

Environmental Technology Centre Ireland Technical Annex

- 1.1. Proposals are invited for a national research ‘centre of excellence’ in the area of environmental technologies, specifically Waste Conversion Technologies with special reference to solid and liquid waste management and to provide laboratory and pilot plant space for development and demonstration of waste and wastewater conversion technologies. Proposals should put forward concepts and ideas for technologies to maximise the recovery of high-value products and energy contained within by-product / waste streams.
- 1.2. Proposals should be developed with reference to Irish and EU legislation and policies including the ‘Water Framework Directive, Landfill Directive and Irish National Environmental Technology Action Plan (ETAP)’. Due regard should also be given to the 2008 United Nations Environment Programme’s *New Green Deal* and ‘Building Ireland’s Smart Economy’ (2008).
- 1.3. A strong focus on technology transfer and links with industry and public bodies to deliver practical outputs for rapid take-up is encouraged.
- 1.4. The Environmental Protection Agency (EPA) will publish a targeted call for proposals to coincide with the first year of operation of the centre(s) that would be open only to groups who are formally part of the centre(s). The value of research supported through this call would be of the order of €1m subject to EPA Board approval.

2. Suggested Focus Areas

- 2.1 The suggested focus of the proposed centre is ‘*Waste Conversion Technologies*’ and would encompass strands on both solid and liquid waste streams. The solid waste stream referred to would include, for example, municipal & domestic wastes, industrial wastes & by-products, waste sludges etc. The liquid waste stream would comprise of wastewaters from municipal, industrial and domestic sources etc.
- 2.2 Technological developments and improvements to be explored would include, among others: novel enzymes and micro-organisms, microbial genomics and bioinformatics and metabolic engineering and modelling, biocatalysts, advanced process integration, innovative downstream processing, optimal energy efficiency, appropriate waste management. The Suggested Focus Areas and Technologies for the Environmental Technology Centre are summarised in Table 1 below.

Table 1. Suggested Focus Areas and Technologies for the Environmental Technology Centre

	SOLID WASTES	LIQUID WASTES
High Level Goal	Waste Prevention & Minimisation	Excellent Water Quality
Priority Focus Areas	Management of MSW, Sludges Industrial Waste streams	Municipal & Domestic waste waters, Industrial liquid wastes
Other Focus Areas	Hazardous industrial wastes, WEEE Agricultural wastes	Water Conservation & Recycling Agricultural waste waters
Adapting & Developing Existing	Pyrolysis, Anaerobic Digestion, Composting, Mechanical-Biological	Biofilm reactors, membrane reactors, Energy saving modifications on classical

Technologies	Treatment etc.	systems etc..
Innovation using emerging technologies	High-value products from “clean wastes” Bioethanol/Bioplastics from MSW , Green Chemistry Cleaner Production Nanotechnology	Nanotechnology Biotechnology ICT: control and sensing systems Green Chemistry Cleaner Production Development of the Microbial fuel cell
Overarching Assessments	Screening for Emerging Priority Pollutants, rapid pathogen detection Health impacts, modelling, early warning systems. Impacts of Climate Change Industrial Ecology Assessment / Horizon Scanning for Next Generation of Environmental Technologies Financial & Socio-economic studies	

3. Themes

Some key thematic areas for this centre could include:

- 3.1 *Waste to energy* - Potential technologies to be examined would include Pyrolysis, Gasification and Anaerobic Digestion. The development of systems for the mitigation of greenhouse gas emission for waste to energy operations would also be a priority topic in this area. Systems to be developed would be required to deal with mixed wastes and provide an efficient and socially-acceptable alternative to disposal.
- 3.2 *Recovery of high-value products from 'clean' waste streams eg food wastes* -Ireland's agri-food industries produce an abundance of carbohydrate-rich wastes that offer potential for the recovery of high-value products such as biopharmaceuticals, bio-fuels. In addition, many other industries produce wastes & by-products that offer strong potential for transformation to useful products.
- 3.3 *Biological and biochemical transformation of wastes to products* - Biotechnology offers great potential, using bacteria, yeasts and enzymes for new kinds of products that can be used as alternatives to chemical detergents, water resource management, soil remediation or biomass processing.
- 3.4 *Nanotechnology* - Nanotechnology is an emerging scientific field that covers surface technologies as well as nano-structured materials, sensors and microprocessors. Ireland could not only be at the head of pioneering and developing environmental nanotechnology but also lead methods for environmental assessment and remediation of the materials developed in this field. The potential resource efficiencies achieved by nanotechnologies has major environmental importance and benefits, as it can produce small, efficient, lighter and more durable goods and services, thus less environmental impact.
- 3.5 *Cleaner Industry* - There is a pressing need for the development of more environmentally acceptable industrial processes to serve ever greater demands on both the planet's resources and its ability to absorb the effects of human activity. The widespread acceptance that the traditional approach to large-scale manufacturing is eminently unsustainable has driven the emergence of 'Green Chemistry' and Cleaner Production which can be central enabling technologies in the pursuit of 'greener' processes.

- 3.6 *Wastewater treatment & control* - There is a pressing need to develop methods to treat water pollution and prevent eutrophication of our waters; arising both as point source (discharges through pipes etc) or diffuse (domestic, agricultural activity). The application of remote sensing and information technologies for monitoring performance of wastewater treatment systems (and receiving waters) represents an opportunity to capitalise on the rapid evolution of technology in this area and on the advanced capabilities developed in leading national technology research centres funded previously by EPA, Marine Institute and SFI.

4. Establishment of the Centre

- 4.1 The proposed centre would facilitate research in a tiered manner in order to accommodate the differing needs of technologies at various levels of development. Resources would include work-spaces suitable for field-trialling and pilot-scale demonstrations of existing technologies which are being refined and adapted for specific applications. Provision would also be required for experimental halls/laboratory space to accommodate development of emerging technologies.
- 4.2 Equipment for the centre would include fermenters, digestors, reactors, combustors etc along with materials handling and analytical facilities to support research operations.
- 4.3 A particular focus of the centre should be the establishment of a testing and trialling facility to encourage and assist technology transfer.
- 4.4 It is anticipated that this activity would be established as a single centre with multiple partner institutions to bring together dispersed expertise. An alternate approach would be to consider two centres working in parallel, one examining technologies appropriate to solid wastes and the second looking at technologies suitable for liquid wastes.
- 4.5 In either approach, the centre(s) could be established on a single institution basis or could be focused on a single centre with multiple partner institutions. The latter approach probably offers greatest benefit in terms of collaborative working and attaining critical mass.