

Evaluation of the methodology proposed for identifying priority pests in EU

Background and assignment

Pursuant to the new plant health regulation (EU regulation 2016/2031) a list of Union Quarantine pests which qualify as priority pests shall be established. The pests will be classified as priority pests according to the severity of the economic, social or environmental impact that they can potentially cause in the union territory following the criteria in Annex 1, section 2.

The Joint Research Center (JRC) has been given the task to develop a model to facilitate ranking of quarantine pests according to the criteria of priority pests in the new PHR. EFSA will support the work by providing technical and scientific data related to the pests being assessed (EFSA 2018). JRC has proposed to use a multi-criteria decision analysis with composite indicators. The proposed methodology was presented as a PowerPoint presentation (JRC 2018).

The unit for risk assessment of plant pests at SLU has been given the assignment to, based on the information in the presentation by JRC, provide feedback on the proposed methodology to support the Swedish Board of Agriculture in the continuing discussions at EU level. The questions below were provided by the Swedish Board of Agriculture. In the final section some additional issues are discussed.

Evaluation and feedback

For the purpose of this exercise we have summarized the structure of the model proposed by JRC (Appendix 1).

Have the criteria to identify Union quarantine pest which qualify as a priority pest (Annex 1, section 2) been transferred appropriately into the indicators in the proposed model by JRC?

- There seems to be a bit of overlap regarding the criteria to identify Union quarantine pest which qualify as a priority pest. In Annex 1, section 2 (a) it is

stated that “Economic impact: the pest has the potential to cause major losses in terms of the direct and indirect effects referred to in point (4) of Section 1 for plants with a significant economic value in the Union territory.”. However, some of the effects listed under point 4 refers to social or environmental impact. Consequently there is an overlap between the criterion for economic impact and that of social and environmental impact.

- It is sometimes difficult to judge which of the criteria in Annex 1, section 1 and 2 that are the base for some of the indicators presented in the model. It is stated in the presentation by JRC that the each criterion should be linked to the associated indicators by a code (slide 9). This is an excellent idea but the codes are not used in the presentation.
- Some of the indicators appear to have changed focus compared to the criteria given in the PHR. For example in the criteria b (iii) only the impact on tree species are included whereas in the model also impact on other hosts is included in the corresponding indicator (Cultural heritage importance). This means that also pests affecting non-tree hosts will score in this indicator. This change in focus may result in that pests of trees will receive a relatively lower ranking than they would otherwise obtain. But how significant this effect will be in the end will also depend on how the indicators are combined in the model. Possibly there are other criteria that has been included resulting in the broader description of the indicator in the model. This is however difficult to evaluate based on the available presentation.

With regard to the indicators for:

- **Economic impact**
 - The following criteria listed in Annex 1 section 1 point 4 does not seem to be included anywhere in the JRC model:
 - **“(c) costs of replanting and/or losses due to the necessity of growing substitute plants;”**

This cost does not appear to be directly included in any of the indicators, but it may possibly be included in the indicator “additional producer cost”. Replanting of street trees is for example associated with considerable costs. Thus, if this criterion is not considered, the impact of pests that mainly cause damage on tree species commonly used as street trees may be underestimated.

- **“(f) effects on native plants, biodiversity and ecosystem services;”**.

The impact on native plants is included in the indicator ‘Damage/mortality of native plants’. But only *protected animals* (and plant species) are included in the indicator ‘Losses of biodiversity and wildlife’. Thus, negative impact on native animals, that are not “protected”, as well as other organism groups (e.g. fungi) are not included. These organisms should be included since they are a vital part of the biodiversity. Moreover, the impact on ecosystem services is limited to effects on “water erosion” and “soil carbon stocks” which is related to the following point;

- **“(o) changes in ecological processes and the structure, stability or processes of an ecosystem, including further effects on plant species, erosion, water table change, fire hazards, nutrients cycling;”**.

In the proposed indicators the following factors from the criteria are missing; water table changes, fire hazards and nutrient cycling. Moreover, it is unclear why the indicator “soils carbon stocks” has been limited to only soil and why aboveground biomass has been omitted.

- **“(p) costs of environmental restoration and prevention measures;”**

This could possibly be included as part of the indicator ‘Public expenditure’ but it is not clear from the available presentation if this will be done and if so how.

- **“(s) effects on water quality, recreation, tourism, landscape heritage, animal grazing, hunting, fishing.”**.

Water quality does not appear to be included in any indicator.

- **Regarding Indicator 1.4 (Difficulty of eradication)**

It is stated that this is still under development, but it is currently explained as a classification based on “polyphagous pest vs monophagous; perennial vs annual hosts; presence of asymptomatic infections vs not presence; natural spread rate”. It would be interesting to obtain more information about this indicator as to what criteria it refers to, e.g. criteria (h), and whether this will be a dichotomous variable or whether the costs involved will be quantified.

- **Social impact**
 - The indicator 'employment loss' is stated to be limited to employment related to different production systems and do not appear to also include "...industries related to those sectors, including tourism and recreation;" as stated in the criteria in Annex 1 section 2 point b (i).
 - The criteria in Annex 1 section 2 point b (iii) refers to "the disappearance of, or long-term large-scale damage to, important tree species growing or cultivated in the Union territory or tree species of high importance in terms of landscape as well as cultural or historical heritage for the Union.". The requirement of "long-term large-scale damage" is not included in the description of the corresponding indicator in the model, i.e. "Cultural heritage importance".
- **Environmental impact**
 - The criteria in Annex 1 section 2 point c (i) refers to "significant effects on biodiversity...". This is not in correspondence with the model where a dichotomous variable is used to answer if "...the pest can negatively affect species of native plants.", Preferable this variable should be exchanged to a quantitative assessment or at least the question should be reformulated to "the pest can *significantly* affect species of native plants." in the indicator "Damage/mortality of native plants".

Are the chosen indicators understandable?

Generally it is not possible based on the information available in the presentation by JRC to understand in any detail what the indicators will include and how the indicators will be measured. This is a major obstacle for evaluating the model. However, it is possible to comment on the overall approach as well as seemingly missing elements.

Are there other indicators that should be included?

Certain parts and details included in the criteria listed in the new PHR appear to be absent from the indicators, see answer above.

Will the availability of data significantly affect the ranking? Or will limited availability of certain data result in an unacceptable uncertainty?

Limited data for some of the parameters that will be assessed will cause high uncertainties. However, since different pests differ significantly in the type of impact they cause the effect of the weighting of parameters and precisely how the parameters are defined will probably have a much larger impact on the final ranking than the uncertainty associated with the lack of data.

How is uncertainty included in the model?

It is stated that “Uncertainty incorporated via sensitivity analysis – Impact on pest selection of weights and data quality” (slide 8). It seems like the program @RISK will be used to calculate the uncertainty distribution based on the available data and expert elicitations (EFSA presentation, slide 14). Exactly how the uncertainty distributions of each parameter will be combined in JRCs model is however not clear.

The requirement in article 6.1 b) in PHR is formulated as follows “their potential economic, environmental OR social impact is the most severe...” whereas the description of the JRC model indicate that the values from the three main categories will be summed to obtain the overall score. Any comments on this?

- For most pests we consider that the additive method would be the best approach (but see exceptions below). The disadvantage with the alternative approach where the pests are rated based solely on the category within which they have their strongest impact is that e.g. a pest with a very high economic impact and no social and environmental impact would be ranked higher than a pest with only slightly lower economic impact and high impact within the other categories (fig. 1).

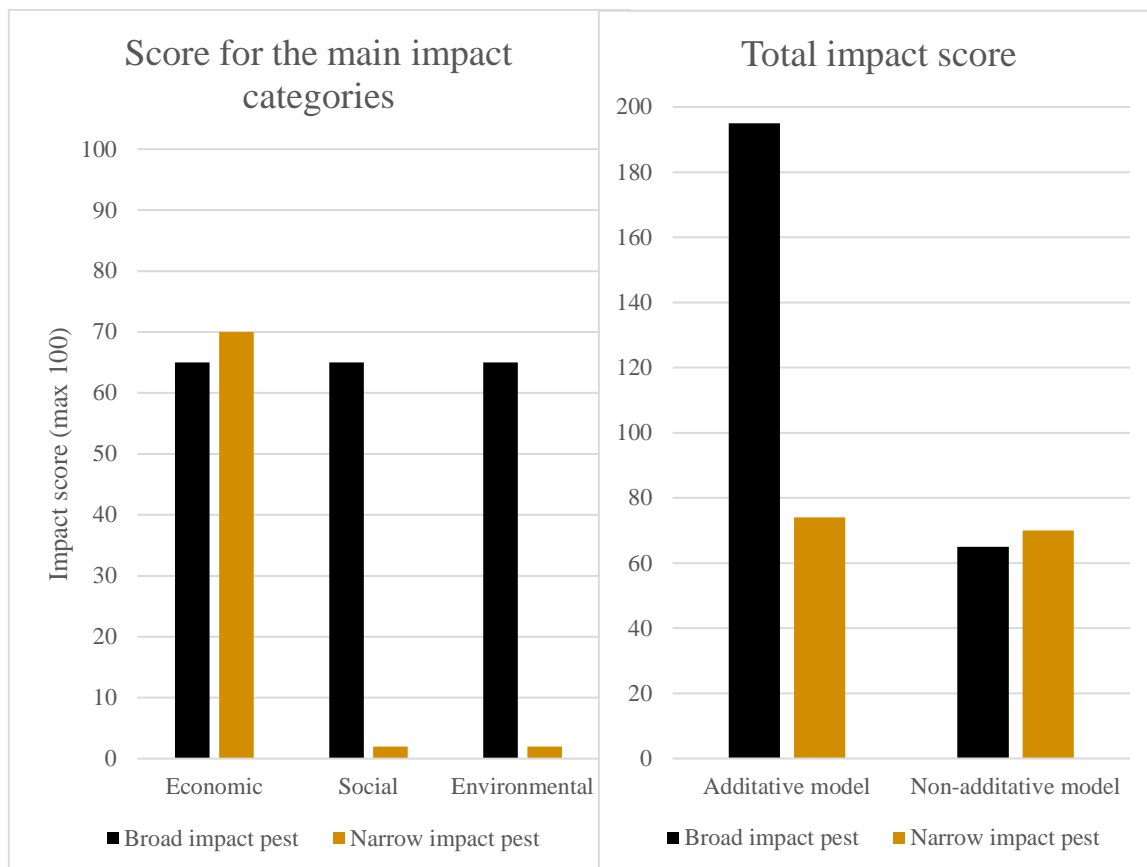


Fig. 1 Hypothetical example of a broad vs. a narrow impact pest and the resulting total impact score using an additive and a non-additive approach.

- If the interpretation of the formulation in article 6.1 b) is that it is enough if a pest has the most severe impact in one category then the additive method may exclude pests that according to the PHR should be included. One approach to make sure that a pest with a maximum impact score in one of the three main categories (i.e. economic, social or environmental impact), ends up as a priority pest is to include a threshold value within each main category for which pests that receives a higher score directly qualifies as a priority pest.

The procedure to use an additive method to calculate the overall impact score is not restricted to the three main categories but also applies to the calculations of and between the subcategories. Since the estimations of the different types of impact to a high degree is based either on yes or no questions or on counting, e.g. the number of affected animal and plant species, the model will likely benefit pests with a broad rather than a narrow but high impact. The key concern is that it appears highly unlikely

that a pest with an extreme impact within one or a few of these subcategories where the significance of the impact is not assessed quantitatively will end up on the list of priority pests (fig. 2). For example, a pest that, if established in EU, would be likely to cause extinction of a high number of native species without economic or social importance would not end up on the list of prioritized pests. To be able to implement such a procedure it would be valuable to evaluate how the model score a species with a very narrow impact, e.g. Dutch elm disease (*Ophiostoma novo-ulmi*).

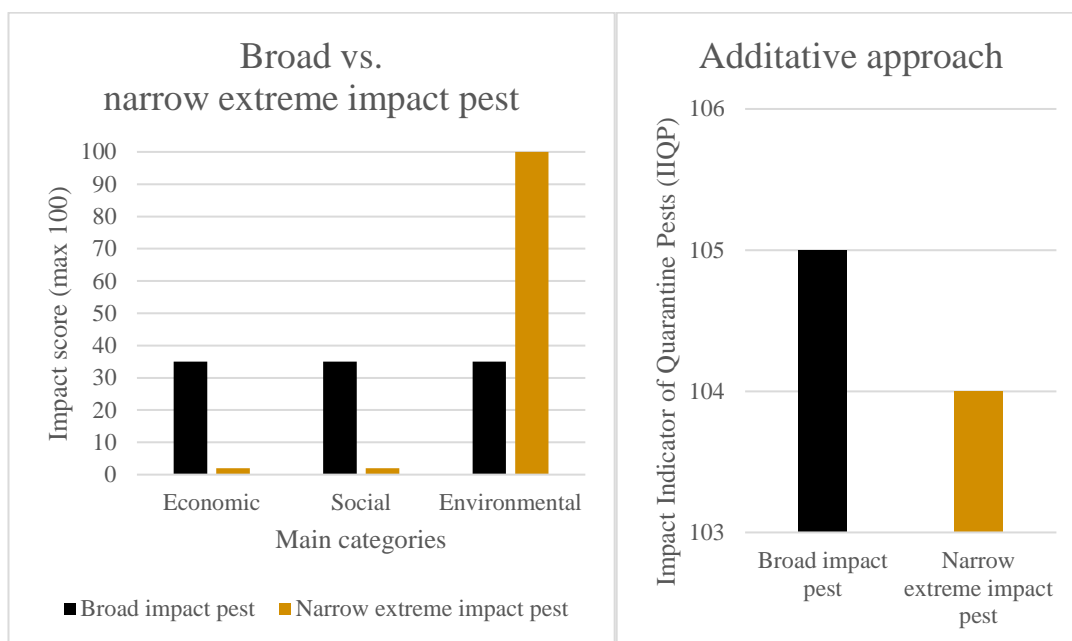


Fig. 2 Hypothetical example of a broad vs. a narrow extreme impact pest and the resulting total impact score using an additive approach.

How is the weighting of the parameters proposed to be incorporated in the model?

It is stated that the weights for the indicators relating to the sub-category “Production impacts” will be set by legislator(s). This is the first category described in the presentation and we assume that this also applies to the other subcategories although it is not stated. Further, the impact of weighting options on the pest listing (selection for priority) will be analyzed using a sensitivity analysis. Presumably the main purpose of the model is to provide a tool that allows legislators to weight the different categories of potential impacts according to how important they think the different aspects are. In other words, if the model is not transparent enough to help legislators to weight the different types of impacts against each other it should not be used.

Any comments regarding the proposal to apply the model separately on pests of crops and forestry pests?

- It seems appropriate in a first step to separate pests of crops and pests of trees. Some of the parameters that are included in the model will not be relevant for pests on crops, e.g. effects on ornamental and street plants, and some are not applicable for forest pests, e.g. food security impact.
- In addition, we suggest that the term *forestry pests* is replaced by *pests of trees species* to also include tree species not specifically used in forestry.

Data availability at MS level: so far mostly based on EU wide available data bases: Any suggestions hints for sources?

The following are examples of sources from Sweden that may be used;

- National statistics on distribution of crops/plants/trees and annual production of plants and plant products, e.g. Widenfalk et al. (2018).
- National data on share of production that is exported, e.g. Widenfalk et al. (2018).
- National data on employment rate of different production systems/sectors.

Covering data gaps with ad-hoc consultation to MS? How to articulate the process?

One possibility is that individual MS suggest specialists that may contribute in their area of expertise to expert elicitations in a similar fashion as is already done at EFSA and EPPO. It is however important that this process is transparent and documented accordingly.

Regarding economic impacts and yield loss (slide 14). How are these factors calculated for perennial plants and what does planted area mean in relation to forests?

It is unclear how the maximum production loss is calculated for perennial crops such as forest trees. Probably this has not been decided yet since in the presentation by EFSA they list "Pest impact on annual vs. perennial crops e.g. trees" under the heading "Some of the challenges" (EFSA 2018). Anyway, this may not be a significant problem if agricultural crops and forest pests are analyzed separately.

An alternative unit to *planted area* to use for forests is to instead estimate standing biomass.

What does “Share of MS affected” (slide 18) refer to? Proportion of the number of MS affected or the proportion of area affected in the EU territory?

It is unclear why “Share of MS affected” have been included as a separate indicator in the model. From slide 15 it is clear that it will be measured as the number of NUTS2-regions which are climatically suitable for the pest (we assume that only NUTS2-regions that also overlap with the host plants distribution are included). Thus, it will not be a measure of the proportion of the actual land area of a MS that will be affected (fig. 1).

To some degree a measure of proportion of NUTS2-regions correspond to the share of people within a MS that lives within the regions which are climatically suitable for the pest. Measures where the number of people “exposed” to a pest in the area where they live have previously been used to evaluate for example the social impact of losses of street trees. But here it is used as one parameter to calculate the production impacts of a pest. The approach used in the model is to use NUTS2-regions as the assessment unit for measuring the “Share of MS affected” area but the actually share of land area in ha for example seems to be a better measure. Anyhow, an explanation of why this factor has been included is necessary.

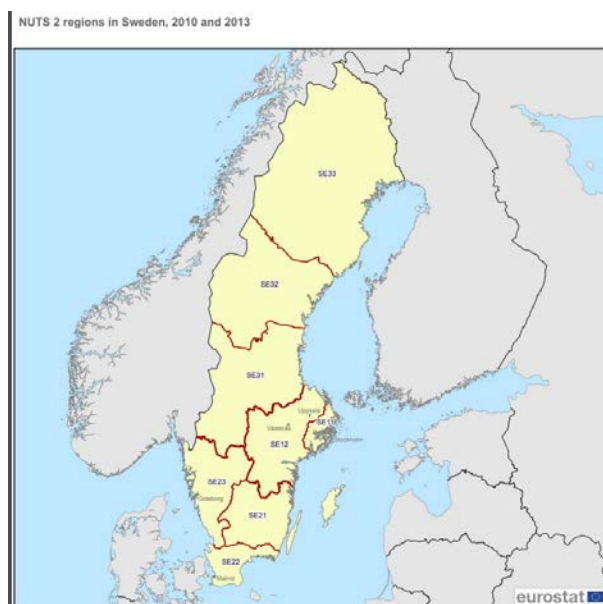


Fig. 1. NUTS2-regions in Sweden (from Eurostat: <http://ec.europa.eu/eurostat/documents/345175/7451602/nuts-map-SE.pdf>).

Regarding the indicator “Export network” (slide 24). If two countries have a huge import and 15 countries together have a very small import, how is this weighted and compared?

It is unclear why it matters how many countries EU export a specific commodity to. It would make much more sense to quantify the total export value and disregard the number of countries that is receiving the commodity.

Regarding the indicator “Upstream and downstream effect” (slide 28). What does the explanation “Number of sector downstream and upstream affected” refer to?

It is not clear from the presentation what this refers to and it is not clear which criteria in the new PHR that this corresponds to. Regardless, it seems like an extremely vague measurement to use *number of sectors* and it would be better to try to quantify the total indirect economic impact in monetary terms.

Regarding the indicator “Employment loss”. Will a higher degree of mechanization of the sector lead to a lower estimated social impact?

Yes, that is also our interpretation. The proposed model for calculating employment loss implies that MS with a higher degree of mechanization in their production systems will in general have a lower estimated social impact for this indicator compared to MS with a low degree of mechanization (per unit produced). The value of the indicator will largely depend on how the value of the “labour needs for production (AWU/ha)” is calculated. Will it be calculated at the level of NUTS-2 regions or will it be based on the average value at the EU level?

Regarding the sub-category “Food security/Food safety impacts”. What does caloric, protein and fat supply signify (slide 33-35)?

Our interpretation is that these indicators will be estimated as the proportion of the total consumption of calories, protein and fat that is potentially lost due to a pest. The indicators appear to be largely derived from standard food security indicators found for example at FAO (<http://www.fao.org/faostat/en/#data/FS>).

Regarding the indicator “Degree of diversification” (slide 37), what type of data from Eurostat does this refer to?

Presumably this indicator corresponds to criteria (s) in Annex 1 section 1 point 4 “effects on water quality, recreation, tourism, landscape heritage, animal grazing, hunting, fishing.” But, it is unclear what is actually meant by the description of the data from Eurostat that will be used. In addition, the explanation that the indicator is ‘common to all crops’ is very confusing.

Regarding the indicator “Capacity to boost other pests” (slide 43), what does this signify?

The “capacity to boost other pests” probably refer to the following criteria in the PHR: “(g) effects on the establishment, spread and impact of other pests, for example due to the capacity of the pest concerned to act as a vector for other pests;” (Annex 1 section 1 point 4). However, most pests benefit other pests since attacked hosts tend to become more susceptible to secondary attacks, e.g. plants with fungal infections frequently becomes more vulnerable to insect infestations. Preferably a ranking scale should be used, e.g. low, medium and high, to avoid that the answer will become “yes” for almost all pests. At least the indicator should be rephrased to “...significantly boost...”.

Additional comment

The impact assessment proposed in the JRC model is very comprehensive compared to most other ranking models developed, e.g. FinnPrio. However, in contrast the model developed by JRC does not incorporate any assessment of entry, establishment and spread. Thus whether a pest is likely or very likely to establish will not influence the ranking it receives in the JRC model.

References

EFSA Working Group on Priority Pests (Giuseppe Stancanelli, Richard Baker, Carsten Behring, Gianni Gilioli, Tomasz Kaluski, Olaf Mosbach Schulz and Trond Rafoss). 2018. EFSA support for the identification of the *Union quarantine pests* qualifying as priority pests. PowerPoint presentation in Brussels 16/01/2018.

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PHR (the new EU Plant Health Regulation (regulation EU 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R2031>

Widenfalk, O., Jakobsson, M., Hammarström, A., Widenfalk, L. 2018. Trade and production of plants and plant products in Sweden - A knowledge base for pest risk analysis. Technical Report, External project leaders Björklund, N., Boberg, J. Greensway and SLU, pp 40. <https://www.slu.se/globalassets/ew/org/centrb/riskv/pub/trade-and-production-of-plants-and-plant-products-in-sweden.pdf>

Appendix 1

