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IMPACT ASSESSMENT

Accompanying the document

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

amending Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment

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Glossary of Abbreviations

EEE: Electrical and electronic equipment

IASG: Impact Assessment Steering Group

NRMM: non-road mobile machinery

RoHS: Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

RoHS 1: Directive 2002/95/EC of the European Parliament and of the Council

RoHS 2: Directive 2011/65/EU of the European Parliament and of the Council

SME: Small and medium-sized enterprise

WEEE: Waste electrical and electronic equipment

WEEE Directive: Directive 2002/96/EC of the European Parliament and of the Council on waste electrical and electronic equipment

Introduction

Directive 2011/65/EU (RoHS 2) lays down rules on the restriction of the use of certain hazardous substances[1] in electrical and electronic equipment (EEE). RoHS 2 provisions apply to EEE placed on the EU market regardless whether they are produced in the EU or in third countries and then imported into the EU market. The production of EEE is a globalised activity which takes place in many countries across the world. Thus, RoHS 2 affects mainly industrial manufacturers, importers and distributors of EEE, and, to a lower extent, also EEE customers.

RoHS is a directive implementing the highest priority of the waste hierarchy, which is waste prevention. Waste prevention is defined, inter alia, as measures that reduce the content of harmful substances in materials and products. The decrease of hazardous substances in waste EEE benefits the waste EEE management as a result. This type of prevention promotes the reuse of products and the recycling of used materials, thus promoting the circular economy in the sector.

RoHS 2 is necessary to prevent barriers to trade and distortion of competition in the Union, which could have been generated by disparities between the laws or administrative measures if these were adopted individually by the Member States and to contribute to the protection of human health and the environmentally sound recovery and disposal of waste EEE and, at the same time.

RoHS has stimulated a global change in hazardous materials reduction: several third countries, including China, Korea, US, have developed RoHS-like legislation.

Issues introduced by the recast

RoHS 2 is a recast of the earlier RoHS Directive 2002/95/EC. It introduced new definitions and expanded the scope to cover medical devices and monitoring and control instruments. These provisions were already impact assessed with the Commission's proposal in 2008. However, RoHS 2 also introduced further changes: the 'open scope' by, firstly, introducing a new category 11 "Other EEE not covered by any of the other categories"[2], so that the Directive became applicable to all EEE and, secondly, a broader interpretation of EEE as a result of a new definition of the dependency on electricity. These open scope provisions were introduced during the codecision procedure of the recast and they were not specifically impact assessed.

RoHS 2 Article 2(4) provides a 10-entry list of specific equipment which is excluded from the new scope[3]; this list defines the only EEE currently not under the scope of the new Directive.

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[1] The ten substances restricted under RoHS 2 are namely: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) polybrominated diphenyl ethers (PBDE), bis(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP) the restriction of DEHP, BBP, DBP and DIBP will apply from 22 July 2019; other substances could be restricted in future. The substances covered by RoHS 2 are scientifically well researched and evaluated and have been subject to different measures both at Union and at national level.

[2] The eleven categories of EEE are large household appliances (category 1), small household appliances (category 2), IT and telecommunications equipment (category 3), consumer equipment (category 4), lighting equipment (category 5), electrical and electronic tools (category 6), toys, leisure and sports equipment (category 7), medical devices (category 8), monitoring and control instruments including industrial monitoring and control instruments (category 9), automatic dispensers (category 10), and other EEE not covered by any of the categories above (category 11).

[3] The ten RoHS explicit exclusions are in short: military equipment, equipment to be sent into space, equipment that is only part of excluded equipment, large-scale stationary industrial tools, large-scale fixed installations, means of transport for persons or goods, professional non-road mobile machinery, active implantable medical devices, photovoltaic panels, research and development equipment. These are the only EEE that at the moment do not fall under the scope of RoHS 2.

Moreover, to ease the phasing-in of the additional EEE that had been introduced through the open scope, RoHS 2 provides for a transitional arrangement until 22 July 2019 for electrical and electronic equipment that was outside the scope of RoHS 1 and that is now in scope of RoHS 2[4]. The phase-in transition allows that new-in-scope EEE can still be placed and circulated on the EU market until 22 July 2019, even if they contain restricted substances. However, undesired implications of this provision hampering secondary market operations have been discovered after the publication of RoHS 2. As pointed out in the strategy on the circular economy recently proposed by the Commission,[5] in most cases the extension of the EEE life-time via repair, resale and refurbishment is both economically and ecologically desirable and a positive contribution to resource efficiency.

The review of RoHS 2

RoHS 2 Article 24(1) mandates the Commission to examine the need to amend the scope of this Directive in respect of the EEE definition and of additional exclusions of product groups covered by RoHS 2 by virtue of the open scope introduced with the 2011 recast. The current Impact Assessment builds upon the Impact Assessment carried out prior to the RoHS recast. It responds to the mandate of Article 24(1) of RoHS 2 and takes into account, in addition, the impact assessment studies commissioned on the previously unassessed scope-related provisions in RoHS 2. A list of undertaken studies and analyses is presented in 7.1 Annex 1 Procedural information.

A general review of the Directive is required to be carried out by 22 July 2021, as required by Article 24(2).

Exemption mechanism under RoHS providing for flexibility

Under the RoHS 2 Directive, time-limited exemptions from substance restrictions can be granted for specific applications when the conditions spelled out in Article 5(1) of the Directive are met: if a substance substitute does not exist, if existing substitutes are not reliable or if they are worst in terms of overall impact. This flexible mechanism is a useful solution for product groups covered by RoHS, where the substitution of the restricted substances needs more time to take place, thus allowing a gradual application of the restriction. While already a single market operator only can request an exemption, the mechanism allows all market operators to use existing exemptions. This possibility in particular is beneficial for SMEs as they can rely on exemptions requested through industrial associations, thus limiting the burden on individual operators.

Additionally, to assist in the implementation of the Directive, guidance on interpretation of RoHS with regard to specific product groups was drafted following consultation of stakeholders and with the help of experts. Such guidance is given regularly[6] to cover issues of interpretation relating to product groups under RoHS 2.

As confirmed by stakeholders during the development of the scope-related studies and by the Member States RoHS experts[7], exemptions[8] and guidance have been used adequately

[4] From now on, "new-in-scope EEE"; see RoHS 2 Article 2(2)).
[5] http://ec.europa.eu/environment/circular-economy/index_en.htm
[6] The RoHS FAQ document is publicly available at: http://ec.europa.eu/environment/waste/rohs_eee/pdf/faq.pdf
[7] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2810, and

and effectively for issues related to several products groups, including those facing the upcoming RoHS restriction. Thus, considering the possibilities given by the exemption mechanism and guidance, as well as the Impact Assessment studies[9], which were developed with comprehensive public and targeted stakeholder consultation, no problems were identified for the following new-in-scope product groups or areas, which have been confirmed as not needing to be formally excluded from RoHS 2:

- Gas water heaters with electrical function;
- Combustion powered (garden) equipment for non-professional or dual use;
- Electric windows, doors and gates;
- Cables as finished EEE;
- Complex air conditioning systems;
- Fuse boxes;
- Electric two-wheel vehicles which are not type-approved (i.e. electric bicycles);
- Furniture with an integrated electrical function;
- Light switches, power wall sockets;
- Power switches;
- Safes;
- Swimming pools for home use with pumps included;
- Toys with minor electrical functions;
- Power generation sets;
- Refurbishment of medical devices;
- Towed machineries for the agriculture (covered by existing exclusion of Article 4(c)).

Therefore, this Impact Assessment focuses on how best to address the residual identified issues that cannot be dealt with either by substance substitution or by exemptions and guidance, e.g. for specific product groups with permanently unresolvable compliance problem or when scope provisions generate market distortions.

Other related existing policies have been considered within the assessment. RoHS 2 and the REACH regulation are consistent in terms of policy interaction, working efficiently in synergy: this is expressed in several recitals and provisions of RoHS 2, e.g. a coherence provision with REACH is provided for both to restrict new substances (RoHS 2 Article 6(1)) and to grant exemptions from restriction (RoHS 2 Article 5(1)). Guidance to explain how the interface is to be managed, particularly in view of potential overlaps in the scope of this legislation, is provided in the Common Understanding Paper drawn up by the Commission and endorsed by the Member States on the interface between REACH and

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[8] http://ec.europa.eu/environment/waste/rohs_eee/adaptation_en.htm

[9] A summary for each of the product groups is given in the studies, i.e. in section 6.1 of the study http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf; in section 2.10 and 3.8 of the study http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/201406012_RoHS_Scope_Review_report_final.pdf; and in sections 2.6, 3.7, 3.8, 4.10 and 4.11 of the study http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/20150312_RoHS_scope_review_final_a.pdf, in addition to the general 2008 study http://ec.europa.eu/environment/waste/weee/pdf/ia_report.pdf.

Directive 2011/65/EU (RoHS)[10]. This Common Understanding Paper is fully in line with Better Regulation principles and represents the Commission's response to the need, recognised in the 2013 REACH Review, "to avoid any possible future overlaps or inconsistencies with restrictions laid down in EU sector-specific legislation". RoHS 2 is furthermore consistent with other legislation on waste, such as in particular Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) and Directive 2000/53/EC of the European Parliament and of the Council on end-of life vehicles (ELV)). Despite the name, the Non-road mobile machinery (NRMM) directive[11] is not specifically linked to RoHS 2, which excludes NRMM from its scope. Both directives have different NRMM definitions; however, this is not considered an inconsistency as they have a different purpose: the first directive regulates the combustion emissions from NRMM engines, while RoHS 2 regulates hazardous substances used in EEE.

This initiative is not part of the REFIT agenda. No recently adopted initiatives or other initiatives under preparation touch upon the same problems.

[10] http://ec.europa.eu/DocsRoom/documents/5804/attachments/1/translations/en/renditions/native
[11] Directive 97/68/EC of the European Parliament and of the Council

1 POLICY CONTEXT, PROBLEM DEFINITION AND SUBSIDIARITY

1.1 Policy context

This impact assessment assesses policy options to reduce unnecessary burden on industry from unintended side-effects of the open scope provisions of RoHS 2, while promoting a circular economy in the sector and maintaining a high level of environmental and health protection.

This report provides an in-depth assessment on how best to address the problems identified, which cannot be solved by means of substance substitution or through granting exemptions and providing guidance, as explained in the introduction. These issues have been identified and confirmed by the studies and stakeholder consultations, and relate to specific product groups where compliance with RoHS 2 cannot be achieved and to situations of market distortions caused by scope provisions, namely:

- Secondary market operations for RoHS 2 EEE which were not in scope of RoHS 1;
- Spare parts for RoHS 2 EEE which were not in scope of RoHS 1;
- Pipe organs;
- Cord-connected non-road mobile machinery.

While all these problems are scope-related, they are not directly linked with each other and can only be solved independently; consequently, possible impacts and options will be analysed individually.

1.2 Secondary market problem

One of the key principles of RoHS 2 and other EU product legislation is the protection from retroactive measures[12] (in RoHS 2 the substance restriction applies only at the first time an EEE is made available on the EU market). This means that when legal requirements, including substance restrictions, apply to a product from a certain date and an individual product of this type is lawfully placed on the EU market before that date, the same product can continue to be circulated in the EU market after that date without having to respect the meanwhile applicable legal requirements. In such case, all secondary market operations, such as the reselling of used EEE, would, irrespective of their date, be unaffected by the obligations of RoHS 2. In general, the extension of the lifetime of a functioning product is indeed both economically and environmentally beneficial.[13]

However, as per Article 2(2) RoHS 2, Member States shall provide that EEE that was outside the scope of RoHS 1, but which would not comply with RoHS 2, may nevertheless continue to be made available on the market until 22 July 2019, without prejudice of the specific provisions established for medical devices and monitoring and control instruments. This transitional period applies to the placement on the market for new-in-scope EEE other than medical devices and monitoring and control instruments. However, it also sets an end date to all market operations (including the first) for all

[12] See Blue Guide, http://ec.europa.eu/DocsRoom/documents/16210 p. 20

[13] The impact assessment for the "secondary market" issue is based on the above mentioned 2014 Oeko-Institut study. For further information and references see the following report: http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/201406012_RoHS_Scope_Review_report_final.pdf.

new-in-scope EEE (including medical devices and monitoring and control instruments) that do not meet the RoHS 2 requirements. Indeed, there is no other provision in RoHS that would allow these products to be made available on the market (i.e. placed on the market or any subsequent market operation) after 22 July 2019. As for medical devices and monitoring and control instruments product group, Article 4(3)[14] only additionally limits the time window for the placing on the market of non-compliant equipment in this group, but does not allow for secondary market operations beyond 22 July 2019.

Therefore, as a result of the current wording of Article 2(2) and Article 4(3), products that are affected by the problematic 'hard-stop' of secondary market operations are medical devices, monitoring and control instruments and other new-in-scope EEE captured by category 11.

Data on the contribution of EEE production to the economy shows that the value of production has remained quite stable in its ratio to GDP, amounting to around 7% in 2012. Sector specific quantification is given for selected cases in 7.4 Annex 4 Case studies on secondary market operations and spare parts use for certain newly in scope product groups.

The industry most impacted by the secondary market hard-stop would be the sector producing long-life high-priced EEE. Examples are:

a) Medical devices and monitoring and control instruments:

EEE in this product group are high-priced high-tech equipment with an average lifetime of ten years and beyond. They very often get refurbished and resold at around half of their expected lifetime. The industry impacted by the hard-stop of secondary market operations is firstly the medical device industry which often proposes also product lines of used repaired or refurbished products.[15]

Non-compliant products were allowed to be placed on the EU market until 21 July 2014.[16] The typical business scenario sees the customer sending a device bought before 2014 to a refurbisher authorised by the manufacturer five or six years later, and replacing it with a new model from the same manufacturer. Refurbishment of these products not complying with RoHS 2 and recirculation after 22 July 2019 would however be an infringement of the Directive due to the hard-stop of secondary market operations. If this legal constraint remains unchanged, this will result in reducing the lifetime of many products on the market.

[14] Article 4(3) states that the restriction "shall apply to medical devices and monitoring and control instruments which are placed on the market from 22 July 2014, to in vitro diagnostic medical devices which are placed on the market from 22 July 2016 and to industrial monitoring and control instruments which are placed on the market from 22 July 2017."

[15] Under the medical devices legislation, the term “fully refurbished” exists. “Fully refurbished” products are assimilated to new products. The proposed new Regulation on medical devices adopted by the Commission on 26 September 2012 defines "fully refurbishment" as follows: "the complete rebuilding of a device already placed on the market or put into service, or the making of a new device from used devices, to bring it in conformity with this Regulation, combined with the assignment of a new lifetime to the refurbished device". For any refurbishment other than "fully refurbishment", the person who carries out the refurbishment holds the responsibility to verify whether or not, in the light of the changes done, the refurbished product should be considered as a new product and, where applicable, undergo a new conformity assessment procedure.

[16] Article 4(3)

Strong industrial actors in the sector are based in the EU, but medical devices and the spare parts production, as well as the repairs, takes place also in third countries as this market is global.[17]

b) New-in-scope equipment other than medical devices and monitoring and control instruments:

The hard stop of secondary market operations will also apply to a very diverse range of other products[18], including furniture with integrated electric functions, swimming pools, lawnmowers with electric ignition, electric bicycles, electric windows and sport shoes with lights. While this might be irrelevant for e.g. sport shoes, it is indeed an issue for high-priced long-life products, especially if they have only been placed on the market close before 22 July 2019.

In short:

	21 July 2014-21 July 2019	From 22 July 2019 onwards
Medical devices and monitoring and control instruments	may not be sold if non-compliant but secondary market possible	Secondary market not allowed for non-compliant EEE
Other newly in scope EEE	may be sold if non-compliant and secondary market possible	Secondary market not allowed for non-compliant EEE

1.3 Spare parts problem

The possibility to repair a product placed on the EU market with a view to reusing or reselling it (repair-as-produced principle) underpins EU product legislation[19], including RoHS 2. This means that when specific legal requirements such as substance restrictions apply to a type of product from a specified date and an individual product of this type is placed on the EU market before that date, it can be repaired or upgraded with spare parts in the EU after that date without having to respect the meanwhile applicable legal requirements.[20] Once an individual product is placed on the EU market and it is therefore compliant with the applicable legal requirements at the time, all its spare parts are unaffected by the obligations of RoHS irrespective of the date of repair, upgrade, etc. The reasoning behind this is that in most cases the extension of the lifetime of a functional product is both economically and environmentally beneficial.

However, after 22 July 2019, RoHS 2 new-in-scope products other than medical devices and monitoring and control instruments can only be repaired with RoHS 2-compliant spare parts and only if the repair is not part of a secondary market operation (i.e. not for reselling).

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[17] For example, see COCIR members, http://www.cocir.org/index.php?id=131. In any case, RoHS applies equally to imported equipment.

[18] In RoHS 2 these products will be grouped in Category 11, "other EEE"

[19] See the Blue guide, which provides horizontal interpretation on the principles for the Union harmonisation legislation on products, p. 17-21: http://ec.europa.eu/DocsRoom/documents/4942/attachments/1/translations/en/renditions/native

[20] The "spare parts" impact assessment is based on the above mentioned 2014 Eunomia/Oeko-Institut study. For further information and references see http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/201406012_RoHS_Scope_Review_report_final.pdf.

Experience shows that it is often difficult and sometimes impossible to replace an original non-compliant part with a different, compliant spare part. As product reuse, refurbishment and extension of lifetime are both environmentally and economically beneficial, spare parts need to be sufficiently available.[21]

1.4 Pipe organs problem

Today 99% of pipe organs[22] built use at least one electric blower. Some use other electrical or electronic components, all of which are compliant with RoHS 2. However, the presence of the electrical components used in pipe organs makes the whole organ, including the pipes, fall under the RoHS 2 scope. Indeed, RoHS 2 introduced an EEE definition[23] where the word "dependent" means "necessary to fulfil at least one intended function", and it added a product category "other EEE"[24] to which pipe organs pertain. The combination of these provisions means that pipe organs are in the scope of RoHS 2, with full compliance requirements from 22 July 2019 for the whole product, pipes included.[25]

The vast majority of pipes are made of lead alloys. The variation of lead and tin is used to vary the timbre of the organ sounds. No other material can be manufactured in the same way as the tin/lead alloy, meaning that there are no substitutes to the lead in organ pipes and neither can the product be modified for it to fulfil its intended function. The key problem will then be the use of lead, a substance restricted by RoHS, in the pipes alloy.

If the legal situation remains unchanged, pipe organs containing lead will be non-compliant products under RoHS 2, due to a lack of possible substitutes for lead. Therefore, they cannot be placed on the EU market as from 22 July 2019 leading to the loss of jobs and market shares in this sector. The industry affected would be the organ builders industry and the cultural business of organ music concerts. As of today, there is no indication of health and environmental problem generated by the production and use of pipe organs, which are a product with an extremely long life.

1.5 Non-road mobile machinery problem

Non-road mobile machinery (NRMM) is excluded from the scope of RoHS 2 when made available exclusively for professional use.[26]

Certain types of machinery are produced in the same production line in models either with an on-board power source or with an external power source; see for example, Figure 1,

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[21] See RoHS recital (20); this in line with the promotion of a circular economy.

[22] The "pipe organs" impact assessment is based on the 2012 BioIS study: http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf. For further information and references see 7.5 Annex 5 Quantitative data on pipe organs and the factsheet no. 9 Pipe organs in: http://ec.europa.eu/environment/waste/rohs_eee/pdf/RoHS%20website%20documents.zip

[23] Art. 3(1) 'electrical and electronic equipment' or 'EEE' means equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current;

[24] Annex I, entry 11 "Other EEE not covered by any of the categories above"

[25] Under RoHS 1 pipe organs were formally excluded from the scope of the directive. Also in the Commission RoHS recast proposal of 2008, pipe organs installed in churches were then officially listed as excluded. Due to the new and broader definition of EEE in RoHS 2, as from July 2019 if no changes are introduced, pipe organs that require electricity will fall in the scope of this Directive and the restriction will apply to all components, also non-electrical ones, on the homogeneous material level.

[26] See Article 3(28) and Article 2(4)(g) of RoHS 2. The "NRMM" impact assessment is based on the 2015 Eunomia/Oeko-Institut study: http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/20150312_RoHS_scope_review_final_a.pdf

Figure 2, and Figure 3. In light of the reference of the Article 3(28) definition to an on-board power source,[27] only the models with an on-board power source are excluded from the scope of RoHS 2, while the twin models with external power source fall under RoHS 2 scope.

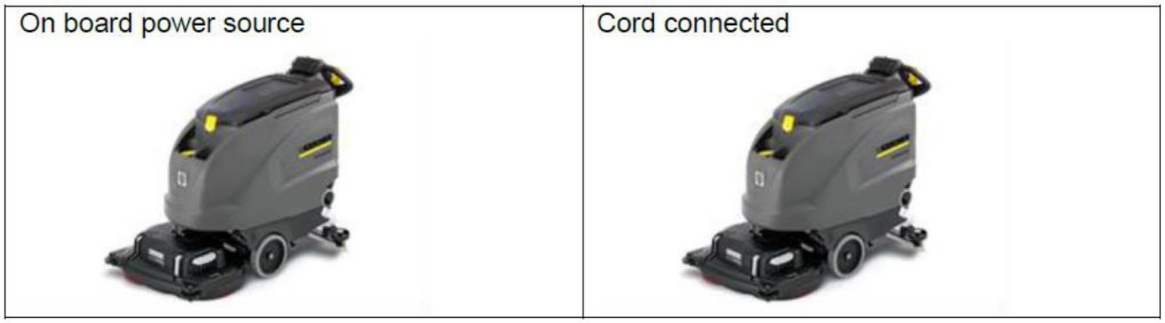

Figure 1: Pictures of identical machines with an on-board power source and cord-connected for professional use

Relevant product groups for the latter include professional cleaning machinery (see Figure 1) and certain types of construction or mining machinery (see Figure 2 and Figure 3).

Figure 2: Example of NRMM without on-board power source: concrete spraying machine used in mining

Market quantities of relevant machinery product groups (i.e. where a scope-excluded model is also produced with a scope-included version) are:

- Professional cleaning machinery: estimates of over 70,000 units placed on the EU market per annum, with a distribution between models with an on-board power source and models without (cord connected) of 80:20. Most manufacturers are assumed to be close in size to SMEs or possibly slightly larger.

- Construction or mining machinery: several types of machinery used primarily in mining are practically identical to diesel- or gas-powered NRMM in every other respect, excepted for the electrical power system replacing the on-board power source.

[27] Battery or combustion engine

Figure 3: Example of NRMM without on-board power source: a wheel loader used in mining

The current NRMM definition would thus lead, after 22 July 2019, to a situation resulting in very similar types of equipment being regulated differently and inconsistently.

1.6 The EU's right to act and justification

The legal basis of the RoHS 2 directive and of this initiative is Article 114 of the Treaty on the Functioning of the European Union (TFEU), the objective of which is to harmonise national laws and to ensure that the same rules are applicable throughout the Union. This initiative concerns a review of a Directive required by Article 24(1) of the Directive itself and is therefore justified on the grounds of subsidiarity.

The problems highlighted cannot be solved without changing the scope of RoHS 2, as they originate in the current legal formulation of the RoHS 2 scope and related provisions. Only a solution at EU level can solve the problems, as provisions regarding the restriction of the use of hazardous substances in EEE have a direct impact on the EU internal market and cannot be solved at Member States' level.

2 OBJECTIVES

The general, specific and operational objectives of this initiative are presented in Table 1.

Table 1: Objectives

GENERAL	SPECIFIC	OPERATIONAL

• The contribution to the protection of human health and the environment, including the environmentally sound recovery and disposal of waste EEE, through the restriction of the use of certain hazardous substances. • The correct and regular functioning of the Union internal market in relation to electrical and electronic equipment products by preventing barriers to trade and competition distortion.	• Removing unnecessary barriers to secondary market operations, so to promote a circular economy for the EEE sector in the Union • Exclusions from the scope of product groups with unresolvable compliance problems and negligible benefits from their inclusion into RoHS 2 scope. • Preventing distortion in the second hand operations (repair, reselling) for products already placed on the Union internal market. • Prevent inconsistent treatment of almost identical machinery placed on the Union internal market.	• Allow second hand operations for all EEE in scope • Exclude pipe organs product group from the scope of RoHS 2. • Exclude from restriction spare parts for repair for all EEE. • Clarify the scope of RoHS 2, with adjustments to Article 2(2), Article 4(3), and Article 4(4). • Fine-tune the definition of NRMM in Article 3(28) to prevent unbalanced treatment of almost identical machineries.

3 POLICY OPTIONS

3.1 Baseline scenario

The baseline scenario with no policy changes (also referenced in the next sections as the policy Option 1) will develop as follows in relation to the four problems[28]:

- In the secondary market baseline scenario[29] spill-over effects due to similarities in the production chains between products already in scope of RoHS 1 and products newly in scope of RoHS 2 should facilitate compliance. Indeed, even in the baseline scenario, manufacturers are making efforts to reach compliance before the 2019 deadline.[30] Product life corresponds with design cycles, and shorter design cycles should again facilitate substance substitution and compliance. Also, the list of already available exemptions from the substance restrictions, in Annexes III and IV of RoHS 2, facilitates compliance. It can hence be assumed that some products newly in scope are already

[28] See also Sections 0 to 0 for further information on the problems which the current scenario will face.

[29] For case studies on secondary market operations for articles with integrated lighting, equipment with an internal combustion engine, gardening equipment, and toys newly in scope, see 7.4 Annex 4 Case studies on secondary market operations and spare parts use for certain newly in scope product groups.

[30] For example, entry 41 in Annex III is a specific exemption requested for a product newly in scope; this exemption was added by a Commission delegated directive in March 2014.

compliant and therefore not impacted by the hard-stop of secondary market operations. Several other products will however be impacted, especially high-value, long-lifetime products.

- As for the spare part problem, the potential lifetime of many affected products on the market will be reduced.

- Pipe organ builders will have to abandon the production of pipe organs of the traditional type and quality before the 22 July 2019 compliance date. Existing pipe organs can continue to be used, but it will be impossible to both sell and resell pipe organs, as well as repair them with spare parts after 2019.

- NRMM manufacturers will have to adapt their production either by creating two different lines for almost identical machinery or by becoming RoHS 2-compliant also for out-of-scope NRMM towards the 22 July 2019 compliance date.

3.2 Options for the secondary market problem

The key problem is the curtailment of the potential lifetime of operational EEE and the negative economic consequences thereof, due to the hard-stop of secondary market operations for new-in-scope products. Article 2(2) prevents the recirculation of non-compliant products after 22 July 2019 even if they were placed on the market before this date. The following policy options were developed and discussed in the early steps of the impact assessment:

- Option 2 – the exclusion of medical devices and monitoring and control instruments, from the scope of the Article 2(2) transition period, thus preventing specific negative impacts on medical devices and monitoring and control instruments resale and refurbishment;
- Option 3 – the removal of the hard stop to secondary market operations for all new in scope EEE, including medical devices and monitoring and control instruments: this entails the transformation of the transition period into a compliance phase in requirement for the placing on the market of new in scope EEE in Article 4(3).

Option 2 is based on the assumption that medical devices and monitoring and control instruments would be the product groups with the longest life (10 years if no secondary market is allowed, up to 30 years in case of refurbishment) and innovation cycles (e.g. 7 years) and therefore most affected by the 2019 secondary market hard-stop. Stakeholder input showed however that also other product groups (e.g. certain articles with integrated lighting, certain equipment with an internal combustion engine, certain gardening equipment, or certain toys; in general, all EEE pertaining to category 11, "other EEE") were equally affected. While option 2 would solve the problems related to medical devices and monitoring and control instruments (e.g. supply-related patient health issues), it does not tackle the problems with the other new-in-scope products, e.g. some articles with integrated lighting such as post boxes, souvenirs, shoes, signs, music instruments, doors, windows, and mirrors; some equipment with an internal combustion engine, some gardening equipment, as illustrated by the case studies in Annex 2. Therefore, **Option 2 would not effectively solve the problem and is not retained for further assessment**.

Option 3 does not discriminate between the various product groups newly in scope, while leaving the original compliance date unchanged.

3.3 Options for the spare parts problem

The key problem is the curtailment of the potential lifetime of functional/repairable EEE and the negative economic consequences thereof, as a consequence of impeding repair operations

for products newly in scope through replacement of broken parts. The main reason is the lack of a specific repair-as-produced[31] spare part provision in the Directive. The policy option identified in the early steps of the impact assessment is:

- Option 2 – the introduction of a specific provision, which excludes from restriction the spare parts concerned, in order to allow the repair of pre-RoHS 2 EEE with pre-RoHS 2 spare parts.[32]

Option 2 introduces a repair-as-produced provision, which, for the sake of legal clarity and enforceability, needs to be fully aligned with the product compliance date.

3.4 Options for the pipe organs problem

The key question regarding pipe organs is whether the product group should be kept within the scope of RoHS 2, assuming that organ builders will not be able to change the nature of their product.

The policy options identified in the early steps of the impact assessment were:

- Option 2 – scope exclusion for pipe organs, thus removing them from the scope of RoHS 2;

- Option 3 – issuing guidelines on applicable existing exclusions to pipe organs (e.g. large-scale fixed installations);

- Option 4 – the use of temporary RoHS 2 exemptions for pipe organs which remain in RoHS 2 scope.

Option 3 was discussed to verify whether larger church organs would fall within the category of "large-scale fixed installation",[33] which is excluded from the RoHS 2 scope, and whether additional scope exclusion would be redundant. It was considered that the "large-scale fixed installation" definition allows room for interpretation and Member State positions on this issue tend to vary. This could lead to a market distortion and make enforcement nearly impossible. Moreover, this would discriminate against manufacturers of smaller organs for no apparent scientific or technical reason. Thus, **option 3 was discarded and it is not retained for further analysis**.

Option 4 was discussed to verify whether it was possible to keep pipe organs in scope, as manufacturers could always apply for an exemption of lead in the organ pipes. However, the RoHS 2 exemption mechanism is meant to allow adaptation to technical and scientific progress, whereas pipe organs have not changed significantly over hundreds of years. Hence, an exemption is not appropriate to address the reality of the sector and it would constitute an unnecessary financial burden. Thus **option 4 was discarded and it is not retained for further analysis**.

3.5 Options for the non-road mobile machinery problem

The key question regarding NRMM is whether its definition should be broadened to exclude cord-connected twin machinery from the RoHS scope.

The policy options identified in the early steps of the impact assessment were:

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[31] See section 0

[32] Pre-RoHS 2 means placed on the EU market before the RoHS 2 requirements applied to the relevant product category and therefore potentially containing restricted substances beyond the (post-enforcement) tolerated limit values.

[33] Article 3(4)

- Option 1 – the baseline scenario with no policy changes;
- Option 2 – a change in the NRMM definition so that the NRMM exclusion covers also external source powered machinery models fitted with a traction drive.

Option 2 would consistently exclude all the NRMM, from RoHS 2 scope, whether its power source is on board or external.

4 ANALYSIS OF IMPACTS

This chapter provides the analysis of the impacts for the different options; the baseline scenario (i.e. "no policy change" Option 1) is described as whole in section .
Quantification is provided for impacts in the pipe organs and NRMM problems, while in the secondary market and spare parts problem, the limitation of quantification is due to uncertainty in quantifying the following aspects:

- The open scope: the split between EEE already in scope of RoHS 1 and EEE newly in scope in terms of quantity, value and influence on the market is quite difficult. This is because, for some products, certain models may fall under the old scope and others under the new, with no distinction in terms of activity classification. This brings a severe level of uncertainty in quantifying the EEE subject to the secondary market hard stop.
- The secondary market is generally possible for EEE in category 1 to 7 and 10, while for EEE newly in scope (e.g. medical devices - cat. 8, monitoring and control instruments – cat. 9 and any other EEE not belonging to the other categories – cat. 11) will be stopped after the transition period. Quantifying amount of EEE (as a percentage of those subject to the hard stop) which will be subject to refurbishment/reselling/repair is also difficult and aleatory, as it will depend on market evolution and public budget conditions (e.g. for medical devices).
- Refurbishment of medical devices is a global scale business; thus it is very complex also to split this business between the two flows: refurbished EEE from third countries (which would be placed as new EEE in the EU), and refurbished EEE coming from the EU (which would count as secondary market EEE). Additionally, under medical devices legislation, the term “fully refurbished” exists. “Fully refurbished” products are assimilated to new products.
- Some EEE can be resold without being repaired or refurbished.

4.1 Public consultation

The results of the public consultation are presented in detail throughout the analysis of the impacts, which is based on the Commission studies.[34] Further information is provided in 7.2 Annex 2 Stakeholder consultation.

Stakeholders were intensely consulted during the development of these studies by means of a dedicated website, three stakeholder consultations of 12-weeks and four stakeholder meetings through the years 2012-2015.

More than three hundred contacts were reached for the consultation, including independent experts, representatives from Member States, industry associations, manufacturers of EEE, environmental NGOs, consultancy companies and institutes, and other types of organisations (e.g. universities). Overall, responses from around forty participants were received. Respondents were in essence private companies, associations representing industrial

[34] Footnotes 51, 52, and 53.

companies, including SMEs, third countries or global bodies/associations and Member States authorities/agencies, while response rate from academic/research institutions, NGOs, consumer associations or individual citizens, despite invitations and promotion given on the initiative, was low. This response pattern with contributions coming almost only from industrial and institutional stakeholders is frequent under RoHS, despite the constant effort to reach also different audience through public consultation.

When asked about their preferences, a majority of the respondents preferred: for secondary market problem, the removal of the hard stop to secondary market operations for all new-in-scope EEE and the transformation of the transition period into a compliance phase-in requirement by the same date; for the spare parts problem, the introduction of a repair-as-produced provision; for the pipe organs problem, a scope exclusion provision for pipe organs; for the NRMM problem, the exclusion from RoHS scope of cord-connected twin machinery. These are seen as efficient, effective and safe solutions.

4.2 Impacts of the baseline scenario

Secondary market

Possible **environmental impacts** result from a reduction in the use of banned substances (a positive environmental impact) versus a reduction of product lifetime (a negative environmental impact), and shifting of sales abroad. The baseline scenario should ensure that by the end of 2019 all new-in-scope products are compliant with RoHS 2. This is however ensured by the compliance date, and not through the interdiction of secondary market operations. Operators are expected to stop acquiring non-compliant products as late as 2018, depending on the market situation. After mid-2018, products would be sold at lower prices and more likely to non-EU customers (in this case also beyond mid-2019), with more end-of-life equipment containing RoHS 2 restricted substances ending up in non-EU countries with potentially improper treatment and undesired effects. Another negative environmental side-effect might be a consumers' shift towards products with a shorter service life.

Waste new-in-scope EEE content of mercury, cadmium, lead, chromium VI, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) could pose risks to health or the environment, in particular when the waste EEE is treated in less than optimal conditions. Similarly, evidence available suggests that the four restricted phthalates[35], when used in EEE, can have a negative impact on recycling and on human health and the environment during waste EEE management operations. Therefore, the hard stop of secondary market for existing EEE containing such substances, resulting in those products to enter their waste phase earlier is likely to have negative consequences in terms of both environment and health impacts. On the contrary, product reuse, refurbishment and extension of lifetime of existing EEE are likely to have positive impacts as they reduce the rate of waste EEE being generated per unit of time.

The secondary market closure will in addition involve **disproportionate administrative costs** for economic operators, in particular SMEs which work in the EEE refurbishment sector, given that the second life of most products post-2018 will depend on documentation and not on the technical possibility to refurbish the product. Additionally, as concerns enforcement, disproportionate administrative costs are expected for public administrations as well.

The refurbishment of non-compliant medical devices would be stopped after 2019. **Health impacts** specifically related to the secondary market stop might occur where medical devices

[35] Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) are substances of very high concern (SVHC). DIBP is a substance that can be used as a substitute for DBP and was subject to previous assessments performed by the Commission.

products' life ends earlier than technically necessary. The forced changes in the supply of refurbished' medical equipment in the EU could result in negative impacts on patients' health in terms of medical devices equipment availability, especially in times of budgetary constraints to the public health sector.

Economic impacts on the manufacturing of products are primarily related to the 2019 compliance date rather than to the interdiction of secondary market operations. This interdiction of secondary market operations will however motivate industry to reach full compliance earlier; indeed, in absence of the possibility to repair and resell non-compliant products, customers would look for compliant products already in the years 2017-2018. This means that the product portfolio will be screened for occurrence of RoHS 2 restricted substances. If needed, manufacturers would apply for exemptions and adapt production to the required changes. The managing of the product portfolio requires the updating of product documentation and the training of personnel. A 2008 study[36] performed a survey of 30 industry companies, including 4 SMEs, regarding compliance with RoHS 2 and found that past costs and future one-off administrative costs were a maximum of € 42.7 million per company, with an average of € 5.9 million and a weighted average of € 13.2 million. Future yearly administrative costs were estimated to reach a maximum of € 4.7 million, with an average of € 265,500 and a weighted average of € 675,000. This was further explained to mean that below 0.001 and 1.233% (0.024% – weighted average) of turnover was relevant for past costs and future one-off costs, whereas between 0.0001 and 0.15% (0.014% – weighted average) of turnover was projected for future yearly costs. Annual costs however were expected to remain at a similar rate, as they are tied with general administrative work such as documentation of compliance, and not necessarily affected by the distribution of compliant and non-compliant products. These compliance costs would be hastened to the period 2017-2018 by the interdiction of secondary market operations.

To sum up, the stop of secondary market operations does not add anything substantially positive to the mere compliance requirement, while it might have significant negative environmental, economic and social side-effects.

Spare parts problem

The impacts from the spare part issue are very similar to the ones triggered by the secondary market stop. Indeed, the spare part issue will push manufacturers towards products with shorter lifetimes and result in higher administrative costs (e.g. market surveillance). Although it is unlikely that any economic operator will repair a pre-RoHS 2 product with compliant spare parts, market surveillance will become more complex and vulnerable to fraud.

The spare part provision specifically impacts long-lived products newly in scope, where the average lifetime is ten years and repair might still be relevant several years after 2019.[37] Specialised repair business is a well-established part of the EEE sector, typically undertaken by SMEs; the limitation of this activity, taking place both in the EU and in third countries, will most likely have some degree of negative economic and social impact, including on reduced international trade of spare parts and on SMEs. The shortening of EEE life under this scenario will also negatively affect the use of resources needed to early replace end-of-life EEE.

[36] http://ec.europa.eu/environment/waste/weee/pdf/rpa_study.pdf - Arcadis Ecolas & RPA (2008), A Study on RoHS and WEEE Directives - Final Report 06/11925 for European Commission DG Enterprise and Industry, p. 103, 110.

[37] See case studies in Annex 2.

To sum up, the 2019 repair-as-produced stop does not appear to have tangible positive impacts.

Pipe organs problem

No more pipe organs of the traditional type and quality will be placed on the EU market. In addition to the loss of annual European turnover, this would have significant impacts on employment and on culture. This translates into a loss of 3,000-3,300 jobs in Europe by 2019, or a salary loss of € 15-16.5 million per year from 2019.[38]

Moreover, if pipe organs remain within the scope of RoHS 2, they are products newly in scope and therefore affected by the problems created by Article 2(2). This means that also existing pipe organs placed on the EU market before 22 July 2019 cannot be resold or, more importantly, repaired after that date. This will lead to an additional loss of 60% of jobs in the sector and would only leave organ tuners and maintainers employed, which account for 10% of the current total. The accumulated job losses would translate into a salary loss of € 24-26 million from 2020 to € 59-65 million per year by 2025. Health and environment would not receive any relevant benefit from the phase-out of lead-containing pipe organs in the EU as today there is no recognised health and environment issues triggered by their production and use.

Non-road mobile machinery problem

Environmental impacts

In terms of environmental impacts, if machinery with an off-board power source is to remain in scope, some (limited) environmental benefits could be expected, related to RoHS 2 restricted substances being replaced with time in some applications. Although exact quantities are not provided, it is expected that for most of the applications RoHS 2 restricted substances presence would be small in terms of the total mass per machine.

Finding alternatives with comparable performance and reliability may be challenging, given the conditions of use of cleaning machinery or mining machinery. Such devices could become RoHS 2 compliant through the development of substitutes, expected in some cases in the next years, or, where this would require additional time (post 2019), by requesting exemptions until the reliability of possible alternatives could be proven. Environmental benefits are expected connected to the phase-out of RoHS 2 restricted substances; in the case of mining activities some additional emissions can also be expected in case of a shift toward engine-based equipment. However, in light of the small market share of both cleaning and mining machinery industries, compliance depends on the development of substitutes for other EEE, whose market share determines a strong influence over the suppliers. As only a limited percentage of machinery are said to be in scope (e.g. 20% of cleaning machinery), it is concluded that overall environmental benefits would be limited.

Economic impacts

The cleaning machinery sector is highly specialised and export-oriented, with the European turnover amounting to 1.5 billion €. Only part of this is relevant for equipment which is in RoHS scope, i.e. the 20% of the product range with off-board power source, amounting to 14,000 units placed on the market per annum. Also the electric powered NRM mining machinery has a very small EU market share. Furthermore, most manufacturers of cleaning machinery are SMEs or slightly larger than SMEs.

[38] See p. 282 of the Biois study: http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf.

Therefore, efforts towards RoHS 2 compliance could create a large burden for this industry, in particular where substitution is to require resources for research and development as well as for reliability testing over a longer period of time. Since the main market share of these companies is in the manufacture of machinery with on-board power sources, manufacturers could pull cord-powered models off the EU market to avoid the need for compliance. As a consequence, higher costs and a loss of effectiveness are expected in those cleaning services where the cord-connected machineries are requested (e.g. where recharging creates a loss of working time). Changes to market structure are not expected as all manufacturers produce both types of models in light of the similarity of both on and off-board powered equipment; all manufacturers are expected to be affected by RoHS 2 similarly, regardless of types of machinery that they produce or the location of manufacturing sites (inside or outside EU). Though the impacts shall be similar, larger manufacturers may be able to cope slightly more easily with this burden in comparison with smaller manufacturers, which are understood to be more dominant in this industry.

Therefore, substantial costs in the cleaning machinery sector are expected due to:

- the efforts needed to support compliance;
- the turnover of the machinery; and
- the size of manufacturers.

Similarly, for the mining sector the burden of compliance for a niche sector (electric powered NRM mining machinery) is also potentially high, leading to negative economic impacts for sector consumers. A small market share of electric powered non-road mobile mining machinery could also mean that the market share is too small for manufacturers to be willing to carry the burden of RoHS 2 compliance.

Manufacturers could thus phase-out cord-powered models, shifting costs to consumers, at least until substitutes are found for similar applications. Costs of compliance are regarded as high due to the large development effort needed to make substitutes available. Overall, the economic burden seems disproportionate in relation to the benefits expected.

Social impacts

Where a shift to battery-operated cleaning machinery is to occur, the higher operational costs could lead to labour savings to compensate the costs, which could have an impact on employment levels. In terms of impacts on health, positive impacts are only to be expected in relation with the phase-out of RoHS 2 restricted substances.

In case of mining machinery, phasing-out of RoHS 2 restricted substances in some applications could bring minor positive health impacts only with lower emissions throughout the equipment life cycle. However, negative health impacts could also occur in case of a shift toward engine-based equipment: for example, the machinery operators would be heavily affected by the flue gases in close working environment[39] in case the NRMM were replaced by an engine-based equivalent.

Manufacturers could be impacted either by higher costs (shift to on-board-power-source machinery) or by abandoning of the segment product for the EU. In both cases, impacts on employment are expected in the manufacturing sector or downstream sectors (e.g. the mining sector). If however manufacture is mainly impacted in light of the research and development of substitutes for RoHS 2 restricted substances, this could create employment opportunities related to research and development.

[39] See Figure 2 and Figure 3

4.3 Secondary market problem

The baseline scenario[40] deviates from the principle of non-retroactivity of RoHS 2 as it prevents the recirculation of products that are already on the EU market. Moreover, it has considerable negative impacts, both economically and environmentally. Option 2 is not retained as explained in Section 3.1; its positive impacts would have been similar, but more limited than the impacts of Option 3 as it would solve the problem only for specific product groups and not for all; for this reason it is considered worse than Option 3. Option 3 aims at fixing the underlying legal problem by adjusting the legal construction, thus allowing recirculation of all pre-RoHS 2 products.

The following potentially relevant impacts were assessed for the Option 3 in comparison to the baseline scenario:

- Environmental impacts: use of RoHS 2 restricted substances, emission of RoHS 2 restricted substances[41], waste prevention;
- Economic impacts: functioning of the internal market; competitiveness; costs and administrative burden, including on SMEs; innovation and research,;
- Social impacts: employment; consumers behaviours linked to product availability; health.

Given the very broad range of diverse categories of products involved, the impacts are described in qualitative terms as a detailed quantification is impractical, while detailed quantification is though provided for some case studies below and in 7.4 Annex 4 Case studies on secondary market operations and spare parts use for certain newly in scope product groups.

Public consultation

Stakeholders were provided with background information of the projects and related policy scenarios and unanimously expressed their positions as follows:

- The secondary market problem is relevant for many of them.
- Stakeholders underlined the difficulties triggered by a baseline scenario where no changes are introduced in RoHS 2 and were in favour of the policy options proposing a specific change in RoHS 2 to prevent the hard-stop of secondary market operations.
- Stakeholders consider that only EU level action can solve the secondary market problem of RoHS 2 scope.

Regarding the policy options aiming to address the secondary market problem, Option 3 was supported by most stakeholders, as detailed in 7.2 Annex 2 Stakeholder consultation.

Option 3 – removal of the hard stop to secondary market operations

Potentially relevant impacts are assessed below for Option 3 as a variation from the baseline scenario.

Environmental impacts

As for the use of RoHS 2 restricted substances and emissions from WEEE, deadlines of compliance are not affected, thus no specific impacts are expected for Option 3.

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[40] See section 0.

[41] See footnote 1 and baseline scenario.

In terms of waste generation impacts, Option 3 is likely to be beneficial in light of the removal of secondary market limitations, because it results in prolonging product's life thus contributing to the circular economy in the EU; the total quantity of waste prevented is estimated at more than 2000 tonnes per year only for the sector of medical equipment and 1000 tonnes per years in the case of monitoring and control instruments. No negative environmental impacts from the market circulation of pre-RoHS 2 products (containing restricted substances) or possible changes in the distribution of environmental impacts resulting from export of such items are expected given that the EEE concerned are already circulating in the EU market.

Internal market

For Option 3 no cost difference is expected for placing new products on the market, while for the entire market costs could be lower with a fully operational secondary market.

Manufacturers' competitiveness and cost of innovation and research

As under this option the deadlines are unchanged, no cost difference is expected.

Costs and administrative burden

Option 3 facilitates enforcement, resulting in lower administrative costs for public authorities: market surveillance measures to enforce the removal of non-compliant articles from the EU market shall also no longer be needed, resulting in lower costs for public authorities.

Long-lifetime product groups have important repair and resale markets. Thus, industries concerned, mostly SMEs could be severely affected by the secondary market problem. Under Option 3 this impact on industries would be removed.

Employment

Option 3 stimulates secondary market operations

Consumers

With regard to secondary market operations, Option 3 would positively impact all non-compliant articles placed on the market prior to the various compliance deadlines, given that it leaves the original compliance date untouched. Allowing secondary market operations will remove negative impacts on consumers, otherwise tied with the limited supply of non-compliant articles by secondary market operations. This eliminates negative impacts on consumers caused by an early end-of life of the products concerned, with the highest benefit linked to the supply of secondary long-life products.

Health

Promoting medical equipment refurbishment in the EU would have positive impacts on patients' health in terms of medical devices equipment availability, given in particular that that the difficult budget situation of public health sectors goes along with an increased demand of used medical equipment. The potential loss for EU hospital due the Article 2(2) hard stop in the resale of used imaging medical equipment is estimated above 100 million €. Additionally, the health sector will have to spend an additional 70 million € to buy new equipment, for a total increased cost exceeding 170 million € for EU hospitals. Thus, the removal of the hard-stop would trigger a corresponding saving of 170 million euro for EU hospitals in comparison to the baseline scenario. Further significant savings (in terms of avoided costs) will occur also for other medical devices and again after 2021, when other substances (phthalates) will be banned in EEE.

Summary

The baseline scenario might have significant negative environmental, economic and social side-effects. Option 3 is better in terms of economic and social benefits, and whilst there are both positive and negative environmental factors, the environmental benefits overall also appear likely to prevail.

Option 3 is likely to deliver the intended result with less administrative costs and greater legal certainty. Stakeholders, including SMEs, favour Option 3, which is seen to achieve the result of solving the issue identified without going beyond what is needed, meeting the general and specific objectives.

4.4 Spare parts problem

The Option 1 baseline scenario[42] hampers the repair of products that are already on the EU market. Option 2 resolves the reparability aspects of all non-compliant articles placed on the market prior to the compliance deadlines. Option 2 does not impact any other aspects as neither the deadlines for compliance, nor secondary market operations are affected.

The following potentially relevant impacts were assessed for Option 2:

- Environmental impacts: use or emission of RoHS 2 restricted substances, waste prevention;
- Economic impacts: functioning of the internal market; competitiveness; costs and administrative burden; innovation and research;
- Social impacts: employment; consumers' behaviour; health.

The impacts are described in qualitative terms as a detailed quantification is impractical, given the broad range of diverse categories of products involved. Quantification is provided for specific case studies and details are provided below and in 7.4 Annex 4 Case studies on secondary market operations and spare parts use for certain newly in scope product groups.

Public consultation

Stakeholders were provided with background information of the projects and related policy scenarios and a vast majority of them expressed their positions as follows (the others did not express their opinion):

- The spare parts problem is relevant for most of the respondents.
- Stakeholders were in favour of the policy options proposing a specific change to the legal provisions of RoHS 2; in general they clearly underlined the difficulties triggered by a baseline scenario where no changes are introduced in RoHS 2 concerning the spare parts problem.
- Stakeholders consider that the related specific problems can be solved at EU level only, directly in RoHS 2 scope, without going beyond what is needed. They in particular supported option 2.

[42] The detailed description of option 1, the baseline scenario, is given in section 0.

Regarding the proposed solutions, as the spare parts problem affects a broad amount of different sectors, addressing it was supported by most stakeholders; more details are given in 7.2 Annex 2 Stakeholder consultation.

Option 2 – introduction of a repair-as-produced provision[43]

Potentially relevant impacts for Option 2 as a variation from the baseline scenario are assessed below.

Environmental impacts

Reparability of non-compliant EEE newly in scope is made possible in Option 2, thus resulting in a certain production and imports of non-compliant spare parts and cables, which shall entail further use of RoHS 2 restricted substances (negative impact) and may cause additional emissions, particularly tied to treatment of WEEE (the replaced broken spare parts). However, in terms of total waste generation impacts, a major positive benefit is expected from Option 2 reparability of non-compliant EEE newly in scope, resulting in a reduction of products being scrapped early or shipped to non-EU countries to be re-paired and resold. This triggers a reduction of the WEEE rate over time, due to the prolonged life of the products concerned, thus contributing to the reduction of use of raw resources in the sector.

Internal market

Option 2 should bring no cost difference to market operators, while benefits, especially on SMEs are expected through promoting repair operations.

Manufacturers' competitiveness

The option would result in reduced costs of compliance to repair non-compliant products. Reduced costs for manufacturers would also derive in terms of easier screening of compliant versus non-compliant spare parts.

Costs and administrative burden

Option 2 facilitates enforcement, resulting in lower administrative costs for market surveillance authorities.

Long lifetime product groups have important repair and resale markets. Thus, they could be severely affected by unavailability of spare parts for industries concerned, mostly SMEs. Option 2 would remove this impact on industries by solving the spare parts problem.

Employment

Positive impacts are expected in light of additional work on repair of non-compliant products both related to repair operations and to the production of spare parts.

Consumers

Consumers will also benefit from extended reparability, which might even lead to a shift in warranties and consumer behaviour towards long life articles in some product sectors.

Health

While there will be a certain use of RoHS 2 restricted substances in the manufacture of non-compliant spare parts and cables, the reduction in manufacturing of the entire equipment (which often contains anyway some restricted substances by virtue of exemptions) to replace articles, counterbalances the impacts.

[43] The "Repair as produced principle" was generally impact assessed for the 2008 Commission proposal on the RoHS recast, see p. 50 in the report http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008SC2930&from=EN

Summary

The baseline scenario does not contribute positively to the objectives.

Option 2 could result in the manufacture of more non-RoHS compliant spare parts as such spare parts would be allowed for the repair of articles placed on the market before the compliance deadlines. This negative environmental impact in terms of the use of RoHS 2 restricted substances is more than offset by the positive impact of articles being repaired and thus not reaching their end-of-life early. Where repair aspects are of relevance, impacts on industry and consumers are expected to be positive. The most positive impact should be on enterprises connected to such operations, i.e. manufacturers of parts, further repair of old articles, second-hand sellers. Option 2 resolves the key economic problem with no important negative side-effects. Stakeholders, including SMEs, favour Option 2, which achieve the result of solving the identified issue without going beyond what is the needed and meeting the general and specific objectives.

4.5 Pipe organs problem

There is no official collection of pipe organ data at a European level and only very few Member States have a local industry representation. Available data is based on information provided by the International Society of Organbuilders (ISO) and on sector publications.

The annual turnover for Germany is € 120 million and for the UK € 8 million. This data can be used to extrapolate an EU wide figure of around € 350-400 million. The EU-wide turnover of the sector was estimated at € 350-400 million[44]. Stakeholders describe the market as stable, which means that the market demand will not change in the foreseeable future.

The components of pipe organs relevant for this assessment are the pipes, as they contain large amounts of lead. All other components are RoHS 2-compliant. The five biggest organ pipe builders, producing half of the pipe organs placed on the EU market, t use around 28 tonnes of lead per year for the pipes. This suggests a total lead consumption of 56 tonnes per year. As explained, lead-free production is not an option, nor do alternatives exist to the use of electricity for generating the air pressure necessary to play the instrument.

The following potentially relevant impacts were assessed:

- Environmental impacts: waste generation and recycling; air quality;
- Economic impacts: functioning of the internal market; competitiveness; costs and administrative burden; innovation and research;
- Social impacts: culture; employment; health.

Public consultation

Stakeholders were provided with background information of the projects and related policy scenarios and the only interested stakeholder, the International Society of Organ Builders expressed its positions as follows:

- The pipe organs problem is relevant for them,
- They were in favour of the policy options proposing a specific change to the legal provisions of RoHS 2, i.e. Option 2; in general they clearly underlined the difficulties triggered by a baseline scenario where no changes are introduced in RoHS 2.

[44] See 7.5 Annex 5 Quantitative data on pipe organs

- They consider that the related problems can be solved only at EU level directly in RoHS 2 scope as only this would solve the specific problems without going beyond what is needed.

Option 2 – Scope exclusion for pipe organs

Potentially relevant impacts for Option 2 as a variation from the baseline scenario are assessed below

Environmental impacts – Waste generation and recycling

Pipe organs are long-lived products; many are between 100 and 400 years old. It is very rare that a pipe organ lasts less than 25 years. When an organ is beyond repair, the pipes are not disposed of. They are either reused in their original form or melted down and transformed into new pipes. This means that a closed-loop business had already been established before RoHS, and the addition of pipe organs to the RoHS 2 scope does not have any impact, nor will possible scope exclusion lead to an increase in waste generation or a decrease in recycling, which is in the sector's own interest.

Environmental impacts - Air emissions

When the lead/tin alloy is melted, the temperatures used are too low to emit lead fumes into the environment. Temperatures range from 300 to 350 degree Celsius, whereas the critical threshold for the release of lead fumes is at approximately 480 degree Celsius.[45] Lead foundries in the EU would apply the best available techniques as requested by the Industrial Emissions Directive; this implies that prevention techniques (e.g. temperature control), coupled with primary and/or secondary abatement systems would bring dust and gaseous lead emissions down to negligible values.[46] There is therefore no major difference between the two scenarios with regard to emissions.

Internal market

RoHS 2 should affect all pipe organ builders in the EU equally, and no competitive pressures within the EU should be expected.

Competitiveness

Only around seven organs are being imported into the EU per year, mainly from Switzerland. However, RoHS 2 covers imported products, and the RoHS 2 scope inclusion (baseline scenario) would stop imports as well. No significant differences between the two scenarios are expected.

Costs and administrative burden

Due to a lack of possible substitutes, as explained above, pipe organ builders, which are mainly SMEs, would have to completely abandon their production for the EU market, which is approximately 95%, by 2019 in the baseline scenario. Although strictly speaking no additional costs or burden would be incurred, the total loss of annual turnover in the EU would be € 350 – 400 million. Option 2 would avoid these costs.

Innovation and research

In view of the history of the sector and its specific musical requirements, it is very unlikely that the restriction of lead in pipes in the baseline scenario should lead to the development of adequate lead-free alternatives. No differences between the two scenarios are expected.

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[45] See p. 280 of the Biois study: http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf;

[46] Currently dust level associated with the use of best available techniques is < 20 mg/Nm³ in the dry normalised foundry flue gas, see p. 321 of the following report: http://eippcb.jrc.ec.europa.eu/reference/BREF/sf_bref_0505.pdf

Culture

The baseline scenario has a significant negative cultural impact, as the extinction of the instrument has long-term implications regarding music performances. While all other impacts affect only the manufacturing sector, the cultural impact is relevant to the wider public. Option 2 would avoid this vast cultural loss.

Employment

As explained in the problem definition, the baseline scenario will lead to an accumulated loss of 9,000 to 10,000 jobs in Europe (90% of the current total), or a salary loss of € 24-26 million from 2020. Moreover, all European organ builders qualify as SMEs, which would particularly suffer from this hardship. Option 2 would avoid this impact.

Health

A possible health issue related to the organ manufacturing process is the impact of lead on the pipe makers. Some long-term of over 30 years test results from UK and Austria show that there are no health effects on workers.[47] Therefore there is no difference between the two scenarios with regard to workers' health.

Summary

The baseline scenario means the de-facto end of organ production for the EU market and therefore a significant loss of turnover and jobs in Europe. It also means the extinction of this musical instrument in the long run and a significant cultural loss.

With regard to competitiveness, the two scenarios are equivalent. Both scenarios affect manufacturers inside and outside the EU in the same way. With regard to the functioning of the internal market, the baseline scenario might create problems that the scope exclusion should resolve.

No environmental, economic or social reasons for keeping pipe organs within the scope of RoHS 2 could be identified. Several reasons justify full scope exclusion. Stakeholders, including the pipe organs industry that is mainly composed by SMEs, are in favour of Option 2.

The environmental and health impacts of the two scenarios are identical. From an environmental and health perspective, the inclusion of pipe organs in the scope of RoHS 2 is therefore unnecessary. Option 2 does not go beyond what is necessary to ensure that the objectives specified in section 2 are achieved, as only a full exclusion of the subsector would solve entirely the identified problem.

4.6 Non-road mobile machinery problem

In general, NRMM with off-board power sources are manufactured in small quantities.

The EU market share of cord-connected electric powered non-road mobile mining machinery is estimated to be relatively low compared to the global market. Because of the size, nature, expense and operating costs of these products, the market concentrates within professional use in mines only. A very small number of electric rope shovels and continuous miners are used in the EU. These products can be as large as a building and cost several millions of Euros. The total sales of each individual product are relatively low globally.

As regards professional cleaning machinery it's estimated that over 70,000 units are to be placed on the EU market every year, with a distribution between models with an on-board power source and models without (cord-connected) of 80:20.

[47] See p. 283 of the Biois study: http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf;

Most manufacturers are assumed to be close in size to SMEs or possibly slightly larger for both cleaning and mining machineries product groups.

The following potentially relevant impacts were considered in the assessment:

- Environmental impacts, including waste generation and recycling, air quality;
- Economic impacts, including the functioning of the internal market, competitiveness, costs and administrative burden, innovation and research;
- Social impacts, including culture, employment, health.

Public consultation

Stakeholders were provided with background information of the projects and only some of them expressed a position, [48] which can be summarised below:

- The NRMM problem is relevant for some stakeholders.
- Stakeholders concerned were in favour of the policy options proposing a specific change to the legal provisions of RoHS 2, as highlighted in the problem description; in general they underlined the difficulties triggered by a baseline scenario where no changes are introduced in RoHS 2. Therefore, they called for a solution in line with option 2.
- Stakeholders consider that the related problems can be solved only at EU level directly in the RoHS 2 scope as only this would solve the specific problems without going beyond what is needed.

Regarding the NRMM problem, the stakeholders concerned supported the solution of option 2.[49]

Option 2 – exclusion from RoHS scope of cord-connected NRMM

Potentially relevant impacts are assessed below for Option 2 as a variation from the baseline scenario, i.e. in a scenario where the non-road mobile machinery with off-board power source is excluded from RoHS 2 scope.

Environmental impacts

RoHS 2 restricted substances are present in some components of non-road mobile machinery with an off-board power source. However, given also the limited amount of EEE placed on the EU market and the limited amount of substance per EEE, the total environmental impact of excluding from the scope this product group is considered limited, especially because it is only on a portion of a sector (the NRMM with an on-board power source are already excluded).

Economic impacts

The exclusion of the cord-connected machinery models would bring relevant economic benefit to the cleaning and mining machinery sector, which are mostly made up by SMEs, due to avoided costs of compliance and of research and development. As only a limited percentage of machinery are said to be in scope (e.g. 20% of cleaning machinery), it is concluded that most of the burden would be borne by the excluded EEE sector (NRMM with

[48] CECE (Committee for European Construction Equipment, i.e. the European construction equipment manufacturers' association) and Eunited Cleaning, the European Cleaning Machines Association. Also, third countries associations (e.g. from the US) expressed similar positions.

[49] See Oeko 2015 study, pages 24-32

an on-board power source) as the solutions can only be developed for the whole sector NRMM sector.

Social impacts

Negligible social impacts are expected due to size of this sector.

Summary

Costs of compliance are expected to be high in relation to the possible benefits in case of maintaining the cord-connected NRMM in scope. Costs are significant and they would likely be borne by EEE manufacturers concerned, while environmental benefits are expected only to a limited extent, and regardless of whether cord-powered equipment remains in scope or not. Therefore, the baseline scenario does not positively contribute to the objectives of the Directive and the inclusion of cord-connected NRMM in the scope of RoHS 2 is therefore unnecessary. Option 2 does not go beyond what is necessary to ensure that the objectives set out in section 2 are achieved, as only a full exclusion of the cord-connected NRMM would solve entirely the identified problem.

5 COMPARING THE OPTIONS

5.1 Secondary market problem

A qualitative comparison of impacts is given in Table 2.

Table 2: Impacts of policy options for the secondary market problem compared to the baseline scenario

Policy option / **Impact**	Option 3: Deletion of Article 2(2) and compliance date 22 July 2019 brought to Article 4(3)
Environmental impacts	
Use of RoHS 2 restricted substances	+
Emissions from WEEE	+
Waste prevention	++
Environmental - aggregate	+/++
Economic impacts	
Industry's substitution costs	=
Industry's administrative costs	=
Internal market distortion	=
Market changes / trade impacts	=
Authorities' administrative costs	+
Economic – aggregate	=/+

Policy option / Impact	Option 3: Deletion of Article 2(2) and compliance date 22 July 2019 brought to Article 4(3)
Social impacts	
Employment	=
Consumer behaviour	+/++
Health	=
Social – aggregate	+

Magnitude of impact as compared with option 1 (the baseline is indicated as 0): + + strongly positive; + positive; – – strongly negative; – negative; = marginal/neutral; ? uncertain; n.a. not applicable

The comparison shows that an amendment to Article 2(2) should be beneficial in any case.

Option 1 has significant negative impacts with regard to coherence and consistency with other overarching EU policy objectives; it does not help achieving the objective of the contribution to the protection of human health and the environment and it could go against the objective of the correct and regular functioning of the Union internal market.

Option 2 does not address the problem in its entirety and was discarded as explained in Section 4.2.

Option 3 is clearly preferable with regard to its environmental and social performance. This option was supported by all stakeholders. Option 3 of the secondary market problem would mutually reinforce option 2 of the spare parts problem. Option 3 will also entail a reduction of costs and administrative burden.

As the secondary market problem is fundamentally a legal problem, it can only be resolved by an amendment to the relevant RoHS 2 provision. **This means that the 'hard-stop' for secondary market operations should be removed by deleting Article 2(2), and, at the same time, adding a phase-in compliance provision in Article 4, covering all products newly in scope (in addition to already covered medical devices and monitoring and control instruments), stating that the compliance date for these products is 22 July 2019, which is the date also originally foreseen for the transition.**

5.2 Spare parts problem

A qualitative comparison of impacts is given in Table 3.

Table 3: Impacts of policy options for spare parts problem compared to the baseline scenario

Policy option / Impact	Option 2: Addition of a “repair-as-produced” spare part provision in Article 4(4)
Environmental impacts	
Use of RoHS 2 restricted substances	–

Policy option / **Impact**	Option 2: Addition of a "repair-as-produced" spare part provision in Article 4(4)
Emissions from WEEE	–
EEE lifetime related impacts	++
Environmental - aggregate	?
Economic impacts	
Industry's substitution costs	+
Industry's administrative costs	+
Authorities' administrative costs	+
Product value from reparability	++
Product warranty	++
Economic – aggregate	+/++
Social impacts	
Employment	++
Consumer behaviour	++
Social – aggregate	++

Magnitude of impact as compared with option 1 (the baseline is indicated as 0): + + strongly positive; + positive; – – strongly negative; – negative; = marginal/neutral; ? uncertain; n.a. not applicable

Option 2 has significant positive economic and social impacts in comparison to the baseline scenario. It should be noted that significant negative impacts from WEEE treatment only occur in a worst case scenario. Also, the assumption that the current repair prohibition (baseline) will lead to a significant reduction in the circulation of banned substances cannot take possible substance exemptions for future products into account. In any case the positive environmental impacts from the extension of product service life outweigh these negative impacts. The overall assessment clearly supports option 2, i.e. the addition of a repair-as-produced clause. Option 2 in the spare parts problem would mutually reinforce option 3 of the secondary market problem. Option 2 will also entail a reduction of costs and administrative burden. This option was supported by most stakeholders.

As the spare parts problem is fundamentally a legal problem, it can only be resolved by an amendment to the relevant RoHS 2 provision. **This means that a new clause should be added in Article 4 for the use of spare parts for the repair, reuse etc. of all products newly in scope (in addition to already covered medical devices and monitoring and control instruments already covered) that were placed on the market before 22 July 2019.**

5.3 Pipe organs problem

In Table 4, a qualitative comparison of the impacts is given.

Table 4: Impacts of policy options for the pipe organs problem compared to the baseline scenario

Policy option / **Impact**	Option 2: Full exclusion of pipe organs from RoHS 2 scope (Article 2(4))
Environmental impacts	
Waste generation and recycling	=
Air quality	=
Economic impacts	
Internal market	=/+
Competitiveness	=
Costs and administrative burden	++
Innovation and research	–/=
Social impacts	
Culture	++
Employment	++
Health	=

Magnitude of impact as compared with the situation before RoHS 2 enforcement (2019): + + strongly positive; + positive; – – strongly negative; – negative; = marginal/neutral; ? uncertain; n.a. not applicable

Option 1 has significant negative impacts with regard to coherence and consistency with other overarching EU policy objectives; it does not help achieving the objective of the contribution to the protection of human health and the environment and it could go against the objective of the correct and regular functioning of the Union internal market.

Option 2 has significant positive economic and social impacts without any negative side-effects and is therefore the preferred option, helping to meeting the objective of the correct and regular functioning of the Union internal market, without hampering the objective of the contribution to the protection of human health and the environment.

Option 2, the scope exclusion, is clearly preferable. It resolves the identified problem in the simplest possible way without weakening the level of environmental and health protection. Transposition into national legislation will be simple. The exclusion of pipe organs from the scope of RoHS 2 has no impact on the EU budget and will also entail a reduction of costs and administrative burden. This option was supported by the stakeholders concerned.

As the pipe organs problem is fundamentally a legal problem, it can only be resolved by an amendment to the relevant RoHS 2 provision. **This means that pipe organs should be excluded from the scope of RoHS 2 by adding them as a new entry to the list of excluded product groups in Article 2(4).**

5.4 Non-road mobile machinery problem

In Table 5, a qualitative comparison of the impacts is given.

Table 5: Impacts of policy options for the NRMM problem compared to the baseline scenario

Policy option / **Impact**	Option 2: change of definition of non-road mobile machinery to exclude from RoHS 2 scope also off-board power source NRMM – Article 4 and Article 3(28)
Environmental impacts	
Waste generation and recycling	=
Air quality	=
Economic impacts	
Internal market	+
Competitiveness	=
Costs and administrative burden	++
Innovation and research	–/=
Social impacts	
Culture	=
Employment	=
Health	=

Magnitude of impact as compared with the situation before RoHS 2 enforcement (2019): + + strongly positive; + positive; – – strongly negative; – negative; = marginal/neutral; ? uncertain; n.a. not applicable

Option 1 has significant negative impacts with regard to coherence and consistency with other overarching EU policy objectives; it does not help achieving the objective of the contribution to the protection of human health and the environment (negligible contribution) and it could go against the objective of the correct and regular functioning of the Union internal market.

Option 2, the NRMM definition change to cover also twin machineries having an off-board power source NRMM, has significant positive economic and social impacts without any negative side-effects and is therefore the preferred option, helping to meeting the objective of the correct and regular functioning of the Union internal market, without hampering the objective of the contribution to the protection of human health and the environment. It

resolves the identified problem in the simplest possible way without weakening the level of environmental and health protection. Transposition into national legislation will be simple. The NRMM definition change has no impact on the EU budget and will also entail a reduction of costs and administrative burden. This option was supported by stakeholders concerned.

As the NRMM problem is fundamentally a legal problem, it can only be resolved by an amendment to the relevant RoHS 2 provision. **This suggests that NRMM where an off-board power source replaces an on-board power source should also be excluded from the scope of RoHS 2, by changing correspondingly the NRMM definition in Article 3(28).**

6 MONITORING AND EVALUATION

Monitoring and ex-post evaluation of the taken measures are neither necessary nor technically feasible, as all measures aim at a comprehensive solution of the underlying problems by means of a fundamental yet simple change to the legal status. All tangible impacts except the direct economic consequences for the EEE sector are neutral. As there are no gradual implementation steps foreseen and Member States will only need to transpose the legal text one-to-one into national legislation, there is no need for any specific follow-up. Market surveillance is expected to be simplified by this initiative.

7 ANNEXES

7.1 Annex 1 Procedural information

7.1.1 Identification

This Staff Working Paper was prepared by the unit A2 'Waste Management & Recycling' of Directorate A 'Green Economy' of Directorate General 'Environment'.[50] The Rolling Work Programme reference of this initiative is 2012/ENV/009.

7.1.2 Organisation and timing

The lead DG in this exercise is DG ENV. Other services of the Commission with a policy interest in the subject have been associated in the development of this analysis. The Impact Assessment Steering Group was established in October 2013 by inviting the following DGs: ENV, GROW, SG, SJ, ECFIN, COMP, EMPL, CLIMA, and SANTE.

The impact assessment was undertaken through several studies conducted on behalf of DG ENV between 2011 and 2015. DG GROW was consulted in the course of these studies. All DGs participating in the impact assessment steering group (IASG) were notified of the outcome. A first roadmap was adopted in 2014 and was replaced by an Inception Impact Assessment in December 2015.

The Impact Assessment Steering Group met for the first time on 25 February 2016 to discuss a first version of the draft Impact Assessment report, including the possible policy options as well as its preliminary impacts. During the first meeting, A2 presented the draft content which were based mainly on the three studies. The participants (units in DG ENV, DG GROW and Secretariat General) discussed and provided their input and comments during the process.

The final Impact Assessment Steering Group meeting was held on 08 April 2016; during this final meeting, the Impact Assessment Steering Group members discussed the updated Impact Assessment report and took some conclusions, whose content have been consequently reflected in this report.

7.1.3 Regulatory Scrutiny Board

The Regulatory Scrutiny Board some recommendations, which were used to amend the text as explained in the table below.

Table 6: Recommendations and improvements

Recommendations	**Improvements**
(1) The report should provide, where possible, additional details and quantitative data on the likely impacts of the different options, including with regard to the order of magnitude of the foreseen burden reductions.	Additional details and quantitative data on the impacts of some options were introduced in sections 4.3 and 4.4. Where this was not possible, explanations have been given in in the introduction of section 4.
(2) In order to increase transparency, the report should provide more information	Additional details and explanations on the discarded options were introduced in sections

[50] Currently Unit B3 Waste Management & Secondary Materials in directorate B "Circular Economy & Green Growth" of Directorate General 'Environment'

regarding the discarded policy options and, where appropriate, include them as alternative options to be impact assessed even if they only partially address the problem.	4.3 and 4.4.
(3) More detailed information should be provided on the stakeholder consultation acknowledging the strong response bias in favour of businesses and public authorities. Efforts to seek views from other stakeholders should be clarified.	Section 4.1 was improved by adding details and explanations on the reaction pattern.
(4) In order to effectively serve as reference point for the analysis, only one baseline scenario should be introduced and assessed.	The baseline scenario description and impacts were revised as recommended in sections 3.1 and 4.2. The related comparison analysis in sections 5.1 to 5.4 was accordingly harmonised.
Other suggestions	Minor fine tuning improvements were brought to section 2.

7.1.4 Evidence

The options considered in this impact assessment were designed by taking into account the following Commission studies on the RoHS open scope:

1. DG ENV in 2011 commissioned a study ("Measures to be implemented and additional impact assessment with regard to scope changes, pursuant to the new RoHS Directive" (2012)) which identified possible problem areas due to the scope related changes in the RoHS 2. The final report was published July 2012 and highlights all the problems addressed in this impact assessment.[51]
2. A follow-up study ("Additional Input to the Commission Impact Assessment for a Review of the Scope Provisions of the RoHS Directive" (2014)) commissioned for DG ENV analysed various possible solutions to the problems identified in the above mentioned 2012 study. The final report was published in July 2014.[52]
3. An additional study ("Study for the analysis of impacts from RoHS2 on non-road mobile machinery without an on-board power source, on windows and doors with electric functions, and on the refurbishment of medical devices " (2015)) on certain specific product groups' issues was published in March 2015.[53]

The stakeholders' opinion expressed during the public and targeted consultations helped shaping the development of the above studies.

Also other studies on the RoHS 2 scope were taken into account:

[51] http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf.

[52] http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/201406012_RoHS_Scope_Review_report_final.pdf.

[53] http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/20150312_RoHS_scope_review_final_a.pdf.

- A 2010 study for the Danish Ministry of the Environment addressed selected aspects and product categories under a potential open RoHS 2 scope, however without analysing the problems addressed by this impact assessment.[54]
- A UK study published in November 2012 explored some RoHS scope related issues from an economic perspective.[55]

Other sources are referenced in the studies and range from public agencies documents to industry figures and estimates.

7.1.5 External expertise

The European Commission sought external expertise on the technical field as well as on the impacts of the possible amendments to the RoHS 2 scope, by contracting three subsequent studies and by involving stakeholders' expertise in the field in the development of the studies.

The first study was conducted by Biois and ERA consultants associated; the second and third studies were conducted by Oeko Institute and Eunomia associated. Details of the study findings are provided throughout the report.

7.2 Annex 2 Stakeholder consultation

Public websites were set up and updated on a regular basis to implement the public consultations carried out in the years 2012-2015. More than three hundred participants were registered as stakeholders on the websites, including representatives from Member States, industry associations, manufacturers of EEE, environmental NGOs, consultancy companies and institutes, and other types of organisations (e.g. universities).

All project-relevant documents were made available on specifically-built websites throughout the duration of the work. Stakeholders were notified by an email of the availability of new documents.

As part of the consultation, also several workshops (see Table 9) were organised with stakeholders who were also consulted in the development of the Commission studies, both online and in writing. Dedicated webpages facilitated the exchange of information. Stakeholders from Member States' administrations, European industry and NGOs were extensively consulted on the identification of relevant product sectors, gathering and interpretation of data, and definition and assessment of problem areas. The stakeholder consultations were open to the public twice via online websites and lasted twelve weeks. Commission minimum standard has thus been met.

Further follow-up consultations targeting specific stakeholders were carried out also through direct contact, in writing and through workshops.

For the Commission studies, relevant background information and stakeholder input are available online.[56]

In the first twelve-week consultation, respondents were either industry or industry associations, for a total of 13 responses. 20 responses were received in the second 12-week consultation. While this number is not high, the quality of the answers was very satisfactory and these contributions did feed into the analysis. Additional stakeholder meetings took place involving around forty stakeholders, which provided additional input to the analysis.

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[54] http://www2.mst.dk/udgiv/publications/2010/978-87-92617-50-7/pdf/978-87-92617-51-4.pdf.
[55] http://www.legislation.gov.uk/uksi/2012/3032/pdfs/uksifia_20123032_en.pdf.
[56] See http://ec.europa.eu/environment/waste/rohs_eee/pdf/RoHS%20website%20documents.zip and http://rohs.exemptions.oeko.info/index.php?id=127.

Another 12-week consultation was carried out providing participants with a short summary of the aim of the project and the scenarios investigated, as well as with a questionnaire outlining the main areas where information was needed. Various EEE manufacturers participated in this exercise, providing information and data as to possible impacts of the current status of products addressed by different scope-related RoHS 2 articles. Along with the review of publicly available information, the results of this consultation have provided a basis for the subsequent analysis and assessment.

In total, some forty respondents (see Table 7) participated to the public consultation or stakeholders' meetings (see Table 9) and provided input that has been taken into account during the development of the studies in the years 2012-2015.

Table 7: Public consultation participants

Industry associations	**Companies**	**MS public bodies**	**Third countries or global bodies**
ACEA	Andreas Stihl AG & Co KG	Belgian Federal Public Service Environment	American Chamber of Commerce to the EU
CECED	Briggs & Stratton	Danish EPA	Japan Business Council in Europe
CECE –Committee for European Construction Equipment	Daikin Europe	French Environment Ministry	TechAmerica Europe
CEMA – the European association representing the agricultural machinery industry	Denso	Swedish Chemicals Agency (KEMI)	SEMI – the global industry association rep-resenting the manufacturing supply chain for the semiconductor and related industries
COCIR, European Coordination of the Radiological, Electromedical and Healthcare IT Industry	EADS (European Aeronautic Defence and Space Company NV), (now Airbus)	UK Department for Business	
EDMA/EUCOMED (European Diagnostics Manufacturers Association /	FEI		

Industry associations	**Companies**	**MS public bodies**	**Third countries or global bodies**
European medical devices industry)			
EGMF (European Garden Machinery industry Federation)	Intel		
EPEE	NIKO		
EPTA	Océ Technologies BV		
European Semiconductor Industry	LG Electronics		
Orgalime, the European Engineering Industries Association	NEC Europe		
GAMBICA – the UK Association for Instrumentation, Control, Automation and Laboratory Technology	Panasonic Europe		
EUROMOT – The European Association of Internal Combustion Engine Manufacturers	Philips Healthcare		
Eucomed and EDMA, the industry associations representing the medical devices and	Siemens Healthcare		

Industry associations	Companies	MS public bodies	Third countries or global bodies
in vitro diagnostic medical devices sectors respectively			
LEU – LightingEurope	United Technologies		
EUnited Cleaning – the Association of European Cleaning Machines Manufacturers			

In Table 8, stakeholders' positions on the options discussed are reported.[57]

[57] The numbering of the policy options in this annex corresponds to the options of the secondary market problem, except for Option 5, which correspond to the Option 2 for the spare parts problem in this document. Individual documents can be found in the webpage: http://ec.europa.eu/environment/waste/rohs_eee/studies_rohs4_en.htm.

Table 8: Summary of stakeholders' contributions

Stakeholder	Product and/or categories to which contribution refers	View of proposed policy scenarios	Comments
GAMBICA – the UK Association for Instrumentation, Control, Automation and Laboratory Technology	Particularly concerned with industrial products/equipment falling under Category 9.	Support Option 3 and Option 5. Option 2 is also supported, though GAMBICA comment that a solution that addresses all affected EEE would be preferable.	*Urge the Commission to act quickly in order to remedy the unintentional consequences of Article 2(2) and remove the uncertainty that is currently affecting industry and consumers.*
EUROMOT – The European Association of Internal Combustion Engine Manufacturers	Concerned with all equipment powered by internal combustion engines, assumed to fall under Category 11.	Support Option 3 and Option 5.	Note that most engine-powered equipment is covered by exclusions under Article 2 (4) and that engine powered equipment above 1000 V for alternating current and 1500 V for direct current is not in scope of the RoHS Directive.
AMCHAM EU – American Chamber of Commerce to the EU	General contribution with some comments referring specifically to Cat. 8 and 9 articles.	Contribution consists of contribution to BIOIS Project, prepared in 2012, thus proposed policy options are not mentioned.	AMCHAM EU support the proposal to change Article 2.2 to replace the term "making available" with the term "the placing on the market of the product". It is also understood that a spare parts provision is supported to allow refurbishment and reuse of equipment.
COCIR – European Coordination of the Radiological, Electromedical and Healthcare IT Industry	Particularly concerned with medical devices falling under Cat. 8.	COCIR explain that Option 2 is suited to avoid unwanted impacts on Category 8 products, however, it is further explained that there are other products for medical use which are not strictly medical devices which can fall under Cat. 11 which would be affected negatively by Article 2.2 (i.e. equipment for	COCIR explains its position that medical devices are not affected by Art. 2.2 of RoHS 2

Stakeholder	Product and/or categories to which contribution refers	View of proposed policy scenarios	Comments
		training). Therefore COCIR believes that Options 3 and 4 are preferable. COCIR does not express an opinion as to Option 5.	
Eucomed and EDMA, the industry associations representing the medical devices (MD) and in vitro diagnostic (IVD) medical devices sectors respectively	Represent manufacturers of CE-marked IVDs and MDs, i.e. products which fall under Cat. 8. Also refer to similar products in the medical veterinary and forensic fields as well as 'medical devices' which are intended for research or training purposes, which might fall under Cat. 11.	Support Option 3 and Option 5. Option 2 is also supported, though as a secondary preference.	Request that the economic, legal and environmental impact of Article 2.2 on the MD and IVD industries as well as on their consumers –hospitals, laboratories and ultimately patients – be taken into account.
EGMF the European Garden Machinery industry Federation	Refer to petrol driven garden equipment falling under Cat. 11.	Support Options 3 and 5 as long as such incorporation is consistent with the principles of the EU Treaty and the New Legislative Framework (NLF).	
JBCE – the Japan Business Council in Europe	Concerned with all products to be impacted by current legal text.	JBCE supports the combination of both Scenario 3 and 5	
LEU – LightingEurope	Refer to articles with an integrated lighting function	Do not refer to the proposed policy options.	Are concerned with impacts to incur where manufactures decide not to include lighting in their products.
Orgalime – the European Engineering Industries Association	Concerned with all products to be impacted by current legal text.	Support Options 3 and 5 as long as such incorporation is consistent with the principles of the EU Treaty and the New Legislative Framework (NLF).	Warn that the proposed earlier compliance date in Option 4 risks a direct conflict with the general rule of non-retroactivity of legal obligations.
KEMI – the Swedish Chemicals Agency	Concerned with all products to be impacted by current legal text.	Support Options 3 and 5.	Further propose the addition of a time limit for resale of equipment that has never been operated by an end user.

Stakeholder	Product and/or categories to which contribution refers	View of proposed policy scenarios	Comments
TechAmerica Europe represents leading European high-tech operations with US parentage	Concerned with all products to be impacted by current legal text.	Support Option 3 and Option 5. Option 2 is also supported, though as a secondary preference.	Regarding the proposed earlier compliance date in Option 4, state that given the time needed by Member States to draft, negotiate, publish and then transpose such a requirement, it is highly likely that this scenario would result in industry not being allowed a sufficient transition period to bring products into compliance.
EUnited Cleaning – the Association of European Cleaning Machines Manufacturers	Refer to cleaning machines.	Contribution consists of document sent to the EU COM at the time of the Stakeholder Consultation, with relevance to the policy options discussed, however none of the options are specifically referred to as document not prepared as a contribution.	State that it will be necessary to keep the compliance deadline at 21 July 2019 in order to give the industry sufficient time to find suitable solutions for substituting RoHS substances and achieving compliance.
SEMI – the global industry association representing the manufacturing supply chain for the semiconductor and related industries	Refer to semiconductor manufacturing equipment not covered by the Article 2(4) large scale exclusions.	SEMI believes that the RoHS text should be revised on the basis of Options 3 and 5. SEMI further suggest keeping Article 2(2) and modifying it as follows: *Without prejudice to Article 4(3) and 4(4), Member States shall provide that EEE that was outside the scope of Directive 2002/95/EC, ~~but~~ which ~~would~~ does not comply with this Directive, may ~~nevertheless~~ continue to be ~~made available~~ placed on the market until 22 July 2019.*	Explain that such equipment has an active secondary market, which would also apply to equipment moved between manufacturing sites of the same corporate enterprise when these are in different member states, as ownership is transferred from one legal entity to another.

Table 9: Stakeholders' meetings and workshops

Study	Event	Date	Venue
First Commission study[58]	1st Stakeholder meeting	29 November 2011	Brussels, Belgium
	2nd Stakeholder meeting	21 February 2012	Brussels, Belgium
	3rd Stakeholder meeting	15 May 2012	Brussels, Belgium
Third Commission study	Targeted stakeholder meeting	27 November 2014	Brussels, Belgium

The stakeholder consultations undertaken identified the following product groups and RoHS 2 scope areas as problematic, namely:

- Secondary market operations for RoHS 2 EEE which were not in scope of RoHS 1 (RoHS 2, Article 2(2))
- Spare parts for RoHS 2 EEE which were not in scope of RoHS 1
- Pipe organs
- Certain cord-connected Non-Road Mobile Machinery

The vast majority of stakeholders were of the opinion that those problems can be solved only with an amendment to the RoHS 2 directive in order to allow the secondary market operation of new-in-scope EEE, including with the use of pre-RoHS 2 spare parts, in addition to the exclusion of pipe organs and cord-connected non-road mobile machinery. This opinion was also reflected in the Commission studies.

7.3 Annex 3 Who is affected by the initiative and how

Who is affected	How
Member States	The amendments to the scope of the RoHS 2 directive will require Member States to: • Transpose the amendments into national law • Enforce the amended provisions (jointly with previous RoHS 2 provisions to be enforced at the end of the transition period) by the compliance date through market

[58] http://ec.europa.eu/environment/waste/rohs_eee/pdf/1.%20Biois%20study%20-%20RoHS_II_IA_Final%20Report.pdf
Meeting documents can be downloaded at:
http://ec.europa.eu/environment/waste/rohs_eee/pdf/RoHS%20website%20documents.zip

	surveillance A reduction of costs for the public administration is envisaged due to simplified market surveillance.
Manufacturers, distributors and importers	Manufacturers, distributors and importers will make available EEE on the EU market in compliance with the amended provisions. This means that: • Manufacturers, including SMEs, will be enabled to perform secondary market operations, also through repair operations with pre-RoHS2 spare parts, also on new-in-scope EEE. This will be particularity important for manufacturers of long-life high priced EEE which have an important secondary market. • Manufacturers, including SMEs, will be able to place on the EU market pipe organs and cord-connected non-road mobile machinery with no RoHS substance restriction. Therefore, the amended provisions will reduce regulatory burden on the category of manufacturers, distributors and importers, including on SMEs concerned.
Consumers and Users	Consumers and users will take benefit of increased availability of EEE in the EU market. This means that: • An increased availability of second-hand newly-in-scope EEE, also after repair operation with pre-RoHS2 spare parts, could result in additional benefits to consumers, including for health in the case of medical devices. • Pipe organs and cord-connected non-road mobile machinery will continue to be made available to them with no substance restriction.

7.4 Annex 4 Case studies on secondary market operations and spare parts use for certain newly in scope product groups[59]

Articles with integrated lighting newly falling in the scope of RoHS 2

Lighting Europe[60] (LEU) submitted a contribution to the Stakeholder Consultation[61] as well as a response to clarification questions[62] prepared following the initial contribution. Both

[59] This Annex is identical to chapter 3.5.3 of http://rohs.exemptions.oeko.info/fileadmin/user_upload/reports/201406012_RoHS_Scope_Review_report_final.pdf; for underlying statistical data and stakeholder input see appendices therein. The numbering of the policy options in this annex corresponds to the options of the secondary market problem, except for Option 5, which correspond to the Option 2 for the spare parts problem in this document.

[60] LightingEurope is an industry association of 33 European lighting manufacturers, national associations, and companies producing materials. LightingEurope members represent over 1,000 European companies, a majority of which are SMEs; a total workforce of over 100,000 people in Europe; and an annual turnover estimated to

documents concern products with an integrated lighting function, which did not fall under the scope of RoHS 1, as the electric function (i.e. lighting) was not the primary function of the product. Subsequent to the new interpretation of dependency on electricity, these products are to be regulated according to RoHS 2.

LEU state that "*A typical case is furniture, which is normally a non-EEE product. Typically, the same type of furniture can be sold with and without a LED luminaire. In case it is sold with an integrated LED luminaire the whole furniture has to be RoHS compliant, including those parts which are normally not EEE, and were probably never assessed against RoHS requirements. Normally, these products are not assessed if sold without LED luminaire. Conformity assessment for the whole product, including all nonelectrical parts, has to be performed according to harmonized European Standard EN50581*." LEU warns that this group includes "*a huge variety of products for which a reliable impact assessment on cost and benefits is not available and even difficult to prepare*". Examples of such products equipped with LED lighting specified in the first contribution include: post boxes; art/souvenirs; shoes; signs; music instruments; toys (e.g. scooter with LED in wheel); doors, windows; and mirrors.[63]

Additional examples were provided in LEUs response to clarification questions: clothing; sport equipment; dog collars; cups; porcelain; and carpets. In this regard LEU explained that "*Members of LightingEurope observed that LED has features (e.g. lightweight, small size, little electricity consumption), which inspires other business (entrepreneurs, designers etc.) to use LED in fields where lighting was not present before. As a consequence we can observe an increasing trend to integrate a non-electrical product with LED*".[64]

Areas of possible non-compliance are tied to the non-electric components of the product. LEU provides some examples of materials where compliance may be a problem, such as in the use of:

- "*lead in glass (limit 0,2% in EEE)*
- *lead in brass (limit 4% for brass in EEE, up to 6%, no limit, in non-EEE brass products*
- *lead in aluminium,*
- *flame retardants / plasticisers in clothing*
- *lead in leather*
- *lead in steel*"[65]

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exceed 20 billion Euros. LightingEurope is dedicated to promoting efficient lighting practices for the benefit of the global environment, human comfort, and the health and safety of consumers.

[61] LightingEurope (LEU) (2014a), Contribution to RoHS Stakeholder Consultation Concerning RoHS Scope Review, submitted 10.03.2014, available under: http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IA_2_2/20140310_LE_PP_EEE_Newly_in_the_scope_20140310_final.pdf.

[62] LightingEurope (LEU), (2014b), Response to Clarification Questions concerning LEU Contribution to RoHS Stakeholder Consultation Concerning RoHS Scope Review, submitted 11.04.2014 per e-mail.

[63] Op. cit. LEU (2014a).

[64] Op. cit. LEU (2014b).

[65] Op. cit. LEU (2014b).

LEU explains that as consequence to the inclusion of such products in the scope of RoHS, the administrative burden on clients of the lighting industry, particularly of producers of non EEE products, shall increase. The lack of awareness of such manufacturers to the RoHS compliance requirements may increase the risk for non-compliance of the whole product in such cases. This is stated not to be in line with the WEEE Directive, under which such products are not considered to be WEEE at the end of life and could bring about hundreds of exemption requests.[66]

LEU estimate the main impacts tied with this product group as follows: "The logical reaction of the producers of "EEE newly in the scope" is to avoid costs and risks by not including lighting in their products. Therefore, LightingEurope believes that the open scope has negative impacts:

- On the lighting industry in the form of loss of business;
- On producers of category 11 products in the form of increased cost and loss of product diversification; and
- On consumers in the form of decrease of product functionality;
- All while the positive environmental impact is not known and based largely on estimations.[67]

LEU further explains that some guidance is further provided in this regard in the EU COM FAQ document which gives the example of a wardrobe with lighting and "*suggests that the whole cupboard is EEE, if lighting and cupboard are integrated and cannot be separated into two fully functional units. In the opinion of LightingEurope this explanation does not remove the legal uncertainty with regard to the question, what is EEE and what is the notion of integration. While the FAQ provides much appreciated guidance, it is not a binding, legal document, and introduces further uncertainty by the addition of the word "integral" and "fully functional unit*". The main concern is understood to be, that despite the compliance of the electric components used in these products, non-compliance of other components shall make the whole product non-compliant (lighting as well as lighting fixtures were in scope of RoHS 1 and are thus expected to be compliant). To avoid this complication, manufacturers of such products are expected to avoid use of electric components, leading to the above mentioned impacts.[68]

LEU thus request a further exclusion be added to Article 2(4) to resolve this issue, and propose the following formulation in this regard: "*(k) non-electrical parts of EEE in Category 11 of Annex I, which are using lighting as a non-primary function*". As further exclusions from the scope of RoHS are beyond the scope of the current project, this request is not discussed, and the following evaluation shall merely try to shed light on the type and magnitude of impacts tied to this product group.

[66] Op. cit. LEU (2014a).
[67] Footnote cited from LEU (2014a): See BIOIS report, for European Commission, DG ENV: Measures to be implemented and additional impact assessment with regard to scope changes, pursuant to the new RoHS Directive, 2012, Annex V, Furniture with secondary electrical functions.
[68] Op. cit. LEU (2014a).

LEU could not provide data to clarify the scope or the turnover related to the manufacture and sales of such products in the EU, but referred to the estimation made by BIOIS: "*The same report in chapter 1.3.33 tries to estimate the market size of furniture with secondary electrical function, which is around 1% of the total turnover, corresponding to 1.26 billion EUR per year".*[69] However, to provide some insight to the possible implications of these products being in scope, they provided an estimate as to the fraction of the lighting industry's turnover, which is tied to the use of lighting in these products: "*At the moment the estimation of LightingEurope is that approximately 5% of the turnover is coming from integration of LED lighting into non-EEE products. This turnover was achieved during the times, when only the lighting part of such integrated products had to comply with RoHS Directive. Since LED technology is very young there is still space for market development. We are not able to estimate however how big this market will grow*." Later on in the document a further rough estimation was provided of 5-15% concerning the possible loss of business at best-case and worst-case. "*Coming to the implications on the market trends, LightingEurope can at the moment only apply the common business sense to this case. Our conclusion is that the market growth in this segment will lag behind of its potential, what would be without the RoHS compliance obligation to non-EEE part. At the end of the day it is a lost business for lighting industry and lost opportunity for the European economy and European consumers without any significant improvement in the state of environment*." Examples were also provided for products which can be designed to be custom-made (such as furniture), in which case the burden of compliance is higher as each article will separate compliance documentation.[70]

In light of the relevance of the lighting sector to this product group, information was extracted from Eurostat[71] as to the value of sales of lighting applications in the EU 27. Data is based on NACE classifications for lighting applications such as lamps and lighting fixtures. The total value of the sector in 2012 was estimated to be around €20 billion with fluctuations in turnover of up to 10% in the last few years. Based on the estimations provided by LEU, it is thus estimated that between € 1–1.5 billion of the lighting sector turnover may be at risk where impacts are to arise from the need of products with integrated lighting to be RoHS compliant. The worst case situation would be a loss of business of this volume, though the consultants assume that even if the worst case situation is to be relevant, it would not result in a loss of all business tied to this product group. Detailed statistical information is provided in Appendix 5.

The consultants interpret the information provided by LEU to clarify that two sub-groups can be outlined concerning compliance:

- The first includes products which are free of RoHS substances. The burden of compliance will result in additional costs for the manufacture of articles with integrated lighting, whereas no environmental benefit is expected as the product was RoHS substance free to begin with.

[69] Cited in Op. cit. LEU (2014b) as Bio Intelligence Service, Impact Assessment, Annex: Furniture with secondary electrical functions, chapter 1.3.2.5 p. 243.
[70] Op. cit. LEU (2014b).
[71] Op. cit. EUROSTAT (2014).

- The second includes products, which may use RoHS substances in the non-electric components (components tied with the lighting function are assumed to be compliant in light of already being in scope of RoHS 1). The manufacturer, who may produce products both with and without integrated lighting, will need to consider if only RoHS regulated products are to be redesigned to be compliant or all products. The latter would be a result of the separation of production lines to be non-feasible. Environmental benefits are expected, with their volume depending on the decision to redesign only RoHS regulated products or all products.

In both cases, the burden of compliance on manufacturers of products normally not regulated under RoHS may result in a decision to discontinue manufacture of products with integral lighting in order to avoid such expenses. It could be argued that the lighting could be redesigned so that it would not be "integral", however the distinction between "integral" and "non-integral" may not be completely clear to manufactures, as explained by LEU, and is not legally binding as it is provided in the EU COM FAQ document and not in the RoHS legal text. A further result could be that consumers purchase items and lighting fixtures separately and have lighting retrofitted into the item (individually or assisted by a professional craftsman).

A summary of the expected impacts relevant for Option 1 (Business as Usual) is provided in Table 10.

Table 10: Impact expected in Option 1 for products with integrated lighting

Impact area	Impact expected in Policy Option 1: Business as usual
Environmental impacts	Some benefits for products with non-EE components using RoHS substances. If as a result of current legislation, manufacturers shall discontinue manufacture of articles with integrated lighting or shall revert to designs where lighting component is no longer integrated and can be easily removed; this would have benefits concerning the management of waste at end of life. In contrast, where manufacture is not expected to change, more costs shall be relevant in terms of the recycling sector coming to terms with a product which is not WEEE, but must still be included in part in the treatment of WEEE.
Economic impacts – manufacturers	Additional costs for manufacturers of products with integrated lighting, (technical costs of compliance and administrative costs of compliance). Loss of income where manufacture discontinued, though in most cases consumers are expected to purchase articles without light capability, supplementing a light fixture adjacent to the item or through a retro-fitting of the lighting fixture within the purchased item.
Economic impacts – suppliers	Small to large burden for providing documentation (lighting suppliers and other suppliers respectively). Loss of business where manufacture is discontinued, though in some cases lighting fixtures may be purchased separately and assembled by owner.
Economic impacts – public authorities	Additional costs due to additional products being regulated under RoHS.

Impact area	Impact expected in Policy Option 1: Business as usual
Economic impacts - consumers	Loss of product diversity (lighting capabilities) of relevant product groups, though in some cases articles and lighting fixtures would be purchased separately and assembled by owner.
Social impacts - employment	Impacts to incur both in products where production is to be discontinued (negative) and where product compliance is to be sought (positive).
Social impacts – consumer behaviour	Where products are to be discontinued, in some cases consumers may purchase lighting equipment to provide lighting capabilities otherwise supplied by product.
Social impacts - health	Impacts proportional to change in environmental benefit (tied to decrease in RoHS substances)

The implication of the reparability and secondary market aspects were not discussed by LEU regarding this product group, though they may have impacts, as at least some of the products are assumed to be long life and thus also resalable and reparable. Nonetheless, for the most part, the impacts addressed by LEU are not expected to change in light of these two aspects. It is generally expected that the various stakeholders would benefit if the secondary market and reparability issues could be resolved (Options 3 or 4 and 5, respectively), however other impacts mentioned in the table above would not be expected to be significantly affected in the various policy options. In this sense the consultants conclude that this product group is more or less indifferent to the proposed scenarios. For the most part, impacts addressed in this section shall remain similar in all scenarios. In the consultants' view some of the uncertainty in this regard could be addressed through clarification of the notion of integrity for products where the electric function is not primary, though, this may also lead to further confusion if not handled carefully.

Equipment with an internal combustion engine newly falling in the scope of RoHS 2

The European Association of Internal Combustion Engine Manufacturers (EUROMOT) submitted a contribution to the Stakeholder Consultation.[72] EUROMOT explain that, as the primary energy is not based on electricity but fuel such as petrol, diesel or gas, all equipment powered by internal combustion engines did not fall under the scope of RoHS 1, but would newly be in the scope of RoHS 2, probably falling under category 11. It is further explained that most engine-powered equipment is covered by exclusions under Article 2(4)[73] and that engine powered equipment above 1000 V for alternating current and 1500 V for direct current is not in scope of the RoHS Directive. Engines are explained to power many different product groups and markets, making the retrieval of market data on this diverse group of products challenging. EUROMOT explain that service life *"varies significantly between equipment*

[72] The European Association of Internal Combustion Engine Manufacturers – EUROMOT (2014), Contribution to RoHS Stakeholder Consultation Concerning RoHS Scope Review, submitted 07.03.2014, available under: http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IA_2_2/Products_newly_in_scope/20140307_EUROMOT_RoHS_2_Oeko-Institut_Review_EEE_newly_in_Scope-Questionnaire_Final_Response_2014-03-07.pdf.

[73] This is understood to refer to the exclusions available in RoHS 2 for large scaled installations stipulated in Articles 2(4)(d and e).

based on internal combustion engines. Some products may have an average service life of 50h (two years) others in excess of 80,000 hours may still be in service after 25 years. In general, it is common practice to repair equipment based on internal combustion engines and it is an important part of the business. Depending on the type of equipment the engines may have multiple overhauls in their service life. Each overhaul will need many spare parts some of which may contain substances which are restricted under the RoHS 2 Directive". Detail as to possible parts where RoHS substances shall be required are specified below.[74]

Concerning secondary market operations, EUROMOT explain that "*secondary market operations are common for many products based on internal combustion engines. This includes leasing, renting, and secondary sales operated both by retailers and equipment owners. For some products, the secondary market is so well established that the potential for resale is an important factor in the value of the product*."[75]

Concerning the compliance of such equipment, at present the main substances of concern are understood to be lead (Pb) and hexavalent chromium (Cr VI). Cr VI is used for corrosion protection of certain engine parts in current equipment and will probably be needed in the future for spare parts of engines. Manufacturers are working on replacing Cr VI, however, in many cases spare parts will probably not be redesigned. EUROMOT provides the following examples for Pb, which is used in light of the high temperature range and the vibration of the engine and the resulting high strength requirement for the solder joints.[76]

- Compression Ignition Engines:
  - Pb in solder of the Monitoring Instruments is likely to be above the restricted 0.1wt% threshold at homogeneous level;
  - Pb in solder in engine control electronic systems exceeds the 0.1 wt% threshold at homogeneous level;
  - Likewise Pb in the engine bearing and bushing components of the Combustion Engine is also likely to exceed the 0.1wt% threshold.
- Spark-ignition engines:
  - Pb in solder for the spark-ignition system and engine control electronic systems exceed the 0.1 wt% threshold;
  - Pb in metal alloys for engine body;
  - Pb as impurity in recycled plastics.
- Pb is also used in the starter batteries of internal combustion engines, which are notably exempted under the End of Life Vehicles Directive covering engines in automobiles.

EUROMOT explains that for some components, particularly in large scale products, present alternatives may result in an unacceptable reduction in service life. Although EUROMOT members have stated their intention to comply by the end of the transitional period,

[74] Op. cit. EUROMOT (2014).
[75] Op. cit. EUROMOT (2014).
[76] Op. cit. EUROMOT (2014).

EUROMOT claims that present indications show that some products may not be capable of complying.[77]

Generating sets (GENSETs) and power systems equipment is specified as a sub-group, for which additional information was submitted. Here too repair and secondary market operations are explained to be of relevance, though a large portion of equipment is assumed to be excluded through the Article 2(4) provisions. However in some cases the rental use of equipment does not allow benefiting from these provisions. "*EUROMOT wishes to point out the apparent contradiction caused by the interpretation of the term "Large Scale" in relation to certain applications. In the FAQ document, 12 December 2012, page 11, it is noted that: 'Machinery that has partial mobility, for example semi-mobile machinery running on rails, can be of 'permanent use'. On the other hand, EEE that is intended to be used on different sites during its life is not considered as permanent. It is an indicator of permanent use if the equipment is not readily re-locatable (or 'mobile intended') and if it is intended for use at one single location.*'" In this regard, an example is provided of a 2.5 MW enclosed generating set installed permanently at a pre-defined and dedicated location, which would be excluded as a Large Scale Fixed Installation. In comparison, the same GENSET offered for rental use would not be entitled to this exclusion in light of use in multiple locations. EUROMOT claims that there is a *"significant risk that rental and similar products placed on the market during the transition period may not be capable of being repaired with compliant parts and may be forced out of service, to the detriment of the environment and all stakeholders."*[78]
EUROMOT also make a short statement concerning professional lawn, garden and forest equipment falling under this product group, which shall be further explained in Section 0 below.

EUROMOT recommend implementing Option 3 (the *2019 Scenario)* as it brings a single date enabling alignment of all EEE compliance with reduced impact to the environment. Option 4 (the *2017 Scenario)* in comparison would artificially shorten the time needed to ensure compliant parts, whereas in some cases significant R&D work is required to establish compliance, stretching beyond the specified timeframe. Concerning Option 5 (the *Spare-Part Scenario*) EUROMOT state that this option will help to clarify and support the needs of products with a long life cycle as well as secondary markets that are an integral part their members business'. If secondary market operation and spare parts provisions are not included, this is said to result in more waste and a negative impact on the environment because of limitations to resale and limitations to service in light of non-reparability. [79]

To provide some indication as to the volume of sales that may be relevant for this case, information was extracted from Eurostat[80]. In the information provided by EUROMOT (which concerns combustion engines being used in a diverse range of equipment) it was stated that clarifying the range of sales of all products would be challenging. To provide some indication, the example of generating sets was thus the focus of data extracted from the Eurostat data, regarding sales in the EU 27 between 2008 and 2012 (as opposed to data

[77] Op. cit. EUROMOT (2014).
[78] Op. cit. EUROMOT (2014).
[79] Op. cit. EUROMOT (2014).
[80] Op. cit. EUROSTAT (2014).

concerning manufacture of all combustion engines). Data is based on NACE classifications for GENSETs falling under classification *"27.11 Manufacture of electric motors, generators and transformers"*. The total value of the EU GENSET sector in 2012 was estimated to be around €5.5 billion. After a 27% fall in sales in 2009, assumed to be tied to the economic crisis, the market seems to have stabilized in the last few years. Detailed statistical information is provided in Appendix 6.

In the consultants' opinion, it is important to make a distinction between equipment which is only available for professional use, consumer equipment and equipment designed for professional use but also available to private consumers (through renting and leasing operations or through direct purchase). The GENSET example is a private case of the first equipment group; whereas the case of garden equipment, developed in the next section is more relevant to the last group.

For the GENSET case, the information provided by EUROMOT suggests that costs of compliance shall mainly be a burden in cases where equipment is circulated on the rental market, as such equipment would not enjoy the large scale exclusions which are understood to cover a large portion of GENSETs. In comparison with privately owned equipment[81] with a single owner (or even multiple owners), rented equipment is expected to have significant disadvantages embodied in the burden of compliance. This would be expressed in the general costs of compliance in terms of technical costs of researching and applying substitutes and in administrative costs of screening product portfolios for compliance issues and preparing and maintaining documentation. As rented equipment will usually have a longer service life and be repairable, additional costs are expected in light of the limitations relevant for both of these aspects on Option 1 (business as usual). As expressed in the general evaluation of options (Section 3.5.2), costs tied to secondary market operations shall be alleviated in policy options 3 or 4, and costs tied to reparability alleviated in policy option 5. However, the differentiation between mobile and fixed (as well as semi-mobile) equipment means that certain market distortions may arise. First of all, manufacturers providing equipment mainly for the rental market would be heavier burdened with compliance than manufacturers providing equipment to a mixed market, not to mention those mainly selling to private users. This burden would either be shifted to consumers (rental operators and further on to consumers) or would give way to a shift of market structure away from rental operations. In both cases costs could be expected for manufacturers, for the secondary market operators and for consumers of rental equipment. Though policy options resolving secondary market and reparability aspects will alleviate some of these costs, they do not provide a full solution. Nonetheless, as it is understood that manufacturers are already preparing for the transition to compliance, it can be assumed that where substitution is possible, it shall be achieved for a larger range of equipment than that falling in scope. This means that if industry is provided sufficient time to comply with the RoHS substance restrictions, additional benefits (in the form of substitution of products excluded from scope) may be relevant. It is thus concluded that providing such products with the longer transition period (2019) would ease the burden of compliance and

[81] Equipment owned by a professional user could still be sold on to a second user, however as the location is fixed during the period of ownership, such resale is allowed. Ownership periods are also assumed to be longer, as otherwise purchase would be less economic in comparison with rental. Thus such equipment may have a few locations, but would still be interpreted as semi-mobile and benefit from an exclusion from scope.

may have additional positive impacts in terms of the environment and the respective social impacts (health). Provision of a spare parts provision (Option 5) will have similar beneficial effects.

It may be argued that the burden of compliance on the sector, in light of the forced compliance of articles which are not in scope, does not justify the expected benefits of such compliance. However, such aspects were not quantified in the submitted data, nor would the consultants be in the position of recommending further exclusions from scope of certain articles in light of the scope of this project.

A further potential subgroup was identified in the case of **equipment in one particular category of EEE with similarity to other groups**. Certain product groups falling under Cat. 11 have been mentioned by stakeholders with regard to their similarities to other categories, in particular those in Cat. 8 and 9 where there are advantageous compliance stipulations within RoHS. EUCOMED Medical Technology and EDMA Diagnostics for Health[82], the industry associations representing the medical devices and in vitro diagnostic medical devices sectors respectively, mentioned such product groups in their contribution. They explained that though their products are intended for human medical purposes, similar products were used for veterinary and forensic uses. Despite such similarities, these product groups were assumed to fall under Category 11 of RoHS2. In this sense, the consultants assume that despite similarities of compliance aspects (availability of substitutes) as well as reparability and secondary market aspects, such articles would be penalized in comparison with Cat. 8 & 9 counterparts (under the current legal text, reparability and secondary market operations of non-compliant articles are limited). Furthermore, even if articles are to be granted the same exemptions, the 7 year duration of exemptions for Cat. 8 & 9 would not apply, meaning that maintaining exemptions would also be more burdensome. Though such product groups would be alleviated from the former mentioned costs under the joint implementation of Option 3 (or 4) and Option 5, the latter costs shall still apply. To conclude, it appears that additional areas may exist where similar articles have requirements which are slightly different. However, further information was not made available by such stakeholders. As it is assumed that the manufacturers of such equipment are for the most part the same manufacturers as those of Cat. 8 & 9 equipment, the consultants assume that the additional burden did not justify providing a contribution to quantify the difference of costs in such cases.

Gardening equipment newly falling in the scope of RoHS 2

EGMF, the European Garden Machinery Industry Federation submitted a contribution to the Stakeholder Consultation.[83] The data they provide concerns the possible impacts expected where garden equipment is concerned. They provide a list of equipment which would fall under this product group including augers; blowers/vacuums; brush cutters; chain saws; edge

[82] Eucomed & EDMA (2014), Contribution to RoHS stakeholder consultation concerning RoHS scope review, submitted 10.03.2014, available under: http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IA_2_2/Products_newly_in_scope/20140310_EDMA_Eucomed_RoHS_Art_2_2_and_Art_4_consultation_response_to_Oeko_Institute_2014_03_10_PUB.pdf.

[83] EGMF (2014), Contribution to RoHS stakeholder consultation concerning RoHS scope review, submitted 28.02.2014, available under: http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IA_2_2/Products_newly_in_scope/20140310_FINAL_EGMF_answers_to_Oko_28022014_all6parts.pdf.

trimmers; grass trimmers; hedge trimmers; high pressure cleaners; Ice augers; lawn and garden tractors; lawnmowers; log splitters; motor hoes; pole prunes; pumps/submersible pumps; scarifiers/turf aerators; shredders; snow throwers; sprayers; stump grinders; and sweepers. All of these products are specified to be newly in scope in light of the change in the definition of EEE (interpretation of dependency on electricity). For most products, similar items exist which are already in scope in either battery or electric powered versions. However, articles operated with petrol but with an electrical function were not in the scope of RoHS 1, though these are now to be regulated within RoHS 2. This regards a total of 8.6 million units of equipment, estimated for Europe (geographical) sales volumes for 2012 of petrol driven machines, for EGMF members only.[84]

The average service life of products is 10 years and all equipment is said to be reparable. All parts are explained to have spare parts and examples of critical ones, in which RoHS regulated substances, are used, being: e.g. electric parts, fasteners, blades, coated/plated parts. Furthermore all of these products can be leased, rented or can be sold as second hand products.[85]

EGMF[86] provides information about compliance of equipment as presented in Table 11.

Table 11: Compliance of petrol powered garden equipment with the RoHS substance restrictions

Presence of RoHS regulated substances (% weight & quantity of substance):	
Lead	*Yes, in solder, metal alloys, ceramics, recycled plastics. Estimation: 0.74 g in solder per product.* ***Investigations are still ongoing and it is unknow precisely how much lead remains in the product.***
Mercury	*No*
Cadmium	*Yes (in switches/recycled plastics)*
Hexavalent chromium	*Yes, on fasteners and other steel parts for corrosion protection. Estimation: up to 200 µg per product*
Polybrominated biphenyls (PBB)	*Yes, mainly in plastics, insulation parts, paints, electric parts* ***Investigations are still ongoing and it is unknow precisely if / how much PBB remains in the product.***
Polybrominated diphenyl ethers (PBDE)	*Yes, mainly in plastics, insulation parts, paints, electric parts* ***Investigations are still ongoing and it is unknow precisely if / how much PBDE remains in the product.***

Source: Op. cit. EGMF (2014)

It is understood that in most cases exemptions or alternatives are available, with the main concerns of substitution being focused on lead in general usages, and cadmium in switches. It is explained that the substitution with lead free solder may result in a reduction of the lifespan of the entire product, due to reduction of the lifespan of certain components of the product for which lead free solder has been used. This would result in an increase of the waste generated in light of early end-of-life. Investigations are still ongoing regarding the possible effects of

[84] Op. cit. EGMF (2014).
[85] Op. cit. EGMF (2014).
[86] Op. cit. EGMF (2014).

lead free solder on the lifespan of product/components. EGMF provide a roadmap of the stages needed to enable compliance with RoHS, estimating a total of 6 to 8 years needed for compliance of new products (time differs for various products included in the product range). It is further stated that (under the current legislation) exemptions would be needed to enable the use of non-compliant spare parts for repairing equipment already on the market.

A table comparing the costs and benefits of each of the proposed policy options is provided by EGMF to clarify that Option 3 (the *2019 Scenario*) and Option 5 (the *Spare-Part Scenario*) are preferable for this sector. Option 4 (the *2017 Scenario*) would resolve the limited secondary market issues, but would require earlier compliance, possibly increasing costs in light of insufficient time. Option 2 is understood to be irrelevant as it shall not change the impacts relevant for products of EGMF members.

On the basis of the information provided by EGMF, the consultants could estimate that in 2012 the following quantities of RoHS substances were brought on the market:

- Lead – 6.364 kg (an average of 0.74 g per each of 8.6 million units placed on the market in light of use of lead solders, metal alloys, ceramics and recycled plastics);
- Hexavalent chromium – 1.72 kg (an average of 0.0002 g per each of 8.6 million units placed on the market in light of use in fasteners and other steel parts where corrosion protection is relevant).

It is assumed that as compliance is achieved towards 2019, these quantities shall decrease. It is further understood that especially concerning the use of lead, this decrease may require additional time beyond 2019, where exemptions already exist or would be requested. These reductions are observed as an environmental benefit of compliance, with various costs being tied to the efforts needed for such benefits to incur. In light of the time needed specified by EGMF for the various stages of achieving compliance (including research of substitutes {2 years} testing {2 to 3 years} and redesign {2 to 4 years}), it can be followed that achieving compliance before 2019 would be difficult, and would result in additional costs since various stages would need to be performed in parallel (where this can be done). It can also be followed that in some cases, earlier deadlines shall not result in earlier benefits, and it is unclear if the additional benefit of an earlier deadline (2017) would justify earlier environmental benefits. In this regard, it can be followed that Option 3 (the *2019 Scenario*) will be preferable in terms of the cost of compliance for industry and society (considering impacts on manufacturers, impacts on secondary market operations, and impacts on employment). If this Option 3 is coupled with Option 5 (the *Spare-Part Scenario*), then benefits, in terms of reparability shall also incur for industry, for the environment and for society (employment, health).

Toys newly falling in the scope of RoHS 2

The Toy Industries of Europe (TIE) Association submitted documents, prepared in the course of the BIOIS report, to the Stakeholder Consultation. As documents were listed as confidential, TIE was sent clarification questions and requested to provide information that could be made public. The information concerning toys regulated under RoHS is based on the response[87] provided by TIE to these questions.

[87] Toy Industries of Europe (TIE) (2014), Response to Clarification Questions Sent by Oeko-Institut, submitted per e-mail on 01.04.2014.

To provide some indication as to the volume of sales that may be relevant for this case, information was extracted from Eurostat[88] as to the value of sales of toys in the EU 27. Data is based on NACE classifications, which in the case of toys are understood not to fall under the group classifications of EEE. The total value of the EU toy sector in 2012 was estimated to be €5.2 billion with large fluctuations in turnover (annual changes of -4% to +31% have occurred over the last 5 years). As separating between data for conventional toys and toys with electric functions is not feasible in terms of the available classifications, it cannot be determined what part of this value would be attributed to EE toys, let alone to EE toys newly in scope. Detailed statistical information is provided in Appendix 7.

Toys falling under the scope of "EEE newly in scope" are understood to be "toys with a minor electrical function" as these would fall under RoHS 2 in light of the new interpretation of dependency on electricity. The compliance of such products is also to be underway if not already achieved: "*All members of TIE, and all its members' members are aware of the new situation and of the new scope of RoHS, and therefore have already taken measures to make sure they will comply with the new requirements when these will enter into force after the transition period. The biggest toy manufacturers have long taken the approach that any electrical toy (regardless of whether the toy has a primary or secondary electrical function) needs to comply with RoHS."* Such articles are characterised as follows: "*24 categories of toys were identified that contained electrical or electronic (EE components). The average electronic content of EE toys was found to be 8%. This includes circuit board & wiring (1.7%), motors and transformers (6%).*" It was estimated that nearly 85,000 tonnes of EE toys were sold in the EU in 2002. The applicability of these quantities in 2014 was explained by TIE stated as follows: "*In some Member States such as Spain, the amount (in Kg) of electrical toys decreased by 8% from 2011 to 2012, and by 13% from 2012 to 2013. However, we cannot tell whether this is a result of the economic crisis or responds to other reasons. We will have to check the data and tendency of the coming years."*[89]

The consultants understand this to mean that some of the larger enterprises already comply, whereas others are expected to become compliant by 2019. A possible exception to this understanding may be in smaller enterprises (SME's) which may not be fully aware of the RoHS Directive and its possible implications.

Concerning Compliance of EE toys, TIE provide the following information: "…*it is important to note that the average metal content of EE toys is low at 7% compared to 51% in most WEEE. Toy manufacturers do not "use" heavy elements. Toys have been regulated for heavy metals for many years and the toy industry complies with these regulations. Legislation such as REACH, RoHS or the Batteries Directive add to the recently revised Toy Safety Directive 2009/48. The new migration limits for 19 heavy elements (incl. lead, cadmium, mercury and chromium VI) laid down in the Toy Safety Directive apply as of July 2013. Very minor quantities (traces) of lead might be found in EEE toys, due to its natural occurrence in raw materials and mainly due to the solder used. Mercury is not likely to be found in toys. Chromium VI compliance has not been an issue for toys that are within scope of RoHS until now. Flame retardants PBB and PBDE are not used in toys. They were banned for a very*

[88] Op. cit. EUROSTAT (2014).
[89] Op. cit. TIE (2014).

large group of products, and they have essentially disappeared from the supply chain." It is thus understood that RoHS substances should not be contained in toys, unless possibly in alloys used for soldering purposes. Where these are applied in electric components, acquired from suppliers, these areas were explained to be easier for achieving compliance, as suppliers will probably manufacture components for other EEE and so either compliance has been achieved, or the transition is expected to be relatively simple. In comparison, where solders are used by the toy manufacturer, this could be more complicated as in the past *"... a number of relevant companies have replaced their solders by lead-free solders. These companies have had to modify their toys as the solder was different and reacted differently. It was not easy."*[90]

The consultants assume that complications with solders were more relevant for toys with primary electric functions that have already come into scope under RoHS 1, whereas in toys with secondary electric functions, electric components will more often be provided by suppliers, making compliance easier. It is not known to what degree this assumption would clarify the easier compliance, however TIE estimate in this regard that given sufficient time, compliance should not be problematic "*Toy manufacturers of toys with a secondary electrical function (new in scope) will be compliant at the date of entry into force of the new obligations. In fact, manufacturers, who need around 18 months to prepare and design new products, are already taking these new obligations into account. As RoHS-compliant components are already available on the market, no big hurdles are expected*."

The consultants thus conclude that achieving compliance by 2019 should not be a problem for the toy industry. If the date of compliance was moved to 2017, as long as it could be ensured that industry would be notified at least 18 months ahead of time (mid 2016), compliance would probably still be possible. In this regard however, the consultants assume that this may result in some negative financial impacts to business as it would require a change of business plan to ensure earlier compliance. It is unclear if compliance in this regard is still forthcoming in some cases (subsequently also resulting in associated environmental benefits) or if this mainly requires an administrative effort to guarantee that electric components, obtained from the supply chain, are indeed RoHS compliant.

Concerning Secondary Market Operations, TIE state that "*Toys are often kept in attics, collected by collectors or simply kept for many years for emotional reasons, and therefore the life expectancy of a toy can be very long. It is almost impossible to have accurate data on secondary market operations, but we can be sure that toys are part of many charity actions in Europe where second-hand products are sold at lower price or offered. In any case, these toys are compliant with the legal requirements applying at the time they were placed on the market for the first time*."[91]

In the consultants' opinion, though it is unclear what part of such products would fall under the definition of EEE newly in scope (in light of date placed on the market), it is understood that in such cases, such charity activities would have to adapt activities to comply with RoHS. This may result in a few scenarios: (1) Charities may choose to offer such EEE free of charge to avoid complications or otherwise (2) it would need to be discarded or (3) exported to non-

[90] Op. cit. TIE (2014).
[91] Op. cit. TIE (2014).

EU countries. Though the first and latter option may have benefits to society (in the EU or in other countries, respectively), they would result in higher costs/lower benefits for the charities. Discarding of such toys would have negative environmental costs as products would reach end of life early and charities would also have a loss of income in this regard, which facilitates their activities in general. Though it is unclear if implementing RoHS regulation in the context of charity sales is feasible, it can be understood that the current situation would lead to various costs that would be avoided if the secondary market aspect was resolved. Society may have lower benefit in this regard (as toys will not be given free of charge or supplied to countries outside the EU, however these are assumed to be balanced with the elimination of charity costs, which would result in less charity activities for society in light of less financial resources. Thus the environmental benefit would also be in favour of resolving this issue.

The following information was provided which provides some background for aspects of Reparability. The life time of toys is explained to be rather long. "*A recent TIE study from 2012 shows that the average life expectancy of a toy can be very long ... life cycle of an electric toy will obviously depend on the toy itself and the use the consumer makes of it. The study found that it is rare for toys to be thrown away. 19 out of every 20 toys are either stored or re-used after use, usually by passing the toy onto friends or family or donating to charity or nursery. Toys are generally kept in the house for a long time prior to being given up for re-use. Typically toys are kept for between 6 to 12 years. The mean time they are kept is 10 years... In general, toys are not subject to repairs, because it is much less cost effective to do this than for other more expensive products*"[92]

The consultants thus understand that despite the long life time of toys, repair may not be a common practice where use continues regardless of dysfunction of electrical components. For example, a teddy bear with a light function is assumed to remain in use as such, regardless of the operation of the light component. Articles where use would be discontinued in the event of electric malfunction, are assumed to already be in scope through RoHS1 since the electric components provide the main function in this case (such as in computer game devices). Against this background, this project category would be relatively indifferent to addition of a spare part provision.

To conclude, it is understood that Option 3 (the *2019 Scenario*) would be preferable for the toy sector, as it would solve the possible problems of secondary market operations. Such operations, mainly relevant in light of charity activities, are understood to have an impact on the environment, on society and on consumers and not to be a concern of industry. Though Option 4 (the *2017 Scenario*) is expected to solve secondary market operations as well, it may result in some costs for the toy industry as well as their supply chain, in light of need to reallocate resources to support earlier transition to RoHS compliance. From a comprehensive perspective, **Option 3 would thus be preferable**, as all other factors are understood to remain unchanged. The addition of a spare parts provision (*Option 5*) in Article 4(4) is not expected to have an impact on the toy sector, which would thus be indifferent to its implementation.

[92] Op. cit. TIE (2014).

7.5 Annex 5 Quantitative data on pipe organs

Table 12: Average UK organ builder income[93]

Average UK organbuilder income		
GBP	Conversion rate	Euros
25,900	1.18	30,562
Adjustment for UK purchasing power standard		
UK income in Euro	PPS conversion rate[22]	Adjusted UK income
30,562	0.89	27,200

Table 13: Average European organ builder income[94]

Average European organbuilder income based on UK						
Concentration of EU organbuilding jobs	Number of builders	Weight	GDP per capita in PPS 2010[23]	Conversion rate	EU average adjusted for pps in €	Weighted
Belgium	15	8%	119	1.19	32368.21	2582.57
France	14	7%	108	1.08	29376.19	2187.59
Germany	75	40%	118	1.18	32096.21	12804.34
Sweden	15	8%	123	1.23	33456.22	2669.38
UK	15	8%	112	1.12	30464.20	2430.65
Others	54	29%	100	1.00	27200.18	7812.82
Total	188	100%				
Average European organbuilder income						**30,487.35**

Table 14: Inflation rate adjustment

Inflation rate adjustment	
Average adjusted European organbuilder income	
2012	30487.35
2013	31097.10
2014	31719.04
2015	32353.42
2016	33000.49
2017	33660.50
2018	34333.71
2019	35020.38
2020	35720.79
2021	36435.21
2022	37163.91
2023	37907.19
2024	38665.33
2025	39438.64

[93] Based on Eurostat, GDP per capita in PPS, 2010, accessed at http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tec00114.
[94] Eurostat, GDP per capita in PPS, 2010, accessed at http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tec00114.

Table 15: Employment impacts

Direct costs of jobs losses			
Year	Accumulated job losses	Accumulated job losses based on 10,000 total	Accumulated job losses based on 11,000 total
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	30%	3000	3300
2020	40%	4000	4400
2021	50%	5000	5500
2022	60%	6000	6600
2023	70%	7000	7700
2024	80%	8000	8800
2025	90%	9000	9900
Total costs/yr by 2019		**15,008,735.48**	**16,509,609.03**
Total costs/yr 2020		**23,813,860.29**	**26,195,246.32**
Total costs/yr 2025		**59,157,958.50**	**65,073,754.34**