EPPO Study on wood commodities other than round wood, sawn wood and manufactured items

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Content

Executive Summary

Parts of trees can carry pests, and represent a significant potential pathway for moving pests into new areas. During recent EPPO Expert Working Groups for Pest Risk Analysis it was noted that there is little information available on the different types of non-manufactured wood commodities being moved into and within the region. A study was therefore commissioned to gather more data including information on measures being applied to these commodities by industry or by importing countries. A desk study was carried out by a consultant and reviewed by an Expert Working Group, whose participants are shown below.

The title of the study was amended after its inception so that it covers “wood commodities other than round wood, sawn wood and manufactured items”. Round wood and sawn wood are already well defined internationally, and appropriate measures can be specified. Manufactured items are the subject of an International Standard in preparation on “International movement of wood products and handicrafts made from wood”.

The study concluded that “firewood” is not a useful category for risk assessment and risk management measures - any sort of wood may be burned. The key factors driving risk are the area of origin and the pests present there, and the type of processes to which the commodity has been subject which may kill pests or prevent their dispersal. In many cases wood is subject to a succession of processes by different operators, in different locations, for different purposes. For example chips may be made directly from fresh wood, from harvesting residues, from processing residues or from post-consumer scrap, either in the area in which the trees were grown or far away. While for perishable plant products end use may be an important determinant of risk (ISPM 32, 2012), for wood this is not the case. Wood is relatively durable and risks arise during transport and storage regardless of its ultimate use.

A range of different cutting and crushing processes are described, along with the descriptive terms, specifications (where available) and uses for the resulting products. Some assessment is made of the extent to which these processes reduce risks from different types of organisms. Presence of bark and wood together significantly increases the risks for some pests which live in the cambium between the two. In many cases data on survival (or efficacy if the process is regarded as a phytosanitary measure) is lacking. The study provides some indications of key data gaps (e.g. survival of bark beetles in chips of 2.5 cm maximum dimension) which could be addressed through research.

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Ad hoc Meeting on non-manufactured wood commodities
Paris, EPPO Headquarters (FR), 2014-10-07/10

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Background

During recent expert working groups to perform PRA on forestry pests, it was noted that little information on wood chips and wood waste commodities is available. However, it seems that international trade of these commodities is increasing (Eurostat, 2012), which may create additional pest risks. The Panel on Phytosanitary Measures and the Working Party for Phytosanitary Regulations agreed that a study should be conducted with the purposes to classify and describe different types of wood commodities, to develop definitions for those of them which were missing from the Glossary, to identify the intended uses of wood commodities and current practices of their production and trade, to gather information on these types of commodities as well as on existing measures applied by the industry or required by other countries, and to identify possible phytosanitary measures as well as gaps in knowledge for developing such measures. Such information will be used in future PRAs and Standards. Round wood and sawn wood were excluded from the Study because they are already well defined and possible phytosanitary measures are specified. Manufactured items are also not covered by the Study. They are currently covered by the draft ISPM on 'International movement of wood products and handicrafts made from wood'. Firewood is not regarded as a single category for risk management purposes since different types of wood, with different levels of pest risk, may be used for fuel.

The pest risk depends on the type of processing and its degree. In ISPM 32 'Categorization of commodities according to their pest risk' the categorisation of commodities is described according to their pest risk: 'The first stage of categorization is based on whether the commodity has been processed and, if so, the method and degree of processing to which the commodity has been subjected before export. The second stage of categorization of commodities is based on their intended use after import'. For pest risk of wood commodities, the type of processing and its degree are of major importance. Important risks can also arise during storage before processing/treatment and during transport if these are within the flight periods of the main insect pests (or vectors of major pests). The intended use is less important.

Identification of different types of commodities

Identification of the different types of wood commodities other than round wood and sawn wood was based on a review of technical literature, and took account of standards under development and on-going studies, as well as advice from relevant organizations. The study shows that different terminology is used for the same commodity in different countries and fields of activity, and the same commodity could have different names and characteristics between regions and organizations (Appendix 1). Existing Glossary definitions are provided in Table 1.

In the phytosanitary terminology (ISPM 5, 2014) definitions are missing for some wood commodities as 'wood chips', 'wood residues', 'particle wood', 'waste wood', 'hogwood', etc.

Various information sources (including customs codes and Harmonized Commodity Description and Coding System) were reviewed including International Standards for Phytosanitary Measures, industry standards, papers prepared by the Forestry Department of FAO, EPPO Standards. After the analysis the following types of commodities were identified.

Residues

Different sources use different descriptions of wood residues and wood 'wastes'. Usually these are separated into harvesting (logging) residues and processing (mill) wood residues.

Harvesting residues

In the study on 'The harvest of forest residues in Europe' (Vonk & Theunissen, 2007) the following types of management of harvesting residues were identified:

- collected and transported (see Figure 1);
- collected, bundled and transported (see Figure 2).
- collected, chipped in the forest and transported (see Figure 3).

Figure 1. Transportation of collected harvesting residues.
http://www.loggingon.net/how-does-handling-logging-residue-affect-its-moisture-content-and-composition_news_op_view_id_704

Figure 2. Bundled harvesting residues.
http://finland.fi/public/default.aspx?contentid=192731&nodeid=41800&contentlan=2&culture=en-US

Figure 3. Chipping in the forest
http://www.nrs.fs.fed.us/sustaining_forests/conserve_enhance/biodiversity/biomass/

All parts of trees (e.g. tops of trees, branches, stumps, roots, pieces of logs and bark) can be regarded as a part of harvesting residues (see Figure 4).

Figure 4. Harvesting residues.
http://www.helsinki.fi/~korpela/Ajoura.jpg
http://www.loggingon.net/userfiles/Image/news/March%202011%20(2)/woodfuel%20forestry%20logging%20biomass%20residue.jpg

According to the FAO Forestry Department it is not uncommon for approximately 60 % of the total harvested trees to be left in the forest and for non-commercial species to be subjected to slash and burn, or merely felled and left to rot to make access easier for logging (http://www.fao.org/docrep/t0269e/t0269e08.htm). Practices such as sawing and squaring logs in the forest, rather than at the sawmill, leaves additional residues (8-10 % and 30-50 % respectively) in the forest. However, although forest residues may appear to be an attractive fuel source, collection and handling costs must be taken into consideration, as well as its loss as a valuable soil nutrient. The viability of its use may be improved if collection is undertaken at the same time as log extraction, with shared equipment and management, whereby harvesting slash and marginal wood may be collected and chipped using portable or semi-portable chippers placed in the immediate logging areas (Nilsson, Blom & Thornqvist, 2013).

Processing wood residues

Wood residues are a by-product of the transformation of wood into the desired article (see Figure 4). Nevertheless, wood residues may move as a consignment. (Draft ISPM 'Management of pest risks in the international movement of wood', 2006-029).

In the study 'Secondary Mill Residues and Urban Wood Waste Quantities in the United States' (Fehrs, 1999) the secondary processing (mill) wood residues are defined. Secondary processing wood residues are produced by secondary wood product industries that manufacture products from round wood, engineered wood products, or wood particles. Examples include companies that manufacture furniture, doors, cabinets, flooring, pallets, fences, and building products.

Figure 4. Processing wood residues.
http://www.myclimate.org/fileadmin/myc/klimaschutzprojekte/honduras-7169/klimaschutzprojekt-honduras-7169-3.jpg
http://extension.missouri.edu/explore/images/g05153art02.jpg

Firewood

Any type of wood commodity may be used as fuel or firewood. Burning as an end use does not significantly reduce the level of pest risk unless transport and storage of the wood is tightly controlled. Outdoor storage of firewood for long periods is common practice and provides opportunity for the spread of pests and their vectors. Risks from firewood therefore depend largely on the origin, type of the wood and timing between cutting and transportation and use, and not on its end use. Logs which are cut and split specifically for fuel (see Figure 5) fall within the ISPM 5 definition of round wood. The quality of firewood is more variable than that of round wood for other purposes so the pest risk may be higher. Firewood which meets the definition of round wood should therefore be regulated as round wood. For this kind of wood, the risk of infestation during storage and transportation is high so there is a high risk of pest spread.

Figure 5. Firewood.
Contributed by Kamal Sharaf, Ashdod Port, Israel, 2013.

Bark

According to ISPM 5, bark in a botanical sense is the layer of a woody trunk, branch or root outside the cambium. Bark as a commodity could be defined as 'bark separated from wood' (proposed Glossary definition). Bark can be used for different purposes, therefore phytosanitary risk is different. Some pests can be associated with bark, particularly when pieces of cambium and wood are attached. Bark as mulch or addition to the growing medium may represent a pathway for pests.

The use of bark as mulch (see Figure 6) is explained in a factsheet (Rakow, 2014).

Figure 6. Bark used as mulch.
http://www.thegardeningblog.co.za/gardening/controlling-weeds-in-the-garden#/

According to this factsheet, bark for trade is most usually prepared as mulches for gardening. It can be packed and sold in various sizes of packages. Commercial bark mulches are generally the by-products of milled fir, Douglas fir, pine, redwood and spruce logs. Three grade standards have been adopted for landscape use based on particle size:

- Bark chunks (decorative bark indoors and outdoors, may include large pieces).
- Bark granules (soil conditioner)
- Shredded bark (e.g. for mulch) (see Figure 7).

Figure 7. Shredded bark.
http://www.pleasantvalleylandscape.com/PleasantValleyLandscape/Decorative%20Bark.html

Some bark mulches may be toxic to young plants, particularly if the bark is fresh or if it has been improperly stockpiled. Bark mulches are most likely to cause damage to plants if the mulch particles are small, if the mulch is particularly deep, or if high proportions of plant roots are in the surface layer of the soil. Among the most desirable characteristics of bark mulches are their excellent resistance to compaction and blowing in the wind, their attractiveness and their availability.

'Cork' is a particular case of bark which is used for further manufacturing.

Bark also can be used for extraction of tannin and some medical substances and also for fuel.

Processing to get granule or shredded bark could reduce pest risk by physical action or rendering remaining conditions unsuitable for pest development.

According to the EPPO commodity standard for Coniferae PM 8/2(2) *Commodity-specific phytosanitary measures for Coniferae* (EPPO, 2014), a possible phytosanitary measure for bark is pest free area or heat treatment (HT) to achieve a minimum temperature of 56°C for a minimum duration of 30 continuous minutes throughout the entire profile of bark pieces.

Possible additional phytosanitary measures for bark could be dielectric heating (DH), fumigation or irradiation.

Sawdust

The Customs combined tariff code for sawdust whether agglomerated or not is 4401393000 (see Figure 8). Non-agglomerated sawdusts may contain both wood and bark dust and can be used for fuel and for animal bedding. Some pathogens may be associated with sawdust. Pest risk from sawdust derives from the status of the parent material which may include bark but the risk is reduced by the physical action of sawing including incidental heating. Insect pests are unlikely to be associated with sawdust. Both living nematodes and pathogens (those which are only transmitted by vectors) can be isolated from sawdust produced from infested wood (Kulinich, Montecchio, 2014, pers. comm.) but their transfer to living plants is not likely in the absence of their vectors in sawdust. Non-agglomerated sawdusts fall under the definition of 'processing wood residues' developed under this Study (see Table 1).

Figure 8. Sawdust (not agglomerated)
http://skelbiu-img.dgn.lt/1_5_177356510/biomases-deginimo-kieto-kuro-katilas-177356510.jpg

Agglomerated sawdust (which falls under the Glossary definition of 'processed wood material') is used as fuel for heating, energy or other purposes. This material is not likely to present a pest risk because the physical action of the sawing and the heat and pressure applied.

Under the Renewable Energy Council Directive of the European Union (European Commission, 2014b), EU Member States have taken on binding national targets for raising the share of renewable energy in their energy consumption by 2020. These targets, which reflect Member States' different starting points and potential for increasing renewables production, range from 10% in Malta to 49% in Sweden (Eurostat, 2012).

In the Energy Analysis concerning the International Trade of Wood Pellets (NREL, 2013), the history and problems of international trade of pellets were discussed. Due to 'aggressive emissions policy' in the European Union, the production of wood pellets from sawdust has increased dramatically in recent years (Eurostat, 2012). Advantages of wood pellets include the main feedstock, which is wood 'waste' from primary and secondary saw mills, and the high energy density and consistency of the fuel, which allows international

trade to be feasible (Junginger *et al*., 2008). Historically, wood 'waste', such as pulp and sawdust, has been used for energy within the wood product plants or for local municipalities, disposed of in landfills, or exported (Hillring, 2006). The supply of wood 'waste' is driven by the demand for wood-based products, such as paper and lumber, rather than the demand for wood pellets (Spelter & Toth, 2009). Tracking the trade of wood pellets internationally is very difficult; trade statistics combine sawdust, wood 'waste' and wood scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms, into one category (See Figure 9). Fortunately, a new code for wood pellets (4401.31.0000) was added in 2012 to the Harmonized Commodity Description and Coding System this change may lead to more consistency in international trade data for pellets trade agencies (Lamers *et al.*, 2012a).

Figure 9. Different forms of agglomerated sawdust.
http://biomas.com.es/imagenes/pellets.jpg
http://www.ignitewoodfuels.co.uk/910kg-premium-hardwood-briquettes-including-delivery-and-vat-91-x-10kg-packs-on-a-pallet-56-p.asp

Wood chips

Wood chips (see Figure 10) are small pieces of wood with or without bark that have been created by running wood through a shredder, breaking it into uniformly sized chips. There are a number of uses for wood chips, and there are often several ways to obtain them. Pest risk of chips depends on pest presence in the original material, bark content and chip size. Generally, this risk is likely to be higher than that of sawdust.

The precise size of wood chips varies, depending on the type of wood and the chipper used to create them. The chips may be produced from branches, off cuttings, debris, and other by-products of wood processing, but may also be produced from larger pieces of wood or whole trees.

One common use for wood chips is as a ground cover. A thick layer will keep weeds from breaking through, and help to retain the soil or to create bedding for animals. They are often used as a soft surface in playgrounds. Some gardeners also use wood chips as mulch, spreading chips out between their plants to keep grass and weeds down and to give the garden a smooth, uniform look.

Many wood chips wind up being pulped for paper, and they are also sometimes used to fuel furnaces, boilers and electrical generation equipment at sawmills. Speciality chips made from woods such as hickory and oak may be sold for people to use in smoking, grilling and barbecuing. These aromatic wood pieces are soaked in water before being put on the fire where they will smoulder slowly, releasing scented smoke which infuses the food being cooked over the fire.

Consignments of wood chips are likely to contain a mixture of tree species in which several pests could be potentially present, and it may be difficult to avoid including wood of other tree species during large-scale logging operations (Økland *et al*., 2012). Since it is not feasible to distinguish different tree species by inspection controls of large chips consignments, wood chips may be considered as a commodity including different tree species instead of wood chips from individual tree species.

Biomass energy centre (2014) in the United Kingdom provides information on the characteristics of wood chips. The characteristics of wood chips will depend on the chipper and the material from which they are made. They can be divided into following groups:

- Tree felling chips - including:
    - Log chips - from delimbed stem wood;
    - Whole tree chips - from all the above-ground biomass of a tree;
    - Residue chips - from branches, brush, etc.;
    - Stump chips - from stumps.
- Short rotation coppice / short rotation forestry chips - from the respective energy crops.
- Processing residue chips - from sawmill or manufacturing residues and off-cuts;
- Post-consumer scrap chips - from wood residues, recycled wood;

Quality criteria for wood chips are chip size, moisture content, infestation and contamination. The criteria for particle size for wood chips are defined in the European Pellets Standard – EN14961-1 and provided in Appendix II.

According to the report on 'Global Wood Chip Trade for Energy' (Lamers *et al.*, 2012b), wood chips vary in quality depending on their source material and intended use. High quality pulp chips are directly derived from round wood; wood chips for energy purposes are mainly made from harvesting/logging or processing residues i.e. branches, tree tops,

thinnings, not suitable for material or pulp and paper production, and recovered wood. Bioenergy related trade streams may therefore fall under the trade code for wood chips (HS 440120), further defined into coniferous (HS 440121) or non-coniferous (HS 440122), or under the code for sawdust and 'waste' wood (HS 440130). Technically, wood chips may also be transported as firewood (fuel wood) (HS 440110) or round wood (HS 4403) – prior to chipping and combustion.

On EU level, no further differentiation is made for wood chips i.e. the 8-digit-codes are simply extended i.e. CN 44012100 for coniferous and CN 44012200 for non-coniferous chips. Other relevant 8-digit trade codes on EU level include CN 44013080 for wood 'waste' and scrap; and CN 44013020 for pellets. These can be grouped together as HS 440130. This differentiation allows a better image of picture of energy related wood 'waste' trade.

In the same report, 'Recent US developments on eradicating nematodes in wood chips' are presented. In 2010, a scientist at the University of Arkansas was contracted by a private company to develop a process using heat treatment that would eradicate the nematode in pine wood chips without degrading the quality of the chip and that would gain approval by the USDA. The results of the testing proved conclusive and the testing was moved from the lab scale to commercial scale. The process uses lower temperatures than those of ISPM 15 heat treatment over 2 ½ hours duration which does not degrade the wood chips but has been shown to kill the nematodes. Other processes for eliminating nematodes continue to be studied in the US. These include densification of the wood chips in briquette form to allow the fibres to stay intact as well as more cost effective heat treatment methods. Another university study is also examining the possibility that once in chip form, nematodes, if found in the chips, cannot pose a threat to living trees (The Pinewood Nematode in Vermont, 1995).

In the EPPO Standards PM 9/14(1) *Agrilus planipennis*: procedures for official control (EPPO, 2013a) and PM 9/16(1) *Anoplophora chinensis*: procedures for official control (EPPO, 2013b), one of phytosanitary measures mentioned is chipping to the size of not more than 2.5 cm in any dimension. Such a chipping significantly reduces the risk of survival of most of pests (McCullough *et al.*, 2007). According to European Pellets Standard – EN14961-1, the size of such chips (2.5 cm in any dimension) would comply with requirements of chips size of class P16A 3.15 ≤ P ≤ 16 mm ≤ 12 % ≤ 3 % > 16 mm, and all < 31.5 mm. The cross sectional area of the oversized particles < 1 cm^2. It is very important to remember that possible coarse fractions are allowed in the above mentioned European Pellets Standard (less than 3% of chips bigger than 16 mm and all smaller than 30 mm) and therefore the minor risk remains of survival of these pests and further spread.

Figure 10. Wood chips.
https://69.img.avito.st/640x480/657676869.jpg

According to the results of case study “Detection probability of forest pests in current inspection protocols – A case study of the bronze birch borer” by Økland et al. (2012), inter- continental trade of wood chips for biofuel represents a significant risk of introducing invasive pest species that can cause major impacts on forest ecosystems. There are uncertainties about what measures and treatments would be effective against the whole range of possible insects and other pests, which could be imported with wood chips, except for avoiding known areas of distribution for high-risk pests. Requirements for more aggressive treatment measures could be introduced, such as heat treatment, fumigation, or transporting and storing chips in closed containers, although these measures may be costly and, in some cases, may have environmental side effects. Import control based on samples from large consignments of imported wood chips is not a reliable method to detect organisms of phytosanitary risk.

When considering wood chips in risk assessments, it may be important to compare risks with closely related categories of wood commodities, such as for example hogwood.

Hogwood

The term ‘hogwood’ is proposed to cover any type of crushed wood product (see Figure 11). It can be burned for fuel or used for other purposes such as coverage in horse riding arenas, and paths, or to build temporary roads or to create bedding for animals. It is often called ‘hogfuel’ because the material can be burnt for fuel at pulp mills to generate electricity (Cedar Hog Fuel Bulk & Pre Bagged, 2014).

Hogwood is the basic feedstock for some biomass-fired power plants. Recovered wood fuel products replace non-renewable fossil fuels such as oil or natural gas at the industrial energy facilities that use them (Wastewood recovery systems, 2014).

According to European Pellets Standard – EN14961-1 (Kofman, 2010), there are no requirements for the particle size of hogfuel (‘hogwood’ in terms of this Study). According to the Standard prEN14588 ‘Solid Biofuels - Terminology, definitions and descriptions’ (Kofman, 2010), hogfuel is in the form of pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails.

When considering hogwood in risk assessments, it may be important to compare risks with closely related categories of wood commodities, such as wood chips. The pest risk associated with hogwood is initially similar to the risk associated with wood chips. However, the important difference consists in the fact that chipping can be used as a phytosanitary measure by regulating particle size whereas this is not possible in the case of hogwood.

Figure 11. Hogwood.
http://laneforest.com/wood-fiber/

Processed wood material

Processed wood material includes plywood, fibreboard, etc. (see Figure 12), but also pellets under the form of compressed wood for fuel. Since heat or pressure is used for production of processed wood material, it does not present a phytosanitary risk.

Figure 12. Plywood, fibreboard.
http://www.dunkirksupply.com/plywood
http://www.plywoodagents.in/products.htm

Wood pellets are a compacted form of wood fibre with low moisture content and high energy density. Pellets are typically more expensive to produce than alternative wood fuel sources, including chip and logs, but they have the benefit of being easier to handle, cheaper to transport and are ideally suited to automated burning systems. The convenience of wood fuel pellets is better suited to small-scale domestic heating requirements.

The production of pellets involves the reduction of wood to the size of sawdust, which is then dried to approximately 12 % moisture content, before being extruded in specially adapted agricultural pellet mills to form pellets of some 6 to 18 mm diameter and 15 to 30 mm long, with a density in the range of 950 to 1 300 kg/m^3. Drying of the furnish prior to extrusion is usually undertaken in rotating drum dryers, fired by approximately 15 to 20 % of the plant's pellet production. (Forest Research, 2014)

Briquettes or logs are generally formed by forcing dry sawdust or shavings through a split cylindrical die using a hydraulic ram. The exerted pressure, of some 1 200 kg/cm^2, and the resultant heat generated bonds the wood particles into ‘logs’ (FAO, 2014).

Requirements for pellets are stated in European Pellets Standard – EN14961-1 (see Appendix III).

Post-consumer scrap wood

According to the customs classification of wood (European Commission, 2014a), 'wood waste and scrap wood' ('post-consumer scrap wood' in terms of this Study) are classified under subheading code 440131. They consist of wood that is not usable as 'timber' and includes:

- saw mill or planning mill rejects,
- manufacturing 'waste',
- broken planks,
- old crates,
- bark and shavings,
- 'waste' and scrap joinery and carpentry,
- spent dyewood and tanning wood bark.

'Waste' and scrap wood ('post-consumer scrap wood' as defined in this Study) are used in particular in paper manufacturing, particle board and fibreboard manufacturing as well as for fuel. All 'waste' and scrap wood that is intended for use as fuel, regardless of whether it's been formed into common fuel types like logs, briquettes or pellets, is always classified as 'waste' wood under subheading 4401 31 and never as fuel wood.

Urban 'waste' is defined in the study 'Secondary Mill Residues and Urban Wood Waste Quantities in the United States' (Fehrs, 1999). Urban wood 'waste' (see Figure 13) refers collectively to a wide variety of wood 'waste' present in commercial, industrial, and municipal solid 'waste'. Examples include used wooden pallets and shipping containers, wood contained in construction and demolition debris, used railroad ties (railway sleepers), wood mixed with other solid 'waste', and other types of wood not included in (or defined as) logging residues, primary wood products industry residues, or secondary mill residues.

Figure 13. Post-consumer scrap wood.
http://www.arc-ers.co.uk/wp-content/themes/arc/images/waste-wood.jpg

Results and Conclusions

Some wood commodities do not have Glossary definitions. They may however have other definitions (Appendix I). Taking into account the fact that international and internal movement of wood commodities occurs, it is important to have information about possible phytosanitary risks during transportation and use of these commodities.

The EPPO Expert Working Group, composed of EPPO and NAPPO experts, discussed the draft document, considered existing phytosanitary terms and definitions of the ISPM 5 *Glossary of Phytosanitary Terms* for wood commodities (e.g. 'round wood', 'sawn wood', 'bark', and 'processed wood material'), and discussed classification and definitions for those wood commodities which are not covered by the Glossary. The EWG considered recommendations received on the draft document from IFQRG (International Forest Quarantine Research Group), EFSA (European Food Safety Authority) and ISO/TC 218 Timber, and decided for phytosanitary reasons to distinguish the following wood commodities other than round wood, sawn wood and manufactured items:

- Harvesting residues
- Processing wood residues (including sawdust)
- Bark
- Wood chips
- Hogwood
- Processed wood material
- Post-consumer scrap wood

Following recommendations of EFSA and ISO/TC 218 Timber, the EWG avoided the use of the term 'waste' or 'wood waste' in the Study because most wood residues at different stages of wood consumption are used for different purposes, when they are really waste for disposal they are no longer commodities in international trade. For 'firewood', the EWG concluded that it refers to the final use of wood commodities, which could be any of the abovementioned commodities, or in many cases also 'round wood'.

The EWG developed definitions for those above mentioned wood commodities which were missing from the Glossary. Proposed terms and definitions for wood commodities as well as Glossary definitions (ISPM 5, 2014) of other wood commodities are listed in Table 1. All possible existing wood commodities belong to one of the categories of this table.

The general pest risk presented by each subcategory of wood commodities of concern was assessed in a very preliminary way and presented in the Table 3.

Table 1. Definitions used in the Study (including existing definitions from ISPM 5 *Glossary of Phytosanitary Terms* for wood commodities and definitions developed as part of the Study)

Commodity	Definition	Origin of definition
Harvesting residues	Wood material consisting of any parts of trees left on the site after round wood harvesting	Proposed under the Study
Round wood	Wood not sawn longitudinally, carrying its natural rounded surface, with or without bark	Glossary (ISPM 5)
Processing wood residues	Parts of wood and bark that are left after the process of transforming round wood into sawn wood and further transformation of sawn wood	Proposed under the Study
Bark (as a commodity)	Bark separated from wood	Glossary (ISPM 5)
Sawn wood	Wood sawn longitudinally, with or without its natural rounded surface with or without bark	Glossary (ISPM 5)
Wood chips	Wood with or without bark in the form of pieces with a definable particle size produced by mechanical treatment with sharp tools	Proposed under the Study
Hogwood	Wood with or without bark in the form of pieces of varying particle size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails	Proposed under the Study
Processed wood material	Products that are a composite of wood constructed using glue, heat and pressure, or any combination thereof	Glossary (ISPM 5)
Manufactured wood items	To be added when defined under the ISPM (under development) on 'International movement of wood products and handicrafts made of wood'	
Post-consumer scrap wood	Wide variety of wood material from ex-commercial, industrial and domestic use made available for recycling	Proposed under the Study
Firewood except sawn wood, processing wood residues, wood chips, hogwood, processed wood material and post-consumer scrap wood	See 'round wood' definition	

The EWG established the links of commodities listed in the Table 1 with terms used in ISO system, in the IPPC E-phyto Study and in Customs codes. For each of the identified wood commodities (and some subcategories), the EWG considered the initial material from which they derive, most common intended uses, trade and transport practices, pests which are likely to be associated and survive, existing and possible phytosanitary measures. This detailed information is summarised in the Table 2.

In an eradication or containment action destruction of material by burning or deep burial may be an appropriate measure but is not included in the table because the Study focuses on measures to facilitate safe movement of commodities.

Analysed wood commodities were preliminary assessed for their pest risk considering conditions of the material (e.g. freshness, bark presence, particle size etc.) and depending on initial material. See Table 3.

Table 2. Risk factors and possible phytosanitary measures for wood commodities

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
Harvesting residues		stump		440110 – fuel wood in logs, in billets, in twigs, in faggots or in similar forms	Standing trees (may include stumps and roots)	chips production, hogwood production, for fuel	Loaded in open transport or in closed containers	All kinds of forest pests. If stumps and roots are included there is risk of soil borne pests. Risk of leaves and needles contamination	Pest free area, chipping to a specified size, HT, DH, fumigation, irradiation	Lack of information on trade volumes and distances	High risk
Processing wood residues	sawdust & shavings	sawdust	Wood sawdust, wood shavings, wood waste	440130 – sawdust, wood 'waste', scrap, whether or not agglomerated in logs, brickets, pellets or similar forms	Round & sawn wood	production of chips, hogwood, processed wood material, for fuel, animal litter, packing material	In closed containers of different types and sizes depending on intended use	Nematodes and pathogens	Pest free area	Lack of information on trade volumes and distances	Low for insect pests. Low to medium for other pests.
	off-cuts	slab	wood scrap, wood waste	440130 – sawdust, wood 'waste', scrap, whether or not agglomerated in logs, brickets, pellets or similar forms	Round & sawn wood (with or without bark)	chips production, hogwood production, production of processed wood material, for fuel	In closed containers of different types	All kinds of forest pests	Pest free area, chipping to a specified size, HT, DH, fumigation, irradiation	Cost efficiency of possible measures	High risk unless it is bark-free. Medium risk if bark-free.

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
Bark		bark	bark	440110 – fuel wood in logs, in billets, in twigs, in faggots or in similar forms	Round wood	Production of mulch, fuel, as part of growing medium, for decoration, biofiltration	In bulk or in closed containers of different types and sizes depending on intended use	Pathogens, nematodes, some bark beetles. Some beetles can be attracted and transported with bark. Risk of leaves and needles contamination	Pest free area, HT, DH, fumigation, irradiation	Non-vector transmission of pathogens. Importance of bark beetles species carried in bark.	Medium risk
Wood chips	chips with bark from fresh* wood (*with intracellular moisture content suitable for pest development) and untreated wood larger than 2.5 cm	chip	wood chips	440121 – coniferous wood in chips or particles 440122 non-coniferous wood in chips or particles	Round wood with bark, harvesting residues, off-cuts with bark	For fuel, production of mulch, pulp and processed wood material, for animal bedding, road covering, packing material, biofiltration	In bulk or in closed containers of different types and sizes depending on intended use	Pathogens, nematodes, bark beetles, longhorn beetles. Some beetles can be attracted and transported with chips. Risk of leaves and needles contamination	Pest free area, HT, DH, fumigation, irradiation	Non-vector transmission of pathogens. Importance of bark beetles species carried by chips.	High risk
	chips with bark from fresh (with intracellular moisture content suitable for pest development) and untreated wood not larger than 2.5	chip	wood chips	440121 – coniferous wood in chips or particles 440122 non-coniferous wood in chips or	Round wood with bark, harvesting residues, off-cuts with bark	For fuel, production of mulch, pulp and processed wood material, for animal bedding, road covering,	In bulk or in closed containers of different types and sizes depending on	Pathogens, nematodes, bark beetles, some longhorn beetles. Some beetles can be attracted and transported with	Pest free area, limit of particle size, HT, DH, fumigation, irradiation	Non-vector transmission of pathogens. Importance of bark beetles species carried by chips.	Medium risk

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
	cm in any dimensions			particles		packing material, biofiltration	intended use	chips. Risk of leaves and needles contamination		Survival of insects in small size chips.	
	chips without bark from fresh (with intracellular moisture content suitable for pest development) and untreated wood larger than 2.5 cm	chip	wood chips	440121 – coniferous wood in chips or particles 440122 non-coniferous wood in chips or particles	Round wood without bark, harvesting residues, off-cuts without bark	For fuel, production of mulch, pulp and processed wood material, for animal bedding, road covering, packing material, biofiltration	In bulk or in closed containers of different types and sizes depending on intended use	Pathogens, nematodes, some bark beetles, some longhorn beetles. Some beetles can be attracted and transported with chips.	Pest free area, HT, DH, fumigation, irradiation	Non-vector transmission of pathogens. Importance of bark beetles species carried by chips.	Medium risk
	chips without bark from fresh (with intracellular moisture content suitable for pest development) and untreated wood not larger than 2.5 cm in any dimensions	chip	wood chips	440121 – coniferous wood in chips or particles 440122 non-coniferous wood in chips or particles	Round wood without bark, harvesting residues, off-cuts without bark	For fuel, production of mulch, pulp and processed wood material, for animal bedding, road covering, packing material, biofiltration	In bulk or in closed containers of different types and sizes depending on intended use	Pathogens, nematodes, bark beetles. Some beetles can be attracted and transported with chips.	Pest free area, limit of particle size, HT, DH, fumigation, irradiation	Non-vector transmission of pathogens. Importance of bark beetles species carried by chips. Survival of insects in small size chips.	Medium to low risk (further research needed before this is regarded as low risk)
	chips from post-consumer and/or treated wood	chip	wood chips	440121 – coniferous wood in chips or particles	Post-consumer and/or treated wood	For fuel, production of mulch and processed wood material,	In bulk or in closed containers of different types and	Dry wood insects.	No measures needed	Use of this kind of chips	Low risk

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
				440122 non-coniferous wood in chips or particles		road covering, packing material (?)	sizes depending on intended use				
Hogwood				440121 – coniferous wood in chips or particles 440122 non-coniferous wood in chips or particles	Round wood with or without bark, harvesting residues, off-cuts	For fuel, production of mulch and processed wood material, for animal bedding, road covering, packing material	In bulk or in closed containers of different types and sizes depending on intended use	Pathogens, nematodes, bark beetles, some longhorn beetles. Some beetles can be attracted and transported with hogwood. Risk of leaves and needles contamination	Pest free area, HT, DH, fumigation, irradiation,		High risk unless it is produced from bark-free wood. Medium risk if produced from bark-free wood. Low risk if produced from post-consumer scrap wood
Processed wood material	pellets, brickets, particle boards	glued laminated wood		44013020 – sawdust, wood 'waste', scrap, whether or not agglomerated in logs, brickets, pellets or similar forms 4410 - Particle board, oriented strand board (OSB) and similar	harvesting residues, wood chips, hogwood and post-consumer scrap wood	Production of manufactured wood items, packaging and packing, fuel	In bulk or in closed containers of different types and sizes depending on intended use	Dry wood insects.	No measures needed		Low risk

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
				board (for example, waferboard) of wood or other ligneous materials, whether or not agglomerated with resins or other organic binding substances 4411 - Fibreboard of wood or other ligneous materials, whether or not bonded with resins or other organic substances 4412 – Plywood, veneered panels and similar laminated wood 4413 - Densified							

Commodity	Subcategory	ISO terms	Terms from E-phyto IPPC Study	Customs names/codes	Initial material	Most common intended use	Transport practices	Pests likely to be associated with	Possible phytosanitary measures	Gaps in knowledge	Pest risk
				wood, in blocks, plates, strips or profile shapes							
Post-consumer scrap wood			wood scrap, wood waste	44013020 – sawdust, wood 'waste', scrap, whether or not agglomerated in logs, brickets, pellets or similar forms	manufactured wood items, wood packaging material	For fuel, production of chips hogwood, and processed wood material	Open or closed containers of different types	Dry wood insects.	No measures needed		**Low risk**

HT: heat treatment
DH: dielectric heating

Table 3. Preliminary assessment of pest risk associated with wood commodities depending on initial materials.

Commodities	**Initial material**	**Likelihood of presence of large insect pests (e.g. longhorn beetles & buprestids)**	**Likelihood of presence of small insect pests (e.g. bark and ambrosia beetles) which may develop in wood**	**Likelihood of presence of small insect pests (e.g. bark and ambrosia beetles) which can develop only under the bark**	**Likelihood of presence of non-arthropod pests (nematodes fungi, bacteria, etc.)**	**Notes**
Harvesting residues	Standing trees	+++	+++	+++	+++	
Off-cuts	Fresh* wood with bark	+++	+++	+++	+++	
Wood chips larger than 2.5 cm	Fresh* and untreated wood with bark	+++	+++	+++	+++	
Hogwood	Harvesting residues, wood with bark	+++	+++	+++	+++	
Off-cuts	Wood without bark	++	++	+	++	
Wood chips larger than 2.5 cm	Fresh* and untreated wood without bark	++	++	+	++	
Wood chips not larger than 2.5 cm in any dimension	Fresh and untreated wood with bark	+/++	++	++	++	Lower risk for large insects, further research needed
Bark		+	++	++	++	Risk higher if wood is present

Wood chips not larger than 2.5 cm in any dimension	Fresh* and untreated wood without bark	+	+/++	+	+/++	Further research is needed before these are regarded as low risk especially for small insects
Hogwood	Wood without bark	+	+/++	+	+/++	
Sawdust and shavings	Wood	+	+	+	+	Low risk for insects as pests and as vectors of non-arthropod pests
Post-consumer scrap wood	Manufactured wood commodities, Wood packaging material	+	+	+	+	Need to consider whether this can be from rather fresh wood (e.g. rustic furniture)
Wood chips	Post-consumer scrap wood or treated wood	+	+	+	+	
Hogwood	Post-consumer scrap wood	+	+	+	+	
Processed wood material	Wood	-	-	-	-	

+ means low pest risk, ++ medium pest risk, +++ high pest risk
* Fresh meaning that intracellular moisture content is suitable for pest development
NB Overall risk depends also on phytosanitary status of the area of origin and destination

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Appendix I

Definitions from various sources. (See also Table 1 for the definitions used in the Study)

Type of commodity	Definitions
Bark	• The layer of a woody trunk, branch or root outside the cambium (ISPM 5 [CPM, 2008]) • The tough outer covering of the woody stems and roots of trees, shrubs, and other woody plants. It includes all tissues outside the vascular cambium (http://www.thefreedictionary.com/bark) • The external covering of the woody stems, branches, and roots of plants, as distinct and separable from the wood itself (http://dictionary.reference.com/browse/bark) (proposed IPPC definition)
Isolated bark	Bark, which is no longer attached to wood. Isolated bark may contain pieces of wood with bark. (EPPO Standard PM 8/2(1) Proposed revision)
Bark (as a commodity)	Bark separated from wood. (ISPM 5 Proposed revision)
Wood	A commodity class for round wood, sawn wood, wood chips or dunnage, with or without bark [FAO, 1990; revised ICPM, 2001]
Processed wood material	Products that are a composite of wood constructed using glue, heat and pressure, or any combination thereof (ISPM 5:2012) (this includes pellets, brickets, etc.)
Sawdust	• Particles of wood formed by sawing (http://www.thefreedictionary.com/sawdust; http://dictionary.reverso.net/english-definition/sawdust) • Fine particles created when sawing wood. NOTE: Most of the material has typical particle length of 1 to 5 mm (European Pellet Standard – EN 14961-1)

Wood chips	• Small pieces of wood used to make pulp. Chips are made either from wood 'waste' in a sawmill or pulpwood operation, or from pulpwood specifically cut for this purpose. Chips are larger and coarser than sawdust. (http://www.srs.fs.usda.gov/forestops/products/glossary.html) • Woodchips are very small pieces of wood, usually made from 'waste' wood, which are used in processes such as making paper. (http://dictionary.reverso.net/english-cobuild/woodchip) • Small chip of wood, especially one that flakes off when felling a tree or splitting a log; woodchips, chips of wood, especially fir or other pine, used as a winter mulch on plants and shrubs. (http://dictionary.reference.com/browse/woodchi). () • Chipped woody biomass in the form of pieces with a defined particle size produced by mechanical treatment with sharp tools such as knives. (prEN14588) • Small pieces of wood that have been created by running wood through a shredder, breaking it into uniformly sized chips. (http://www.wisegeek.com/what-are-wood-chips.htm)
Hog	Machine used to grind wood into chips for use as fuel or for other purposes; the wood used is usually 'waste' wood unfit for lumber or other uses. -Coarse wood chips to be burned as a fuel http://www.srs.fs.usda.gov/forestops/products/glossary.html#H
Hogfuel	• Fuel made by grinding 'waste' wood in a hog; a mix of wood residues such as sawdust, planer shavings, and sometimes coarsely broken-down bark and solid wood chunks produced in the manufacture of wood products and normally used as fuel (http://www.srs.fs.usda.gov/forestops/products/glossary.html#H) • Fuel wood in the form of pieces of varying size and shape, produced by crushing with blunt tools such as rollers, hammers, or flails. (Standard prEN14588)
Slash	• Woody material or debris left on the ground after an area is logged. Also known as brush. (http://www.srs.fs.usda.gov/forestops/products/glossary.html#H) • The residue, e.g., tree tops and branches, left on the ground after logging or accumulating as a result of storm, fire, girdling, or delimbing (http://dictionaryofforestry.org/dict/term/slash)

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Residuals	Trees remaining after an intermediate or partial cutting of tree crops or stands. In general, residuals are byproducts of some operation. Also known as 'waste'. Examples are chips from lumber production and hog fuel from any wood processing operation. (http://www.srs.fs.usda.gov/forestops/products/glossary.html)
Residue	Wood or bark that is left after a manufacturing process (http://www.srs.fs.usda.gov/forestops/products/glossary.html#H)
Forest residuals	Sum of wasted and unused wood in the forest, including logging residues; rough, rotten, and dead trees; and annual mortality.
Wood 'waste' and scrap	Urban wood 'waste', which refers collectively to a wide variety of wood 'waste' present in commercial, industrial, and municipal solid 'waste'. Examples include used wooden pallets and shipping containers, wood contained in construction and demolition debris, used railroad ties, wood commingled with other solid 'waste', and other types of wood not included in (or defined as) logging residues, primary wood products industry residues, or secondary mill residues. (Fehrs, 1999)
Wood pellets	Densified biofuel made from pulverized woody biomass with or without additives, usually with a cylindrical form, random length of typically 5 to 40 mm with broken ends. (prEN14588)
Wood briquettes	Densified biofuel made with or without additives in the form of cubiform or cylindrical units, produced by compressing pulverized woody biomass. (prEN14588)

Appendix II

Requirements for wood chips – EN 14961-1

Class	Minimum 75-w% in main fraction, mm[a]	Fines fraction, w-% (<3,15 mm)	Coarse fraction, w-%
P16A	3,15≤ P ≤ 16 mm	≤ 12 %	≤3% >16 mm and all 30 mm[c]
P16 B	3,15≤ P ≤ 16 mm	≤ 12 %	≤3% >45 mm and all 120mm [c]
P45A	8 ≤ P ≤ 45 mm	≤ 8 % [b]	≤ 6% >63 mm, and max. 3,5 % > 100 mm, all <120 mm,
P45B	8 ≤ P ≤ 45 mm	≤ 8 % [b]	≤ 6% > 63 mm, and max. 3,5 % > 100 mm all <350 mm
P63	8 ≤ P ≤ 63 mm	≤ 6 % [b]	≤ 6% > 100 mm, and all < 350 mm
P100	16 ≤ P ≤ 100 mm	≤ 4 % [b]	≤ 6% > 200 mm, and all < 350 mm

[a] The numerical values (P-class) for dimension refer to the particle sizes passing through the mentioned round hole sieve size according to standards prEN 15149-1.
[b] Main fraction for P45B is 3,15≤ P ≤ 45 mm, for P63 is 3,15≤ P ≤ 63 mm and for P100 is 3,15≤ P ≤ 100 mm and amount of fines can be maximum 25 w-%, if raw material is logging residue, which includes thin particles like branches, needles or leaves.
[c] The cross sectional area of the oversized particles shall be P16<1 cm², for P45 < 5 cm², for P63< 10 cm² and P100 < 10 cm².
02/12/2009

Appendix III

Major traded forms of solid biomass according to European Pellets Standard – EN14961-1

Fuel name	Typical particle size	Common preparation method
Whole tree	≥ 500 mm	No preparation or delimbed
Wood chips	5 mm to 100 mm	Cutting with sharp tools
Hog fuel	Varying	Crushing with blunt tools
Log wood /firewood	100 mm to 1000 mm	Cutting with sharp tools
Bark	Varying	Debarking residue from trees Can be shredded or unshredded
Bundle	Varying	Lengthways oriented & bound
Fuel powder	< 1 mm	Milling
Sawdust	1 mm to 5 mm	Cutting with sharp tools
Shavings	1 mm to 30mm	Planing with sharp tools
Briquettes	Ø ≥ 25 mm	Mechanical compression
Pellets	Ø < 25 mm	Mechanical compression
Bales Small square bales Big square bales Round bales	 0,1 m^3 3,7 m^3 2,1 m^3	 Compressed and bound to squares Compressed and bound to squares Compressed and bound to cylinders
Chopped straw or energy grass	10 mm to 200 mm	Chopped during harvesting or before combustion
Grain or seed	Varying	No preparation or drying except for process operations necessary for storage for cereal grain
Fruit stones or kernel	5 mm to 15 mm	No preparation or pressing and extraction by chemicals
Fibre cake	Varying	Prepared from fibrous waste by dewatering