Waste Management and Circular Economy

Bharti Ujjani, CIH

RAMBOLL

Bright ideas.
Sustainable change.

The Unsustainable Use of Our Landfills

Running out of safe options to dispose of waste

Climate change poses a major threat to human health. Natural disasters precipitated by climate change including hurricanes, heatwaves, wildfires, and floods can lead to direct health effects.

Sustainability

Identifying and integrating more holistically sustainable approaches to achieving business goals and economic health.

- Support of the achievement of the UN SDGs
- Climate change
- Circular economy
- Eco-design
- Strategic sustainability assessment
- Sustainable investments
- Liveable and healthy cities
- ESG-related services

Trends Shaping Waste & Resource Management/ Circular Economy

- Climate change, plastic pollution and the circular economy are prominent drivers for sustainable waste & resource management
  - Waste & resource management is a highly regulated area and compliance with existing regulation is still the main driver
  - Ensure compliance and future legislation in strategic planning
- Corporate ESG strategies will drive circular economy and waste & resource management actions in private companies
  - Especially in multinational companies
  - Developed with assistance from management consultants
  - Waste reduction, circularity and zero waste (to landfill) targets are common
- The European Union is the global leader for policy and regulation
  - Ambitious plans, policies and regulations that are becoming more and more transformative
  - The lead s currently from the EU as a central institution, less so from Member States
  - Inspires and impacts initiatives in other parts of the world
- NGOs and NGO/consultancy hybrids are driving action more and more
  - For example, the Alliance to End Plastic Waste, Ellen MacArthur Foundation, Circle Economy
  - Often supported by multinational companies as partners
  - Very common in relation to plastic pollution
- On 28th July 2022, UN General Assembly recognized in a resolution the right to a clean, healthy and sustainable environment as a human right
  - Amongst others, unsustainable management of chemicals and waste is recognized to interfere with the enjoyment of a clean, healthy and sustainable environment
  - The resolution is to prompt countries to protect the right to a healthy environment in national constitutions, which would allow people to challenge environmentally destructive policies under human rights legislation
  - The resolution is expected to be a supplemental driver for the circular economy and sustainable waste & resource management
  - Results in a larger focus on environmental issues in development aid and financing

The Drivers for Waste Resource management and Circular economy

- New York State -The plastic bag ban, which went into effect on March 1, 2020.
- Plastic Bag Reduction, Reuse and Recycling Law—Article 27, Title 27 of the Environmental Conservation Law (ECL)
- State Assistance Programs (Grants) for Waste Reduction, Recycling and Household Hazardous Waste Programs
- DEC Announces Draft Regulations to Reduce Waste Sent to Landfills, Improve Waste Management, and Reduce Climate Change Impacts-May 18, 2022
- Proposed Regulations Strengthen State's Solid Waste Management to Protect Public Health and the Environment
- New Jersey Enacts Food Waste Recycling Mandate
- Missouri Becomes Milestone 20th State to Pass Advanced Recycling Legislation
- California- Extended Producer Responsibility and Stewardship, places responsibility for end-of-life product management on the producers, and all entities involved in the product chain, instead of the general public;
- On June 30, 2022, California passed the Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54), setting targets for reducing and recycling single-use packaging and requiring plastics producers to create a $5 billion fund to help low-income communities impacted by the effects of plastic pollution.

Why Zero Waste and Circular Economy?

UN Goal 12, Sustainable Consumption and Production

The circular economy is a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution

- 92% of world's resources are used only once. Making waste a huge resource
- Circular Economy: Reduce, reuse, recycle, recover
- Reduce: Limit material use by increasing efficiency, Use as few a materials as possible, Design products for multiple purpose use
- Reuse: Library, borrow power tools instead of buying
- Recycle: Make new products from used material.
- Recover: Turn waste into resource, better management of waste prevents pollution. Recover material and repurpose, or Waste to energy
- CE in the US is it is only voluntary; However, the European Union is introducing laws to create a CE.
- EU adopted CE in 2015 with a 54 step CE Action Plan
- In 2019 European Commission introduced the Green Deal, with CE as the main building block to slow climate crisis.

Circular economy principles

A circular economy is based on three principles, all driven by design.

- Eliminate waste and pollution-Waste prevention
- Circulate products and materials-Waste reduction
- Regenerate nature-Waste recycling

Making Waste & Resource Management Workable

Programme Management

Commitments and targets

Corporate commitments
Group policies

Actions and initiatives

KPIs, Approach, Cost and resources, Responsibility

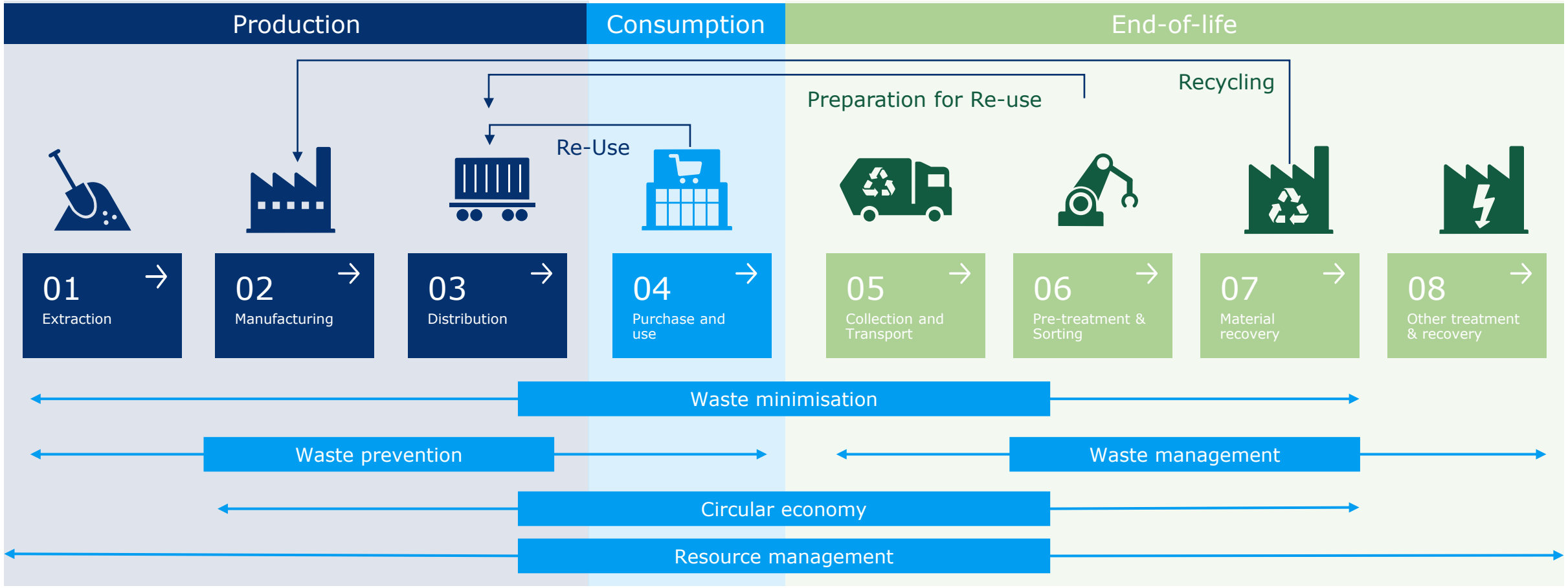
Measuring and reporting

Templates, Instructions, Systems, Analysis

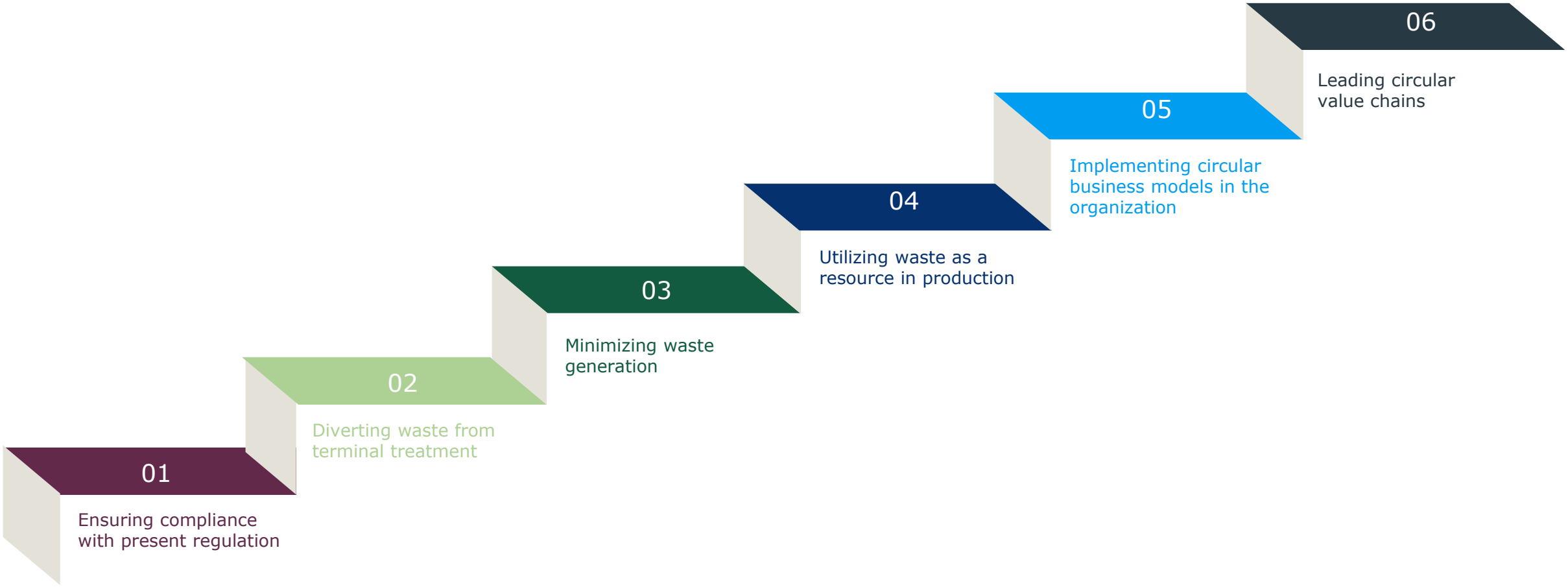
Legal & Compliance

Communication & Education

Waste & Resource management along the value chain



Waste management – Where are you?



Waste & Resource management – system maturity

01

- Lacking or inadequate policy and regulatory framework
- Low-level governance and enforcement capabilities
- Majority of the generated waste not collected or disposed at unregulated dumpsites
- Recycling activities, if any, primary carried out by informal sector

- No facility waste management plan
- Hazardous waste segregated and exported for treatment
- Limited recycling initiatives
- Residual waste disposed at local engineered landfills or dumpsites

02

- Basic policy and regulatory framework is established
- Moderate governance and enforcement capabilities
- Majority of the generated waste disposed at engineered landfills
- Majority of recycling activities, carried out by the informal sector

- Basic facility waste management plan in place
- Hazardous waste segregated and mainly exported for treatment
- Moderate recycling initiatives
- Residual waste disposed at local engineered landfills

03

- Well-established policy and regulatory framework
- Good governance and enforcement capabilities
- Majority of the generated waste treated by other means than landfilling
- Majority of recycling activities, carried out by the formal sector

- Full, but stand-alone, facility waste management plan in place
- Hazardous waste segregated and mainly treated in-country
- Limited recycling initiatives
- Majority of residual waste disposed by other means than landfilling
- Some focus on waste minimization

04

- Well-established and ambitious policy and regulatory framework
- Extensive governance and enforcement capabilities
- Very low fraction of the generated waste is landfilled
- Virtually all recycling activates carried out by the formal sector

- Full and well-integrated facility waste management plan in place
- Hazardous waste segregated and mainly treated in-country
- Extensive recycling initiatives
- Virtually achieving zero-waste-to-landfill targets
- Systematic focus on waste minimization

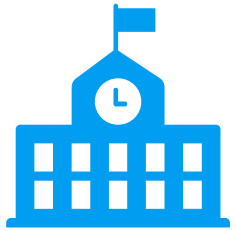
An interdisciplinary approach

- Waste management and circular economy are multi-faceted fields
- One-dimensional solutions rarely work
- An inter-disciplinary team and a holistic approach

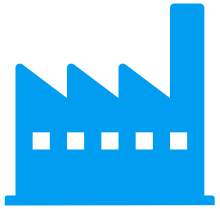
Wide-ranging service portfolio and broad client base

- Strategies and Plans
- Analysis, Assessments and Mapping
- Compliance and Permitting
- Waste Collection Services
- Waste Management Facilities
- Procurement of Waste Management Services

Due Diligence, Impact Assessment, product Stewardship, Life-Cycle Analysis and Carbon Accounting



National authorities

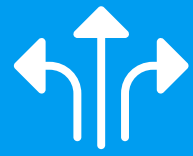


Industry

International organisations

Review of Waste Activities

- Deep dive into production processes, wastes generated, classification of waste types and sources, and facility waste characteristics.
- Review of production and non-production materials utilized throughout the facility.
- Investigation of wastes generated via waste container examinations.
- Classify sources and wastes and review overall contribution towards waste metrics.

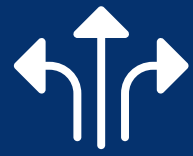


Outcomes and deliverables

- Summary of information related to operations at the facility and waste contribution.
- Detailed waste data with expectations of waste and wastes identified.

Landfill Reduction Strategy Development

- Working with the facility to detail reduction/reuse strategies in addition to alternative waste treatment methods to achieve landfill reduction goals.
- Develop reduction and reuse strategies based on the facility's use of material and waste generation.
- Review waste vendors and final destination facilities of waste to increase the percentage of non-landfill treatment methods.



Outcomes and deliverables

- Agreed-upon strategy for reduction/reuse opportunities.
- Detailed plans of current waste activities versus planned changes, with roadmap to 80% landfill reduction.

Implementation and Future Consideration

- Preparation of information for facility implementation of strategies for landfill reduction and a review of future approaches for landfill and waste reduction.
- Moving towards a higher ratio of recycling (material recovery) versus incineration (energy recovery).
- Exploration of use of recycled feedstock/reused products.
- Review of substitution of materials/products for inclusion into waste program.

Outcomes and deliverables

- Roadmap for waste management initiatives to support 80% landfill reduction.
- List of recommendations for future waste activities.

Sustainable use of resources

Effective waste management is critical for the conservation of limited natural resources, making it central to ensuring a sustainable future. As waste production grows globally, so does the urgency with which we must focus on recycling, re-use and recovery. Protecting the environmental and human health from the impact of waste goes hand in hand with the efficient use of resources.

Case Studies

Helping build and execute a landfill-free program for global plastic manufacturer

Challenge

A global plastic manufacturing client wanted to differentiate themselves amongst competitors by creating and implementing a landfill-free program to reduce landfill waste by up to 90% from facilities. The client required independent third party verification of landfill-free activities as part of corporate sustainability initiatives.

What we do

Ramboll created landfill-free rules, which governed waste management requirements to achieve the internal landfill-free certification. Also, Ramboll provided third-party independent verification of facility compliance with program rules and waste metrics. In addition to verification, Ramboll supported the development of tools for the client to review their waste supply chain for verification of proper waste management and compliance with recycling/disposal regulations.

Effect

The client has implemented the landfill-free program at sites globally, allowing the inclusion of these sites as landfill-free certified in their publicly-available sustainability reporting. The client continues to implement the landfill-free program at more sites globally each year.

Landfill reduction project for animal health manufacturing client

Challenge

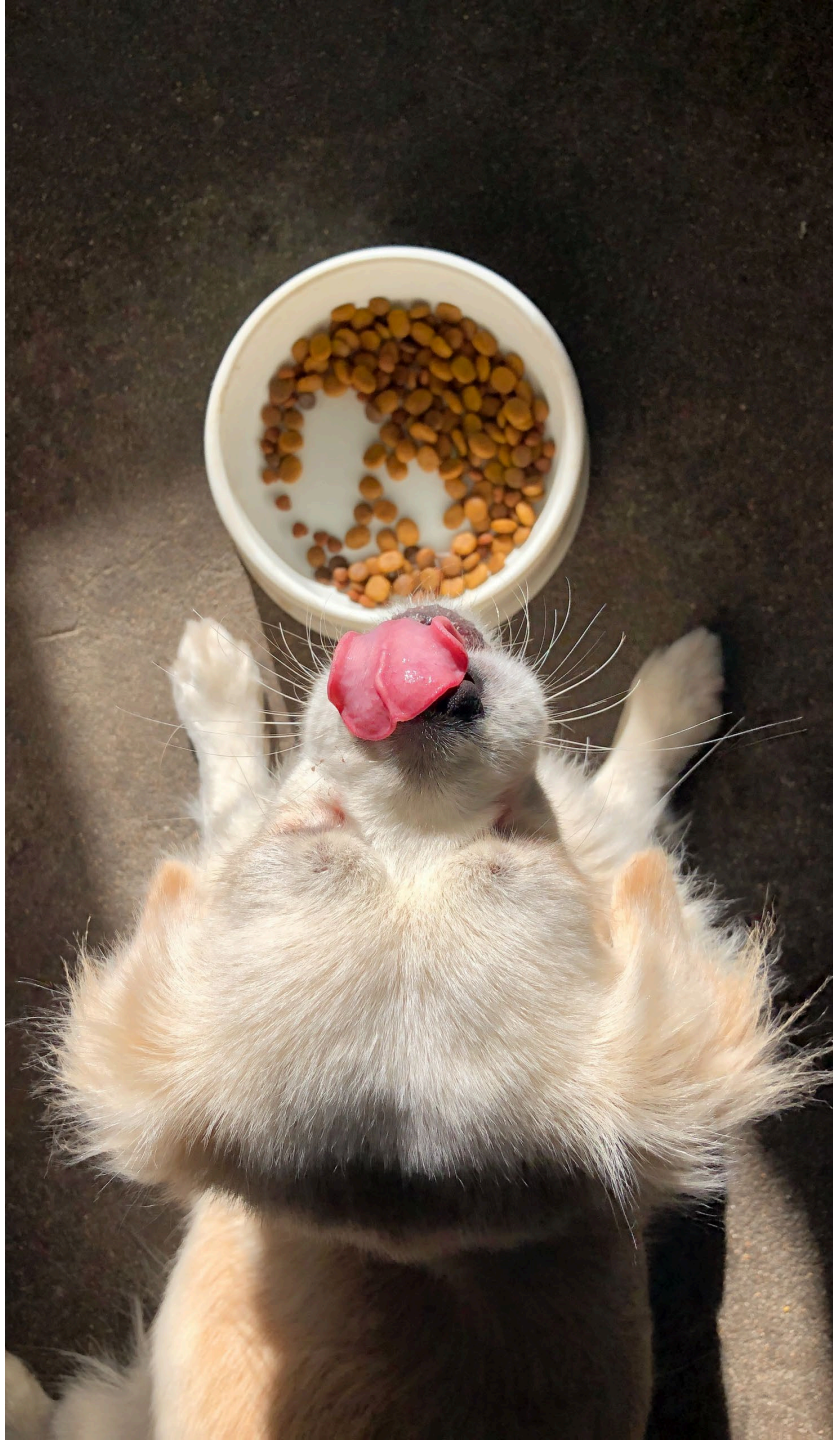
The client’s sustainability goals did not contain concrete metrics and means to calculating progress. The site had little experience in managing site activities to reduce landfill impact.

What we do

Ramboll worked with the client to define landfill reduction goals in more easily tracked metrics that will significantly impact the facility’s landfill footprint. The facility and Ramboll performed a detailed analysis of all waste streams generated at the facility, including final resting locations for all waste. Ramboll and the facility created a detailed landfill reduction roadmap for activities in the next three years to achieve program goals.

Effect

The facility has a clear picture of the path to achieving their landfill reduction goals. The corporate sustainability team have refined metrics and approach to landfill reduction strategies, focusing on metrics that are more straightforward for facilities to work towards.



Circular Economy Approach for the dismantling of wind turbines

Challenge

- The rate of dismantling of existing onshore wind turbines is accelerating
- Concerns over dismantling practice and management of wastes generated during dismantling
- Options for producer responsibility for components

What we do

- Assess status (legal, technical) of dismantling and waste management
- Detailed prognosis of costs and of amounts of waste generated
- Definition of sustainable requirements for dismantling and waste management
- Discussion of policy options and recommendations

Effect

- Compilation of broad factual basis for decision-making
- Development of recommendations for political measures, developed in consultation with key stakeholders

Circular Economy incentives for construction products

Challenge

Construction is one of the most resource-intensive economic international sectors. Under current conditions, ecological advantages gained from the conservation of natural resources or travelling shorter distances to transport materials cannot be translated into financial incentives and are therefore systematically under-represented in the evaluation of recycling possibilities. A further challenge faced by the industry is the effective removal of pollutants and impurities from the material cycle.

What we do

- Identification of relevant actors and their respective position in relation to the existing regulatory framework.
- Selection of products suitable for implementation of recycling measures in the building sector with respect to financial feasibility.
- Development and evaluation of conceptual models in consideration of regulatory and economic circumstances and incorporating expert opinions through workshops and interviews.

Effect

- Evaluation of options for strengthening recycling and setting incentives for use of recyclable materials in line with the producer-pays principle in the field of construction products.

Regulatory support services for industrial clients – overview

Electronics / batteries / ELV / packaging

Challenge

Producer responsibility is a concept whereby those who place products on the market are (to differing extents) responsible for the sound collection for treatment of the products once they become waste (including financing collective systems of take-back and recycling). The regulatory environment is very dynamic, being regularly revised to consider technical and scientific progress

What we do

Ramboll is working with clients all over the world to help them navigate and comply with regulations on producer responsibility regulations and the respective systems. For instance, we have advised clients in the automotive industry relating to their obligations and the suitability of their internal processes to ensure compliance.

Effect

- Supporting clients to be compliant with environmental regulatory requirements when placing their products on the market
- Alternative design approaches and optimisation potential

EU H2020 collectors - Waste collection systems assessed, and good practices identified

Challenge

Existing studies have not been effective enough in supporting the implementation of well-performing EU collection systems. Many territories are still lagging when it comes to achieving current recycling targets.

What we do

- Analyse 12 EU good practices according to:
- The quality of sorted materials
- The positive economic and environmental outcomes of better performing systems
- Social acceptance.

Effect

- Develop a solid knowledge base of the overall performance of EU systems
- Improve decision making for waste collection systems
- Increase separate collection and sorting in the EU.

THE GLOBAL BIOMASS WASTE MARKET

CHALLENGE

Ramboll was commissioned by a global energy company to undertake a comprehensive market analysis of the global biomass feedstock for the energy generation market.

WHAT WE DID

The analysis included an assessment of the characteristics of the value chains, feedstock availability, underlying market drivers and the overall market attractiveness. The analysed feedstocks comprise Municipal Solid Waste (MSW), Agricultural Waste (Animal and Agriculture residues), Forestry Waste and Energy Crops.

EFFECT

The results of the assessment will enable the client to better align strategic investments in biomass to energy across the world with the client's overarching development strategy and green transitioning.

Client: Confidential

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Clients: confidential

Waste mapping for a multinational aerospace manufacturer

Ramboll assisted implementation of their waste mapping/waste reduction systems at their European sites.

In order to achieve a 25% reduction in waste generated (normalised against financial turnover), Ramboll were engaged to pilot the company's waste mapping methodology at four large European facilities. Ramboll provided training and delivered workshops to enable site personnel to effectively use the methodology to identify and assess the feasibility of waste minimisation opportunities

The project included identification and costing/feasibility assessment of a number of specific waste minimisation opportunities, presentation of successful case studies to promote implementation across the different business divisions, identification of barriers to implementation, and development of an overall waste reduction strategy to enable waste reduction targets to be achieved.

Sludge drying circularity options appraisal

Ramboll's client wished to identify a more circular, sustainable and cost-effective outlet for the disposal of large volumes of wet effluent treatment plant sludge. However, any proposed solution could not increase the total carbon footprint of the client's facility.

Ramboll's Energy team completed a detailed technical waste heat recovery appraisal of the client's energy intensive facility to identify the quantity of waste heat and whether this could reasonably be captured and fed to a dryer. We identified the delta to the dryer's required heat input, and assessed options for providing supplementary heat (e.g., additional biomass boiler or increasing output from the existing gas boilers), in the context of not increasing the facility's carbon footprint and considering the cost/benefit of each option.

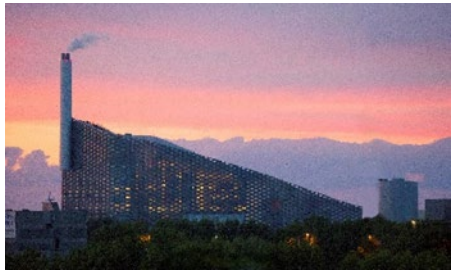
We completed a technical options appraisal of the available drying technology on the market and presented a detailed costed options appraisal to the client's management team to allow an informed selection of the preferred solution.

We also undertook a regulatory review of the proposed solution and circular waste pathway to identify potential regulatory or other environmental liabilities which may require consideration and management and recommended appropriate actions to ensure the Client remained compliant with applicable permits and legislation and avoided material liabilities.

WASTE MANAGEMENT FACILITIES – SELECTED PROJECTS

Aerobic Digestion Plant, Hong Kong
Establishing a new 110,000 tonnes per year anaerobic digestion facility. Consultancy from conceptual design to preparation of specification and tender documents

Integrated Waste Management Facility, Singapore
Assisting NEA as Owner's Engineer during conceptual design and feasibility study, tendering, procurement, design review and implementation



Energy from Waste, Copenhagen, Denmark
Assisting I/S Amager Resource Centre (ARC) as Owner's Engineer during planning and definition, tendering, implementation, commissioning and operation

Energy from Waste, West Palm Beach, Florida USA
Assisted Solid Waste Authority as technical advisor during tendering, procurement, design review and implementation

Thank you/Questions

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