Nanomaterials in future waste streams

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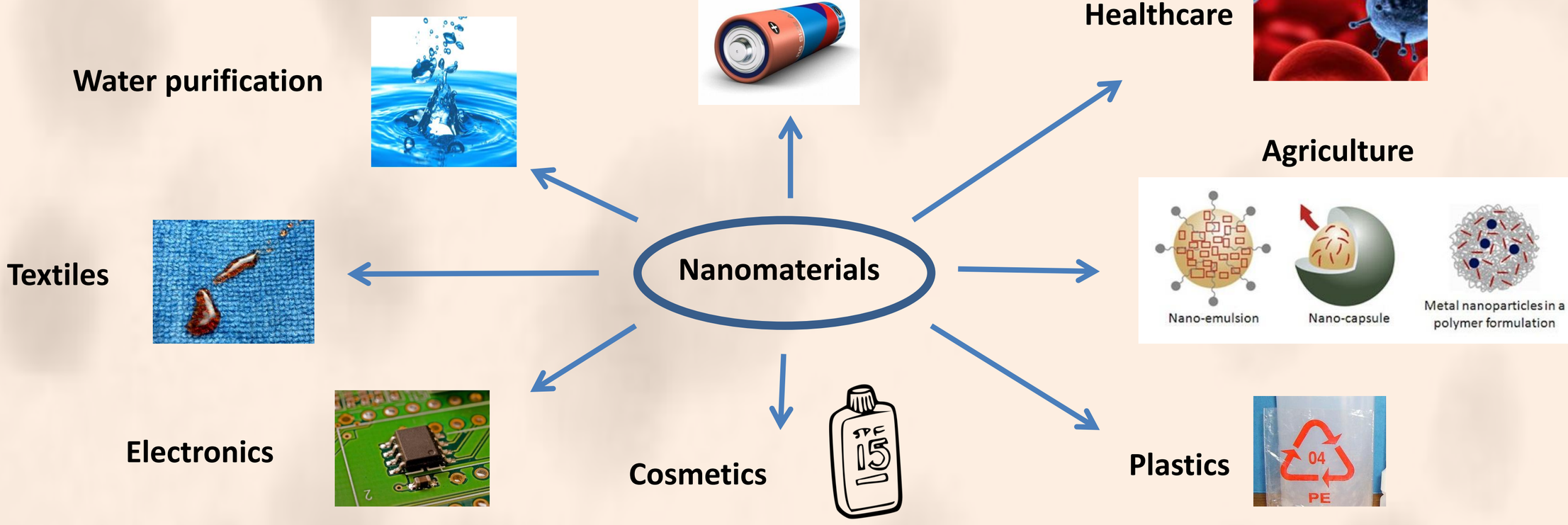
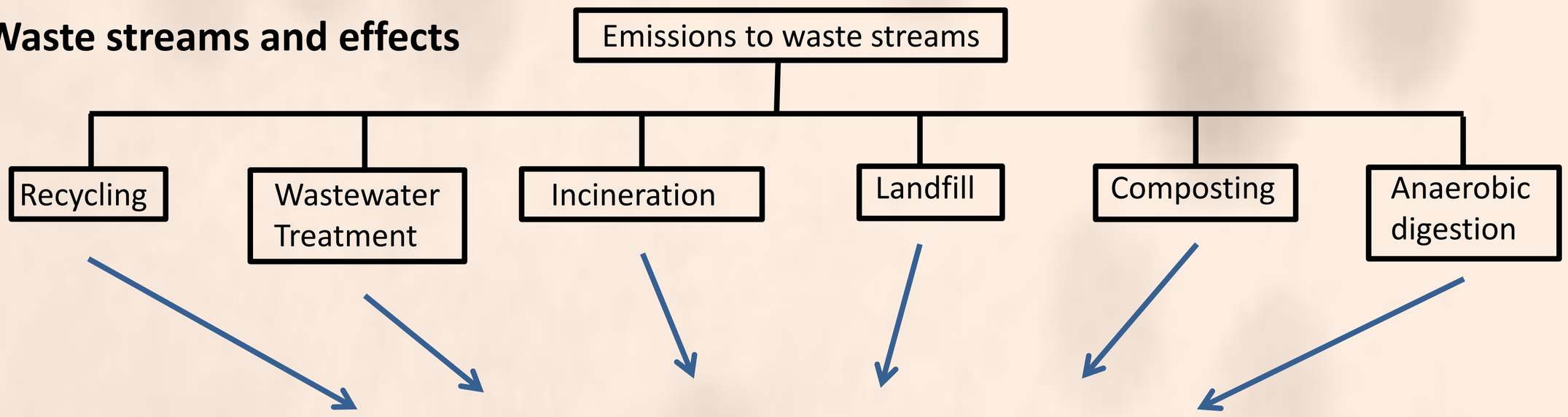
Introduction

Nanomaterials (NMs) are made from or incorporate particles that have dimensions between 1-100 nm. At the nanoscale a materials physical and chemical properties are very different from their bulk counterparts so these properties are now being exploited. Products underpinned by nanotechnology are forecast to be worth 2 trn euros by 2015. It is increasingly likely that NMs will enter waste streams, be released to the environment, and that human contact will occur. Therefore, it is important to consider NM impacts and waste management options to meet sustainability objectives.

Product sector development



Waste streams and effects



Potential Toxicological and Ecotoxicological effects

Cellular level effects include:

- Oxidative stress, antioxidant activity, generation of reactive oxygen species, lipid peroxidation, damage to mitochondrial function, direct protein oxidation, and potential neurological injury

Microorganism effects

- Respiratory inhibition to nitrifying bacteria leading to disruption of microorganism community structure impacting nutrient cycling, plant growth, & crop yield

Project overview

The aim of this catalyst project is to engage with an interdisciplinary and intersectoral community of scientists from academic, industrial, and regulatory sectors to develop:

- an overview of the release of NMs to different future waste streams,
- an assessment of the potential impacts of NMs on waste stream processes, the natural environment, and human health, and
- an overview of potential approaches for the recovery of NMs from different waste streams, including an assessment of their of the environmental cost and benefits.

The outcome will be a proposal that aims to develop approaches for the recovery of NMs from waste streams that will benefit both environmental and human health.

Approach

Review of published literature

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Expert workshop

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Survey of experts with knowledge of nanotechnology

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Stakeholder workshop

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Proposal development