

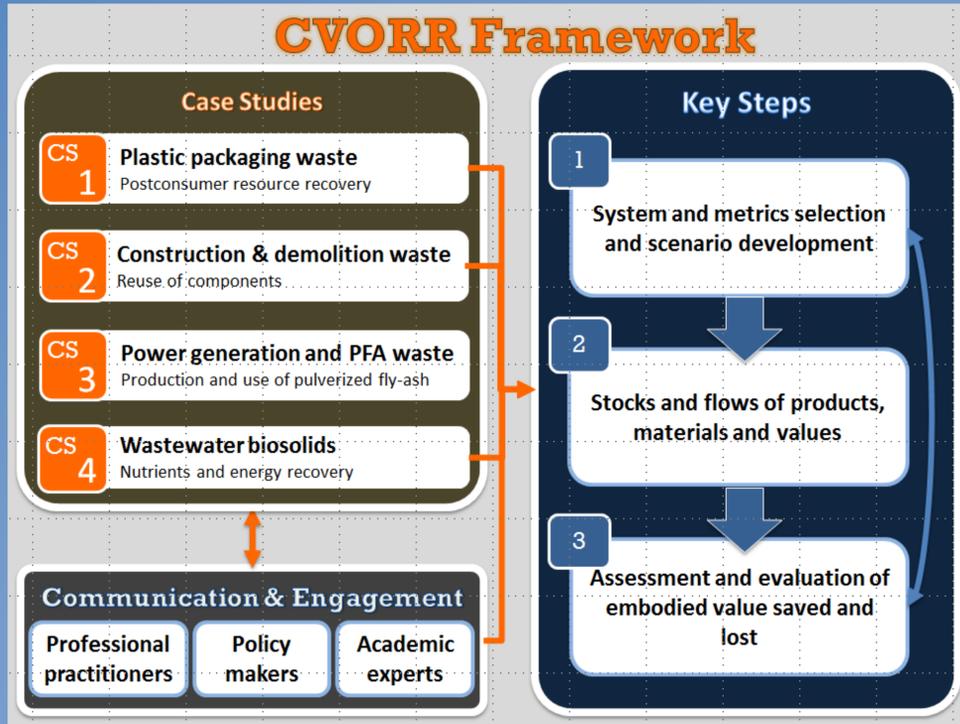
# Complex-Value Optimisation for Resource Recovery

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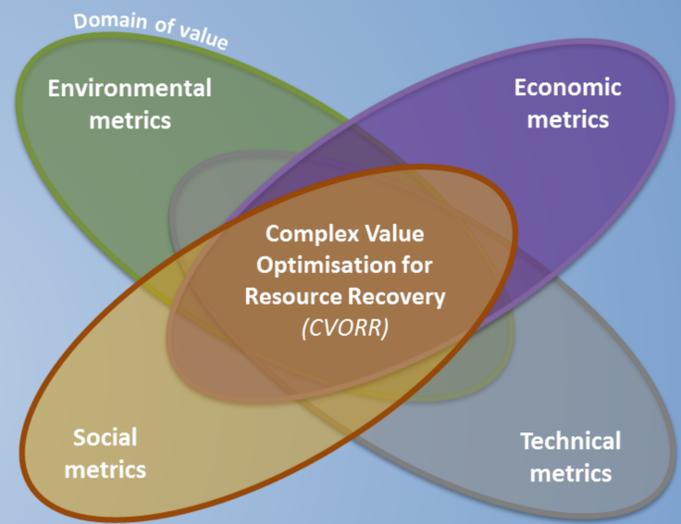
## Project rationale

CVORR aims to redefine value as a complex variable with benefits and losses in multiple dimensions including metrics from the environmental, economic, social and technical domains of value. Its overarching goal is to produce a novel tool for optimizing resource recovery processes that include upstream and downstream parts of the resource recovery from waste (RRfW) systems. This will allow more objective evaluation of interventions intended for recovering resources from waste, moving away from 'end-of-pipe' paradigms towards a whole-systems approach, preventing dissipation of value into waste and rethinking current practices.



## Step 1: System and metrics selection

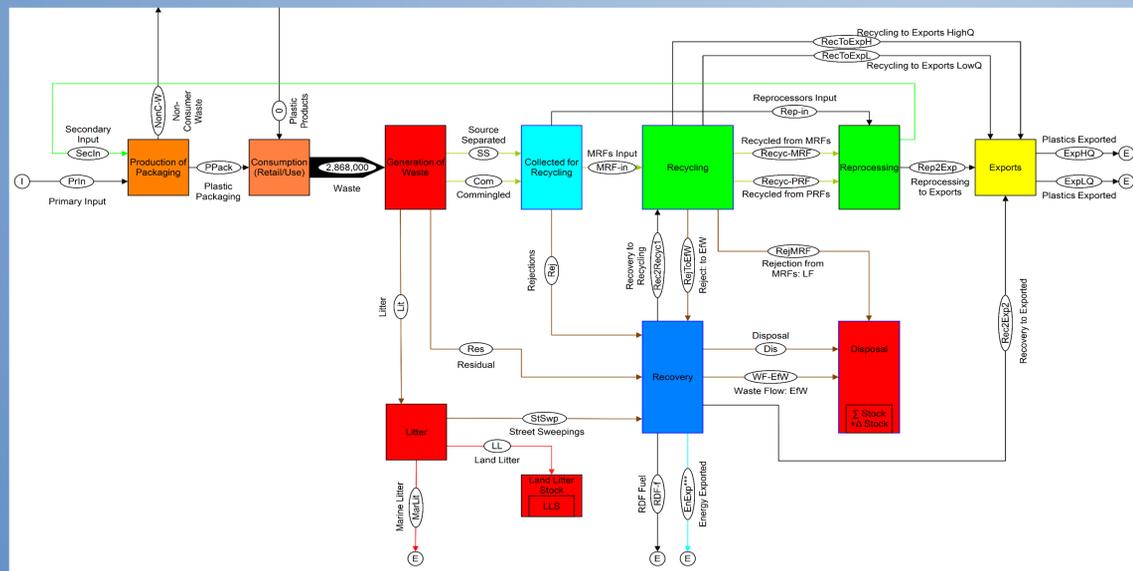
Taking a holistic approach, CVORR will bring together the best aspects from existing analysis techniques – material flow analysis, LCA, value chain analysis and others – into a flexible, transparent and user-friendly approach to help industry, policy-makers and communities make better decisions concerning resource recovery processes. Selection of appropriate metrics that accurately describe (or at least reliably proxy for) benefits and losses, is critical in ensuring a systemic analysis of RRfW systems, and enabling the detection of otherwise invisible environmental, economic, social and technical aspects. A wide array of existing metrics used in environmental, economic, social and technical assessment of upstream and downstream parts of the supply chain, has been reviewed in order to provide an analytical approach as to how existing metrics are able to support systems analysis and decision-making for promoting the resource efficient recovery of resources/wastes (Figure 1).



## Step 2: Stocks and flows of products, materials and values

The plastics packaging case study presents the complex nature of RRfW systems and the need to account for the materials stocks and flows across the system in order to:

- Make trade offs explicit – eliminate partial/double accounting
- Extend to comprehensive environmental and social valuation
- Remain transparent under unnecessary aggregation
- Separate objective measurement from value judgment
- Explicitly design the system boundaries
- Include all 'values' that could be of relevance
- Optimise sophisticated multi-objectives



## Step 3: Assessment and evaluation of value saved and lost

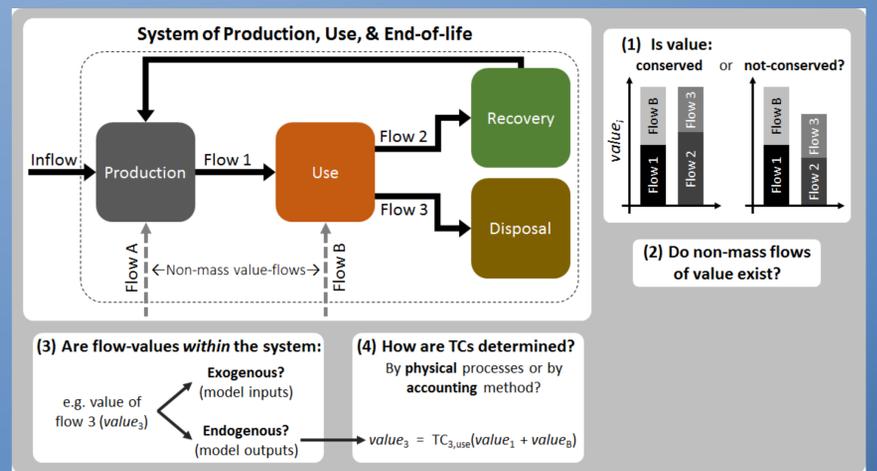
Metrics have been categorised in the model environment and have been divided into four different categories and types, as indicated in the Table below.

**Step 3: Model development-categorising metrics in the model environment**

	Type 1	Type 2	Type 3	Type 4
Conserved	Not conserved	X	X	X
Attached only to mass-flows	Attached to mass- and non-mass-flows	X	X	X
Endogenous values	Exogenous values	X	X	X
Transfer coefficients determined by physics	Transfer coefficients determined by accounting	X	X	X

## The Novelty

CVORR will first be used to highlight how changes made in one part of the system might have unintended impacts in other parts of the system. This will help us avoid making well-meaning interventions that actually do more harm than good. Second and perhaps more interestingly, it will be used to highlight the type of changes required in the system that could not only recover but also create additional value for the economy, society and environment. In this way, CVORR is as much about creating business opportunities as it is about highlighting the environmental, economic and social malfunctions of our supply chain systems. It will be a tool to help align the incentives of the actors in a system such that all can benefit from the advantages of working together towards closing the material loops when feasible, practicable and worthwhile.



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