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Protecting the Bay: Weaving the Strands to keep Galway Bay

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In this presentation …

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Introduce Galway Bay

Introduce Ireland's science base

Introduce the SmartBay project

Give some specific project examples

Explain why SmartBay is a model that works

Ireland's Ocean

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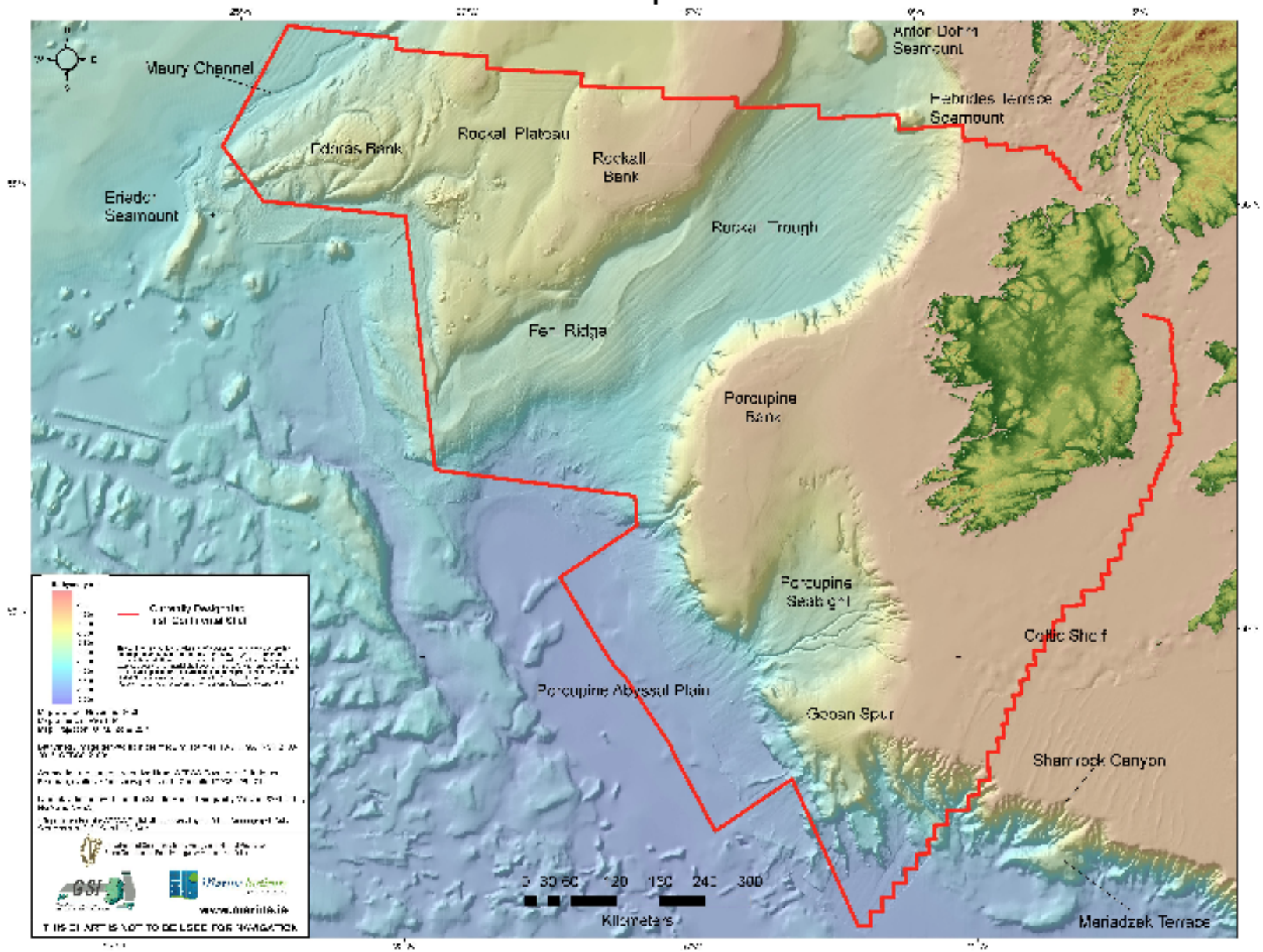
Ireland's ocean territory …

– Our greatest natural resource (bar our people)
– 10x our landmass - 220,000,000 acres underwater territory, granted by the United Nations Convention on the Law of the Sea, encompassing a wealth of natural resources
– Irish government funding largest civilian seabed mapping project in the world, Geological Survey of Ireland and the Marine Institute
– Has lead to the "real" map of Ireland

The Real Map of Ireland



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– Work continues to map the full physical, chemical and biological features of the seabed

Ireland's Ocean

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Ireland's ocean territory …

– Strategically positioned on western periphery of EU, abutting the important Gulf Stream at the Boreal and Lusitanian divide

– Resources include oil and gas, aquaculture, marine transport and shipping, coastal tourism, wind and wave renewable energy

– Ireland has the highest **wave energy** resource in Europe with estimated generating capacity of 60 GW (1/5th of Europe)
– while wave energy is potential, **tidal energy** is at early stage development with several projects moving to commercial phase
– off-shore **wind energy** is already commercial

Galway Bay

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Galway Bay, on the Western seaboard, a scenic bay, culturally important with a diverse range of maritime activities, a complex ecological environment with a good infrastructure

Galway Bay is special, but not unique as a bay

Galway Bay

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38 protected Habitats
Freshwater ingress
2 Marine parks

Galway Bay

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2 Protected species
– Common Seal
– European Otter

Galway Bay

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An Assortment of Cetaceans

Galway Bay

38 protected Habitats
Freshwater ingress
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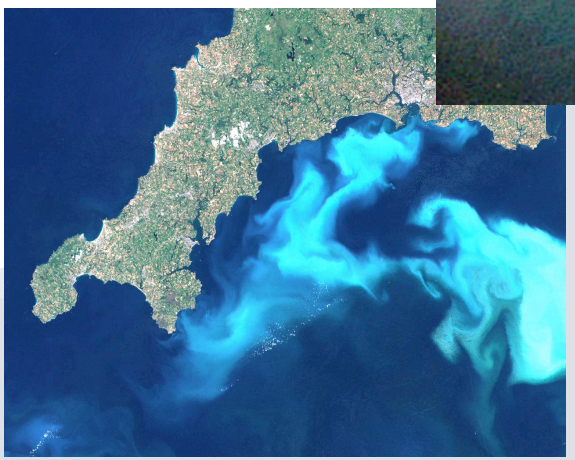
An Assortment of Cetaceans
Harmful Algal Blooms caused by nutrients at certain times of year



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Full range of maritime activities

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- Environmental monitoring
- Shipping
- Fishing, inshore and offshore
- Marine leisure
- Marine tourism
- Aquaculture, finfish, shellfish
- R&D Aquaculture
- R&D Ocean Energy

Galway Bay is the setting for the “SmartBay” project

Ireland's science

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Ireland's S+T policy since 2000 placed increased emphasis on research and development, especially innovation

Science Foundation Ireland and others, established 2003, funding scientists and engineers in bio, ICT, sustainable energy

Attracting R&D activities, driving indigenous company innovation, Environmental Protection Agency and also Marine Institute R&D programmes

Total Irish R&D spending trebled to €2.6B in 2008, 1.66% of GNP

Beginning to have significant impact … examples is "CLARITY"

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CLARITY: Centre for Sensor Web Technologies

100 researchers in 3 sites, focus on intersection between adaptive sensing and information discovery

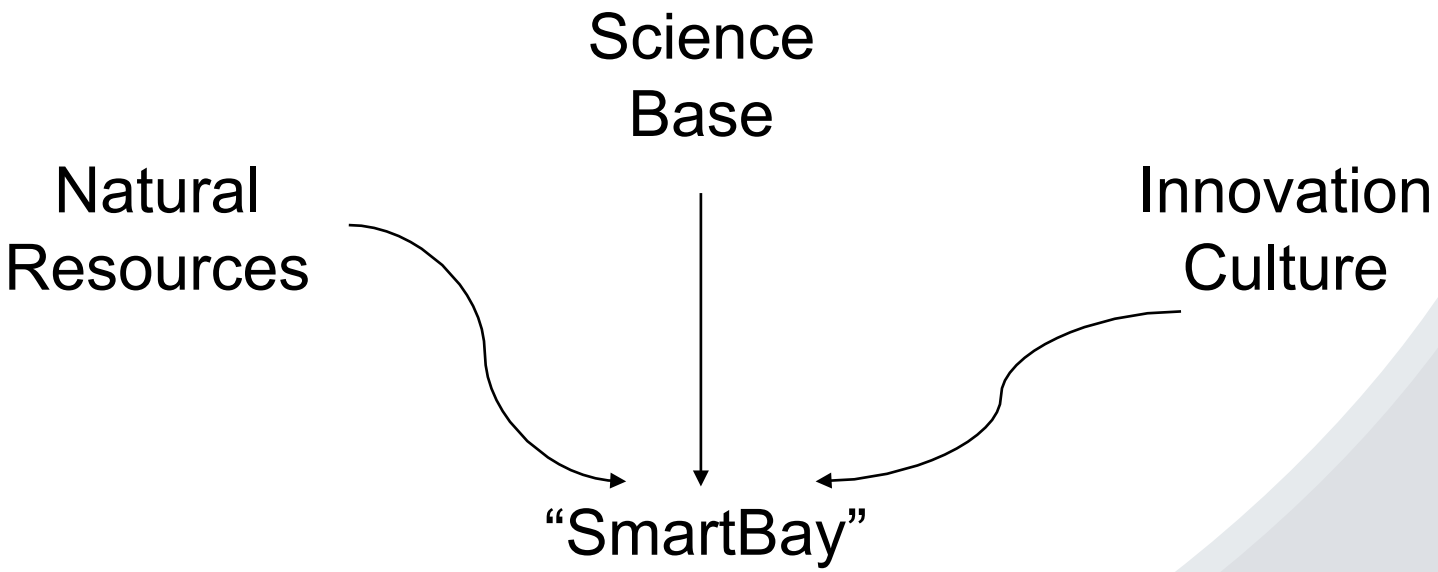
Develop new sensors and use OTS, gather data, aggregate, and turn into actionable information

Domains include environmental monitoring

Part-funded by Irish government, supplemented by industry partners including IBM, Disney Imagineering, QinetiQ North America, and others.

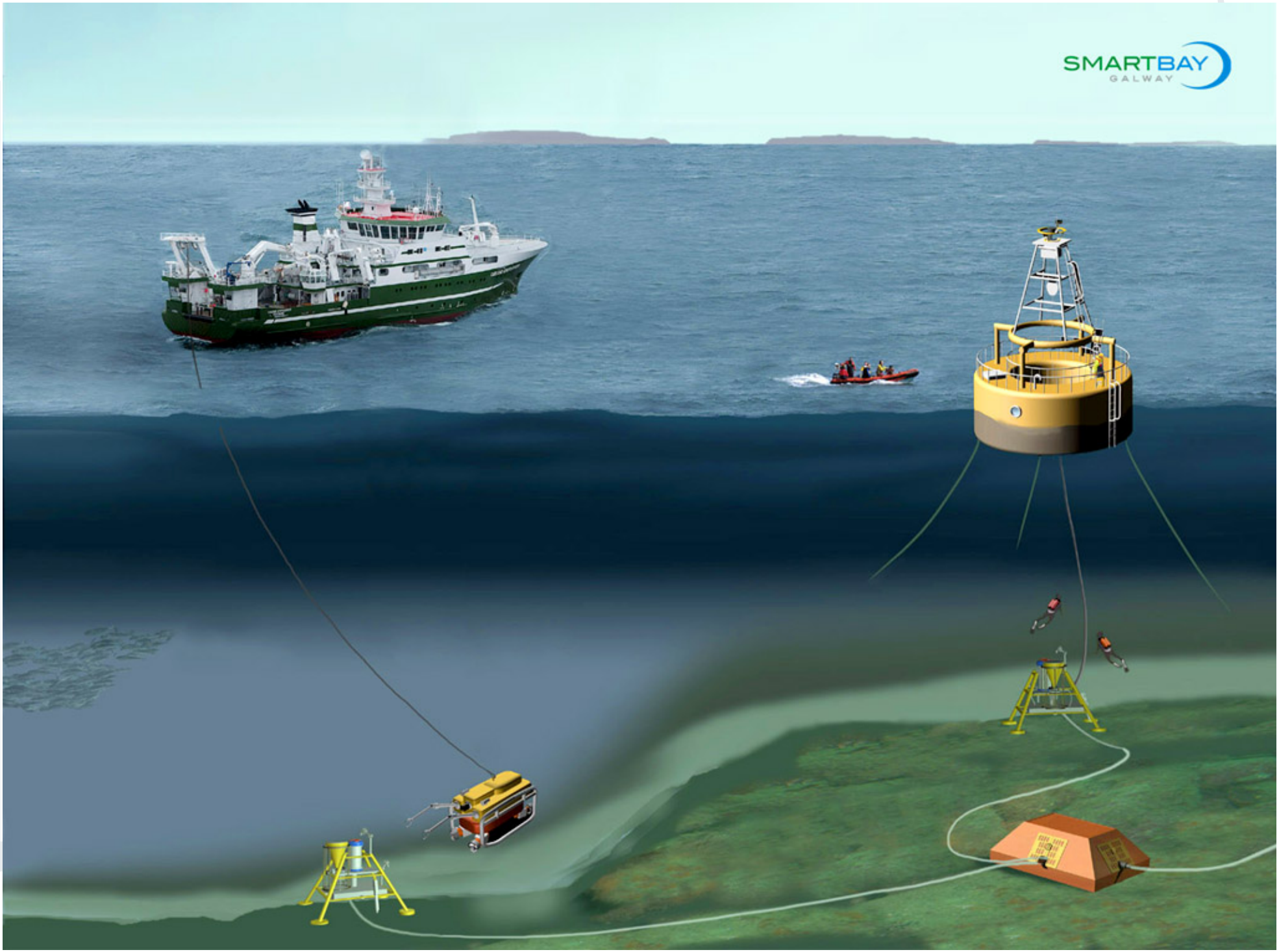
Measurable outputs include innovation metrics, promotion of innovation, inter-disciplinarity, growing indigenous sector

SmartBay



Supported by Marine Institute and EPA, the SmartBay Pilot is designed to be a ***research, test and demonstration platform and innovation testbed*** for new ocean technologies

A Network of buoys, sensor hardware and comms in Galway Bay, against which prototype products or services can be validated


SMARTBAY
GALWAY

SmartBay Projects

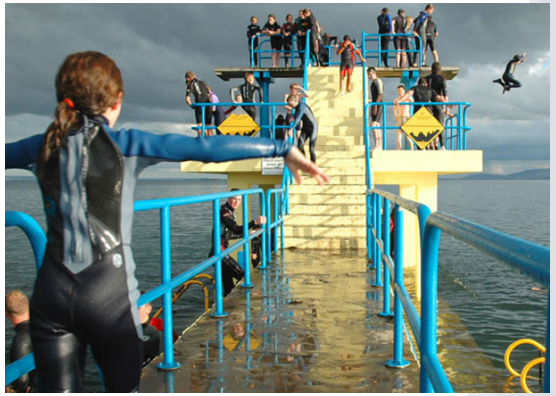
Projects:

- Bay Oceanography
- Fish Stock Monitoring
- Carrying Capacity Studies
- HAB prediction and mitigation
- Fresh water ingress

SmartBay Projects

Projects:

- Aquaculture RD&D
- Water quality & environment monitoring
- Sea conditions
- Wave and current monitoring
- Marine traffic



SmartBay Project 1

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IBM Ireland *Centre for Excellence in Water Management* has developed an "end to end" reference architecture with large scale in mind, to support Smart Planet Strategy

SmartBay demonstration project shows IBM capabilities for extracting intelligence from sensors and devices, new paradigms in analytics, generating new intelligence

SmartBay Project 2

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Intel + others undertaking marine trials of WiMax high speed broadband, across the bay

This “over water” trial connects offshore sensor platforms, buoys, wave energy platforms, etc., with on-land data aggregation

Exploring technical aspects of “over water”, reflection, signal reach, etc.

SmartBay Project 3

CLARITY role in SmartBay …

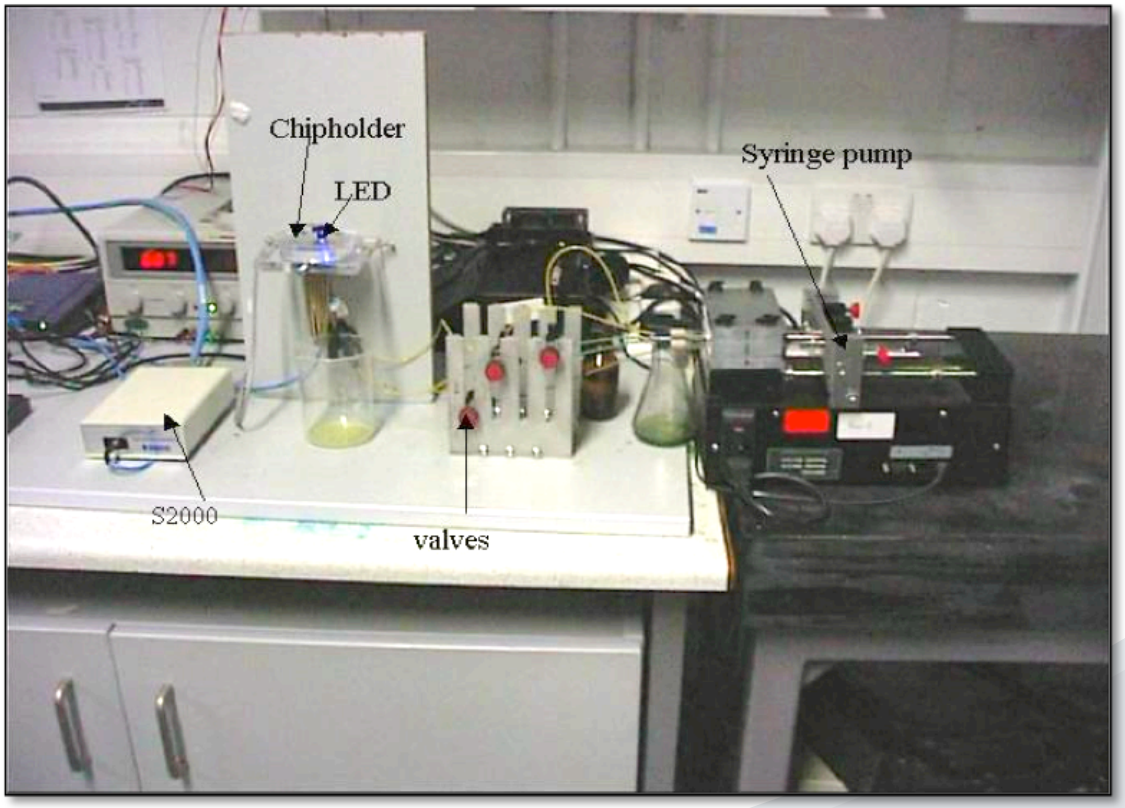
We develop nutrient (phosphate) sensors in our labs

We build these into prototype wireless, remote powered sensor platforms

We deploy in lakes and rivers which ingress into Galway Bay

We engage with small indigenous company to work with large multi-national company, to build and deploy on a larger scale

Reagent based Nutrient Analyser



Setup ca. 1999

Worked well but not an integrated system

Autonomous Reagent-based Nutrient Analyser (ca. 2008)

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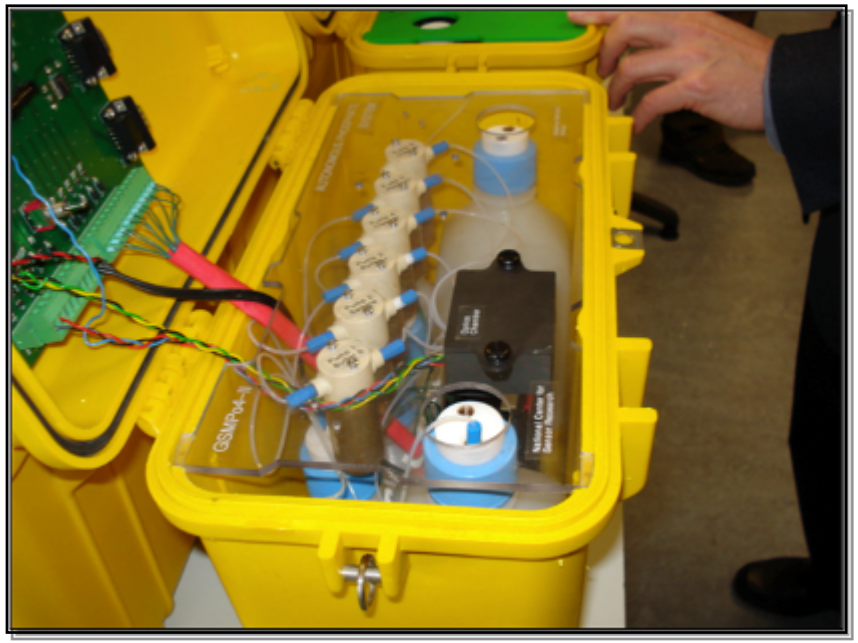

Complex system integrated into a robust platform: component cost c.€2,000

Analyser Platform

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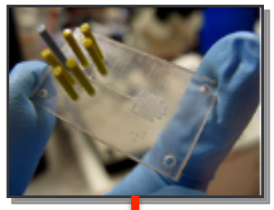
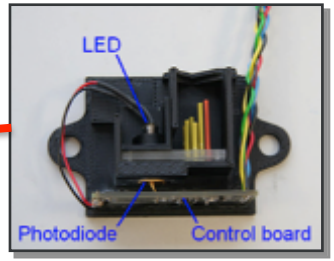
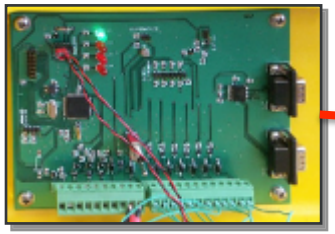
Fluidics



Detection

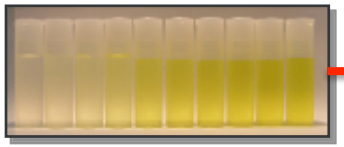


Electronics

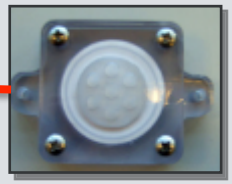


Comms

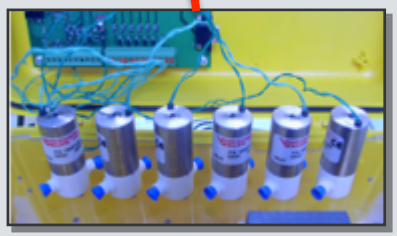
Chemistry



Sampling



Power



Pumps & valves

2010 Generation Phosphate Analyser

Episensor-CLARITY collaboration

Cost now ca. €250 per unit;

Episensor-IBM (Environmental Solutions) collaborative agreement signed (May 2009)

2008

2010

Water Quality Monitoring

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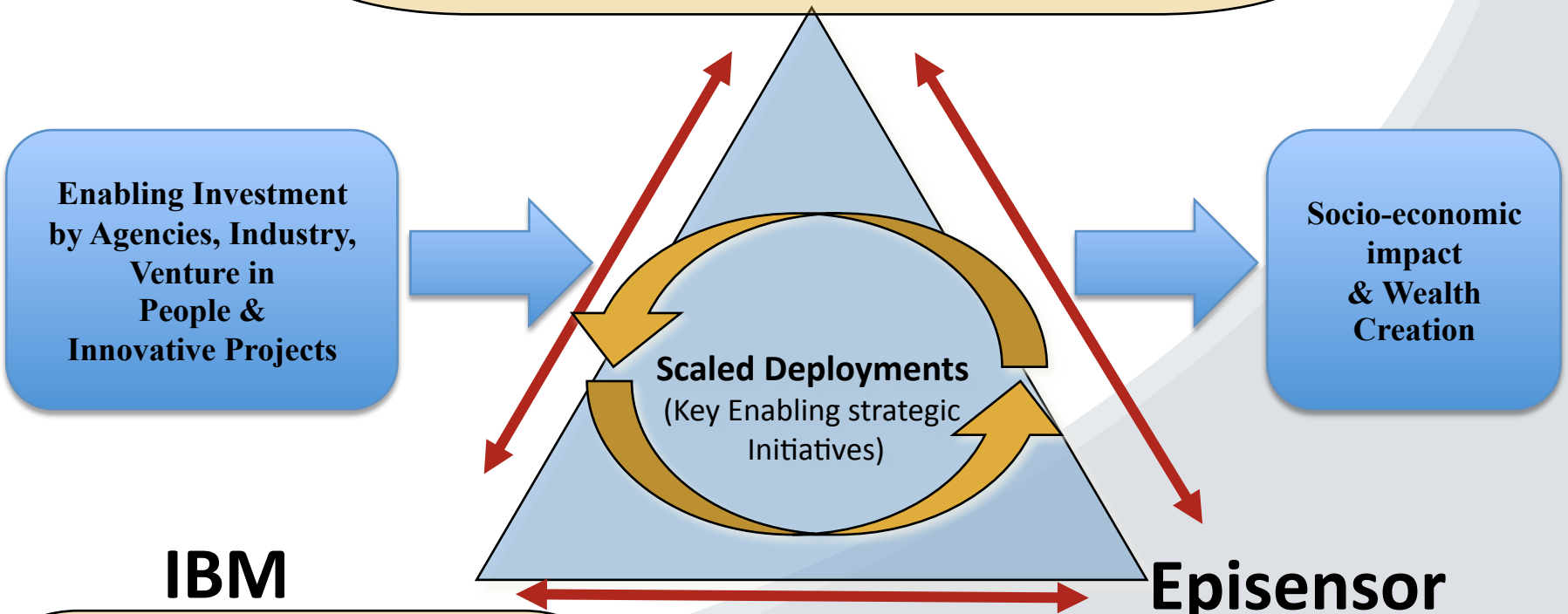
research capabilities, innovative environment



IBM

global perspective, market penetration, rapid scale up

Episensor

Flexible, dynamic, niche focus

System Design

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Sheet Metal Frame

Reagent & Standard Bags

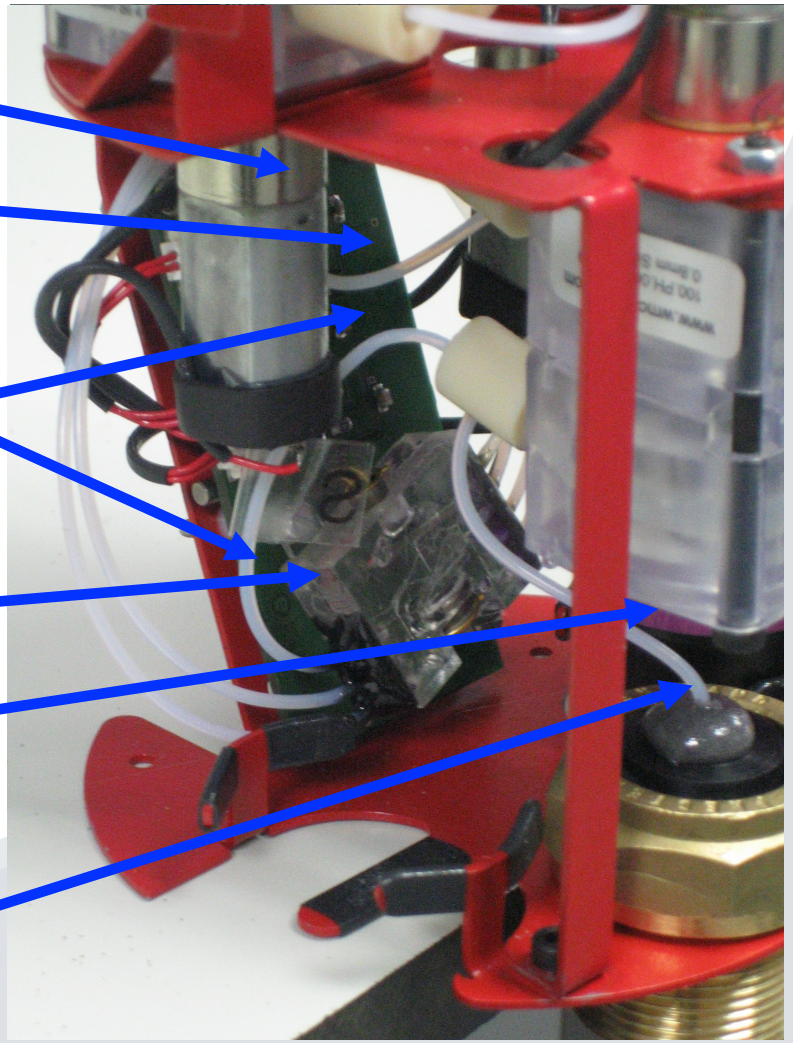
Dual Channel Pumps

Control Board

Detection System

3.6V Battery

Sample Inlet (0.45um Filter)



2010 Detection System

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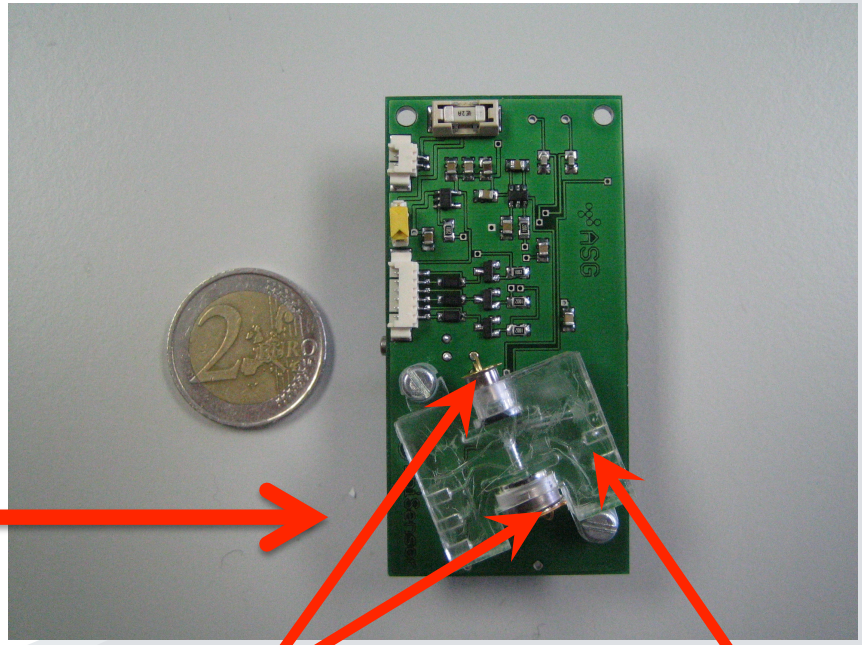

LED and Photodiode Detector

Microfluidic Chip

Evolutionary Improvements

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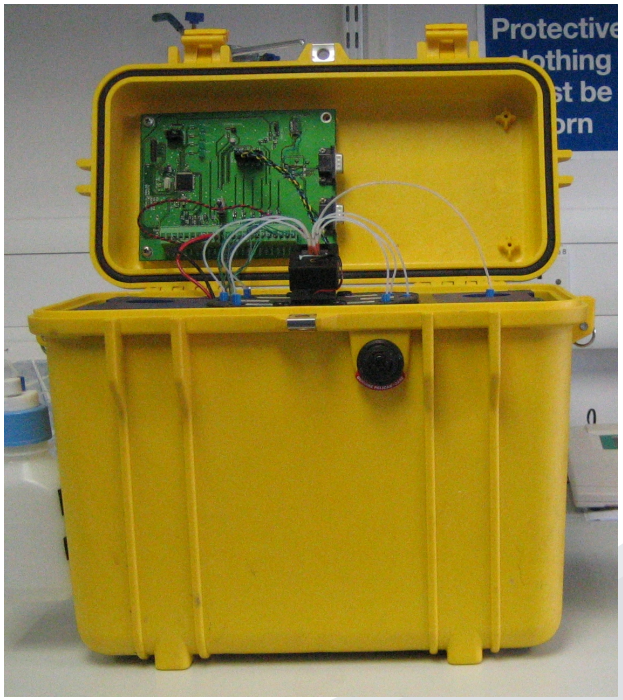
Microlab

>€20,000 per unit

1st Gen System (2008)

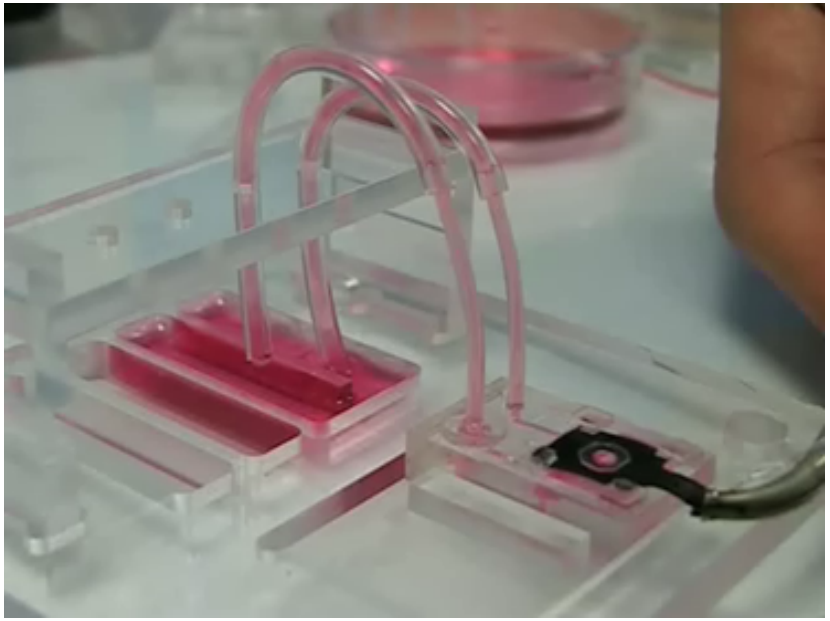


11 Deployments, almost 10,000 measurements over 282 days

2nd Gen System (now)

Handover of 10 systems to Episensor (March 2010); Deployments commencing

Towards the €20 Analyser: Polymer Micropumps and Valves



Low power, low cost components are vital for realisation of next generation micro-dimensioned analytical platforms

Based on polypyrrole CP ‘biomimetic’ soft polymer actuators (artificial muscle)

Soft polymer actuators more attractive for integrated ufluidics manifolds

Cost Comparison Analyser (€)

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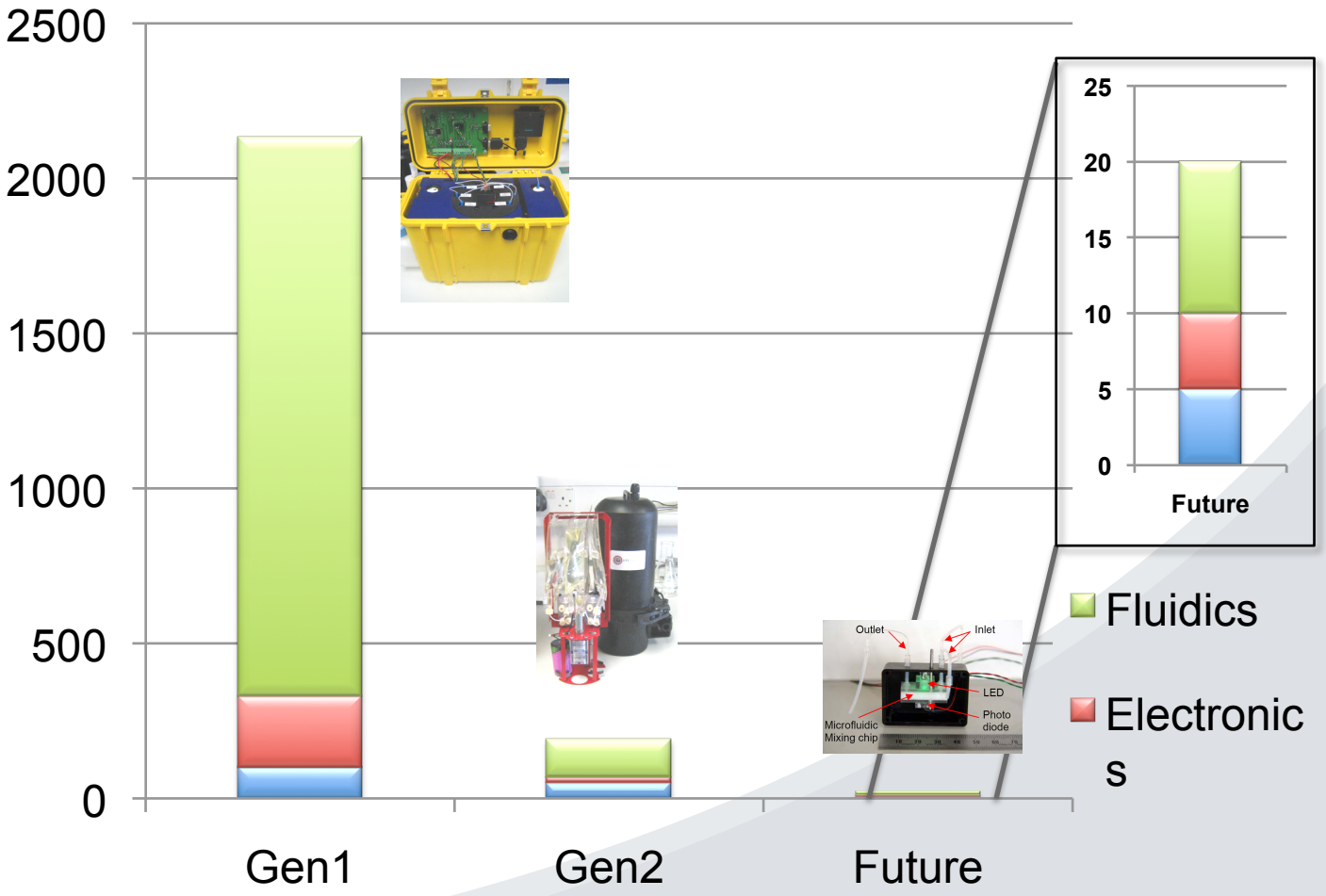

Conclusion

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"Our natural world is no longer a backdrop to our society, but the bedrock of our existence"
- Marine Institute, 2010

Our oceans are the part of our natural world we know least about.

SmartBay is a ***research, test and demonstration platform and innovation testbed*** for new ocean technologies

SmartBay works because it is a collaboration between multi-nationals, SMEs, indigenous companies, researchers and academics across multiple disciplines, and government institutions