



RE-DEFINING VALUE

THE MANUFACTURING REVOLUTION

Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy

KEY INSIGHTS FOR POLICY MAKERS

- 1 Value-Retention Processes (VRPs) (namely remanufacturing, (comprehensive) refurbishment, repair and direct reuse) and recycling are complementary processes that, if pursued strategically, can enable faster achievement of circular economy. While most actors in the manufacturing supply chain are currently focused on recycling their products, the adoption of VRPs can lead to the retention of substantially greater value in the system: VRPs enable the retention of the inherent value of the product, whereas recycling retains just the value of the material or resource that is recycled.
- VRPs create net-positive outcomes for circular economy by enabling product-level efficiency gains in material and energy use, and in emissions and waste generation. Remanufacturing and comprehensive refurbishment can contribute to GHG emissions reduction by between 79% and 99% in appropriate sectors. Similarly, the opportunity for material savings via VRPs is significant: Compared to traditional Original Equipment Manufacturer (OEM) New production, remanufacturing can reduce new material requirement by between 80% and 98%; comprehensive refurbishing saved slightly more materials on average, between 82% and 99%. Repair saved an even higher share, between 94% and 99%; and arranging direct reuse largely does not require any inputs of new materials.
- Where pursued strategically and systematically, expanded adoption of VRPs in a country's production activities can enable increased production activity without the associated increased negative environmental impacts.
- Remanufacturing and comprehensive refurbishment (Full Service Life VRPs) are intensive, standardized industrial processes that provide an opportunity to add value and utility to a product's service life. These processes enable 'as-new' (remanufacturing) and 'high-quality' (comprehensive refurbishment) products, at significantly lower environmental impact and lower cost to the producer, and potentially the customer.
- Repair, refurbishment, and arranging direct reuse (Partial Service Life VRPs) are formal and informal maintenance processes that provide an opportunity to extend the product's useful life at significantly lower environmental impact and lower cost to the producer, and potentially the customer.
- The intensive nature of remanufacturing and comprehensive refurbishment means that growth of these VRP activities creates new demand and opportunity for skilled labor. Remanufacturing and sometimes refurbishment have larger requirements for skilled labour than a linear production of the product. Remanufacturing increased skilled labour hours by up to 120%. Repair required less labour than the linear reference product, showing a decrease of 70% to 99%.
- Barriers to VRPs that inhibit the generation of demand (e.g. policies that restrict the import, distribution, and/or sale of VRP products) prevent the strong business case that industry members require to engage in VRP production.
- There is opportunity for VRPs to be adopted in appropriate industries and markets: currently Remanufacturing accounts for only ~2% of US production, and only ~1.9% of EU production (U.S. International Trade Commission 2012, European Remanufacturing Network 2015). Overcoming regulatory, infrastructure, technological and market barriers will allow opening new markets while generating environmental and social value.
- Policy makers are called on to alleviate some of these barriers. Barriers to VRPs that restrict VRP producer's technological capacity (e.g. policies that restrict access to VRP inputs such as cores¹, and skilled labor shortages) restrict domestic production capacity and limit the potential to achieve reduced environmental impacts.
- It is important that policy interventions target both radical

¹ A core is a previously sold, worn or non-functional product or module, intended for the remanufacturing process. During reverse logistics, a core is protected, handled and identified for remanufacturing to avoid damage and to preserve its value. A core is usually not waste or scrap, and it is not intended to be reused for other purposes before comprehensive refurbishment or remanufacturing takes place.

(system-level) and incremental (process-level) innovation, via integrated technology, innovation, and environmental policy approaches.

- All economies can benefit – environmentally, socially and economically – from implementing VRPs and optimizing their role within their circular economy strategy. VRP expansion strategies in industrialized countries must leverage mature manufacturing industries and well-established production, logistics and collection infrastructures. In these countries, policy approaches should focus on encouraging value-add Full Service Life VRPs and should engage industry members and consumers in the alleviation of barriers, which are

primarily market-based and technological in nature.

- VRP expansion strategies in non-industrialized countries should focus on the formalization of existing VRP economies and systems. In these countries, policy initiatives should focus on the alleviation of access and regulatory barriers. 'Closing-the-loop' must be a short-term policy priority, focused on establishing efficient collection programmes and infrastructure. Longer-term policy priorities must focus on expanding VRP production capacity via knowledge and technology transfer, and training programmes to increase skilled labor supply.

SUMMARY OF POLICY RECOMMENDATIONS

The increased adoption of value-retention processes (VRPs) can enable substantial environmental benefits and economic opportunities for countries pursuing a transition to circular economy. The following recommendations highlight the key priorities that policy-makers from every country should incorporate into a broader circular economy strategy:

1. **Eliminate** regulatory barriers that impede and/or prohibit the movement of finished VRP products within and between countries.
2. **Eliminate** regulatory barriers that interfere with the movement of cores¹ within and between countries and ensure that cores are as far as possible considered as 'non-waste'. This effort must be balanced with equally important measures to prevent dumping (e.g. e-waste) that may occur under the guise of VRPs.
3. **Accept and align** VRP definitions across different countries, particularly within trade policies, trade agreements, and between trade partners.
4. **Adopt** the definitions of each class of VRP and ensure alignment of these definitions within related national waste hierarchy, waste management, and other diversion policy language.
5. **Expand** existing 3R's approaches to integrate VRPs alongside traditional recycling policies, and position VRPs as gateway activities to improved recycling.
6. **Engage** with stakeholders (producers, distributors, sellers, customers, collectors, policy-makers, political leaders, research and education institutions, etc.) to communicate and ensure clear understanding of these VRP definitions and the opportunities inherent to expanded adoption of VRPs.
7. **Establish** clear standards and guidelines for each class of VRP, which are accepted by industry and government, and which can be used to effectively differentiate VRPs and VRP products from traditionally manufactured options.
8. **Establish** review and compliance mechanisms for defined VRP standards and definitions to prevent misuse of VRP product labeling in the market.
9. **Enforce** VRP standards and guidelines with domestic VRP producers to ensure that practice in the market reflects accepted definitions and expectations.
10. **Align** the regulatory treatment of validated remanufactured products with the treatment of OEM New products in both domestic and trade policies. Validated remanufactured products meet or exceed the quality and performance specifications of OEM New products and should thus be treated equally.
11. **Lead-by-example** by adopting VRP-friendly public procurement practices and policies to facilitate awareness, adoption, and stimulation of domestic demand for VRP products.
12. **Invest** in accelerated VRP adoption and capacity by providing funding to VRP producers for R&D, capital acquisitions and workforce training.
13. **Implement** customer market education and awareness campaigns to encourage the acceptance of VRP products and to strengthen the business-case for VRP producers.
14. **Encourage** participation in circular economy and VRPs by investing in accessible and efficient end-of-use (EOU) product collection programs and infrastructure and restricting options for EOU products to be disposed into the environment (e.g. landfill bans).

For more information please contact the Secretariat of the International Resource Panel at:
resourcepanel@unep.org

The full report and Summary for Policymakers can be downloaded at:
<http://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution>