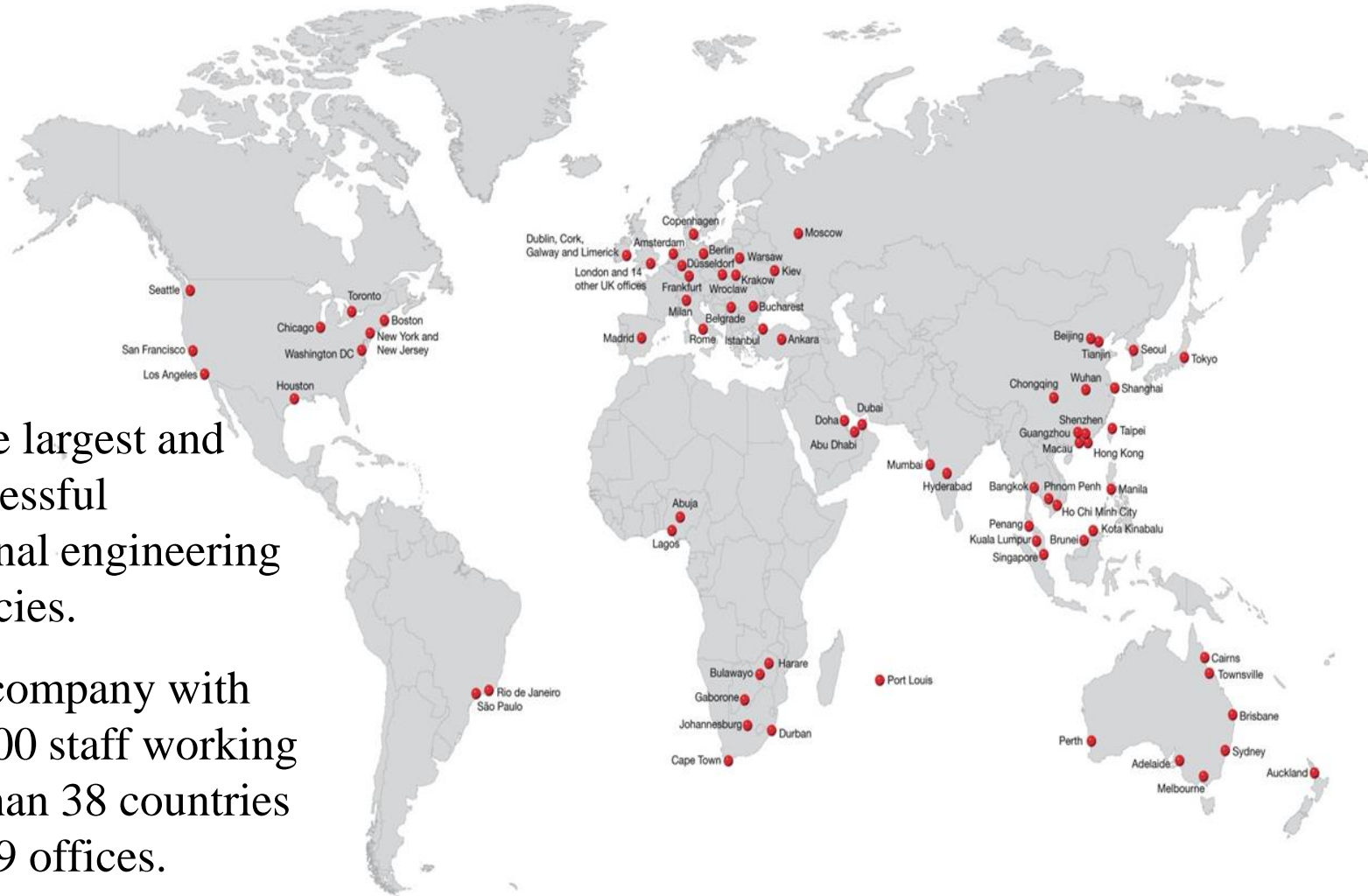


Designing Out Waste In the Civil Engineering Sector

Athens 2014

Dioni Spiliopoulou MCIWM
Bob Hudson MCIWM

About Arup

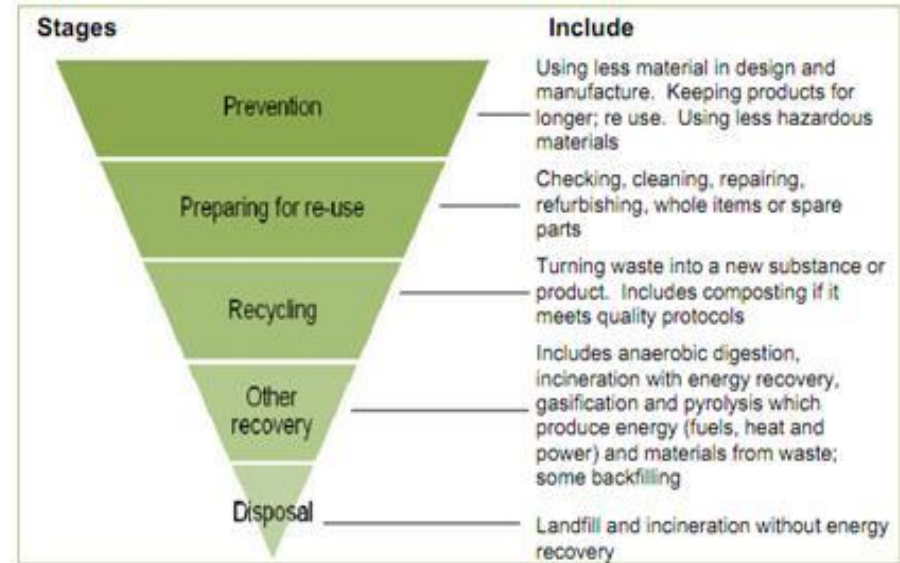


- One of the largest and most successful international engineering consultancies.

- A global company with over 12,000 staff working in more than 38 countries through 89 offices.

Why consider waste prevention?

- Construction and demolition waste is one of the largest waste streams generated in the EU.
- WFD 2008 established a target to recycle 70% of non-hazardous construction and demolition waste by 2020.
- However focusing on recycling will not achieve the same environmental and economic benefits as waste prevention.
- WFD also requires member states to produce a Waste Prevention Plan.



970 million tonnes of construction, demolition and excavation waste are being produced in the EU each year

Source: EUROSTAT 2010 (2006 data)

Designing Out Waste Principles

Design for:

- **Reuse and recovery** e.g. Refurbishment/refit rather than demolition and new build
- **Off site construction** e.g. Prefabrication of complete modules and individual component assemblies.
- **Materials optimisation** e.g. Using less material, and reducing variables and bespoke elements in materials and design.
- **Waste efficient procurement** e.g. Early Contractor Involvement or Integrated Project Teams, and consider how the project programming can affect waste creation.
- **Deconstruction and flexibility** e.g. Consider maintenance & adaptability for future uses.

Source: WRAP (2012) Designing out waste: A design team guide for civil engineering



Designing out Waste Process



- **Identify** opportunities to Design Out Waste
- **Prioritise** those with biggest impact and easiest to implement
- **Investigate** their viability
- **Quantify** the benefits
- **Embed** in the design
- **Record** in the SWMP
- **Communicate** to the site
- team/subcontractor

Source: WRAP (2012) *Designing out waste: A design team guide for civil engineering*



Barrier

Overcoming the barrier

Perceived Cost



- Understanding the real value of waste is important and can help in prioritizing the areas to target to prevent waste.
- True cost of waste = 20 times the amount of the original estimate for waste disposal.
- The best opportunities for waste prevention & cost savings in infrastructure and construction projects occur during the design stage.
- Try to quantify the cost savings associated with waste prevention opportunities.

Barrier

Designing out Waste is considered too late in the Project.

Project stage	Action
Pre-construction	Tendering and appointment
Outline design	Designing out Waste Estimating waste
Detailed design	
Construction	Site waste management and recovery
Post-construction	Reviewing performance Benchmarking

The biggest opportunities occur in the design stages

Overcoming the barrier

- Think about preventing waste as early as possible in the project life cycle.
- The outline design and detailed design are the best time to design out waste and evaluate options.

Barrier

Not client driven:
 Errors in contract documents
 Contract documents incomplete at commencement of construction
 Lack of early stakeholder's involvement.



Overcoming the barrier



Project 1: Ipswich Chord

C Spencer Ltd (Spencer) commissioned Arup to provide multi-disciplinary design on the Ipswich Chord rail project. The key designing out waste opportunities identified included:

- Recycling demolition material from an existing building for use in embankment construction;
- Topsoil stripped for re-use in new embankments and site landscape works;
- All retaining walls will utilise precast units constructed off site; and
- The site's 3 main bridges would be formed of pre-fabricated steel which can easily be recycled.



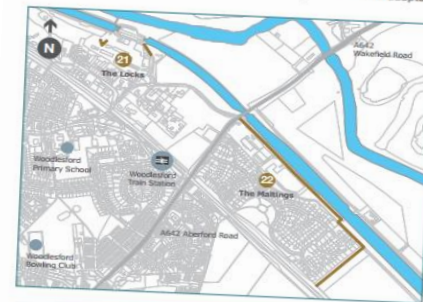
Project 2: Leeds Flood Alleviation Project

Arup have been commissioned by Leeds City Council (LCC) to prepare a planning application as well as multidisciplinary design for stage 1 of the proposed Leeds Flood Alleviation Scheme (FAS). The key designing out waste opportunities identified included:

- Topsoil stripped on site will be re-used in new embankments and site landscape works;
- All retaining walls utilise precast units constructed off site; and
- The site's 3 main bridges were formed of pre-fabricated steel which can easily be recycled.



Above No.6 - Visualisation at Asda House showing new wall and adaptations to landscaping



Above No.22 - Visualisation at Woodlesford - The Maltings, showing the new embankment

Project 3: Bathing Waters Directive Project

This project from the UK covered a range of sites which required upgrading such as Wastewater Treatment Works as well as new pipelines and sewage pumping stations. The key designing out waste opportunities identified included:

- Using excavated materials to form bunds and landscaping to ensure compliance with planning conditions;
- Reusing aggregate from piling mats and haul roads and incorporated this within the permanent works for roads; and
- Reducing excavated materials by optimising the dig for a new rising main;
- Topsoil was donated to a local land owner for landscaping of a holiday cottage development.



Summary

- Tackling resources and waste is likely to achieve significant environmental and commercial benefits.
- Remember – the true cost of waste is important and can help in prioritizing the areas to target to prevent waste.
- Designers play a key role for identifying opportunities to design out waste.
- The sooner waste is considered in the design process the better.
- Always consider potential constraints/ barriers which occur on every project.
- There are tools to assist designers and waste specialists.

ARUP

We Shape A Better World