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Policy Brief

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Overview

ZeroWIN (Towards Zero Waste in Industrial Networks) is a five-year project (2009–2014) under the European Commission's Seventh Research Framework Programme. The ZeroWIN project has developed effective strategies for waste prevention through industrial networks. Ten industrial case studies in the automotive, construction, electronics and photovoltaic industries form the core of the project and exchange energy, water and materials in such a way that waste from one industry becomes raw material for another. This brief suggests what can be done to advance the implementation of industrial networks in practice, based on first outcomes of the ZeroWIN project. The research leading to these results has received funding from the European Community's Seventh Framework Programme FP7 2007–2013 under grant agreement n° 226752.

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Towards Zero Waste in Industrial Networks: Policy Recommendations from the ZeroWIN Project

Industrial networking in European legislation

The ZeroWIN project has identified four key strategies for the realization of zero waste in industrial networks: industrial symbiosis, supply chain management (including collaboration of actors along the supply chain), product stewardship and eco-design. A review of the current European policies has shown that "industrial symbiosis" is the ZeroWIN strategy least addressed by European Union (EU) policies. Relevant EU policies were selected based on their impacts on industrial networks along the product life cycle: raw material acquisition, manufacturing, distribution, product purchase and use, and end of life. Only a few policies address the first phases of the life cycle; most policies and legislation predominantly regulate the end of life of products and materials, with sector-specific policies having the greatest combined impact on the high-tech sector. Sustainable procurement (as part of supply chain management) is supported at the EU level only in a voluntary way. For the construction sector, the EU appears to lack a concerted policy approach on resource efficiency. No dedicated construction and demolition laws are in place in most countries, and most of the existing regulations concern general waste only.

Consultation with industry stakeholders and desk research on policy measures covering the electronics, photovoltaic, automotive and construction sectors have shown that most stakeholders consider the zero waste approach promising. However, various barriers were mentioned regarding its practical implementation, including lack of access to appropriate technologies and waste materials, lack of partners for establishing by-product/waste exchanges, high costs associated with the implementation of necessary new technologies and the transportation of wastes or by-products from one company to another, lack of economic incentives, barriers resulting from unclear definitions and non-harmonized standards and legislation, and lack of political support. It is important to emphasize that some (or all) of the

"barriers" on this list are "perceived" barriers from industries that may have a vested interest in retaining the status quo.

Standards are key

Feedback from the ZeroWIN industrial case studies has shown that, across all sectors, one of the major barriers for stakeholders to engage in industrial networks is the perception that products of lower quality may result from the use of recycled and reused parts and components. A European standard for second-hand components and products would help ensure the liability of parts and components and counteract this fear and scepticism. An equally important issue, particularly for the IT reuse industry when it comes to reverse logistics, is the lack of information associated with returned products. Producers should be required to provide information about the operating life of the component to refurbishers or reuse organizations, so that a warranty for the part or component can be issued accordingly. Some companies already have comparable standards on a voluntary level. Xerox, for instance, has developed processes and technologies to ensure that all its products, regardless of their reused or recycled content, meet the same specifications for performance, appearance, quality and reliability, and carry the same guarantees, warranties and service agreements as Xerox equipment made from all new parts. To take this one step further, the increased use of standardized components would generally increase the exchangeability of items in the production, installation, repair, reuse and recycling phases. Both the photovoltaic and the IT industries, in particular, would benefit from such standardization and exchangeability, among others, of parts, plugs and interfaces.

Overall, more research on recycling and reuse technologies and the use of recovered materials must be encouraged. Accordingly, there must also be greater public investment to support these endeavours.

As the photovoltaic sector is still relatively new, specific guidelines for the inspection, control and repair of broken photovoltaic (or component parts) or their decommissioning should be introduced. In this way, all complete systems or parts at end-of-life can also be reused. In addition, with a substantial share of modules expected to become waste in the coming years, there is a great need for research on recycling technology and the issuance of reference documents for best available technologies for photovoltaic reuse and recycling.

Huge barrier to industrial networking: Unclear definitions of waste and by-products

One of the key stumbling blocks to realizing zero waste in industrial networks is a lack of clarity regarding the definition of the terms "waste" versus "product" and an inconsistent interpretation and implementation of the Waste Framework Directive (and other Directives) across EU member states. This lack of clarity often leads to significant administrative burdens (and respective costs) associated with turning waste materials into new production cycles. Legislation needs to impose a clear definition of waste and end-of-waste status and simplify the recognition of by-products to facilitate the legal exchange of materials. End-of-waste criteria being developed – and in some cases already published – in the context of the Waste Framework Directive will further promote common approaches and downstream markets for recovered fractions. Such a clarification in definitions is also needed to bring the national measures, which vary considerably across Europe, into closer harmony. Different interpretations among member states should be avoided and policies should be written in a way that limits the potential for alternative interpretation. For example, the same collection categories, targets or target setting principles – e.g. the new Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU) introduced collection targets based on electrical and electronic equipment put on the market or waste generated in a national context – and reporting systems should be implemented in all EU member states, in particular for the electronics, photovoltaic and automotive industries.

To support this harmonization of definitions and policies, a stronger focus on compliance and monitoring is needed, which depends on sufficient funding to environmental agencies for enforcement. Waste management plans, for instance, as a cornerstone of European waste policy and as required by the Waste Framework Directive are not efficient if not enforced. Enforcing environmental laws and regulations is an important ingredient in protecting the environment and reducing environmental harm caused by improper recycling or illegal waste disposal. In some cases, enforcement agencies rely on coercive powers to demand compliance with environmental laws, while others make use of educational strategies to persuade individuals, organizations and governments to comply with environmental laws and regulations. It is thus equally important to support law enforcement agencies whose activities and strategies are governed by legislative instruments and which need to be put in place and secured with adequate supporting funds.

Not enough support for reuse

Reuse is integral to achieving the goal of zero waste. Reuse – whilst environmentally superior to recycling – is a necessary part of overall waste reduction; however, in particular for the electronics sector, current legislation does not sufficiently promote reuse. Furthermore, uncertainties regarding the quality, timing and quantity of returned products are a major stumbling block to the creation of a functioning reuse market. This is essentially an issue of reverse logistics, where such supply uncertainties and value destruction due to time delays and storage can cause a serious barrier. Therefore, an efficient acquisition and reverse distribution system, in particular for business equipment, is essential for tracking, collecting and returning used products to the IT asset management or refurbishment facility. Setting separate collection targets for reuse and recycling in the WEEE Directive would support this. These targets should apply to both the business-to-business (B2B) and the business-to-consumer (B2C) sector. To counter low returns of equipment suitable for reuse, ZeroWIN CS 1 and CS 3 suggest that specific collection and transportation systems for high-value reusable appliances be put in place to ensure that they are not damaged in the process. It is also recommended that municipalities ensure that appropriately trained staff inspect incoming equipment at municipal collection points. In addition, municipalities should be required to guarantee reuse companies access to municipal collection points. Finally, a reimbursement policy would provide financial incentives for consumers to turn in their reusable equipment, as would inclusion of reused products in green procurement policies. However, one has to keep in mind that these measures might imply higher costs and might also increase compliance costs and eventually turn into a discussion of who pays what. This needs to be further researched.

For small reuse enterprises in particular, potentially high labour costs and the externalization of costs pose a significant challenge. Social enterprises can solve this by combining training and/or rehabilitation of certain categories of workers. Reducing value-added tax for reused products would support reuse by making it more financially attractive to consumers. Value-added tax is included in the price of new products. It is thus recommended that a reduced value-added tax be applied to previously used products. Overall, some financial support of social enterprises active in refurbishment and reuse (e.g. through tax incentives, subsidies and "welfare to work" funding for labour) could trigger a change from the traditional manner of operating.

For reuse of B2B IT equipment as well, economics seem to be the main driver. Even though trade in used B2B IT equipment is ongoing in some European countries, this is not covered by current WEEE Directive (2002/96/EC)

"Policy instruments will have to trigger a change of the traditional ways industry is operating"

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reporting, with organizations collecting and treating for reuse and recycling without the same requirements defined by legislation for B2C WEEE. A solution that addresses these issues needs to be developed which considers both the drivers of the system, the value in reuse and resource exploitation, and the barriers that affect decision making. There is a pressing need for accountability and a mechanism needs to be put in place for actors to declare their share of the market (to ensure adequate coverage in total) and to treat to an acceptable standard. Simple annual mass data by category would be sufficient to determine an organization's total collection share from the sales figures provided by manufacturers for WEEE Directive reporting (usually on an annual basis), potentially supported by third-party verification. However, one has to keep in mind that market share details can be seen as commercially sensitive. Accounting of collection and correct treatment might also be more difficult to implement for smaller actors for whom WEEE cascades into smaller streams as it moves through these networks. Whether a unit is viable for reuse depends on the likelihood of its sale and the costs of its repair or treatment when compared with the potential profit. This value assessment was shown to be completely market-driven and the requirements of such a market are highly specific and variable.

www.zerowin.eu

The ZeroWIN project aims to provide targeted policy recommendations supporting the development of industrial networks in practice. The ZeroWIN project's Work Package on Policy Implications and Recommendations investigates barriers, trade-offs and overlaps of relevant legislation while integrating the outcomes of these case studies at a policy level. Consultation with industry stakeholders highlighted some difficulties and concerns regarding practical implementation of industrial networking and its underlying principle of mutual benefit through the exchange of waste materials. However, initial results from the case studies are promising, suggesting that industries can reduce greenhouse gas emissions by at least 30 per cent and achieve a 70 per cent overall reuse and recycling rate for waste by successfully engaging in an industrial network.

The ten ZeroWIN industrial case studies are:

Implementation of design recommendations in high-tech products:
CS 1: Prototype of a D4R laptop
CS 2: Prototype of a D4R photovoltaic system
CS 3: Development of a regional reuse network for ICT products

Zero-waste construction – Construction resource efficiency networks:
CS 4 and 5: Two new buildings in Portugal and the United Kingdom
CS 6: Refurbishment of Deutsche Bank's Head Office and New Construction Schwabinger Tor in Germany

Zero-waste construction – Zero-waste management in demolition activities:
CS 7 and 8: Demolition of end-of-life building in Portugal and the United Kingdom
CS 9: An automotive component
CS 10: B2B EEE industrial networks

Landfill bans and certification schemes are promising instruments

Particularly for the construction sector, landfill bans appear to be an efficient legislative tool. Bans on the disposal of certain types of waste in landfills encourage the development of industrial networks to find alternative solutions such as recycling and reuse. In the United Kingdom, as a result of the banning of plasterboard from landfills, the recycling content of plasterboard has increased from around 10 per cent in 2007 to 78.5 per cent in 2011. This has worked so well because considerable efforts were made prior to the legislation being enforced to work with the primary manufacturers and waste disposal companies to develop segregation and collection schemes. This development of an industrial network made it possible for the legislation to be implemented effectively.

Across all sectors studied in the ZeroWIN project, for some products, the costs for recycled materials are higher than those for virgin materials or for landfill disposal. In the construction sector, new material is relatively cheap. Costs for dismantling, storage, cleaning, etc. of material to enable reuse, on the other hand, are high, and sustainable products are on average

more expensive than ordinary products. In such cases, the aforementioned landfill bans could be transposed or landfill costs could be increased to encourage the use of recycled material in industrial networks. Other financial incentives such as taxes or subsidies for the use of recovered materials can also be beneficial. Case studies in the photovoltaic sector, as in the construction sector, highlighted that the higher cost of using recycled materials or components presents a barrier for realizing industrial networks.

The extended producer responsibility (EPR) principle was introduced by legislation to make producers responsible for their products over the entire life cycle, especially at their end of life. Proponents of EPR argue that if producers have to deal with their products and the resulting waste, they will have a greater incentive to design their products in such a way that they can be more easily disassembled, reused and recycled. However, EPR in the construction sector is very difficult to implement because of the long life cycle of buildings. The same applies to the photovoltaic industry, where the average lifetime for panels is 25 years. In the construction sector one promising instrument is the certification of buildings. Such schemes usually set high standards in construction and may thus push the establishment of strong networks of well-performing industries. Moreover, a push to make the current voluntary environmental product certification schemes for construction materials mandatory by law would mean that all construction products and materials could be compared on environmental grounds as well as price. Major achievements have already been made in the construction sector in the area of energy performance; however, there is room for improvement to steer certification towards a stronger inclusion of recovered materials and support for industrial networks. This could either be achieved by implementing a new certification system or adjusting existing certifications systems as LEED (Leadership in Energy and Environmental Design) by the United States Green Building Council, BREEAM in the United Kingdom or DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen; German Sustainable Building Council) in Germany to support industrial networking (and thus provide an argument to the owner of a construction project for creating an industrial network).

"The extended producer responsibility (EPR) principle was introduced to make producers responsible for their products over the entire life cycle"

Policy adjustments: A more concrete call for action

Feedback from ZeroWIN members and invited stakeholders has shown that the WEEE Directive, RoHS Directive and the Ecodesign Directive are considered to be the most effective measures for achieving zero waste in industrial networks. Even though none of these directives directly foresee or promote the exchange of waste with

other industrial sectors, this development is not precluded either. The WEEE Directive, after its recast as well, has a particular focus on waste as a resource, conveyed through its principles of prevention, recovery and safe disposal of WEEE. As for the RoHS Directive, restricting the use of hazardous substances in electronic products is likely to enhance the economic profitability and possibility for recycling of WEEE and thus facilitates, in a general way, the exchange of waste and resources in industrial networks. However, in particular for the Ecodesign Directive, which provides consistent EU-wide rules for improving the environmental performance of energy-related products, there is some criticism that the current focus on energy consumption during the use phase of products is too narrow, neglecting the potential for design for reuse and recycling (D4R). Accordingly, there are calls to make the Ecodesign Directive about eco-design, i.e. to extend its scope to other design aspects (for reuse, disassembly, universality, etc.) and to include non-energy-using products.

The recast of the WEEE Directive introduced a major change for the photovoltaic industry. Previously exempt from WEEE recycling obligations, the recast now includes photovoltaic under Category 4 (consumer equipment and photovoltaic panels) and Category 5 (small equipment with integrated photovoltaic panels), meaning that producers of photovoltaic panel systems will be obligated to ensure the collection and recovery of end-of-life photovoltaic products. However, one of the proposed collection targets (from 2019 onwards) of 65 per cent of the items put on the market in the last three years is not at all realistic for photovoltaic panels, considering that their average lifetimes are about 20 years and that the market is still expanding so that "substitution" of old panels is currently limited. It seems much more appropriate to have an individual collection target for photovoltaic panels, as this would encourage separate collection of this product, whose composition and recycling techniques differ from those of other electrical and electronic equipment. In order to reflect the very long lifetime of photovoltaic panels and the recent appearance of photovoltaic markets in Europe, an individual collection target for photovoltaic panels could be based on the quantities of waste (from photovoltaic panels) generated in the territory.

The Green Public Procurement Programme supports and promotes sustainable procurement at the EU level. It is, however, only voluntary. The inclusion of mandatory procurement criteria promoting the purchase of reused goods and adding requirements for inclusion of reused or recycled content as well as promoting the potential for reuse and recycling would be a big step towards supporting reuse and recycling and thus industrial networking. In addition, funds granted to public bodies (e.g. universities) for procurement activities oftentimes only apply to the purchase of new products and not of reused products.

For the demolition sector, the lack of specific legislation and guidance related to demolition is causing a barrier to more environmentally sound demolition and reuse. Legislation imposing targets for reuse or up-cycling of the material generated on-site would promote selective demolition and increase the availability of reusable materials.

"There is general scepticism in industry regarding the perceived practicality of industrial networks"

Education of all stakeholders is needed

While the concept of industrial networks has been widely discussed in academic circles, there still seems to be a general scepticism in industry regarding the perceived practicality of industrial networks, what costs are involved and how barriers can be overcome. Using waste from another company requires environmental permits and can potentially lead to costly and time-consuming court proceedings over the waste or by-product question. Furthermore, companies often seem to have very little knowledge of the by-products and wastes from other industries that could possibly be utilized. It is important to foster industry trust in existing industrial networks, to support industrial symbiosis initiatives and use successful local, regional and national cases to market their economic benefits and showcase best practices – and ensure that their activities are not illegal (or reduce the uncertainty or perception thereof). This could also involve making public funds available for such initiatives or, as mentioned

earlier, awarding financial incentives via tax breaks for companies that get involved in closed-loop industrial networks and prove to be cooperating with positive commercial results and environmental impacts. In addition, waste exchange information should be encouraged to allow the market to find the right suppliers and create demand. A good example for this is the Resource Exchange Platform (www.trxp.eu), which was developed under the ZeroWIN project and which provides possibilities for offers and requests of materials and allows providers and seekers to communicate directly and negotiate prices independently.

Education is also vital for supporting reuse, in particular related to electronics. Consumer education on the environmental, social and financial benefits of reuse is necessary to create a market and generate demand for reused products. For the construction sector, education can be a tool to oppose illegal disposal of construction and demolition waste. Designers also need to be educated; currently, designers and architects often give priority to aesthetic aspects and only give minor consideration to environmental and energy performance or the possibility for material recovery at the structure's end of life. For public buildings in particular, the tender process, prescribed by legislation, results in a lengthy delay between the design and construction phases. Thus, the builder is normally not involved in the design phase and has little ability to change the materials, equipment and techniques set by the architects in the design stage. Greater reuse rates could be encouraged by making the use of recycled/reused materials in the construction industry a criterion for the evaluation of public tenders. This would encourage project professionals to think about these aspects in the design stage and would increase the likelihood that planners (local authorities/end users/architects) would be more open to incorporating the use of sustainable materials and to consider input substitution with by-products, recycled materials or materials whose by-products have a high reuse potential in other processes.

Industrial networking can create energy and material savings, a competitive advantage and new business opportunities for industry, and minimize waste and pollution. Stakeholder consultation shows that a lingering mental barrier among industry actors contributes to scepticism as to the benefits of industrial networking and hesitance to change their traditional operations. Currently, the automotive, construction, electronics, photovoltaic and other industries are under no obligation to change their ways of operating. In order to establish effective industrial networks and achieve the goal of zero industrial waste, policy instruments will have to trigger this change.

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SCYCLE, located in Germany, is UNU-ISP's first Operating Unit and became operational on 1 January 2010. SCYCLE stands for Sustainable Cycles, its mission being to:

Enable societies to reduce the environmental load of the production, use and disposal of especially but not exclusively, electrical and electronic equipment to sustainable levels through the development and promotion of independent, comprehensive and practical research as a sound basis for policy development and decision making.

Within this context SCYCLE:

- Conducts research on eco-structuring towards sustainable societies
- Develops interdisciplinary and multi-stakeholder public–private partnerships
- Undertakes education, training and capacity development
- Facilitates and disseminates practical, science-based recommendations to the United Nations and its agencies, governments, scholars, industry and the public

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