SmArt Cities and Waste: Developing an interdisciplinary Network for Waste Management & Treatment Innovation



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SmArt Cities and Waste:
Developing an interdisciplinary network for waste management and treatment innovation

- UK-Dutch partnership [AHRC-funded] 2016-18
- Research-practitioner workshops in 4 cities (Amsterdam, Maastricht, London, Bangor-Wales)
- Demonstration / Citizen Science projects
- Knowledge exchange and network development through website/social media/workshops

2005 10 2015 Arts & Humanities Research Council
MACCH Maastricht Centre for Arts and Culture, Conservation and Heritage
Middlesex University London
Prifysgol Bangor University
VU University Amsterdam

Aims of the Waste network

- **Primary aim**: Interdisciplinary Knowledge Exchange and capacity building: arts/science/policy/practitioners/ 'the public'
- **Secondary aim**: Identify key 'intervention points' most suitable for developing interdisciplinary, 'participatory design' approaches through ***demonstration projects***:

  e.g. site-based - London Olympic Park, IBA Limburg/Chemelot Campus;

  EU projects: BioMoP LIFE, Eutropolis H2020

Sustainable waste management: on the policy agenda across Europe…

We need to develop further the concept of a circular economy, where one person's waste becomes another's valuable resource…Making the changes **requires innovation and creative thinking** and **community/public/stakeholder-led approaches** (*Prevention is better than cure: The role of waste prevention in moving to a more resource efficient economy* , UK Govt. 2013)

the construction and organic waste chains have plenty of potential to become **circular**. A chain is the process of production, transport, consumption and waste; in the various steps of the process, value is either added or lost.... (Circular Amsterdam, 2016)

City Waste Challenge

- In Europe total waste production amounts to over 2.5 billion tonnes, but only a limited share (36%) is recycled, with the rest landfilled or burned
- Of the 600m tonnes of products and materials that enter the UK each year, only 115m is recycled - 60% of all waste generated in London is currently exported for treatment or disposal outside of the city - UK Govt's Waste Strategy states that waste should be managed as close *as possible to the point of production…*
- The total volume of waste generated globally is expected to increase by nearly 50% over the next decade, however there are major variations in landfill disposal - Copenhagen (2%), Paris (11%), to New York (64%)
- European Water Framework Directive (2000) Water Quality targets were not met by 2015…

Municipal Waste Challenge



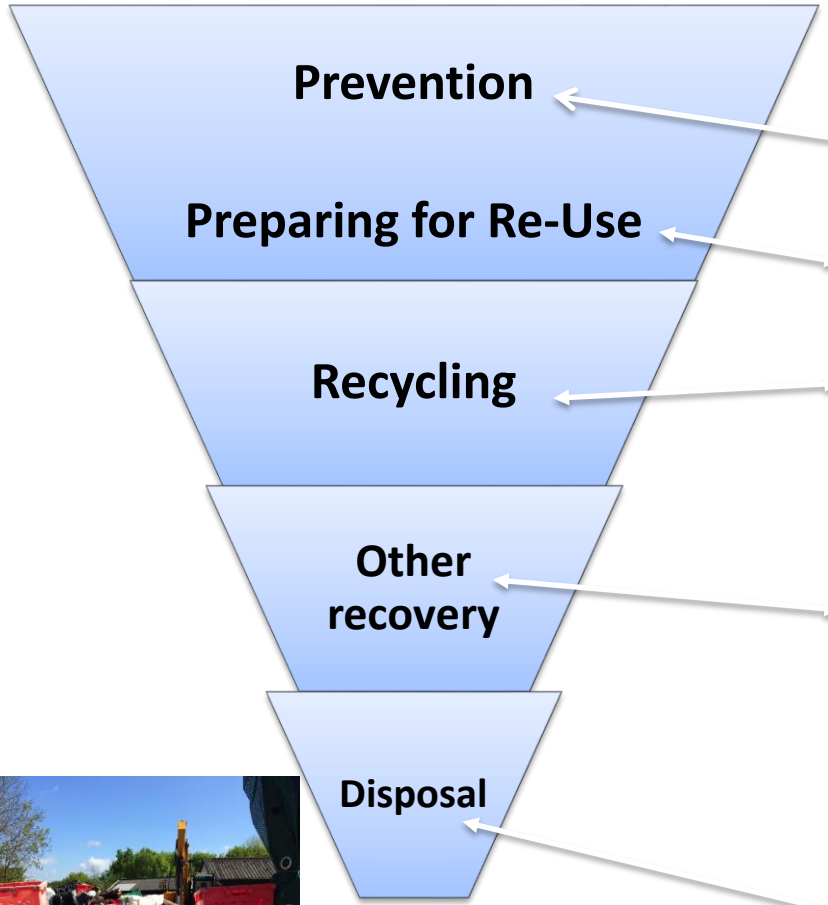








Waste Hierarchy (DEFRA, UK 2011)



Using less material in design and manufacture; Keeping products for longer; Using less hazardous material; Re-use

Checking, cleaning, repairing, refurbishing, repair, whole items or spare parts

Turning waste into a new substance or product. Includes composting if it meets quality protocols

Including anaerobic digestion, incineration with energy recovery, gasification and pyrolysis which produce energy (fuels, heat and power) and materials from waste; some back filling operations

Land fill and incineration without energy recovery



Waste is a social/cultural product

Techno/scientific waste innovation needs to have input from **intermediary** and **end users**

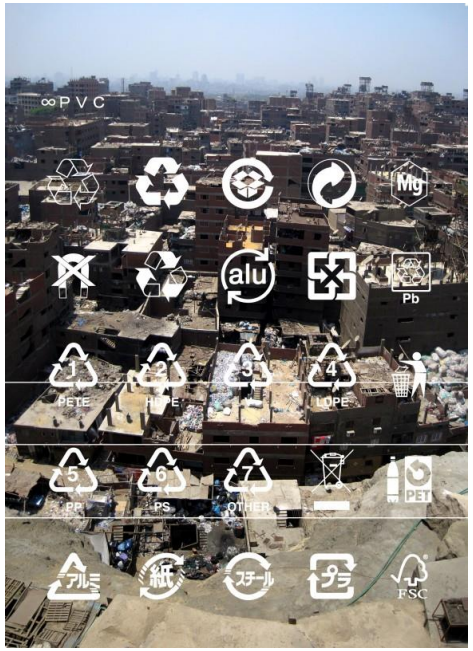
- Participatory design
- Scientific citizenship
- Local knowledge
- **Behavioural Change**



→ Role of art & design and social sciences/Society Technology Studies (STS)

5) improved final innovations because of drawing on "local knowledge"

1)capture public attitudes, knowledge through different methods



2)two way knowledge exchange/feed back : publics with WP industry/experts

3) findings feed into improved innovation of waste prevention and mangement

4) interative process- repeating steps 1-3

Network Waste themes

- Construction (re-use, recycling)
- Water recycling (grey/black water)
- Water sampling, tracing pollution sources
- Anaerobic digestion-energy (biogas, solar)
- Bioplastics: bio-inspired monomers & polymers
- Biomining: biological and bioelectrochemical recovery of critical and scarce metals
- Municipal recycling design (home, ‘dumps’)
- Artists pop-ups and waste installations

One Planet Olympics, London 2012

The original Summer Olympics bid focused on five sustainability themes:

1. Climate change
2. **Waste**
3. Biodiversity
4. Inclusion
5. Healthy living





Green building measures included:

- water recycling - *recycled water is any water that has been recovered from disposal and redirected back into use, most commonly after some processing*
- halving the carbon footprint of all construction projects
- sourcing 25% of project materials from recycled sources

Recycling and reuse of materials

- 1.4 million cubic metres of soil were treated
- 80% of the excavated soil was re-used on site (vs. 50% industry standard)
- A ‘soil hospital’ used industrial cleaning machines to remove contaminants e.g. oil, petrol, tar and toxic heavy metals including arsenic, lead and zinc from soil
- 4,000 tonnes of crushed concrete was salvaged 10,000m^3 crushed into gabion walls, 25% was reused in foundations, the rest offsite
- 98% of demolition material was reused or the majority recycled







The majority of soil was washed and the remainder treated by complex sorting, chemical stabilisation or bioremediation

Over 80,000 cubic metres of soil were treated by this method not previously used in the UK on this scale



Waste Management

NEW CONSTRUCTION

- Zero municipal waste directly to landfill by 2025.
- All new buildings to have adequate internal/external storage space for recyclable household waste
- Promote on-site compost facilities to reduce the amount of household waste sent to landfill

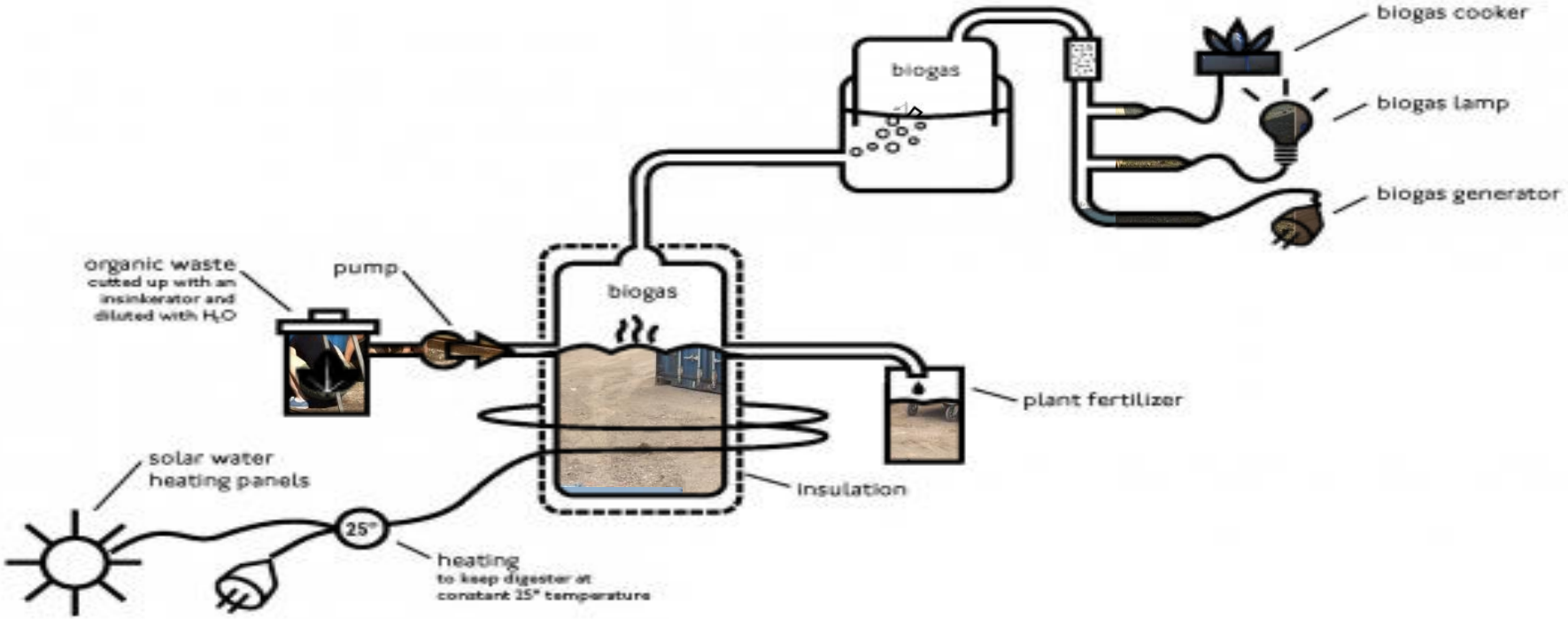
VENUES & PARKLANDS

- Recycle or compost 70% of commercial waste by 2015
- 100% provision of recycling facilities in public areas
- Zero parklands waste to landfill by 2030

CORPORATE

- Develop education programmes for visitors, workers, and residents about reduction and management of waste, e.g. blackwater recycled non-potable water
- Integrate sustainability requirements into supplier contracts & rules
- Monitor performance, publish data to set benchmarks, and report on sustainability targets

ANAEROBIC DIGESTER

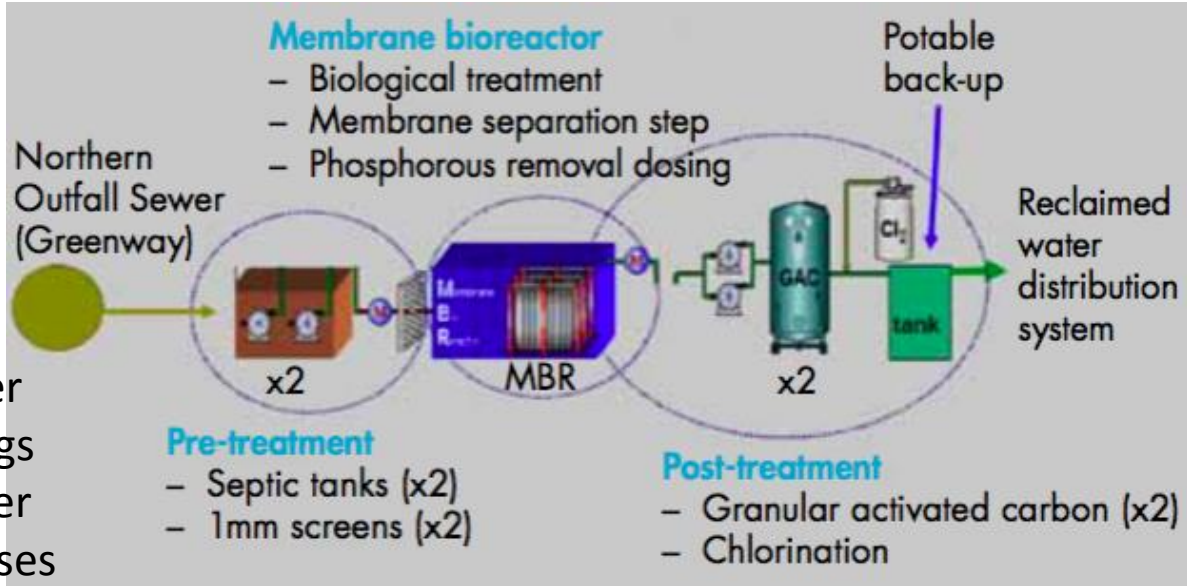


Water Recycling Centre



Greywater is wastewater from wash basins, showers/baths, which can be recycled for uses such as toilet flushing and landscape irrigation and often includes waste water from laundry, dishwashers and kitchen sinks. It differs from the waste water of toilets which is designated sewage or **blackwater** to indicate it contains human waste.

New homes incorporate water efficient taps, toilets & shower heads, and plants requiring less water meeting a standard of 90lppd, vs. 125lppd outlined under Building Regulations, and below the national average water use of 142lppd. Additional savings made through the Old Ford Water Recycling Plant (above), which uses advanced treatment processes to turn **blackwater** (sewage waste water) into non-potable water for irrigation and toilet flushing. (lppd=litres per person and day)



Cre8 ARC

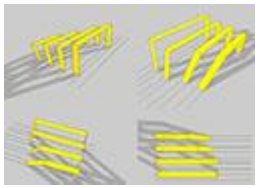
The Cre8 Arc is an eco hub, permaculture gardens and sporting facility built using reused and recycled material from the Olympic Park.

The Cre8 Arc is a passive, off grid out-house and permaculture garden designed and built by a pioneering project team using materials from the London 2012 Games and local organisations to showcase a sustainable legacy of London 2012.

Built by the community, for the community, the Cre8 Arc is a template for innovation in sustainable design and community engagement. A voluntary project supported by professionals from local companies and universities.










Hub67
built with
(timber, steel,

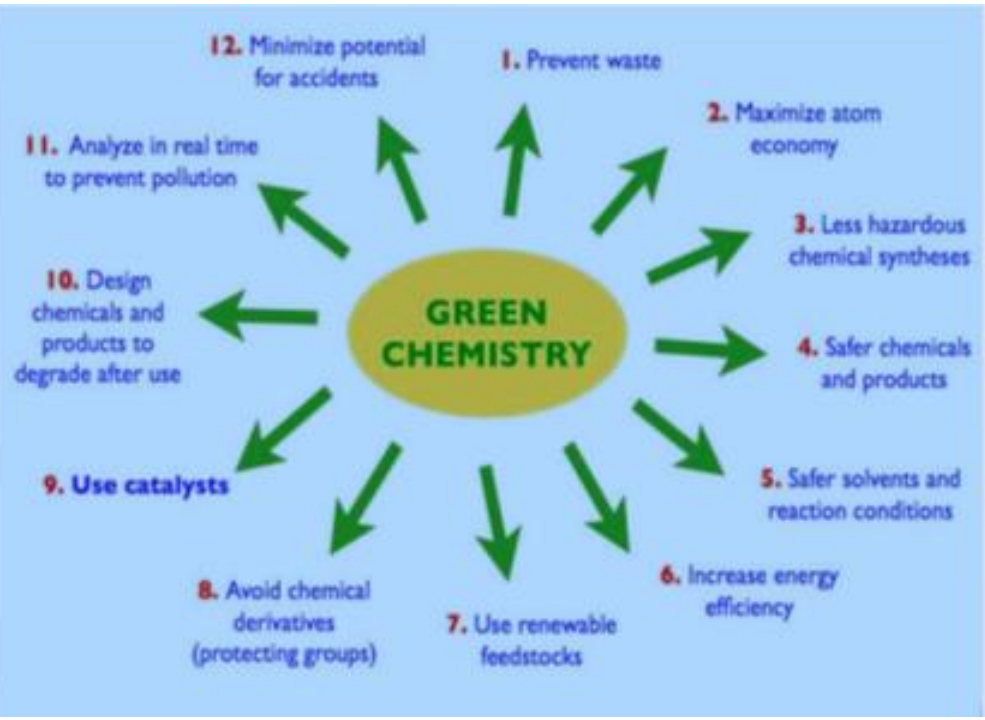




Community Centre,
recycled materials -
ceramics, wire…)

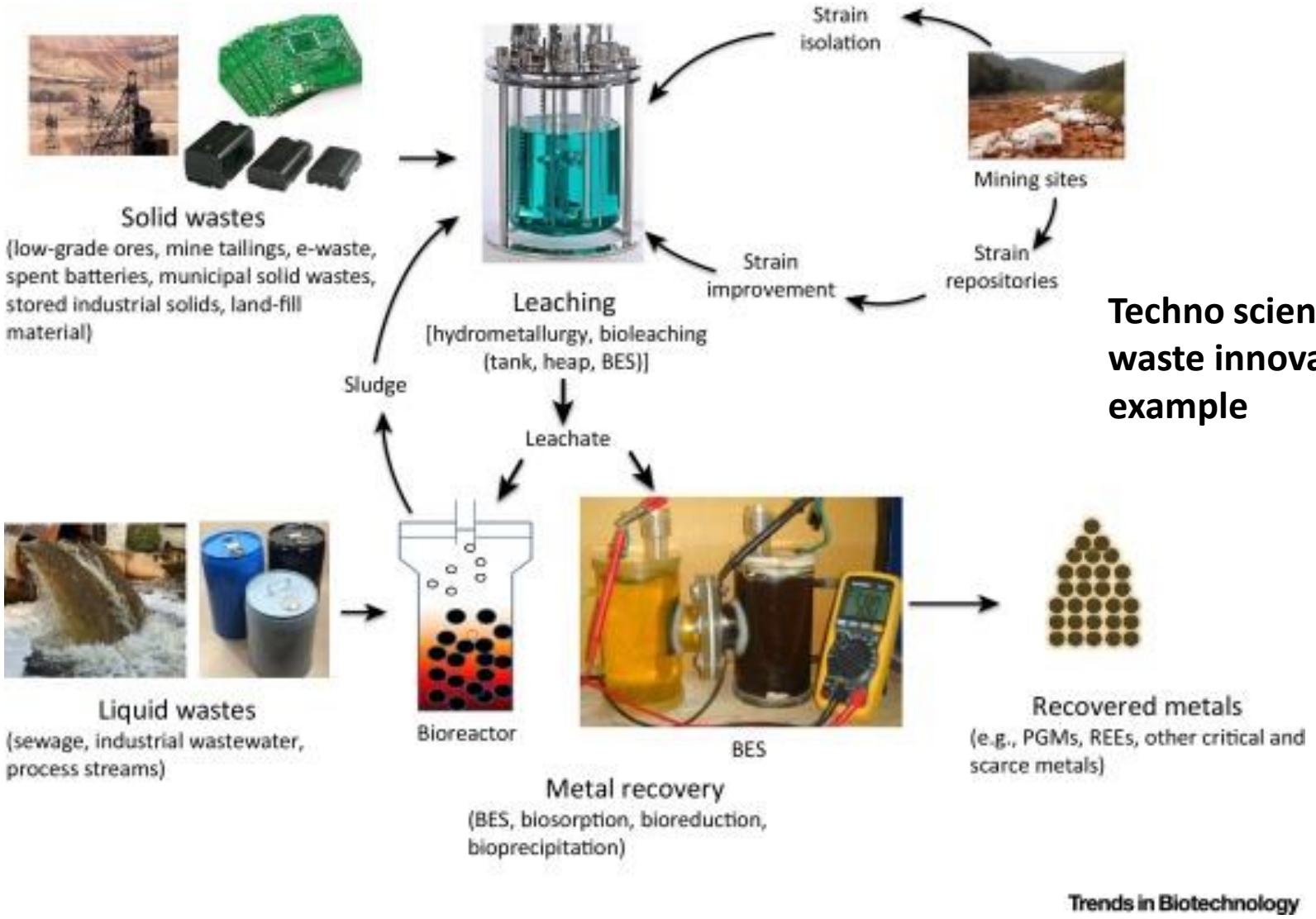
BioInspired Monomers and Polymers (BIMoP)





IA (itaconic acid)-based monomers and polymers are used to produce bio-based adhesives, inks and paints to ensure that the most common bioplastics used for food-packaging, such as polylactic acid (PLA), maintain the biodegradable and compostable properties required by the EU standard EN 13432

Biomining (Eutropolis)



Techno scientific waste innovation example

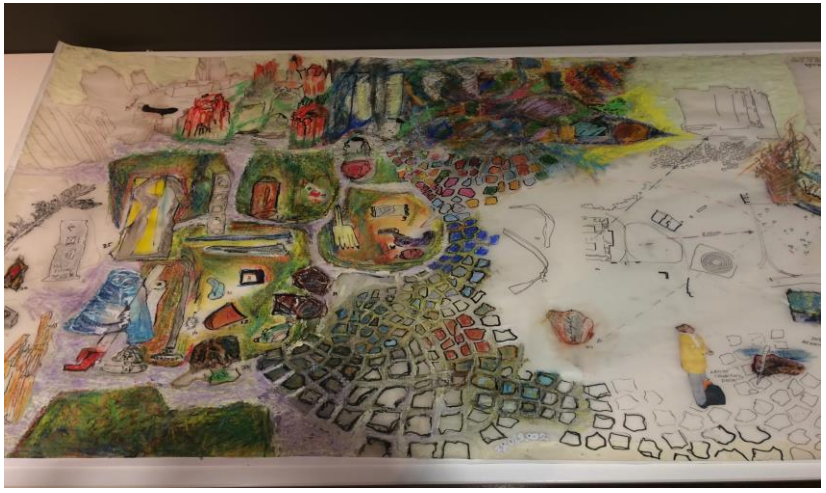
Biological and Bioelectrochemical Recovery of Critical and Scarce Metals
Nancharaiah, Y.V. et al. *Trends in Biotechnology* , 34 (2), 137-155, 2016

Artists interventions and installations









DEN-City - a temporary utopian city of installations, dens and assemblages. Colourfully, repurposing, and recycling on the theme ‘Work in Progress’ . DEN- City is mushrooming on a prime piece of land by the Olympic site







S.P.A.R - The Society for the Preservation of Admirable Rubble meeting at DEN-CITY discussing the campaign to keep the rubble formed by demolishing homes and buildings in the fabric and foyers of all new developments













Network Outcomes

- Improved awareness and knowledge of waste options, processes and impacts by public, local government and industry and artists & designers
- Greater understanding and value placed on local knowledge and co-design/co-production of solutions
- Creative and Design thinking in waste innovation and management
- Creative collaboration between scientists, technologists, social scientists and ‘creatives’
- Scale-up local demonstration projects



Danke!

Please sign up to the Waste Network:

www.smartcitiesandwaste.org

Next workshop in Maastricht, Netherlands

9 December 2016

+ London 2017