Activating Circular Services in the Electric and Electronic Sector

GA NUMBER: 776714

Deliverable 1.2. Guidelines for circular economic models in the E&E sector

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1. Executive Summary

This report forms part of WP1 of the C-SERVEES project, the main objective of which is to provide guidance for the successful implementation of circularity in the E&E sector. The research enabled the C-SERVEES project to engage extensively with stakeholders in the EEE value chain that could provide valuable input to the development of CEBMs. This was performed via seven different stakeholder surveys and at two conference workshops aimed at the following groups in the EEE value chain:

- Designers of EEE
- Suppliers to manufacturers of EEE
- Manufacturers of EEE
- EEE Retailers
- Business users of EEE
- Household users of EEE
- WEEE handlers

The survey received over 1,300 responses and, although the results provided several surprises, there were many commonalities between the stakeholder groups, particularly those in the EEE supply chain, that have allowed recommendations to be made with some confidence. Results were discussed extensively with partners, especially from the manufacturing sector, and their appraisal and feedback on the results are incorporated into this report.

The recommendations provided are aimed at giving guidance for the next steps in the C-SERVEES project, which focus on the development and adoption of the CEBMs. The comments within each recommendation reflect the results of the consultation of stakeholders and subsequent discussion of the results. These are listed in a loose order of priority, though it should be stressed that there is very little difference in the level of priority between one and nine.

1. *Make the business case to industry*

Industry appears unconvinced that there is a solid business and financial case for CEBMs. They rate softer opportunities like building trust and enhanced CSR above harder opportunities such as increased revenue. The advancement of circular economy requires a demonstration to business actors of the sustainability of CE practices as well as incentives to improve the financial viability, i.e. reduce costs and improve profit margins.

2. *Convince stakeholders of the benefits of the leasing model*

Leasing of products ranked low with all stakeholder groups. Previous research and examples suggest that leasing is a strong option for inclusion in CEBMs. The challenge is to shift the mindset of all stakeholders so that leasing of products is embraced.

3. *Create incentives*

Incentives geared towards return of products and improving ease of maintenance and repair are required to encourage the adoption and implementation of circularity. These should include fiscal incentives if the cost of repair, refurbishment and remanufacture continue to be of concern to stakeholders. In addition, certificates and guarantees should be used to help sell products.

4. *Engage in partnerships*

The actors in the value chain need to engage in partnerships. Manufacturers need to be made aware of the technical and operational requirements of WEEE treatment and WEEE handlers need to be informed of which materials are used to manufacture products. Furthermore, the cost and responsibility for implementing CEBMs needs to be shared by all stakeholders.

5. *Use ICT tools to share product information*

Knowledge of where products are and what they contain is essential for dealing with them at the end of their life.

6. *Provide training & education*

The adoption of circularity requires training around the basic principles of CE and the development of supporting tools so that all stakeholders understand and appreciate the concept.

7. *Harmonise and enforce legislation*

Authorities must be called on to harmonise legislation, regulation and enforcement in order to create equivalent market conditions and a level playing field at a global level. Different pieces of legislation in different countries should not contradict each other. Definitions and responsibilities need to be clear.

8. *Promote trust and enhanced CSR*

Considering that a vast majority of designers, suppliers, manufacturers and retailers identify building trust and enhancing corporate responsibility reputation as distinct economic opportunities, these should be built on and nurtured so that they strengthen and support CEBMs.

9. *Stimulate demand or supply*

The solution to the chicken and egg problem, i.e. circularity is not offered due to lack of demand, while demand for circular products and services fails to pick up due to lack of supply, is that the one or the other needs to be stimulated. More demand will call for its own supply, while more offering of CE products and services will create its own demand. The other recommendations should help to stimulate at least one of the two and this recommendation acts as reminder that this is key.

Contents

2. Acronyms and abbreviations

AB	Advisory Board
CE	Circular economy
CEBM	Circular Economy Business Model
CSR	Corporate Social Responsibility
E&E	Electrical & electronic
EEE	Electrical & electronic equipment
ICT	Information & Communications Technology
WEEE	Waste electrical & electronic equipment
WP	Work Package
WPL	Work Package Leader

3. Introduction

This report forms part of WP1 of the C-SERVEES project, the main objective of which is to provide guidance for the successful implementation of circularity in the E&E sector, based on consultation with stakeholders. The specific objectives of WP1 are:

- Engagement and consultation of relevant stakeholders throughout the entire EEE value chain.
- Analysis of technical, economic, socio-cultural, regulatory and environmental barriers and opportunities for the eco-innovative solutions proposed in the project.
- Identification of the requirements of stakeholders regarding circular economic models.

WP1 is divided into three different tasks that outline the working steps:

- Task 1.1 identified and defined the information that needed to be collected and produced the surveys that were used to collect this information.
- Task 1.2, the longest in duration, used surveys, as well as workshops, to collect quantitative and qualitative data from the different stakeholders.
- Task 1.3 is the analysis of the results of the consultation and a summary of these along with conclusions and recommendations are presented here.

4. Methodology

4.1. Developing the survey

The survey was developed during T1.1 and is the subject of a separate deliverable report[1]. For convenience a brief summary of this process is provided, and the surveys are contained in Annex A.

The initial stage in the development of the surveys set out to capture WPLs' requirements for the questionnaire surveys and supplemented these with a literature review. The next stage was to cluster the captured data and information into topics, which were then organised into the categories of:

- Circular economy awareness;
- Current practices relating to circular economy; and
- Circular economy opportunities, barriers and enablers.

The final survey structure was converted into a master survey draft, which was subsequently reviewed by WPLs.

Based on the initial stakeholder list (provided through Task 8.1), eight specific stakeholder groups were chosen, representing the key E&E supply chain actors and eight different

[1] D1.1 Survey Design and Planning

surveys were developed each focusing on one of these eight groups. These eight stakeholder specific surveys were reviewed by project partners and the AB. The final stage of survey development involved incorporating relevant feedback from partners and the AB in the creation of the final stakeholder surveys.

The eight stakeholder groups representing the key E&E value chain actors were:

1. Designers of EEE
2. Suppliers to manufacturers of EEE
3. Manufacturers of EEE
4. EEE Retailers
5. Business users of EEE
6. Household users of EEE
7. WEEE handlers
8. Consumer organisations

During follow-up discussion between partners, the eighth stakeholder group, consumer organisations, was dropped from the survey in favour of asking these groups to target their members with the relevant survey from the other seven groups.

4.2. Delivering the survey

The WEEE Forum was the lead partner for T1.2, which focused on delivering the survey, and all other partners in the project had time assigned to this task.

The final surveys were entered on Google Forms to allow participants to respond easily online and for answers to be drawn together quickly for analysis. The uploaded surveys were in English, Italian, Spanish and Turkish which enabled the project partners to optimise the targeting of their networks.

Targets for survey returns were set for each of the seven stakeholder groups as shown below. These targets did not represent a statistically significant sample apart from for household users which was significant at European Union member state level. However, the target did represent a realistic expectation, based on experience of similar surveys, and would give the project enough evidence to be able to draw conclusions. The targets are shown in Table 4.2.a below.

Table 4.2.a: Survey targets per stakeholder group

Designers	Suppliers	Manufacturers	Retailers	Business Users	Household Users	WEEE Handlers	TOTAL
50	100	100	100	200	700	100	1,350

Each partner was also given a target for the number of surveys it had to collect per sector. The quantity for each partner per sector was based on the position in the value chain of that partner. For example, the product manufacturers were set higher targets in the

designers and suppliers stakeholder groups and the recyclers were set higher targets in the WEEE handlers' group because they had direct contact with these groups.

The survey was promoted through social media channels, newsletters, during presentations at events and through websites. This was done at project-wide level using the project social media accounts and website and individually by each partner and by members of the AB. In addition, partners contacted their networks via email and by telephone, making personal requests for participation in the survey. The survey was also sent to the C-SERVEES network, a group of individuals that had registered an interest, through an electronic form on the project website, in being kept up to date on project progress and being involved in the research.

Newsletter articles, a covering email and Tweets were created by the project and distributed to partners and the AB for their use in order to reduce the effort required to promote the survey. An example of the generic article – this is taken from the WEEE Forum newsletter - is shown in Figure 4.2.1 below, along with an example Tweet from the C-SERVEES Twitter account.

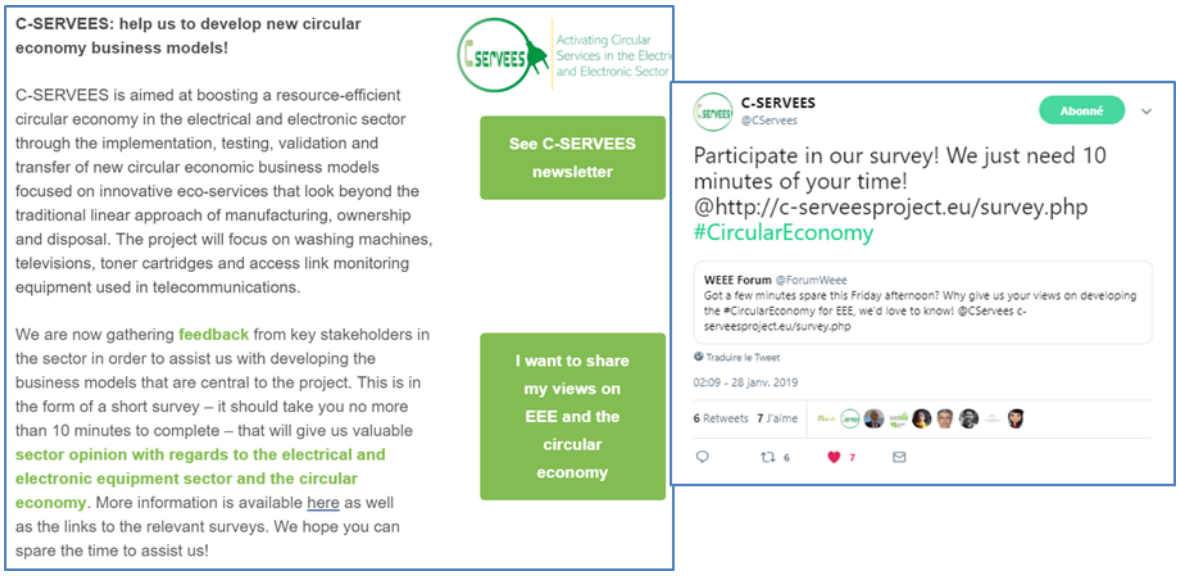


Figure 4.2.1: Example media promotion for the survey – newsletter extract and Tweet

The survey was undertaken between early November 2018 and the end of March 2019.

4.3. Workshops

In addition to the survey, Task 1.2 also sought to solicit stakeholder feedback through workshops. Two of these were held, the first at the CARE Innovation Conference in Vienna on 28 November 2018 and the other at the IMPEL (EU Network for the Implementation and Enforcement of Environmental Law) Making the Circular Economy Work conference in Rome on 21 March 2019. At the former, attendees debated the question 'Is circularity possible in the EEE sector?' after being provided with an overview of the project and presentations giving, firstly, a cynical view of circularity in the E&E sector and, secondly, a more positive view providing successful examples of circularity on the E&E sector. At

the latter conference a presentation of interim results was given and discussed by the audience; the audience also gave their wider views on the question of circularity in the E&E sector. All stakeholder groups apart from suppliers were represented across the two events with around 120 people attending in total. The results of these discussions are provided below in Section 5.

5. Results

This section discusses the results of the survey and of discussions at the workshops. It provides information on response rates, general comments on the results, discussion of specific aspects of the results and an overview of correlation analysis.

The results were analysed by C-SERVEES partner Exergy. This analysis was performed on each question in each stakeholder survey and on questions common to the different stakeholder groups to enable answers to be compared. All charts showing the results of the survey are contained in Annex B.

5.1. Survey returns

The number of surveys returned is shown below. The targets are also shown in this table alongside the proportion of surveys returned against targets.

Table 5.1.a: Survey returns versus targets

	Designers	Suppliers	Manuf-acturers	Retailers	Business Users	Household Users	WEEE Handlers	TOTAL
Survey returns	92	41	93	30	102	857	88	**1,303**
Target	50	100	100	100	200	700	100	**1,350**
% of target achieved	184%	41%	93%	30%	51%	122%	88%	**97%**

As can be observed, the targets for the surveys for designers and household end users were exceeded. For manufacturers and WEEE handlers the returns were also good, although slightly below target. Only 51% of target was reached for business users but the quantity returned (102) was enough for the statisticians analysing the data to do so with some confidence in the conclusions (based on their past experience of similar analysis). For suppliers and retailers, the returns were well below target. With both these stakeholder groups the engagement process proved difficult. For suppliers it was affected slightly by the ban on Google in China where numerous suppliers were based; Word versions of the survey helped to partially overcome this. For the retailers, the survey proved to take too long to complete in the time available to contacts.

The level of returns for household end users means that conclusions can be drawn at Europe Union member state level but for the other groups the answers can only be claimed to represent the respondents to the survey and not a wider group.

Overall, there was a return of 1,303 surveys against a target of 1,350, which is 97% of the overall target.

5.2. Geographic coverage of responses

As C-SERVEES is funded through the EU's Horizon 2020 programme, it is, in essence, Europe-centric, so the majority of responses to each of the surveys were from Europe. At sub-European level, the responses tended to come from those countries in which the C-SERVEES partners are based because this is where the networks of project partners are also based, these being:

- Austria
- Belgium
- Croatia
- France
- Germany
- Italy
- Netherlands
- Norway
- Portugal
- Romania
- Spain
- Turkey
- United Kingdom

Another factor in response rates per country is language; more responses were received from countries into whose primary language a survey had been translated. However, this is not to say that there was not a good geographic spread of responses as Figure 5.2.1 shows.

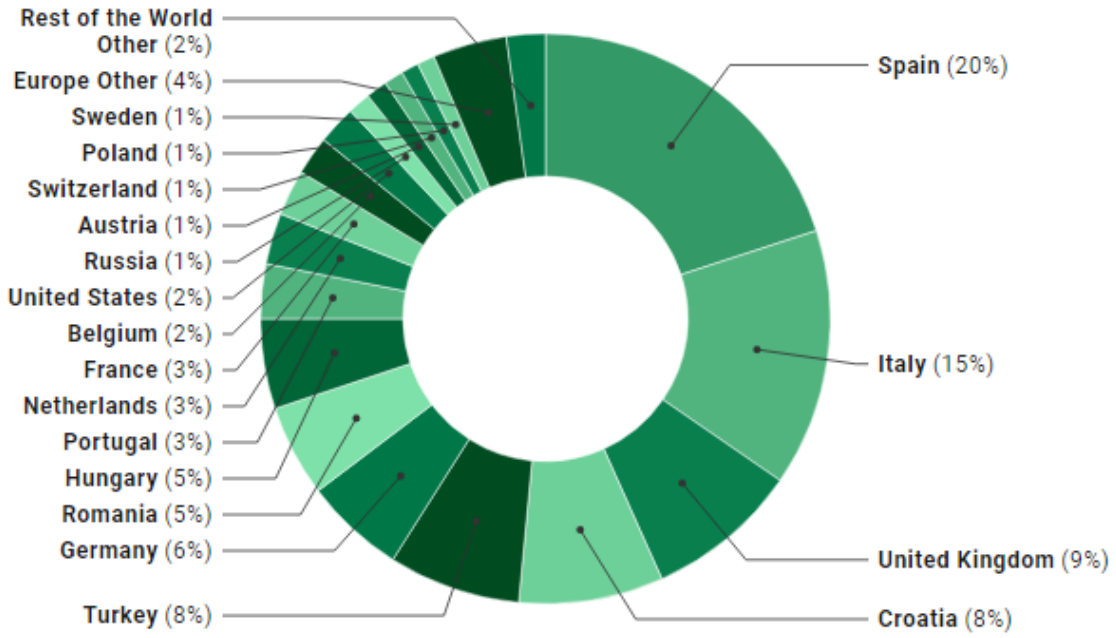


Figure 5.2.1: Distribution of responses per country for all stakeholder groups

This good geographic spread was also generally present in the other stakeholder groups but was less favourable in the designers' survey where 41% of the 92 respondents were from Turkey.

5.3. General comments on the results

The complete set of analysed results was shared with those partners contributing to T1.3 (Circularise, Ecodom, Electrão, Loughborough University, Remedia and SAT), those WPLs not involved in T1.3 (Aimplas, Gaiker, RINA-C and Vertech), the partners that are E&E manufacturers (ADVA, Arcelik and Lexmark) and the AB (18 industry experts). General comments from these organisations and individuals on the results are noted here and more specific observations and conclusions are shared in Section 5.4.

5.3.2. Spread of responses

One important point to note at the outset is that the responses stakeholders provide differ, but less significantly than one might expect. For example, most manufacturers seem to see opportunities in all areas. However, most also seem to think that there are significant challenges everywhere at the same time meaning there appear to be big opportunities as well as big challenges. This occurs across most questions for all stakeholder groups. This might suggest that, while discussion on CE has been ongoing for many years, individuals' thinking is not, on the whole, so advanced. Intriguingly, however, there is quite a lot of consensus on what the biggest challenges and opportunities are. The 'top' and 'bottom' answers are consistently common across numerous groups.

This situation makes the results less easy to draw conclusions from because it could be argued that all options are important given that it is generally the majority of respondents

that note agreement or significance with each answer. In order to overcome this challenge and draw reasonable conclusions, the authors have looked at the degree of agreement or significance against each statement for each question and ranked them from highest to lowest. As a result, where 'rank' is talked about in the discussion of the results, this refers to the relative degree of agreement or significance attached to a statement. Consequently, in the chart shown in Figure 5.2 below, 'design and manufacturing for product reuse, maintenance etc.' would be considered the highest ranked and most significant opportunity and blockchain the lowest ranked and least significant opportunity (although the level of 'don't know' answers should also be taken into consideration in the latter, which is discussed below).

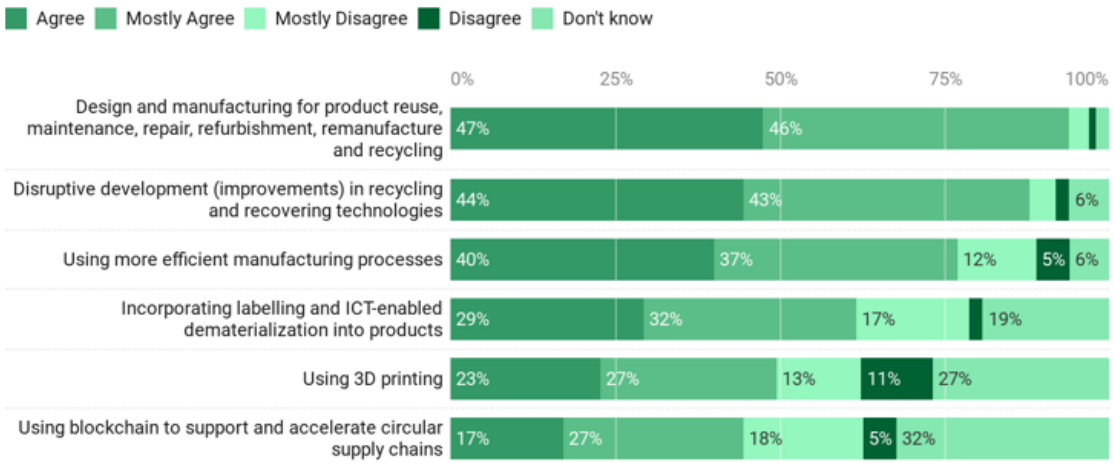


Figure 5.2.1: Manufacturers' assessment of the technical opportunities for enhancing their business through the adoption of CEBMs

5.3.3. Revealed preferences

The question in the business end users' and household end users' surveys, 'Please rate your level of agreement that the following factors influence your decision to purchase electrical and electronic products' seeks to obtain information on purchasing intent and does not show consumers' revealed preferences. It was commented by a member of the AB that EEE manufacturers and retailers often survey consumers after their purchase to see why they decided to buy a certain product. In almost all cases the primary reasons are still price, functionality, features, brand and design, but rarely sustainability, which typically shows up as a reason lower down the list, usually ranked six to eight. The project needs to consider this in its subsequent phases.

5.3.4. Bias

Some of the responses seem to be dominated by respondents from just a few countries whereas other sets of responses are such that, if one adds up 'major' and 'significant' challenges, the result is (almost) always higher than 75%. The former might possibly indicate that the results have been biased by nationality or geographic conditions, whilst

the latter might be interpreted to mean that those respondents were 'locked into' the major/significant options.

5.3.5. Surprising results

A comparison of designers, suppliers, manufacturers and WEEE handlers reveals some results that are counterintuitive. Manufacturers care about "insufficient interest from customers" less than other stakeholder groups, and for "negative perception of recycled content in new products", manufacturers are less worried than the others. In addition, it would not be anticipated that "ensuring financial viability of takeback schemes" is more important for designers than for manufacturers.

Further to this, retailers strongly favour "Reuse and easy maintenance and repair of products" where it might be assumed that they still consider selling products as their main source of income. Indeed, it was commented in one of the workshops that the sales team of a large manufacturer had made very negative comments regarding moving from selling to leasing and the affect this would have on revenue streams.

Blockchain and 3D printing are not considered strong enablers for circular economy as they consistently rank in the lowest two answers for 'strongly agree' and 'agree'. Blockchain may not have been fully understood by respondents as it was generally the case that a significant proportion of respondents answered, 'don't know' when asked if they saw it as a technical challenge – this was 33% of respondents to the WEEE handlers' survey and 32% for the manufacturers' survey. Moreover, some stakeholder groups cite tracking of products as a significant technical challenge (designers, suppliers and retailers) and others, knowledge of the content of products as a technical challenge (suppliers and, unsurprisingly, WEEE handlers). Tracking and content information are both things that blockchain can offer.

It was anticipated that 3D printing would be considered a strong enabler as suppliers do not have to produce spare parts in advance, store them in a warehouse and ship them to the customer when needed, or, if nobody needs them, dispose of them. With 3D printing the supplier can simply store a digital file and print it on demand where it is required. It is possible that the results of the survey indicate that 3D printing is seen as useful in the repair of products produced in smaller quantities and may not be so applicable to mass market products.

Data security is much less of an issue than previous surveys have suggested although it is still the majority of respondents that see it as an issue (53%-66%) as Figure 5.3.2 shows. A survey conducted in 2003 by SAT[2] revealed that at that time it was the biggest concern of users with more than 90% highlighting this.

[2] "IT on demand" project, SAT (funded by the City of Vienna), 2003

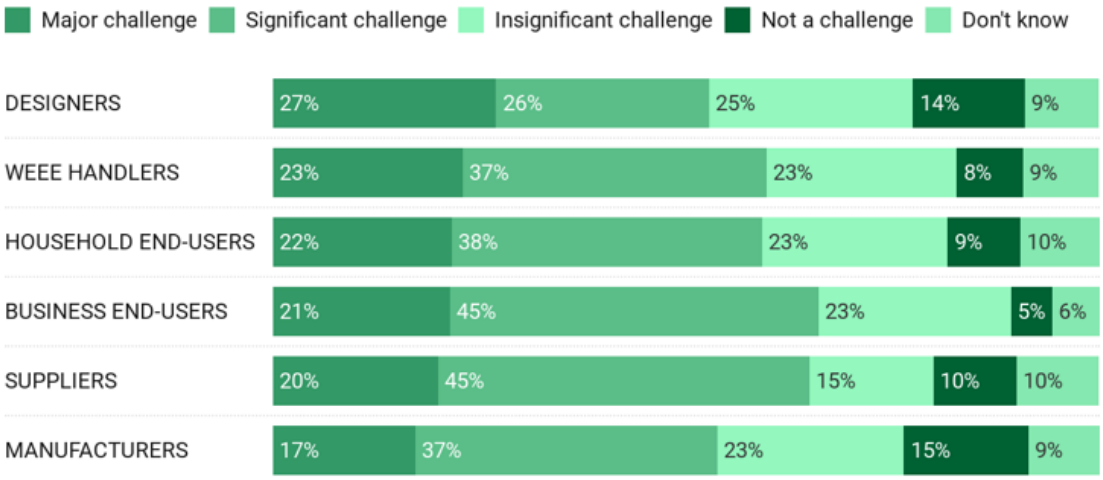


Figure 5.3.2: Responses to statement that 'concerns over personal and/or organisational data security' is a challenge

5.3.6. Variance between stakeholder groups

Unsurprisingly, the different stakeholder groups view the main challenges differently. Suppliers, for example, see everything as less of a challenge than all the other stakeholder groups. Retailers see the social aspects as the most difficult challenges; in the five areas they were questioned, of all the stakeholder groups they had the highest level of agreement for four of them. WEEE handlers score many of the business and management challenges more highly than the other stakeholder groups.

5.4. Main observations from the survey

5.4.1 Renting and leasing

There seems to be broad discomfort with renting and leasing products as this consistently ranks lowest, or among the lowest, across the different questions and stakeholder groups. Surprisingly, for both businesses and households, affordable and reliable leasing services appear to present insignificant opportunities and are not perceived as social enablers. The fact that products are associated with leasing services does not influence end users' decision to purchase electrical and electronic products. Possibly as a result of that fact, manufacturers do not rank highly the absence of renting and leasing services on offer as economic or social challenge (see Figure 5.4.1.4.1 below) and all respondents, except WEEE handlers and suppliers, say that renting and leasing offer no CEBM adoption opportunities.

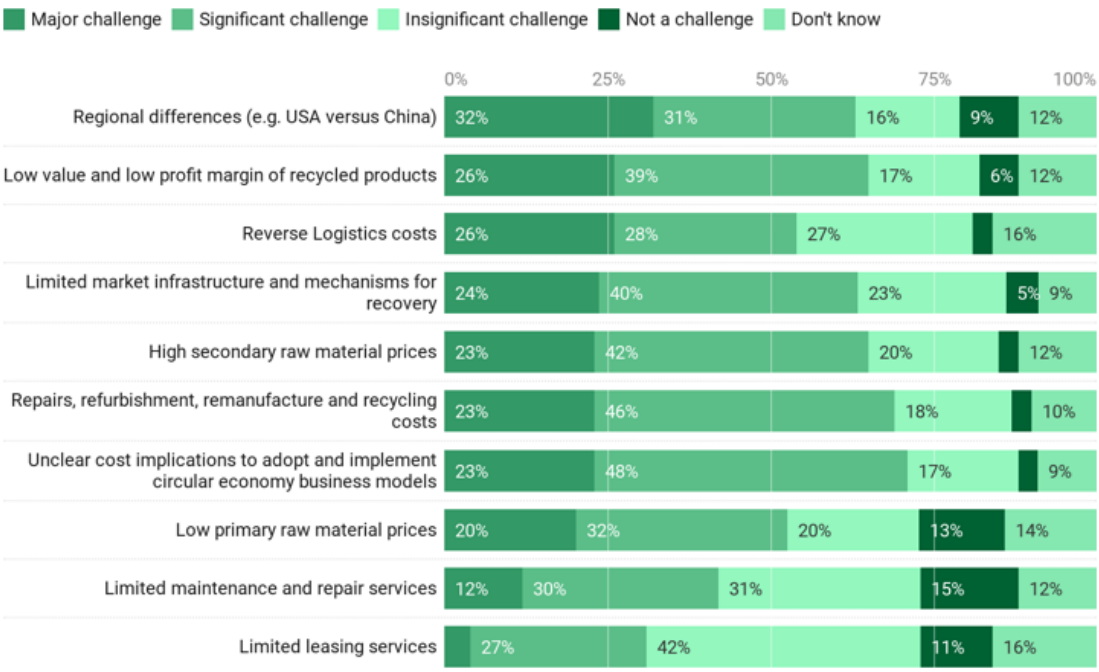


Figure 5.4.1: Manufacturers' assessment of the economic challenges that could impede implementation of CE practices

Overall, looking at the comparisons between how stakeholders responded with the highest level of agreement/disagreement there seems to be a lack of understanding about leasing and renting and its connections to the circular economy. For example, five of seven stakeholder groups that were asked had the highest level of disagreement that renting or leasing is a CE opportunity, three out of five stakeholder groups the highest level of disagreement that limited leasing services is a social challenge, six of seven the highest level of disagreement that affordable and reliable leasing services are a social enabler to CE and four of four the highest level of disagreement that disseminating the benefits of renting and leasing is a CEBM enabler.

These findings are prima facie contradictory to the literature on CE which says that leasing leads to more durable products which have longer use phases and are therefore more circular. The findings suggest that stakeholders need to be convinced of the actual business opportunities they are currently overlooking, leasing services need to be better marketed with the public at large, which should include incentives to influence the supply of leasing services, and a shift of mindset is required by the public; all things for the wider C-SERVEES project to investigate further.

5.4.2. Longevity of products

The flip side of leasing being viewed as not having such importance is that businesses and households single out ownership of products as the most interesting business model. Furthermore, design and manufacturing for reuse, repair, remanufacture, refurbishment and upgrade have the most relevance attached to them by designers, manufacturers, retailers and WEEE handlers as major technical opportunities.

Both businesses and household users indicate that durability and extension of lifetime (repairability) have a major influence in purchase decisions (see Figure below). However, the fact remains that consumers currently tend to replace products rather than have them repaired and the costs associated with repair, refurbishment, remanufacturing and recycling are most frequently singled out in the survey by suppliers, end users and WEEE handlers as the biggest challenge.

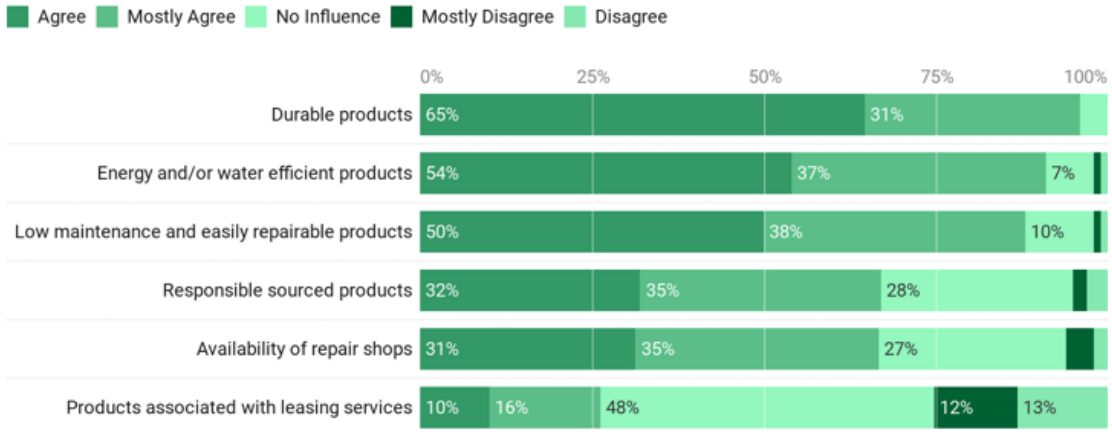


Figure 5.4.2: Household end users' level of agreement that different factors affect their decision to purchase EEE

Business and household users also rank the presence of product certificates and guarantees highly, both of which provide comfort that the product will be durable or be replaced. The other stakeholder groups do not attach as much significance to this.

Designers, manufacturers and retailers highlight lack of knowledge of circular products and practices as a key social challenge. Unsurprisingly, ensuring financial viability of circular products and fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale are the economic enablers that rank higher than most. Consequently, it seems that incentives geared towards return of products and improving ease of maintenance and repair are required to encourage the adoption and implementation of circularity.

5.4.3. Recycling and recovery

Alongside design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacturing or recycling, recovery of useful materials from end-of-life products – which is the most prevalent (traditional) business model – is the element that has been named most frequently by designers, suppliers and manufacturers as presenting considerable opportunities.

In addition, retailers rank improvements in recycling and recovery technologies as the highest technical opportunity. Similarly, manufacturers are demonstrably aware that innovative resource efficient recycling and recovery processes and design and manufacturing for re-use and circularity are technical enablers. Suppliers, manufacturers and WEEE handlers also say that viable WEEE recycling technologies are key supply chain enablers.

Figure illustrates the importance attached by WEEE handlers to design and manufacturing for reuse, maintenance, repair, refurbishment, remanufacture and recycling, and the development of improved technologies for recycling and recovery. This is typical of the responses across the stakeholder groups. The chart also reiterates the low ranking, and low understanding – 'don't know' responses - of blockchain and 3D printing noted earlier.

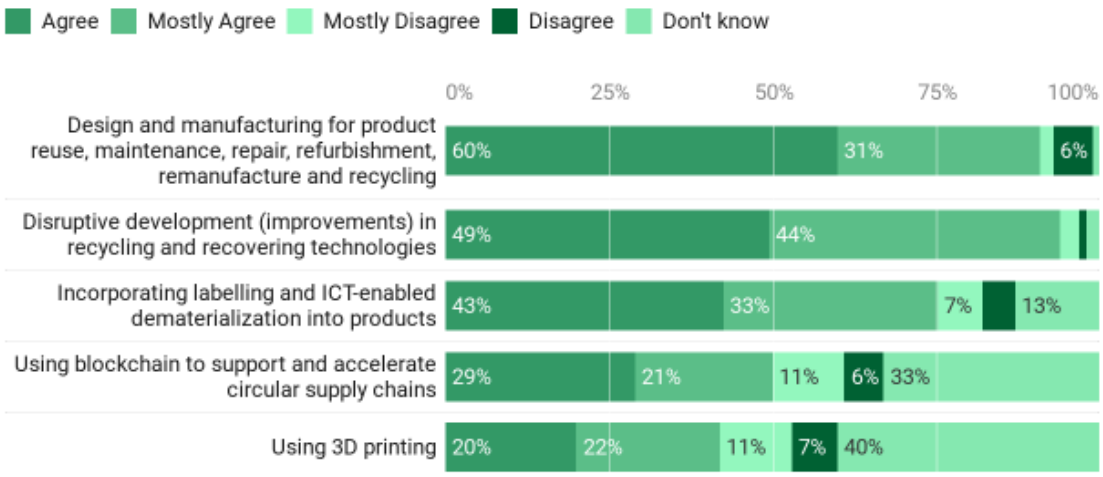


Figure 5.4.3: WEEE handlers' assessment of technical opportunities for enhancing their business through the adoption of CEBMs

5.4.4. Supply chain

Both suppliers and WEEE handlers indicate that partners in the supply chain insufficiently collaborate with each other; most WEEE handlers indicate that this is a major CEBM implementation challenge. This seems to suggest that the different actors in the value chain need to engage in partnerships, for example manufacturers need to be made aware of the technical and operational requirements of WEEE treatment.

Furthermore, the consistent shifting of supply chain challenges into other parts of the supply chain is interesting. As one of the manufacturing partners in the project notes, this indicates a dangerous trend of overly shifting responsibility to other organisations in the supply chain, a trend generally seen in the context of sustainability and related transparency reporting and assessments. It is dangerous because, at least for some manufacturers, it can easily produce unacceptable amounts of effort in supply chain management. In addition, nobody is willing to pay the higher cost of this effort further down the value chain. Together, this means that the complete value chain must cooperate and share benefits and cost in a fair way.

5.4.5. CE knowledge and training

One element that the survey highlights as seeming to be slowing down the adoption of CE principles in businesses and among WEEE handlers is the lack of awareness, skills and

technical knowledge regarding CE issues. Similarly, suppliers (see Figure 5.4.4), manufacturers and WEEE handlers single out the enhancement of CE knowledge and skills as distinct social opportunities and retailers note insufficient customer interest in CE as the most relevant business and management challenge.

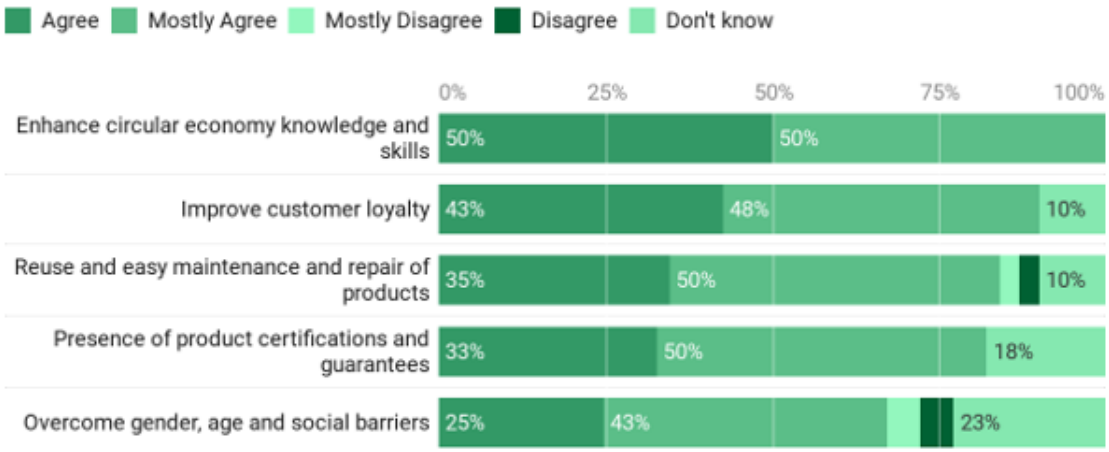


Figure 5.4.4: Suppliers' assessment of social opportunities for enhancing their business through the adoption of CEBMs

Training around CE requirements and the development of supporting tools are, therefore, required to advance the adoption of circularity. Indeed, this is already a focus of the C-SERVEES project, following consultation with the project's AB, and is being integrated in the work on the key enablers for replicability and transferability of the CEBMs. It should be noted, however, that both businesses and households indicate that they disagree that limited best practice CE demonstration projects constitute a major technical challenge and a vast majority of respondents, across the board, indicate that additional government funding for CE skills training is not an economic enabler.

5.4.6. Regulation and legislation

Most stakeholders single out lack of regulatory consensus and varying levels of enforcement of legislation as the biggest legislative challenge (see Figure). They consider it important to operate in various markets under equivalent conditions. Similarly, any initiative that fosters global regulatory consensus is seen by both manufacturers and WEEE handlers as the biggest legislative enabler. Authorities need to consider harmonising their legislation and improve enforcement of the legislation they adopt.

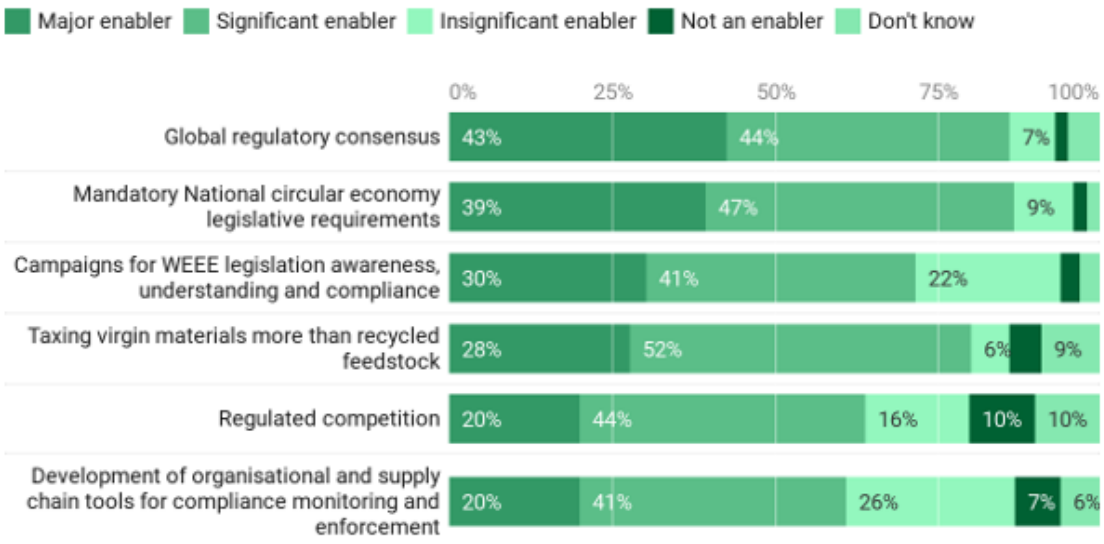


Figure 5.4.5: WEEE handlers' assessment of legislative enablers that could drive the implementation of CE practices

Taxing virgin raw materials is viewed as the most significant legislative enabler by retailers although this is not ranked highly by designers, suppliers or manufacturers.

5.4.7. Business case

The majority of WEEE handlers indicate that the business case for circular economy is insufficiently clear, while most manufacturers say that the added value of adopting circular economy business models and the costs associated with their adoption and implementation also remains unclear. Presumably this is due, among other things, to the high costs associated with repair, refurbishment, remanufacturing and recycling of end-of-life products and unclear quality of materials from recycling. This seems to indicate that a demonstration to business actors of the sustainability of circular economy practices as well as incentives to improve the financial viability, i.e. reduce costs and improve profit margins, is required.

One of the manufacturing partners in the project made further comments on the business case based on their own experience. They noted that recycling and reusing material is not a technical challenge and they have not experienced customer perception issues regarding this. The main issue they face here is the availability, quality and high cost of such material. The results of the surveys of suppliers and manufacturers concur with the issue of high price of secondary raw materials, whereas the designers and retailers do not rank this highly. This high price is certainly judged in comparison with its alternative, i.e. primary raw materials, but, interestingly and as noted earlier, the introduction of a tax on primary raw materials is not a great priority across all stakeholder groups.

The greater challenge is in remanufacturing and refurbishing and principally this is in getting the product back at its end of life stage. This challenge centres on the cost of

collection, on identifying where the product is and establishing if the product is of sufficient quality to make it available for refurbishment.

Furthermore, in most instances, assuming the consumer wants a product that is equivalent to new, remanufacturing is not less expensive than producing a brand-new item. Here there is a major end user perception issue; they believe a remanufactured product should be less expensive as it is viewed as being of potentially lower quality.

5.4.8. Demand and supply

The demand for and supply of circular products is linked to the business case discussed above. Most suppliers and manufacturers indicate that the limited offering of circular products is a major supply chain challenge. Conversely, most respondents, across the board, say that the availability and accessibility of product repair and replacement services are key social enablers (see Figure 5.4.6). This, however, raises the chicken and egg problem: circularity is not offered due to lack of demand, whilst demand for circular products and services fails to pick up due to lack of supply. The one or the other needs to be stimulated for this issue to be addressed.

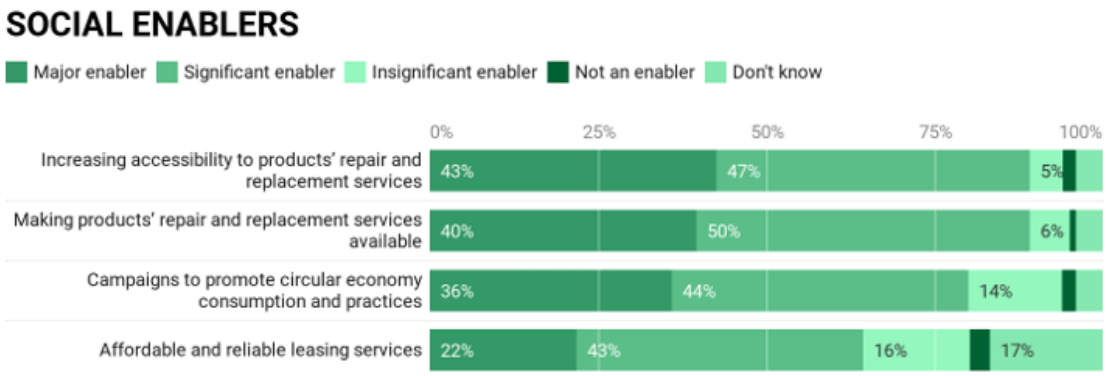


Figure 5.4.6: Business end users' assessment of social enablers that could drive the implementation of CE practices

5.4.9. Trust and corporate social responsibility reputation

All of designers, suppliers, manufacturers and retailers identify building trust and enhancing CSR reputation as distinct economic opportunities, these are usually ranked in the top two of ten statements on economic opportunities and always in the top three (Figure 3 shows the results for manufacturers). Only WEEE handlers do not place such a significance on it, viewing new markets and new revenue streams as more important. This could illustrate that industry does not identify CEBMs as being directly associated with new business, but that new business only comes through enhanced reputation and increased trust. It also confirms the results relating to the business case, where industry does not see a strong case for circularity and places emphasis on fiscal incentives as ways to stimulate the market for circular products.

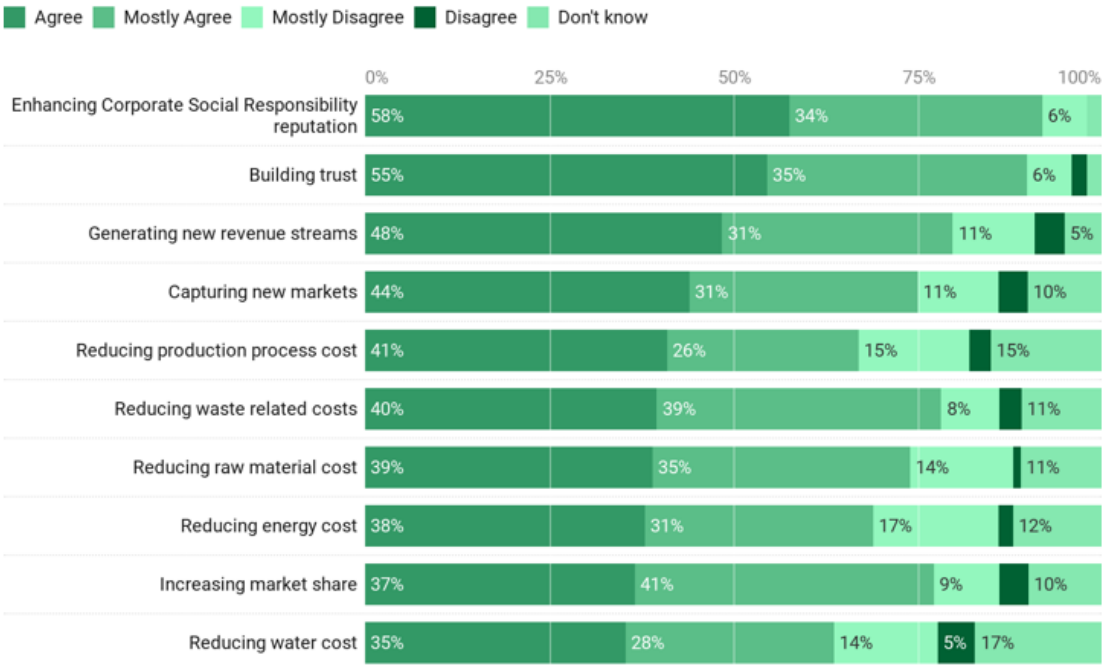


Figure 3: Manufacturers' assessment of economic opportunities for developing CEBMs

5.4.10. Other

Limitations A vast majority of respondents, except in the household end user survey, seem to agree that the technical limitations in different circular economy loops are major technical challenges.

Management Most designers, manufacturers, suppliers and WEEE handlers agree that a long-term management approach to circular economy is the most important business and management enabler.

End-users Business end-users and household end-users often evaluate challenges and opportunities similarly.

5.5. Items of note arising from the workshops

Numerous themes came out in the discussion at the CARE Innovation conference on 28th November 2018 and at the IMPEL, Making the Circular Economy Work conference on 21st March 2019, which corroborate the conclusions arising from the survey. The ideas noted below came out in these workshops.

5.5.1. Price

Electronics are one of the few consumer items that are becoming less expensive, they are no longer items for life. The low-price works against a leasing model and against consumers considering the items as long-term purchases. It was noted that the fact consumers are generally happy with less expensive items means the sector is wary of delivering higher priced goods even if these are better quality and longer lasting. Consumers do not understand the difference between total lifetime costs and one-off

costs, and they are still buying items for the prestige of ownership as well as for the service provided.

Furthermore, price is absolutely key in the sector. Only one-quarter of the cost to the consumer is in production, the rest is in logistics and marketing etc. Higher priced items, such as MRI scanners, are more likely to be recycled or reused because it is financially viable. However, contrary to this, there are numerous service models in B2B for which the items are not designed differently, there is only a different finance model. Items that are leased need to be declared on the balance sheet. In other words, in some cases all it takes is an adjustment of the finance model rather than the type of products or services.

One metal recycler present during the CARE Innovation workshop has worked extensively with the car industry and notes that this sector is talking a lot more about CE than the electronics sector. Part of the reason noted for this is cost because cars are expensive and EEE is generally not expensive. This means that EEE is easily bought and replaced, whereas cars are less accessible, leading to the increased popularity of non-purchase finance options, such as leasing, where the car is never owned by the user.

5.5.2. CEBM

There are some businesses already implementing CEBMs that do not necessarily broadcast this. For example, there are some leasing models developed in asset management teams and in consumer goods that are well established and accepted by the consumer. Satellite TV boxes and routers for home internet are two instances where both remain the property of the company supplying the service of TV channels or internet access.

A neat illustration of this is a telecoms provider in France that each year has returned to it a few million home TV boxes. It largely reuses the inner components but discards and replaces the outer casing. It does not redistribute or market the boxes as brand-new items but has found that the customer prefers them to appear new, which is why the outer casing is replaced giving the impression of a new product.

One manufacturer present at the discussion is focussing on design for circularity and beginning to look at business models. It noted that CEBMs always make the process more expensive. If a company spends €1-2m on product development, the business model must be very solid. It is not easy to have a solid business model that is also circular. Another of the manufacturers present is working on service business models adding further evidence that the sector is advancing its thinking in this area.

5.5.3. Benefits and costs

Manufacturers should look at the benefits of moving to CEBMs as well as the costs. There is an example of a Dutch washing machine manufacturer that moved to offer a lease and servicing package for its machines. This gave them a valuable insight into the technical weaknesses of their product because they were responsible for repairing faults and

receiving broken machines. This enabled them to work on these weaknesses and reduce the number of faulty items returned.

5.5.4. Policy, legislation & regulation

There is a need for stronger policy to drive the adoption of CEBMs. Legislation should not only be placed on design but on reuse and recycling as well as raw materials – tax is still on labour and not on raw materials, which works against the circular economy because it does not discourage the use of raw materials. Some discussions have taken place in Nordic countries where legislators urged the EEE sector not to push for new legislation, because this is already prevalent for EEE, but to get agreement amongst stakeholders on an approach they should take. However, it proved difficult to get all stakeholders to agree and be bound by a single approach; one reason was the ability to audit adherence to agreements, for example testing for recycled content in products is difficult.

The WEEE sector is hugely affected by illegal handling of waste, with just one third of WEEE in the EU being treated through official routes. Increased regulation is required to improve this situation and, in some countries, such as the Netherlands and Ireland, the WEEE sector funds regulators to try and decrease the amount of WEEE being illegal treated.

Legislation on waste can work against recycling and reuse. For example, one telecoms company has 50,000 waste components originating in the UK. It wishes to recycle these in Germany but if they are classed as 'waste' this causes a lot of issues in the journey from the UK to Germany. The same applies to any cross-border movement of items classed as waste even if they are destined for a better facility. The cost to the manufacturer of getting products or components returned to them is a barrier to CE.

Some legislation works against other legislation because directorates in the Commission do not always communicate, resulting in items of legislation that inadvertently clash. There is useful legislation in existence e.g. the reuse levy in France, but it is a challenge deciding if one product is more useful than another and enforcement can be difficult.

5.5.5. Other

Product lifespan A short product lifespan is a good argument for leasing EEE. The lifetime of software can often cause this short lifespan, where it stops working before the hardware stops working.

Design Durability should be an aspect of any CEBM Design is one of the main reasons for lack of CE in the EEE sector. Design changes are important as design affects when repair becomes too expensive or impractical, so also affects obsolescence.

Consumer confidence in repaired and refurbished products Consumers need to have confidence that repaired and refurbished products represent a worthwhile and durable purchase. Standards in repair would help instil this confidence as would the availability of warranties and guarantees.

Consumers Any CE model must revolve around the consumer and what the consumer wants. It is too easy to blame low demand for the lack of CEBMs and companies need to accept the responsibility for marketing items that fit with CEBMs.

5.6. Correlation analysis

Analysis was performed to test if there is correlation between the answers supplied and certain attributes of the respondent. This was undertaken to establish if there were different attitudes to E&E and the circular economy depending on these different attributes. The attributes that were tested were:

- Age range;
- Education level;
- Country;
- Europe vs. rest of the world;
- Years of industry experience;
- Size of company.

This information was not collected for all stakeholder groups but at least two of the attributes were available for each group, thus enabling some analysis to be performed for each stakeholder.

The analysis found that there was no correlation between the attributes and the answers given in any of the stakeholder groups. This means that attitudes towards E&E in relation to the circular economy are not necessarily affected by the attributes noted above. Furthermore, that different approaches do not have to be made to different groups of people depending on these attributes. For example, different approaches do not need to be made in different countries.

6. Conclusion and recommendations

6.1. Conclusion

This research enabled the C-SERVEES project to engage extensively with stakeholders that are relevant to the project and can provide valuable input to the development of CEBMs. The receipt of over 1,300 survey responses is considered a success, although two groups, suppliers and retailers, are under-represented.

Although the results provided several surprises, there were many commonalities between the stakeholder groups, particularly those in the EEE supply chain, that have allowed recommendations to be made with some confidence.

6.2 Recommendations

The recommendations provided here are based on the analysis of the results of the survey and the discussions held at the two workshops. They are aimed at providing guidance for the next steps in the project which focus on the development and adoption of the CEBMs. These are listed in a loose order of priority, though it should be stressed that there is very little difference in the level of priority between one and nine.

1. Make the business case to industry

Industry appears unconvinced that there is a solid business and financial case for CEBMs. They rate softer opportunities like building trust and enhanced CSR above harder opportunities such as increased revenue. The advancement of circular economy requires a demonstration to business actors of the sustainability of CE practices as well as incentives to improve the financial viability, i.e. reduce costs and improve profit margins.

2. Convince stakeholders of the benefits of the leasing model

Leasing of products ranked low with all stakeholder groups. Previous research and examples suggest that leasing is a strong option for inclusion in CEBMs. The challenge is to shift the mindset of all stakeholders so that leasing of products is embraced.

3. Create incentives

Incentives geared towards return of products and improving ease of maintenance and repair are required to encourage the adoption and implementation of circularity. These should include fiscal incentives if the cost of repair, refurbishment and remanufacture continue to be of concern to stakeholders. In addition, certificates and guarantees should be used to help sell products.

4. Engage in partnerships

The actors in the value chain need to engage in partnerships. Manufacturers need to be made aware of the technical and operational requirements of WEEE treatment and WEEE handlers need to be informed of which materials are used to manufacture products. Furthermore, the cost and responsibility for implementing CEBMs needs to be shared by all stakeholders.

5. Use ICT tools to share product information

Knowledge of where products are and what they contain is essential for dealing with them at the end of their life.

6. Provide training & education

The adoption of circularity requires training around the basic principles of CE and the development of supporting tools so that all stakeholders understand and appreciate the concept.

7. Harmonise and enforce legislation

Authorities must be called on to harmonise legislation, regulation and enforcement in order to create equivalent market conditions and a level playing field at a global level. Different pieces of legislation in different countries should not contradict each other. Definitions and responsibilities need to be clear.

8. Promote trust and enhanced CSR

Considering that a vast majority of designers, suppliers, manufacturers and retailers identify building trust and enhancing corporate responsibility reputation as distinct economic opportunities, these should be built on and nurtured so that they strengthen and support CEBMs.

9. Stimulate demand or supply

The solution to the chicken and egg problem, i.e. circularity is not offered due to lack of demand, while demand for circular products and services fails to pick up due to lack of supply, is that the one or the other needs to be stimulated. More demand will call for its own supply, while more offering of CE products and services will create its own demand. The other recommendations should help to stimulate at least one of the two and this recommendation acts as reminder that this is key.

Annex A – Survey Questions

Designers – survey

1. CIRCULAR ECONOMY OPPORTUNITIES

Please rate your level of agreement that the following circular economy opportunities could add value to your work in designing E&E products (1=mostly agree; 2=agree; 3=mostly disagree; 4= disagree; 5=Don't know).

1.1 ECONOMIC OPPORTUNITIES

- Capturing new markets
- Generating new revenue streams
- Increasing market share
- Enhancing Corporate Social Responsibility reputation
- Building trust
- Reducing production process cost
- Reducing raw material cost
- Reducing energy cost
- Reducing water cost
- Reducing waste related costs

1.1.1 If you wish to note any other economic opportunities please do so below.

1.2 SOCIAL OPPORTUNITIES

- Improve customer loyalty
- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

1.2.1 If you wish to note any other social opportunities please do so below.

1.3 TECHNICAL OPPORTUNITIES

- Incorporating labelling and ICT-enabled dematerialization into products
- Using more efficient manufacturing processes
- Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling
- Disruptive development (improvements) in recycling and recovering technologies
- Using 3D printing

- Using blockchain to support and accelerate circular supply chains

1.3.1 If you wish to note any other technical opportunities please do so below.

1.4 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Increased recycled content in products
- Realising in house repair, remanufacture, refurbishment and upgrade
- Realising third party repair, remanufacture, refurbishment, upgrade and resale
- Acquiring new customers and business through shared access and use
- Renting or leasing products
- Recovering useful materials from end of life products
- Incentivising return of products

1.4.1 If you wish to note any other business models adoption opportunities please do so below.

2. CIRCULAR ECONOMY CHALLENGES

How would you assess the severity of the following **challenges that could impede the implementation of circular economy practices** in your work in designing E&E products (1=Not a challenge; 2= Insignificant challenge; 3= Significant challenge; 4= Major challenge; 5=Don't know)?

2.1 LEGISLATIVE CHALLENGES

- Lack of awareness of legislative requirements
- Lack of understanding of legislative requirements
- Overregulation
- Inconsistent level of compliance with legislative requirements
- Varying level of enforcement of legislative requirements
- Not enough compliance checks at Member States level
- Unregulated circular economy competition
- Undecided national circular economy legislative requirements
- Lack of global regulatory consensus

2.1.1 If you wish to note any other legislative challenges please do so below.

2.2 BUSINESS AND MANAGEMENT CHALLENGES

- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Insufficient interest from customers

- Lack of collaboration between supply chain parties
- Shift from short-life products to extended life cycle of products
- Insufficient incentives for designing and manufacturing products for end of life circularity

2.2.1 If you wish to note any other business and management challenges please do so below.

2.3 ECONOMIC CHALLENGES

- Low primary raw material prices
- High secondary raw material prices
- Low value and low profit margin of recycled products
- Repairs, refurbishment, remanufacture and recycling costs
- Reverse Logistics costs
- Limited market infrastructure and mechanisms for recovery
- Unclear cost implications to adopt and implement circular economy business models
- Limited maintenance and repair services
- Limited leasing services
- Regional differences (e.g. USA versus China)

2.3.1 If you wish to note any other economic challenges please do so below.

2.4 SOCIAL CHALLENGES

- Social trend of replacing rather than repairing products
- Limited social acceptance of reused and refurbished products
- Negative perception of recycled content in new products
- Lack of promotion for sustainable consumption
- Lack of knowledge and understanding of circular products and practices
- Limited maintenance and repair services
- Limited leasing services

2.4.1 If you wish to note any other social challenges please do so below.

2.5 TECHNICAL CHALLENGES

- Limited circular economy technical knowledge and supporting tools
- Technical limitations in different circular economy loops (e.g. for parts reuse, life extension, etc.)
- Limited circular economy exchange between designers of different industry sectors
- Lack of transparency about products' content

- Limited information for tracking products
- Lack of circular economy metrics and indicators
- Limited circular components capability
- Concerns over personal and/or organisational data security

2.5.1 If you wish to note any other technical challenges please do so below.

2.6 SUPPLY CHAIN CHALLENGES

- Lack of interest from supply chain
- Competing/conflicting priorities among parties in the supply chain
- Concerns over confidentiality among parties in the supply chain
- Limited suppliers offering circular products
- Lack of takeback schemes
- Lack of information on product and material traceability
- Undeveloped infrastructure and technologies for WEEE recovery and circularity

2.6.1 If you wish to note any other supply chain challenges please do so below.

2.7 CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES

- Limited understanding of circular economy business models
- Unclear added value in adopting circular economy business models
- Inconsistent supply of secondary raw materials
- End-user unwillingness to accept shared access and use
- End-user reluctance to rent or lease products

2.7.1 If you wish to note any other circular economy business models implementation challenges please do so below.

3. CIRCULAR ECONOMY ENABLERS

How would you assess the viability of the following **enablers for driving the implementation of circular economy practices** in your work in designing E&E products (1=Not an enabler; 2= Insignificant enabler; 3= Significant enabler; 4= Major enabler; 5=Don't know)?

3.1 LEGISLATIVE ENABLERS

- Taxing virgin materials more than recycled feedstock
- Regulated competition
- Campaigns for WEEE legislation awareness, understanding and compliance
- Development of organisational and supply chain tools for compliance monitoring and enforcement

- Mandatory National circular economy legislative requirements
- Global regulatory consensus

3.1.1 If you wish to note any other legislative enabler please do so below.

3.2 BUSINESS AND MANAGEMENT ENABLERS

- Clear circular economy business case
- Circular economy training programmes
- Developing new circular procurement
- Long-term management approach to circular economy
- Considering customer preferences in circular economy business models
- Research and development initiatives to devise strategies and methods to extend the lifecycle of products
- Viable financial feasibility studies for circular economy related capital and operational investments

3.2.1 If you wish to note any other business and management enablers please do so below.

3.3 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Ensuring financial viability of takeback schemes
- Producing secondary raw materials cheaper than primary raw materials
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

3.3.1 If you wish to note any other economic enablers please do so below.

3.4 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

3.4.1 If you wish to note any other social enablers please do so below.

3.5 TECHNICAL ENABLERS

- Enhancing circular economy technical knowledge and skills through training
- Innovative resource efficient recycling and recovery processes

- Availability of information for tracking products
- Development of circular economy metrics
- Development of circular economy key performance indicators
- Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products
- Designing out waste
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

3.5.1 If you wish to note any other technical enablers please do so below.

3.6 SUPPLY CHAIN ENABLERS

- Improved circular economy awareness across supply chain
- Enhanced circular economy knowledge and skills through training
- Available information on materials', products and components' traceability
- Suppliers offering circular products
- Accepted assurance schemes for reuse of secondary materials
- Viable takeback schemes
- Viable and cost effective technologies for WEEE recovery

3.6.1 If you wish to note any other supply chain enablers please do so below.

3.7 BUSINESS MODELS' IMPLEMENTATION ENABLERS

- Disseminating the benefits of renting and leasing products
- Developing new circular procurement systems
- Developing innovative design and manufacturing for circular products
- Incentivised return of products e.g. deposits

3.7.1 If you wish to note any other business models' implementation enablers please do so below.

4.1 Please indicate your position in your organisation.*

……

4.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

4.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don’t know

4.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m
- >€50m
- Don’t know

4.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium
- Large
- Don’t know

4.6 Please indicate the country you live in.*

……

4.6.1 In case you live outside of Europe please specify country.

……

4.7 Please indicate the city you live in.*

……

4.8 Please indicate the company you received the invite from to fill in this survey.*

……

4.9 We may wish to discuss your answers or follow up with you on further questions. If you are happy for us to do so, please provide your e-mail address.

……

Suppliers – survey

1. CIRCULAR ECONOMY OPPORTUNITIES

Please rate your level of agreement that the following circular economy opportunities could add value to the way your organisation trades (1= agree; 2=mostly agree; 3=mostly disagree; 4= disagree; 5=Don't know).

1.1 ECONOMIC OPPORTUNITIES

- Capturing new markets
- Generating new revenue streams
- Increasing market share
- Enhancing Corporate Social Responsibility reputation
- Building trust
- Reducing production process cost
- Reducing raw material cost
- Reducing energy cost
- Reducing water cost
- Reducing waste related costs

1.1.1 If you wish to note any other economic opportunities please do so below.

1.2 SOCIAL OPPORTUNITIES

- Improve customer loyalty
- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

1.2.1 If you wish to note any other social opportunities please do so below.

1.3 TECHNICAL OPPORTUNITIES

- Incorporating labelling and ICT-enabled dematerialization into products
- Using more efficient manufacturing processes
- Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling
- Disruptive development (improvements) in recycling and recovering technologies
- Using 3D printing
- Using blockchain to support and accelerate circular supply chains

1.3.1 If you wish to note any other technical opportunities please do so below.

1.4 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Increased recycled content in products
- Realising in house repair, remanufacture, refurbishment, upgrade and resale

- Realising third party repair, remanufacture, refurbishment, upgrade and resale
- Acquiring new customers and business through shared access and use
- Renting or leasing products
- Recovering useful materials from end of life products
- Incentivising return of products

1.4.1 If you wish to note any other business models adoption opportunities please do so below.

2. CIRCULAR ECONOMY CHALLENGES

2. How would you assess the severity of the following **challenges that could impede the implementation of circular economy practices** in your processes and products (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge; 5= Don't know)?

2.1 LEGISLATIVE CHALLENGES

- Lack of awareness of legislative requirements
- Lack of understanding of legislative requirements
- Overregulation
- Inconsistent level of compliance with legislative requirements
- Varying level of enforcement of legislative requirements
- Not enough compliance checks at Member States level
- Unregulated circular economy competition
- Undecided national circular economy legislative requirements
- Lack of global regulatory consensus

2.1.1 If you wish to note any other legislative challenges please do so below.

2.2 BUSINESS AND MANAGEMENT CHALLENGES

- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Insufficient interest from customers
- Lack of collaboration between supply chain parties
- Shift from short-life products to extended life cycle of products
- Insufficient incentives for designing and manufacturing products for end of life circularity

2.2.1 If you wish to note any other business and management challenges please do so below.

2.3 ECONOMIC CHALLENGES

- Low primary raw material prices
- High secondary raw material prices
- Low value and low profit margin of recycled products
- repairs, refurbishment, remanufacture and recycling costs
- Reverse Logistics costs
- Limited market infrastructure and mechanisms for recovery
- Unclear cost implications to adopt and implement circular economy business models
- Limited maintenance and repair services
- Limited leasing services
- Regional differences (e.g. USA versus China)

2.3.1 If you wish to note any other economic challenges please do so below.

2.4 SOCIAL CHALLENGES

- Social trend of replacing rather than repairing products
- Limited social acceptance of reused and refurbished products
- Negative perception of recycled content in new products
- Lack of promotion for sustainable consumption
- Lack of knowledge and understanding of circular products and practices

2.4.1 If you wish to note any other social challenges please do so below.

2.5 TECHNICAL CHALLENGES

- Limited circular economy technical knowledge and supporting tools
- Technical limitations in different circular economy loops (e.g. for parts reuse, life extension, etc.)
- Lack of transparency about products' content
- Limited information for tracking products
- Lack of circular economy metrics and indicators
- Limited circular components capability
- Concerns over personal and/or organisational data security

2.5.1 If you wish to note any other technical challenges please do so below.

2.6 SUPPLY CHAIN CHALLENGES

- Lack of interest from supply chain
- Competing/conflicting priorities among parties in the supply chain
- Concerns over confidentiality among parties in the supply chain
- Limited suppliers offering circular products

- Lack of takeback schemes
- Lack of information on product and material traceability
- Undeveloped infrastructure and technologies for WEEE recovery and circularity

2.6.1 If you wish to note any other supply chain challenges please do so below.

2.7 CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES

- Limited understanding of circular economy business models
- Unclear added value in adopting circular economy business models
- Inconsistent supply of secondary raw materials
- End-user unwillingness to accept shared access and use
- End-user reluctance for renting or leasing products

2.7.1 If you wish to note any other circular economy business models implementation challenges please do so below.

3. CIRCULAR ECONOMY ENABLERS

3. How would you assess the viability of the following **enablers that could drive the implementation of circular economy practices** in processes and products (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5= Don't know)?

3.1 LEGISLATIVE ENABLERS

- Taxing virgin materials more than recycled feedstock
- Regulated competition
- Campaigns for WEEE legislation awareness, understanding and compliance
- Development of organisational and supply chain tools for compliance monitoring and enforcement
- Mandatory National circular economy legislative requirements
- Global regulatory consensus

3.1.1 If you wish to note any other legislative enabler please do so below.

3.2 BUSINESS AND MANAGEMENT ENABLERS

- Clear circular economy business case
- Circular economy training programmes
- Developing new circular procurement
- Long-term management approach to circular economy
- Considering customer preferences in circular economy business models

- Research and development initiatives to devise strategies and methods to extend the lifecycle of products
- Viable financial feasibility studies for circular economy related capital and operational investments

3.2.1 If you wish to note any other business and management enablers please do so below.

3.3 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Ensuring financial viability of takeback schemes
- Producing secondary raw materials cheaper than primary raw materials
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

3.3.1 If you wish to note any other economic enablers please do so below.

3.4 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

3.4.1 If you wish to note any other social enablers please do so below.

3.5 TECHNICAL ENABLERS

- Enhancing circular economy technical knowledge and skills through training
- Innovative resource efficient recycling and recovery processes
- Availability of information for tracking products
- Development of circular economy metrics
- Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

3.5.1 If you wish to note any other technical enablers please do so below.

3.6 SUPPLY CHAIN ENABLERS

- Improved circular economy awareness across supply chain

- Enhanced circular economy knowledge and skills through training
- Available information on materials', products and components' traceability
- Suppliers offering circular products
- Accepted assurance schemes for reuse of secondary materials
- Viable takeback schemes
- Viable and cost effective technologies for WEEE recovery

3.6.1 If you wish to note any other supply chain enablers please do so below.

3.7 BUSINESS MODELS' IMPLEMENTATION ENABLERS

- Disseminating the benefits of renting and leasing products
- Developing new circular procurement systems
- Developing innovative design and manufacturing for circular products
- Incentivised return of products e.g. deposits

3.7.1 If you wish to note any business models' implementation enablers please do so below.

4.1 Please indicate your position in your organisation.

……..

4.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

4.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don't know

4.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m

- >€50m
- Don't know

4.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium
- Large
- Don't know

4.6 Please indicate the country you live in.*

……..

4.6.1 In case you live outside of Europe please specify country.

……..

4.7 Please indicate the city you live in.*

……..

4.8 Please indicate the company you received the invite from to fill in this survey.*

……..

4.9 We may wish to discuss your answers or follow up with you on further questions. If you are happy for us to do so, please provide your e-mail address.

……..

Your response has been recorded. Thank you for answering the C-SERVEES project survey. If you wish to receive further updates on the C-SERVEES project, attend our events or be involved in future consultation exercises, please go to the project website www.c-serveesproject.eu/and click on the 'Join the Network' menu to register.

Manufacturers – survey

1. CIRCULAR ECONOMY OPPORTUNITIES

1. Please rate your level of agreement that the following circular economy opportunities could add value to your organisation (1=agree; 2=mostly agree; 3=mostly disagree; 4= disagree; 5= Don't know).

1.1 ECONOMIC OPPORTUNITIES

- Capturing new markets

- Generating new revenue streams
- Increasing market share
- Enhancing Corporate Social Responsibility reputation
- Building trust
- Reducing production process cost
- Reducing raw material cost
- Reducing energy cost
- Reducing water cost
- Reducing waste related costs

1.1.1 If you wish to note any other economic opportunities please do so below.

1.2 SOCIAL OPPORTUNITIES

- Improve customer loyalty
- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

1.2.1 If you wish to note any other social opportunities please do so below.

1.3 TECHNICAL OPPORTUNITIES

- Incorporating labelling and ICT-enabled dematerialization into products
- Using more efficient manufacturing processes
- Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling
- Disruptive development (improvements) in recycling and recovering technologies
- Using 3D printing
- Using blockchain to support and accelerate circular supply chains

1.3.1 If you wish to note any other technical opportunities please do so below.

1.4 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Increased recycled content in products
- Realising in house repair, remanufacture, refurbishment, upgrade and resale
- Realising third party repair, remanufacture, refurbishment, upgrade and resale
- Acquiring new customers and business through shared access and use
- Renting or leasing products
- Recovering useful materials from end of life products

- Incentivising return of products

1.4.1 If you wish to note any other business models adoption opportunities please do so below.

2. CIRCULAR ECONOMY CHALLENGES

2. How would you assess the severity of the following **challenges that could impede the implementation of circular economy practices** in your manufacturing processes and products (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge)?

2.1 LEGISLATIVE CHALLENGES

- Lack of awareness of legislative requirements
- Lack of understanding of legislative requirements
- Overregulation
- Inconsistent level of compliance with legislative requirements
- Varying level of enforcement of legislative requirements
- Not enough compliance checks at Member States level
- Unregulated circular economy competition
- Undecided national circular economy legislative requirements
- Lack of global regulatory consensus

2.2.1 If you wish to note any other legislative challenges please do so below.

2.2 BUSINESS AND MANAGEMENT CHALLENGES

- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Insufficient interest from customers
- Lack of collaboration between supply chain parties
- Shift from short-life products to extended life cycle of products
- Insufficient incentives for designing and manufacturing products for end of life circularity

2.2.1 If you wish to note any other business and management challenges please do so below.

2.3 ECONOMIC CHALLENGES

- Low primary raw material prices
- High secondary raw material prices
- Low value and low profit margin of recycled products

- Repairs, refurbishment, remanufacture and recycling costs
- Reverse Logistics costs
- Limited market infrastructure and mechanisms for recovery
- Unclear cost implications to adopt and implement circular economy business models
- Limited maintenance and repair services
- Limited leasing services
- Regional differences (e.g. USA versus China)

2.3.1 If you wish to note any other economic challenges please do so below.

2.4 SOCIAL CHALLENGES

- Social trend of replacing rather than repairing products
- Limited social acceptance of reused and refurbished and recycled products
- Negative perception of recycled content in new products
- Lack of promotion for sustainable consumption
- Lack of knowledge and understanding of circular products and practices

2.4.1 If you wish to note any other social challenges please do so below.

2.5 TECHNICAL CHALLENGES

- Limited circular economy technical knowledge and supporting tools
- Technical limitations in different circular economy loops (e.g. for parts reuse, life extension, etc.)
- Lack of transparency about products' content
- Limited information for tracking products
- Lack of circular economy metrics and indicators
- Limited circular components capability
- Concerns over personal and/or organisational data security

2.5.1 If you wish to note any other technical challenges please do so below.

2.6 SUPPLY CHAIN CHALLENGES

- Lack of interest from supply chain
- Competing/conflicting priorities among parties in the supply chain
- Concerns over confidentiality among parties in the supply chain
- Limited suppliers offering circular products
- Lack of takeback schemes
- Lack of information on product and material traceability
- Undeveloped infrastructure and technologies for WEEE recovery and circularity

2.6.1 If you wish to note any other supply chain challenges please do so below.

2.7 CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES

- Limited understanding of circular economy business models
- Unclear added value in adopting circular economy business models
- Inconsistent supply of secondary raw materials
- End-user unwillingness to accept shared access and use
- End-user reluctance to rent or lease products

2.7.1 If you wish to note any other circular economy business models implementation challenges please do so below.

3. CIRCULAR ECONOMY ENABLERS

3. How would you assess the viability of the following **enablers that could drive the implementation of circular economy practices** in your manufacturing processes and products (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5=Don't know)?

3.1 LEGISLATIVE ENABLERS

- Taxing virgin materials more than recycled feedstock
- Regulated competition
- Campaigns for WEEE legislation awareness, understanding and compliance
- Development of organisational and supply chain tools for compliance monitoring and enforcement
- Mandatory National circular economy legislative requirements
- Global regulatory consensus

3.1.1 If you wish to note any other legislative enabler please do so below.

3.2 BUSINESS AND MANAGEMENT ENABLERS

- Clear circular economy business case
- Circular economy training programmes
- Developing new circular procurement
- Long-term management approach to circular economy
- Considering customer preferences in circular economy business models
- Research and development initiatives to devise strategies and methods to extend the lifecycle of products
- Viable financial feasibility studies for circular economy related capital and operational investments

3.2.1 If you wish to note any other business and management enablers please do so below.

3.3 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Ensuring financial viability of takeback schemes
- Producing secondary raw materials cheaper than primary raw materials
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

3.3.1 If you wish to note any other economic enablers please do so below.

3.4 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

3.4.1 If you wish to note any other social enablers please do so below.

3.5 TECHNICAL ENABLERS

- Enhancing circular economy technical knowledge and skills through training
- Innovative resource efficient recycling and recovery processes
- Availability of information for tracking products
- Development of circular economy metrics
- Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

3.5.1 If you wish to note any other technical enablers please do so below.

3.6 SUPPLY CHAIN ENABLERS

- Improved circular economy awareness across supply chain
- Enhanced circular economy knowledge and skills through training
- Available information on materials', products and components' traceability
- Suppliers offering circular products
- Accepted assurance schemes for reuse of secondary materials
- Viable takeback schemes
- Viable and cost effective technologies for WEEE recovery

3.6.1 If you wish to note any other supply chain enablers please do so below.

3.7 BUSINESS MODELS' IMPLEMENTATION ENABLERS

- Disseminating the benefits of renting and leasing products
- Developing new circular procurement systems
- Developing innovative design and manufacturing for circular products
- Incentivised return of products e.g. deposits

3.7.1 If you wish to note any other business models´ implementation enablers please do so below.

4.1 Please indicate your position in your organisation.*

……

4.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

4.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don't know

4.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m
- >€50m
- Don't know

4.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium

- Large
- Don't know

4.6 Please indicate the country you live in.*

……

4.6.1 In case you live outside of Europe please specify country.

……

4.7 Please indicate the city you live in.*

……

4.8 Please indicate the company you received the invite from to fill in this survey.*

……

4.9 We may wish to discuss your answers or follow up with further questions. If you are happy for us to do so, please provide your e-mail address.

……

Retailers – survey

1. CIRCULAR ECONOMY OPPORTUNITIES

1. Please rate your level of agreement that the following circular economy opportunities could add value to your retail operations in the E&E sector (1= agree; 2=mostly agree; 3=mostly disagree; 4= disagree; 5=Don't know).

1.1 ECONOMIC OPPORTUNITIES

- Capturing new markets
- Generating new revenue streams
- Increasing market share
- Enhancing Corporate Social Responsibility reputation
- Building trust
- Reducing production process cost
- Reducing raw material cost
- Reducing energy cost
- Reducing water cost
- Reducing waste related costs

1.1.1 If you wish to note any other economic opportunities please do so below.

1.2 SOCIAL OPPORTUNITIES

- Improve customer loyalty
- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

1.2.1 If you wish to note any other social opportunities please do so below.

1.3 TECHNICAL OPPORTUNITIES

- Incorporating labelling and ICT-enabled dematerialization into products
- Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling
- Disruptive development (improvements) in recycling and recovering technologies
- Using 3D printing
- Using blockchain to support and accelerate circular supply chains

1.3.1 If you wish to note any other technical opportunities please do so below.

1.4 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Increased recycled content in products
- Realising in house repair, remanufacture, refurbishment, upgrade and resale
- Realising third party repair, remanufacture, refurbishment, upgrade and resale
- Acquiring new customers and business through shared access and use
- Renting or leasing products
- Recovering useful materials from end of life products
- Incentivising return of products

1.4.1 If you wish to note any other business models adoption opportunities please do so below.

2. CIRCULAR ECONOMY CHALLENGES

2. How would you assess the severity of the following **challenges that could impede the implementation of circular economy practices** in your retail operations with the electrical and electronic products you sell (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge; 5= Don't know)?

2.1 LEGISLATIVE CHALLENGES

- Lack of awareness of legislative requirements

- Lack of understanding of legislative requirements
- Overregulation
- Inconsistent level of compliance with legislative requirements
- Varying level of enforcement of legislative requirements
- Not enough compliance checks at Member States level
- Unregulated circular economy competition
- Undecided national circular economy legislative requirements
- Lack of global regulatory consensus

2.1.1 If you wish to note any other legislative challenges please do so below.

2.2 BUSINESS AND MANAGEMENT CHALLENGES

- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Insufficient interest from customers
- Lack of collaboration between organisation and supply chain

2.2.1 If you wish to note any other business and management challenges please do so below.

2.3 ECONOMIC CHALLENGES

- Low value and low profit margin of recycled products
- Repairs, refurbishment, remanufacture and recycling costs
- Limited market infrastructure and mechanisms for recovery
- Limited maintenance and repair services
- Limited leasing services
- Regional differences (e.g. USA versus China)

2.3.1 If you wish to note any other economic challenges please do so below.

2.4 SOCIAL CHALLENGES

- Social trend of replacing rather than repairing products
- Limited social acceptance of reused and refurbished products
- Negative perception of recycled content in new products
- Lack of promotion for sustainable consumption
- Lack of knowledge and understanding of circular products and practices

2.4.1 If you wish to note any other social challenges please do so below.

2.5 TECHNICAL CHALLENGES

- Limited circular economy technical knowledge and supporting tools

- Technical limitations in different circular economy loops (e.g. for parts reuse, life extension, etc.)
- Lack of transparency about products' content
- Limited information for tracking products
- Limited circular components capability
- Concerns over personal and/or organisational data security

2.5.1 If you wish to note any other technical challenges please do so below.

2.6 SUPPLY CHAIN CHALLENGES

- Lack of interest from supply chain
- Competing/conflicting priorities among parties in the supply chain
- Concerns over confidentiality among parties in the supply chain
- Limited suppliers offering circular products
- Lack of takeback schemes
- Lack of information on product and material traceability
- Undeveloped infrastructure and technologies for WEEE recovery and circularity

2.6.1 If you wish to note any other supply chain challenges please do so below.

2.7 CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES

- Limited understanding of circular economy business models
- Unclear added value in adopting circular economy business models
- Inconsistent supply of secondary raw materials
- End-user unwillingness to accept shared access and use
- End-user reluctance to rent or lease products

2.7.1 If you wish to note any other circular economy business models implementation challenges please do so below.

3. CIRCULAR ECONOMY ENABLERS

3. How would you assess the viability of the following **enablers that could drive the implementation of circular economy practices** in your e-sector retail operations (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5= Don't know)?

3.1 LEGISLATIVE ENABLERS

- Taxing virgin materials more than recycled feedstock
- Regulated competition
- Campaigns for WEEE legislation awareness, understanding and compliance
- Mandatory National circular economy legislative requirements

- Global regulatory consensus

3.1.1 If you wish to note any other legislative enabler please do so below.

3.2 BUSINESS AND MANAGEMENT ENABLERS

- Clear circular economy business case
- Circular economy training programmes
- Developing new circular procurement
- Long-term management approach to circular economy
- Considering customer preferences in circular economy business models
- Research and development initiatives to devise strategies and methods to extend the lifecycle of products
- Viable financial feasibility studies for circular economy related capital and operational investments

3.2.1 If you wish to note any other business and management enablers please do so below.

- 3.3 ECONOMIC ENABLERS
- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Ensuring financial viability of takeback schemes
- Producing secondary raw materials cheaper than primary raw materials
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

3.3.1 If you wish to note any other economic enablers please do so below.

- 3.4 SOCIAL ENABLERS
- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

3.4.1 If you wish to note any other social enablers please do so below.

3.5 TECHNICAL ENABLERS

- Enhancing circular economy technical knowledge and skills through training
- Innovative resource efficient recycling and recovery processes
- Availability of information for tracking products

- Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products
- Dissemination of best practice circular economy demonstration projects

3.5.1 If you wish to note any other technical enablers please do so below.

3.6 SUPPLY CHAIN ENABLERS

- Improved circular economy awareness across supply chain
- Enhanced circular economy knowledge and skills through training
- Available information on materials', products and components' traceability
- Suppliers offering circular products
- Accepted assurance schemes for reuse of secondary materials
- Viable takeback schemes
- Viable and cost effective technologies for WEEE recovery

3.6.1 If you wish to note any other supply chain enablers please do so below.

4.1 Please indicate your position in your organisation.*

……

4.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

4.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don't know

4.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m
- >€50m

- Don’t know

4.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium
- Large
- Don’t know

4.6 Please indicate the country you live in.*

……..

4.6.1 In case you live outside of Europe please specify country.

……

4.7 Please indicate the city you live in.*

……

4.8 Please indicate the company you received the invite from to fill in this survey.*

……..

4.9 We may wish to discuss your answers or follow up with further questions. If you are happy for us to do so, please provide your e-mail address.

……

Business End Users – survey

1. DECISION FACTORS TO PURCHASE E&E PRODUCTS

Please rate your level of agreement that the following **factors influence your decision to purchase electrical and electronic products** (1= agree; 2= mostly agree; 3= no influence 4= mostly disagree; 5= disagree)

- Responsibly sourced products
- Energy and/or water efficient products
- Durable products
- Low maintenance and easily repairable products
- Availability of repair shops
- Products associated with leasing services

1.2 If you wish to note any other influencing factor please do so below.

2. CIRCULAR ECONOMY OPPORTUNITIES

2. Please rate your level of agreement that the following **circular economy opportunities would be of benefit to business users of electrical and electronic equipment** (1= agree; 2= mostly agree; 3= mostly disagree; 4= disagree 5=Don't know)?

2.1 SOCIAL OPPORTUNITIES

- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

2.1.1 If you wish to note any other social opportunities please do so below.

2.2 TECHNICAL OPPORTUNITIES

- Reuse and easy maintenance and repair of products
- Improving WEEE collection methods
- Optimization/improvements in WEEE recycling methods

2.2.1 If you wish to note any other technical opportunities please do so below.

2.3 CIRCULAR ECONOMY BUSINESS MODELS OPPORTUNITIES

- Renting or leasing products
- Incentivising return of products

2.3.1 If you wish to note any other business models adoption opportunities please do so below.

3. CIRCULAR ECONOMY CHALLENGES

3. How would you assess the severity of the following **challenges to users' circular consumption of electrical and electronic products** (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge; 5= Don't know)?

3.1 SOCIAL CHALLENGES

- Lack of knowledge and understanding of circular products and practices
- Lack of awareness on circular economy benefits
- Social trend of replacing rather than repairing products
- Limited social acceptance of reused, refurbished and recycled products
- Limited maintenance and repair services
- Limited leasing services

3.1.1 If you wish to note any other social challenges please do so below.

3.2 TECHNICAL CHALLENGES

- Concerns over personal and/or organisational data security
- Limited best practice circular economy demonstration projects
- Technical limitations in different circular economy loops (e.g. for parts reuse, life extension, etc.)

3.2.1 If you wish to note any other technical challenges please do so below.

4. CIRCULAR ECONOMY ENABLERS

4. How would you assess the viability of the following **enablers that could drive users' circular consumption of electrical and electronic products** (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5=Don't know)?

4.1 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

4.1.1 If you wish to note any other economic enabler please do so below.

4.2 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

4.2.1 If you wish to note any other social enabler please do so below.

4.3 TECHNICAL ENABLERS

- Availability of information for tracking products
- Mechanisms to avoid exposure of stored personal data in E&E products
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

4.3.1 If you wish to note any other technical enabler please do so below.

5.1 Please indicate your position in your organisation.*

……

5.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

5.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don't know

5.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m
- >€50m
- Don't know

5.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium
- Large
- Don't know

5.6 Please indicate the country you live in.*

……..

5.6.1 In case you live outside of Europe please specify country.

……..

5.7 Please indicate the city you live in.*

……..

5.8 Please indicate the company you received the invite from to fill in this survey.*

……..

5.9 We may wish to discuss your answers or follow up with you on further questions. If you are happy for us to do so, please provide your e-mail address.

……

Household End Users – survey

1. DECISION FACTORS TO PURCHASE E&E PRODUCTS

1. Please rate your level of agreement that the following **factors influence your decision to purchase electrical and electronic products** (1= strongly disagree; 2=disagree; 3=No influence 4= agree; 5= strongly agree).

- Responsible sourced products
- Energy and/or water efficient products
- Durable products
- Low maintenance and easily repairable products
- Availability of repair shops
- Products associated with leasing services

1.2 If you wish to note any other factor please do so below.

2. CIRCULAR ECONOMY OPPORTUNITIES

2. Please rate your level of agreement that the following **circular economy opportunities could add value to electrical and electronic equipment users/customers** (1=strongly disagree; 2=disagree; 3=agree; 4= strongly agree; 5= I don't know).

2.1 SOCIAL OPPORTUNITIES

- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

2.1.1 If you wish to note any other social opportunities please do so below.

2.2 TECHNICAL OPPORTUNITIES

- Reuse and easy maintenance and repair of products
- Improving WEEE collection methods
- Optimization/improvements in WEEE recycling methods

2.2.1 If you wish to note any other technical opportunities please do so below.

2.3 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Renting or leasing products
- Incentivising return of products

2.3.1 If you wish to note any other business models adoption opportunities please do so below.

3. CIRCULAR ECONOMY CHALLENGES

How would you assess the severity of the following **challenges to users' circular consumption of electrical and electronic products** (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge; 5= I don't know)?

SOCIAL CHALLENGES

- Lack of knowledge and understanding of circular products and practices
- Lack of awareness on circular economy benefits
- Social trend of replacing rather than repairing products
- Limited social acceptance of reused, refurbished and recycled products
- Limited maintenance and repair services
- Limited leasing services

3.1.1 If you wish to note any other social challenges please do so below.

TECHNICAL CHALLENGES

- Concerns over personal and/or organisational data security
- Limited best practice circular economy demonstration projects

3.2.1 If you wish to note any other technical challenges please do so below.

4. CIRCULAR ECONOMY ENABLERS

4. How would you assess the viability of the following **enablers that could drive users' circular consumption of electrical and electronic products** (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5= Don't know)?

4.1 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

4.1.1 If you wish to note any other economic enabler please do so below.

4.2 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

4.2.1 If you wish to note any other social enabler please do so below.

4.3 TECHNICAL ENABLERS

- Mechanisms to avoid exposure of stored personal data in E&E products
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

5.3.1 If you wish to note any other technical enabler please do so below.

5.1 Please indicate your age. *

- < 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75 or older
- Prefer not to say

5.2 Please indicate your gender.*

- Male
- Female
- Prefer not to say

5.3 Please indicate your education level.*

- High School
- College no degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree
- Prefer not to say

5.4 Please indicate the country you live in.*

……

5.5 Please indicate the city you live in.*

……

5.6 We may wish to discuss your answers or follow up with further questions. If you are happy for us to do so, please provide your e-mail address.

……

WEEE Handlers – survey

1. CIRCULAR ECONOMY OPPORTUNITIES

1. Please rate your level of agreement that the following circular economy opportunities could add value to your company (1=Agree; 2=mostly agree; 3=mostly disagree; 4= Disagree; 5=Don't know).

1.1 ECONOMIC OPPORTUNITIES

- Capturing new markets
- Generating new revenue streams
- Increasing market share
- Enhancing Corporate Social Responsibility reputation
- Building trust

1.1.1 If you wish to note any other economic opportunities please do so below.

1.2 SOCIAL OPPORTUNITIES

- Improve customer loyalty
- Presence of product certifications and guarantees
- Reuse and easy maintenance and repair of products
- Enhance circular economy knowledge and skills
- Overcome gender, age and social barriers

1.2.1 If you wish to note any other social opportunities please do so below.

1.3 TECHNICAL OPPORTUNITIES

- Incorporating labelling and ICT-enabled dematerialization into products
- Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling

- Disruptive development (improvements) in recycling and recovering technologies
- Using 3D printing
- Using blockchain to support and accelerate circular supply chains

1.3.1 If you wish to note any other technical opportunities please do so below.

1.4 CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES

- Realising in house repair, remanufacture, refurbishment, upgrade and resale
- Realising third party repair, remanufacture, refurbishment, upgrade and resale
- Recovering useful materials from end of life products

1.4.1 If you wish to note any other business models adoption opportunities please do so below.

2. CIRCULAR ECONOMY CHALLENGES

2. How would you assess the severity of the following challenges that could impede the implementation of circular economy practices in your processes and products (1=not a challenge; 2= insignificant challenge; 3= significant challenge; 4= major challenge; 5=Don't know)?

2.1 LEGISLATIVE CHALLENGES

- Overregulation
- Inconsistent level of compliance with legislative requirements
- Varying level of enforcement of legislative requirements
- Not enough compliance checks at Member States level
- Unregulated circular economy competition
- Undecided national circular economy legislative requirements
- Lack of global regulatory consensus

2.1.1 If you wish to note any other legislative challenges please do so below.

- 2.2 BUSINESS AND MANAGEMENT CHALLENGES
- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Limited interest from senior management
- Insufficient interest from customers
- Lack of collaboration between supply chain parties
- Insufficient incentives for designing and manufacturing products for end of life circularity
- Shift from short-life products to extended life cycle of products

-

2.2.1 If you wish to note any other business and management challenges please do so below.

2.3 ECONOMIC CHALLENGES

- Low primary raw material prices
- High secondary raw material prices
- Low value and low profit margin of recycled products
- Repairs, refurbishment, remanufacture and recycling costs
- Reverse Logistics costs
- Limited market infrastructure and mechanisms for recovery
- Unclear cost implications to adopt and implement circular economy business models
- Limited maintenance and repair services

2.3.1 If you wish to note any other economic challenges please do so below.

2.4 SOCIAL CHALLENGES

- Social trend of replacing rather than repairing products
- Limited social acceptance of reused and refurbished products
- Negative perception of recycled content in new products
- Lack of promotion for sustainable consumption
- Lack of knowledge and understanding of circular products and practices

2.4.1 If you wish to note any other social challenges please do so below.

2.5 TECHNICAL CHALLENGES

- Limited circular economy technical knowledge and supporting tools
- Lack of transparency about products' content
- Limited information for tracking products
- Concerns over personal and/or organisational data security
- Limited best practice circular economy demonstration projects

2.5.1 If you wish to note any other technical challenges please do so below.

2.67 SUPPLY CHAIN CHALLENGES

- Lack of interest from supply chain
- Competing/conflicting priorities among parties in the supply chain
- Concerns over confidentiality among parties in the supply chain
- Limited suppliers offering circular products
- Lack of takeback schemes

- Lack of information on product and material traceability
- Undeveloped infrastructure and technologies for WEEE recovery and circularity

2.6.1 If you wish to note any other supply chain challenges please do so below.

2.7 CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES

- Unclear circular economy business case
- No organisational circular economy policy/strategy
- Undeveloped circular economy skills and training
- Insufficient interest from customers
- Lack of collaboration between supply chain parties
- Shift from short-life products to extended life cycle of products
- Insufficient incentives for designing and manufacturing products for end of life circularity

2.7.1 If you wish to note any other circular economy business models implementation challenges please do so below.

3. CIRCULAR ECONOMY ENABLERS

3. How would you assess the viability of the following **enablers that could drive the implementation of circular economy practices** in your processes and products (1=not an enabler; 2= insignificant enabler; 3= significant enabler; 4= major enabler; 5=Don't know)?

3.1 LEGISLATIVE ENABLERS

- Taxing virgin materials more than recycled feedstock
- Regulated competition
- Campaigns for WEEE legislation awareness, understanding and compliance
- Development of organisational and supply chain tools for compliance monitoring and enforcement
- Mandatory National circular economy legislative requirements
- Global regulatory consensus

3.1.1 If you wish to note any other legislative enablers please do so below.

3.2 BUSINESS AND MANAGEMENT ENABLERS

- Clear circular economy business case
- Circular economy training programmes
- Developing new circular procurement
- Long-term management approach to circular economy
- Considering customer preferences in circular economy business models

- Research and development initiatives to devise strategies and methods to extend the lifecycle of products
- Viable financial feasibility studies for circular economy related capital and operational investments

3.2.1 If you wish to note any other business and management enablers please do so below.

3.3 ECONOMIC ENABLERS

- Additional government funding for circular economy skills training of people
- Funding research to optimise circular products
- Ensuring financial viability of circular products
- Ensuring financial viability of takeback schemes
- Producing secondary raw materials cheaper than primary raw materials
- Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale e.g. reduced VAT
- Green Public Procurement

3.3.1 If you wish to note any other economic enablers please do so below.

3.4 SOCIAL ENABLERS

- Campaigns to promote circular economy consumption and practices
- Making products' repair and replacement services available
- Increasing accessibility to products' repair and replacement services
- Affordable and reliable leasing services

3.4.1 If you wish to note any other social enablers please do so below.

3.5 TECHNICAL ENABLERS

- Enhancing circular economy technical knowledge and skills through training
- Innovative resource efficient recycling and recovery processes
- Availability of information for tracking products
- Development of circular economy metrics
- Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products
- Designing and manufacturing for end of life reuse and circularity
- Dissemination of best practice circular economy demonstration projects

3.5.1 If you wish to note any other technical enablers please do so below.

3.6 SUPPLY CHAIN ENABLERS

- Improved circular economy awareness across supply chain
- Enhanced circular economy knowledge and skills through training
- Available information on materials', products and components' traceability
- Suppliers offering circular products
- Accepted assurance schemes for reuse of secondary materials
- Viable takeback schemes
- Viable and cost effective technologies for WEEE recovery

3.6.1 If you wish to note any other supply chain enablers please do so below.

3.7 BUSINESS MODELS' IMPLEMENTATION ENABLERS

- Disseminating the benefits of renting and leasing products
- Developing new circular procurement systems
- Developing innovative recycling and recovery technologies for circular products3.7.1 If you wish to note any other business models´ implementation enablers please do so below.

4.1 Please indicate your position in your organisation.*

……

4.2 Please indicate your years of experience in the industry.*

- <1 year
- 1-5 years
- 5-10 years
- 10-15 years
- >15 years

4.3 Please indicate the number of people employed in the organisation.*

- <10
- 10-49
- 50-249
- >250
- Don't know

4.4 Please indicate the annual turnover of organisation.*

- €0-€2m
- >€2m - €10m
- >€10m - €50m
- >€50m
- Don't know

4.5 Please indicate the size of your company according to the EU definition:

- Micro
- Small
- Medium
- Large
- Don't know

4.6 Please indicate the country you live in.*

……

4.6.1 In case you live outside of Europe please specify country.

……

4.7 Please indicate the city you live in.*

……

4.8 Please indicate the company you received the invite from to fill in this survey.*

……

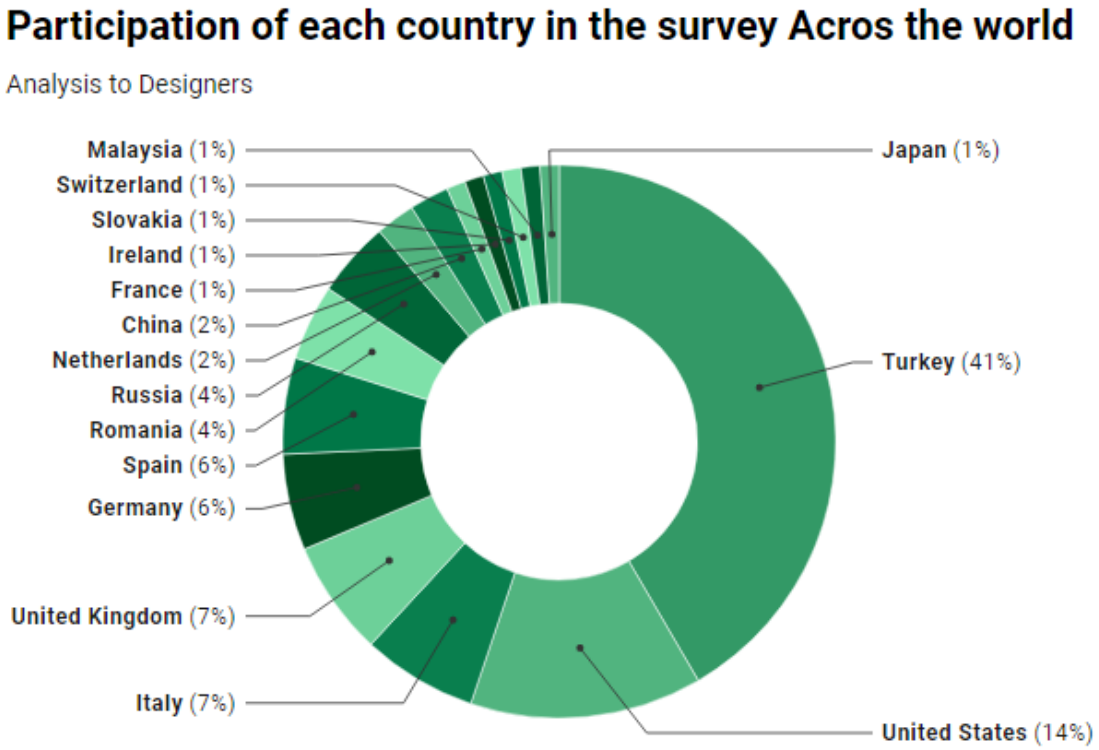
4.9 We may wish to discuss your answers or follow up with you on further questions. If you are happy for us to do so, please provide your e-mail address.

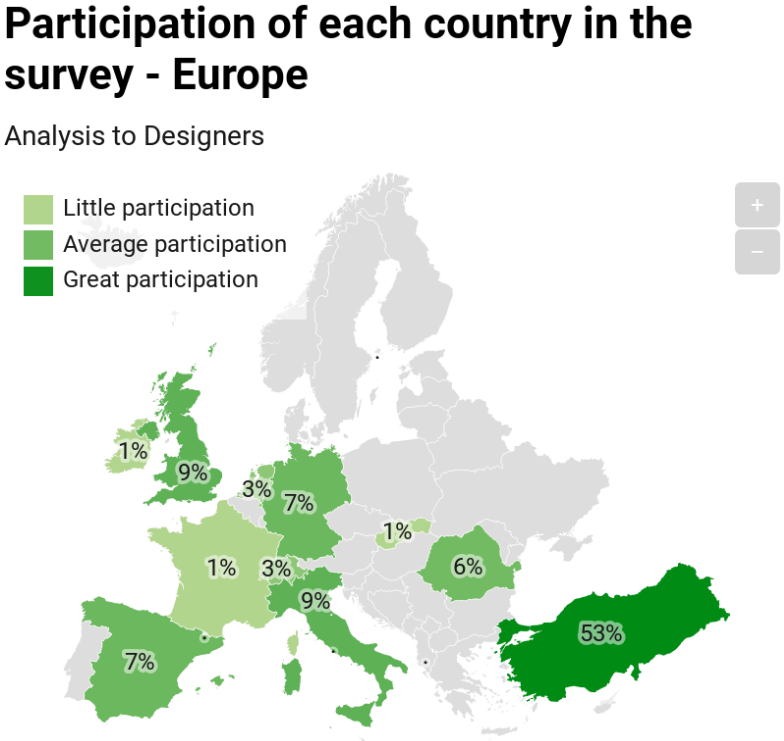
……

Annex B – Charts showing all results

Designers – results charts

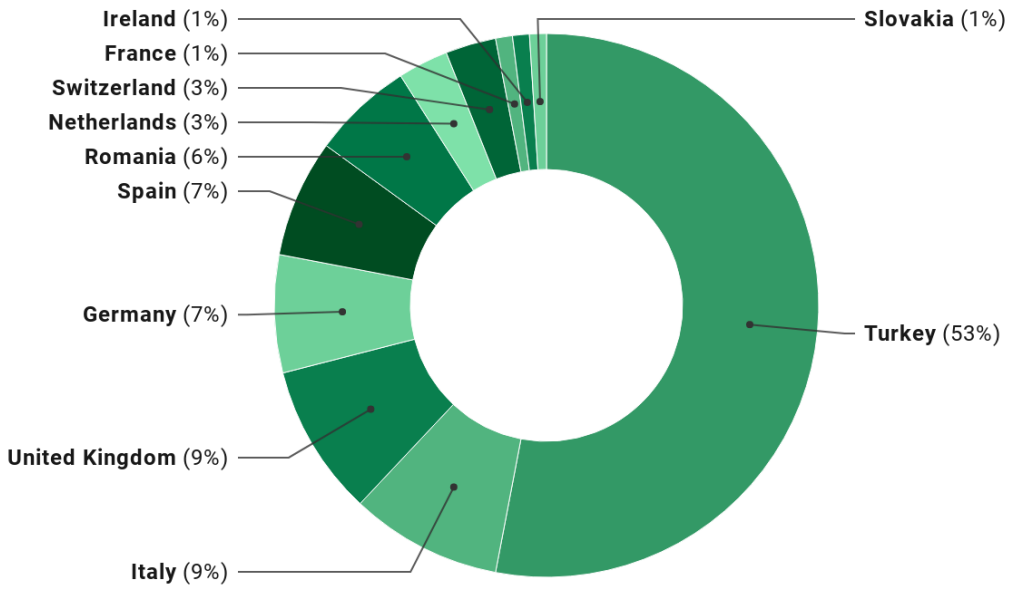
Survey Responeses = 92





Participation of each country in the survey - Europe

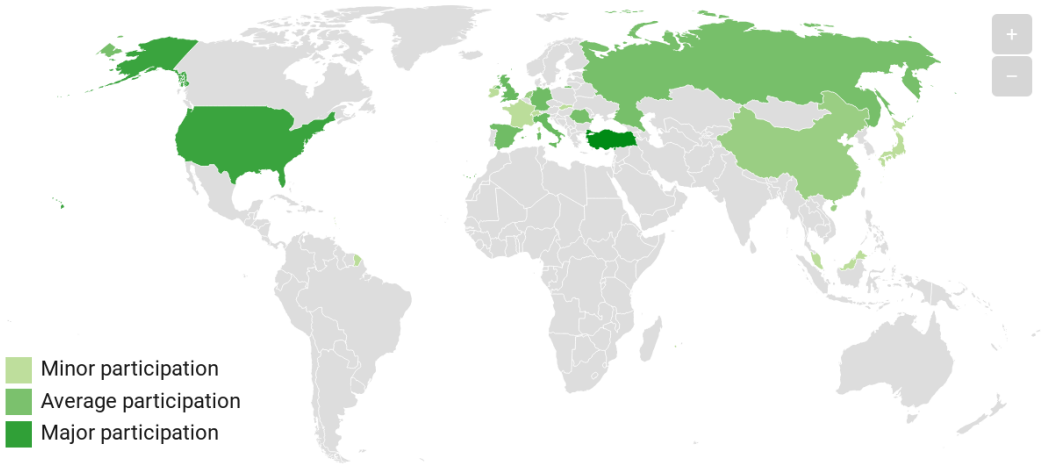
Analysis to Designers



Country (Europe)	Percentage
Turkey	52,9%
Italy	8,6%
United Kingdom	8,6%
Germany	7,1%
Spain	7,1%
Romania	5,7%
Netherlands	2,9%
Switzerland	2,9%
France	1,4%
Ireland	1,4%
Slovakia	1,4%

Participation of each country in the survey - Europe Vs rest of the world

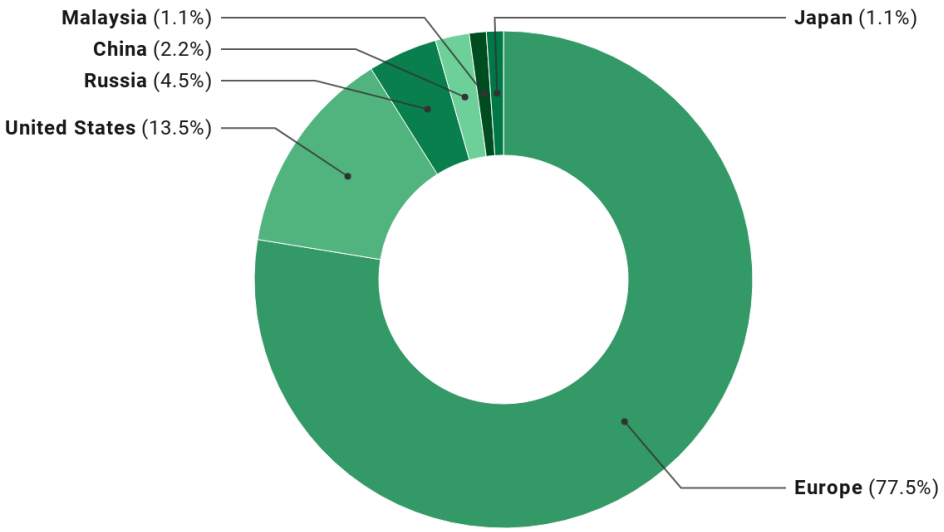
Analysis to Designers



No answers from French Guiana

Participation of each country in the survey - Europe Vs rest of the world

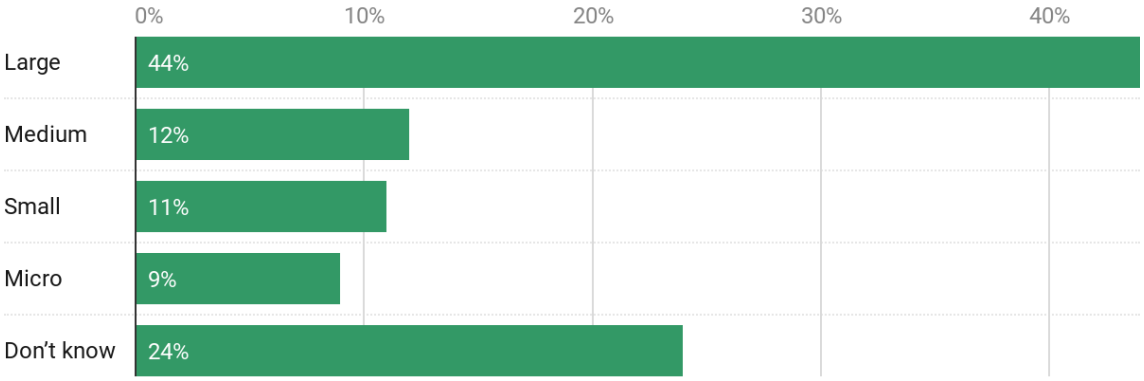
Analysis to Designers



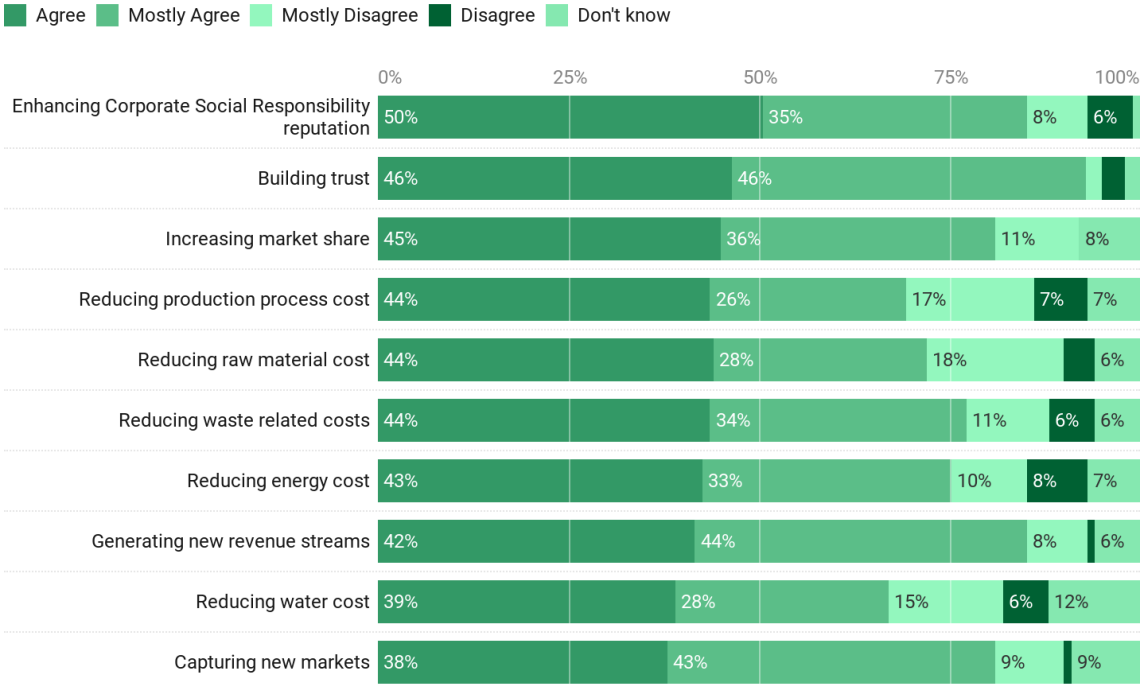
Country (world)	Percentage
Turkey	41,6%
United States	13,5%
Italy	6,7%
United Kingdom	6,7%
Germany	5,6%
Spain	5,6%
Romania	4,5%
Russia	4,5%
Netherlands	2,2%
China	2,2%
France	1,1%
Ireland	1,1%
Slovakia	1,1%
Switzerland	1,1%
Malaysia	1,1%
Japan	1,1%

Size of the company

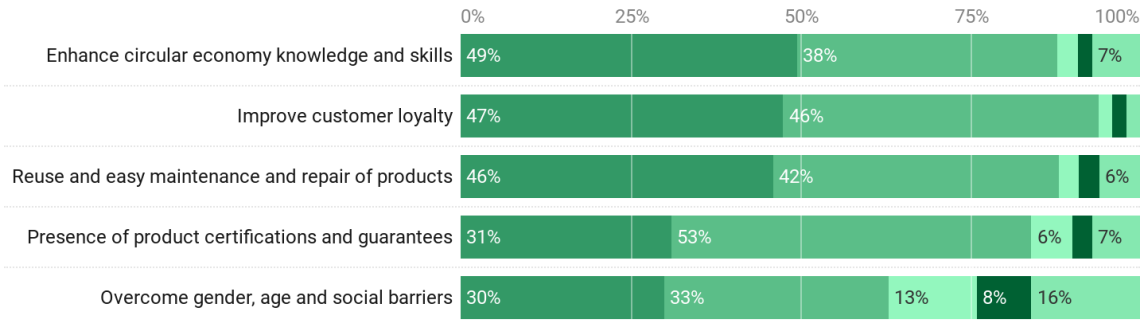
Analysis to Designers



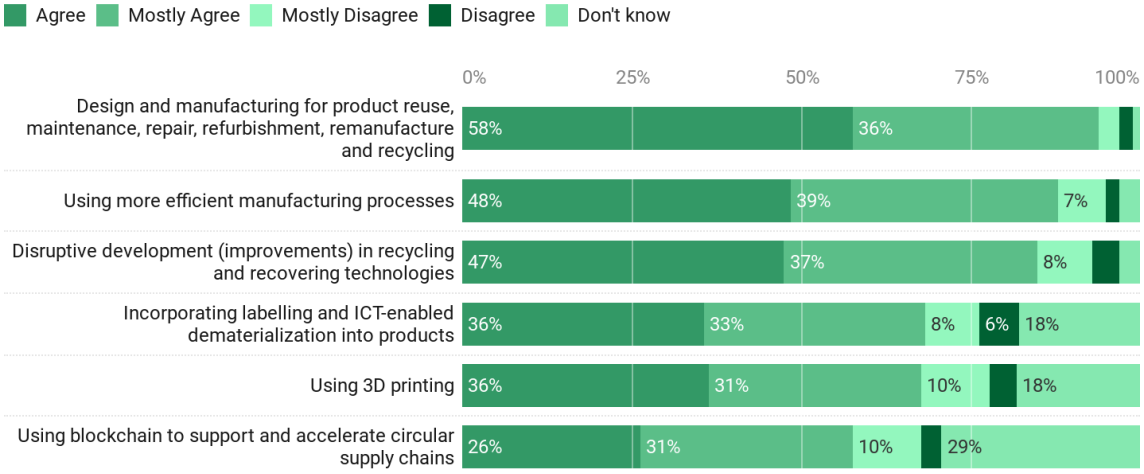
ECONOMIC OPPORTUNITIES



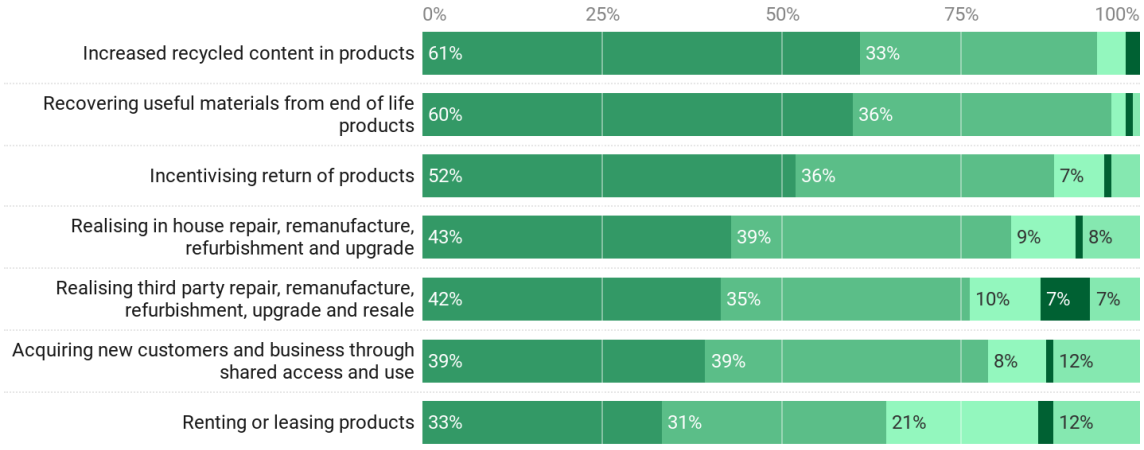
SOCIAL OPPORTUNITIES



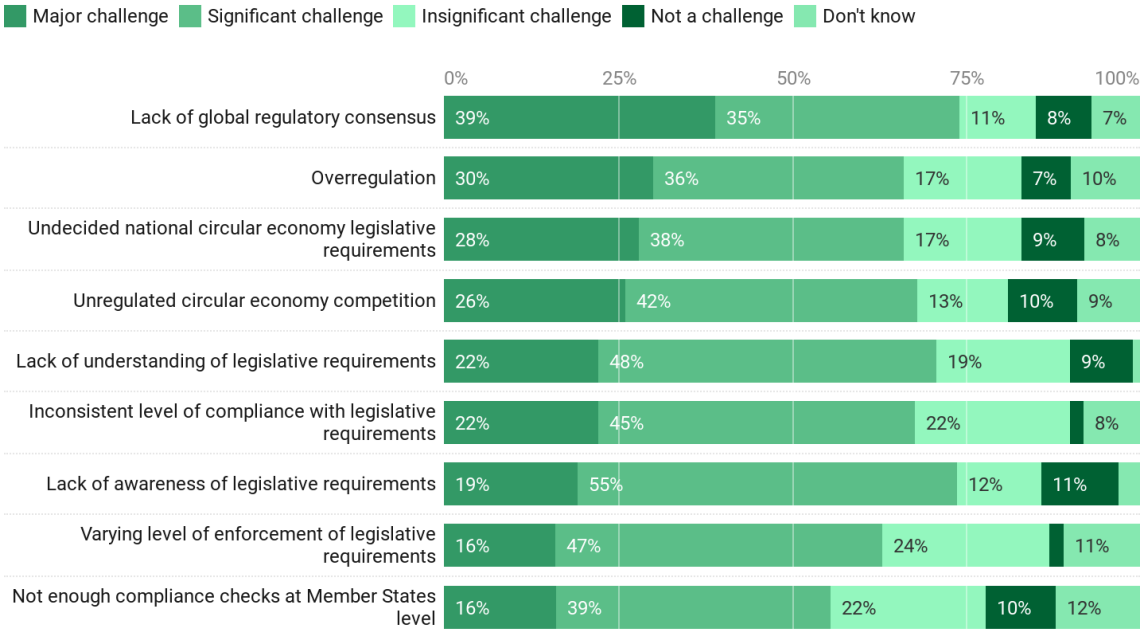
TECHNICAL OPPORTUNITIES



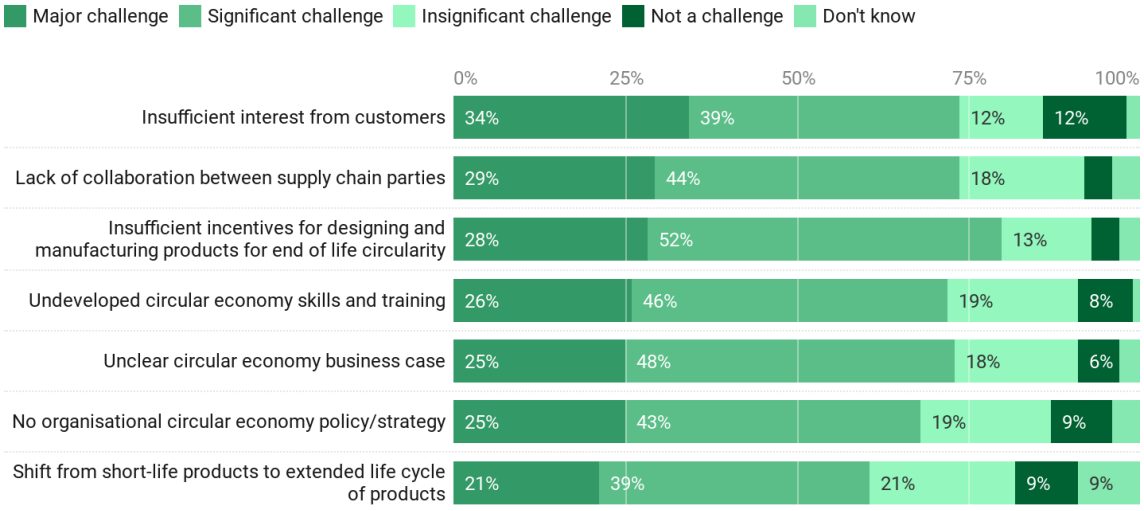
CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



LEGISLATIVE CHALLENGES



BUSINESS AND MANAGEMENT CHALLENGES



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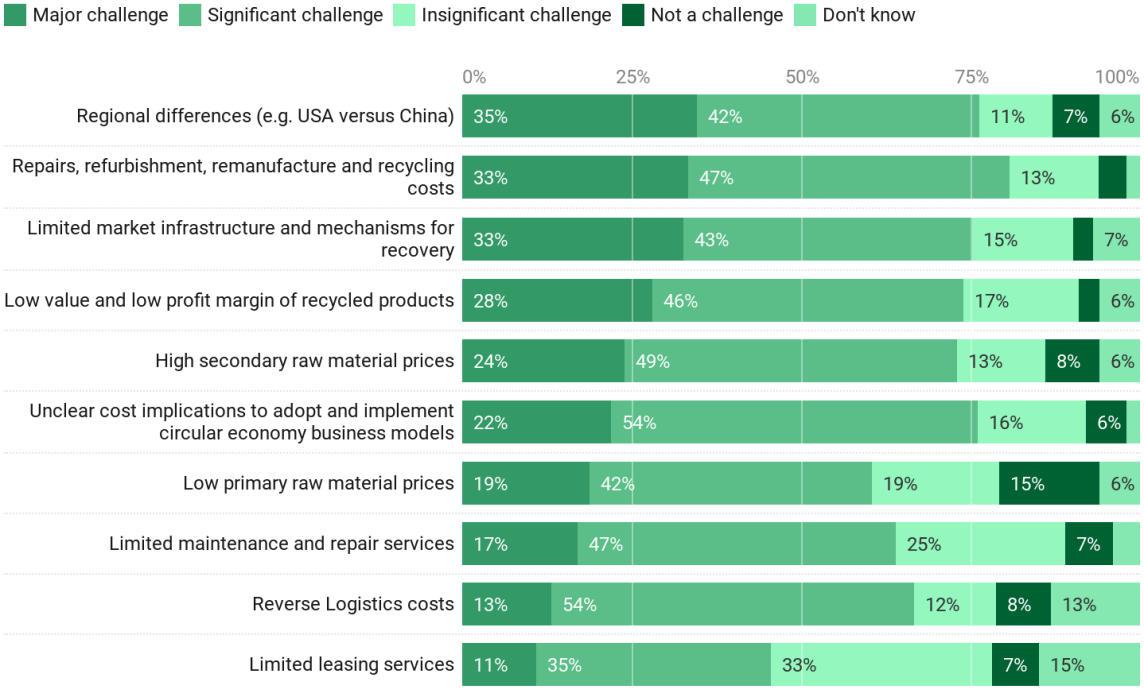
ECONOMIC CHALLENGES



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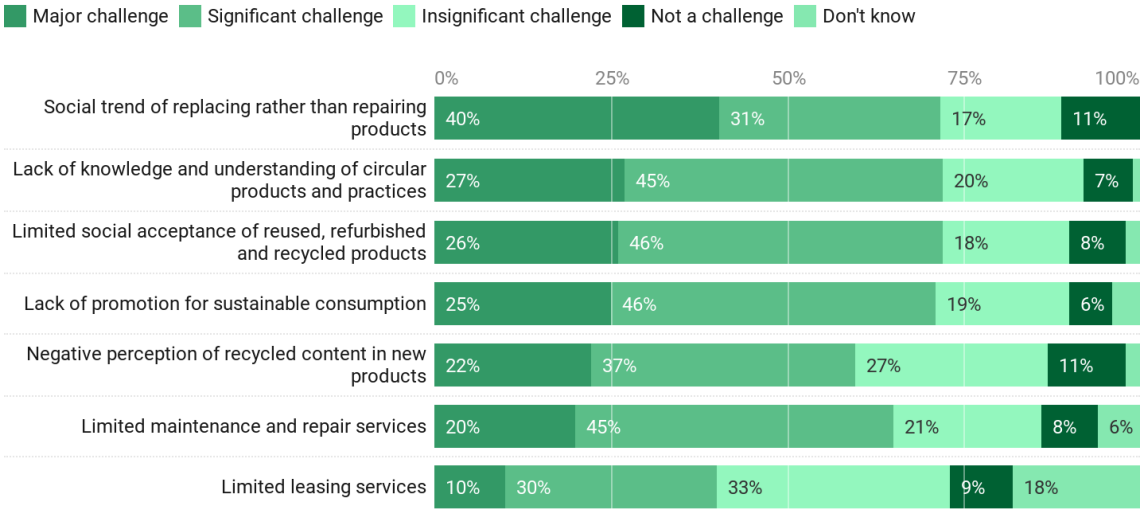
SOCIAL CHALLENGES



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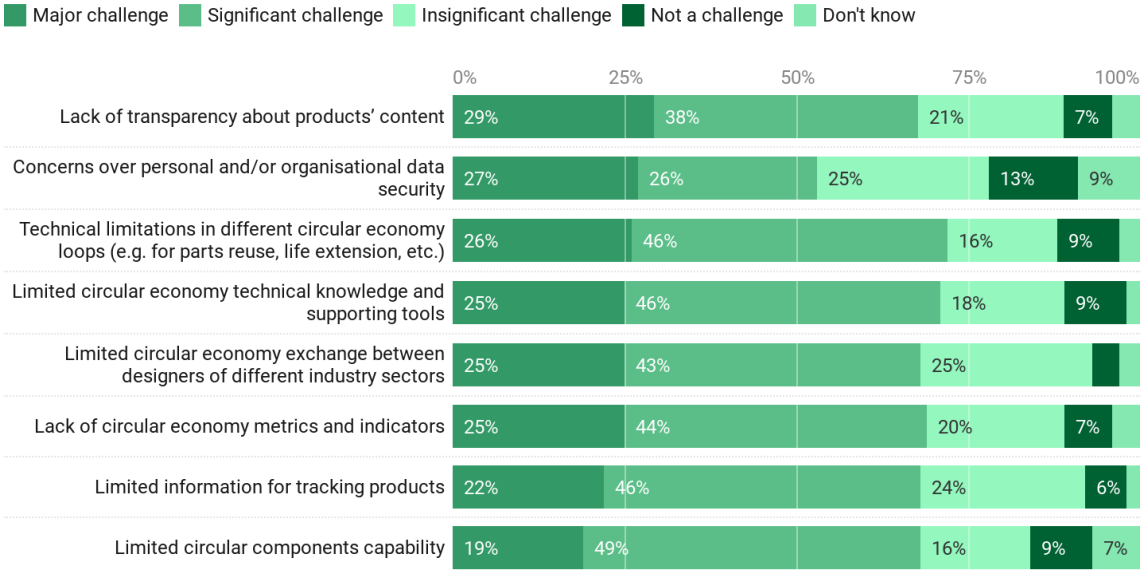
TECHNICAL CHALLENGES



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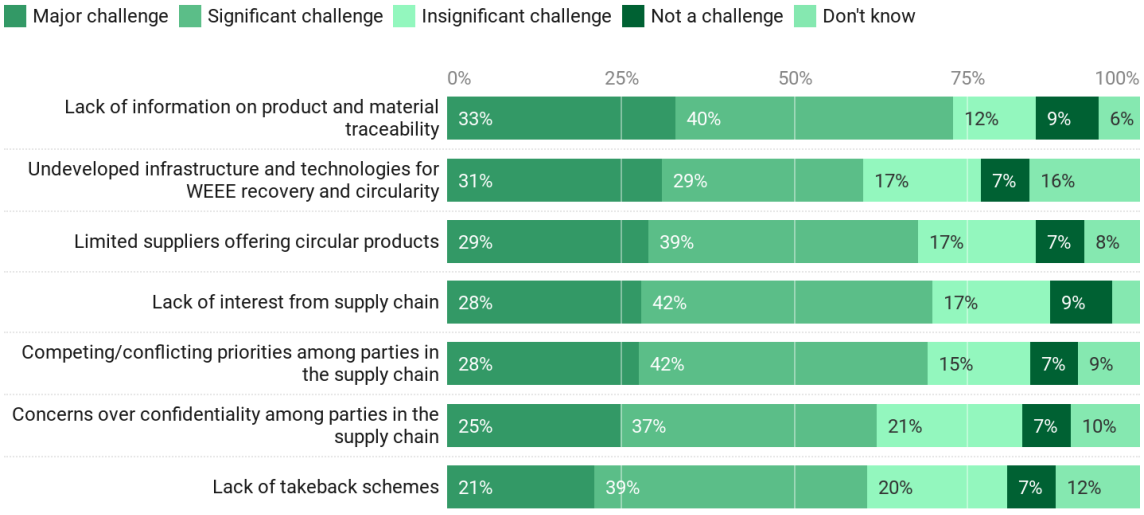
SUPPLY CHAIN CHALLENGES



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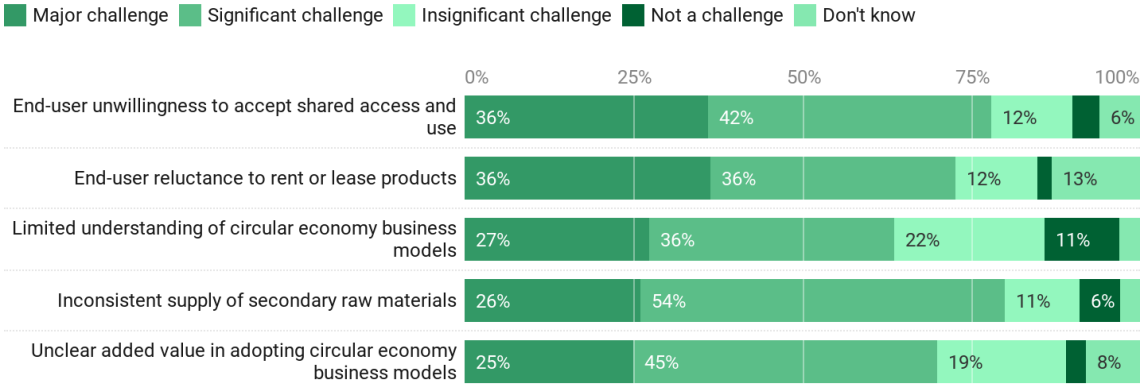
CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES



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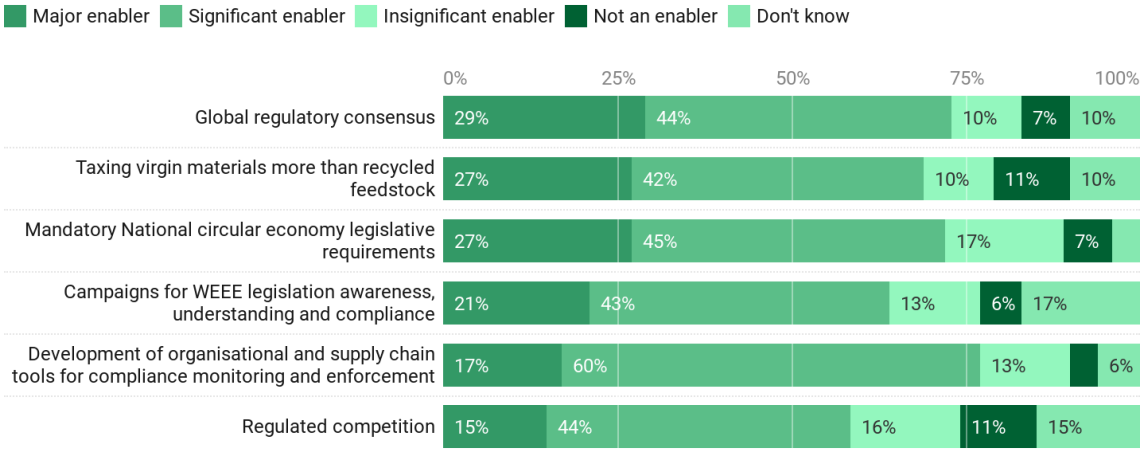
LEGISLATIVE ENABLERS



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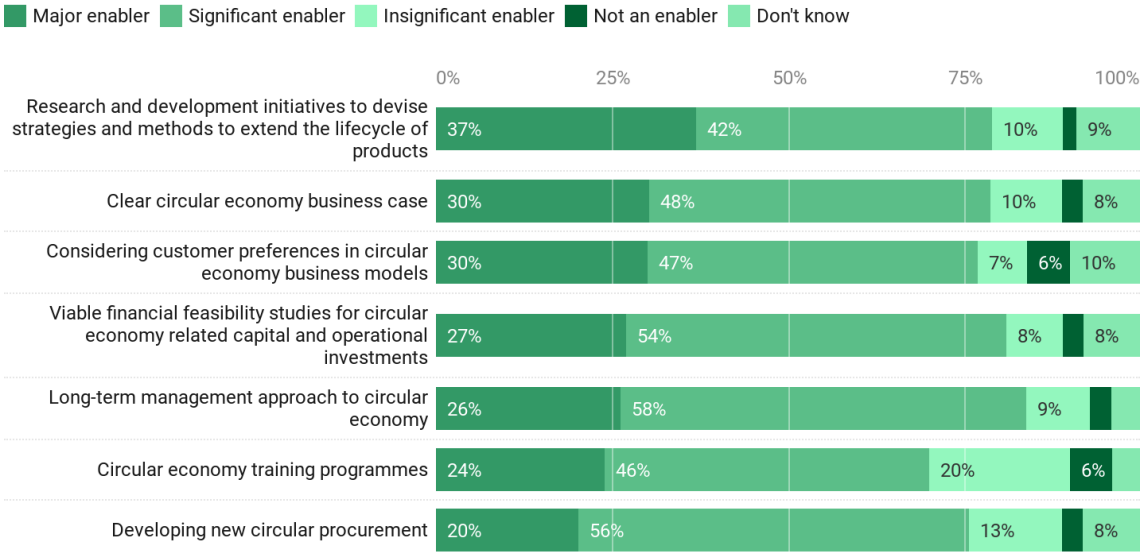
BUSINESS AND MANAGEMENT ENABLERS



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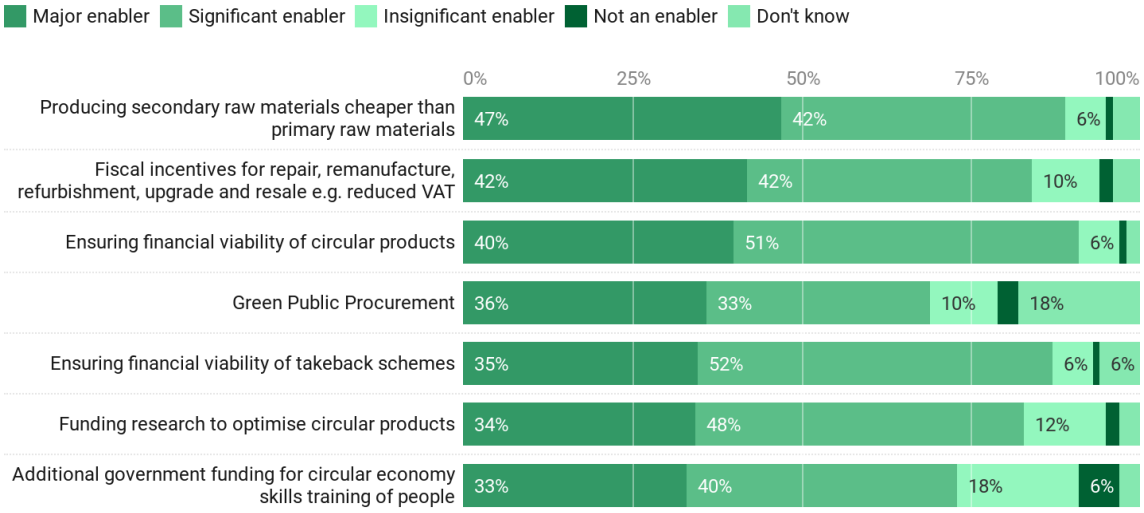
ECONOMIC ENABLERS



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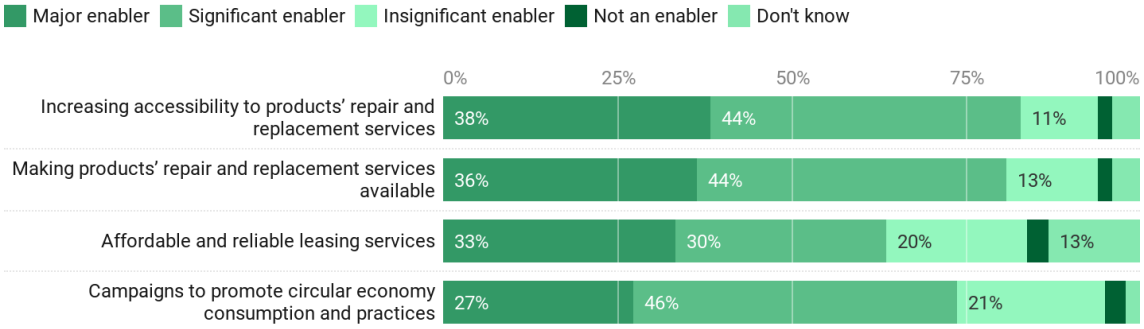
SOCIAL ENABLERS



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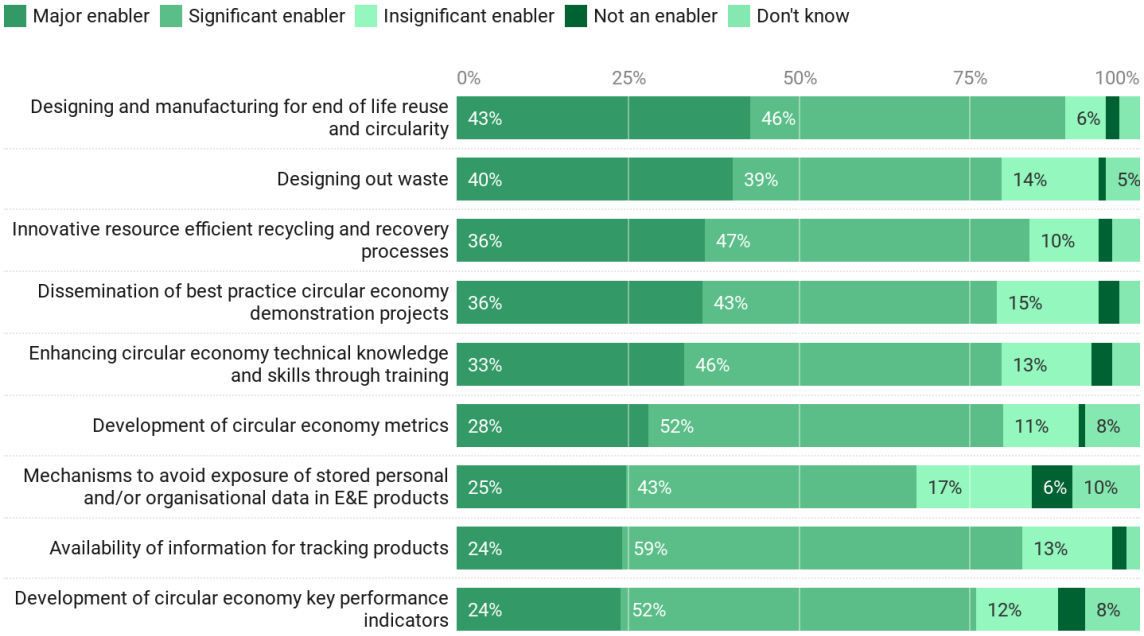
TECHNICAL ENABLERS



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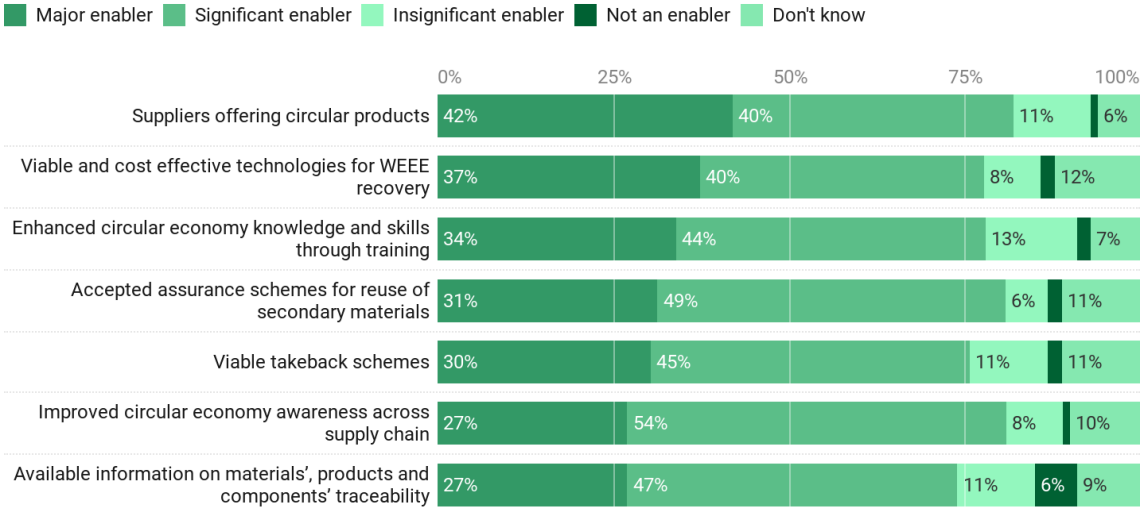
SUPPLY CHAIN ENABLERS



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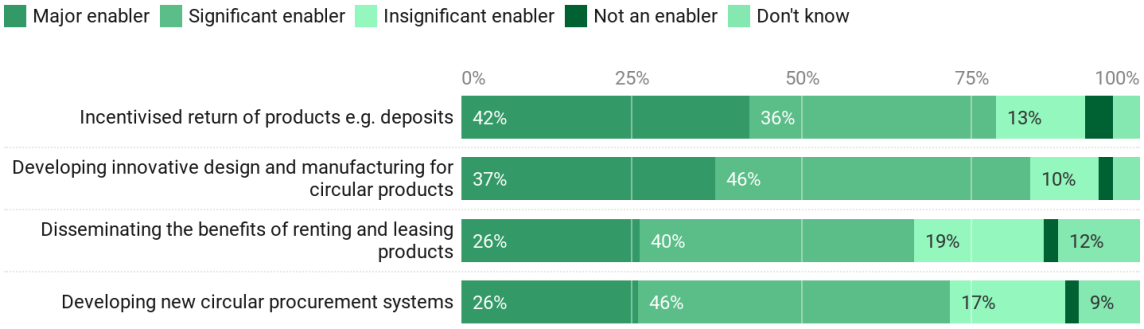
BUSINESS MODELS' IMPLEMENTATION ENABLERS



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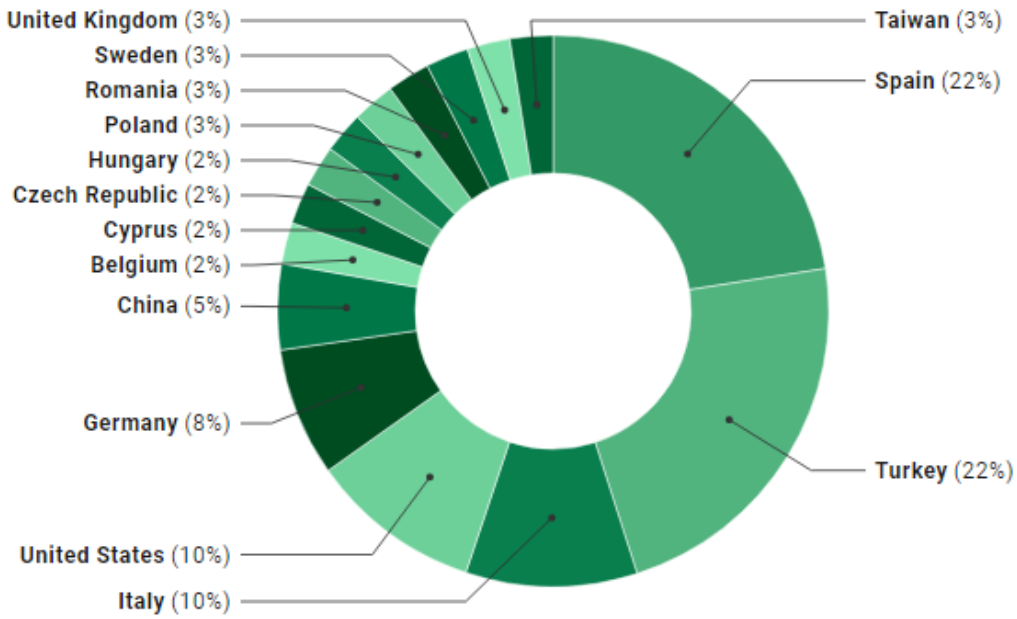
Suppliers – results charts

Survey responses = 41

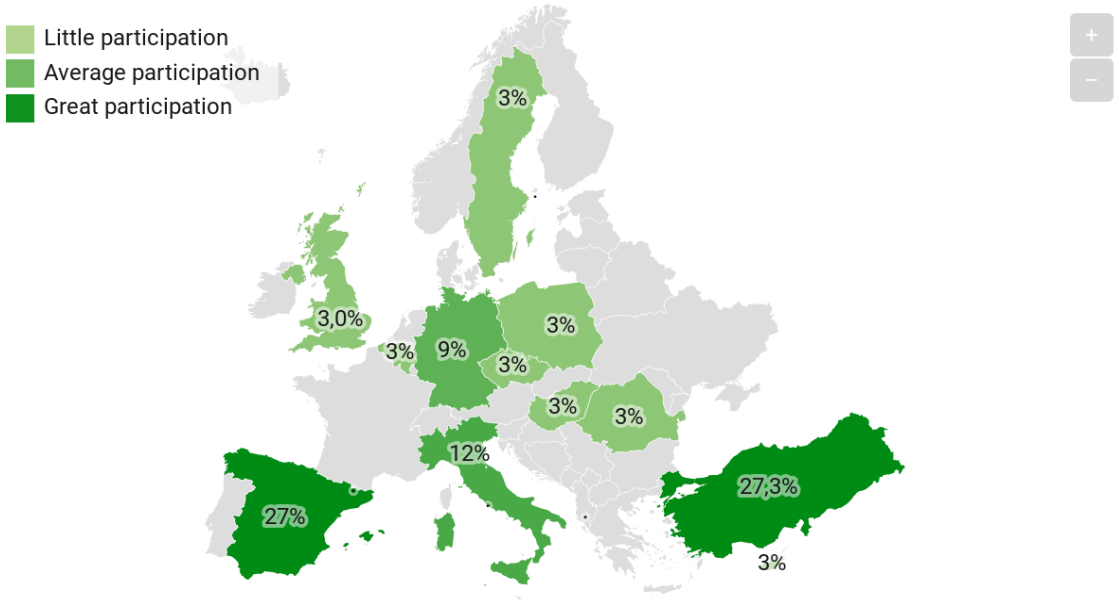
Participation of each country in the survey Acros the world

Analysis to Suppliers



Participation of each country in the survey - Europe

Analysis to Suppliers



Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe

Analysis to Suppliers

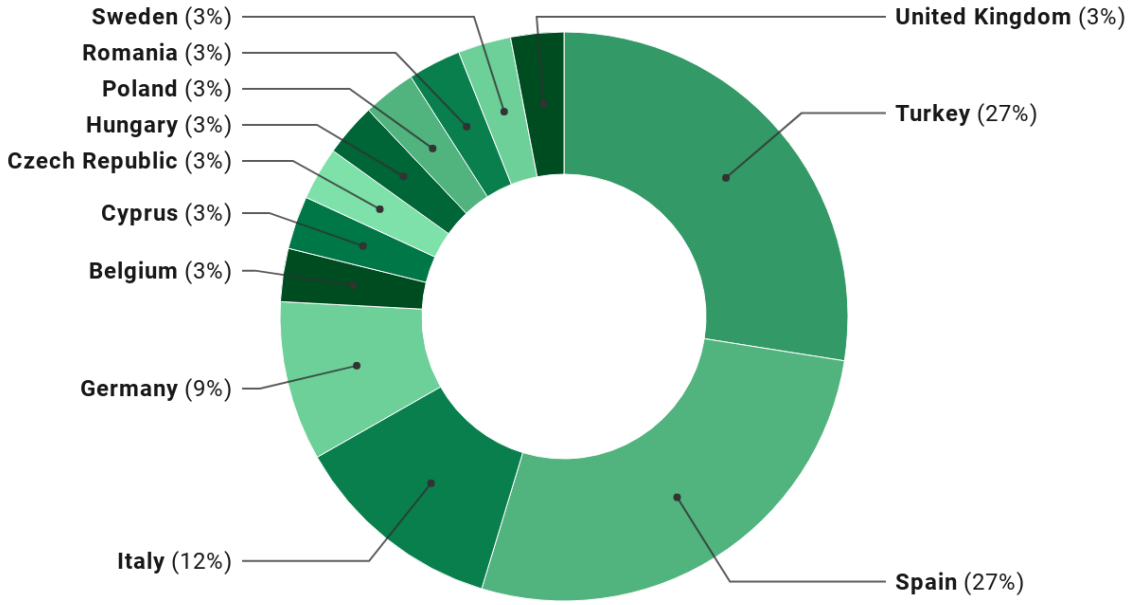
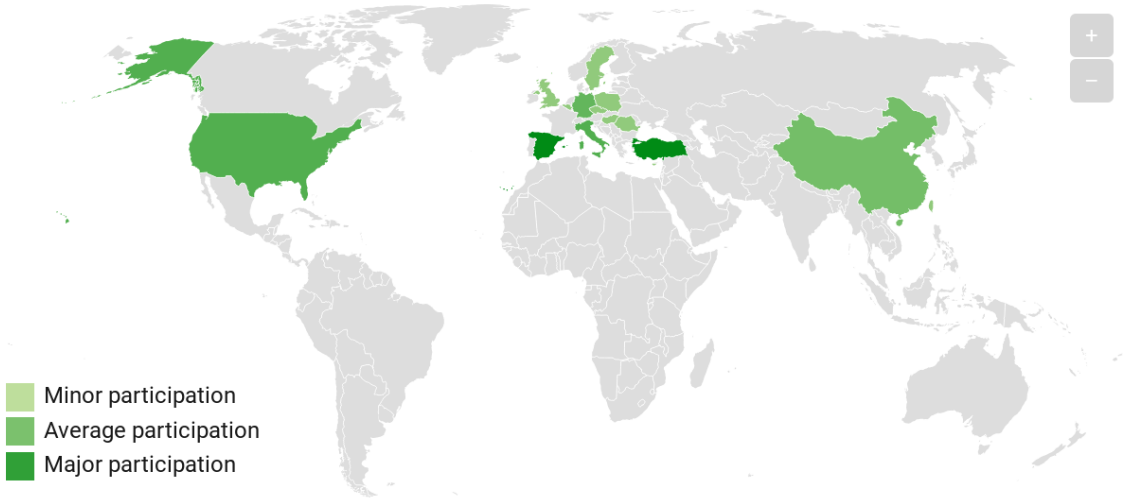


Chart: Exergy • Get the data • Created with Datawrapper

Country (Europe)	Percentage
Spain	27,3%
Turkey	27,3%
Italy	12,1%
Germany	9,1%
Belgium	3,0%
Cyprus	3,0%
Czech Republic	3,0%
Hungary	3,0%
Poland	3,0%
Romania	3,0%
Sweden	3,0%
United Kingdom	3,0%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Suppliers



No answers from French Guiana

Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Suppliers

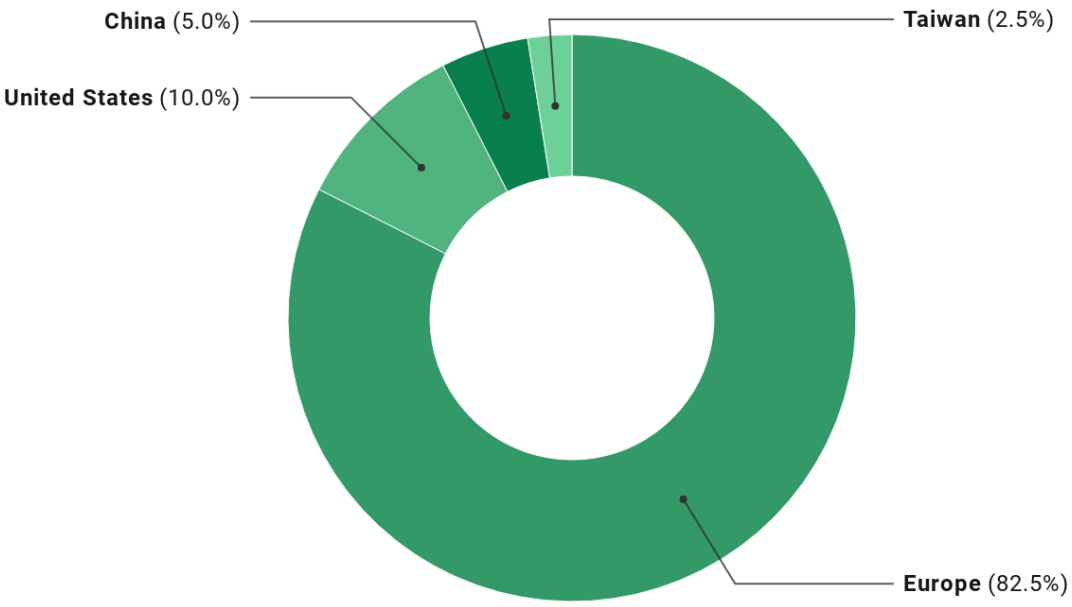
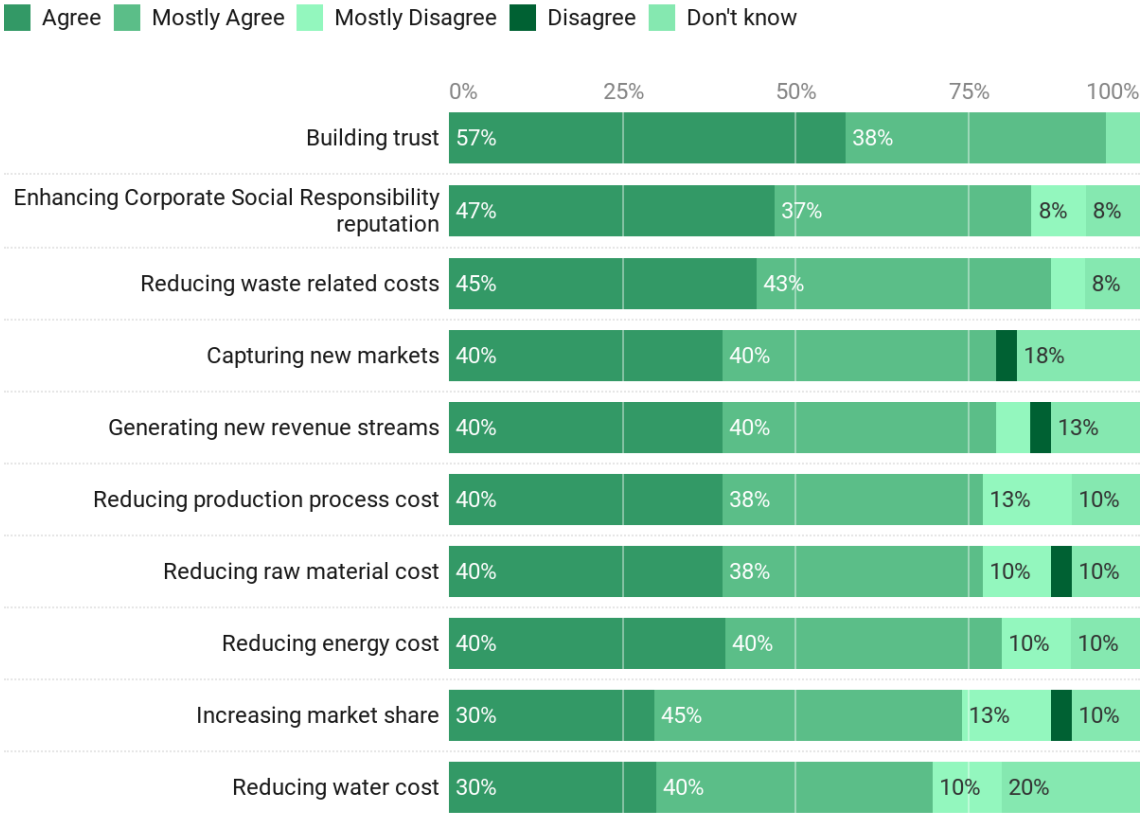


Chart: Exergy • Get the data • Created with Datawrapper

Country (world)	Percentage
Spain	22,5%
Turkey	22,5%
Italy	10,0%
United States	10,0%
Germany	7,5%
China	5,0%
Belgium	2,5%
Cyprus	2,5%
Czech Republic	2,5%
Hungary	2,5%
Poland	2,5%
Romania	2,5%
Sweden	2,5%
United Kingdom	2,5%
Taiwan	2,5%

ECONOMIC OPPORTUNITIES



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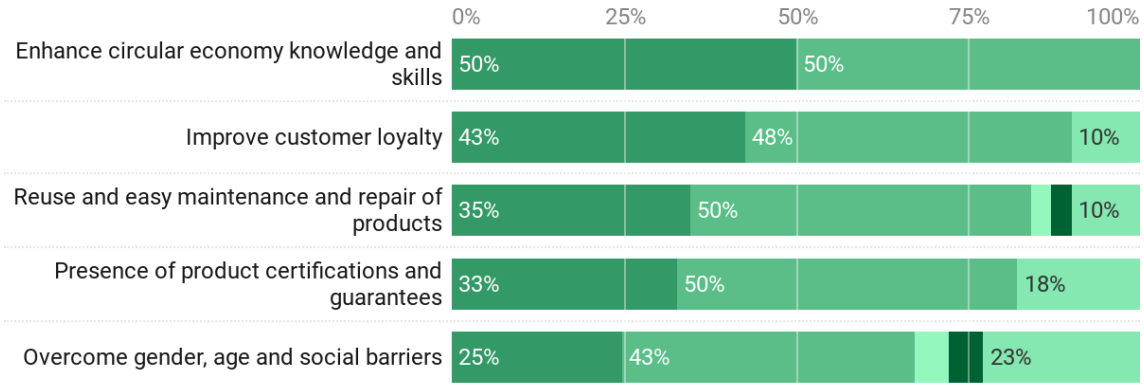
SOCIAL OPPORTUNITIES



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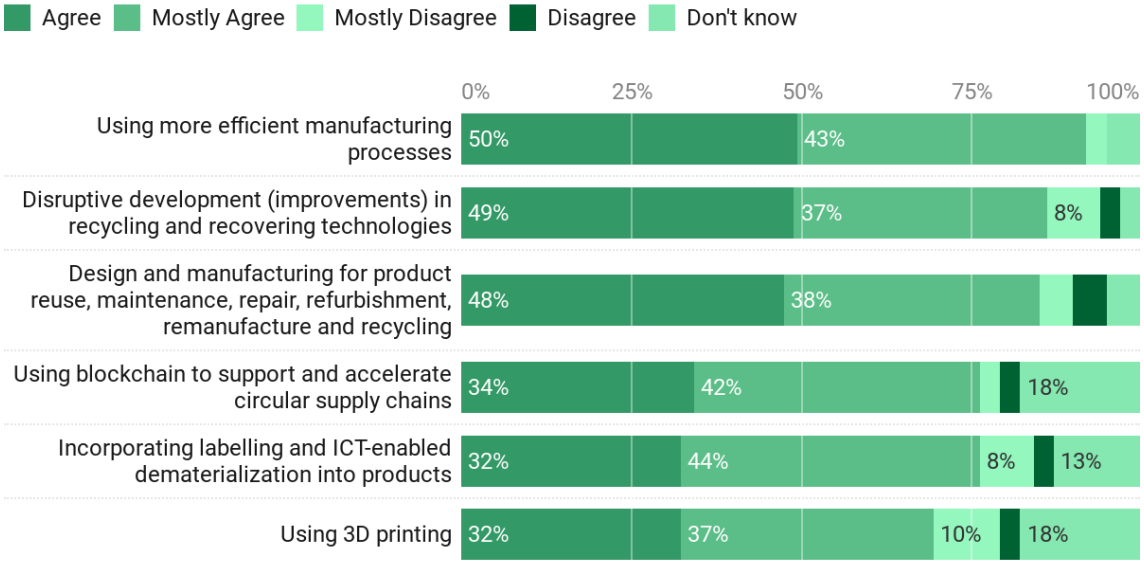
TECHNICAL OPPORTUNITIES



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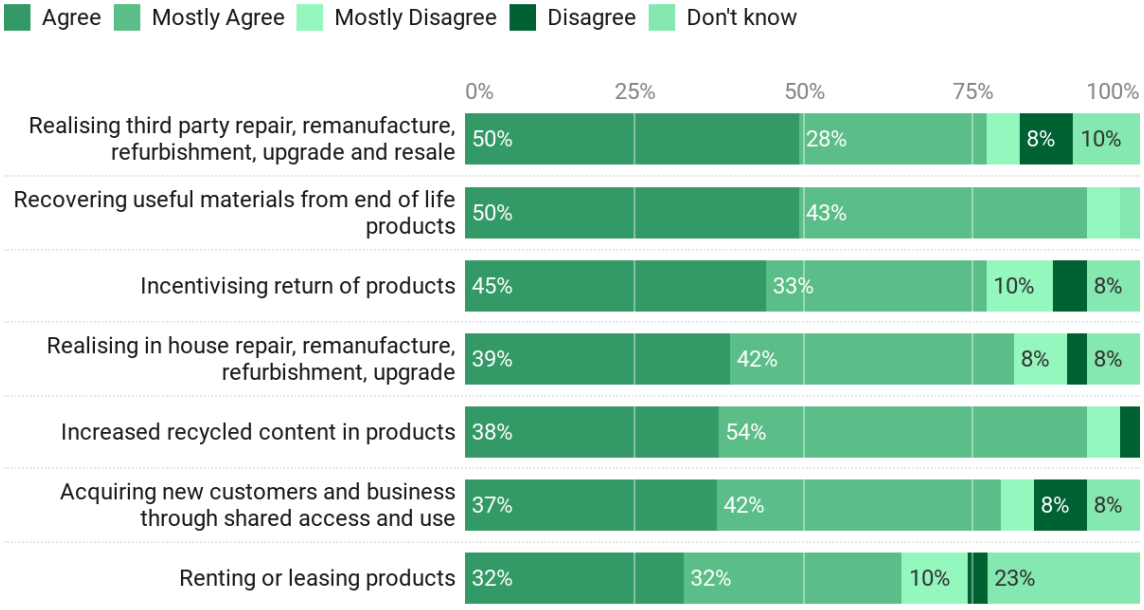
CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



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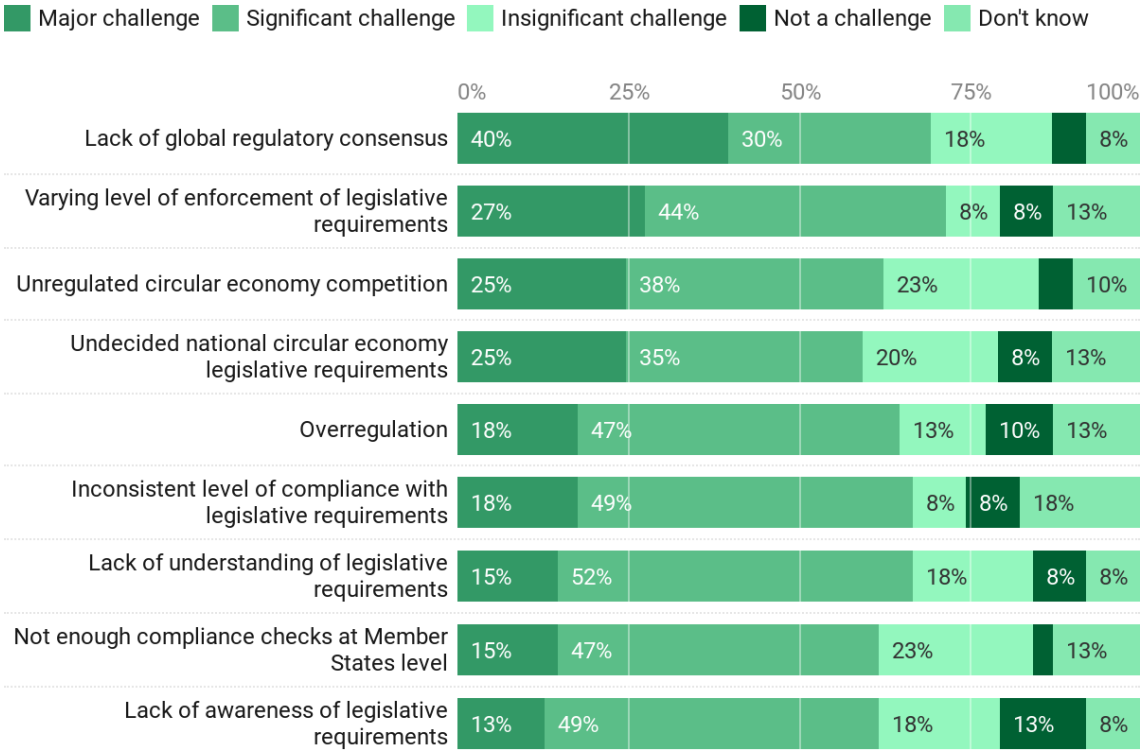
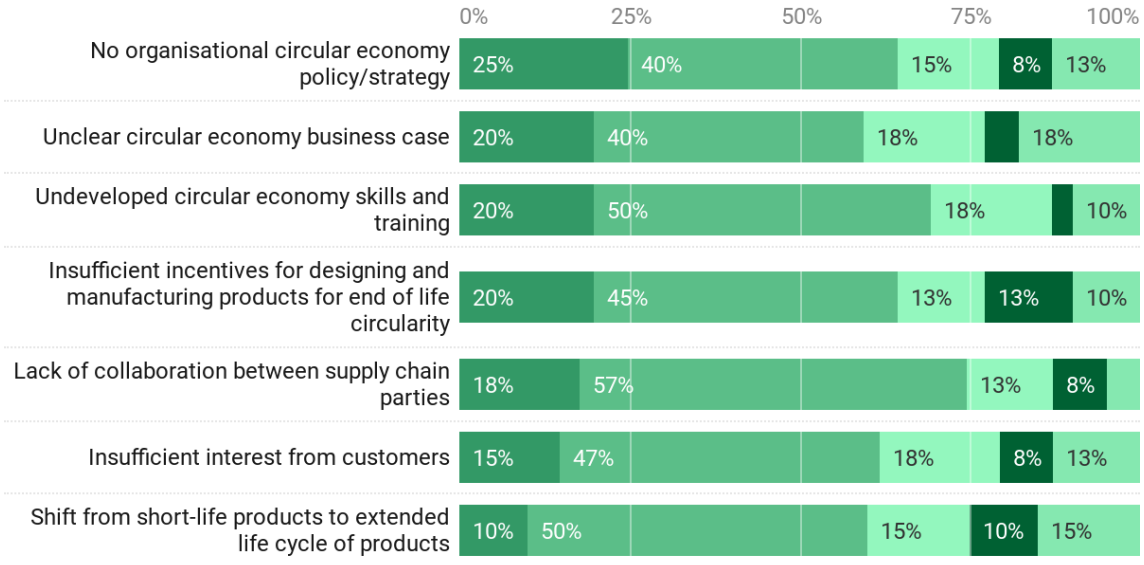
LEGISLATIVE CHALLENGES



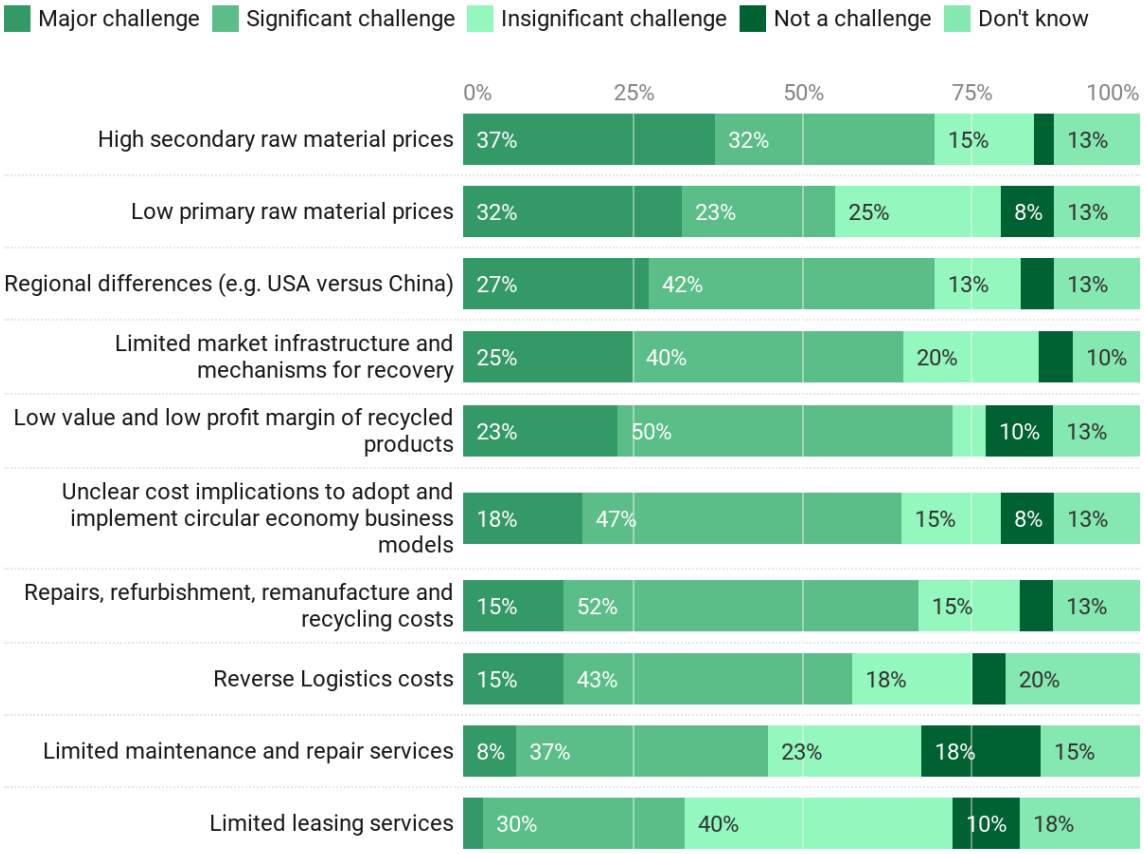
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT CHALLENGES



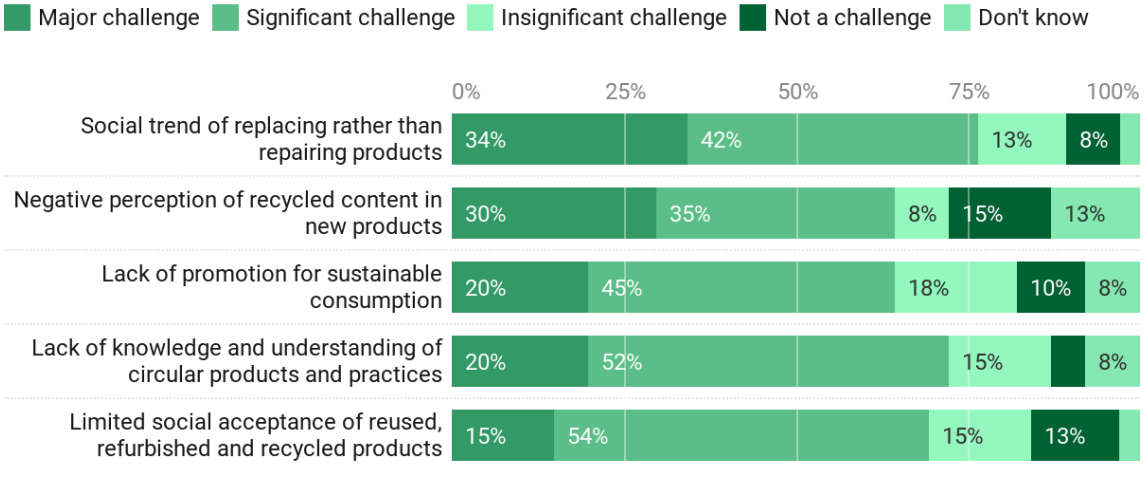
Get the data • Created with Datawrapper

ECONOMIC CHALLENGES



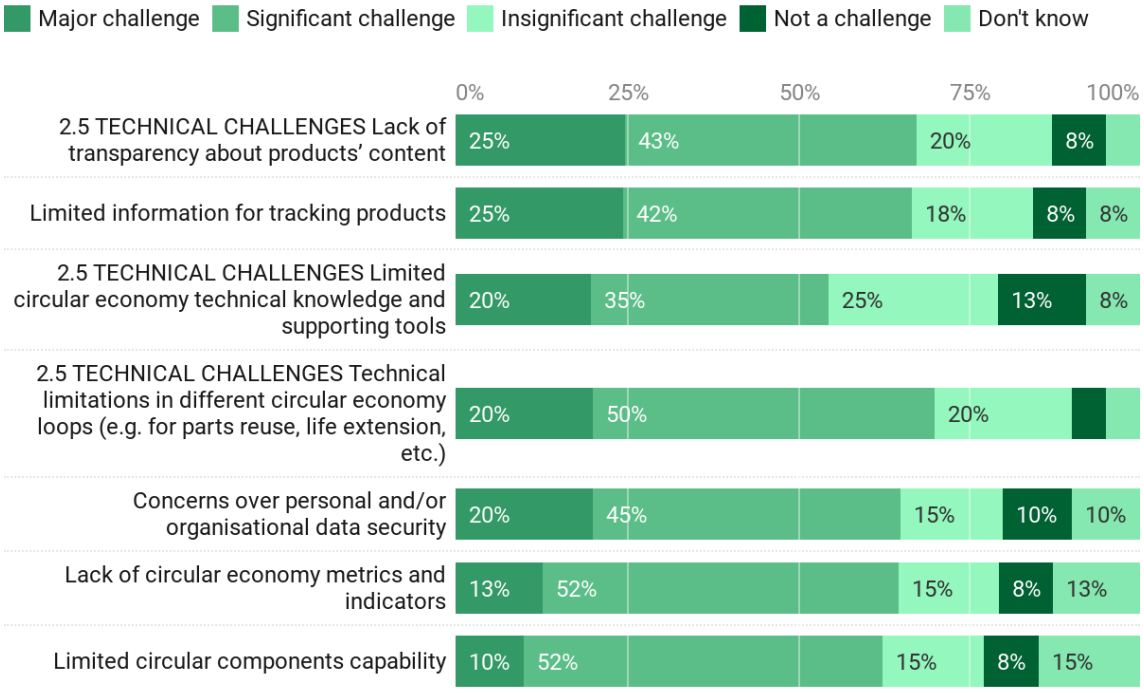
Get the data • Created with Datawrapper

SOCIAL CHALLENGES



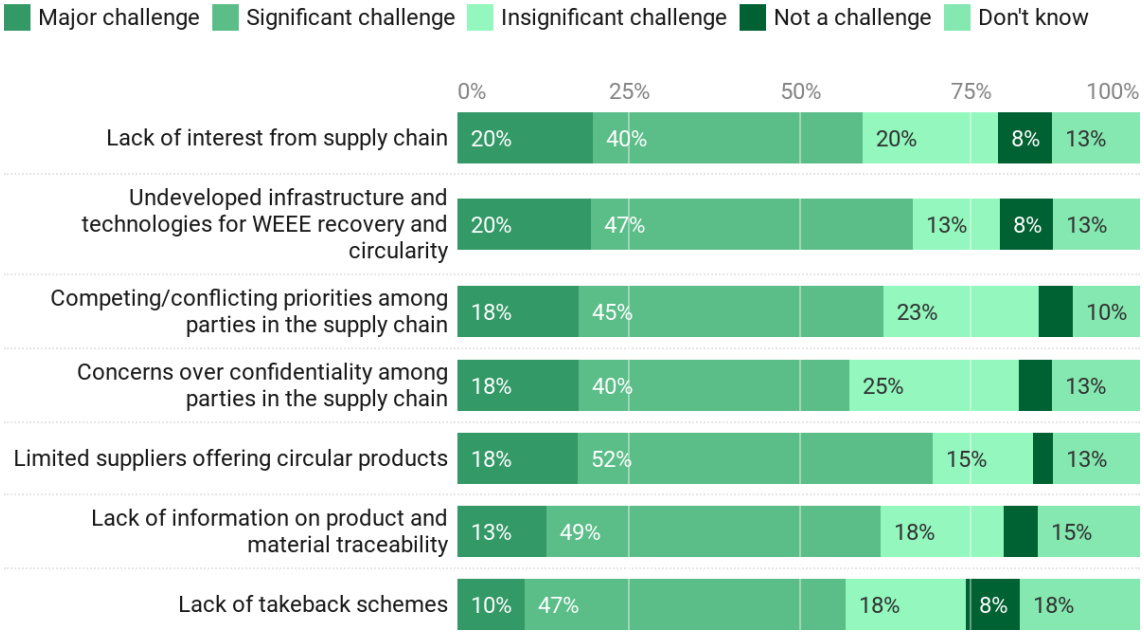
Get the data • Created with Datawrapper

TECHNICAL CHALLENGES



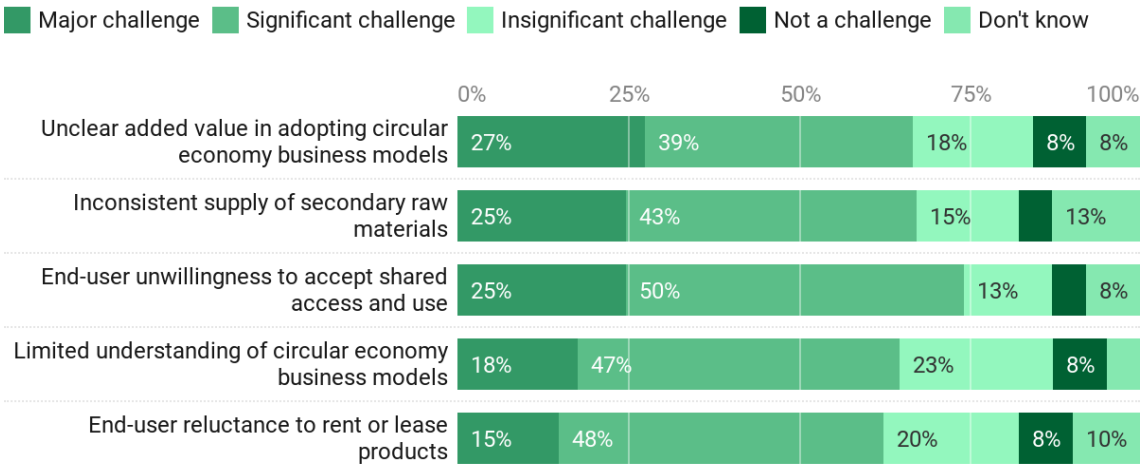
Get the data • Created with Datawrapper

SUPPLY CHAIN CHALLENGES



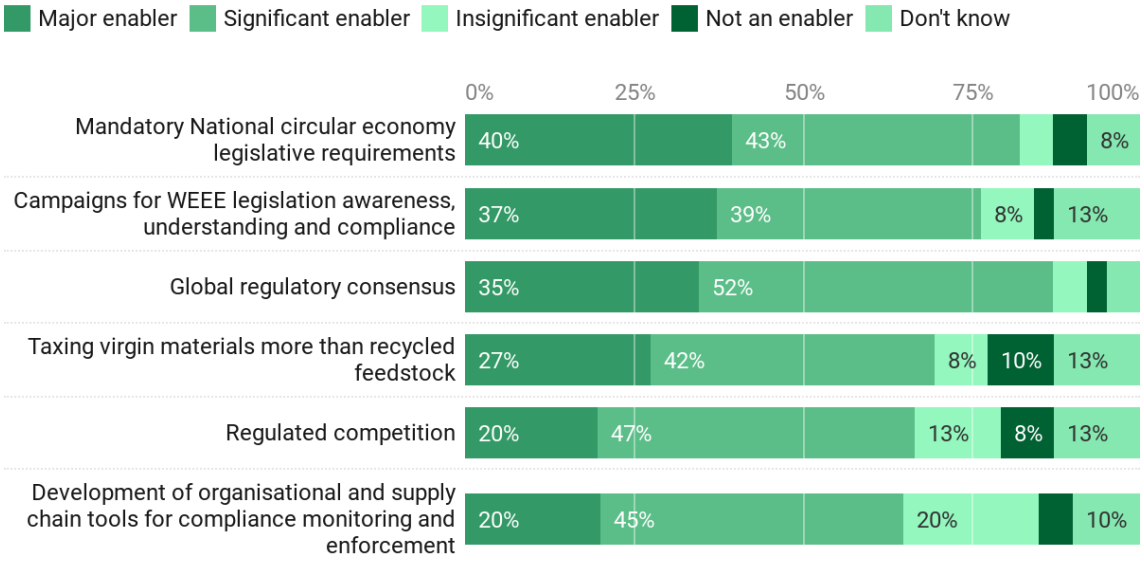
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES



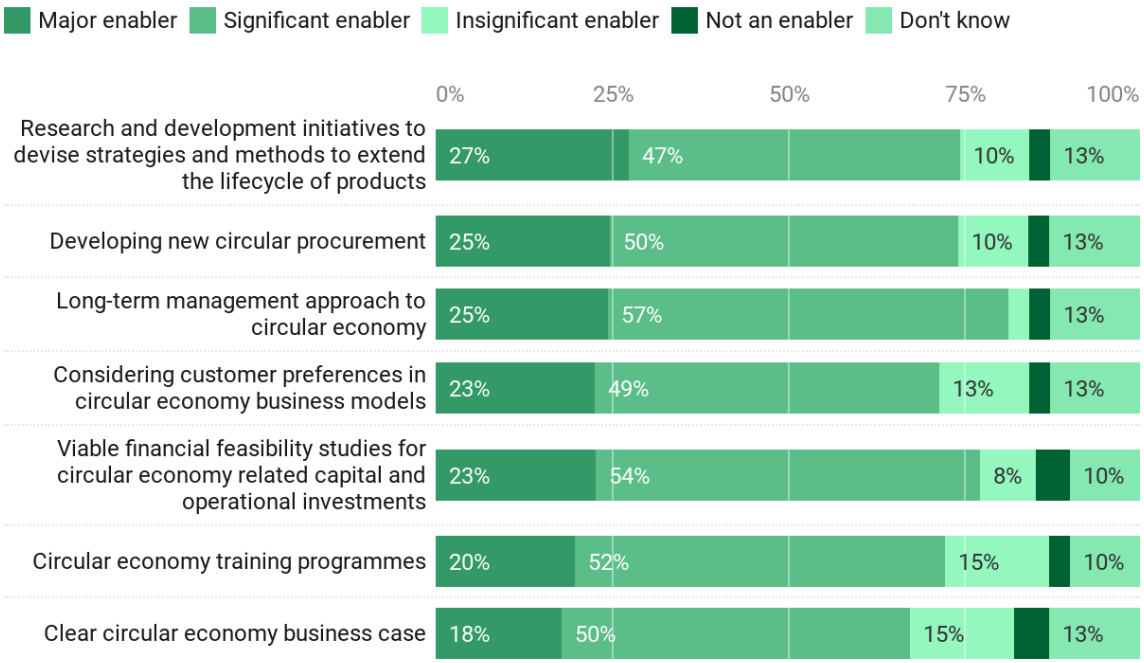
Get the data • Created with Datawrapper

LEGISLATIVE ENABLERS



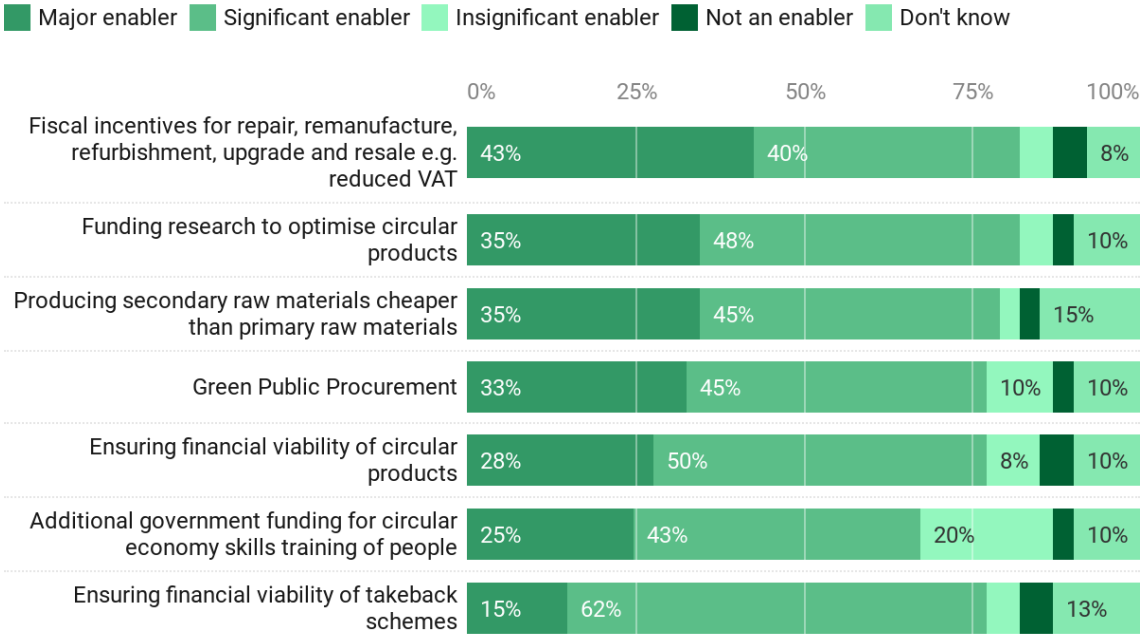
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT ENABLERS



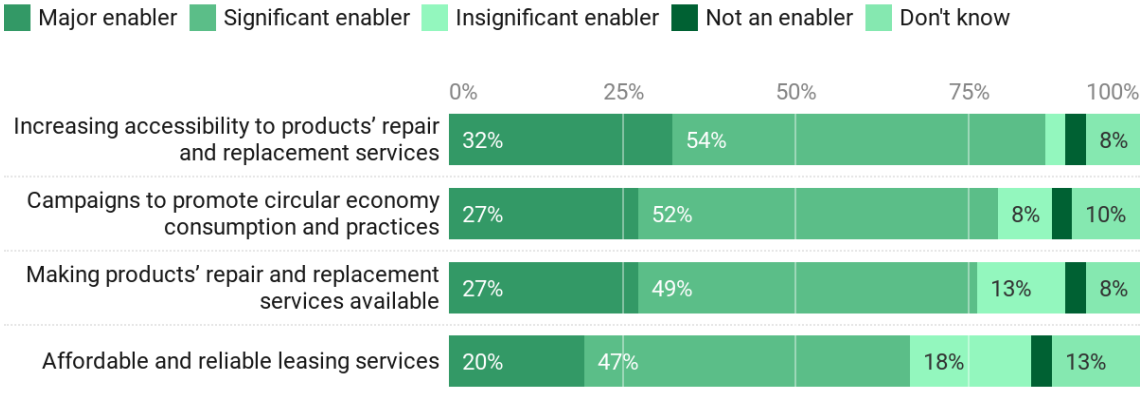
Get the data • Created with Datawrapper

ECONOMIC ENABLERS



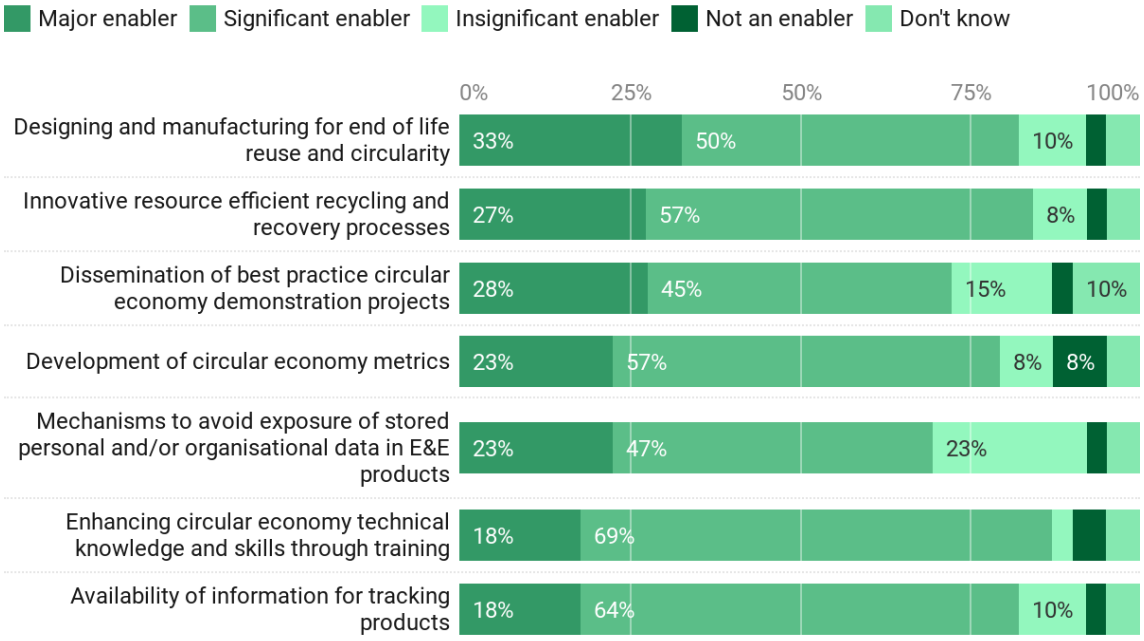
Get the data • Created with Datawrapper

SOCIAL ENABLERS



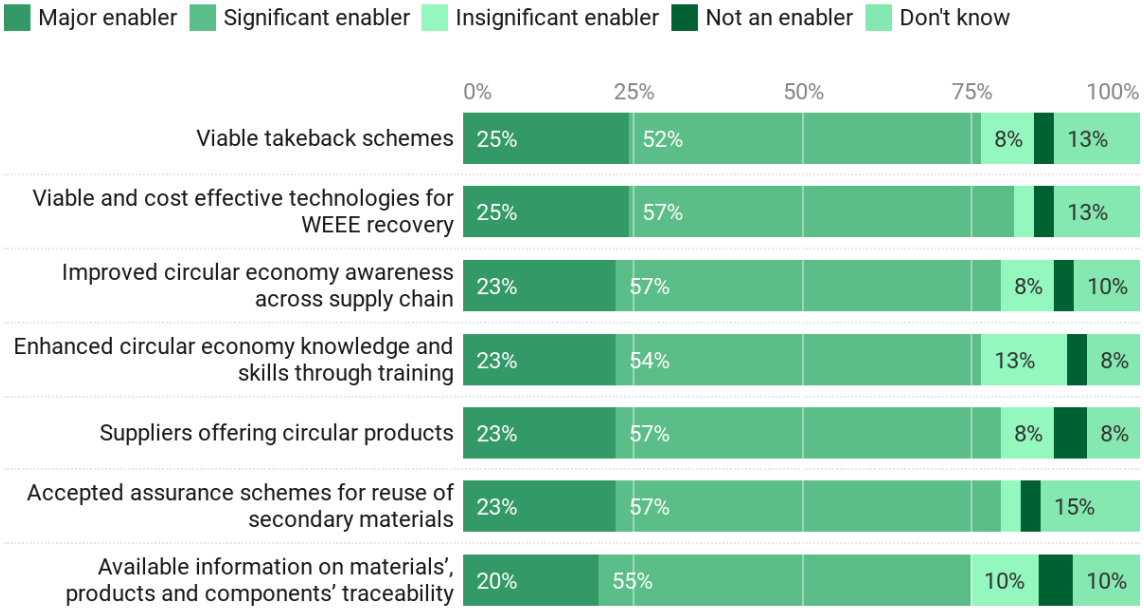
Get the data • Created with Datawrapper

TECHNICAL ENABLERS



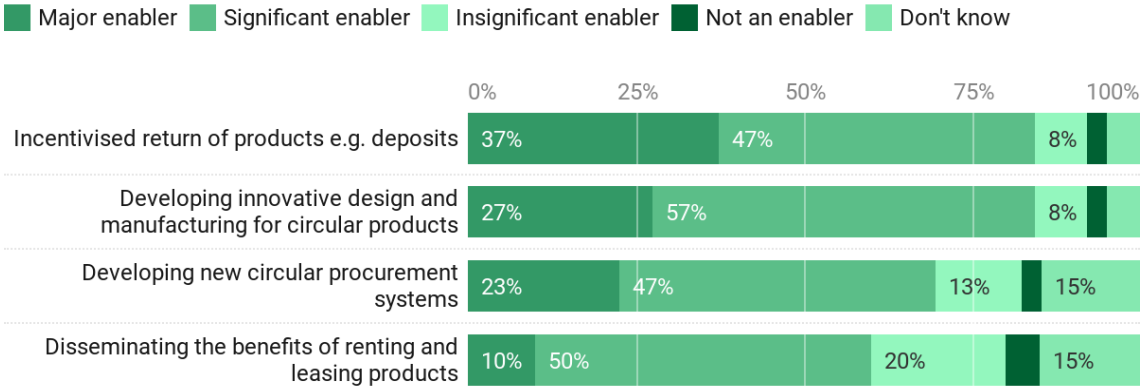
Get the data • Created with Datawrapper

SUPPLY CHAIN ENABLERS



Get the data • Created with Datawrapper

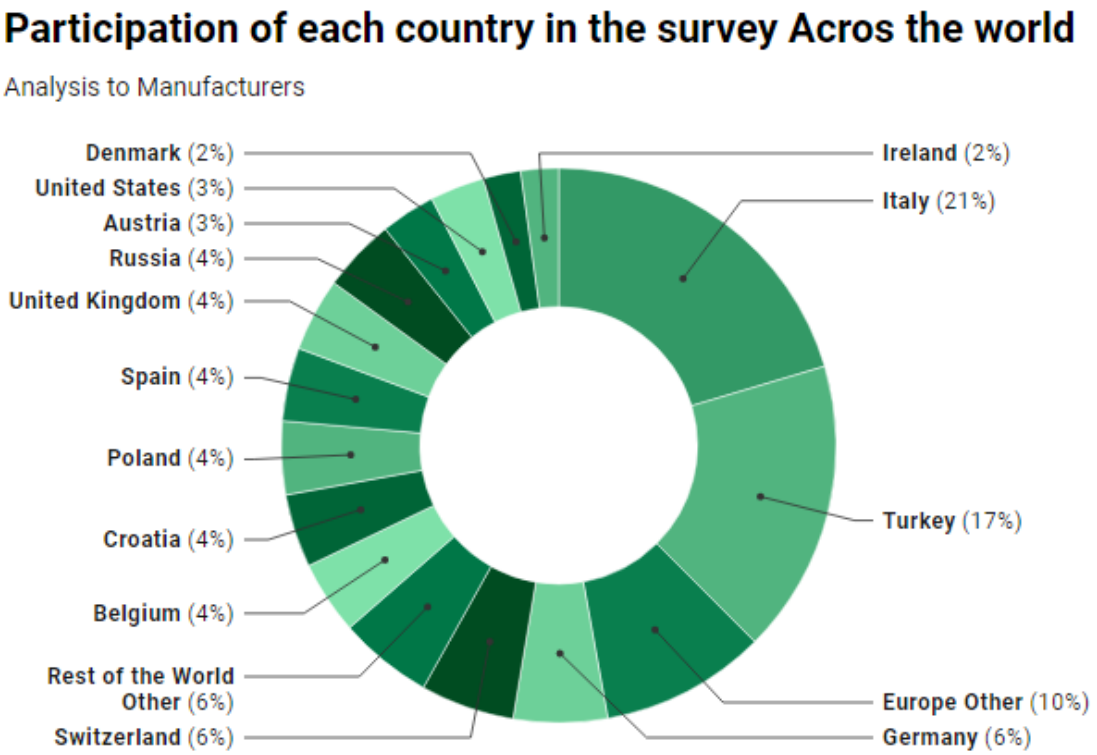
BUSINESS MODELS' IMPLEMENTATION ENABLERS



Get the data • Created with Datawrapper

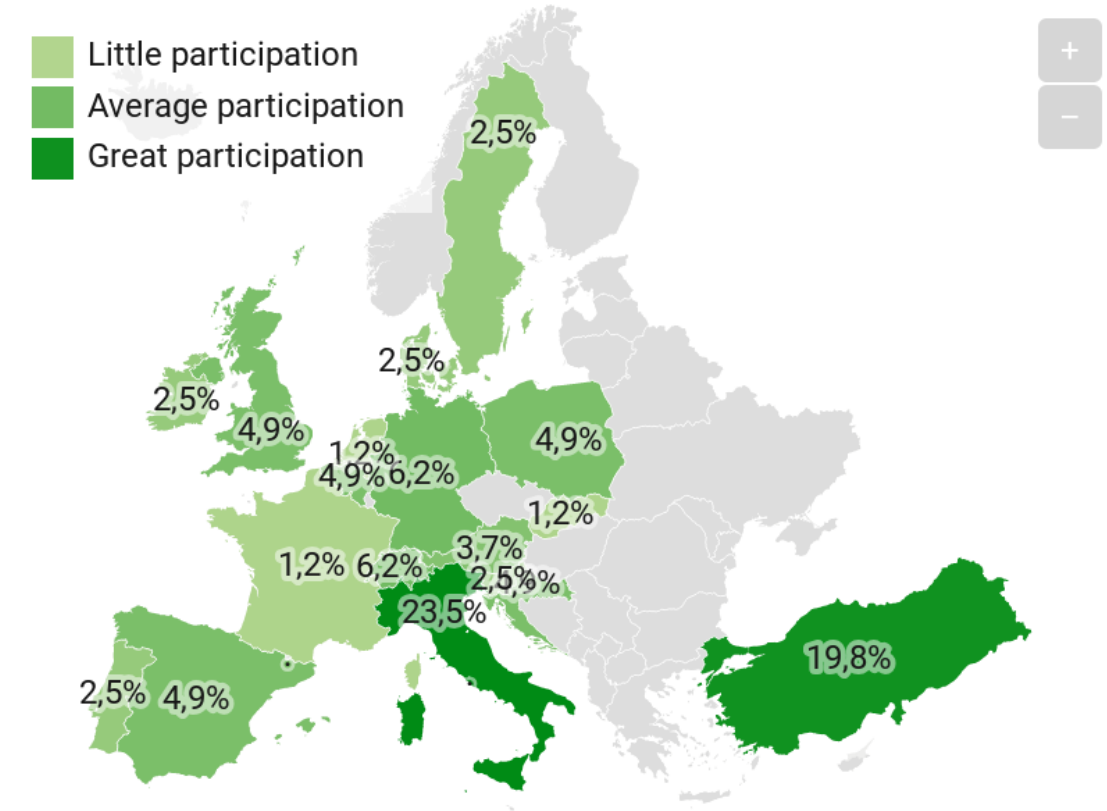
Manufacturers – results charts

Survey responses = 93



Participation of each country in the survey - Europe

Analysis to Manufacturers



Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe

Analysis to Manufacturers

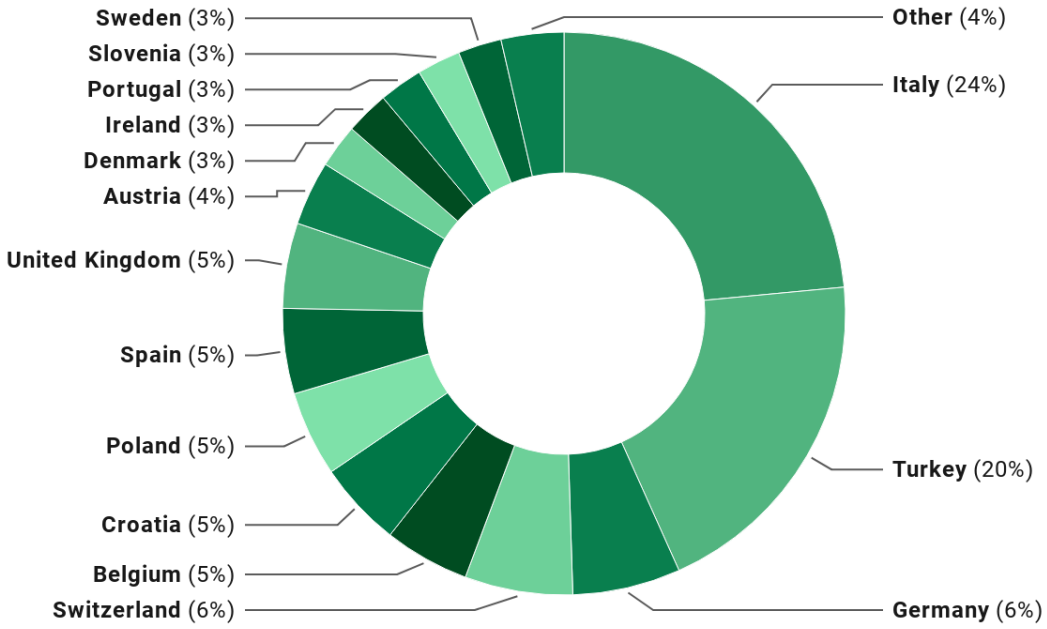
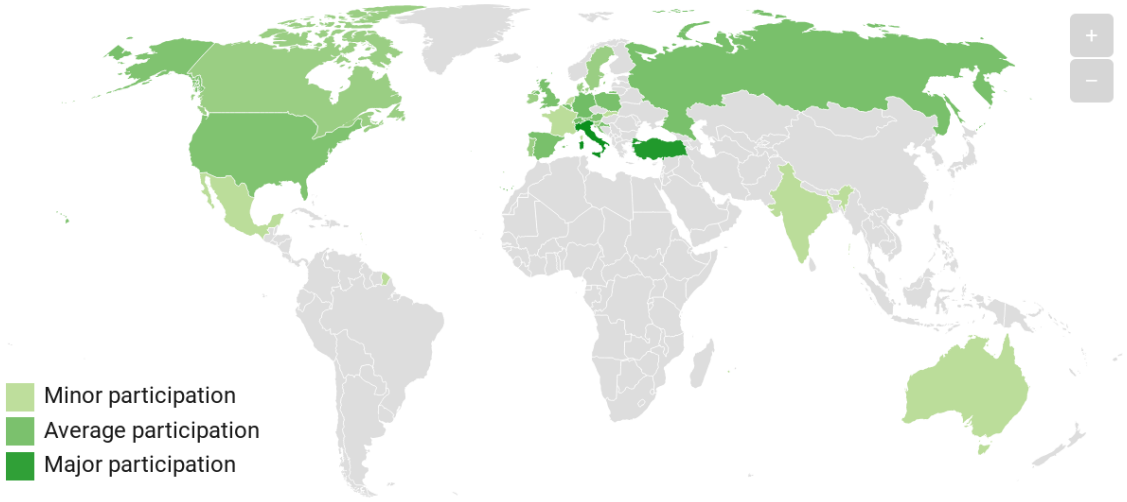


Chart: Exergy • Get the data • Created with Datawrapper

Country (Europe)	Percentage
Italy	23,5%
Turkey	19,8%
Germany	6,2%
Switzerland	6,2%
Belgium	4,9%
Croatia	4,9%
Poland	4,9%
Spain	4,9%
United Kingdom	4,9%
Austria	3,7%
Denmark	2,5%
Ireland	2,5%
Portugal	2,5%
Slovenia	2,5%
Sweden	2,5%
France	1,2%
Netherlands	1,2%
Slovakia	1,2%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Manufacturers



No answers from French Guiana

Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Manufacturers

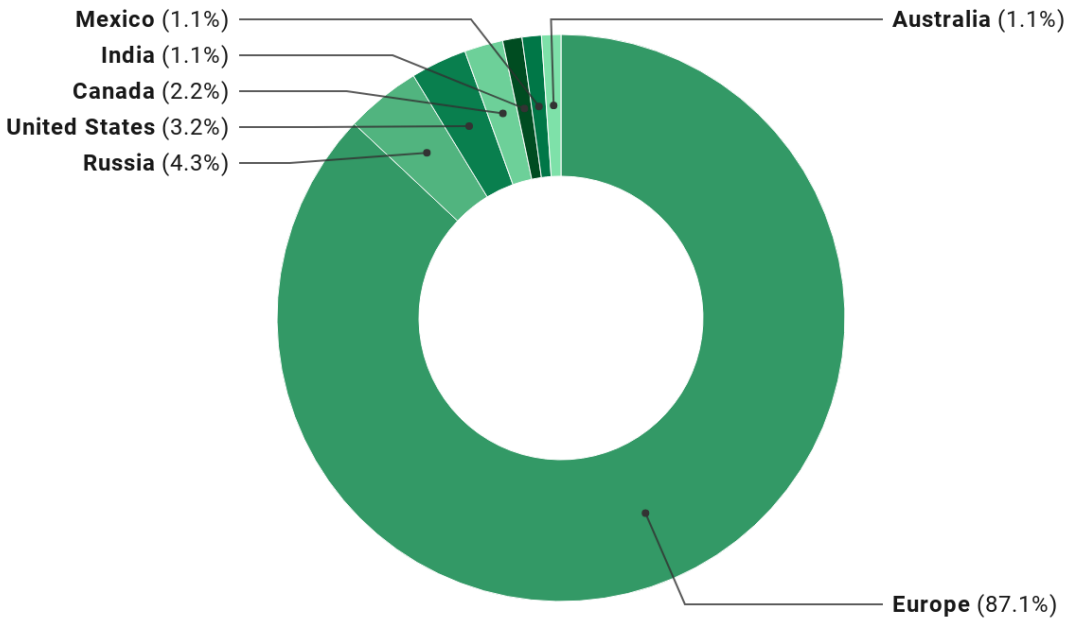


Chart: Exergy • Get the data • Created with Datawrapper

Country (World)	Percentage
Italy	20,4%
Turkey	17,2%
Germany	5,4%
Switzerland	5,4%
Belgium	4,3%
Croatia	4,3%
Poland	4,3%
Spain	4,3%
United Kingdom	4,3%
Russia	4,3%
Austria	3,2%
United States	3,2%
Denmark	2,2%
Ireland	2,2%
Portugal	2,2%
Slovenia	2,2%
Sweden	2,2%
Canada	2,2%
France	1,1%
Netherlands	1,1%
Slovakia	1,1%
India	1,1%
Mexico	1,1%
Australia	1,1%

Size of the company

Analysis to Manufacturers

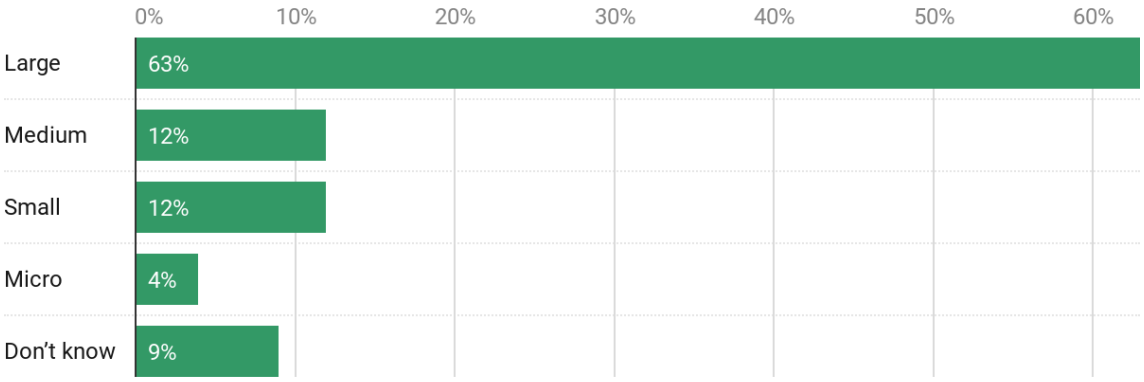
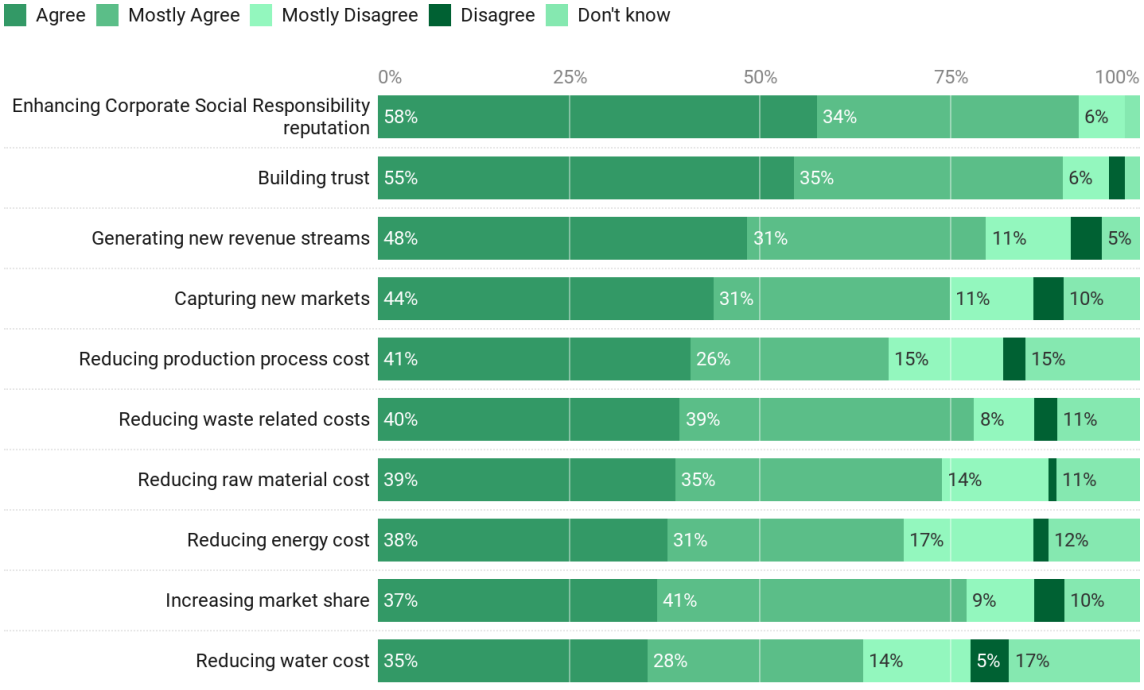


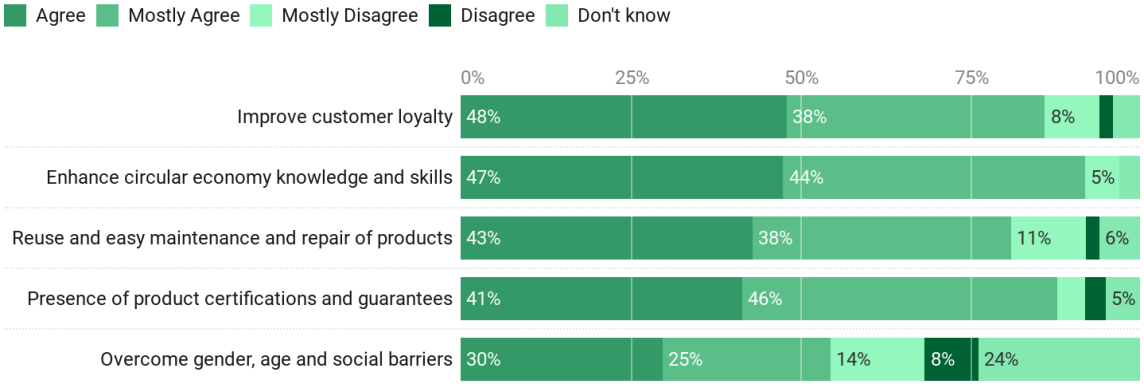
Chart: Exergy • Get the data • Created with Datawrapper

ECONOMIC OPPORTUNITIES



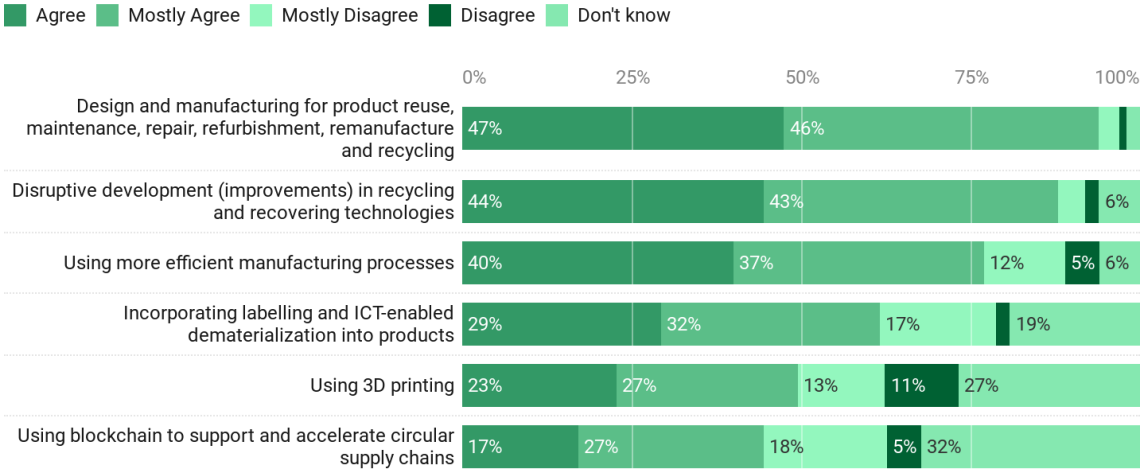
Get the data • Created with Datawrapper

SOCIAL OPPORTUNITIES



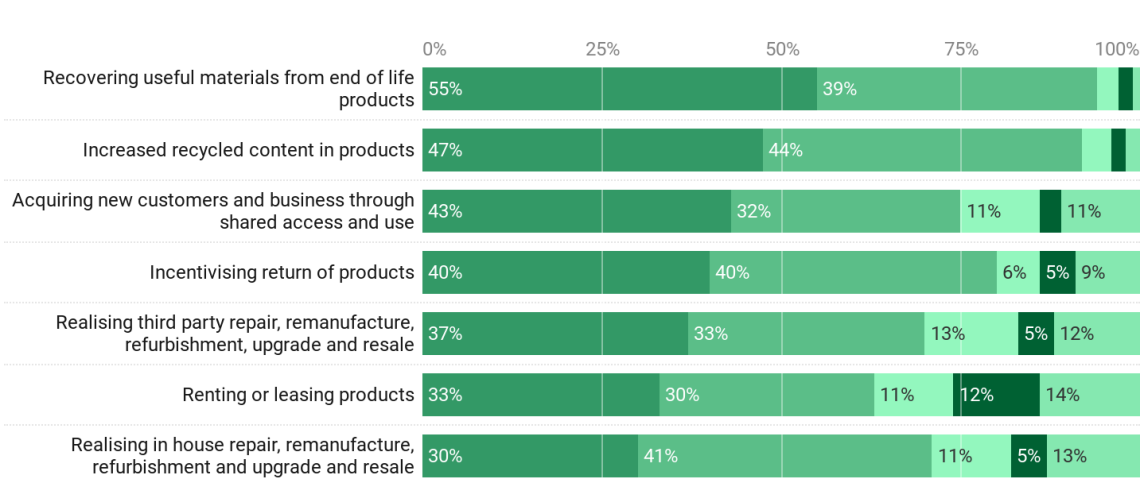
Get the data • Created with Datawrapper

TECHNICAL OPPORTUNITIES



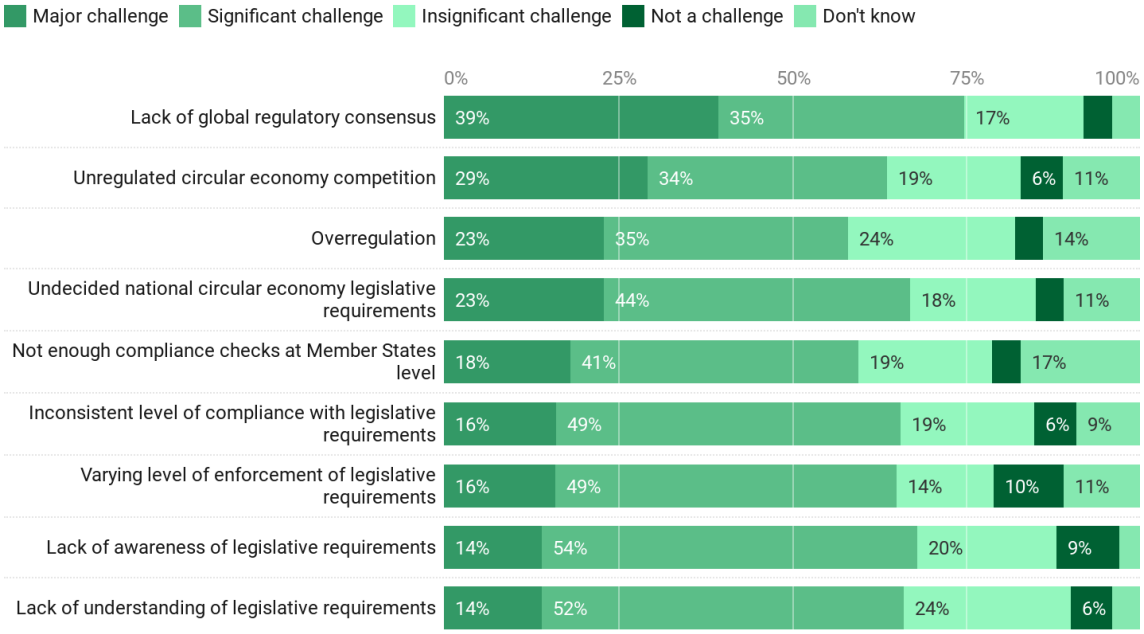
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



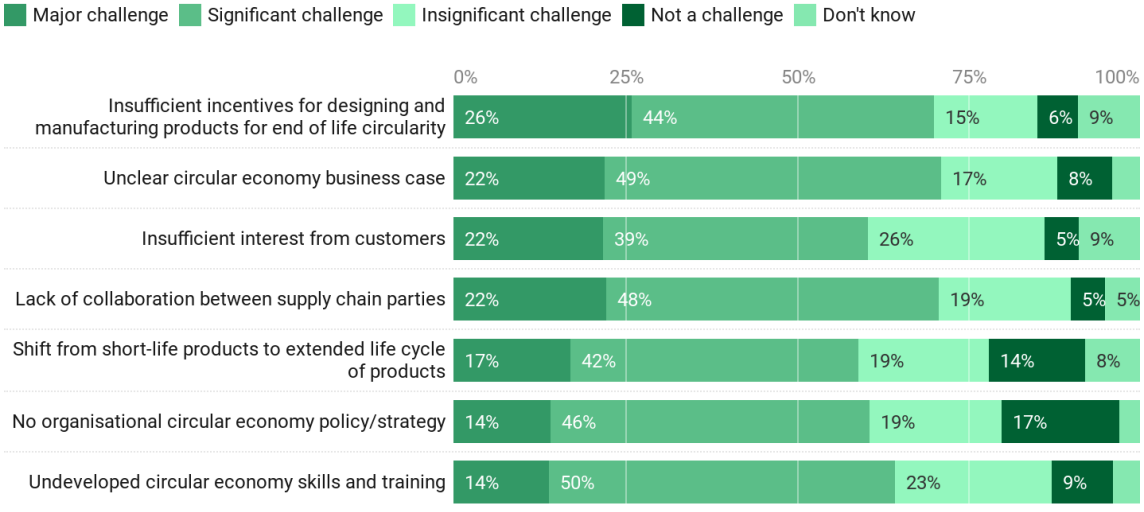
Get the data • Created with Datawrapper

LEGISLATIVE CHALLENGES



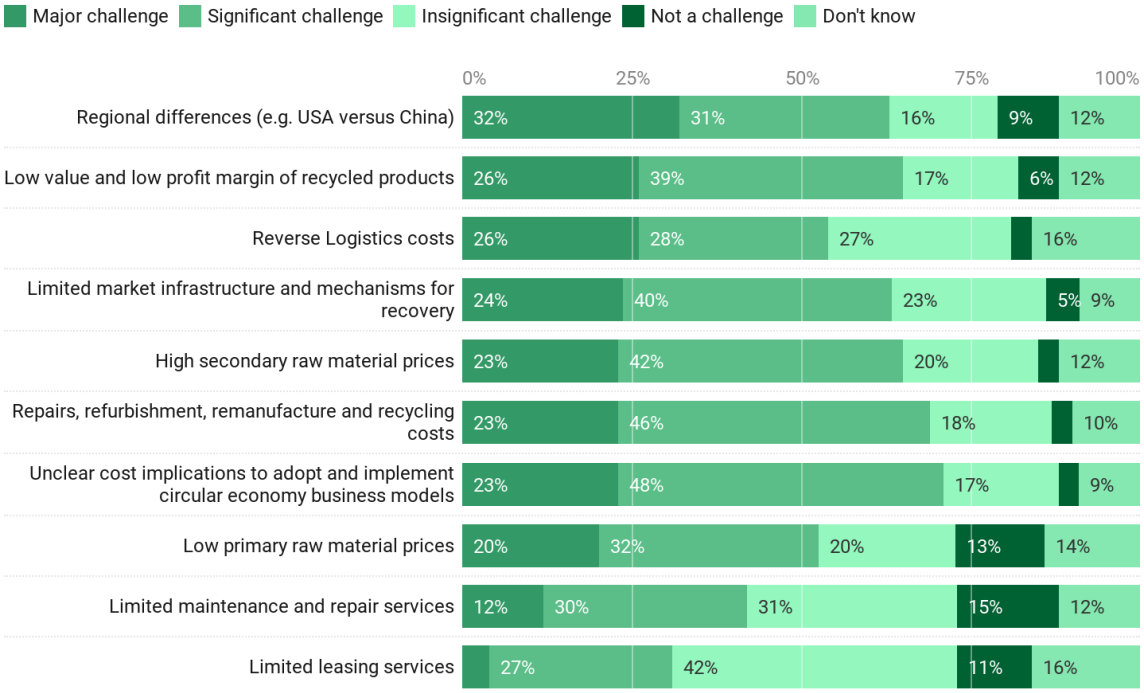
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT CHALLENGES



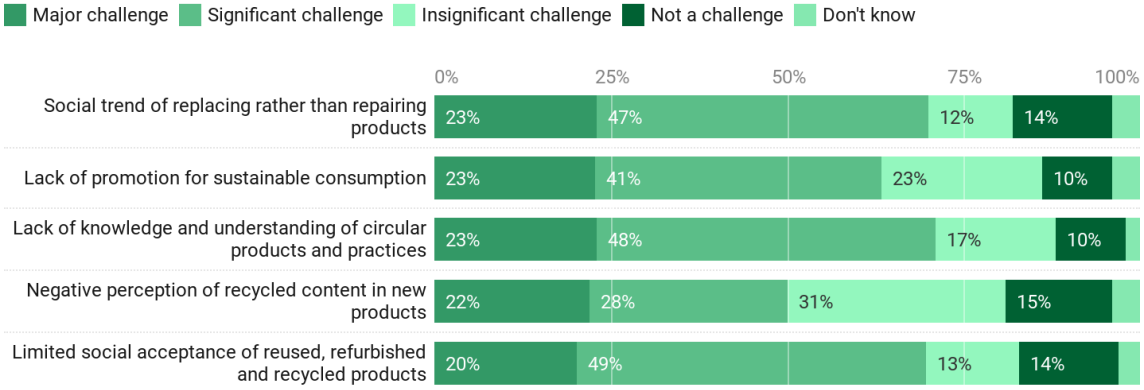
Get the data • Created with Datawrapper

ECONOMIC CHALLENGES



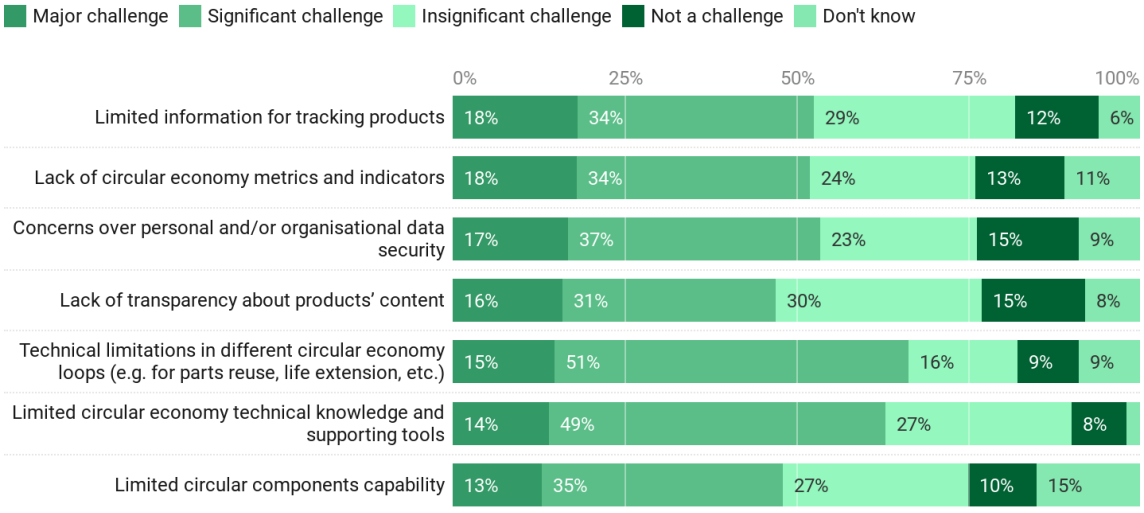
Get the data • Created with Datawrapper

SOCIAL CHALLENGES



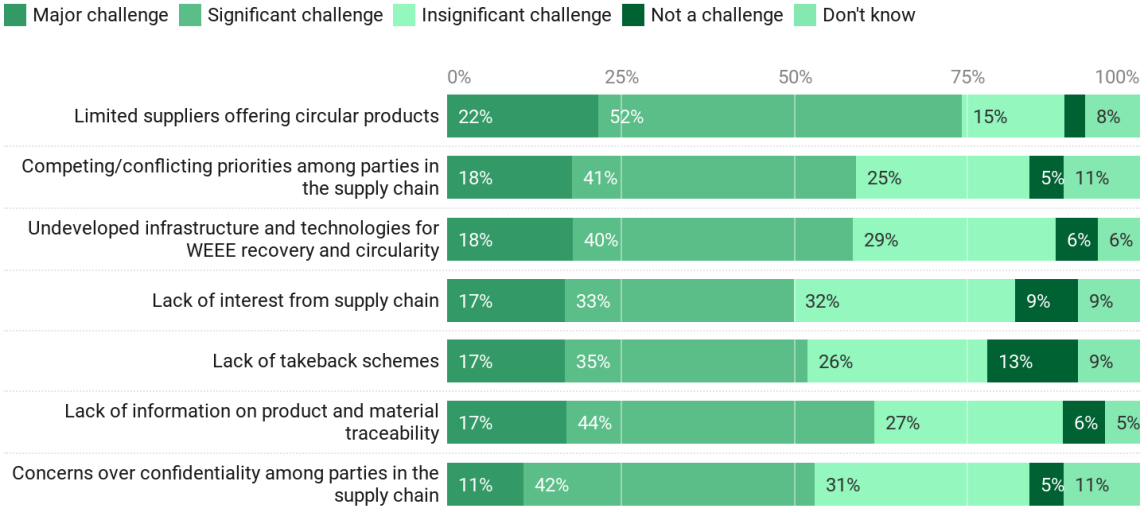
Get the data • Created with Datawrapper

TECHNICAL CHALLENGES



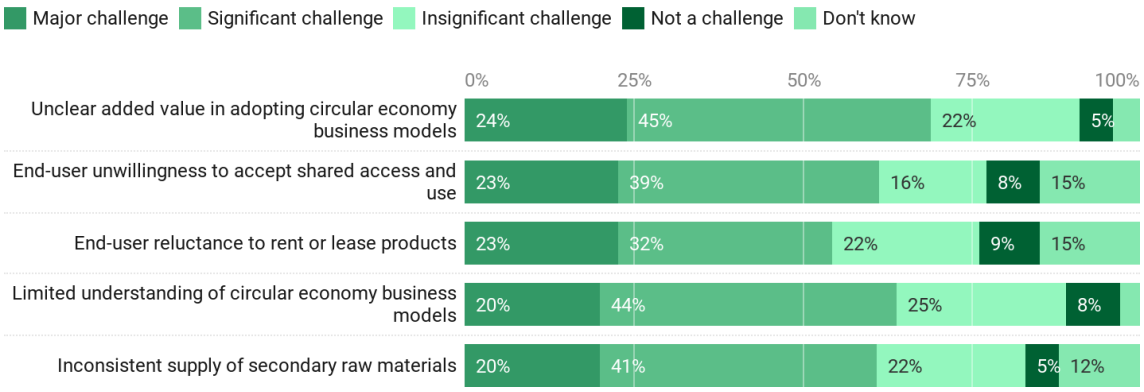
Get the data • Created with Datawrapper

SUPPLY CHAIN CHALLENGES



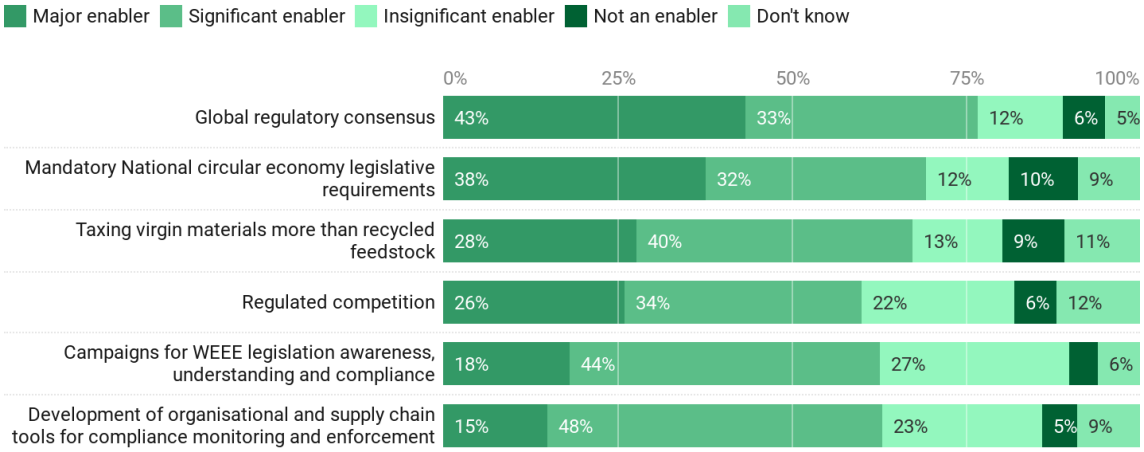
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES



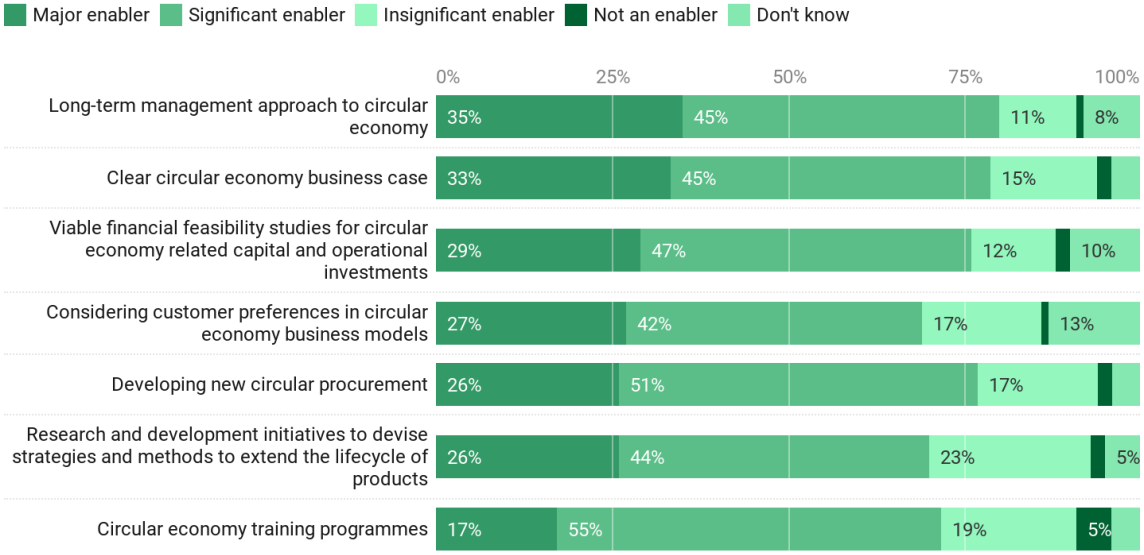
Get the data • Created with Datawrapper

LEGISLATIVE ENABLERS



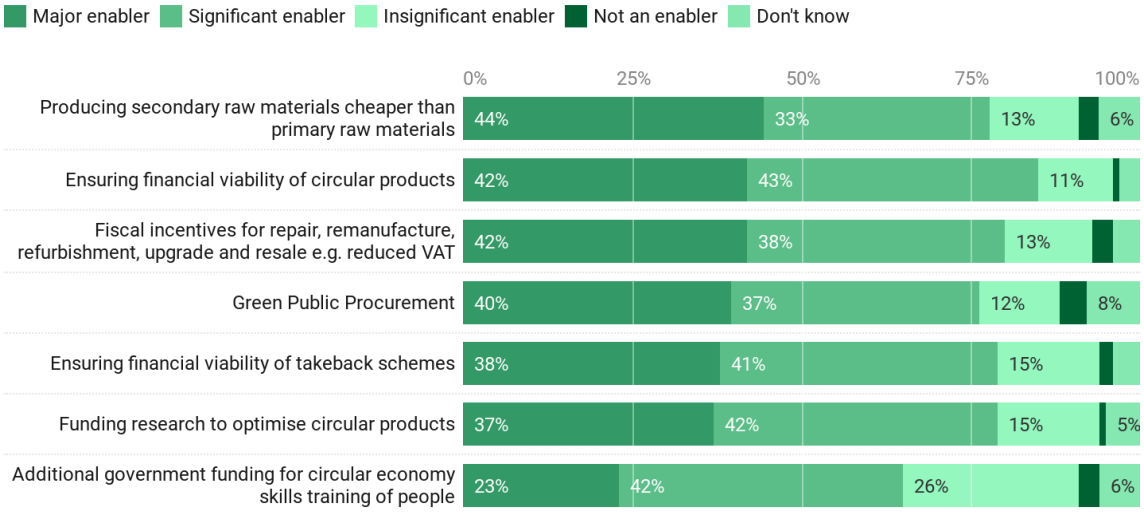
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT ENABLERS



Get the data • Created with Datawrapper

ECONOMIC ENABLERS



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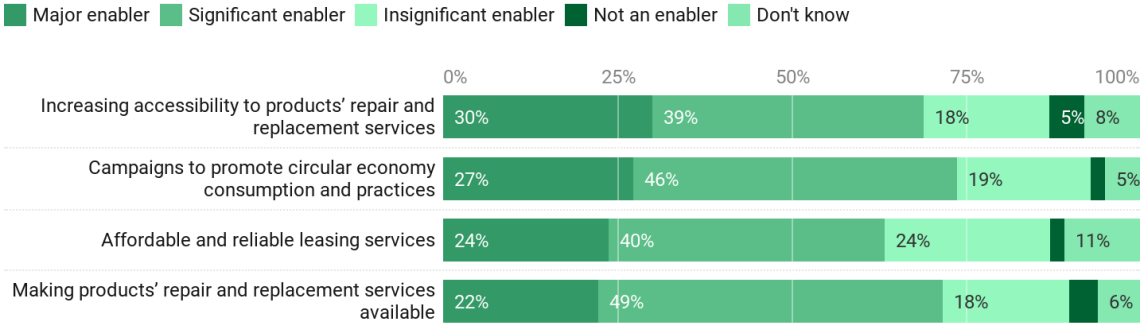
SOCIAL ENABLERS



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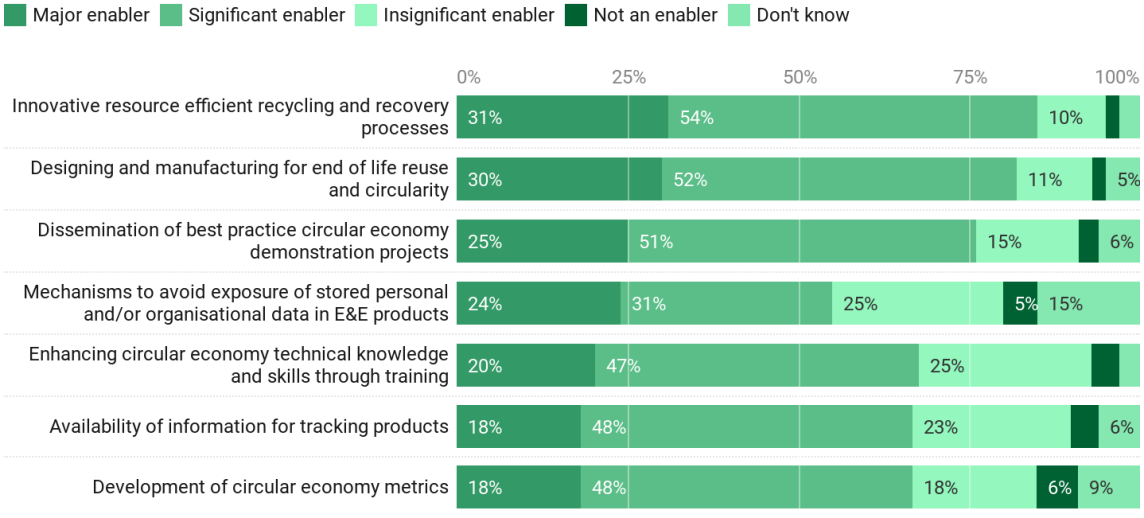
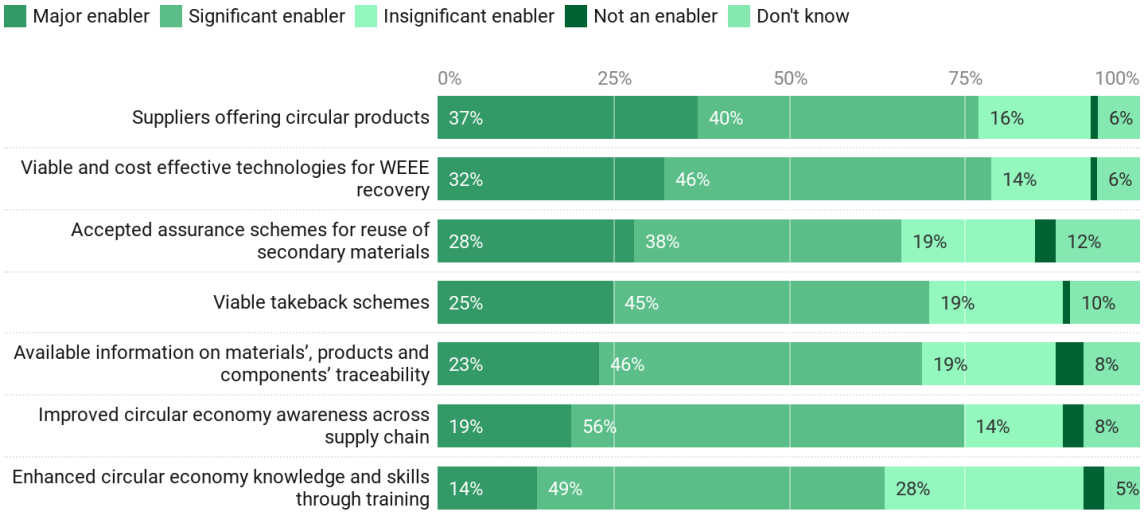
TECHNICAL ENABLERS



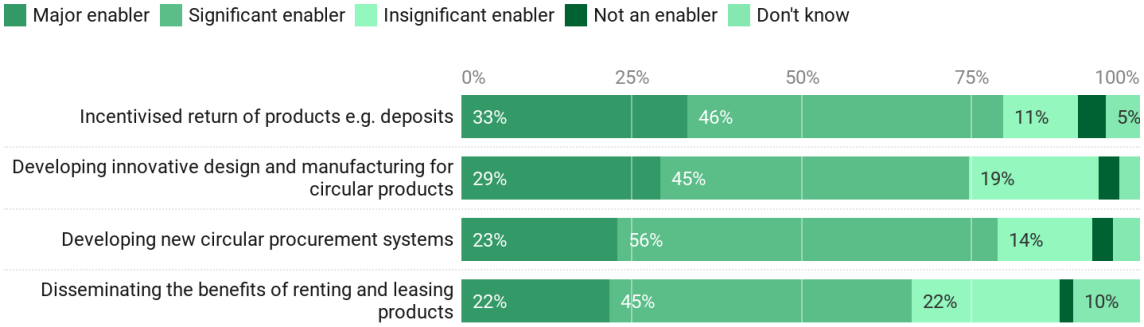
Get the data • Created with Datawrapper

SUPPLY CHAIN ENABLERS



Get the data • Created with Datawrapper

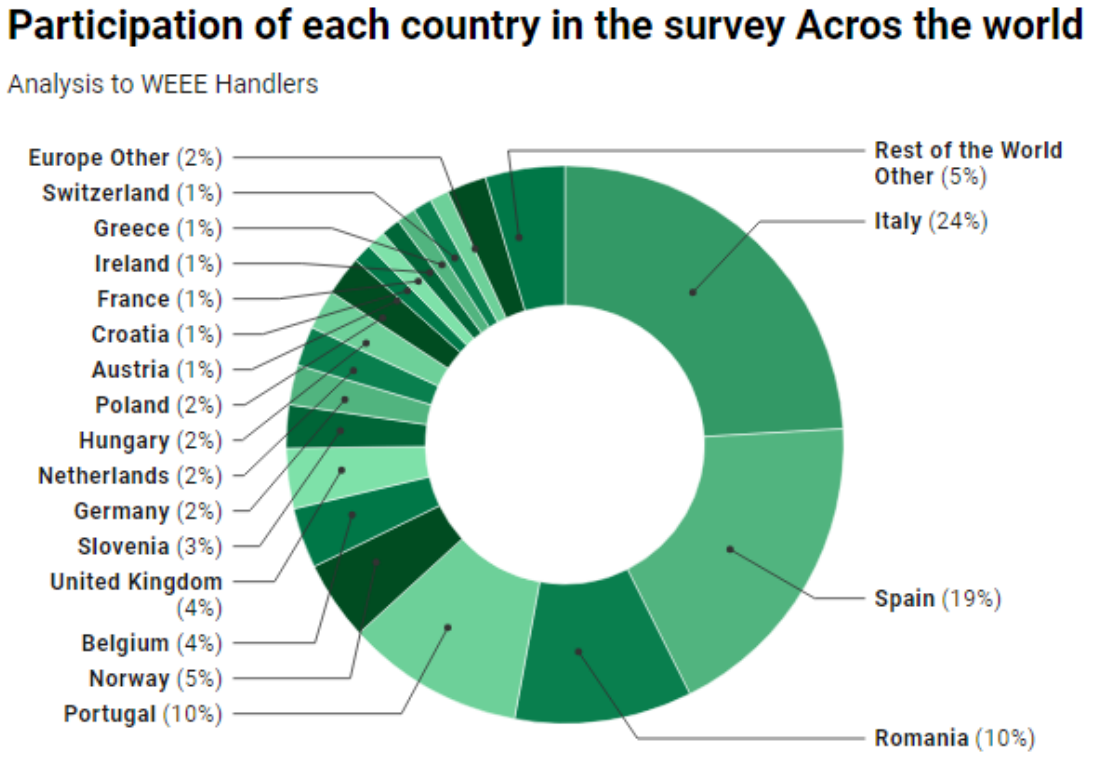
BUSINESS MODELS' IMPLEMENTATION ENABLERS



Get the data • Created with Datawrapper

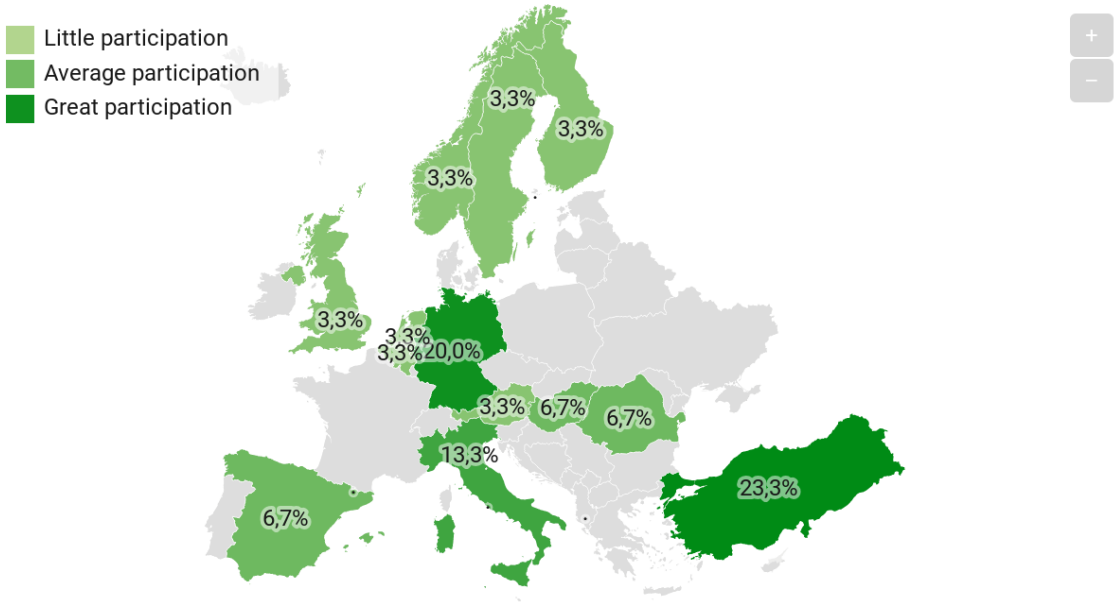
Retailers – results charts

Survey responses = 30



Participation of each country in the survey - Europe

Analysis to Retailers



Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe

Analysis to Retailers

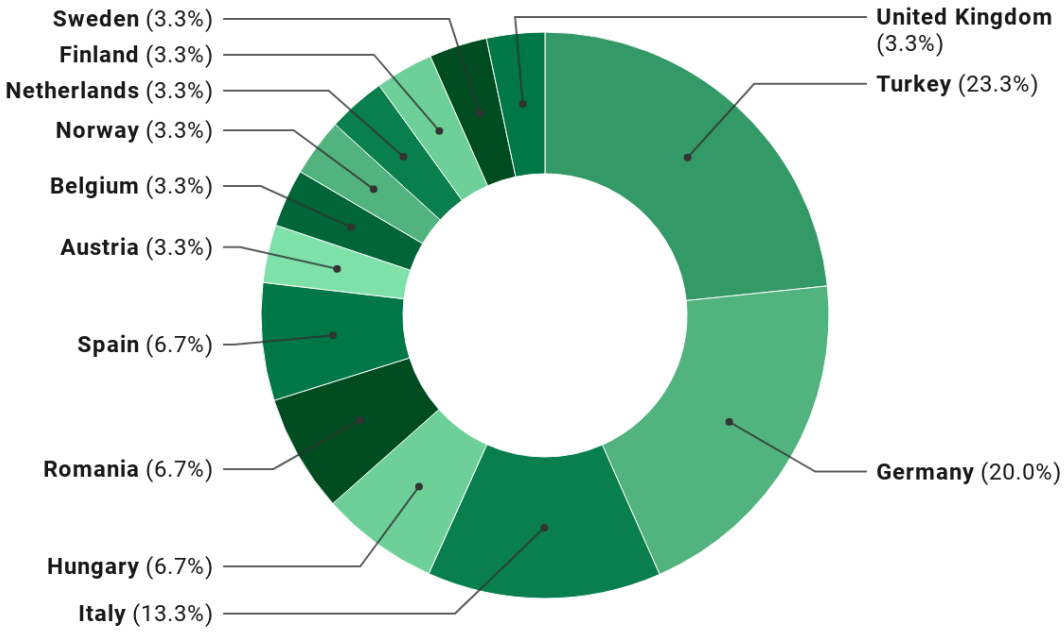


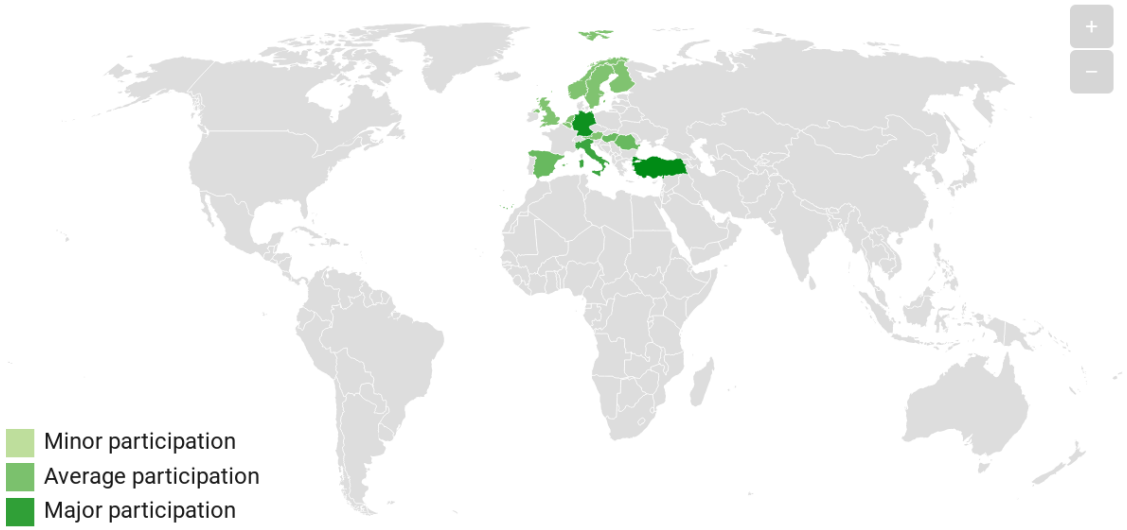
Chart: Exergy • Get the data • Created with Datawrapper

Country (Europe)	Percentage
Turkey	23,3%
Germany	20,0%

Italy	13,3%
Hungary	6,7%
Romania	6,7%
Spain	6,7%
Austria	3,3%
Belgium	3,3%
Norway	3,3%
Netherlands	3,3%
Finland	3,3%
Sweden	3,3%
United Kingdom	3,3%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Retailers



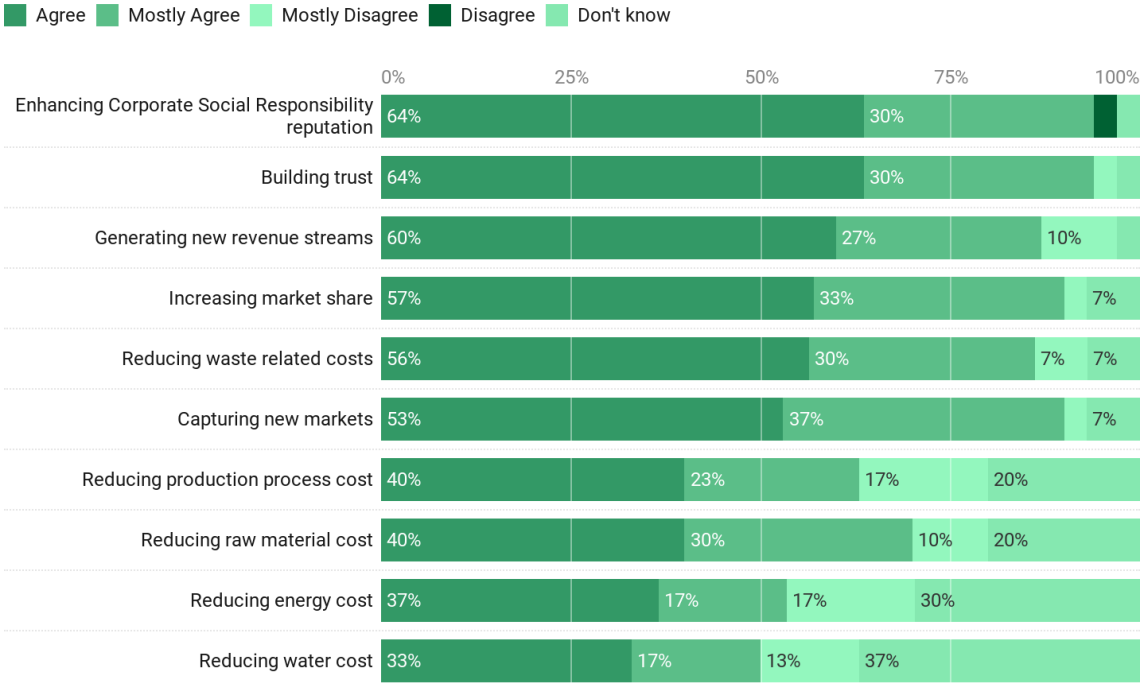
Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Retailers

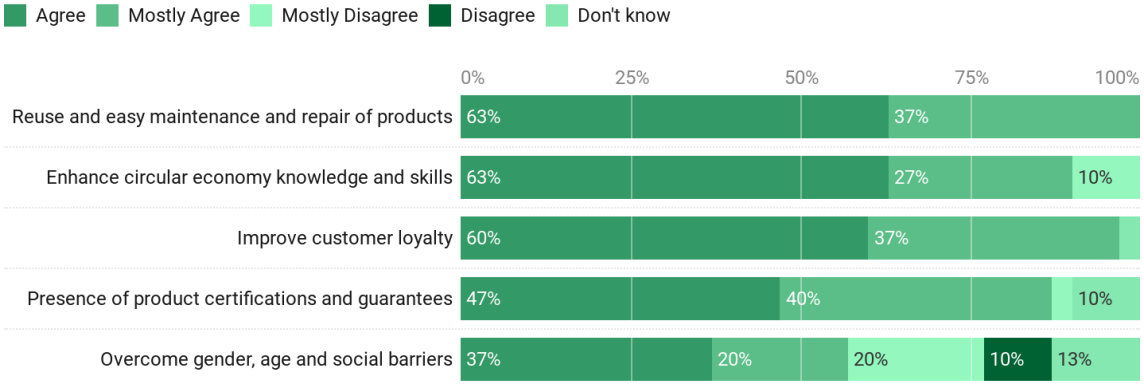
Chart: Exergy • Get the data • Created with Datawrapper

ECONOMIC OPPORTUNITIES



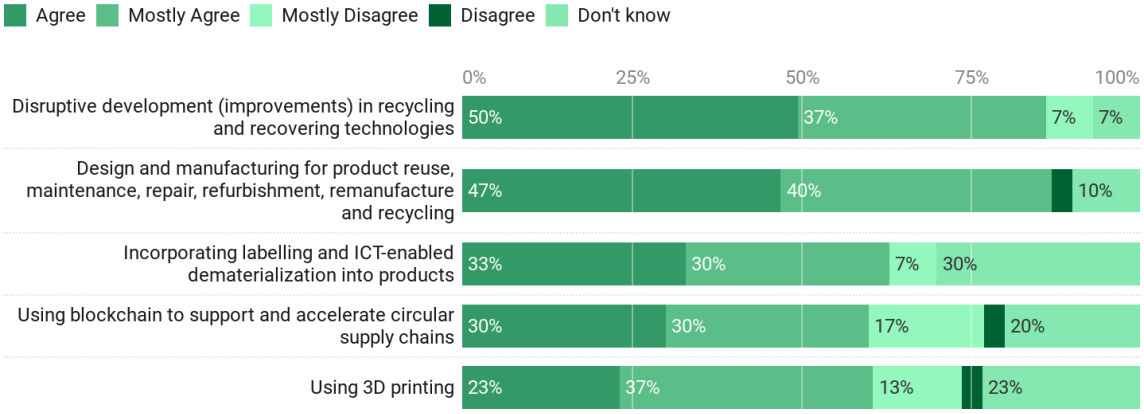
Get the data • Created with Datawrapper

SOCIAL OPPORTUNITIES



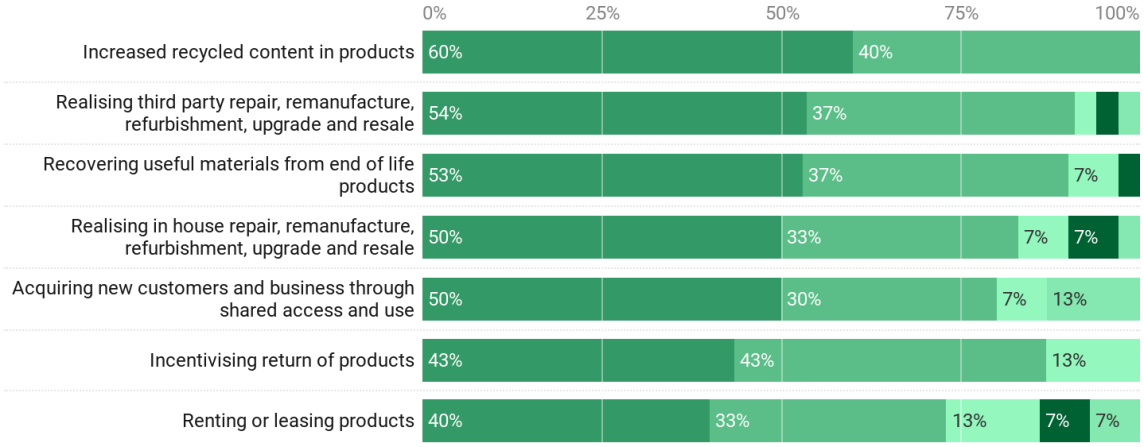
Get the data • Created with Datawrapper

TECHNICAL OPPORTUNITIES



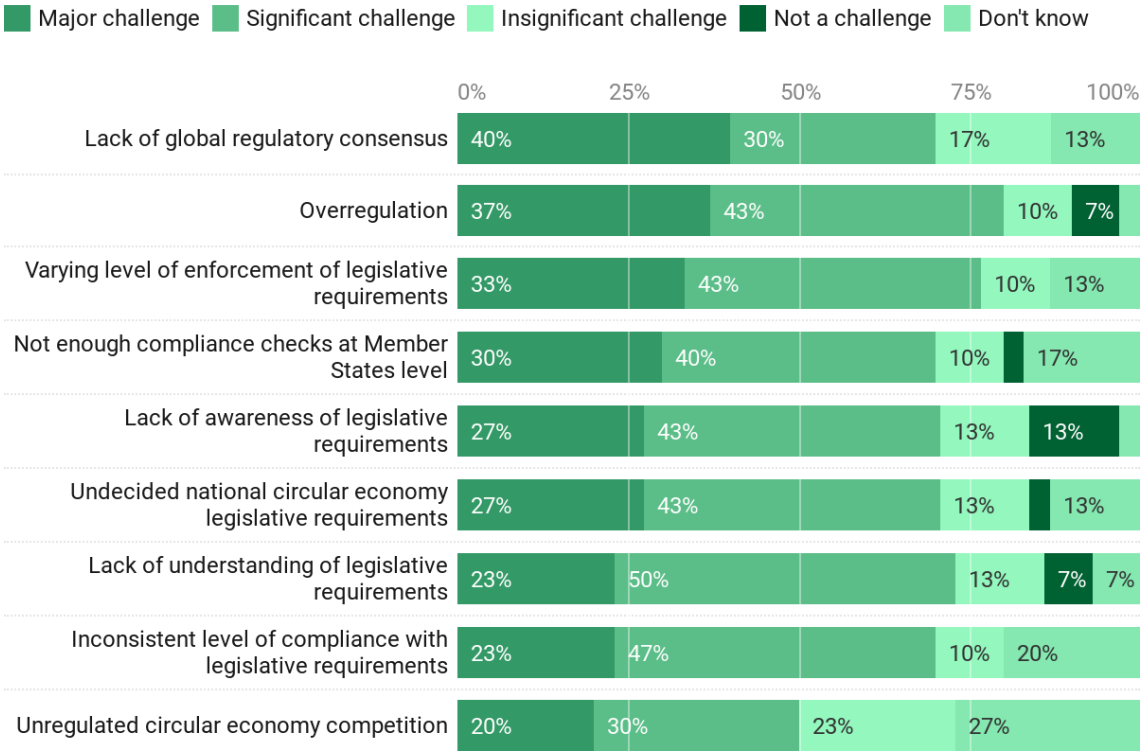
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



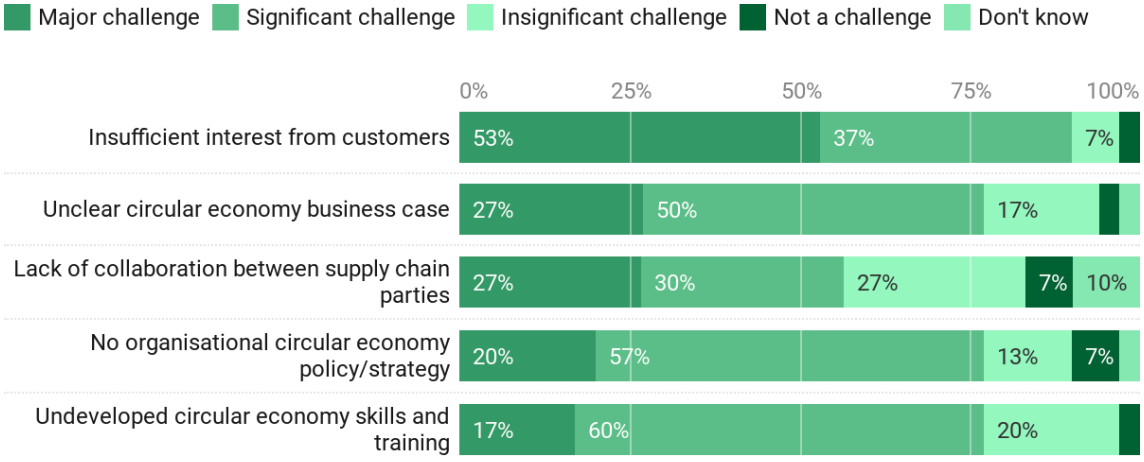
Get the data • Created with Datawrapper

LEGISLATIVE CHALLENGES



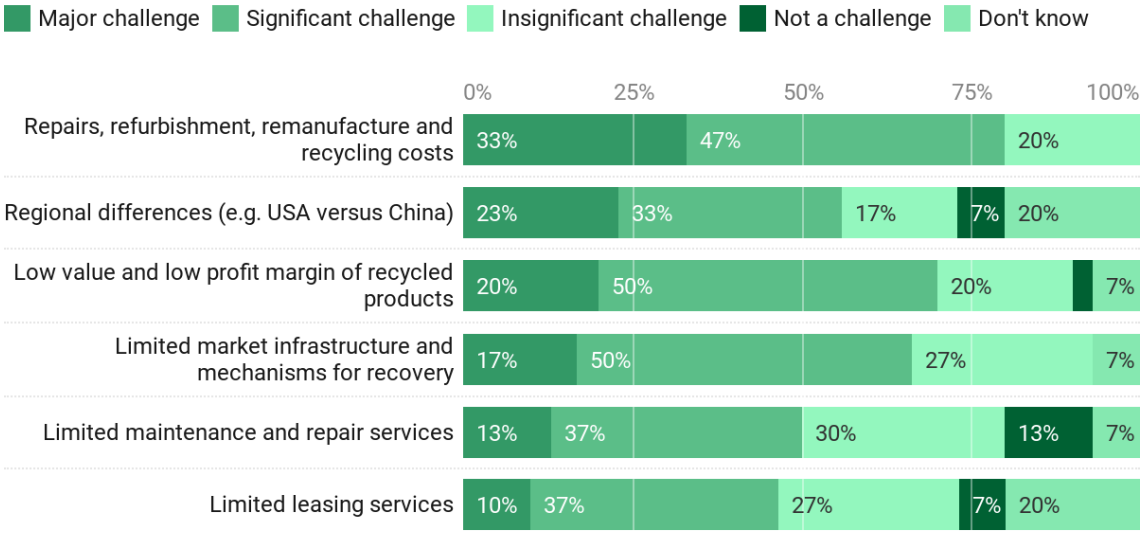
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT CHALLENGES



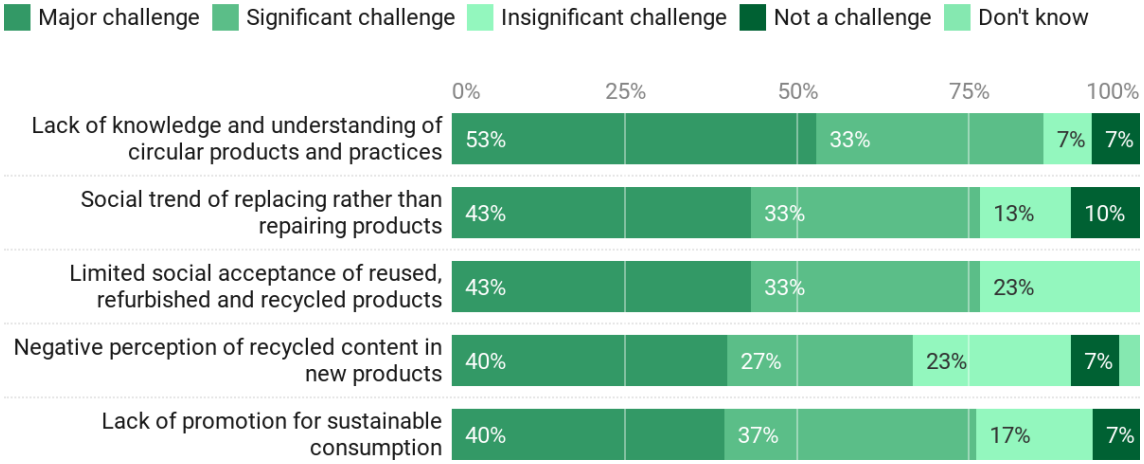
Get the data • Created with Datawrapper

ECONOMIC CHALLENGES



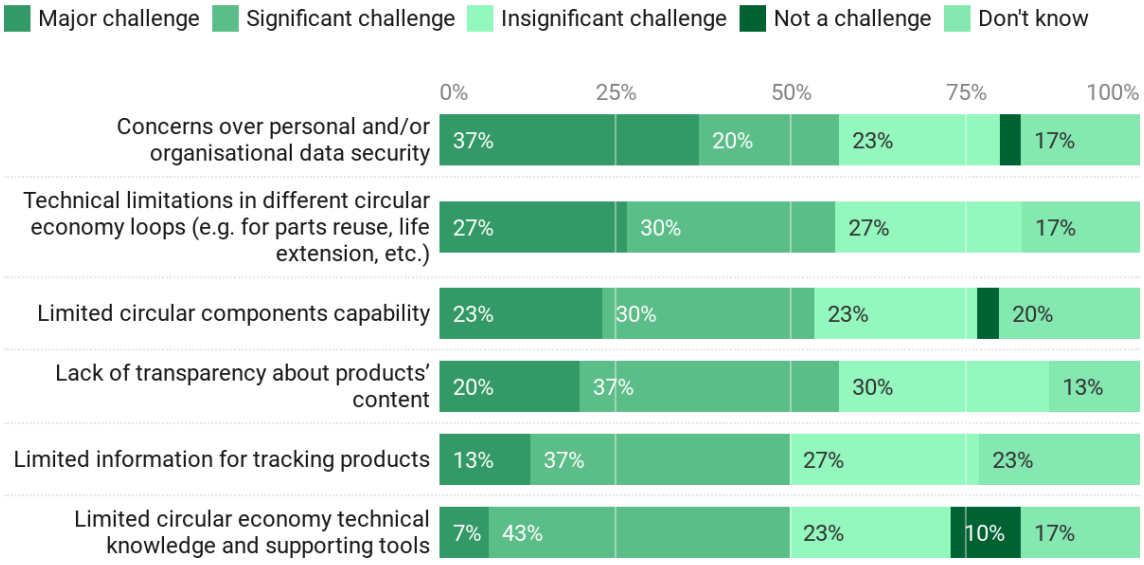
Get the data • Created with Datawrapper

SOCIAL CHALLENGES



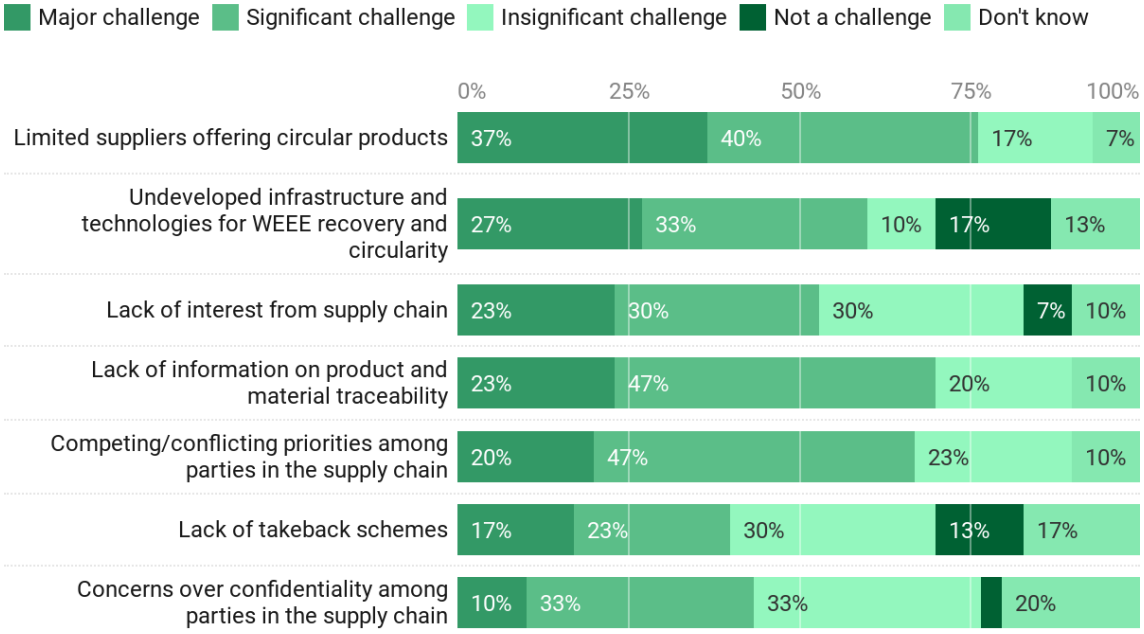
Get the data • Created with Datawrapper

TECHNICAL CHALLENGES



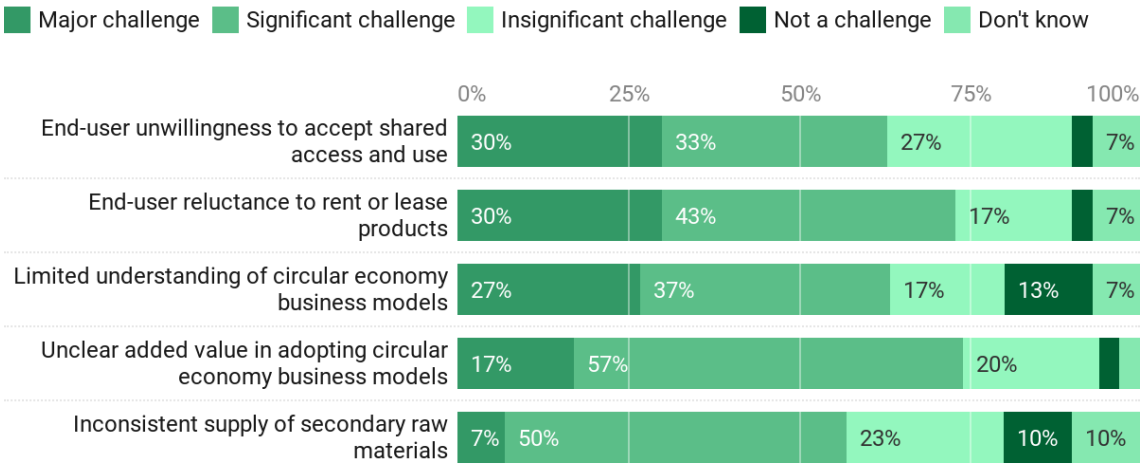
Get the data • Created with Datawrapper

SUPPLY CHAIN CHALLENGES



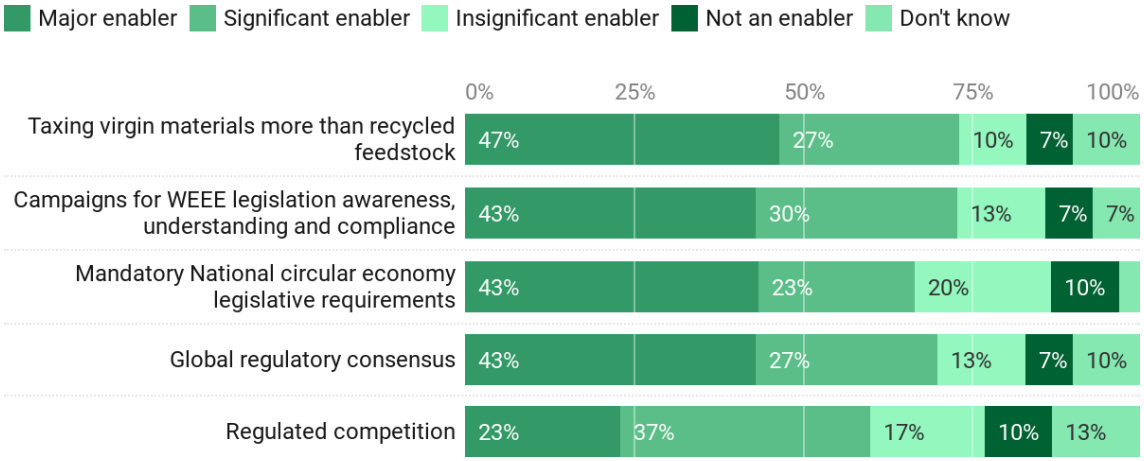
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES



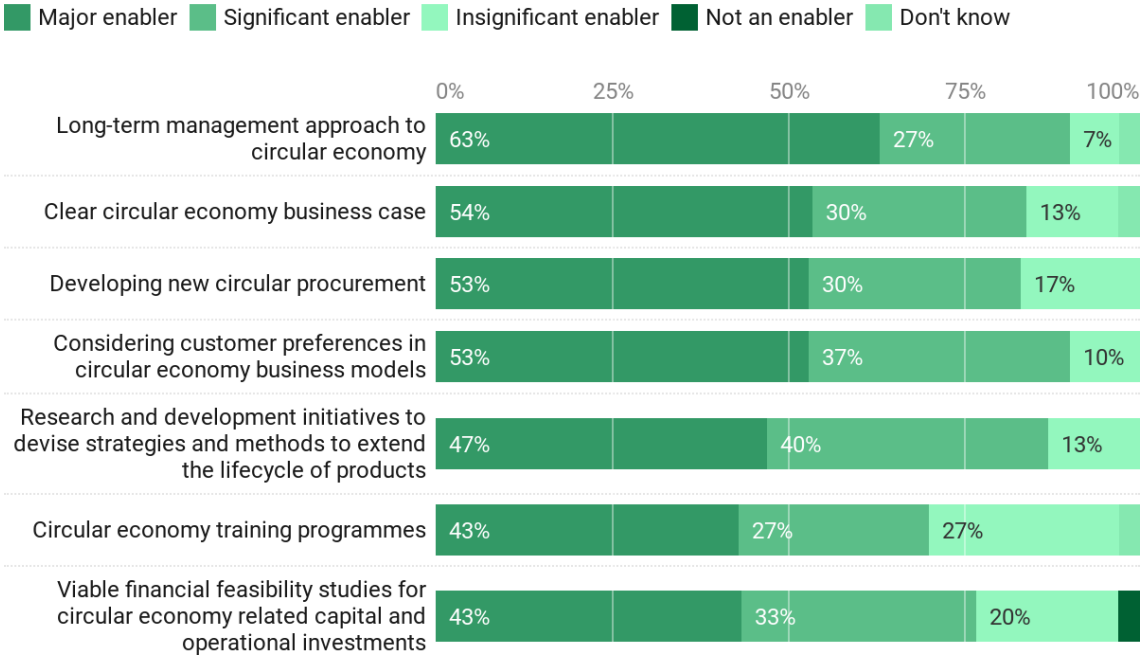
Get the data • Created with Datawrapper

LEGISLATIVE ENABLERS



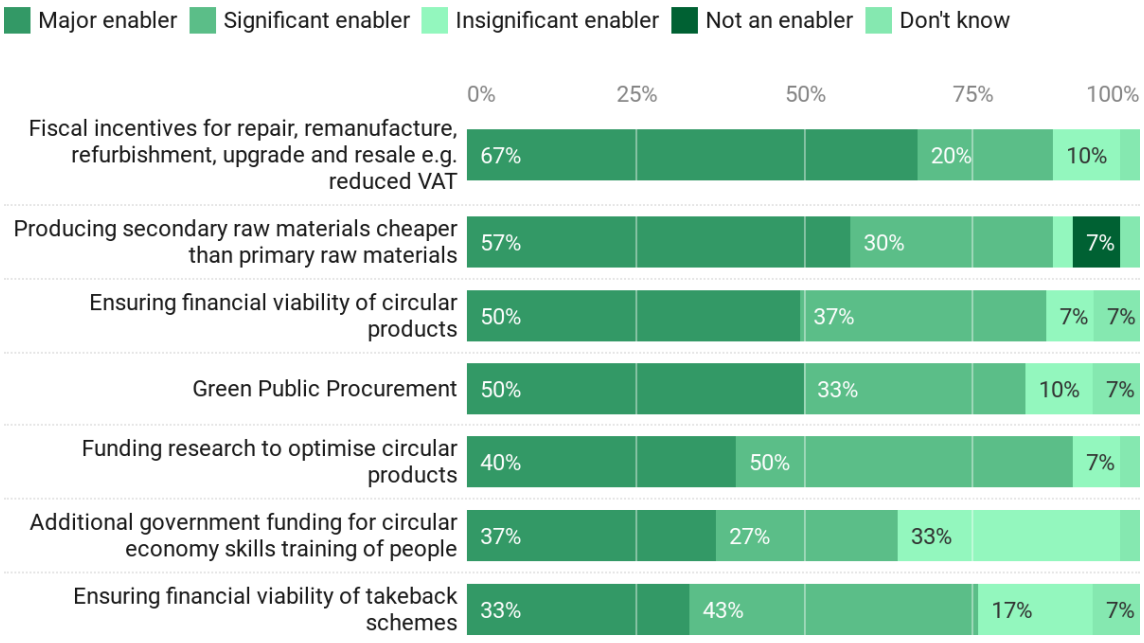
Get the data • Created with Datawrapper

BUSINESS AND MANAGEMENT ENABLERS



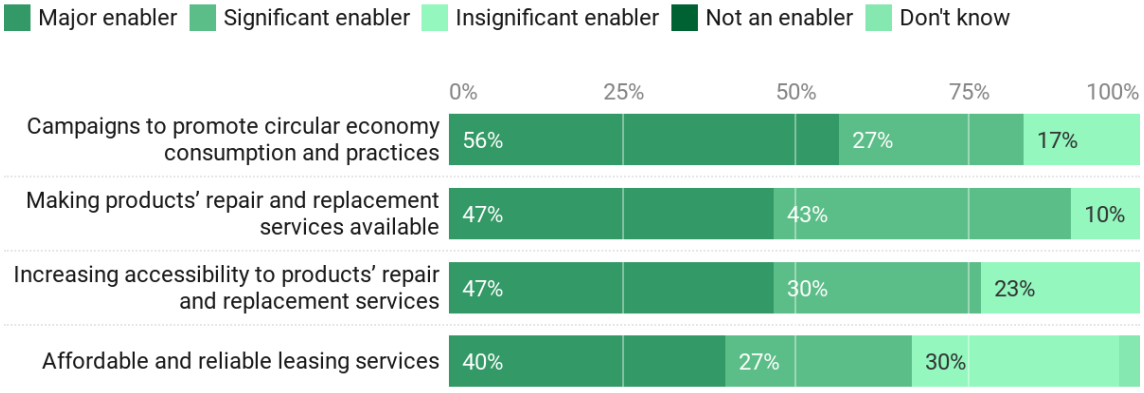
Get the data • Created with Datawrapper

ECONOMIC ENABLERS



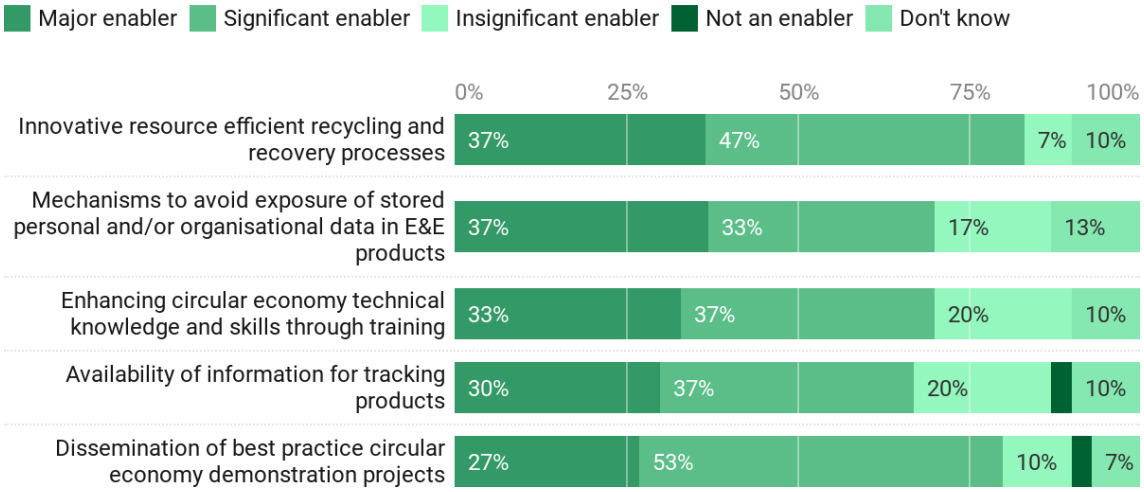
Get the data • Created with Datawrapper

SOCIAL ENABLERS



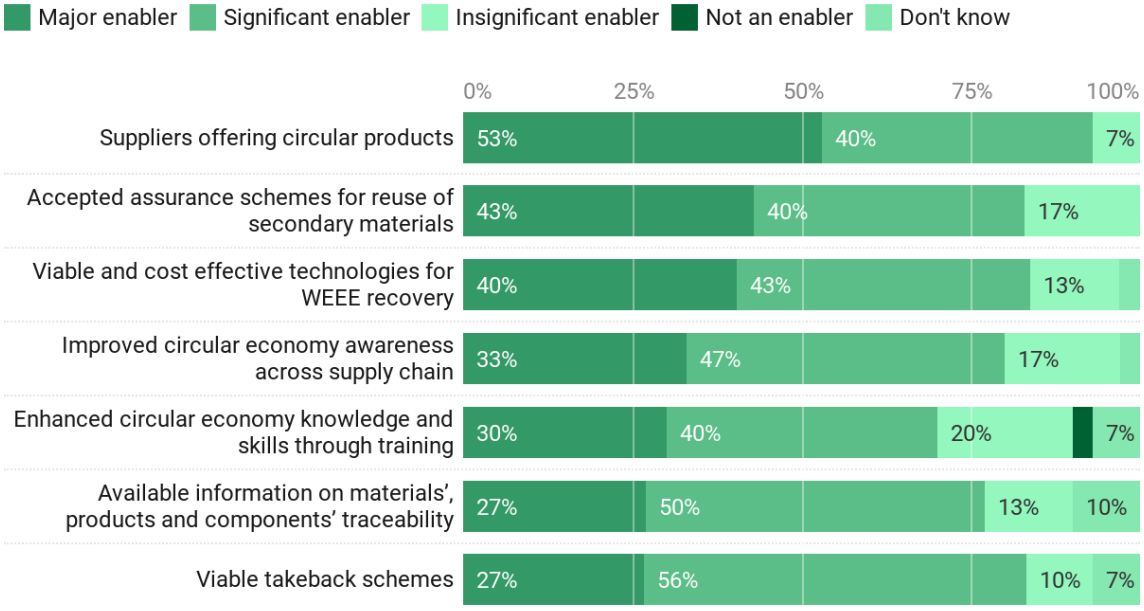
Get the data • Created with Datawrapper

TECHNICAL ENABLERS



Get the data • Created with Datawrapper

SUPPLY CHAIN ENABLERS



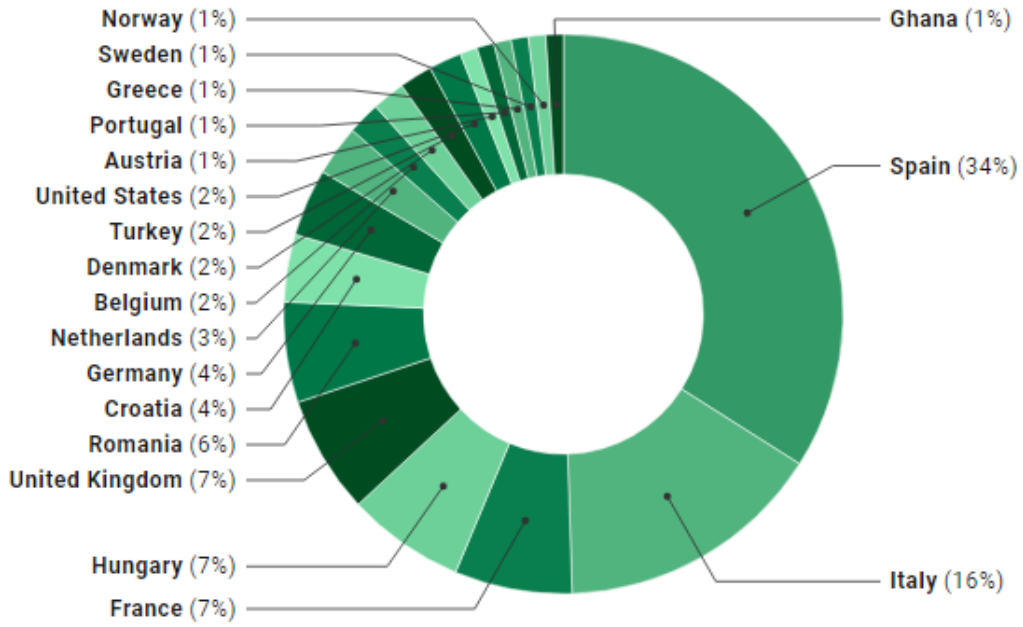
Get the data • Created with Datawrapper

Business End Users – results charts

Survey Responses = 102

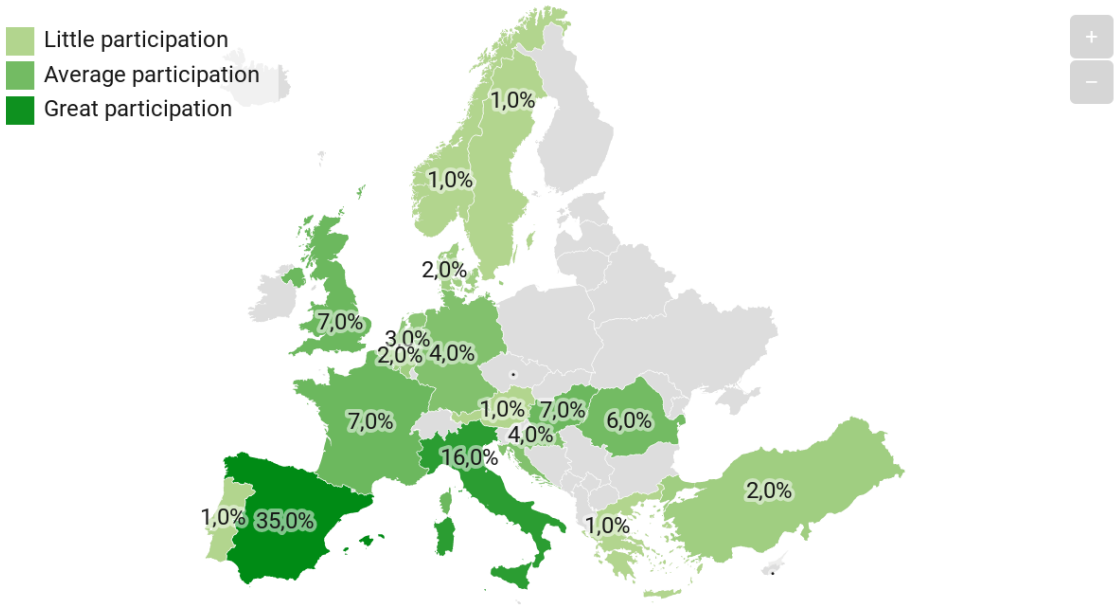
Participation of each country in the survey Acros the world

Analysis to Business End-Users



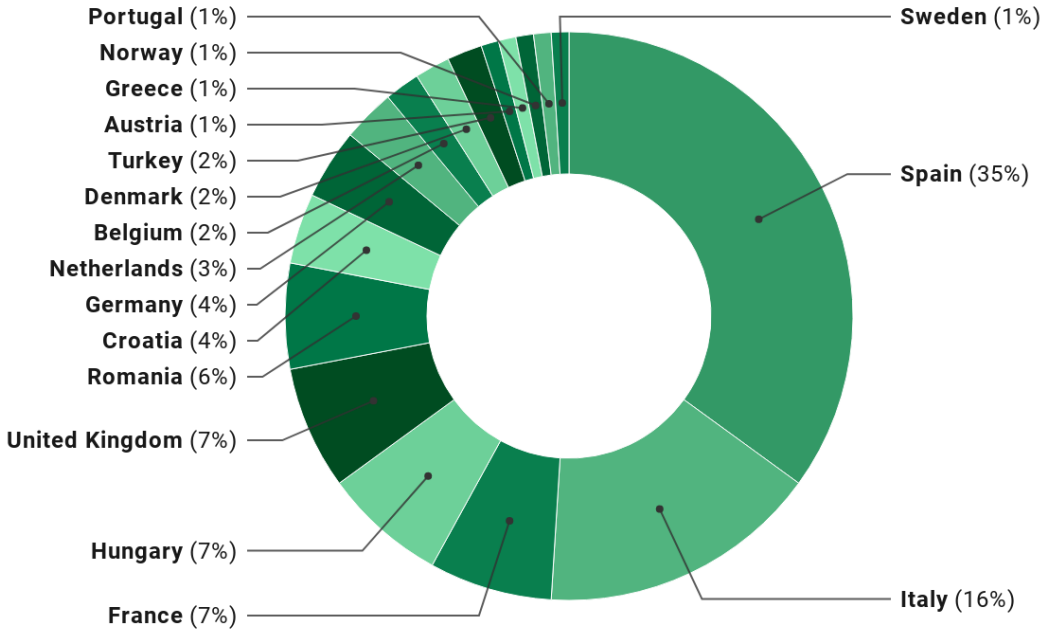
Participation of each country in the survey - Europe

Analysis to Business End-Users



Participation of each country in the survey - Europe

Analysis to Business End-Users

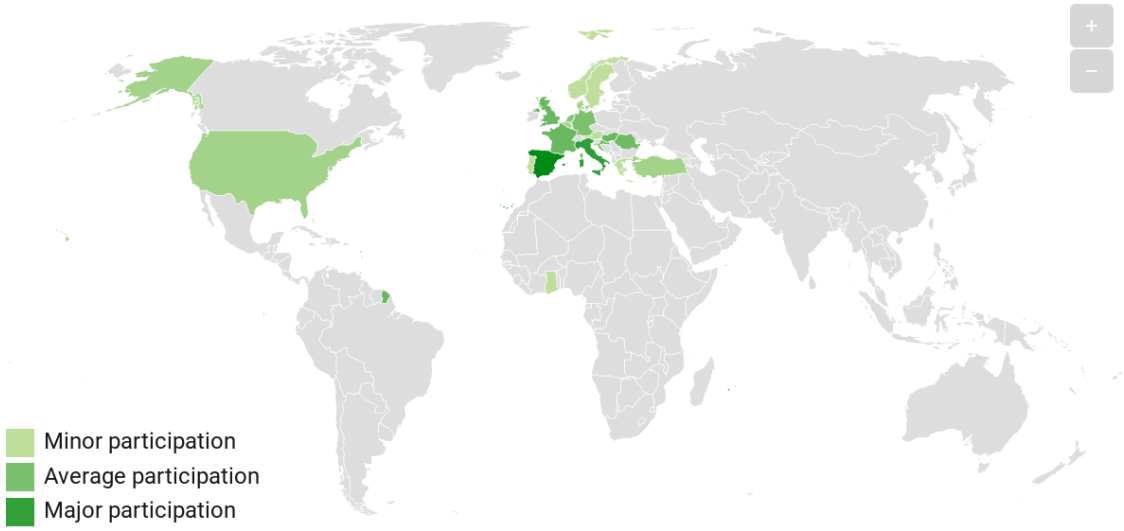


Country (Europe)	Percentage
Spain	35,0%
Italy	16,0%
France	7,0%
Hungary	7,0%
United Kingdom	7,0%
Romania	6,0%
Croatia	4,0%
Germany	4,0%
Netherlands	3,0%
Belgium	2,0%
Denmark	2,0%
Turkey	2,0%
Austria	1,0%
Portugal	1,0%
Greece	1,0%

Sweden	1,0%
Norway	1,0%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Business End-Users

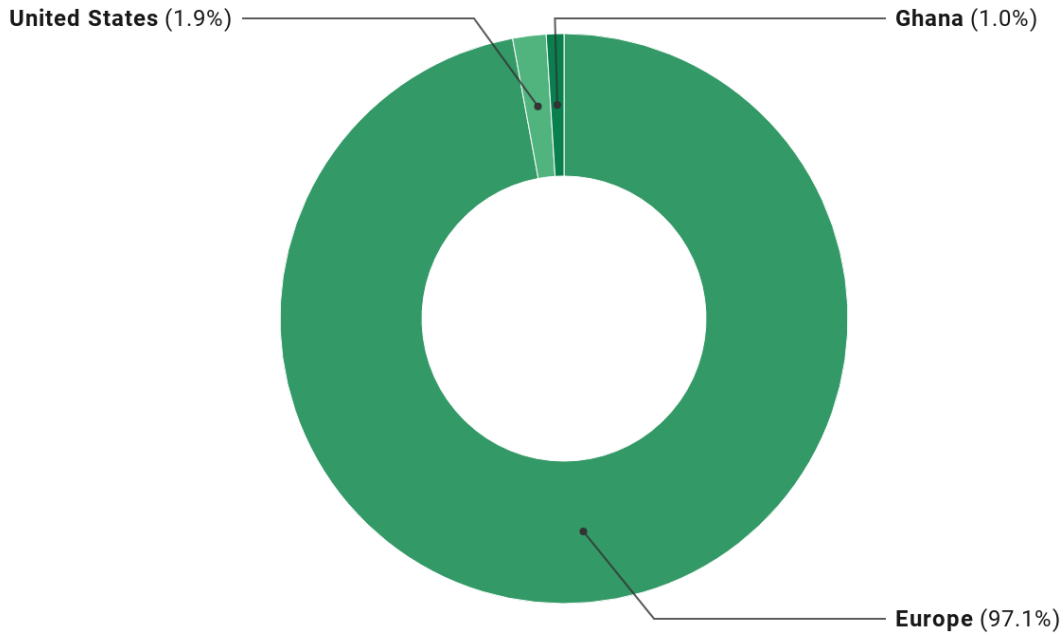


Country (world)	Percentage
Spain	35,0%
Italy	15,5%
France	6,8%
Hungary	6,8%
United Kingdom	6,8%
Romania	5,8%
Croatia	3,9%
Germany	3,9%
Netherlands	2,9%
Belgium	1,9%
Denmark	1,9%
Turkey	1,9%
United States	1,9%
Austria	1,0%
Portugal	1,0%
Greece	1,0%
Sweden	1,0%

Norway	1,0%
Ghana	1,0%

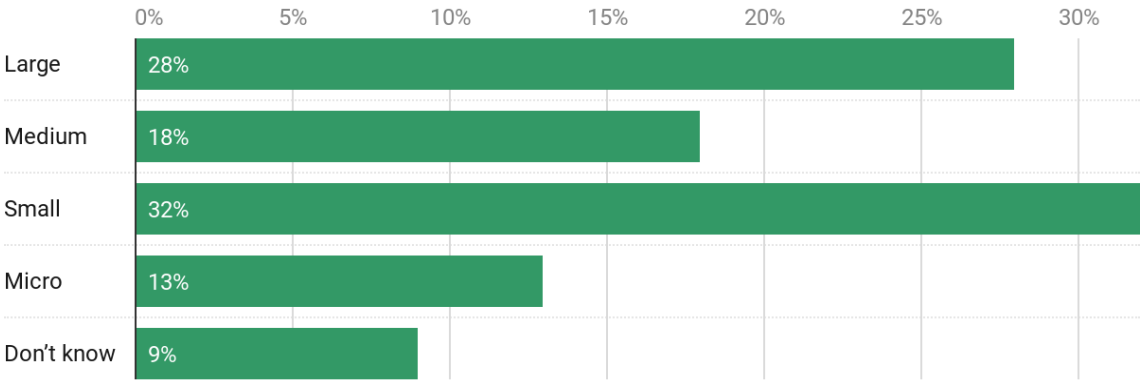
Participation of each country in the survey - Europe Vs rest of the world

Analysis to Business End-Users

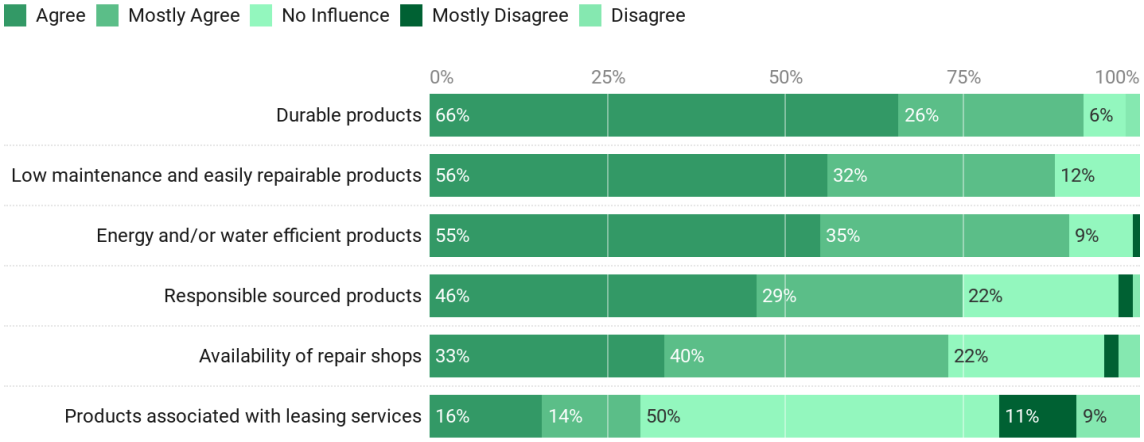


Size of the company

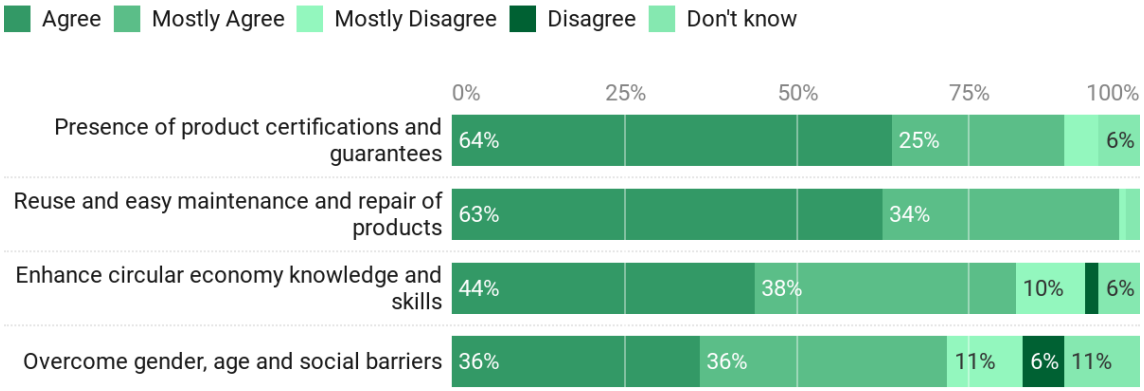
Analysis to Business End-Users



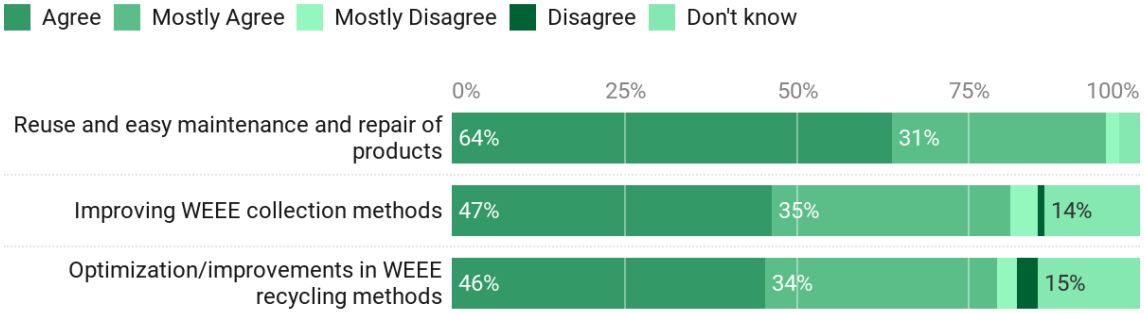
Please rate your level of agreement that the following factors influence your decision to purchase electrical and electronic products



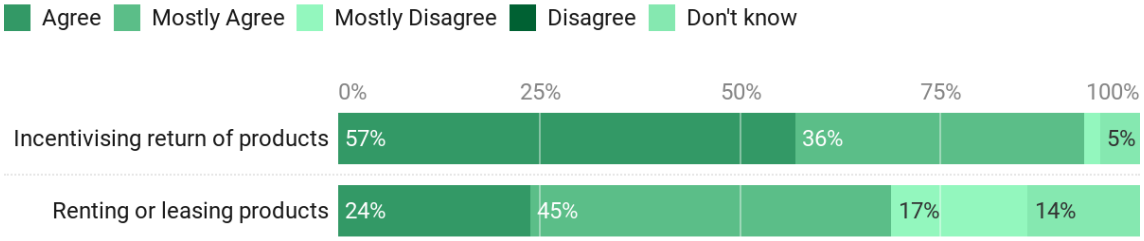
SOCIAL OPPORTUNITIES



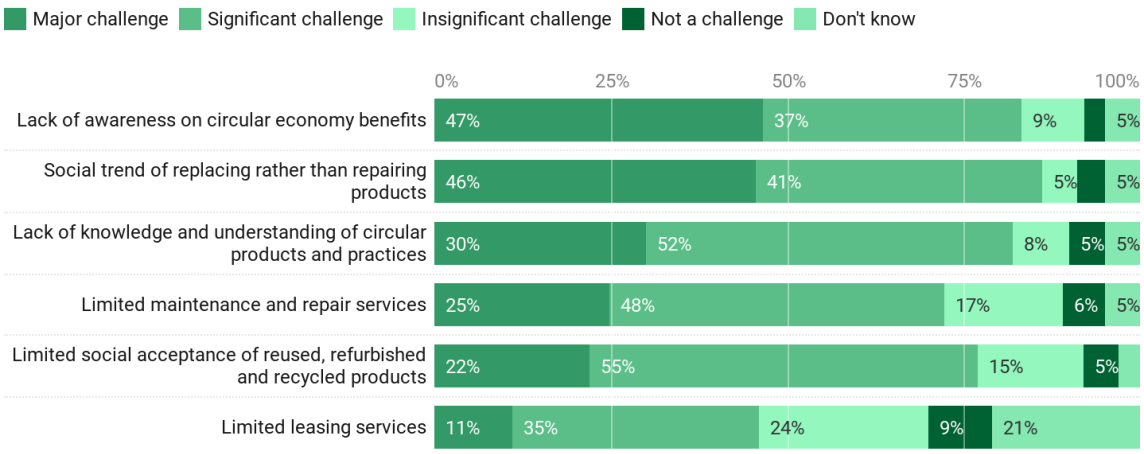
TECHNICAL OPPORTUNITIES



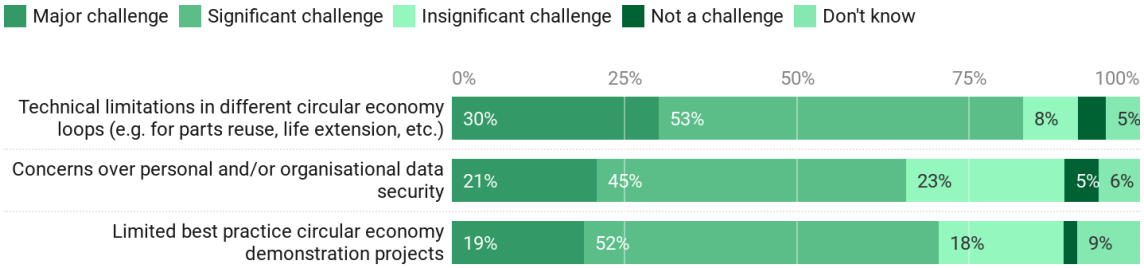
CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



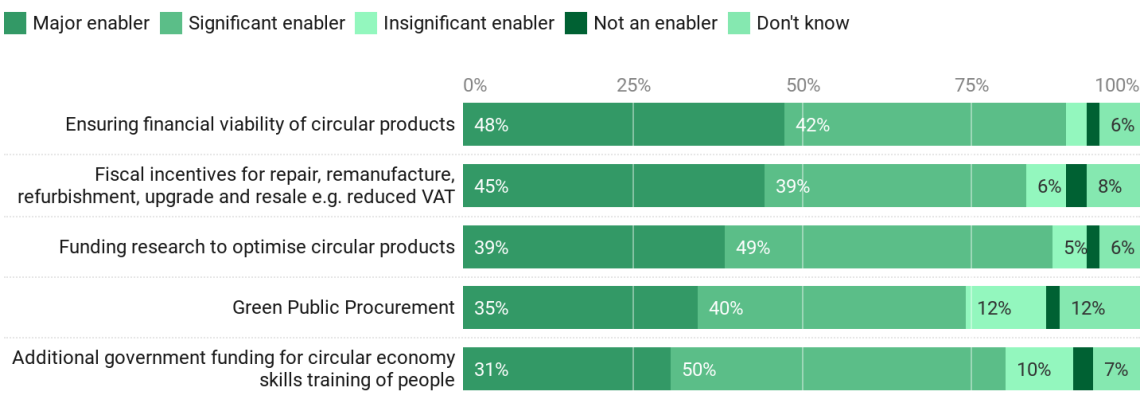
SOCIAL CHALLENGES



TECHNICAL CHALLENGES



ECONOMIC ENABLERS



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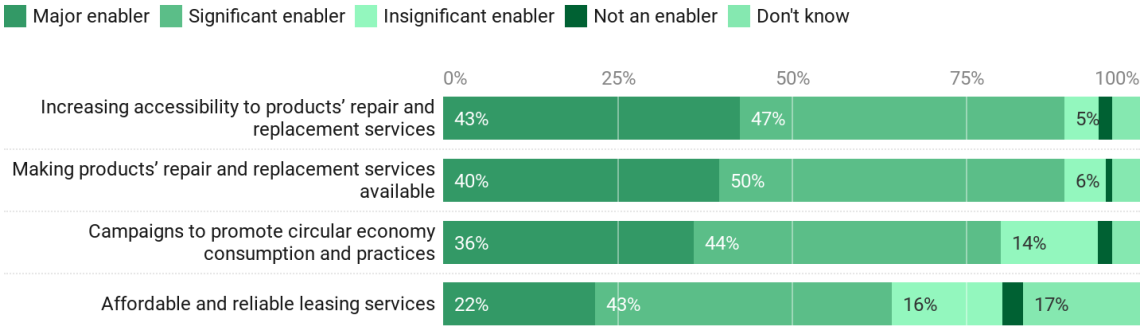
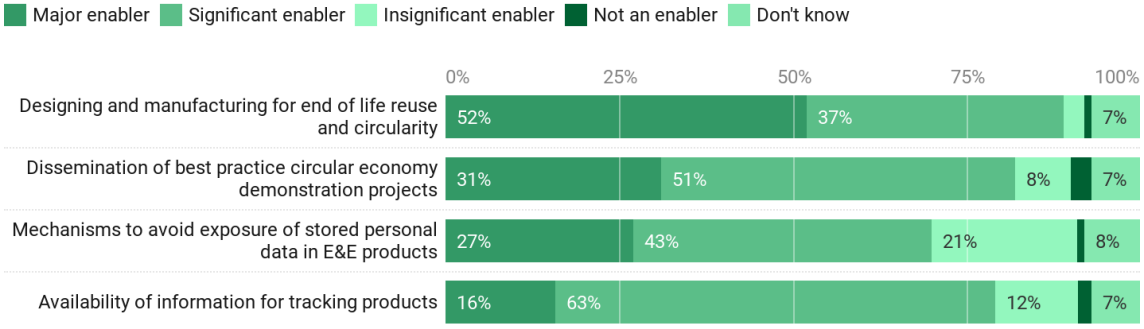
SOCIAL ENABLERS



Get the data • Created with Datawrapper

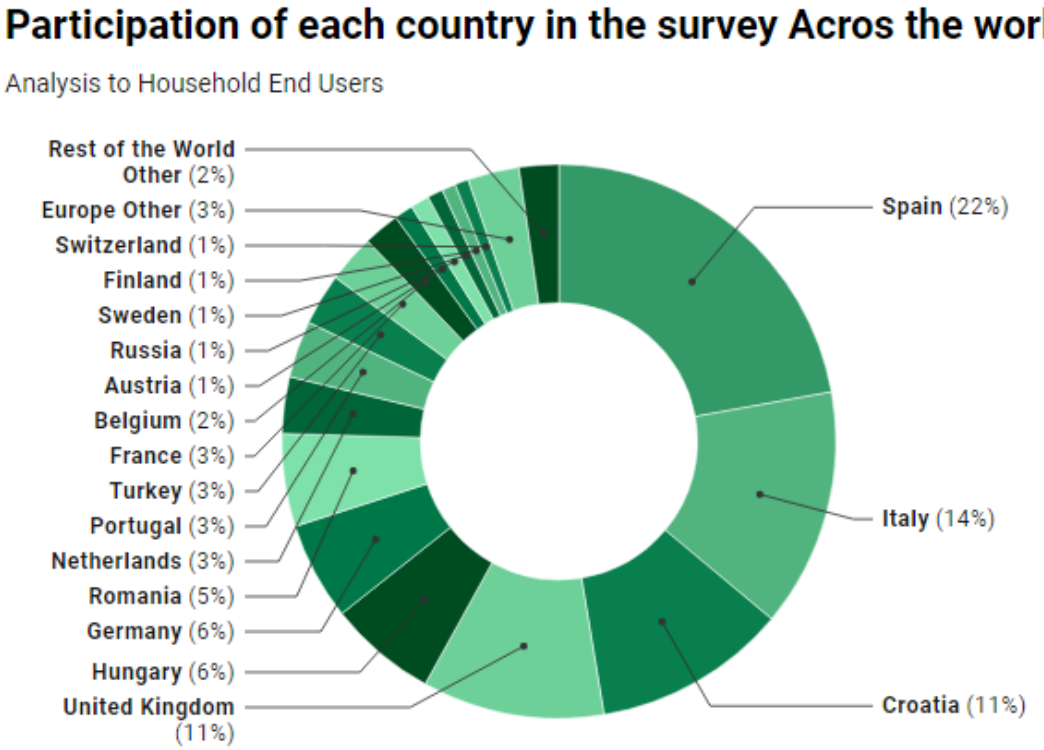
TECHNICAL ENABLERS



Get the data • Created with Datawrapper

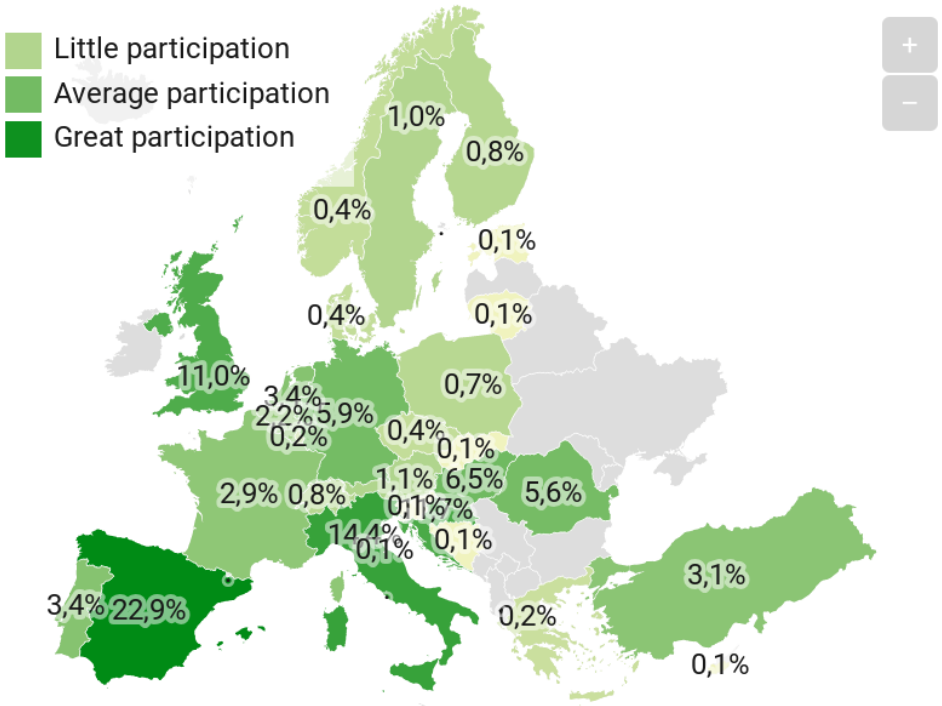
Household End Users – results charts

Survery responses = 857



Participation of each country in the survey - Europe

Analysis to Household End-Users



Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe

Analysis to Household End - Users

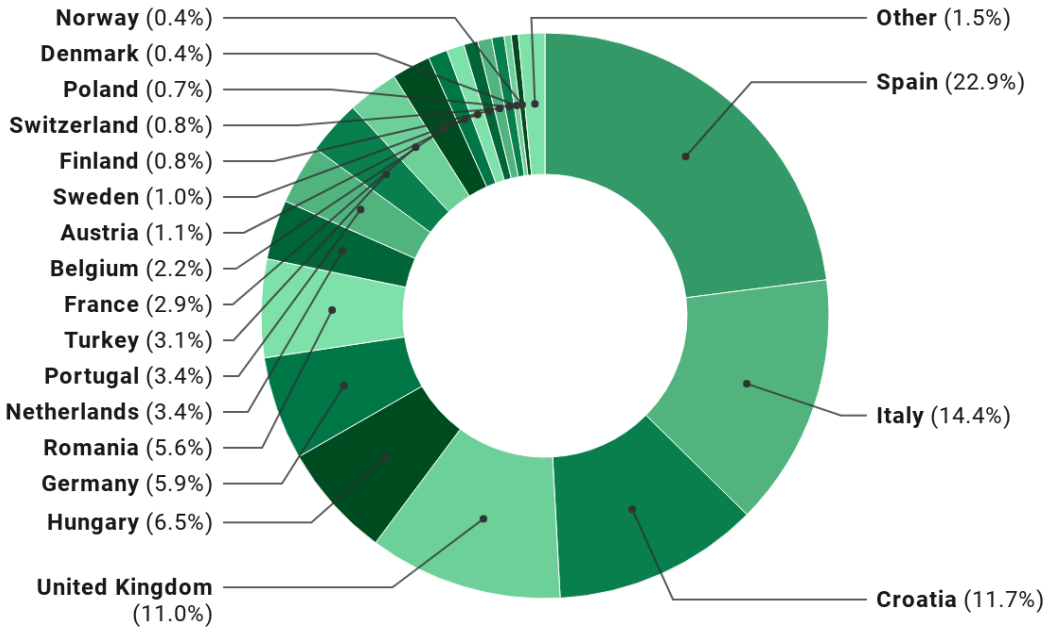
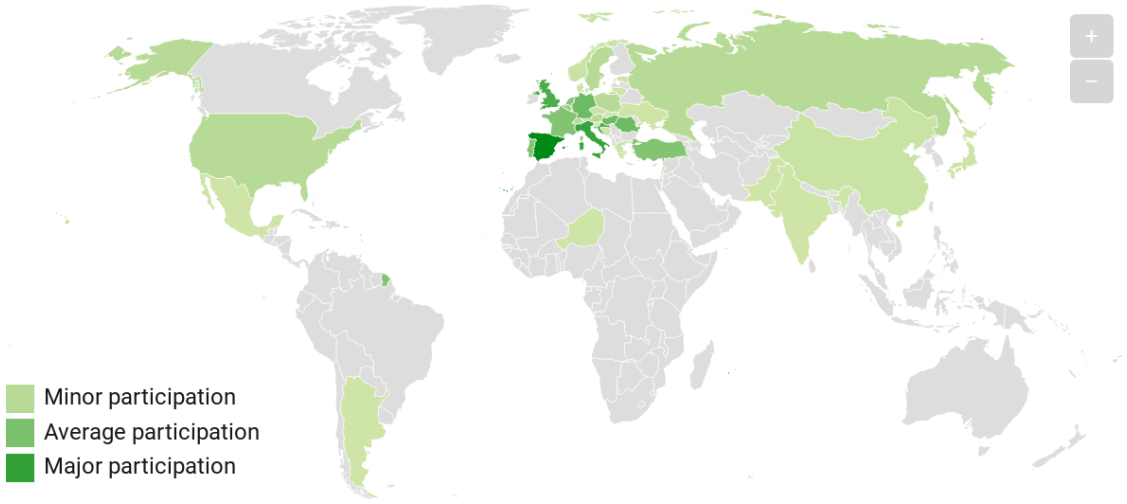


Chart: Exergy • Get the data • Created with Datawrapper

Country (Europe)	Percentage
Spain	22,9%
Italy	14,4%
Croatia	11,7%
United Kingdom	11,0%
Hungary	6,5%
Germany	5,9%
Romania	5,6%
Netherlands	3,4%
Portugal	3,4%
Turkey	3,1%
France	2,9%
Belgium	2,2%
Austria	1,1%
Sweden	1,0%
Finland	0,8%
Switzerland	0,8%
Poland	0,7%
Denmark	0,4%
Czech Republic	0,4%
Norway	0,4%
Greece	0,2%
Luxembourg	0,2%
Bosnia and Herzegovina	0,1%
Estonia	0,1%
Cyprus	0,1%
Lithuania	0,1%
San Marino	0,1%
Slovakia	0,1%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Household End-Users



No answers from French Guiana

Map: Exergy • Get the data • Created with Datawrapper

Country	Percentage
Spain	22,1%
Italy	13,9%
Croatia	11,3%
United Kingdom	10,6%
Hungary	6,3%
Germany	5,7%
Romania	5,4%
Netherlands	3,3%
Portugal	3,3%
Turkey	3,0%
France	2,8%
Belgium	2,1%
Austria	1,1%
Russia	1,1%
Sweden	0,9%
Finland	0,8%
Switzerland	0,8%
United States	0,8%
Poland	0,7%
Denmark	0,4%
Czech Republic	0,4%

Norway	0,4%
China	0,4%
Greece	0,2%
Luxembourg	0,2%
Japan	0,2%
Bosnia and Herzegovina	0,1%
Estonia	0,1%
Cyprus	0,1%
Lithuania	0,1%
San Marino	0,1%
Slovakia	0,1%
Slovenia	0,1%
Argentina	0,1%
India	0,1%
Nigeria	0,1%
México	0,1%
Israel	0,1%
Lebanon	0,1%
Pakistan	0,1%
Ukraine	0,1%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to Household End-Users

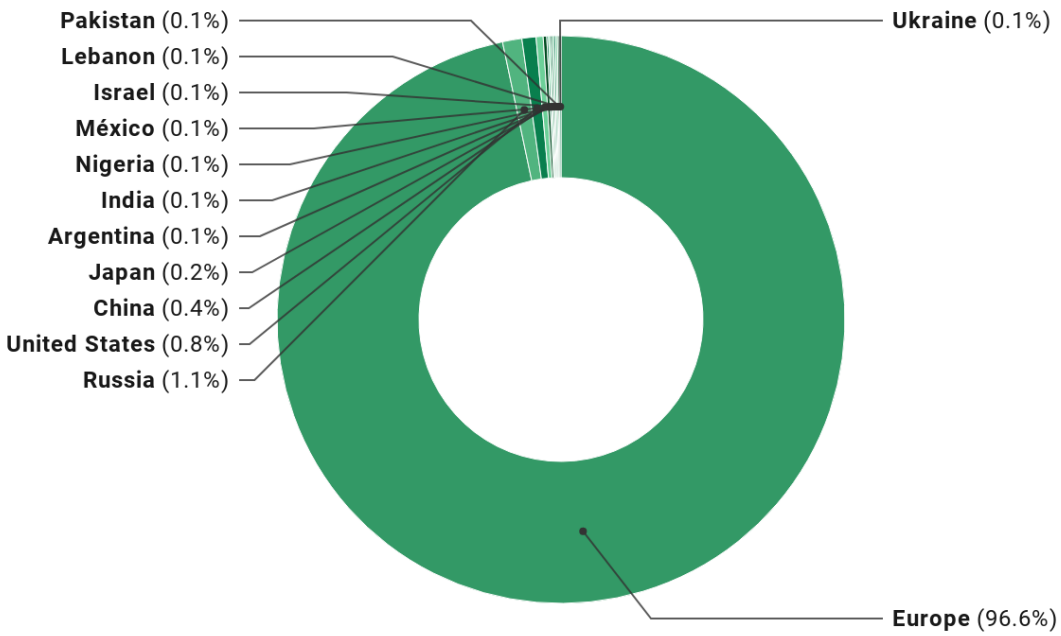


Chart: Exergy • Get the data • Created with Datawrapper

Age Range

Analysis to Householders End-Users

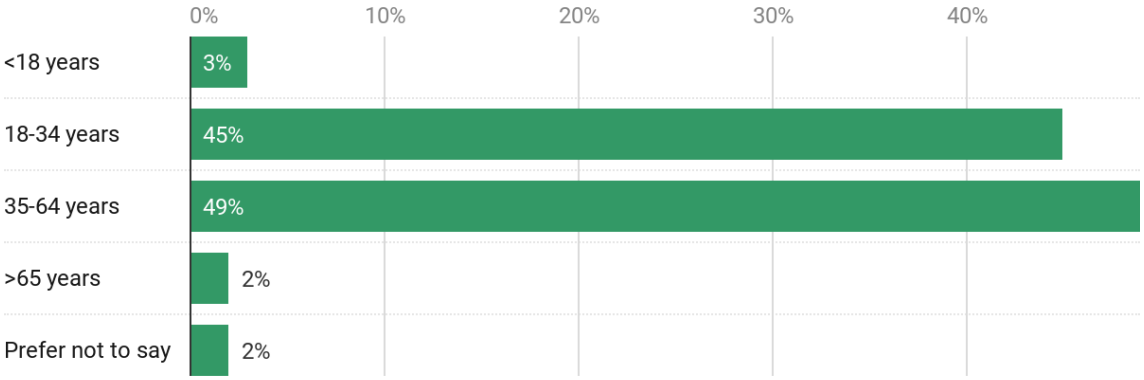


Chart: Exergy • Get the data • Created with Datawrapper

Education Level

Analysis to Household End - Users

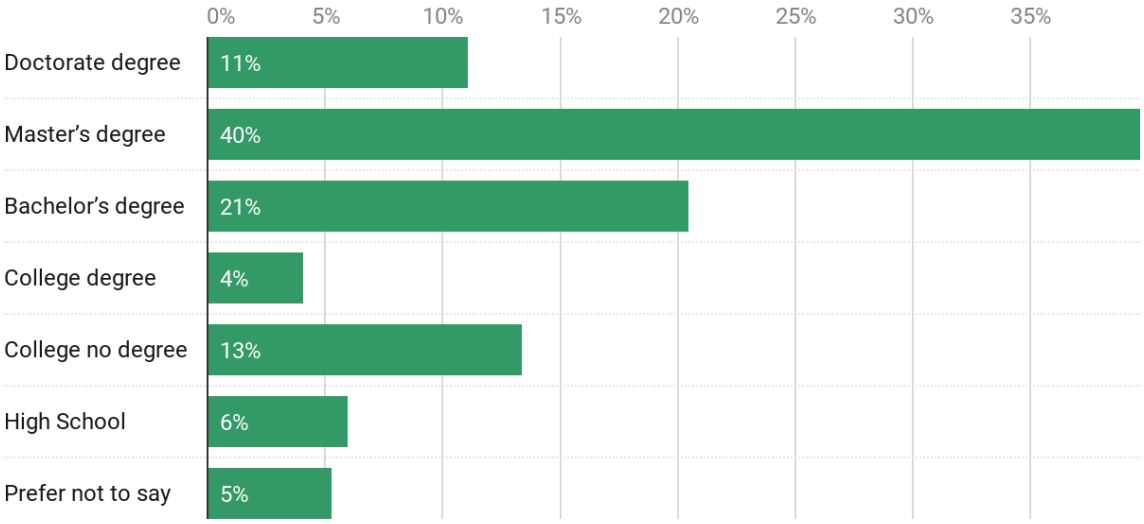
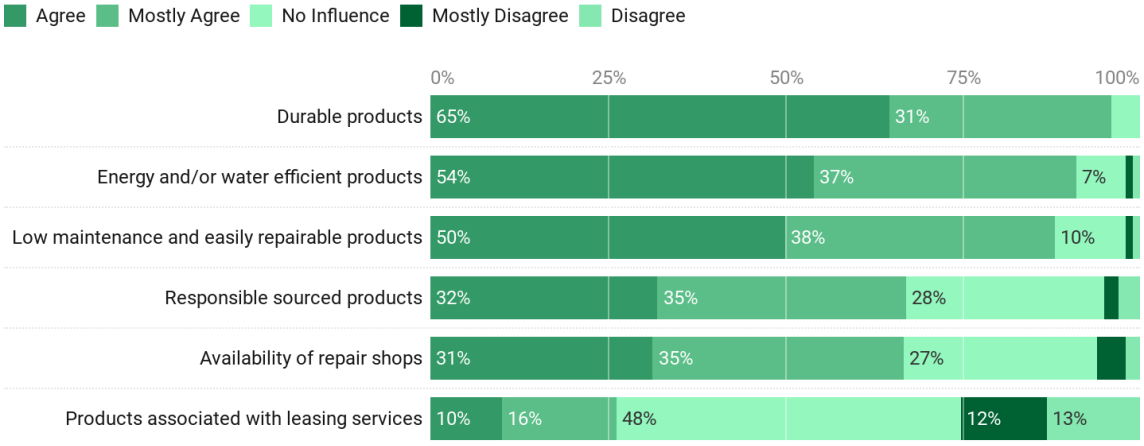


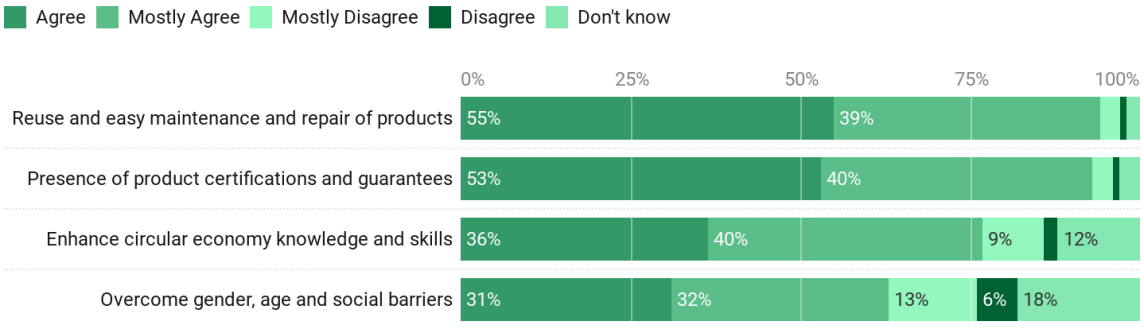
Chart: Exergy • Get the data • Created with Datawrapper

Please rate your level of agreement that the following factors influence your decision to purchase electrical and electronic product



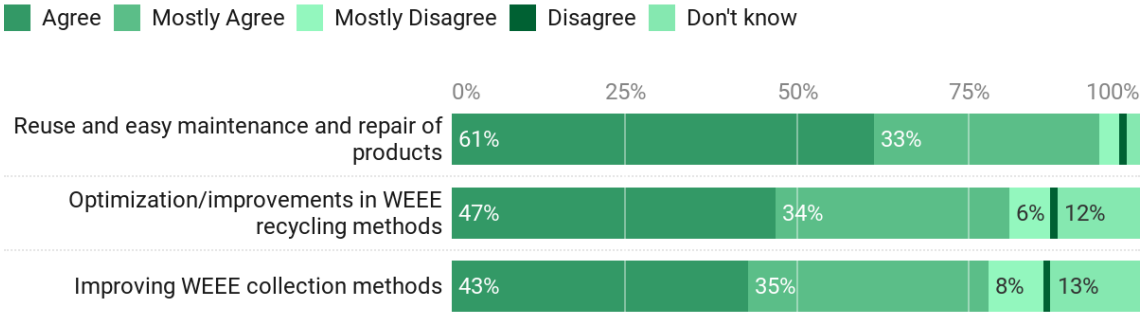
Get the data • Created with Datawrapper

SOCIAL OPPORTUNITIES



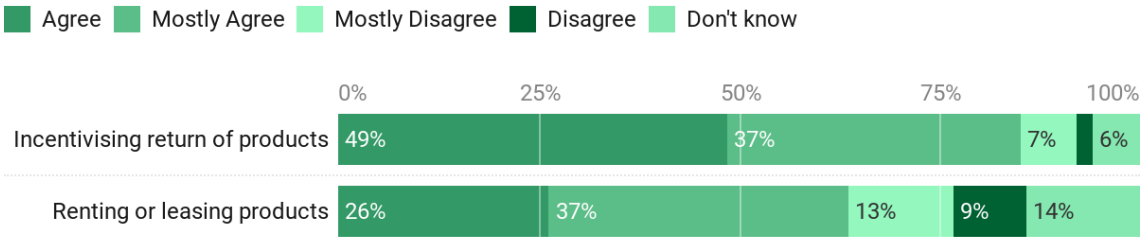
Get the data • Created with Datawrapper

TECHNICAL OPPORTUNITIES



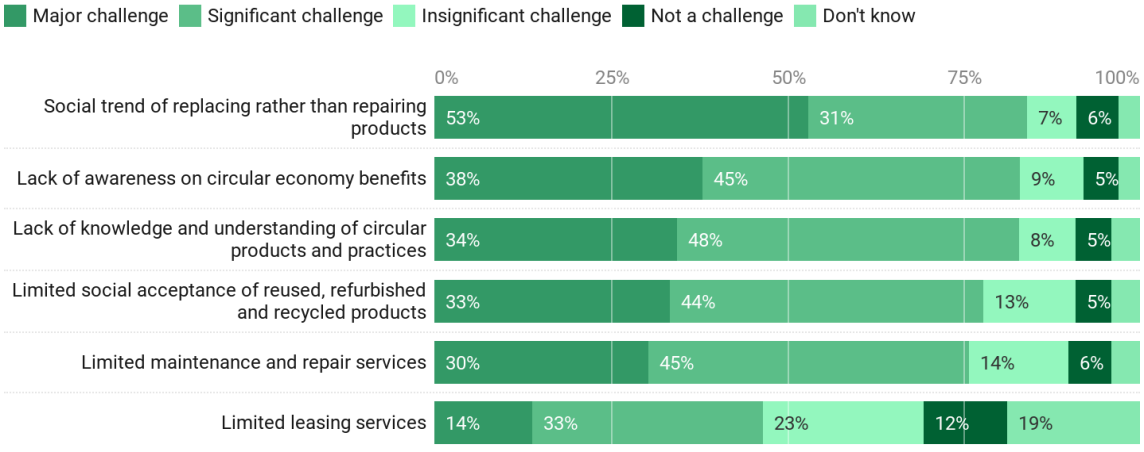
Get the data • Created with Datawrapper

CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



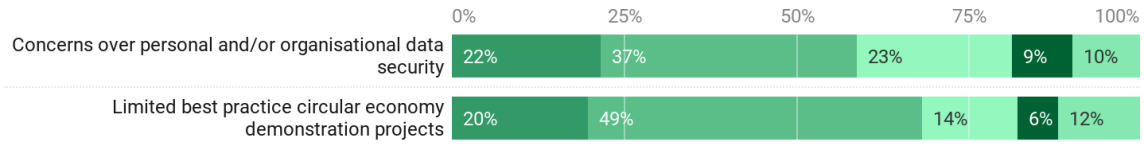
Get the data • Created with Datawrapper

SOCIAL CHALLENGES



Get the data • Created with Datawrapper

TECHNICAL CHALLENGES



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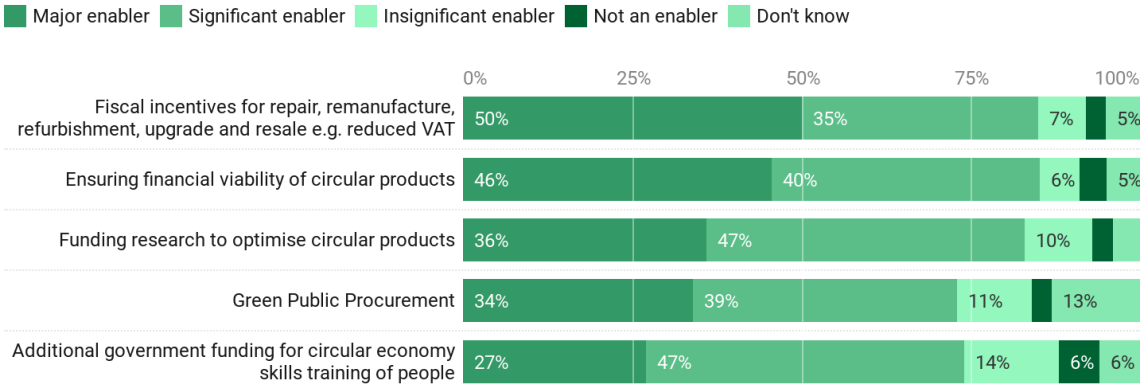
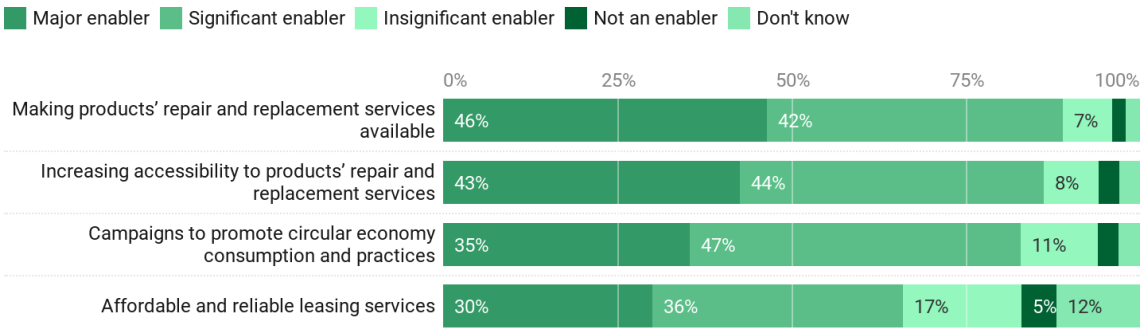
ECONOMIC ENABLERS



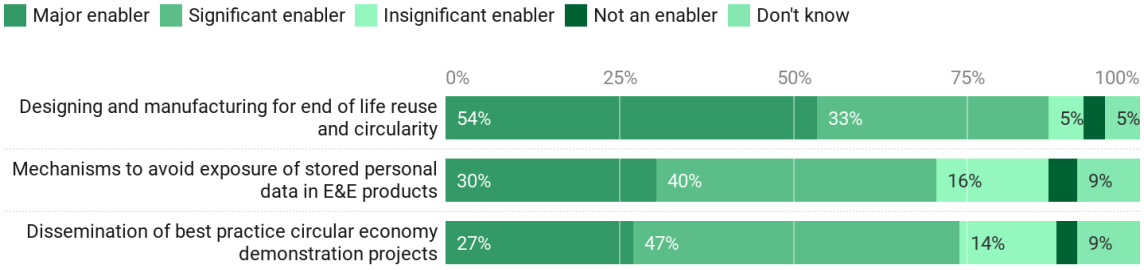
Get the data • Created with Datawrapper

SOCIAL ENABLERS



Get the data • Created with Datawrapper

TECHNICAL ENABLERS



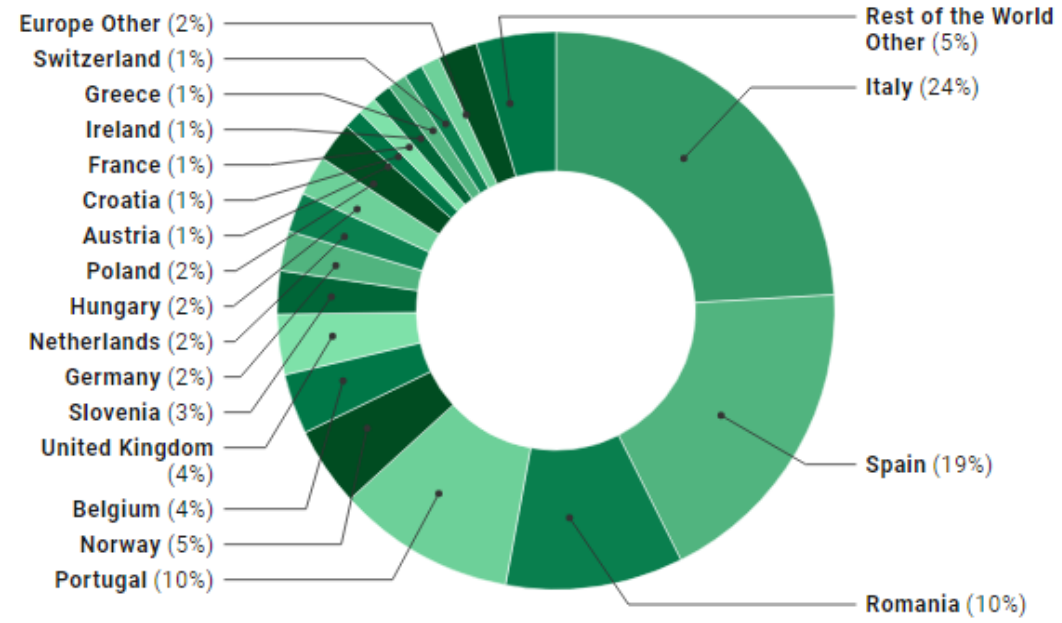
Get the data • Created with Datawrapper

WEEE Handlers – results charts

Survey Responses = 88

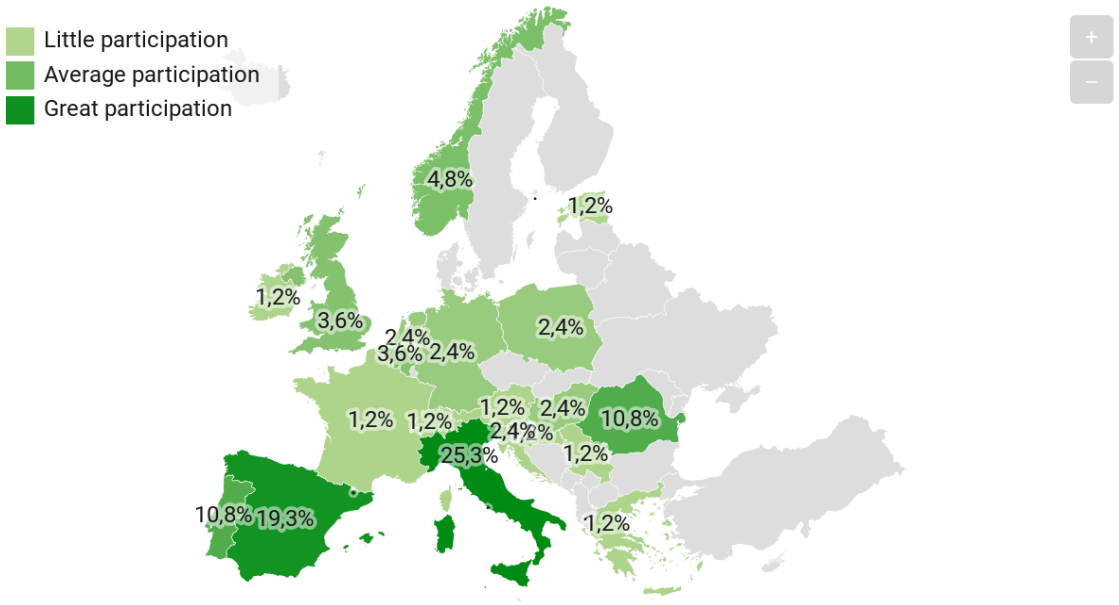
Participation of each country in the survey Acros the world

Analysis to WEEE Handlers



Participation of each country in the survey - Europe

Analysis to WEEE Handlers



Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe

Analysis to WEEE Handlers

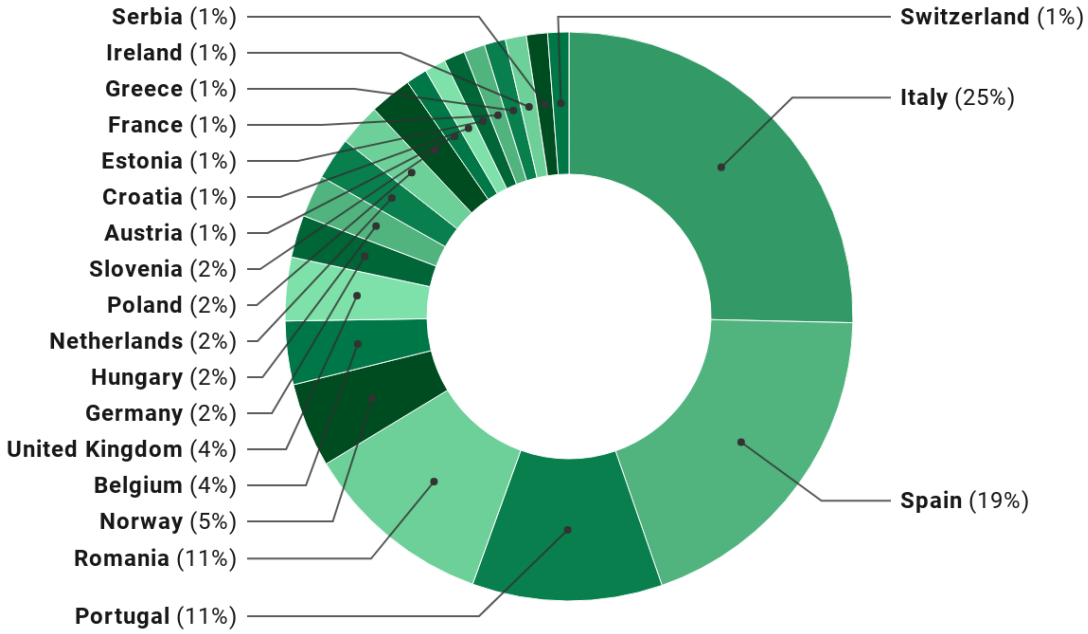
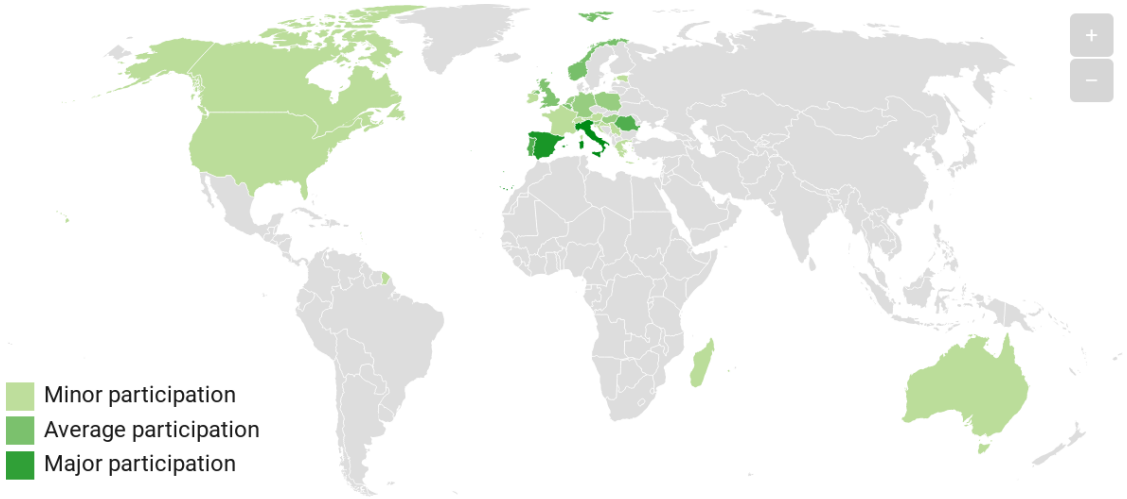


Chart: Exergy • Get the data • Created with Datawrapper

Country (Europe)	Percentage
Italy	25,3%
Spain	19,3%
Portugal	10,8%
Romania	10,8%
Norway	4,8%
Belgium	3,6%
United Kingdom	3,6%
Germany	2,4%
Hungary	2,4%
Netherlands	2,4%
Poland	2,4%
Slovenia	2,4%
Austria	1,2%
Croatia	1,2%
Estonia	1,2%
France	1,2%
Greece	1,2%
Ireland	1,2%
Serbia	1,2%
Switzerland	1,2%

Participation of each country in the survey - Europe Vs rest of the world

Analysis to WEEE Handlers



No answers from French Guiana

Map: Exergy • Get the data • Created with Datawrapper

Participation of each country in the survey - Europe Vs rest of the world

Analysis to WEEE Handlers

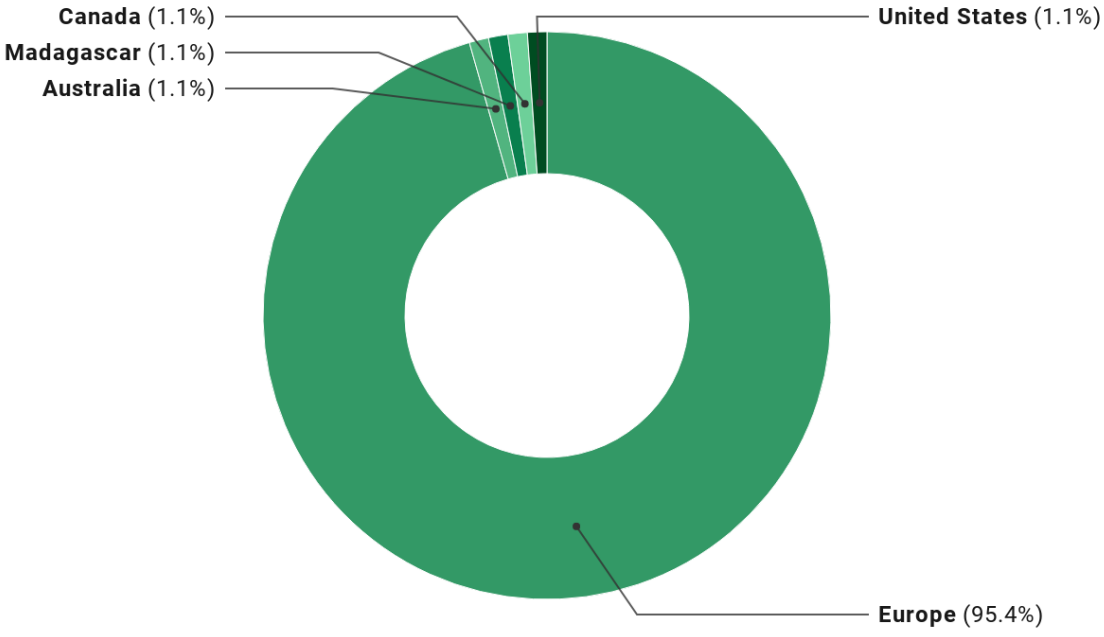


Chart: Exergy • Get the data • Created with Datawrapper

Country (world)	Percentage
Italy	24,1%
Spain	18,4%
Romania	10,3%
Portugal	10,3%
Norway	4,6%
Belgium	3,4%
United Kingdom	3,4%
Slovenia	2,3%
Germany	2,3%
Netherlands	2,3%
Hungary	2,3%
Poland	2,3%
Austria	1,1%
Croatia	1,1%
France	1,1%
Ireland	1,1%
Greece	1,1%
Switzerland	1,1%
Estonia	1,1%
Serbia	1,1%
Australia	1,1%
Madagascar	1,1%
Canada	1,1%
United States	1,1%

Size of the company

Analysis to WEEE Handlers

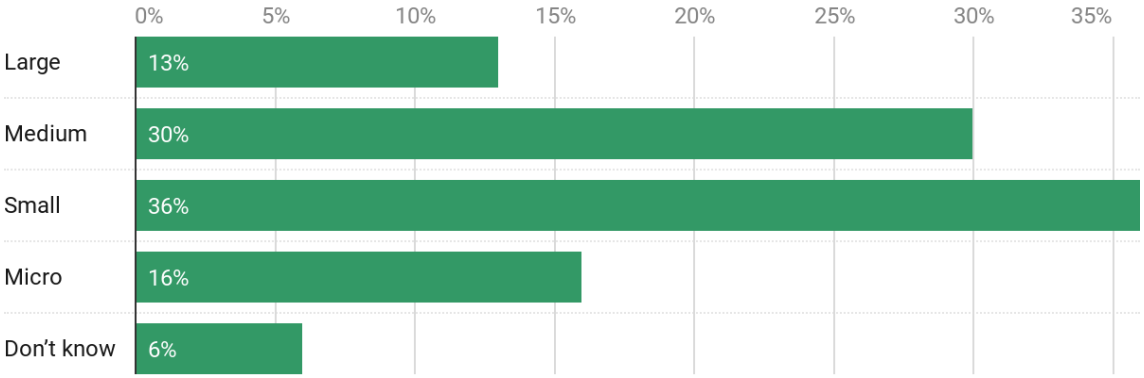
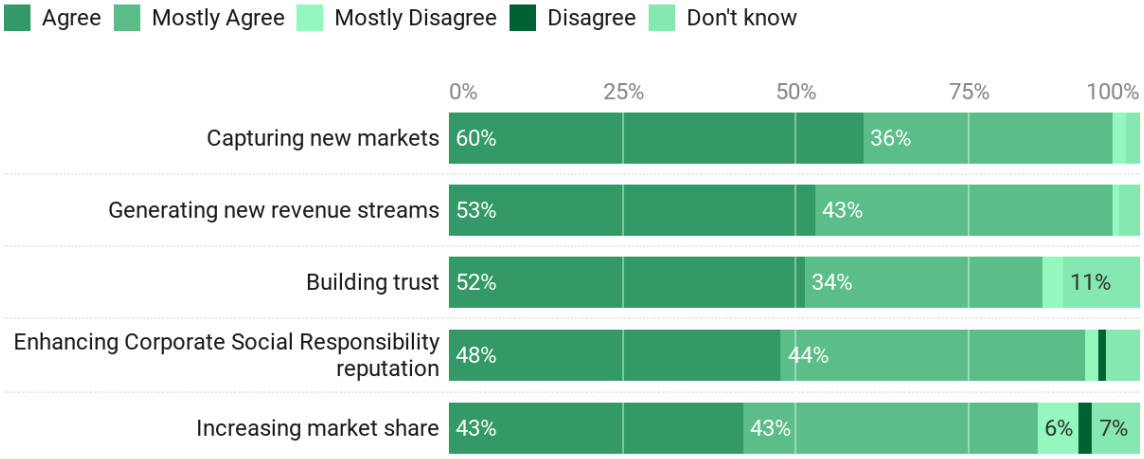


Chart: Exergy • Get the data • Created with Datawrapper

ECONOMIC OPPORTUNITIES



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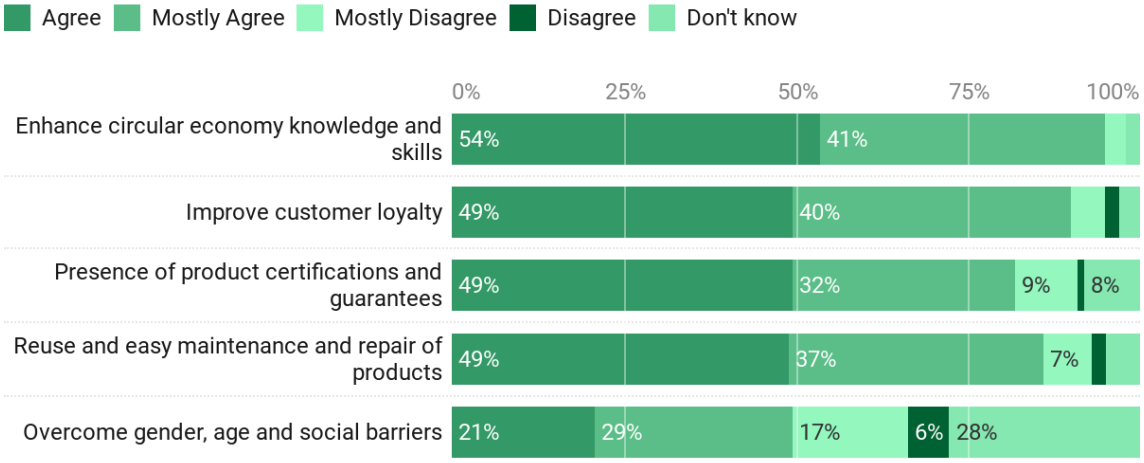
SOCIAL OPPORTUNITIES



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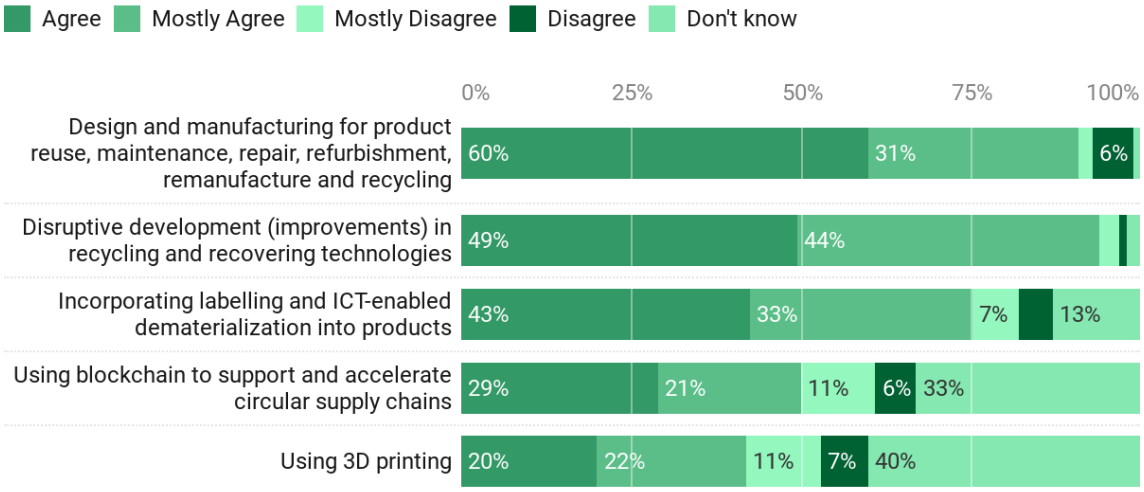
TECHNICAL OPPORTUNITIES



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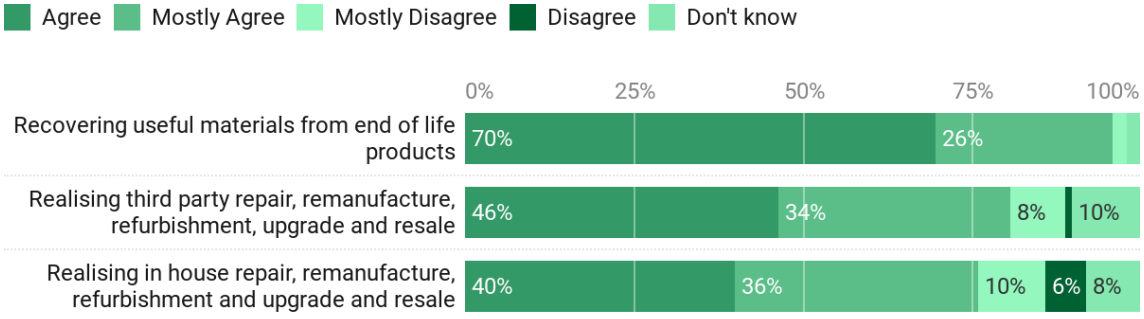
CIRCULAR ECONOMY BUSINESS MODELS ADOPTION OPPORTUNITIES



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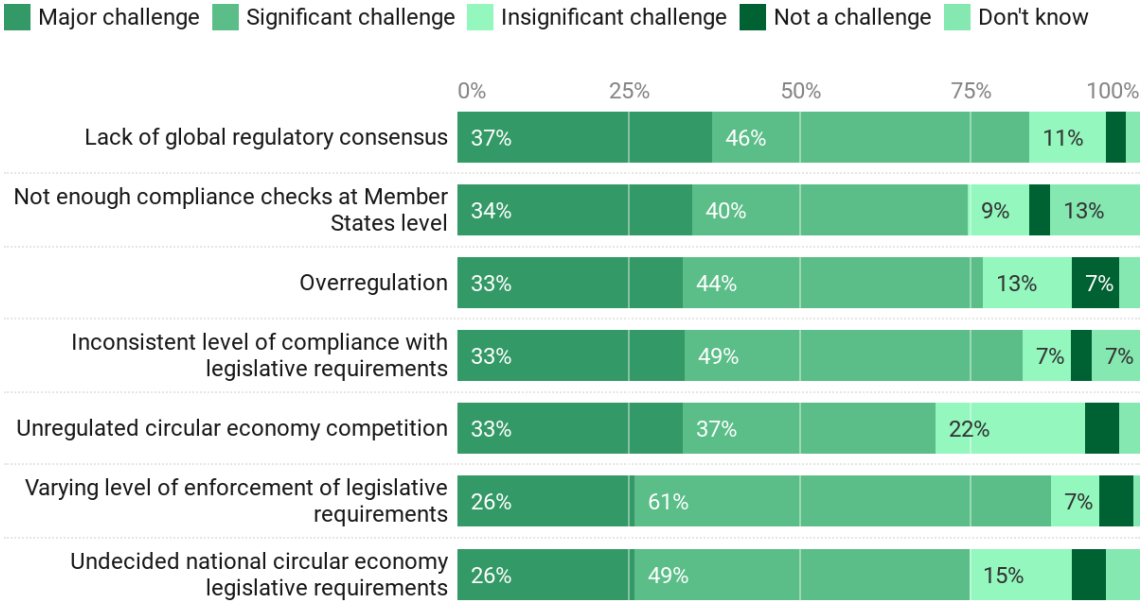
LEGISLATIVE CHALLENGES



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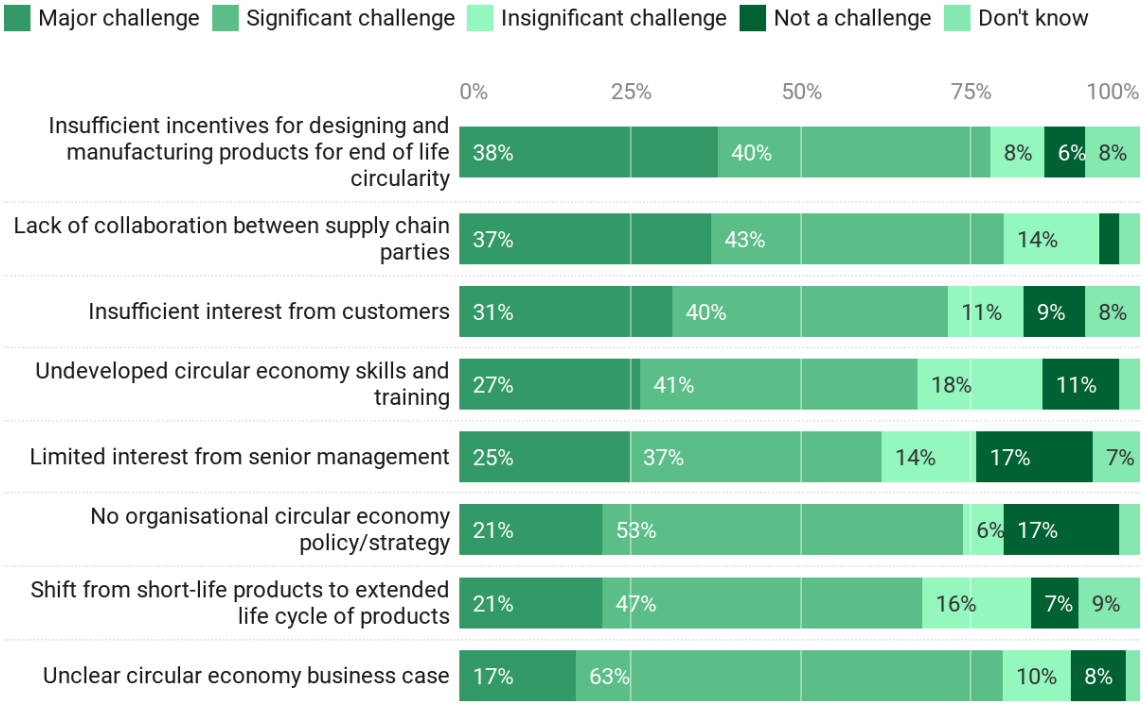
BUSINESS AND MANAGEMENT CHALLENGES



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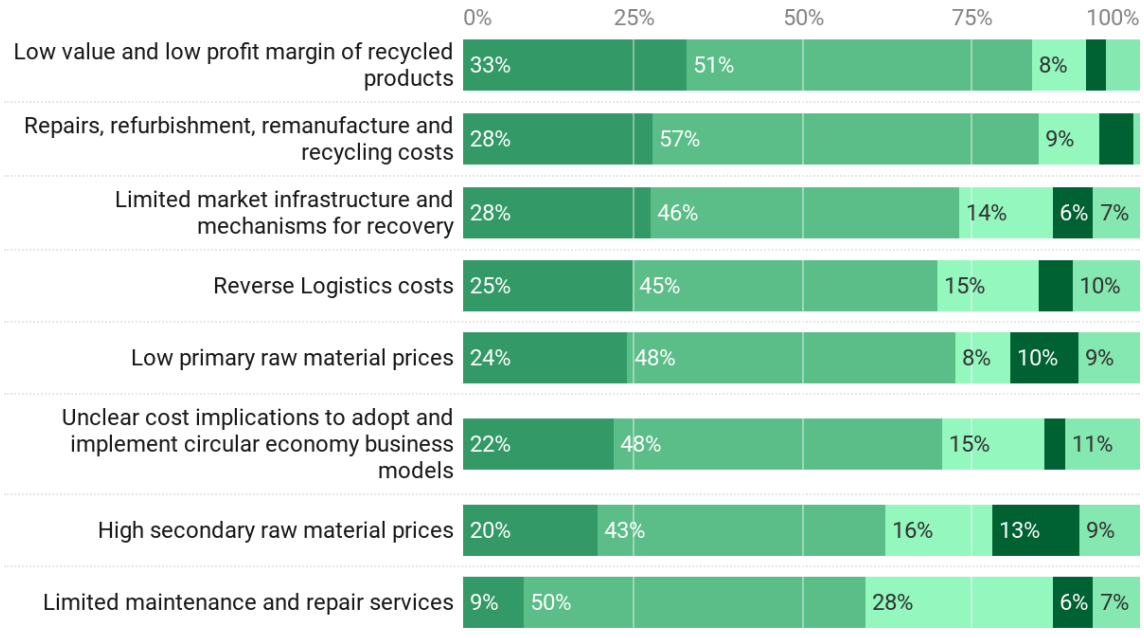
ECONOMIC CHALLENGES



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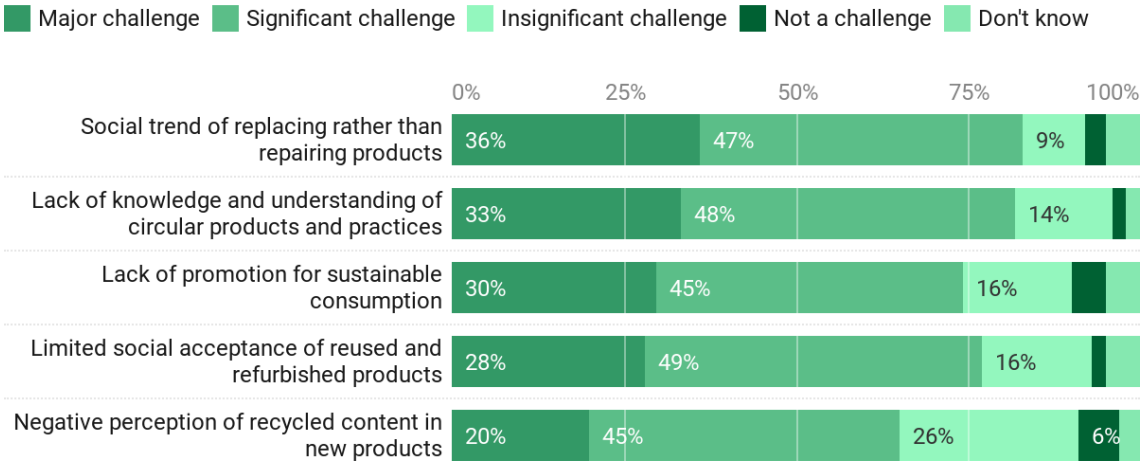
SOCIAL CHALLENGES



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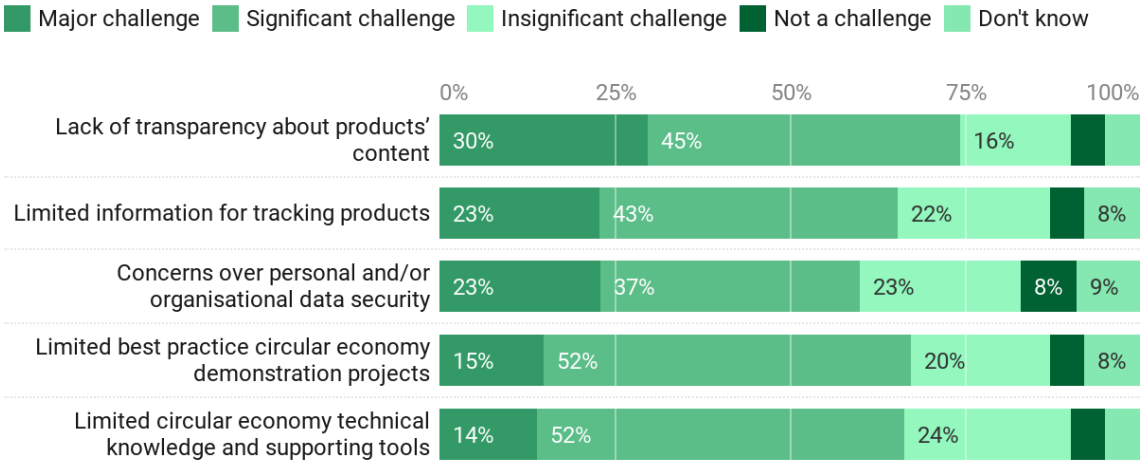
TECHNICAL CHALLENGES



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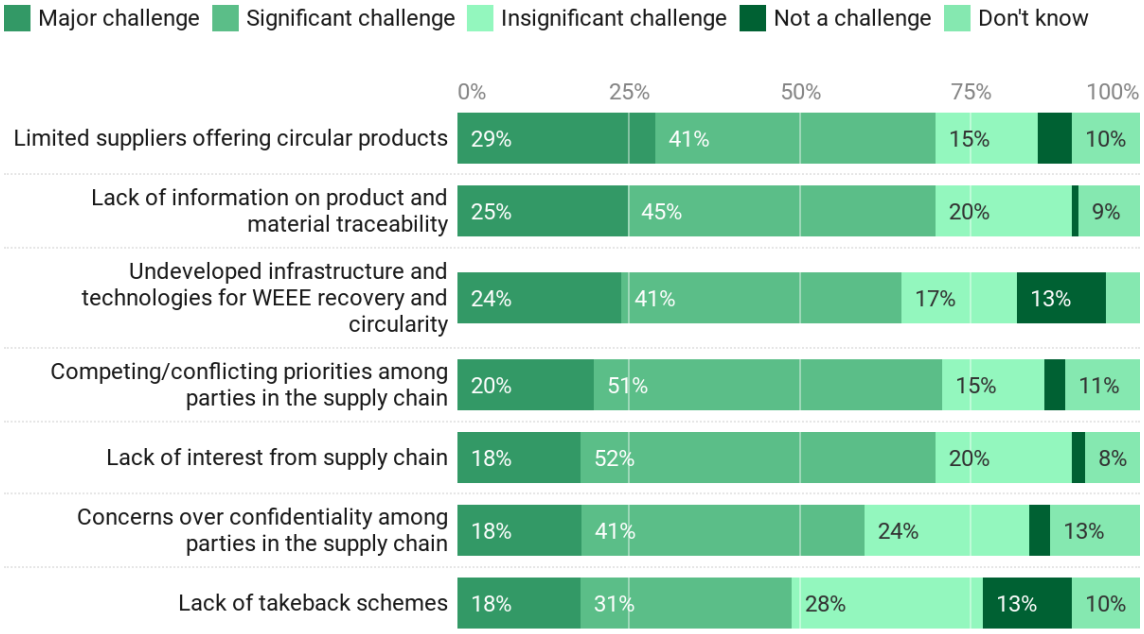
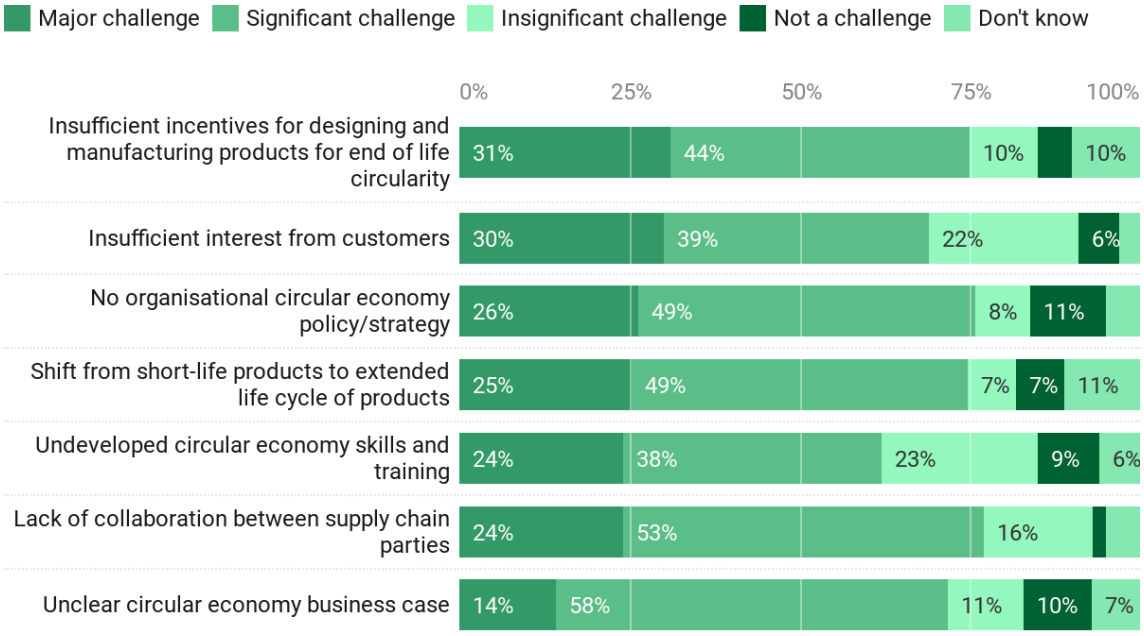
SUPPLY CHAIN CHALLENGES



CIRCULAR ECONOMY BUSINESS MODELS IMPLEMENTATION CHALLENGES



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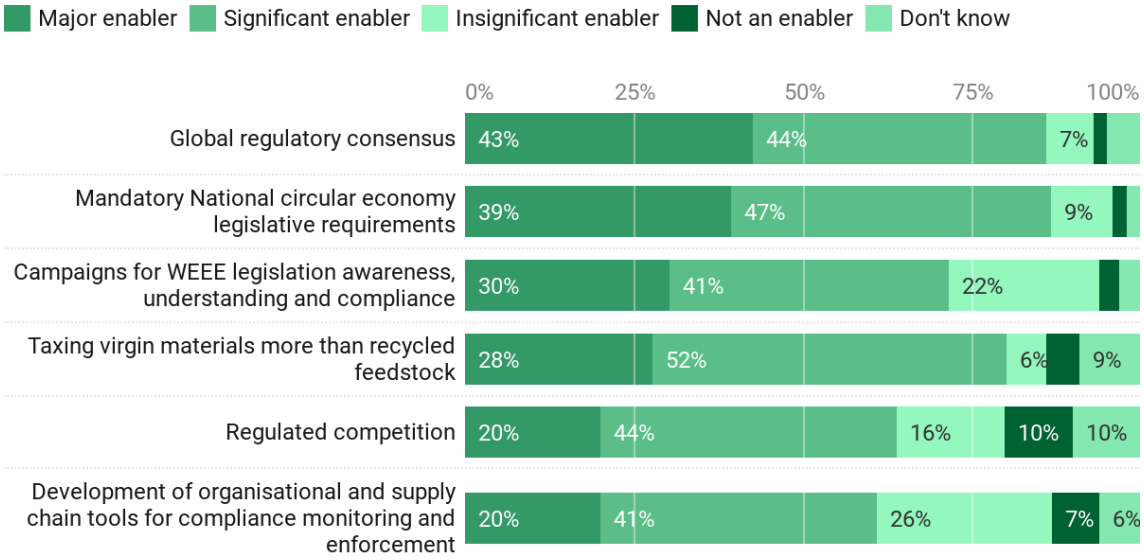
LEGISLATIVE ENABLERS



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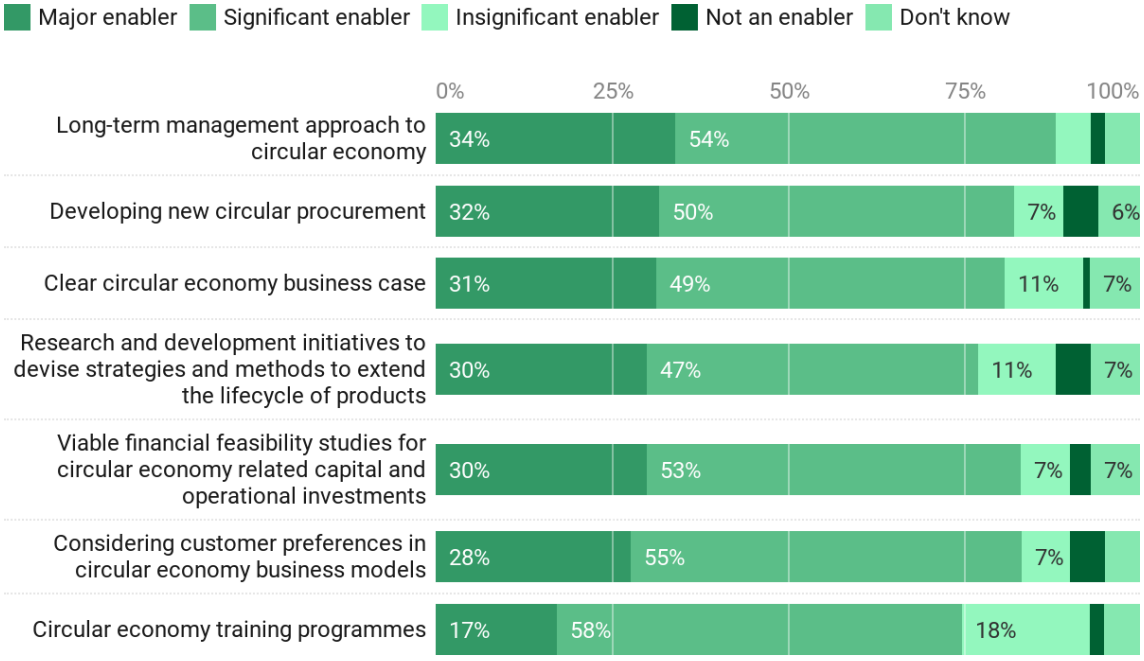
BUSINESS AND MANAGEMENT ENABLERS



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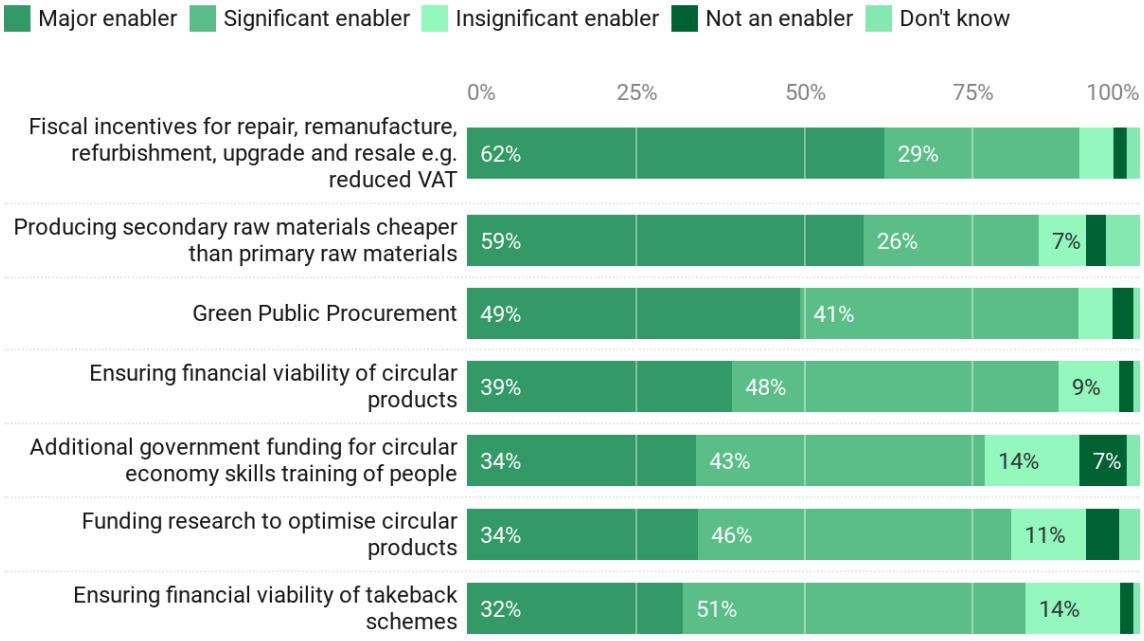

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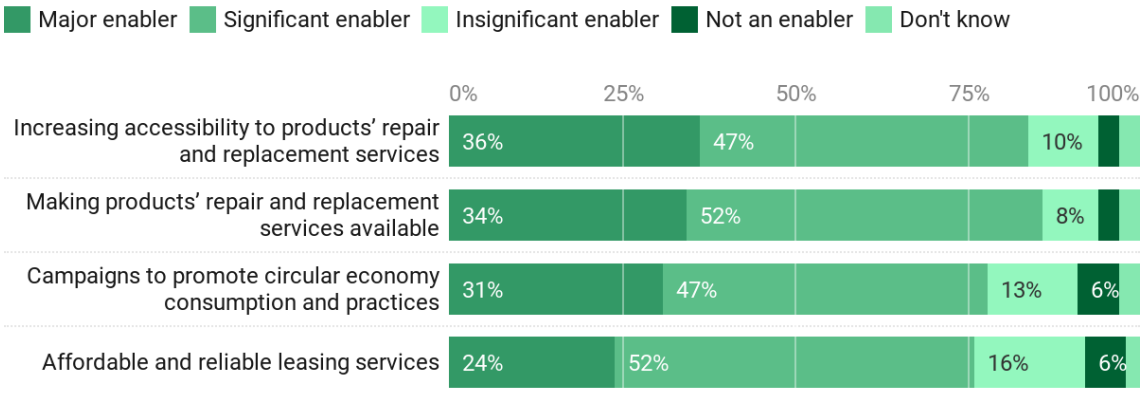
SOCIAL ENABLERS



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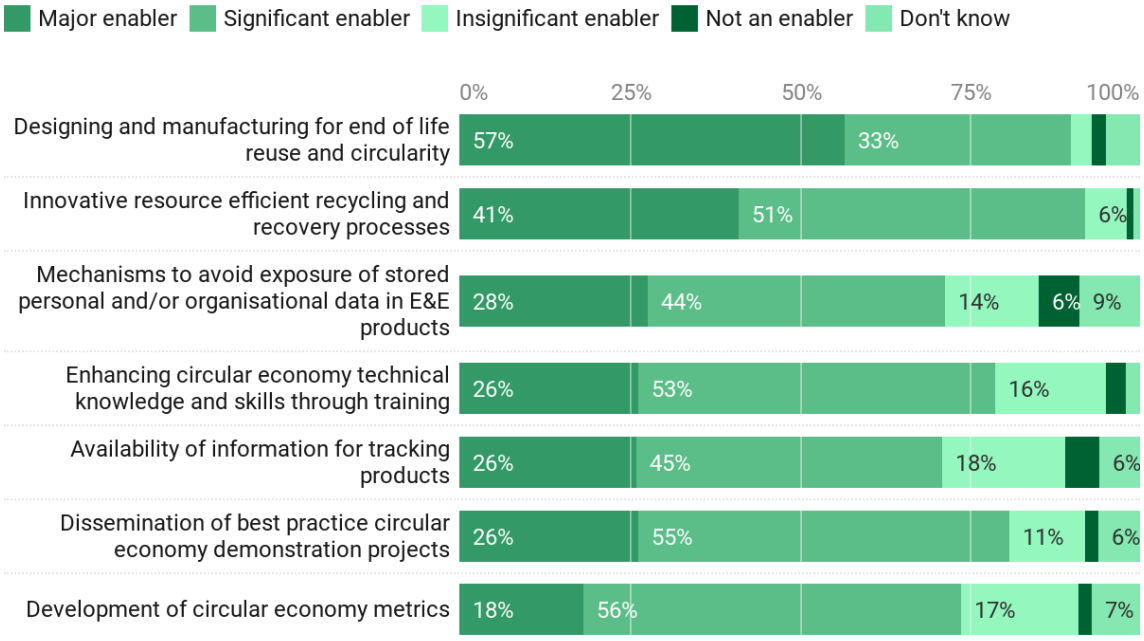
TECHNICAL ENABLERS



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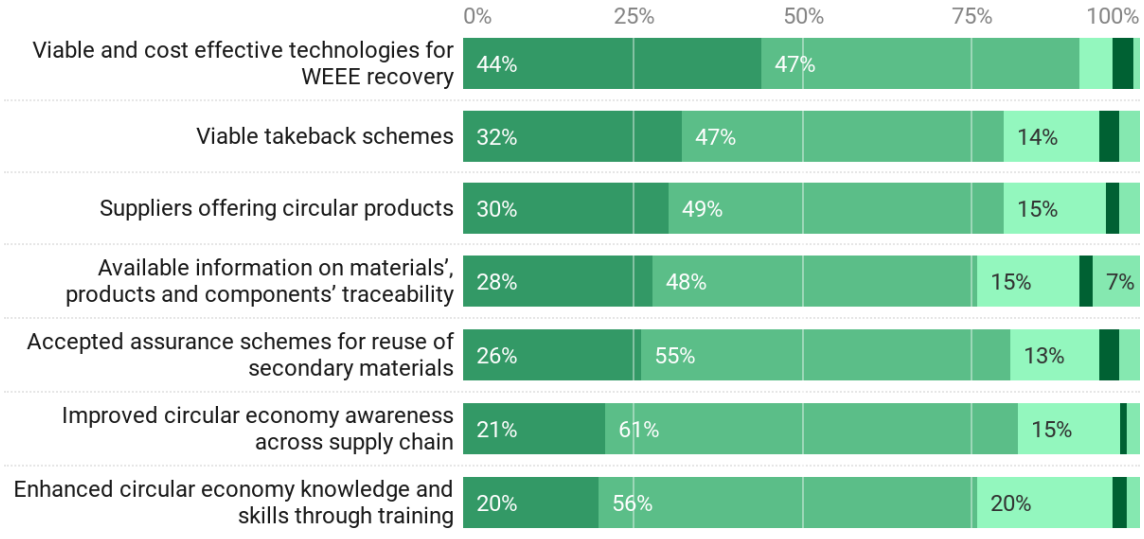
SUPPLY CHAIN ENABLERS



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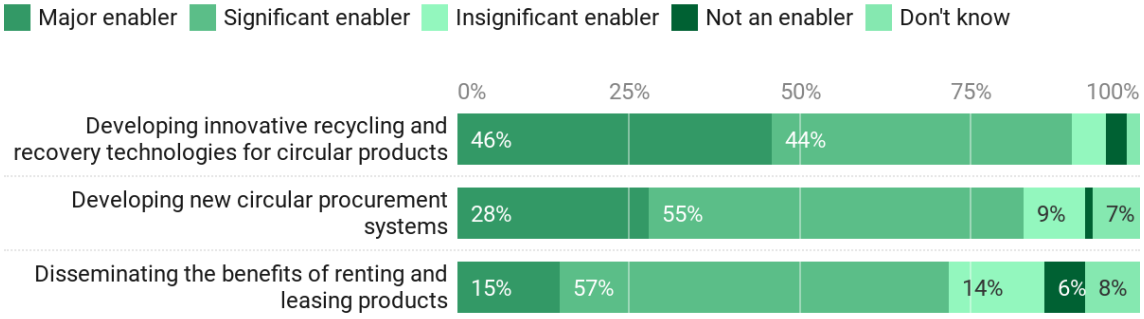
BUSINESS MODELS' IMPLEMENTATION ENABLERS



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Annex C – Highest ranked answers for each question

Selected by the highest % of: Agree + Mostly Agree / Major challenge + Significant challenge / Major enabler + Significant enabler

	Designers	Suppliers	Manufacturers	Retailers	Business End Users	Household End Users	WEEE Handlers
Economic Opportunities	Building trust	Building trust	Enhancing Corporate Social Responsibility reputation	Enhancing Corporate Social Responsibility reputation Building trust	-	-	Capturing new markets Generating new revenue streams
Social Opportunities	Improve customer loyalty	Enhance circular economy knowledge and skills	Enhance circular economy knowledge and skills	Reuse and easy maintenance and repair of products	Reuse and easy maintenance and repair of products	Reuse and easy maintenance and repair of products	Enhance circular economy knowledge and skills
Technical Opportunities	Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling	Using more efficient manufacturing processes	Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling	Design and manufacturing for product reuse, maintenance, repair, refurbishment, remanufacture and recycling Disruptive development (improvements) in recycling and recovering technologies	Reuse and easy maintenance and repair of products	Reuse and easy maintenance and repair of products	Disruptive development (improvements) in recycling and recovering technologies
Circular Economy Business Models adoption Opportunities	Recovering useful materials from end of life products	Recovering useful materials from end of life products	Recovering useful materials from end of life products	Increased recycled content in products	Incentivising return of products	Incentivising return of products	Recovering useful materials from end of life products
Legislative Challenges	Lack of global regulatory consensus Lack of awareness of legislative requirements	Varying level of enforcement of legislative requirements	Lack of global regulatory consensus	Overregulation	-	-	Varying level of enforcement of legislative requirements
Business and Management Challenges	Insufficient incentives for designing and manufacturing products for end of life circularity	Lack of collaboration between supply chain parties	Unclear circular economy business case	Insufficient interest from customers	-	-	Unclear circular economy business case Lack of collaboration between supply chain parties
Economic Challenges	Repairs, refurbishment, remanufacture and recycling costs	Low value and low profit margin of recycled products	Unclear cost implications to adopt and implement circular economy business models	Repairs, refurbishment, remanufacture and recycling costs	-	-	Repairs, refurbishment, remanufacture and recycling costs
Social Challenges	Lack of knowledge and understanding of circular products and practices Limited social acceptance of reused, refurbished and recycled products	Social trend of replacing rather than repairing products	Lack of knowledge and understanding of circular products and practices	Lack of knowledge and understanding of circular products and practices	Social trend of replacing rather than repairing products	Social trend of replacing rather than repairing products	Social trend of replacing rather than repairing products
Technical Challenges	Technical limitations in different circular economy loops	Technical limitations in different circular economy loops	Technical limitations in different circular economy loops	Technical limitations in different circular economy loops Concerns over personal and/or organisational data security Lack of transparency about products' content	Technical limitations in different circular economy loops	Limited best practice circular economy demonstration projects	Lack of transparency about products' content
Supply chain challenges	Lack of information on product and material traceability	Limited suppliers offering circular products	Limited suppliers offering circular products	Limited suppliers offering circular products	-	-	Competing/conflicting priorities among parties in the supply chain
Circular economy business models implementation challenges	Inconsistent supply of secondary raw materials	End-user unwillingness to accept shared access and use	Unclear added value in adopting circular economy business models	Unclear added value in adopting circular economy business models	-	-	Lack of collaboration between supply chain parties
Legislative enablers	Development of organisational and supply chain tools for compliance moitoring and enforcement	Global regulatory consensus	Global regulatory consensus	Taxing virgin materials more than recycled feedstock	-	-	Global regulatory consensus
Business and management enablers	Long-term management approach to circular economy	Long-term management approach to circular economy	Long-term management approach to circular economy	Long-term management approach to circular economy Considering customer preferences in circular economy business models	-	-	Long-term management approach to circular economy
Economic enablers	Ensuring financial viability of circular products	Funding research to optimise circular products Fiscal incentives for repair, remanufacture, refurbishment, rpgrade and resale	Ensuring financial viability of circular products	Funding research to optimise circular products	Ensuring financial viability of circular products	Ensuring financial viability of circular products	Fiscal incentives for repair, remanufacture, refurbishment, upgrade and resale

Highest ranked answers for each question contd.

	Designers	Suppliers	Manufacturers	Retailers	Business End Users	Household End Users	WEEE Handlers
Social enablers	Increasing accessibility to products' repair and replacement services	Increasing accessibility to products' repair and replacement services	Campaigns to promote circular economy consumption and practices	Making products' repair and replacement services available	Increasing accessibility to products' repair and replacement services Making products' repair and replacement services available	Making products' repair and replacement services available	Making products' repair and replacement services available
Technical enablers	Designing and manufacturing for end of life reuse and circularity	Enhancing circular economy technical knowledge and skills through training	Innovative resource efficient recycling and recovery processes	Innovative resource efficient recycling and recovery processes	Designing and manufacturing for end of life reuse and circularity	Designing and manufacturing for end of life reuse and circularity	Innovative resource efficient recycling and recovery processes
Supply chain enablers	Suppliers offering circular products	Viable and cost effective technologies for WEEE recovery	Viable and cost effective technologie for WEEE recovery	Suppliers offering circular products	-	-	Viable and cost effective technologie for WEEE recovery
Business models' implementation enablers	Developing innovative design and manufacturing for circular products	Developing innovative design and manufacturing for circular products Incentivised return of products	Incentivised return of products Developing new circular procurement systems	-	-	-	Developing innovative recycling and recovery technologies for circular products
Influence decision to purchase EEE	-	-	-	-	Durable products	Durable products	-

Annex D - Lowest ranked answer for each question

Selected by the highest % of: Mostly Disagree + Disagree / Insignificant challenge + Not a challenge / Insignificant enabler + Not an enabler

	Designers	Suppliers	Manufacturers	Retailers	Business End Users	Household End Users	WEEE Handlers
Economic Opportunities	Reducing production process cost Reducing raw material cost	Increasing market share	Reducing energy cost Reducing water cost	Reducing production process cost Reducing energy cost	-	-	Increasing market share
Social Opportunities	Overcome gender, age and social barriers	Overcome gender, age and social barriers	Overcome gender, age and social barriers	Overcome gender, age and social barriers	Overcome gender, age and social barriers	Overcome gender, age and social barriers	Overcome gender, age and social barriers
Technical Opportunities	Using 3D printing	Using 3D printing	Using 3D printing	Using blockchain to support and accelerate circular supply chains	Optimization/improvements in WEEE recycling methods	Improving WEEE collection methods	Using 3D printing
Circular Economy Business Models adoption Opportunities	Renting or leasing products	Incentivising return of products	Renting or leasing products	Renting or leasing products	Renting or leasing products	Renting or leasing products	Realising in house repair, remanufacture, refurbishment and upgrade and resale
Legislative Challenges	Not enough compliance checks at Member States level	Lack of awareness of legislative requirements	Lack of awareness of legislative requirements	Unregulated circular economy competition	-	-	Unregulated circular economy competition
Business and Management Challenges	Shift from short-life products to extended life cycle of products	Insufficient incentives for designing and manufacturing products for end of life circularity Insufficient interest from customers	No organisational circular economy policy/strategy	Lack of collaboration between supply chain parties	-	-	Limited interest from senior management
Economic Challenges	Limited leasing services	Limited leasing services	Limited leasing services	Limited maintenance and repair services	-	-	Limited maintenance and repair services
Social Challenges	Limited leasing services	Lack of promotion for sustainable consumption Limited social acceptance of reused, refurbished and recycled products	Negative perception of recycled content in new products	Negative perception of recycled content in new products	Limited leasing services	Limited leasing services	Negative perception of recycled content in new products
Technical Challenges	Concerns over personal and/or organisational data security	Limited circular economy technical knowledge and supporting tools	Lack of transparency about products' content	Limited circular economy technical knowledge and supporting tools	Limited best practice circular economy demonstration projects	Limited best practice circular economy demonstration projects	Concerns over personal and/or organisational data security
Supply chain challenges	Concerns over confidentiality among parties in the supply chain	Concerns over confidentiality among parties in the supply chain	Lack of interest from supply chain	Lack of takeback schemes	-	-	Lack of takeback schemes
Circular economy business models implementation challenges	Limited understanding of circular economy business models	Limited understanding of circular economy business models	Limited understanding of circular economy business models	Inconsistent supply of secondary raw materials	-	-	Undeveloped circular economy skills and training
Legislative enablers	Regulated competition	Development of organisational and supply chain tools for compliance monitoring and enforcement	Campaigns for WEEE legislation awareness, understanding and compliance	Mandatory National circular economy legislative requirements	-	-	Development of organisational and supply chain tools for compliance monitoring and enforcement
Business and management enablers	Circular economy training programmes	Clear circular economy business case	Research and development initiatives to devise strategies and methods to extend the lifecycle of products	Circular economy training programmes	-	-	Circular economy training programmes
Economic enablers	Additional government funding for circular economy skills training of people	Additional government funding for circular economy skills training of	Additional government funding for circular economy skills training of	Additional government funding for circular economy skills training of	Green Public Procurement	Additional government funding for circular economy skills training of	Additional government funding for circular economy skills training of
Social enablers	Campaigns to promote circular economy consumption and practices	Affordable and reliable leasing services	Affordable and reliable leasing services	Affordable and reliable leasing services	Affordable and reliable leasing services	Affordable and reliable leasing services	Affordable and reliable leasing services
Technical enablers	Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products	Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products	Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products	Availability of information for tracking products	Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products	Mechanisms to avoid exposure of stored personal and/or organisational data in E&E products	Availability of information for tracking products
Supply chain enablers	Available information on materials', products and components' traceability	Enhanced circular economy knowledge and skills through training Available information on materials', products and components' traceability	Enhanced circular economy knowledge and skills through training	Enhanced circular economy knowledge and skills through training	-	-	Enhanced circular economy knowledge and skills through training
Business models' implementation enablers	Disseminating the benefits of renting and leasing products	Disseminating the benefits of renting and leasing products	Disseminating the benefits of renting and leasing products	-	-	-	Disseminating the benefits of renting and leasing products
Influence decision to purchase EEE	-	-	-	-	Products associated with leasing services	Products associated with leasing services	-