RE-SOURCING
Briefing document No 4
March 2021
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Identifying Challenges & Required Actions for Responsible Sourcing in the Renewable Energy Sector

Abstract:
As green energy – from renewable sources – becomes the corner stone for a transition to a more sustainable society, the RE-SOURCING Project reviews the state-of-play within the renewable energy sector (PV and wind energy) identifying the main actors, standards and challenges across the mining, manufacturing and collection & treatment nodes of the value chain. Issues such as human rights violations and significant environmental impacts, a lack of commitment to paying fair wages or gender equality, and conflict with local communities were found for both the extractive and manufacturing supply chain stages. Inadequate collection and treatment of equipment for both technologies can be the cause of environmental pollution (toxins from solar PV batteries) and considerable amounts end up in landfills (composite materials from wind turbine blades). Standards and initiatives addressing these issues are numerous, especially for the mining sector. The lack of an international framework and a unified glossary makes it difficult to draw a direct comparison and evaluate pros and cons of different schemes. This briefing document summarises the research and consultations from the report 'Responsible Sourcing in the Renewable Energy Supply Chain: A reality or still a long way to go?

The **RE-SOURCING Project** aims to build a global stakeholder platform for responsible sourcing in mineral value chains. The project addresses the challenges that businesses, NGOs, and policymakers are facing in a rapidly evolving ecological, social, business and regulatory world. RE-SOURCING is funded by the European Commission's Horizon 2020 programme and runs from 1 November 2019 to 31 October 2023.

1. Introduction

Shifting energy production away from fossil fuels to renewables will be a key factor in meeting the UN Paris Agreement 2015 (UNFCC 2015) goal to keep global temperatures from rising by less than 1.5° C. The EU Green Deal ambitions also require a transition to renewable energies at a much faster pace in the next decade, relative to the previous decade. In 2018, 19% of energy consumption in the EU was from renewable sources. The EU Directive 2018/2001 on the promotion of the use of energy from renewable sources has set a target of 32% by 2030.

Wind and solar PV power show the highest growth rates of renewable energy technologies with 23% and 36.5% respectively in 2018 (IEA 2020) and are considered the two technologies with the largest growth potential over the next years.

While Renewable Energy (RE) production contributes to a sustainable development trajectory in Europe at large, the sector itself faces Environmental Social and Governance (ESG) challenges across its value chains from the extraction of minerals that are required for the manufacturing of the equipment needed for wind turbines to the end-of-life management of Solar PVs and wind turbine blades. While there will always be trade-offs for a sustainable development path (there is no such thing as zero emissions, only net zero emissions), more needs to be done to improve the responsible sourcing landscape of the renewable energy sector.

This briefing document summarises findings from the RE-SOURCING Projects Report 'Responsible Sourcing in the Renewable Energy Supply Chain: A reality or still a long way to go?' (October 2020). The second section outlines the RS challenges in three major nodes of the RE value chain: Mining, manufacturing of solar PVs and wind turbines and their collection & treatment systems. The third section then turns to the processes and standards that are being deployed to assess and mitigate these challenges, before section four speaks to the gaps that still need to be addressed. The document concludes with the Vision for the RE sector being developed by the RE-SOURCING Project.

2. The Responsible Sourcing Challenges in the Renewable Energy Sector

The output of the RE sector (clean energy) is a key contributor for a sustainable development path in Europe. However, the value chain of the sector is rife with RS challenges and issues, some of which are being addressed, others not. Without the sector itself implementing RS strategies, the net sustainability contribution from the sector could well be negative. In this section the briefing document outlines the main actors in each stage of the RE value chain (mining, manufacturing, collection & treatment) and urgent known RS challenges that need to be addressed.

Box 1. Challenges in Large Scale Mining

2.1 Mining Challenges

The RE-SOURCING Project focuses on copper, rare earth elements, and silicon.

Copper: Copper extraction is undertaken as Large-Scale Mining and has a host of responsible sourcing issues that are associated with such operations (see Box 1).

The major global producer of copper is Chile, accounting for approximately 28.5% of global supply. Within the EU Bulgaria, Spain, Sweden and Poland are major copper producers. Other important copper producing countries include Zambia and the DR Congo, located in the African Copperbelt where significant sustainability issues were identified, including conflicts between large scale and artisanal and small-scale mining operations threatening the livelihoods of local communities.

Rare earth concentrates: In general, rare earth mining and processing operations have been liked to heavy pollution of earth and water sources. An additional risk arises from the tailings dams resulting from the floatation process during ore separation and are prone to leaching of chemicals, heavy metals, and radioactive elements process. Chinese rare earth production accounts for 73.23% of global supply (2018) and is associated with heavy environmental pollution. Other global producers include Australia and Canada. Projects in Germany, Finland, Spain and Sweden are under development, but have no rare earth production at this time.

Silicon metal: Derived from high-purity quartzite, the main RS issue is the high energy intensity of the process for processing quartz to high-purity silicon (for the production of silicon metal or polysilicon used for solar PV). Dependent on the source of energy, this can cause significant carbon emissions. Moreover, one-third of the polysilicon used by the solar PV industry comes from the Xinjiang region in China, subject to allegations of human rights abuses and forced labour.

China is the largest global producer of silicon metal, accounting for 64% of global supply in 2019. The EU has classified silicon metal as critical raw material due to high consumption (18% of global consumption) and comparatively low production (6% of global supply) in Europe.

It is imperative to address the RS challenges associated with large scale mining noted here (see 'Responsible Sourcing in the Renewable Energy Supply Chain' for more details), to ensure that the positive impacts of renewable energy on sustainability are not curtailed by the negative impacts in the sourcing of its inputs.

Box 2: Key sustainability challenges for the European PV Industry

- GHG emissions
- Materials usage
- Sustainable consumption
- End-of-life management
- Land use
- Biodiversity impacts
- Air quality impacts

R. Rossi (Solar Power Europe)

2.2 Manufacturing Challenges

The RE-SOURCING Project focuses on the manufacturing of wind turbines and solar PV modules.

Solar PV Equipment: Specific challenges for solar PV systems include high energy, water and chemicals consumption for the production of wafers, as well as material losses during production. China is the largest manufacturer of Solar PV equipment. Within Europe, the larger manufacturers include the REC Group (Norway), Hanover Solar (Germany), the ATERSA Group (Spain), and Kioto Solar (Austria).

Wind Turbines: RS challenges in wind turbine manufacturing focus on worker health and safety, due to the use of potentially harmful epoxy resins and fibreglass, as well as

Solar PV's production phase has the highest carbon footprint.

specific challenges due to the height when installing and dismantling wind turbines. The two largest global producers are European manufacturers: Vestas (Denmark) and Siemens Gamesa (Germany/Spain). Wind turbines and associated equipment for the European market are mainly manufactured in Europe, apart from minor volumes of electrical equipment produced in China, India, and North Africa.

RS challenges in the EU manufacturing of wind turbines noted and include lack of commitment to basic human rights principles by manufacturers, respect for land rights, indigenous people rights and gender equality, significant environmental impacts and resource efficiency levels during production. In addition, value chain due diligence for the chain originating from China (rare earths and permanent magnets for direct drive generator systems) is also a concern.

2.3 Collection & Treatment Challenges

The RE-SOURCING Project focuses on the recycling of wind turbines and solar PV modules.

Wind turbines: The main problem for the recycling or reuse of wind turbine materials is the collection and treatment of turbine blades. The dismantling of wind turbines can pose great health risks to workers, including exposure to harmful substances. The dismantling process also needs to take the restoration of land used for wind farms into consideration.

With a generally high recyclability of approximately 80% to 90%, the major components – such as steel from the tower, concrete from the foundation – can be recycled. Currently there are three main options for the treatment of wind turbine blades: (i) disposal, including landfill or incineration without heat recovery, (ii) energy recovery or recycling, i.e. incineration with energy recovery, thermal, chemical, or mechanical recycling, and (iii) repurposing, e.g. co-processing in a cement kiln.

Collection & treatment of wind turbines is a major issue.

Solar panels: With available technologies a little over 90% of solar panels can be recycled, mainly carried out in existing glass and aluminium recycling plants. The challenge in recycling solar panels stems from appropriate collection and treatment of the panels. For example, in China photovoltaic equipment is burned causing severe environmental pollution, with potential adverse impacts on biodiversity and human health. Currently two major group deal with recycling: (i) independent recycling providers, such as the European PV Cycle or the Australian Reclaim PV Recycling, and (ii) collection and treatment by solar PV manufacturers.

3. Standards & Processes Address RS in the Renewable Energy Sector

There are a plethora of RS standards, guidelines and process that are being used to address identified RS challenges for the renewable energy sector. This section provides a summary of the more commonly found standards.

3.1 Mining Standards

The international mining sector, as a whole, has been the focus of many initiatives and voluntary standards to improve production practices and impacts caused by large scale mining operations (See Box 3 and The International Responsible Sourcing Agenda report for more details). These standards apply to a range of minerals, including copper, rare earths and quartz.

Apart from mining specific standards, there are also general standards relevant for mining companies, which include: ISO (14000, 50001, 20400, 26000, 45001), ILO, IFC EHS, OECD Multinational Enterprises (incl. Guidance for Responsible Mineral Supply Chains), UN Human Rights Principles & Global Compact, and the SDGs.

Box3. Standards addressing RS in the extractive sector

- Alliance for Responsible Mining Standards
- EBRD Responsible Mining Standards
- EITI Standards
- Global Reporting Initiative
- ICMM Standards
- IFC EHS for Mining
- ILO Labour Standards
- Initiative for Responsible Mining Assurance
- LME Responsible Sourcing Requirements
- Natural Resource Charter
- OECD Meaningful Stakeholder Engagement
- The Copper Mark
- Towards Sustainable Mining Standards
- World Bank Climate-Smart Mining Initiative

3.2 Manufacturing Standards

Available standards for the RE sector mainly consider the quality and technical specifications of the equipment, performance measurements and test procedures, monitoring and controlling systems, as well as design requirements. Some countries have national guidelines, for example the NSF/ANSI 457 on "Sustainability Leadership Standard for Photovoltaic Modules and Photovoltaic Inverters" in the US. Some general standards and guidelines are also of relevance for this sector, for example from the ILO or IFC EHS guidelines.

The manufacturing of wind turbines and solar panels currently lack an international framework for environment, health and safety. However, there are numerous guidelines currently under development, such as:

- The American Wind Energy Association (AWEA) is developing technical, workforce, and environmental, health and safety standards
- EU Eco-design, Energy Label, Ecolabel, and Green Public Procurement for solar PV modules

3.3 Collection & Treatment Standards

For the collection and treatment of wind turbines mainly general standards are applies, such as the IEC EHS Guidelines for Wind Energy. These include addressing issues and recommendations related to the decommissioning of wind power plants. The German Institute for Standardization (DIN) developed the first industry standard for dismantling and recycling of wind turbines. Some European countries have legislation barring composite materials from being landfilled. Others are considering introducing mandatory recycling rates for wind turbines. Standards under development include efforts from WindEurope, a cross-sector platform, to advance wind turbine recycling with a specific focus on turbine blades. They are also working on international guidelines for wind turbine dismantling and decommissioning.

For solar equipment the best-known standard is the European directive on Waste of Electrical and Electronic Equipment (WEEE Directive). This directive includes a section on photovoltaic panels and provides a framework for collection, transport, and treatment of photovoltaic panels on the notion of extended producer responsibility.

4. Gaps in RS practices within the Renewable Energy Sector

Many of the RS challenges that have been identified in the RE value chain, however, are not been considered adequately under current RS schemes (see Box 4). To achieve RS in the RE sector, these gaps need to be addressed not just within a particular node of the RE supply chain, but through collaboration across the entire value chain. Some of the more urgent issues that need to be addressed are discussed in this section.

Box 4: RS issues not adequality covered by existing initiatives:

- women rights
- conflict with agriculture
- money laundering
- conflict with indigenous people
- responsible person for the standard
- production practices
- alluvial mining
- conflict with LSM
- extortion
- mergers and acquisitions
- pricing & price premiums
- divestment

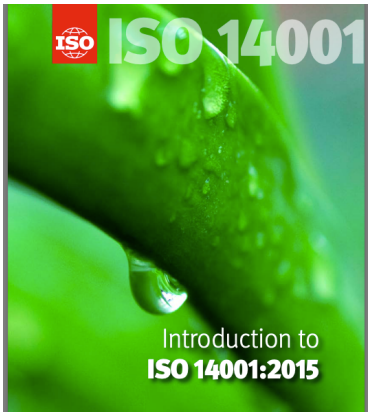
Based on Sustainability Schemes for Mineral

4.1 Weak Proof of Origin Schemes

Also referred to as traceability, this issue has largely revolved around conflict minerals and production sourced from Artisanal and Small-scale Mining (ASM). While blockchain technology, ARM or the Fairmined Standard provide traceability options, on-the-ground implementation remains challenging. With inspectors required to be located directly at operation sites to provide certification, these schemes suffer from logistical and administrative issues which in turn affect their usability across the entire value chain. IRMA is in the process of publishing a Chain of Custody Standard, developed to provide the base-level requirements for traceability for any mined material from the mine through the downstream chain of custody to the end consumer. The IRMA Chain of Custody Standard will, as needed, be supplemented by Annexes specifying additional guidance for specific mineral supply chains.

4.2 Lack of Harmonization of Sustainability Requirements

As many companies attempting to engage with RS schemes will bear witness, there is a 'jungle' of sustainability schemes for mining and manufacturing, with little signs of a joint framework that can harmonise these requirements. The efforts to organise internal management and operational procedures for a company that would be required to respond to many standards is not a small one, requiring both human and financial resources. This effort is further compounded with unclear RS targets and measurements, for both downstream and upstream actors, that have been set out by a plethora of external reporting schemes and standards. Sustainability schemes for mining often differ even in the most basic definitions, such as protected areas (Kickler & Franken 2017; BGR 2020; Schütte et al. 2018). In contrast, examples of harmonised international frameworks such as the ILO Conventions and recommendations that are widely accepted across countries and industries exist.



Currently various standards are under development, with a number of non-sector specific international standards addressing some aspects of the RE manufacturing process, such as the ISO-standards for environmental (14001), occupational health & safety (45001), and energy (50001).

4.3 Specific Recycling Standards not Available

There is a lack of standards specific to the recycling of wind energy and solar PV equipment. While there are some more general guidelines or directives, e.g. the IEC EHS Guidelines for Wind Energy or the EU's WEEE Directive, that also cover issues

related to the decommissioning of wind power plants and the collection and treatment of PV panels respectively, international guidelines that address the specific requirements of wind turbines and solar PV equipment are not available. Given the recycling of these products will be required across a number of jurisdictions, an international framework(s) needs to be established to prevent their disposal in landfills or environmental pollution by battery toxins.

"Increased silicon manufacturing efficiency through optimised manufacturing processes, increased cell efficiency, higher share of recycled materials."

Solar Power Europe

4.4 Resource Efficiency not Being Addressed

Considering the enormous expansion of the renewable energy sector expected over the next couple of decades, resource and impact decoupling is essential for making renewable energy technologies truly sustainable. These considerations need to be included in all stages of the supply chain. For example, the manufacturing of silicon wafers for solar PV panels needs to address its high production losses, efficient collection and treatment systems need to be employed to enable the reuse of materials. Actions on the consumer side are required, including new business models such as car sharing, etc. This is a consideration many of the identified standards and initiatives, including the UN SDGs, are failing to address.

"Companies scored poorly on high-risk issues cited in allegations of abuse, such as respect land rights, land acquisition, & a just and fair relocation policy. "

Business & Human Rights Resource Centre

4.5 Weak Tracking of Procurement across Value Chain

Procurement practices link the various nodes of a value chain and impact the interoperability of RS practices. Some companies have developed internal procurement standards (such as Umicore) as have some governments (Sustainable Procurement Guidelines of the Australian government). There are other non-sector specific standards, such as those provided by ISO 20400 or UNEP Sustainable Procurement Guidelines, but guidance specifically addressing RE need to be developed.

RE specific procurement standards can potentially affect sustainability schemes on the sector level, as they determine requirements downstream actors need to assess for their suppliers. This would have the added value of harmonising procurement guidelines with sector specific standards. Otherwise, they add to the multitude of already available standards and partially overlapping guidelines.

4.6 Lack of Engagement on Select Issues

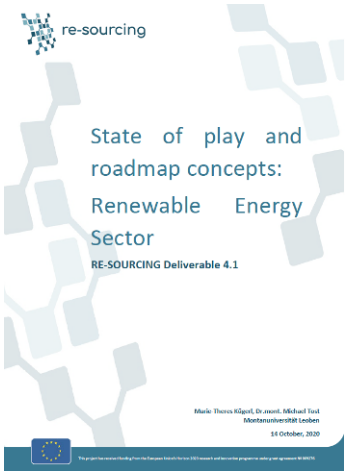
The RE-SOURCING project also conducted a narrative analysis to investigate the online discourse on topics related to responsible sourcing and renewable energies. The narrative analysis indicated that multistakeholder engagement is prominent for investors, companies and the general public for issues such as “ESG mining” or “sustainable mining”, other issues have not received the same attention. Examples include “human rights procurement” or “responsible sourcing raw materials/minerals”. The RE-SOURCING project considers both narratives highly relevant in the context of RS for the renewable energy sector. These topics require more commitment, as they relate to largely unaddressed challenges in the renewable energy supply chain and not just particular to one node. Please see the chapter on narrative analysis in the ‘Responsible Sourcing in the Renewable Energy Supply Chain’ report for more details.

Negative human rights records threaten a sustainable development approach to the energy transition.

4.7 Link to Wider Human Development Missing

Any advancements in the RE sector need to consider not only the value chain nodes (mining/manufacturing/treatment) but also the larger international aspects and planetary boundaries. The UN SDGs encompass a wide range of goals to reach a more sustainable and equitable growth path for all citizens. Yet, these goals may not be enough. RE-SOURCING Project agrees with Jain and Jain (2020) who compare the enhancement of human well-being by using the Human Development Index (HDI) with the carrying capacity of the planet by using the Ecological Footprint (EF). The HDI ranges between 0 and 1, where scores below 0.55 signify low development and above 0.7 as high human development. The ecologically productive area per person is 1.7 gha (global hectares). This means a country with an HDI above 0.70 and an EF above 1.7 gha can be categorised as sustainable. Jain and Jain's assessment however shows that countries with a high HDI usually also have an EF exceeding the 1.7 gha. In contrast, countries with a low HDI also have a significantly smaller EF. This leads them to argue that the preference of economic and social development remains a national issue, often ignoring the larger global environmental aspects and the respect for planetary boundaries.

5. What needs to be addressed in a Vision for Responsible Sourcing in the RES in 2050



The objective of developing a state of play review of the RE sector for the RE-SOURCING project is to identify what has been achieved and what needs to be done for the future to achieve a level playing field, in implementing RS practices, in the RE sector. With that in mind, the project team has developed a Vision (see figure on the last page), which visualizes the future state of the renewable energy sector, to be achieved by 2050. The Vision has been prepared in consultation with experts from the Project's Platform Steering Committee (PSC) and the Advisory Board (AB) and consultations also took place at the renewable energy roadmap workshop, held in October 2020.

The Vision is based on the concepts of planetary boundaries and strong sustainability, providing essential guidelines regarding the preservation of natural capital. Over the course of the project, the team will be developing a roadmap, in consultation with important RES stakeholders and experts from industry, policy and civil society, to provide a step-by-step approach towards achieving the vision.

Some indications for what this roadmap would need to consider include:

5.1 Mining Issues Requiring Urgent Addressing

Given the many challenges for the extractive sector, issues that need to be more urgently address include:

Short term: The improvement of transparency along the entire value chain: End users should have information on the production of the raw materials used in their consumer goods.

5.2 Strategies Required for Manufacturing

Development of strategies for and by both industry and policy makers include:

Short term: Strategies that support measures for carbon pricing, protecting livelihoods and rights of local community
Medium term: Strategies that allow for international standards to be implemented across all value chains, maximizing circular economy principles and reduction of material consumption
Long term: Strategies that provide RS measures in addressing material needs of renewable energy deployment.

5.3 Actions to Improve Collection & Treatment Systems

To ensure the sustainability in the entire lifecycle of RE technologies, implementation strategies and actions are required to address both environmental and social aspects. These actions include the following:

Environmental impact actions include product design to take due consideration of end-of-life recycling and the substitution of critical raw materials.
Social impact actions include the transfer and building of recycling infrastructure in developing countries, with urban mining of e-waste as a potential sector.
Actions to improve policy and legislative framework around collection and treatment including mandatory recycling quotes, incentivizing substitution of critical raw materials, etc.
Actions that set long-term goals to recycle more than 90% of all PV modules and wind turbines and reduce GHG emissions along the whole value chain by more than 90%.

Taking the findings from the consultations and research, the next step for the RE-SOURCING Project is to incorporate these findings and further the case of RS in the RE sector through a series of Flagship case labs and roadmap consultation, to producing guiding principles, case examples and informative documents over the next three years.

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Vision of the Renewable Energy Sector
Environmental
Social
Economic
International Cooperation
Harmonised reporting systems; clear global criteria for responsible and sustainable practice
• Limiting Climate change to 1.5°C
• Net-positive environmental impact
• Net-positive contribution to biodiversity
• Carbon-neutral production and transport
• Zero pollution of land and sea
• Zero harmful emissions
• Use of renewable energy sources
• Resource efficiency (decreasing need for primary raw materials, no use of ground-water, energy efficiency, etc.)
• Zero Human Rights Violations
• Gender equality in all stages of the supply chain
• Elimination of poverty & hunger
• Ensure access to food, clean air & water, sanitation, health care
• Meaningful stakeholder engagement
• Support of local development
• Fair compensation for land-use
• Respect for land rights
• Occupational health & safety
• Community health & safety
• Local recruitment
• Knowledge sharing & training
• Sustainable and responsible investments
• Fair wages
• Transparency
• Zero financial crime
• Fair compensation for land–use, minerals, etc.
• "Unsustainability is unprofitable"
• Companies accept their responsibility
• Decoupling of economic growth from resource consumption & environmental impact
Mining & Mineral Processing
• Zero hazardous tailings discharge
• Re-use of tailings & waste rock
• Better-than-before reclamation
• Efficient processing, incl. energy & water efficiency, improved recovery
• Efficient use of deposit—no high-grading
• Remediation of abandoned mines
• Formalisation of ASM sector & full integration in the supply chain
• Cooperation between LSM and ASM
• Conflict free mineral supply chains
• Sharing of infrastructure (especially in remote areas
• Ensuring water availability & quality for neighbouring communities
• Free prior informed consent
• Proof of origin & traceability of minerals
• Transparent granting of mining licences
• Use of new technologies & automation
• Multi-stakeholder governance
Manufacturing
• eco-design & collaboration of manufacturers and recycling plants
• Responsible use of toxins, use of alternative substances if possible
• Increased input of secondary materials
• Provision of renewable energy to remote/poor areas
• Improving infrastructure
• Local value creation
• Abandonment of "the cheaper the better" philosophy
• Support of responsible production practices upstream
• Local sourcing where possible
• Process optimization
Recycling
• Circular economy—closed loop & zero waste culture
• Recycling of all recyclable materials used for wind turbines and PV panels
• Re-use of decommissioned turbine blades and other unrecyclable materials
• Eco-design & collaboration of manufacturers and recycling plants
• No dumping of toxic materials in landfills
• Maintaining air quality
• Maintaining water quality
• Making unrecyclable material available for urban construction
• Financially more attractive than primary raw materials
• Landfilling is economically unattractive
• Innovation friendly environment
• Adequate legal basis for recycling
• Local recycling & reuse
re-sourcing