timeframe (6 months to one year) after public announcement, of the following:

- Susceptible forest areas which are privately owned where the owners explicitly commit to implement PWN-related measures, in line with the national legislation/EU requirements. This will enable the Competent Authority to apply sanctions in the case of non-compliances;
- Susceptible forest areas for which owners do not declare their intention to manage adequately their forest. On these, the implementation of appropriate/sustainable forest management practices should be organised by the Competent Authority in the public interest. ZIFs with extended powers could be requested to develop plans for managing sustainably these forest areas and implementation of such plans. Forest management plans should aim to improve pine forest conditions, contributing to reduced PWN spread, whilst increasing resilience to forest fires and the commercial value of the wood. ZIFs should be at least partly financed by compulsory membership of forest owners as well as the revenue from the forests managed. This would help to reduce the cost of specific PWN practices and hence reduce the need for public support to compensate for these costs.

This should progressively allow the Competent Authority to be less involved in the implementation of measures and shift their resources to the control of these activities.

5.5.2. Encouraging the forestry sector to self-invest in the sustainable development of the pine sector

The Task Force recommended investigating the possibilities for the sector to self-invest in its development. This could be done by means of a forest levy, i.e. a limited percentage of the sale of all forest products, which could be invested by forest owners and forest industry, with the view to promoting the start of new ZIFs and sustainable forest management. This levy could be administrated by the forest sector itself, without intervention of the State. This approach has proven to be very successful in Sweden and in other countries globally. This would help in developing sustainable forest management, which would contribute indirectly to the fight against PWN.

In a context where stakeholders of the pine wood sector and pine wood industry are not supportive of the idea as they believe that private investments in Portuguese pine forest are unlikely given the high risks of forest fire and PWN infestations as well as the highly fragmented ownership of small pine forests, the Task Force recommended:

- To continue to communicate with the forestry sector on the benefits of sustainable forest management, best practices to protect forests against fire and PWN as well as the possibility of having profitable forests despite these risks. To this aim, the Task Force proposed guidelines to raise awareness of forest owners on these aspects (see Annex 1);
- And in parallel, in order to overcome in the short term the lack of willingness of the sector to get involved, to set up more restrictive measures in order to ensure that forest owners have a clear longer-term interest in developing common management of their forest land. This could be done by setting up compulsory membership and/or financial contribution to associations of forest owners. In addition, more power could be given to these associations so that they can contribute to the sustainable management of pine forests (see also previous section).

5.5.3. Forest fires and PWN related actions

The Competent Authority and municipalities (teams of 'sapadores') dedicate significant human and financial resources to operations related to forest fires. These consist of prevention measures (creation of strips with bare soil to limit fires, removal of branches to reduce the amount of fuel) and sanitation measures following fires (cutting of burned trees of all dimensions). As burned areas are attractive to the PWN vector, the timing of the sanitary cutting is essential in order to help prevent the dispersion of potentially infested vectors into PWN free areas. However, the number of fire-affected areas and the size of some of these, combined with the limitation of resources, often make it challenging if not impossible to complete this work on time.

The Task Force considered that sustainable forest management would help in making both fire prevention and the cutting of wilting pines more effective and part of a profitable forestry. This can be observed in the Troia peninsula where PWN was first detected in Portugal and which, through careful forest management and rapid removal of declining trees, still has a high proportion of living, PWN-free pine trees.

The Task Force recommended that a specific aid programme be set up or continued to support investments in projects such as:

- The creation of ZIFs.
- The possibility to use fire-damaged wood of small dimensions in a profitable way (for instance as fuel to make electrical power and heating in the winter or as raw material to make fuel for vehicles).

5.6. Increasing the efficiency of services in implementing PWN control measures – Recommendations

5.6.1. *Design and use of the common database and other equipment*

The Task Force agreed that the existing common database (FITO) is a key tool for the organisation and monitoring of the work as well as the management of deadlines. It already contains a wide range of geo-referenced information related to the survey, identification and elimination of trees. With a view to improving the effectiveness of this tool and its use, the Task Force made the following recommendations:

- To complement the data already recorded in order to enable the monitoring of progress and the management of deadlines. In particular by:
 - Indicating grid squares that have been surveyed/identified in order to better monitor progress of the work. Additional information on the resource/time needed for performing the work per grid square at an appropriate scale could help produce statistics to be used for planning the work and managing deadlines.
 - Ranking areas based on the risk of natural spread of PWN (particularly adjacent grid squares see section 5.4.2) in order to help coordinators to prioritise the work at district level.
- To adapt the structure of the database to the needs of national and local teams so that it is suitable to:
 - Be directly connected to a geographic information system (GIS) in order to enable the creation of maps at appropriate scales and with relevant information for use by field teams;
 - Produce statistics and standard reports with a view to supporting the effective planning of the work, monitoring progress and managing deadlines.
- To use the database to convey key information to relevant users through alert messages/reminders, with a view to ensuring that measures are appropriately implemented. For instance, the database could highlight a positive sample in a parish adjacent to the Buffer Zone with a recommendation for immediate action to be taken. A message could also be sent to draw attention to deadlines.
- To train and provide procedures to all users, and in particular coordinators, on the efficient use of the database.
- To organise regular (annual) feedback from users with a view to reviewing the application and making sure it meets needs/expectations.

The Task Force recommended the allocation of one tablet with appropriate GIS capability and standardised software to record field data per field team with a view to increasing their efficiency. This would enable maps to be uploaded directly into the field computer/tablet and transferred automatically into the common database when the team is back to the office.

In Portugal, the data handling system is unique and is used throughout the country, whereas in Spain a different system is used which also varies between regions. The Task Force recommended the development of a harmonised data handling system in the long run and agreed that actions between Portugal and Spain are necessary. This would be an asset, especially for future scenarios if PWN spreads throughout the Buffer Zone.

5.6.2. *Human resources*

Local coordinators are appointed to organise the work and ensure that PWN measures are appropriately implemented in their District. Compliance with objectives and deadlines relies largely on coordinators. The successful implementation of measures relies on their

willingness and capacity to meet the challenges that they are confronted with and their technical skills and motivation are determining.

The Task Force therefore recommended that regular training sessions, exchanges of experience and current best practices as well as on the spot supervision by ICNF forest health experts, are organised in order to ensure that local coordinators:

- Have a good knowledge of the cycle of the pest and its vector, a good understanding of PWN measures and of the importance of their timely implementation.
- Are able to use tools at their disposal efficiently for performing their tasks.
- Feel supported and that their efforts are recognised in order to keep their motivation high.

Field teams for the survey, identification of declining and dead trees and supervision of the work of felling operators are limited in number in each District. Each team thus covers significant territory which can be located far from their place of residence. This means that, on average, a significant proportion of the daily working time is dedicated to travelling which limits considerably the efficiency of teams. Ideally, either more locally-based teams should be recruited or trained teams should stay in the area of survey for the duration of survey/sampling rather than travel daily.

The Task Force recommended that consideration should be given to the possibility of involving municipalities more systematically in the implementation of PWN-related measures in their territories in order to overcome this problem.

6. SPAIN

6.1. Evolution of the situation of PWN

PWN was detected in Spain for the first time in October 2008, in "Sierra de Dios Padres" in the Autonomous Community (AC) of Extremadura. This finding of one single infested tree outside the pine forest located at 12.5 km from a wood processing company and 40 km from the border with Portugal was detected during the 2 km x 2 km grid based survey. It was declared as eradicated by the Spanish Authorities on 16 January 2013. Since this first case, three outbreaks were detected in Spain which are all still under eradication:

- in November 2010, a single tree was found infested in As Neves, in the AC of Galicia;
- in February 2012, a single tree was found infested in Valverde del Fresno, in the AC of Extremadura, 595 m from the Portuguese border and
- in December 2013, in Sancti-Spíritus, in the AC of Castilla y León, 135 infested trees were found in a stand of mixed forest of 150 ha in a high risk area due to the proximity to a main transport route for wood from Portugal. The area had been surveyed in 2012 as part of the PWN survey grid point, and samples taken from symptomatic and asymptomatic trees with negative tests results.

In the three outbreaks active in 2014, demarcated areas have been established and eradication measures implemented.

Spain developed a range of national plans and protocols that provides guidance to the ACs on the survey of the territory, methodology to sample for and identify PWN, inspection of wood processing industry procedures and road controls. A national contingency plan was also developed to provide ACs with a framework outlining steps to follow in cases of suspicion and EU requirements when an outbreak is confirmed.

The territory of Spain is surveyed annually according to a grid and a risk based approach, as detailed in the national survey plan. The risk of natural spread is addressed by the establishment of a grid system which has higher density close to Portugal, whereas the risk of spread by movement of wood is addressed by the inspection of places receiving susceptible wood and the survey of their surroundings, supplemented by inspection of wood shipments on roads. At each grid point, samples are taken from declining susceptible trees or, in their absence, from healthy looking susceptible trees. The survey of the surroundings of risk areas covers a maximum of 6 km radius and consists of sampling the first declining trees identified while performing the survey, starting from the immediate vicinity of the risk area.

Action plans are established for each demarcated area, which outline the main features of each demarcated area as well as the organisation of control measures implemented. In both ACs visited, the operations of felling, sampling and/or elimination of declining trees are interrupted during the period of high risk of forest fires, in accordance with the legal bans on forest operations introduced by each AC, generally in place at least during the period June to September.

6.2. Conclusions of the review of the situation of PWN

1. Spain has developed at national level a specific PWN contingency plan i.e. measures to be taken following a finding. However, the plan is general and, in particular, it does not provide detailed guidance on how to act in the event of a confirmed detection of PWN. Recent experience shows that ACs would benefit from specific guidance on how to handle PWN outbreaks.

Conclusion 1: The development of a detailed specific PWN contingency plan at National level would contribute to improving the level of preparedness of all ACs with regard to PWN.

2. The early detection of PWN in trees in an area is crucial for its successful eradication. The annual surveillance of the territory is therefore paramount. The Task Force recognised the appropriateness of the organisation of the surveillance in the Spanish territory. However, several years of experience both in Portugal and Spain indicates that the detection of PWN in healthy looking pine is extremely unlikely.¹⁰

In demarcated areas, the sampling of healthy trees, required in point 6 of Annex I to Decision 2012/535/EU, is not considered to be the first priority given that the pest freedom of the Buffer Zone is already demonstrated by a high level of testing on declining trees.

Conclusion 2: It is appropriate to firstly focus the surveillance and in particular the sampling, on symptomatic trees, in order to improve the effectiveness of the surveys. This is also relevant for the surveys of trees in demarcated areas. The related recommendation could only be implemented if it were to give rise to new legal provisions following the forthcoming review of the legislation.

3. The establishment of a demarcated area with an appropriate Buffer Zone is essential in ensuring and confirming the successful eradication of an outbreak. The experience in Sancti-Spiritus shows that there is a need for providing guidance to Competent Authorities in the ACs in order to support their decisions with respect to the width of the Buffer Zone.

Conclusion 3: It is appropriate to provide guidance on how to implement EU requirements, based on scientific knowledge¹¹ on the flight dispersal capacity of the insect vector and its likely behaviour in a given environment.

¹⁰ Plant Protection Service Spain (unpublished) - <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN> Økland, B., Skarpaas, O., Schroeder, M., Magnusson, C., Lindelöw, Å., Thunes, K., 2010. Is Eradication of the Pinewood nematode (*Bursaphelenchus xylophilus*) likely? An evaluation of current contingency plans. *Risk Analysis* 30(9), 1424–1439.

¹¹ Etxebeste, I., E. Sanchez-Husillos, G. Álvarez, H. Mas I Gisbert y J. Pajares (2015). Dispersal of *Monochamus galloprovincialis* (Col.: Cerambycidae) as recorded by mark-release recapture using pheromone traps. *Journal of Applied Entomology*: In press.

Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015b). Physiological development and dispersal ability of newly emerged *Monochamus galloprovincialis* (Coleoptera: Cerambycidae). *Entomologia Experimentalis Et Applicata*: Enviado.

Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015a). Effectiveness of mass trapping in the reduction of *Monochamus galloprovincialis* Olivier (Col.: Cerambycidae) populations. *Journal of Applied Entomology*.

Torres-Vila, L. M., C. Zugasti, J. M. De-Juan, M. J. Oliva, C. Montero, F. J. Mendiola, Y. Conejo, Á. Sanchez, F. Fernandez, F. Ponce y G. Esparrago (2015). Mark-recapture of *Monochamus galloprovincialis* with semiochemical-baited traps: population density, attraction distance, flight behaviour and mass trapping efficiency. *Forestry* 88(2): 224-236.

4. The main objective of the activities of identification, sampling and elimination of dead or declining trees in the Buffer Zone of a demarcated area under eradication is to 1) confirm that eradication measures implemented in the Infested Zone and its surroundings have been successful and that the Buffer Zone is free from PWN and 2) mitigate any risk of PWN spread by movement of infested wood to areas outside the demarcated areas. The appropriate and timely implementation of these measures can be extremely challenging for official services due to local constraints such as difficult climatic or topographic conditions or extended periods of high risk of forest fire. In a context of scarce resources, it is important to focus the use of resources on measures that are effective in reaching their objective.

Conclusion 4: It is necessary to clarify how and when measures should be implemented taking into account the local context, with a view to ensuring that effective measures are implemented in an efficient way.

Recommendations made by the Task Force to Spain aim at addressing difficulties identified during the review, and are based on the latest scientific knowledge. They are detailed in sections 6.3 to 6.5 and outlined in an overview table presented in Annex 2.

6.3. Contingency plan - Recommendations

The Task Force recommended that:

- The existing National Contingency plan be improved with a view to providing more guidance on how to act in the event of a confirmed detection of PWN. This should help in implementing the Decision 2012/535/EU and building on past experience in eradicating PWN outbreaks. Existing national plans and protocols on the survey of the territory, methodology to sample for and identify PWN, inspection of wood processing industry procedures and road controls could be annexed to the national contingency plan.
- The structure of the contingency plan could, if appropriate, be the same as the structure of existing Spanish contingency plans in other sectors (for instance animal health) which have proven to be adapted to the specificities of the country. As in Sweden or the UK, it could also consist of a short main document complemented by a range of specific annexes. The main document would provide a general explanation on the different steps involved in response to a finding of PWN and explaining how and when the annexes should be implemented. The annexes would provide technical information on procedures to be implemented to ensure a rapid and effective response to an outbreak in any of the 17 ACs. This also offers flexibility in being able to add new information and best practice as soon as it is available.
- For the Organisational structure, that the command structure is identified at national level. The role and responsibility of each identified group should be clearly defined. Detailed guidance for the work of each group could be provided in a separate annex.
- Information on the biology and life cycle of PWN, vectors, detection and spread forms a key part of the contingency plan as it underpins measures to be taken. The situation with respect to expression of wilt symptoms, bearing in mind evidence that sampling at breast height does not always detect PWN infestation in a tree, insect vectors present and their

Haran, J., A. Roques, A. Bernard, C. Robinet y G. Roux (2015). Altitudinal Barrier to the Spread of an Invasive Species: Could the Pyrenean Chain Slow the Natural Spread of the Pinewood Nematode? *PLoS ONE* 10(7): e0134126.

David, G., B. Giffard, D. Piou y H. Jactel (2014). Dispersal capacity of *Monochamus galloprovincialis*, the European vector of the pine wood nematode, on flight mills. *Journal of Applied Entomology* 138(8): 566-576.

influence on the risk of spread and the design of survey/eradication measures could valuably be provided for each AC.

- Task Force recommendations (see section 6.4 to 7.1.2) on implementation of surveys and eradication measures be included in relevant annexes. The specific case of a Spanish demarcated area overlapping with the Portuguese territory could be addressed in order to organise the cooperation and exchanges of information between Portugal and Spain.

6.4. Surveillance of the territory - Recommendations

6.4.1. Grid based surveys

The Task Force recommended that the grid based survey should be focused on identifying and sampling of symptomatic trees as follows:

- The survey at each grid point should cover a sufficient area (a minimum radius could be defined at national level) with a view to identifying and sampling symptomatic trees. In the case where only healthy looking susceptible trees are observed, this information should be recorded. The sampling of healthy trees at such grid points would not be the best use of resources.
- In parts of the territory where latent infestation and possible delayed expression of symptoms is expected to occur, a network of baited traps covering the territory should be established to survey for the presence of PWN in vectors. In addition, wood with signs of vector activity, stored in sawmills and in the wood processing industry including trees in the surrounding areas, should be sampled and tested for the presence of PWN. Verification of the ETpN model¹² is being planned and will provide further indications of which areas are most likely to exhibit latency and delayed expression of symptoms.

6.4.2. Risk based surveys

The Task Force recommended that places where susceptible wood of various origins are transported, stored and/or processed, such as points of entry, sawmills and wood processing industry, should be considered as risk areas for the introduction and spread of PWN. These places are attractive to vectors present in the surrounding area and could be a source of vectors of different origins transported with the wood, which could escape and colonise surrounding trees. It is therefore important to survey for the presence of PWN in these places and their surroundings.

The Task Force recommended:

- To increase the survey effort in these areas by inspecting the nearest neighbouring susceptible trees or group of trees present in all directions around the risk area. These could be at more than 6 km depending on the characteristics of the distribution of susceptible trees in the surroundings of the risk area. Sampling would be targeted at symptomatic trees identified. Since the purpose is to detect initial PWN infestations, composite samples from several trees in a group can be taken to reduce overall sampling efforts. If positive PWN samples are confirmed, then more detailed sampling should be initiated.
- Sampling susceptible wood present in the facilities, focusing on wood parts with symptoms of vector activities.
- To continue placing baited traps in the vicinity of wood storage as well as in the surroundings of the facilities and to test captured vectors for the presence of PWN. This could provide information on the presence of infested vectors locally and could also

¹² REPHRAME - www.rephrame.eu

mitigate risks of infested vectors escaping from the risk areas and colonising trees present in the vicinity.

6.4.3. Recording of results

The Task Force recommended ensuring that symptoms of decline and signs of vector activity observed in the trees sampled are systematically recorded. Indeed, in the case of a positive sample, a detailed description of the nature and quantity of these symptoms and signs would aid understanding the origin and date of the outbreak. In this respect, it would also be most relevant to set up a system to ensure that molecular analysis, using appropriate techniques, of PWN in a fresh sample taken from the trees found infested is performed in order to determine the origin of the infestation.

6.4.4. Reporting on survey results

The Task force recommended:

- The development of detailed guidance to ACs on how to report on surveys inside and outside demarcated areas which would help the collection and compilation of harmonised survey data at national level;
- Establishing a national database for recording PWN related activities (notably surveys) performed in ACs. The possibility and advantages of such a database could be discussed with ACs.

6.5. Eradication measures following confirmation of a finding - Recommendations

6.5.1. Establishment of a demarcated area

The Task Force recommended the following guidance to be included in the National Contingency Plan:

- The width of the Buffer Zone should be based on the flight dispersal capacity of the vector and its likely behaviour in the environment surrounding the trees found infested. Vectors tend to fly short distances within continuous susceptible forests whereas they can fly long distances in open environments with fragmented cover of susceptible tree species¹³;

¹³ Etxebeste, I., E. Sanchez-Husillos, G. Álvarez, H. Mas I Gisbert y J. Pajares (2015). Dispersal of *Monochamus galloprovincialis* (Col.: Cerambycidae) as recorded by mark-release recapture using pheromone traps. *Journal of Applied Entomology*: In press.

Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015b). Physiological development and dispersal ability of newly emerged *Monochamus galloprovincialis* (Coleoptera: Cerambycidae). *Entomologia Experimentalis Et Applicata*: Enviado.

Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015a). Effectiveness of mass trapping in the reduction of *Monochamus galloprovincialis* Olivier (Col.: Cerambycidae) populations. *Journal of Applied Entomology*.

Torres-Vila, L. M., C. Zugasti, J. M. De-Juan, M. J. Oliva, C. Montero, F. J. Mendiola, Y. Conejo, Á. Sanchez, F. Fernandez, F. Ponce y G. Esparrago (2015). Mark-recapture of *Monochamus galloprovincialis* with semiochemical-baited traps: population density, attraction distance, flight behaviour and mass trapping efficiency. *Forestry* 88(2): 224-236.

Haran, J., A. Roques, A. Bernard, C. Robinet y G. Roux (2015). Altitudinal Barrier to the Spread of an Invasive Species: Could the Pyrenean Chain Slow the Natural Spread of the Pinewood Nematode? *PLoS ONE* 10(7): e0134126.

David, G., B. Giffard, D. Piou y H. Jactel (2014). Dispersal capacity of *Monochamus galloprovincialis*, the European vector of the pine wood nematode, on flight mills. *Journal of Applied Entomology* 138(8): 566-576.

Takasu, F., Yamamoto, N., Kawasaki, K., Togashi, K., Kishi, Y. and Shigesada, N. (2000). Modeling the expansion of an introduced tree disease. *Biological Invasions* 2: 141-150

- Reduction of the Buffer Zone width to no less than 6 km could be considered in cases where infested trees are located in an area with continuous and dense pine forest;
- In cases where the outbreak is located in a landscape with few susceptible scattered trees, the capacity of the vector to reach the nearest plots or forest area with susceptible tree species located in any direction around the outbreak area should be allowed for. These should be included in the demarcated area unless there are scientific/technical justifications for doing otherwise.

6.5.2. Survey, identification and elimination of symptomatic trees in demarcated areas where eradication measures are implemented

6.5.2.1. Survey in the demarcated areas

The Task Force acknowledged that the organisation of the survey in the two demarcated areas visited, combining a grid based and risk based approach, is appropriate. In line with conclusion 2, the Task Force recommended:

- Focusing surveys on susceptible trees showing possible symptoms of pine wilt or trees which are suitable for vector breeding;
- Increasing the effort for identifying symptomatic trees throughout the demarcated areas, firstly focusing the sampling on symptomatic trees and presence/absence of the vector. It is appropriate to continue to take samples in different parts of the symptomatic trees especially their crowns and notably parts of the tree presenting symptoms, in order to reduce any risks of false negatives.

The related recommendation to focus the sampling on symptomatic trees could only be implemented if it were to give rise to new legal provisions following the forthcoming review of the legislation.

6.5.2.2. Identification of declining trees

The main objective of the activities of identification and sampling of declining trees in the Buffer Zone of a demarcated area under eradication is to confirm that eradication measures implemented in the Infested Zone and its surroundings have been successful and that the Buffer Zone is free from PWN. It is therefore important to concentrate sampling effort on trees presenting symptoms that could be those of a PWN infestation i.e. trees presenting rapid declining colour (red/brown) on some or all of the tree crown. Samples should be taken in the crown area as well as from the main trunk.

The Task Force recommended that the most appropriate period for identifying trees declining due to PWN infestations are:

- Early Autumn (September/October) when most of the symptoms of PWN infestations appear;
- Early Spring (March/April) when the growth of vegetation starts and delayed expression of PWN infestation from the previous flight period may become visible. However, symptoms can become apparent at any time and so continuous general vigilance is a valuable addition to formal survey periods.

Togashi K, Shigesada N (2006) Spread of the pinewood nematode vectored by the Japanese pine sawyer: modelling and analytical approaches. *Popul Ecol* 48: 271–283.

6.5.2.3. Flight period of the vector

The Task Force considered that the data available for vector emergence do not warrant the application of any different flight period for Spain or Portugal from that given in the Decision 2012/535/EU. However these data could be used for more precise timing for the use of traps.

6.5.2.4. Elimination of declining trees identified

Prevention of forest fires has the highest priority in Spain. A ban on forest operations is triggered during the period of high risk for forest fires (mid-June to mid-September) which might affect the implementation of point 7 of Annex I to Decision 2012/535/EU). This period coincides with the peaks of flights of vectors. Ad hoc solutions might need to be elaborated in specific situations.

The Task Force recommended that in demarcated areas under eradication, the following conditions should mitigate the risk of spread of PWN:

- An effective identification of dead or declining trees to be performed every year both in early Autumn and early Spring.
- Felling, sampling, testing and elimination¹⁴ of identified dead or declining trees to be completed before the start of the flight season (1 April) and thus before the Spanish ban is introduced.
- A network of baited traps to be in place during the whole flight period with a view to monitoring the population of vectors and to determining whether it is free from PWN.

¹⁴ In accordance with point 7 of Annex I to Decision 2012/535/EU

7. CONCLUSIONS OF THE REVIEW AND RECOMMENDATIONS ON ISSUES RELEVANT TO BOTH PORTUGAL AND SPAIN

7.1. PWN outbreaks identified in the vicinity of the border between Portugal and Spain

7.1.1. Conclusions of the review

So far, most of the positive PWN findings in pine trees in Spain have been detected in the vicinity of the border with Portugal, resulting in demarcated areas overlapping with the Buffer Zone in Portugal. Over time, findings of PWN in the Buffer Zone of Portugal are also likely to occur. In these cases, good coordination between Spanish and Portuguese authorities will be necessary to ensure timely and appropriate implementation of measures in the area concerned.

Conclusion: it is necessary that Spain and Portugal increase their level of cooperation with a view to ensuring that PWN outbreaks identified in the vicinity of their common border are appropriately managed to ensure their eradication.

7.1.2. Demarcated areas straddling the border between Portugal and Spain - Recommendations

The Task Force recommended that Spain and Portugal establish a framework for ensuring good cooperation in cases of outbreaks detected in the vicinity of their border. This system should aim at:

- Ensuring that control measures and their results are implemented and recorded consistently throughout a demarcated area straddling the border between the two Member States.
- Ensuring quick communication of any suspicion or confirmation of the presence of PWN in the vicinity of the border (20 km on both sides of the border), cooperation as appropriate for delimiting the extent of the infestation, communication of the exact delimitation of the demarcated area, and control measures to be implemented consistently throughout the Buffer Zone.
- Being effective, with flows of information, frequency of exchanges, contact persons, specific templates and information to be recorded being predefined and agreed by both parties.
- Enabling control measures to be implemented and their results consistently aggregated and communicated as appropriate to the Commission and other Member States.
- Establishing a consistent, harmonised database for managing information related to the survey and control measures implemented and their results.

This system should be operational for possible PWN outbreaks detected either in the Spanish or the Portuguese side of the border.

7.2. Infested Zone - Implementation of a clear-cut zone

Recommendations on this point are to be considered in the context of the future review of the applicable EU legislation. Accordingly, they could be implemented only if they were to give rise to new EU legal provisions. It should be reiterated that the relevant EU legislation, in particular Decision 2012/535/EU is fully applicable and its provisions, including those governing clear-cut zone should be fully implemented and complied with .

7.2.1. *Conclusions on the review*

Point 2 of Annex I to Decision 2012/535/EU requires the immediate felling of all susceptible trees situated within 500 m around each susceptible tree found infested, where PWN is found. Point 3 of the same Annex foresees that the radius can be reduced to 100 m when the implementation of a clear-cut zone has an unacceptable social and environmental impact. Susceptible plants located between 100 and 500 m should instead be intensively surveyed and sampled annually. These requirements would apply both for a finding of PWN in the Buffer Zone of continental Portugal and in Spain.

The Task Force acknowledged the difficulty of ensuring the elimination of 100% of the branches that could contain infested vectors, especially in an extensive infested area and/or when environmental (e.g. steep slopes or waterlogged soils) or weather conditions are not optimal for ensuring the elimination of all small diameter breeding material. Furthermore, results of vector dispersal models developed in the context of the REPHRAME project indicate that wide clear cut belts might not be effective in preventing the spread of PWN from an infested area. It is therefore important to define wherever appropriate control measures that would be more effective to eradicate PWN.

The Task Force considered that, in certain specific circumstances, implementing a clear-cut zone may lead to some counter-productive effects, resulting in the further spread of PWN. In particular, in the event of a finding in the Buffer Zone in Portugal close to the Infested Zone, implementing a clear-cut zone could create an open space and encourage vectors from the Infested Zone to fly further into the Buffer Zone in search of host trees for maturation feeding or breeding.

The Task Force also noted that points 3 and 4 of Annex I to Decision 2012/535/EU (reduction of the radius of the clear-cut zone) mean that each susceptible tree located between 100 m and 500 m radius around the plants found infested, will have to be sampled every year at breast height, which might not always be desirable due to possible impact on tree health, or feasible. Therefore, in practice, an alternative solution has to be carefully developed.

Conclusion: The requirement to always implement a wide (100 to 500 m) clear-cut zone to eradicate PWN may lead to some unintended effects, leading to an increased risk of spread of PWN in certain specific situations such as in the buffer zone in Portugal. This has to therefore be fully considered as part of the forthcoming review of the legislation with a view to the development of a robust alternative, with the aim of ensuring a more fit for purpose control strategy.

7.2.2. *Consideration for possible review of existing EU requirements on Clear-cut zone*

The Task Force recommended that the following elements are taken into account for establishing an appropriate alternative to a clear-cut zone. This concerns situations where the expression of pine wilt is expected either in the year of infestation or the Spring/Summer of the following year.

- It is important to retain healthy pines relatively close to the trees found infested in order to encourage infested *Monochamus* spp to remain in the area and reduce the likelihood of their commencing long distance flights. These trees should be intensively monitored over at least four years and those showing signs of wilting or signs of vector activity, be felled, sampled, tested and eliminated in accordance with Decision 2012/535/EU before the next flying season.
- The nearest susceptible trees in all directions to known infested trees are those presenting the highest risk of being infested by vectors emerging from the infested trees. The preventive felling should therefore concern susceptible trees present within a few metres

around each infested tree in dense forests¹⁵. Where pines are rare in the landscape, intensive surveys of all trees extending to several kilometres in all directions should be carried out with immediate felling and sampling of trees showing any symptoms of infestation (regardless of cause). In addition, sampling of apparently healthy looking trees should focus on parts of the trees presenting signs of vector activity (i.e. trunk and branches in the crown area of the tree). A sufficient density of baited traps should be placed during the following flight season in the infested area and its surroundings in order to trap vectors that could emerge from small diameter breeding material left on sites despite careful elimination of cut waste. All vectors trapped should be tested for the presence of PWN.

- A Buffer Zone should be delimited around each group of infested trees. Its width should be adjusted depending on the characteristics of the environment (see section 6.5.1). The Buffer Zone should be subject to intensive monitoring for the identification, felling, sampling, testing and elimination of declining trees as well as intensive monitoring of vectors and their testing for the presence of PWN. In order to provide sufficient guarantees that all declining trees are identified, the identification activities should combine remote sensing with a high resolution data (any method proven to be effective could be used such as aerial imagery by aircraft or satellite imagery) and ground surveys. Identification activities should be performed twice a year; early Autumn (September/October) when most of the symptoms of PWN infestations appear, as well as early Spring (March/April) when the growth of vegetation starts and affected trees become visible. Further monitoring throughout the growing season followed by a rapid elimination of trees attacked by bark beetles should be performed with a view to maintain the health of stands in the demarcated area. Sampling of symptomatic trees should be done in different parts of the trees, especially the crowns (trunk <25 cm diameter and branches) presenting wilting symptoms and/or signs of activities of the vector). A network of baited traps should be deployed throughout the Buffer Zone, and vectors trapped should be tested for the presence of PWN. This network could have the added benefit of reducing the populations of vectors, thereby reducing risks of spread;
- Injection treatment with systemic chemical nematicides of susceptible trees for preventing the development of PWN could also be envisaged in certain situations to further reduce any risks of spread of PWN.
- These measures should be complemented by restrictions of movement of wood as required by Decision 535/2012/EU.

These considerations do not constitute definite recommendations to Portugal and Spain, as further work including an inventory of methods and measures that could be used, is needed to elaborate a robust and efficient alternative to preventive felling.

However, the following recommendations were made to Portugal for managing an outbreak in the Buffer Zone:

- The Task Force agreed that if PWN-infested trees were detected in the Buffer Zone, the extent of the infestation would need to be determined and infested plants immediately eliminated. Intensive monitoring should be implemented in the 20 km surrounding the Infested Zone with identification, testing at an appropriate level (in accordance with the European Food Safety Authority (EFSA) technical assistance on

¹⁵ Takasu,F.,Yamamoto,N.,Kawasaki,K.,Togashi,K.,Kishi,Y. and Shigesada,N. (2000). Modeling the expansion of an introduced tree disease. *Biological Invasions* 2: 141-150

Togashi K, Shigesada N (2006) Spread of the pinewood nematode vectored by the Japanese pine sawyer: modelling and analytical approaches. *Popul Ecol* 48: 271–283.

sampling statistics¹⁶) and elimination¹⁷ of all dead and declining trees. However, this could be difficult to implement in situations where the 20 km zone largely overlaps with intervention zones. Where additional positives are found in the existing containment Buffer Zone, the eradication areas should be further extended. Where additional positives are found in the current Infested Zone, extending the eradication area would not be necessary. Where the 20 km radius extends into Spain, this Member State would have to apply similar measures.

- In the event of a PWN finding in the Buffer Zone under containment, the task force recommended that an immediate meeting of the task force should be called in order to assess the situation and to define the most appropriate eradication measures to be implemented.

¹⁶ European Food Safety Authority – Supporting Publication 2012:EN-385 – Technical assistance on the sampling statistics to be applied pursuant to Commission Implementing Decision 2012/535/EU on emergency measures to prevent the spread of *Bursaphelenchus xylophilus* (the pine wood nematode) within the European Union

¹⁷ In accordance with point 7 of Annex I to Decision 2012/535/EU

8. OVERALL CONCLUSIONS

The Task Force conducted intensive work from November 2014 to October 2015 aimed first at understanding the local situation and difficulties raised by the control of PWN in Portugal and Spain. The work mainly focused on the spread of PWN by vector dispersal as it represents a major threat to the effective containment of PWN within continental Portugal. Based on this review, the Task Force made a number of recommendations to both Member States with a view to overcoming current difficulties and gaining effectiveness and efficiency in combatting PWN. The successful completion of this work was achieved with thanks to the full cooperation of the Portuguese and Spanish Competent Authorities.

Conclusions of the review and the range of recommendations made are based on the Task Force expertise and latest scientific development, in particular the EU funded REPHRAME project. Recommendations made aim at refocusing attention on risk and measures giving greatest prospect of success as well as maximising the use of resources. These recommendations imply changes of varying degrees to the existing situation in the Member State concerned and some will be challenging to implement.

Both Portugal and Spain are supportive of these recommendations and have informed the Commission that work has already commenced in 2015 for their implementation. However, Portugal also expressed some concerns about the expected rapid setting up and implementation of the new strategy of the "Active Containment Zone", in the Infested Zone, given the additional resources required. Furthermore, the in-depth changes recommended for the forestry sector are also expected to raise difficulties. These difficulties are not only technical but also financial. It is therefore essential that continued attention is given by the Task Force and the Commission, together with Portugal, in order to address these difficulties.

The Task Force underlines that most of these recommendations are only applicable in Portugal and adjacent parts of Spain. This part of the Iberian Peninsula is characterised by only one vector species, almost only one susceptible tree species and expression of symptoms (although with possible delays), which can be expected in most of the territories concerned. This makes it relatively uncomplicated to detect infested trees.

Some recommendations should be assessed and decided on in the framework of the forthcoming review of the applicable EU legislation, in particular Decision 2012/535/EU and could only be implemented if new legal provisions were adopted.

ANNEX 1- SHORT GUIDELINES FOR FOREST OWNERS AND FOREST MANAGERS FOR SUSTAINABLE PINE FOREST MANAGEMENT WITH SPECIAL ATTENTION TO PINE WOOD NEMATODE WITHIN THE INFESTED AREA IN PORTUGAL (DRAFT)

How to use the guidelines

The forest land in Portugal is divided into many small plots. In the absence of a land register, the authorities usually don't know which plot is owned by whom. This makes it extremely difficult to act effectively against the PWN with legal actions or to make forestry profitable. These short guidelines aim to make forest owners without knowledge of forestry aware that their small forest plots have the potential to produce money for their living but only provided that they cooperate with other owners, e.g. in a ZIF or in other ways. Forestry needs machinery, and machinery needs to be used on reasonably coherent and large (1-5 hectares) areas to be profitable. A functioning forest management is also a prerequisite for making effective actions against PWN and forest fires. Experiments since 1999 on the Troia peninsula south of Setubal show that with a good forest management it is possible to grow valuable pine timber also in areas where initially high infestations of PWN were recorded.

These guidelines should be complemented with photographs, translated and provided with addresses to local forest officers, forest owners associations and ZIFs, and be given to forest owners. The guidelines contain advice in relative terms like “give enough space”, “not thin harder than”, etc., which need to be interpreted by a local forester with good knowledge of the local conditions. Hopefully, the guidelines will stimulate contacts between forest owners and foresters and increase the interest for forestry among the owners.

Background

The Pine Wood Nematode (PWN), *Bursaphelenchus xylophilus*, is very difficult to eradicate, but it is possible to reduce its spread by stopping its vector, the pine sawyer beetle, *Monochamus galloprovincialis*. Forest fire is another big problem for the forestry sector. However, both problems can be handled by sustainable forest management. This paper is an as-short-and-simple-as-possible collection of good advice for practical forestry to be implemented by forest owners and forest managers in Portugal. Most of the guidelines could also be implemented in adjacent parts of Spain.

The problem with PWN is mainly a problem for Maritime pine, *Pinus pinaster*, which is the most important pine species for the wood industry in the western part of the Iberian Peninsula. In the text below, “pine” always refer to this species. (Most of the guidelines are also applicable for Aleppo pine *Pinus halepensis*, Scots pine, *Pinus sylvestris* and most other pine species. Stone pine, *Pinus pinea* seems to represent less danger of spreading PWN in the forest because the vector seems much less attracted to stone pine, at least in the presence of Maritime pine. In lack of better knowledge – consider newly dead wood of Stone pine to be as risky as other pine wood, in any case in areas without Maritime pine.)

Economy

Sustainability is always a combination of economy and biology. The economy is usually limited by the costs of the machinery and the size of the forest units. Especially Portugal has very small forest units, but these obstacles could be avoided if all forest owners would start to cooperate e.g. in ZIFs (Zonas de Intervenção Florestal) or other forms of common management. The larger the area for a single forest operation – the lower the costs per cubic metre and hectare, and the higher the profit for the forest owners.

The economy is also dependent on the time between sowing and harvest. If the trees have enough space they will grow fast and reach their optimal economical size in a relatively short time (25 – 35 years). Other advantage with this is that a pine with a relatively large crown will tend to have high vitality and increased resilience against pests. The shorter the rotation time – the lower is the probability for forest fire and other calamities during the lifetime of the stand.

Planning the new stands for fire protection

Keep strips of bare ground, arable land, pastures or forest roads between pine forests for fire protection. In areas with higher humidity, strips can also be regenerated with species of broadleaved trees which can suppress fire, e.g. *Populus* and *Salix*.

Pruning of pines along the roads, and keeping strips of forest ground free from bushes and litter is also a good method to reduce the risk of fire in the crowns. Pines usually survive the fire if it is only burning on the ground. It is good to keep a strip of bare soil between the road and the forest to reduce the risk of fire by cigarette butts.

Young pine stands

As soon as the young trees are big enough to have no problems with competition from other plants and bushes, they should be thinned. The number of trees left is dependent on the conditions on the site (fertility, humidity, etc) and the time before the next action. Ask your local forest officer for more information. In forests of *Pinus pinaster*, all thinning and pruning activities should be done from October to February to mitigate the risk of creating breeding material for bark-beetles.

If the next action is a commercial thinning, the pre-commercial thinning should be hard enough to allow most of the trees left to reach commercially viable dimensions by the next thinning. However, it is important not to thin so hard that the competition from shrubs and herbs will be too strong again.

Pine stands with trunks bigger than 10 cm diameter in breast height

Keeping the stand healthy is the most important way to protect the trees from bark beetles. Try to keep the trees at a distance from each other that allow them to have at least the half (younger stands) or the upper third (older stands) of their length covered with green branches. Thin, dominated trees with small crown and low vitality should be removed. Such trees only trigger bark beetle attacks and produce less valuable wood.

To tap resin from bigger pines is a good way of getting more value from the forest. The wounds will activate the defence system in the pines and probably make them less susceptible for bark beetle damages.

In this stage the pines begin to be interesting as breeding substrate for bark beetles and for *Monochamus galloprovincialis*, the vector of the Pine Wood Nematode (PWN). The vector infests pines with PWN when they feed on the bark of small living twigs in the top of the crowns of healthy pines. However, breeding only takes place in very unhealthy or recently dead trees and, therefore, keeping trees vigorous and healthy is a good strategy to reduce breeding by *M. galloprovincialis*.

A good indicator of PWN is the fast wilting of pines, especially in June through August. It is extremely important to cut all such fast wilting pines in the autumn or at least before next spring, because they will have become attractive to the vector for breeding and could contain developing stages of the vector. All parts of the crown and the stem thinner than 25 cm

diameter have to be processed before the spring. Processing can include sawing with heat treatment of the wood (at least 56° C in the centre of the wood for at least 30 minutes), chipping into pieces smaller than 3 cm in all dimensions, or burning (in situ or as fuel in an oven). Wilting pines and wilting parts of pines that are damaged by forest fire, and wind-felled pines, are also very attractive as breeding substrate by the vector, and should be cut and treated in the same way, at least in areas where PWN is present.

The vector does not breed in trunks of Maritime pine bigger than 25 cm diameter, so that sort of wood can be used (or be left for biodiversity) without risk for spreading the vector. But the wood can still contain PWN, so heat treatment is important if the wood is supposed to be transported or used outside the infested zone where PWN is not present. See special national rules for this, and the EU-decision 2012/535/EU.

ANNEX 2- OVERVIEW TABLE OF TASK FORCE RECOMMENDATIONS

I- Task Force recommendations to improve implementation of existing legal provisions

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
1	Portugal	Infested Zone	Establish an Active Containment Zone straddling the outer limits of the Intervention Zone where 1) Set up annually a network of standardised traps for monitoring intensively vectors in order to identify priority sites where populations of infested vectors are found; 2) In priority sites, destroy all wood suitable for vector breeding before emergence of adults in order to reduce population of infested beetles.	1st bullet point of section 5.3.1 and Section 5.3.2	Control populations of infested vectors in order to mitigate risks of PWN spreading by means of its vector	The EU Decision requires in the infested zone to perform annual surveys of susceptible plants and the vector; eliminate trees found infested, taking all necessary precautions to avoid spreading of PWN and its vector. Therefore this recommendation goes beyond requirements of point 2 of Annex II to the EU Decision.	To be effective, a containment strategy has to rely on both the control of pest populations in the Infested Zone and the maintenance of a pest free Buffer Zone in its surroundings, the Buffer Zone being the last physical barrier preventing the pest from spreading to pest free territories outside the demarcated area. Recent scientific results (REPHRAME – www.rephrame.eu) indicate that the vector has a flight capacity which significantly exceeds the Buffer Zone width.
2	Portugal	Infested Zone	Control the movement of susceptible wood potentially infested from the Intervention Zone to other areas of the Infested Zone 1) Maintain existing restrictions of movement of wood from symptomatic trees 2) Check movements of wood in order to ensure that restrictions are respected	2nd bullet point of section 5.3.1 and Section 5.3.3	Limit risks of PWN human-assisted spread	Recommendation goes beyond requirements of the EU Decision.	The continuous spread of PWN within the Infested Zone appears to be mainly through vector dispersal but could also include human-assisted dispersal. It is therefore important to maintain a strict control of movement of potentially infested timber through transport routes.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
3	Portugal	Infested Zone	<p>Focus annual surveys in the Infested Zone on areas where PWN is not known to occur (ie outside the Intervention Zone) Survey trees and vectors for the presence of PWN according to a risk based approach: - sampling limited to symptomatic trees, sampling of different parts of trees including crowns, - survey of vectors focused on risk areas and their vicinity, using specific traps</p>	3rd bullet point of section 5.3.1 and Section 5.3.4	Increase the effectiveness of surveys activities in order to ensure early detection of PWN	Recommendation is in line with point 2 of Annex II to the EU Decision	<p>The early detection of PWN in areas of continental Portugal where it is not known to be present is crucial for the success of its control. The quality of annual surveys is therefore paramount. Experience both in Portugal and Spain as well as technical and scientific studies(*)(**) indicate that the detection of PWN on healthy looking pine is extremely unlikely and that sampling should be taken from different parts of the trees especially the crown.</p> <p>(*) Plant Protection Service Spain (unpublished) - http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN;</p> <p>(**) Økland, B., Skarpaas,O., Schroeder,M., Magnusson,C., Lindelöw,Å., Thunes,K., 2010 Is Eradication of the Pinewood nematode (Bursaphelenchus xylophilus) likely? An evaluation of current contingency plans. Risk Analysis 30(9), 1424–1439</p>
4	Portugal	Infested Zone	<p>In the parishes of the Intervention Zone adjacent to the Buffer Zone: 1) Continue to implement specific measures when PWN infested trees are detected close to the buffer zone; 2) Increase awareness of forest owners/managers on PWN risks and movement restrictions by placing labels on marked susceptible trees and signposts at the border of the Buffer Zone.</p>	Section 5.3.4	Mitigate risks of PWN spreading by transport of infested wood into the Buffer Zone	Recommendation is in line with Article 8 and goes beyond requirements of point 2 of Annex II to the Decision	The current continuous spread of PWN appears to be mainly through vector dispersal but could also include human-assisted dispersal, the strategy for preventing PWN from spreading to new areas should include measures for mitigating both risks.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
5	Portugal	Infested Zone	Encourage forest owners/managers to implement sustainable forest management in order to prevent forests from being infested or limit the impact of PWN in infested forests.	Section 5.3.1	Control populations of infested vectors in order to mitigate risks of PWN spreading by means of its vector	Recommendation goes beyond requirements of the EU Decision.	To be effective, a containment strategy has to rely on both the control of pest populations in the Infested Zone and the maintenance of a pest free Buffer Zone in its surroundings.
6	Portugal	Buffer Zone	Perform the Identification of declining trees: - by priority order defined according to the risk for natural spread of infested vectors, so that elimination of trees in these areas is always completed before the start of the flight season of the vector; - once in the Autumn when most of the wilting symptoms appear, and early Spring (March-April) when the growth of vegetation starts and declining trees become visible. possibly a third time during the summer; - using modern tools to complement ground surveys by aerial surveys	Section 5.4.2	Increase the effectiveness of the identification work	Recommendation is in line with the EU Decision	The identification and elimination of dead or declining trees in the Buffer Zone aim at mitigating risks of attracting potentially infested vectors from the Infested Zone into the Buffer Zone as well as eliminating trees at risk of being infested. Given the scale of the Buffer Zone and the resources required for the implementation of these measures, it should be ensured that the design of measures and timing of their implementation is maximised.
7	Portugal	Buffer Zone	Adapt the definition of trees in poor health so as to include susceptible trees presenting early symptoms of decline	Section 5.4.3	Increase the effectiveness and the efficiency of the identification work	Recommendation is in line with the EU Decision	It is appropriate to identify and eliminate early declining trees in order to limit risks of attracting potentially infested vectors from the Infested Zone into the Buffer Zone and for competent authorities to gain efficiency in performing this work.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
8	Portugal	Continental Portugal	<p>Overcoming obstacles linked to the forestry sector:</p> <ul style="list-style-type: none"> - Establish a mechanism ensuring that PWN control measures in susceptible forests are implemented by forest owners or their associations, allowing thereby competent authority to focus their resources on controlling the appropriate implementation of these measures; - Encourage the forestry sector in self-investing in the sustainable development of the pine sector, which indirectly helps controlling PWN; - Integrate management measures related to forest fire and PWN respectively 	Section 5.5	Ensure in the medium/Long term effective containment of PWN	Recommendation goes beyond requirements of the EU Decision.	The ownership and management situation in the private forestry sector is currently an impediment to the strengthening of control measures in the Infested Zone and, in the longer term, to the containment of PWN within the demarcated area of continental Portugal. It is therefore relevant to make recommendations concerning the forestry sector so that these obstacles can be overcome. It is necessary to identify measures which are effective in containing PWN in its current geographical area and propose solutions to ensure that the forestry sector contributes actively to their implementation and/or their financing.
9	Portugal	Deamarcated area	<p>Increase the efficiency of competent authority services by investing in management tools and equipment (data handling system...) as well as in human resources (Training, management, supervision of staff)</p>	Section 5.6	Ensure that control measures are implemented in an appropriate and timely manner so that they are effective in controlling PWN	Recommendation is in line with the EU Decision.	Given the scale of the demarcated area, it is appropriate to strengthen the system in place to control PWN in order to increase the efficiency of official services in implementing PWN measures and contribute to a better management of deadlines
10	Spain	Spanish territory	Further develop the national contingency plan in order to provide more guidance and support to all Spanish Regions on how to act in the event of a finding of PWN	Section 6.3	Increase the preparedness throughout Spain	Recommendation is in line with the EU Decision.	The development of a detailed specific PWN contingency plan at National level would contribute to improving the level of preparedness of all Autonomous Communities with regard to PWN.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
11	Spain	Outside demarcated areas	<p>Surveillance of the territory by performing surveys of trees and vectors for the presence of PWN according to a risk based approach:</p> <ul style="list-style-type: none"> - sampling limited to symptomatic trees, sampling of different parts of trees including crowns, - survey of vectors focused on risk areas and their vicinity, using specific traps) 	Section 6.4	Increase the effectiveness of surveys	Recommendation is in line with Article 2.1 of the EU Decision which requires Member States to annually conduct surveys for PWN on susceptible plants, susceptible wood and bark, and on the vector, by their sampling and testing.	<p>The early detection of PWN in trees in an area is crucial for its successful eradication. The quality of the annual surveillance of the territory is therefore paramount. Experience both in Portugal and Spain as well as technical and scientific studies(*)(**) indicate that the detection of PWN on healthy looking pine is extremely unlikely and that sampling of symptomatic trees should be taken from different parts of the trees especially the crown.</p> <p>(*) Plant Protection Service Spain (unpublished) - http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN;</p> <p>(**) Økland, B., Skarpaas,O., Schroeder,M., Magnusson,C., Lindelöw,Å., Thunes,K., 2010 Is Eradication of the Pinewood nematode (Bursaphelenchus xylophilus) likely? An evaluation of current contingency plans. Risk Analysis 30(9), 1424–1439</p>

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
12	Spain	Outbreak under eradication	Establish a demarcated area adapting the width of the buffer zone to the flight capacity of the vector and its likely behaviour in the environment surrounding the trees found infested	Section 6.5.1	Increase the effectiveness of eradication measures implemented	Article 5 (2) requires a buffer zone of a width of at least 20km. Where eradication measures are applied, the width can be reduced to no less than 6 km provided that that reduction does not jeopardise eradication.	<p>The insect vector behaviour is influenced by the forest cover (*)(**) and it is therefore appropriate to adapt the size of the demarcated area accordingly. This should also take into account the flight capacity of the vector (***)</p> <p>(*) Takasu,F., Yamamoto,N., Kawasaki,K., Togashi,K., Kishi,Y. and Shigesada,N. (2000). Modeling the expansion of an introduced tree disease. <i>Biological Invasions</i> 2: 141-150</p> <p>(**) Togashi K, Shigesada N (2006) Spread of the pinewood nematode vectored by the Japanese pine sawyer: modelling and analytical approaches. <i>Popul Ecol</i> 48: 271–283.</p> <p>(***) Etxebeste, I., E. Sanchez-Husillos, G. Álvarez, H. Mas I Gisbert y J. Pajares (2015). Dispersal of <i>Monochamus galloprovincialis</i> (Col.: Cerambycidae) as recorded by mark-release recapture using pheromone traps. <i>Journal of Applied Entomology</i>: In press.</p> <p>. Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015b). Physiological development and dispersal ability of newly emerged <i>Monochamus galloprovincialis</i> (Coleoptera: Cerambycidae). <i>Entomologia Experimentalis Et Applicata</i>: Enviado.</p> <p>. Sanchez-Husillos, E., I. Etxebeste y J. Pajares (2015a). Effectiveness of mass trapping in the reduction of</p>

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
							<p><i>Monochamus galloprovincialis</i> Olivier (Col.: Cerambycidae) populations. <i>Journal of Applied Entomology</i>.</p> <p>. Torres-Vila, L. M., C. Zugasti, J. M. De-Juan, M. J. Oliva, C. Montero, F. J. Mendiola, Y. Conejo, Á. Sanchez, F. Fernandez, F. Ponce y G. Esparrago (2015). Mark-recapture of <i>Monochamus galloprovincialis</i> with semiochemical-baited traps: population density, attraction distance, flight behaviour and mass trapping efficiency. <i>Forestry</i> 88(2): 224-236.</p> <p>. Haran, J., A. Roques, A. Bernard, C. Robinet y G. Roux (2015). Altitudinal Barrier to the Spread of an Invasive Species: Could the Pyrenean Chain Slow the Natural Spread of the Pinewood Nematode? <i>PLoS ONE</i> 10(7): e0134126.</p> <p>. David, G., B. Giffard, D. Piou y H. Jactel (2014). Dispersal capacity of <i>Monochamus galloprovincialis</i>, the European vector of the pine wood nematode, on flight mills. <i>Journal of Applied Entomology</i> 138(8): 566-576.</p> <p>. Takasu, F., Yamamoto, N., Kawasaki, K., Togashi, K., Kishi, Y. and Shigesada, N. (2000). Modeling the expansion of an introduced tree disease. <i>Biological Invasions</i> 2: 141-150</p> <p>. Togashi K, Shigesada N (2006) Spread of the pinewood nematode vectored by the Japanese pine sawyer: modelling and analytical approaches. <i>Popul Ecol</i> 48: 271–283.</p>

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
13	Spain	Outbreak under eradication	Survey in demarcated areas focused on susceptible trees showing possible symptoms of pine wilt or trees suitable for vector breeding; sampling focused on these trees, taken from different parts of the trees including the crowns.	Section 6.5.2.1	Increase the effectiveness of surveys	Recommendation is not fully in line with point 6 of Annex I to the EU Decision which requires systematic sampling of healthy-looking susceptible plants.	Experience both in Portugal and Spain as well as technical and scientific studies(*)(**) indicate that the detection of PWN on healthy looking pine is extremely unlikely and that sampling of symptomatic trees should be taken from different parts of the trees especially the crown. Furthermore, in demarcated areas, the pest freedom is already demonstrated by a high level of testing on declining trees. (*) Plant Protection Service Spain (unpublished) - http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN ; (**) Økland, B., Skarpaas, O., Schroeder, M., Magnusson, C., Lindelöw, Å., Thunes, K., 2010 Is Eradication of the Pinewood nematode (<i>Bursaphelenchus xylophilus</i>) likely? An evaluation of current contingency plans. Risk Analysis 30(9), 1424–1439
14	Spain	Outbreak under eradication	Perform the identification and sampling of declining trees twice early Autumn and early Spring, concentrating on trees presenting symptoms that could be those of a PWN infestation i.e. trees presenting rapid declining colour (red/brown) on some or all of the tree crown. Samples should be taken in the crown area as well as from the main trunk.	Section 6.5.2.2	Focus resources on measures contributing effectively to the control of PWN	Recommendation is in line with point 7 of Annex I to the EU Decision.	In a context of scarce resources, it is important to focus the use of resources on measures that are effective in reaching their objective.
15	Spain	Outbreak under eradication	Maintain the definition the flight season of the vector in the meaning of the EU Decision; period from 1 April to 31 October	Section 6.5.2.3	Effectiveness of eradication measures	Recommendation is in line with Article 1(f) of the EU Decision.	There is no scientific justification for adapting the definition of the flight season of the vector in the meaning of the EU Decision.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
16	Spain	Outbreak under eradication	<ul style="list-style-type: none"> • Perform the identification of dead or declining trees every year both in early Autumn and early Spring; • Fell, sample, test and eliminate identified trees before the start of the flight season (1 April) and thus before the introduction of the ban; • Set up a network of baited traps during the whole flight period with a view to monitoring the population of vectors and to verify its freedom from PWN 	Section 6.5.2.4	Mitigate the risks that the ban on forest operations due to forest fire prevention jeopardise the eradication of PWN	Recommendation is in line with point 7 of Annex I to the EU Decision.	Prevention of forest fires has the highest priority in Spain. A ban on forest operations is triggered during the period of high risk for forest fires (mid-June to mid-September); this cannot be overruled It is appropriate to clarify how and when measures should be implemented taking into account this difficulty with a view to ensure that measures are implemented in an effective way.
17	Spain and Portugal	Border between Portugal and Spain	<p>Demarcated areas stradling the border between Portugal and Spain</p> <p>Establish a framework for ensuring good cooperation in cases of outbreaks detected in the vicinity of the border</p>	Section 7.1.2	Increase the effectiveness of eradication measures	Recommendation is in line with Article 5.4 of the EU Decision.	It is necessary that Spain and Portugal increase their level of cooperation with a view to ensuring that PWN outbreaks identified in the vicinity of their common border are appropriately managed and eradicated.

II- Task Force recommendations which could be implemented only if they were to give rise to new legal provisions as part of the forthcoming review of the EU legislation.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
18	Portugal	Buffer Zone	Perform annual surveys of trees for the presence of PWN according to a risk based approach, focusing sampling on symptomatic trees, taking samples from different parts of trees including crowns. Focus surveys of vectors on risk areas and their vicinity as well as parts of the Buffer Zone where it delayed expression of symptoms can be expected.	Section 5.4.1	Increase the effectiveness of surveys activities in order to ensure early detection of PWN	Point 3(a) of Annex II to the EU Decision requires that annual surveys shall also include systematic sampling of healthy-looking susceptible plants.	Experience both in Portugal and Spain as well as technical and scientific studies (*)(**) indicate that the detection of PWN on healthy looking pine is extremely unlikely and that sampling should be taken from different parts of the trees especially the crown. Furthermore, in the Buffer Zone, the pest freedom is already demonstrated by a high level of testing on declining trees. (*) Plant Protection Service Spain (unpublished) - http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-03-15-0252-PDN ; (**) Økland, B., Skarpaas, O., Schroeder, M., Magnusson, C., Lindelöw, Å., Thunes, K., 2010 Is Eradication of the Pinewood nematode (<i>Bursaphelenchus xylophilus</i>) likely? An evaluation of current contingency plans. Risk Analysis 30(9), 1424–1439
19	Portugal	Buffer Zone	Define appropriately fire-affected areas: areas where susceptible trees are present and weakened sufficiently by the fire to allow egg laying by the vector; Adapt the management of areas affected by fire during the flight season of the vector: 1) by Postponing the elimination of susceptible trees to the following Autumn/winter period and place traps on the site to monitor vectors 2) by taking samples from trees suitable for	Section 5.4.4	Ensure that control measures implemented are effective in containing PWN	Point 3(b)(ii) of Annex II to the EU Decision requires that susceptible plants identified during the flight season of the vector shall, immediately, be felled and destroyed on site, moved under official control into the infested zone or removed.	A forest fire occurring during the flight period of the vector attract vectors from long distances immediately and for some time after the fire. The immediate elimination of trees in the fire-affected area does not mitigate this attractiveness and triggers a risk of further dispersal of vectors already attracted.

N°	MS concerned	Area concerned	Task Force recommendations (outline)	Ref. in the Report	Objectives of the recommendation	Comparison with Decision 2012/535/EU	Justification of recommendations
			the feeding or breeding of the vectors, at the time of felling, from different parts of the trees especially the crown. Adjust the intensity of sampling based on the presence of signs of activities of the vector.				
20	Portugal	Buffer Zone	Elimination of declining trees in the Buffer zone: - Promote the implementation of the Hygiene protocol for machinery; - Ensure that the chipping of felled declining trees is performed safely (equipment adapted to logs above 25cm and chips retained as close as possible to the stump); - Consider possibilities of biodiversity friendly measures in Natura 2000 and other high value forests (maintain logs of more than 25 cm on site)	Section 5.4.5	Increase the effectiveness of measures while preserving biodiversity and safety of operators	Point 3(b) of Annex II to the EU Decision requires that felled identified susceptible plants and their logging remains shall be removed and disposed of. Recommendation is in line with the EU Decision with the exception of specific measures in Natura 2000 or high value forests.	It is appropriate to provide guidance on the most effective and efficient way to implement control measures in the Buffer Zone, taking into account recent scientific development (REPHRAME – www.rephrame.eu) and risks for biodiversity.
21	Spain and Portugal	Buffer Zone of Portugal and Spanish territory	Develop a robust and efficient alternative to clear-cut for those specific situations where the implementation of this measure may be counterproductive	Section 7.2.2	Increase the efficiency and effectiveness of control measures to eradicate or contain PWN	Point 2 of Annex I to the EU Decision requires at least 500 m – clear-cut zone around each infested plant which can be restricted to 100m under certain conditions	Results of spread models developed in the context of the REPHRAME project indicate that wide clear cut belts might not be effective in preventing the spread of PWN from an infested area. In the Buffer Zone of Portugal, a preventive felling might create an open space and encourage vectors from the Infested Zone to fly further into the Buffer Zone in search of host trees for maturation feeding or breeding. This has to be further assessed as part of the forthcoming review of the legislation.

