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ORCHARD'S PRUNING FOR ENERGY PURPOSES – METHODOLOGY OF ENVIRONMENTAL IMPACT ASSESSMENT OF NEW LOGISTIC CHAIN DEVELOPED WITHIN *EUROPRUNING* PROJECT – PART 1

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ABSTRACT

The energy potential from pruning residues of permanent crops is significant. However, there is not much data about the environmental influence of the processes related to harvesting, storage and transportation of pruning residues. In this paper, the methodology of analysis of the environmental impact assessment applied within the *EuroPruning* project is presented. The screening and scoping steps in accordance with *Directive 97/11/EC* as well as other procedures included in *ISO 14001* methodology, which are related to the environmental impact, are described. As a result, the selected approach for the determination of the potential environmental effects, including risk description and prevention actions is presented.

Introduction

The local and global environment protection is one of the most important tasks in relation to human activity. Therefore, sustainable development emphasises that achievement of economic targets should take place with the lowest negative impact on nature. It is essential in case of regional activities, because the environmental consequences will be faced mainly in place and by a local community in short as well as in long term. Therefore, determination and prevention of the potential risk for the environment is crucial for the financial project success and social acceptance.

In Europe there is a total area of 10.6 Mha of permanent crops, like: olive, vineyard, fruits, citrus, nuts and other (Eurostat, 2011). These permanent crops require regular pruning every year to maintain fruits productivity and quality. As a result, a lot of wooden residues are generated in orchards/plantations requiring proper management. Currently, the most popular solutions of pruning management are (Dyjakon et al., 2016): pushing out of the rows and burning on site in the orchards or mulching in-situ (chipping) with the use of agricultural machinery. Both solutions are costly and time consuming. In recent years, more and more attention is paid to more efficient use of the pruning residues, like for energy purposes. However, such a new option of pruning residues utilisation has to solve various

difficulties (Dyjakon et al., 2014). The *EuroPruning* project has developed solutions to the existing technical barriers (related to harvesting, on-site pre-treatment, quality assurance and transport) to bring to the market woody solid biomass from the branches, cuttings or stems produced by common agricultural practices of permanent crops production. Apart from technical constraints, there are also other areas that need to be investigated. One of the issues is the impact of the pruned biomass on the environment (Den Boer et al., 2014).

The use of pruning residues for energy purposes requires the use of proper agricultural machineries (tractor, rake, baler, chipper etc.), loading equipment and means of transportation (trucks, trailers etc.). These machineries use fossil fuels for powering leading to emissions of pollutants to the atmosphere, noise generation and resource depletion for the fuel and machinery manufacture. Additionally, the operation of the machineries may create the risk of accidents and may have an influence also on human health and local surroundings. As a result, the scale of interaction of this activity on the environment should be checked/assessed.

The importance of environmental assessments (*ea*)

It is important from the environmental, economic and social point of view to know and understand the influence of the given activities/projects and changes on the local surrounding they cause. This helps to avoid or minimise the negative consequences of the human actions on the natural environment. Therefore, when conducting an environmental impact study all the factors which a land development or construction project may have on the environment in the area, including population, traffic, fire protection, endangered species, archaeological artefacts, community beauty etc., should be considered (Munn, 1975; Canter, 1996; Jain et al., 1977; Ahmad and Sammy, 1985).

Usually, the human activity in that area is assigned to one of three categories (World Bank, 1999) on the basis of the nature, magnitude and sensitivity of the environmental issues and so designated to the environmental analysis (*EA*). The categories are as follows (fig. 1):

– category *A* (a full *EA* is required, as the actions may have diverse and significant environmental impacts),
– category *B* (although a full *EA* is not required, environmental analysis is appropriate, as the action may have specific environmental impacts),
– category *C* (environmental analysis is normally unnecessary, as the project is unlikely to have significant environmental impacts).

Category *A* requires obligatory performance of the environmental impact assessment (*EIA*) to examine the environmental consequences or impacts, both beneficial and adverse, of the proposed development activity/project and to ensure that these effects are taken into account in the activity/project design. The *EIA* is therefore based on predictions. These impacts can include all relevant aspects of the natural, social, economic and human environment. The study therefore requires a multi-disciplinary approach and should be done very early at the feasibility stage of the activity/project. In other words, the project should be assessed in order to define its environmental feasibility.

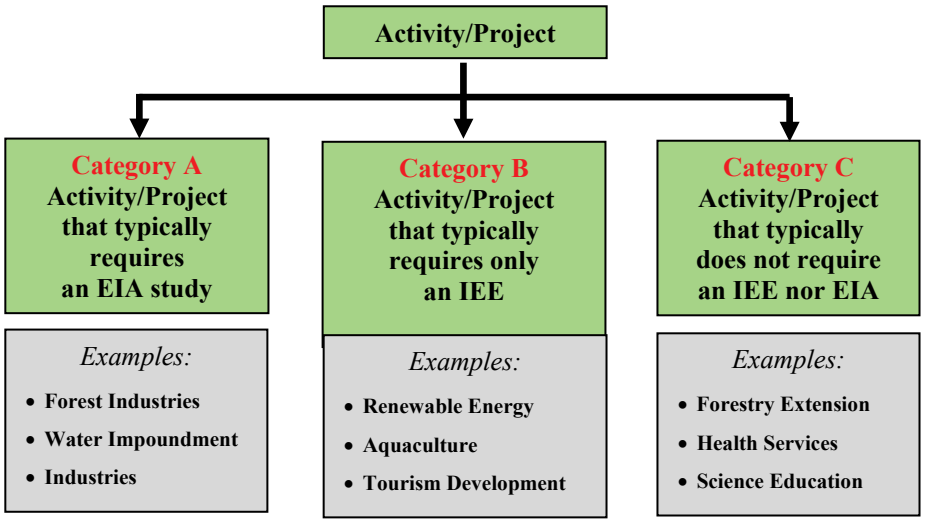

Figure 1. Categories of activities/projects in terms of environmental impact (World Bank, 1999)

Category *B* advices to carry out the initial environmental examination (*IEE*) to determine whether potentially adverse environmental effects are significant or whether mitigation measures only can be adopted to reduce or eliminate these adverse effects. The *IEE* contains a brief statement of key environmental issues, based on readily available information. It is used very often in the early (pre-feasibility) phase of the activity/project planning. Therefore, the *IEE* also suggests whether in-depth studies are needed. When the *IEE* is able to provide a definite solution to environmental problems, the *EIA* is not necessary. The *IEE* also requires expert advice and technical input from environmental specialists so that potential environmental problems can be clearly defined.

Category *C* does not require any special attention neither further environmental study, because the activity/project is not anticipated to have significant impact.

Environmental impact assessment

The Environmental Impact Assessment is a procedure required under the terms of European Union *Directives 85/337/EEC* and *97/11/EC* on assessment of the effects of certain public and private projects on the environment in order to attain one of the Community's objectives in the sphere of environmental protection and the quality of life.

The EIA is a procedure used to examine the environmental consequences or impacts, both beneficial and adverse, of a proposed development project and to ensure that these effects are taken into account in project design. The *EIA* is therefore based on predictions. These impacts can include all relevant aspects of the natural, social, economic and human environment. The study therefore requires a multidisciplinary approach and should be assessed for its environmental feasibility.

The *EIA* should be viewed as an integral part of the project planning process and is applied to new projects and the expansion of the existing projects. The phases of the *EIA* from screening to follow-up are illustrated in figure 2. According to article 4 of *Directive 97/11/EC*, for the projects listed in *Annex I* or *II* of this *Directive*, the *EIA* is mandatory.

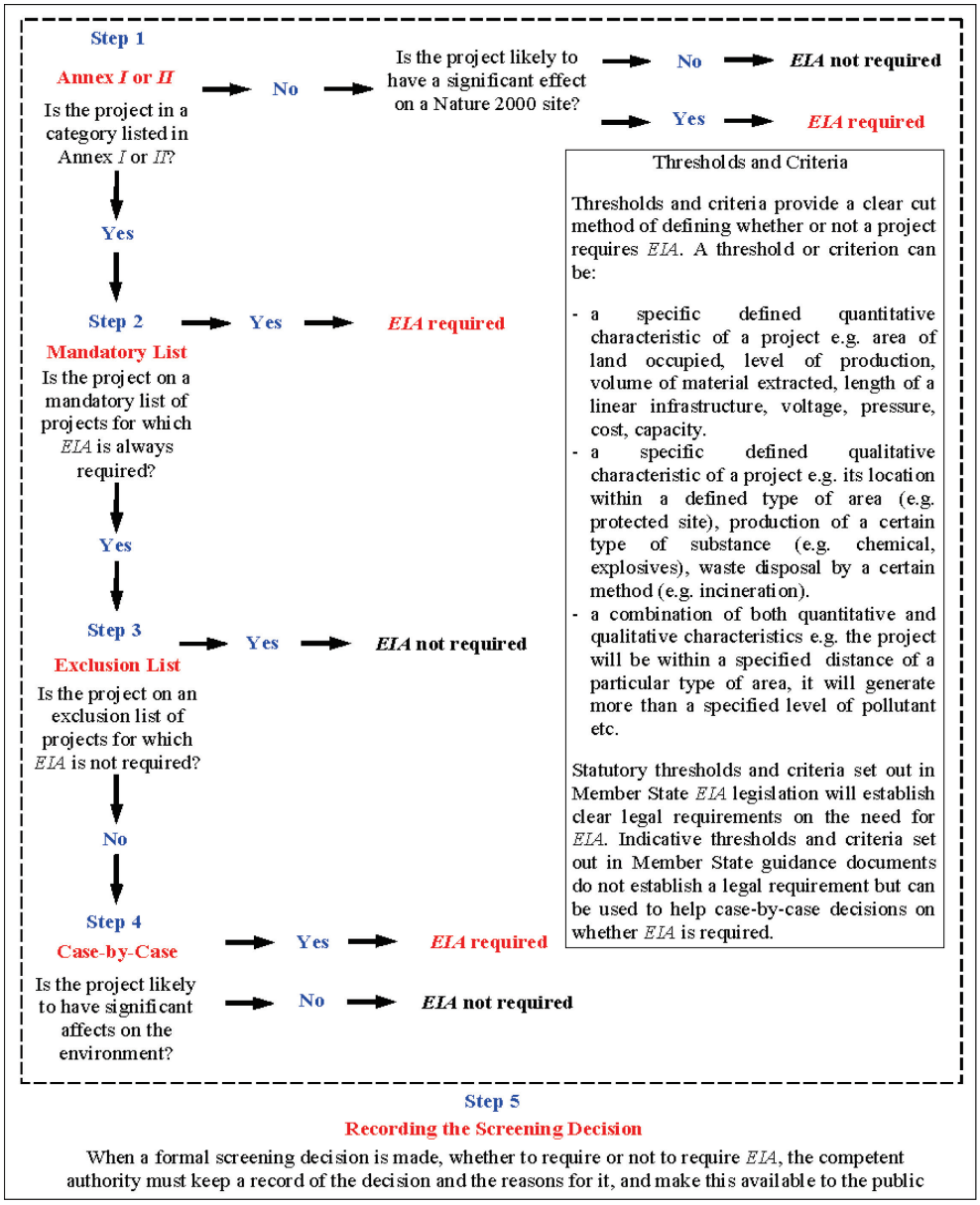

Figure 2. The steps in screening of the EIA procedure (EU Commission, 2001a)

In the *EIA* process there are two important steps during the evaluation: screening and scoping. Screening is the *EIA* process which determines whether the *EIA* is required for a particular project. In turn, scoping is the activity of deciding on matters to be investigated as a part of the *EIA*, once a decision has been taken that the *EIA* is required (if a screening decision has been made).

Prior to the *EIA* process the main information about the project should be provided for screening and scoping to help its proper evaluation. Apart from such data like characteristics of the project, location of the project, also other information including description of the main processes, resources used in construction and operation, characteristics of the potential impact; magnitude, complexity and probability of the impact; duration, frequency and reversibility of the impact; nature of the impacts (*e.g.* direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative) as well as mitigation incorporated into the project design to reduce, avoid or offset significant adverse impacts have to be defined.

It should be marked that these steps may partly overlap. For example, information which is used for making a screening decision may subsequently be used at the scoping stage. In some regimes a preliminary assessment is undertaken to assist in the screening decision. If a decision is made that the *EIA* is required, the information from the preliminary assessment may also be used for scoping.

The europruning project and environmental impact assessment

The consequences of human activities appearing in various forms during the realisation of the project constitute negative as well as positive impacts on the environment. To take more control and minimise the negative effects of these activities, the European Union has introduced *Directive* (97/11/EC) defining the procedure for selection of projects whose implementation should be preceded by analysis of their potential impact on the widely understood external surrounding (so called, environmental impact assessment analysis).

The *EuroPruning* project tends to a more efficient use of pruning residues (as biofuels on the local energy market in Europe) generated in the permanent fruit orchards/plantations by developing solutions for their harvesting, transportation and storage. In this perspective, the project (as a whole) represents an entirely new logistic chain on the European renewable energy market. Furthermore, there is a lack of information about the environmental impact of this strategy,

Therefore, the aim of this paper is to define the methodology and to indicate the areas that should be taken into consideration during the environmental aspects analysis.

Methodology and investigation procedure

According to *Directive 97/11/EC*, the *EuroPruning* project must be checked with the list of projects defined in the *Annex I* and *II* of this ordinance to find the answer, whether a full *EIA* analysis is required or not (fig. 2). Depending on the initial results, the project might undergo further steps: checking with a mandatory list, exclusion list or case-by-case study. In the decision making, especially for new projects, it is recommended to get through the screening and scoping lists included in the guidance on the *EIA* (EU Commission, 2001a; EU Commission, 2001b; EU Commission, 2001c) related to directive 97/11/EC to

be sure about the lack of significant negative impact of the *EuroPruning* project on the local environment.

As the *EuroPruning* project is complex (fig. 3) and contains several steps in the whole logistics chain focused on *Pruning to Energy* (*PtE*) strategy (which may be replicated in different places), the *EIA* scoping and screening issues were analysed according to three main selected parts:

– harvesting process (in the orchard),
– transportation of the harvested biomass (transport outside orchards),
– biomass storage (open air conditions).

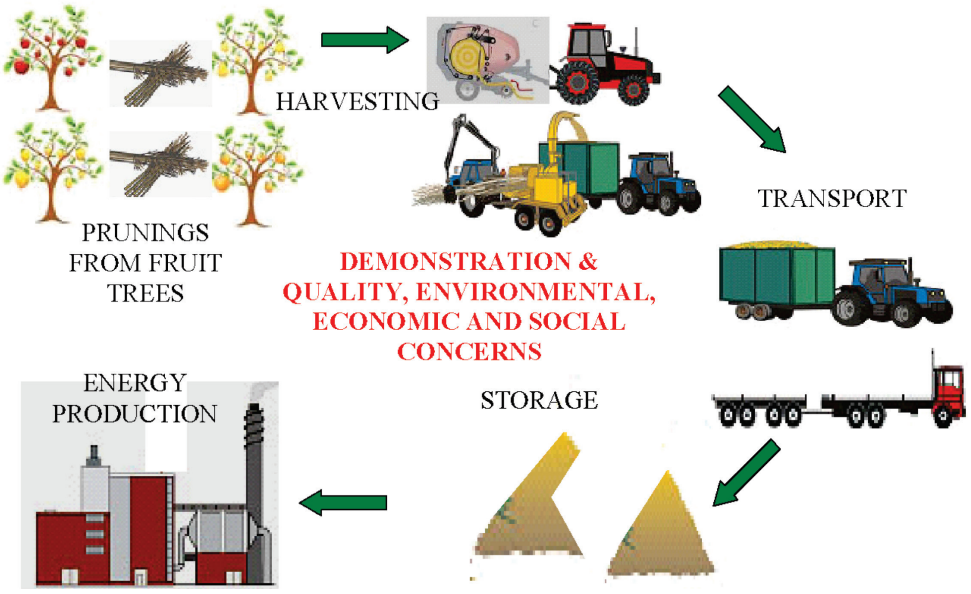

Figure 3. General EuroPruning concept (Dyjakon et al., 2014)

Next, the results of the selected parts have been compiled to cover the project as a whole and the conclusions have been discussed, accordingly.

Moreover, apart from the screening and scoping checklists, the procedure included in *ISO 14001* methodology (risk definition and prevention action proposition) has been applied. This analysis has to characterise:

– part of the logistic chain/location,
– situation/case/operation,
– description of the risk/hazard etc.,
– improvement actions/comments/tips/recommendations leading to the avoidance of the incident.

In case of the *EuroPruning* project, the recognition of the hazards have taken place during the demonstration phase of the pruning harvesting (with the use of developed prototypes: chipper and baler) in the orchards as well as during the material transportation and

storage. Based on the performed observations, the potential risks for the environment have been pointed out and the proper actions for the avoidance of these incidents have been proposed.

Conclusions

The environmental impact assessment certainly has a significant role to play in addressing environmental issues surrounding project development. The integration of the environment into development planning is the most important tool in achieving sustainable development of the certain region. Environmental protection and economic development of the local community must thus be treated in an integrated manner. The *EIA* process is necessary in providing an anticipatory and preventive mechanism for environmental management and protection in any development, especially for new logistics chains.

In Europe, thanks to many Directives (i.e. *85/337/EEC*, *97/11/EC*) and international standards (i.e. ISO 14001) the specified requirements for an effective environmental protection and management system are built. As a result, the procedures help to maintain the balance between human needs and the local environment.

As the *EuroPruning* project is a new strategy for pruning residues treatment, the environmental issues should be considered with care. The selection of proper decisions and methodologies, especially in case of projects with a new logistics chain, is very important in terms of economic growth, respect to the environment and social acceptance by local society.

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GAŁĘZIE Z SADÓW NA CELE ENERGETYCZNE – METODOLOGIA OCENY ODDZIAŁYWANIA NA ŚRODOWISKO NOWEGO ŁAŃCUCHA LOGISTYCZNEGO OPRACOWANEGO W RAMACH PROJEKTU *EUROPRUNING* – CZĘŚĆ 1

Streszczenie. Potencjał energetyczny ściętych gałęzi z sadów i plantacji drzew owocowych jest znaczny. Jednak, niewiele jest danych na temat oddziaływania środowiskowego procesów związanych z pozyskiwaniem, magazynowaniem oraz transportem tego typu biomasowych odpadów sadowniczych dla celów energetycznych. W pracy przedstawiono metodologię analizy oceny oddziaływania środowiskowego wykorzystaną w projekcie *EuroPruning*. Opisano poszczególne etapy oraz zasady postępowania dla tego typu projektów w odniesieniu do dyrektywy *97/11/EC* oraz procedur zawartych w *ISO 14001*, które powiązane są oddziaływaniem na środowisko. W efekcie, przedstawiono przyjętą strategię działania w projekcie dla określenia potencjalnego oddziaływania na środowisko wraz z oceną ryzyka oraz działaniami prewencyjnymi.

Słowa kluczowe: biomasa, gałęzie, wykorzystanie energetyczne, ocena oddziaływania na środowisko