Marine Citizen Science: Trends and Frontier Issues

Dr Jane Delany, Newcastle University
Jane.delany@ncl.ac.uk

Dr Patricia McHugh, NUI Galway
patricia.mchugh@nuigalway.ie

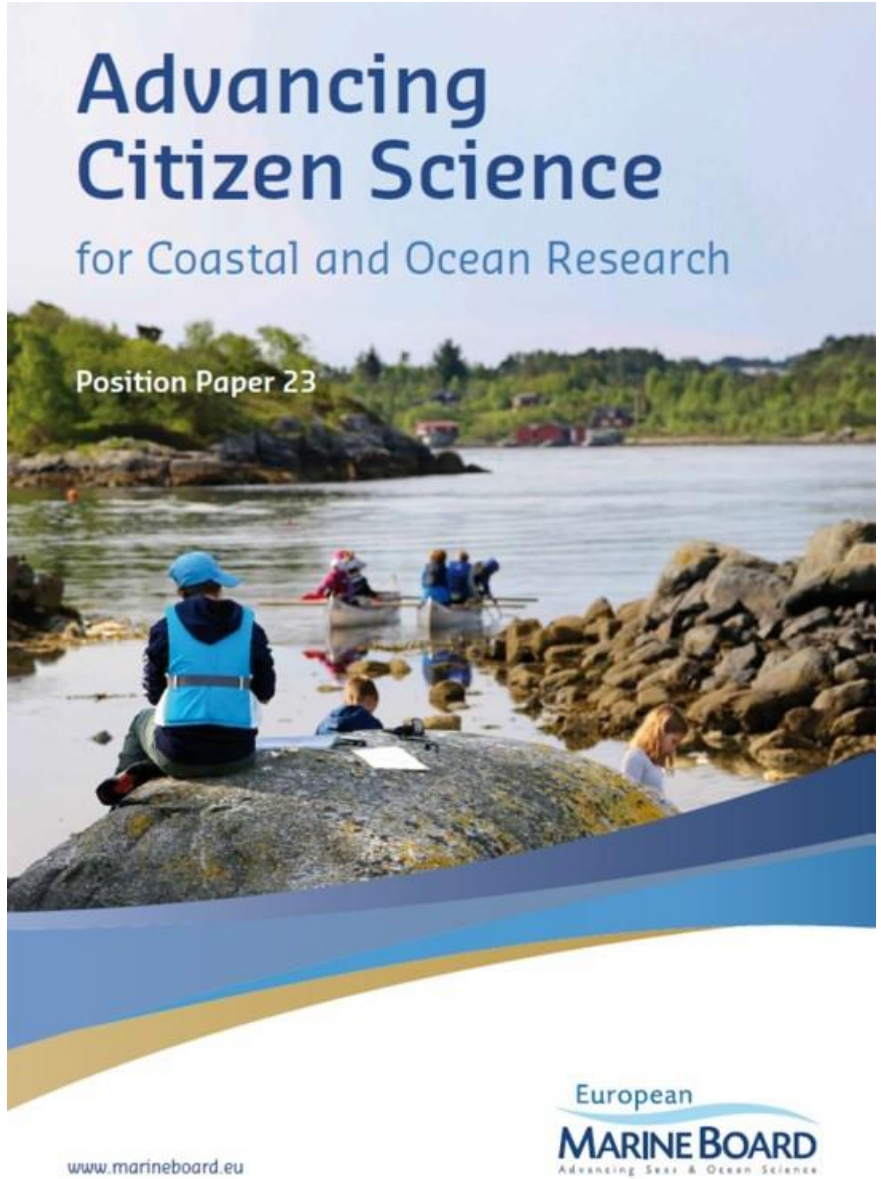
Dr Christine Domegan, NUI, Galway
christine.domegan@nuigalway.ie

Position Paper 23

Current Status: to review and reflect on the existing experiences of European Marine Citizen Science; to consider its potential to enact social change, engagement and to potentially contribute to marine environmental policy

Strategic Action Areas:

Shorter and longer term actions for: building competencies across disciplines, cultivating ocean literacy, unifying platforms, cohesive funding opportunities.



European
MARINE BOARD
Advancing Seas & Ocean Science

What is Citizen Science?

Newcastle University
UK | Malaysia | Singapore

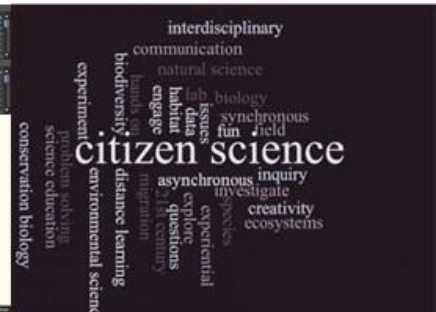
Involvement of non-professional scientists in the systematic collection, analysis or interpretation of scientific data, and testing of natural phenomena.

- Recording observations
- Collecting data in the field
- Sharing expertise ‘lay-expertise’
- Shaping the project

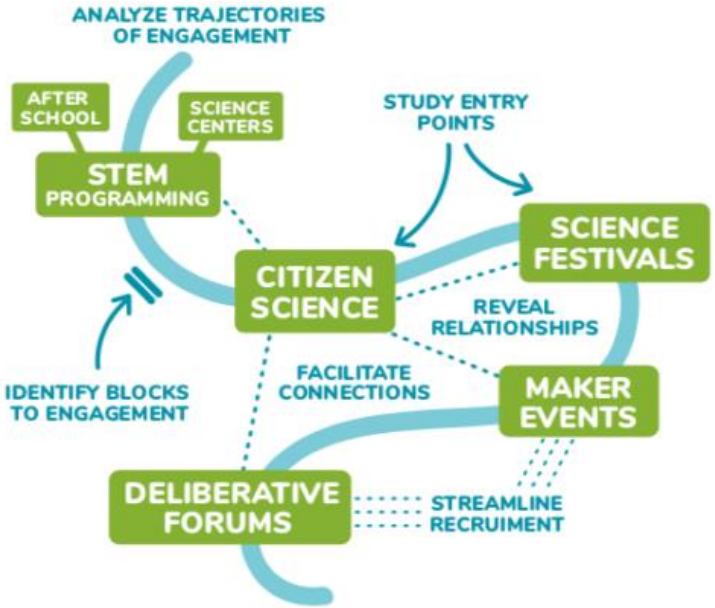
- Analysing/interpreting data
- Participating/assisting in experiments
- Contributing to the writing of manuscripts
- Setting the questions together







What is Citizen Science?



1. Citizen Science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding
2. Citizen science projects have a genuine science outcome
3. Both the professional scientists and the citizen scientists benefit from taking part
4. Citizen Scientists may, if they wish, participate in multiple stages of the scientific process
5. Citizen scientists receive feedback from the project.
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format.
8. Citizen scientists are acknowledged in project results and publications
9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy output
10. The leaders of citizen science projects take into consideration legal and ethical issues, surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution and the environmental impact of any activities.

93% of excess heat from the enhanced greenhouse effect over past few decades is now stored in the ocean.

Sea level rise and coastal squeeze

Ocean acidification

Thermal tolerance of coral reefs, increased ‘bleaching events’ and coral disease

Oceans and seas have lost almost one percent of marine biodiversity *per year* in the last forty years

Plastic pollution

Cumulative and synergistic effects of multiple anthropogenic pressures are jeopardizing the future of marine biodiversity

Overfishing and habitat loss

Pollution, eutrophication and ‘dead-zones’

“***the next decade will be the decade of deoxygenation…”*** Prof Lisa Levin, Scripps Institute, IUCN Expert Panel

@NCLDoveMarine

Our Common Goal is biologically diverse, productive, healthy seas (MSFD)

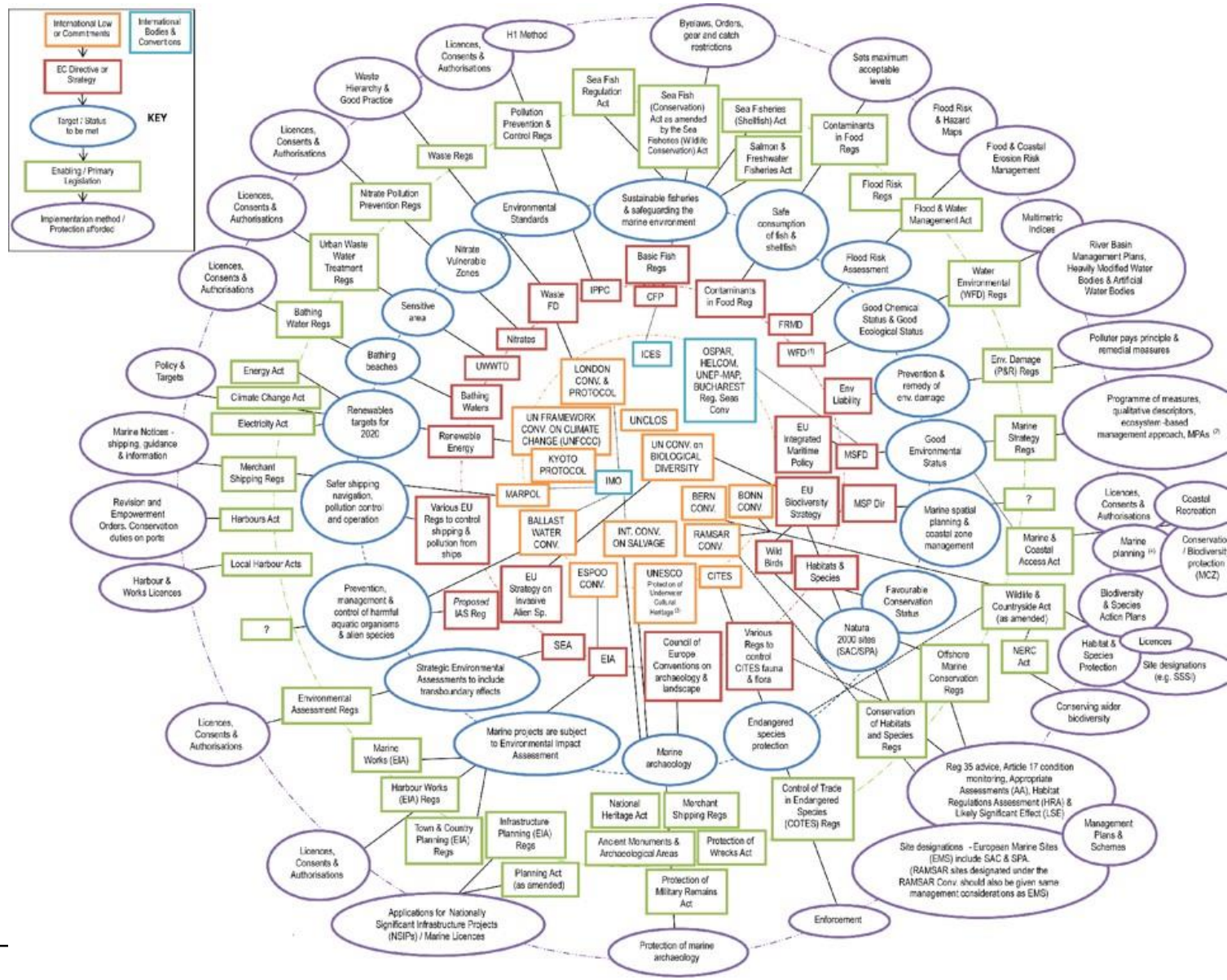
Marine Environmental Policy: *fit for purpose?*

Marine problems are in part due to individual behaviour

Centralised policies should address this

Where are the opportunities for individuals and communities to act? to engage?

Policy creation is a normative process



(Boyes and Elliott, 2014)

Understanding, perception and attitudes

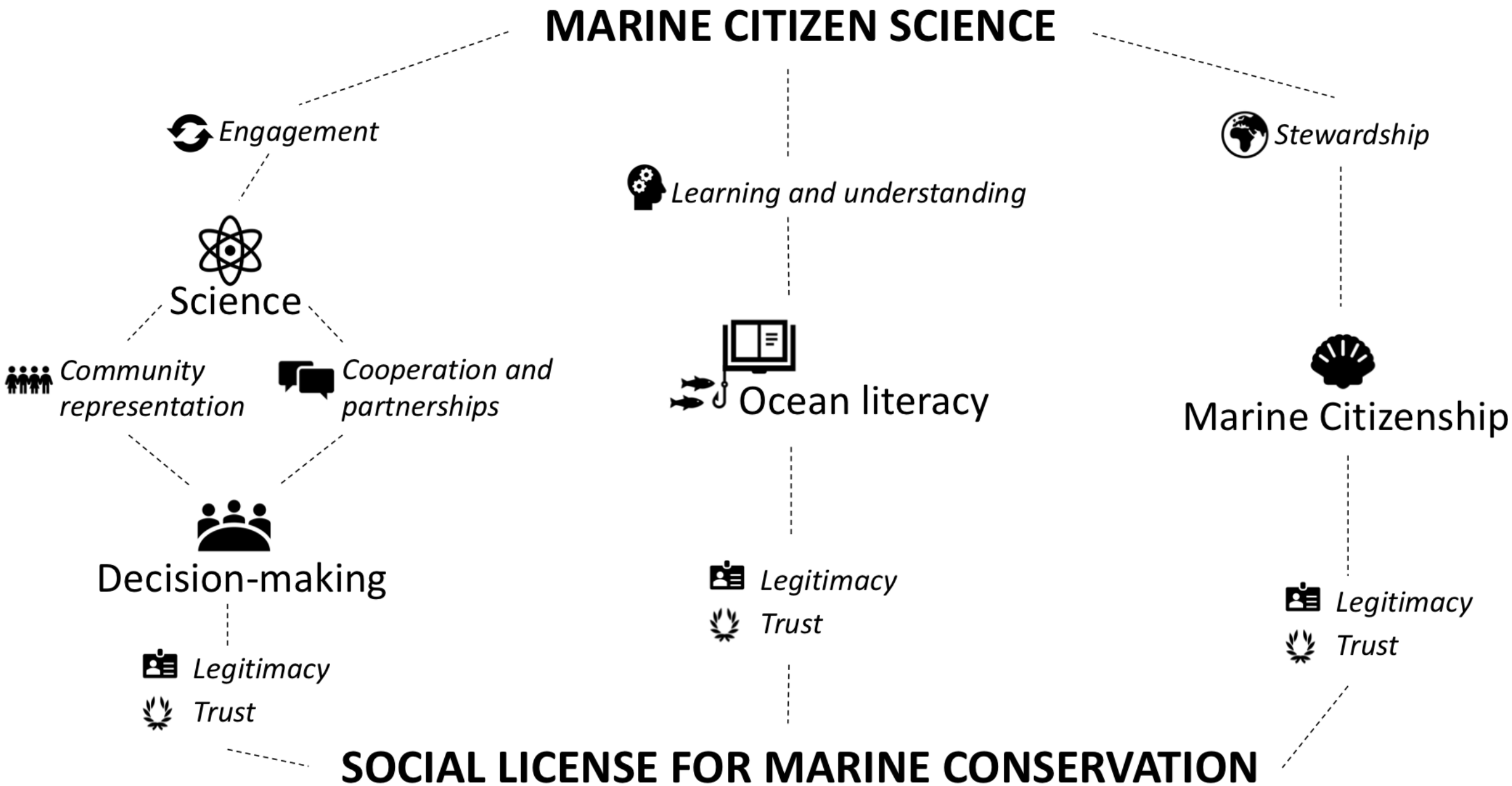
Awareness of scale and challenge associated with threats to the marine environment at local and global levels

Concern for these issues

Appreciation of extent to which theirs, and the behaviours of others, can stem progression of these threats

Motivation to change behaviour, and to facilitate change in others, to lessen impact on the marine environment

Gelcich et al., 2014; Jefferson et al., 2014; Potts et al., 2016; McKinley and Fletcher, 2012; Kollmuss and Agyeman, 2002 ; Toomey and Domroese, 2013


MARINE CITIZEN SCIENCE
Engagement
Science
Community representation
Cooperation and partnerships
Decision-making
Legitimacy
Trust
Learning and understanding
Ocean literacy
Legitimacy
Trust
Stewardship
Marine Citizenship
Legitimacy
Trust
SOCIAL LICENSE FOR MARINE CONSERVATION

Models of Citizen Science

Contractual: communities ask professional researchers to conduct specific scientific investigation

Contributory: designed by scientists, and publics primarily contribute data

Collaborative: designed by scientists; publics contribute data but may help in the design, analysis or dissemination

Co-created: volunteers actively involved in most steps of design process

Collegial contributions: individuals conduct research independently

Shirk et al 2012

@NCLDoveMarine

Contributory Citizen Science Model in Action

Co-Created Citizen Science Model in Action

SEA CHANGE
OUR OCEAN | OUR HEALTH

Our Ocean Our Oxygen

Make a Sea Change in the Bathroom

Human Health and the Ocean factsheets

Ocean Literacy Booklet

Make a Sea Change in the Supermarket

Plastics in the Marine Environment

ID guides for Crab Watch

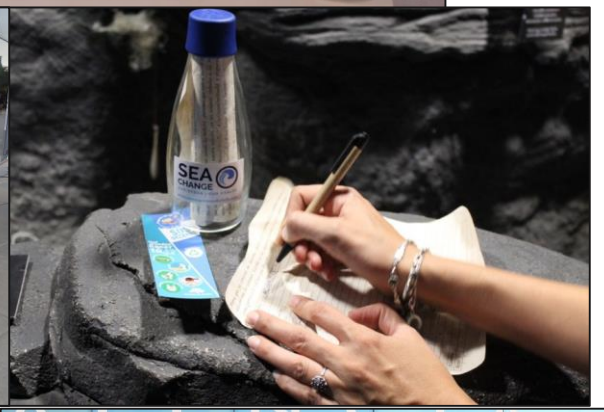
LOVE THE OCEAN

NUI Galway
OÉ Gaillimh

Horizon 2020
European Union Funding
for Research & Innovation

Co-Created Citizen Science Model in Action

Message in a Bottle

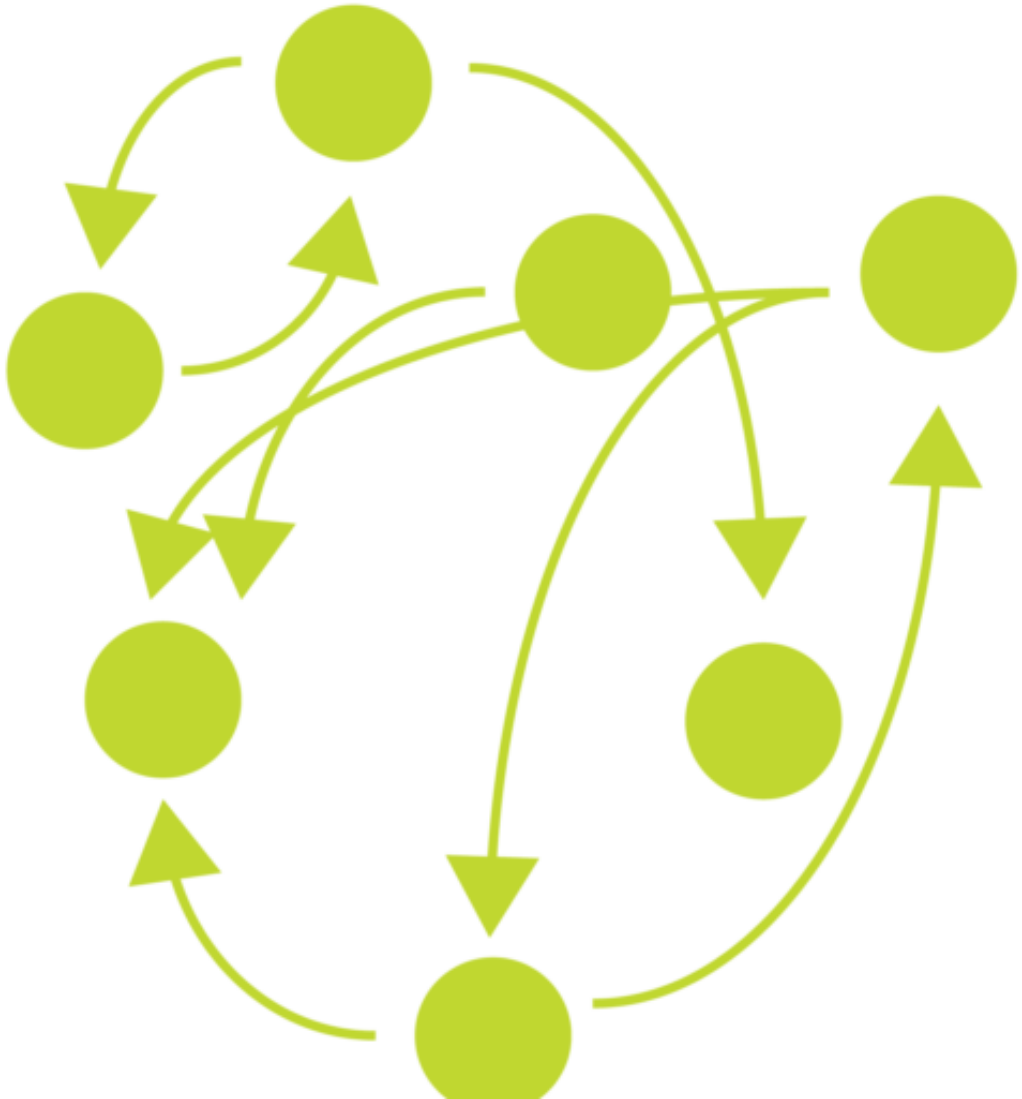


submon
building a sustainable marine future

NUI Galway
OÉ Gaillimh

Traditional thinking

Systems thinking



New Stakeholder Mindset

Much depends on the ability of stakeholders, large, small, governance, NGOs, SMEs to engage in **shared understandings, communication, collective choice,** mutually beneficial exchanges, self-organisation, innovation and leadership.

New Stakeholder Mindset

Re-setting the system for sustainable change

MUCH more than communications, MUCH more than consultation.

New Stakeholder Mindset

Seas, Oceans & Public Health in Europe

Linking oceans and health research

New Stakeholder Mindset in Action In Ireland

IRISH OCEAN LITERACY NETWORK

Explore Your Shore!

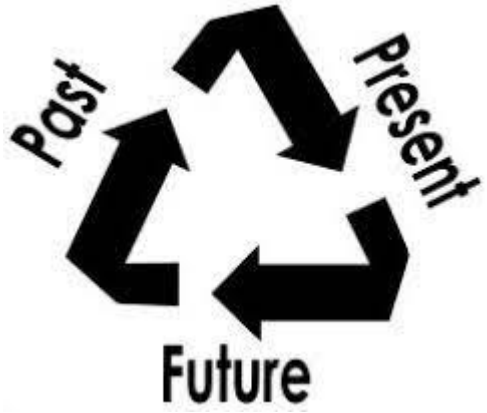
EXPLORERS Education Programme

#5KLitterSnap

DCU Institiúid Uisce DCU DCU Water Institute

NUI Galway OÊ Gaillimh

So what? Why is all this Important for Marine Citizen Science?



Participatory and Collective Impact

Participatory and Collective Impact

Considers:

- Who-to-engage with
- What-to-work-on together
- How-change happens on a large scale

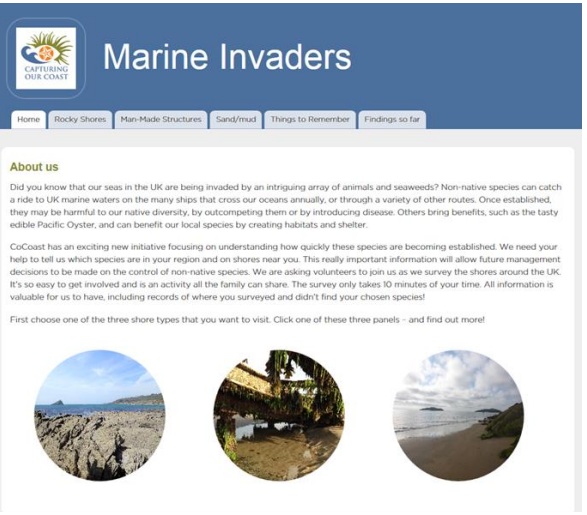
Participatory and collective impact incorporates reflections and feedback loops.

It also moves towards social impact that focuses on the relationships between communities and the progress toward shared objectives for marine citizen science.

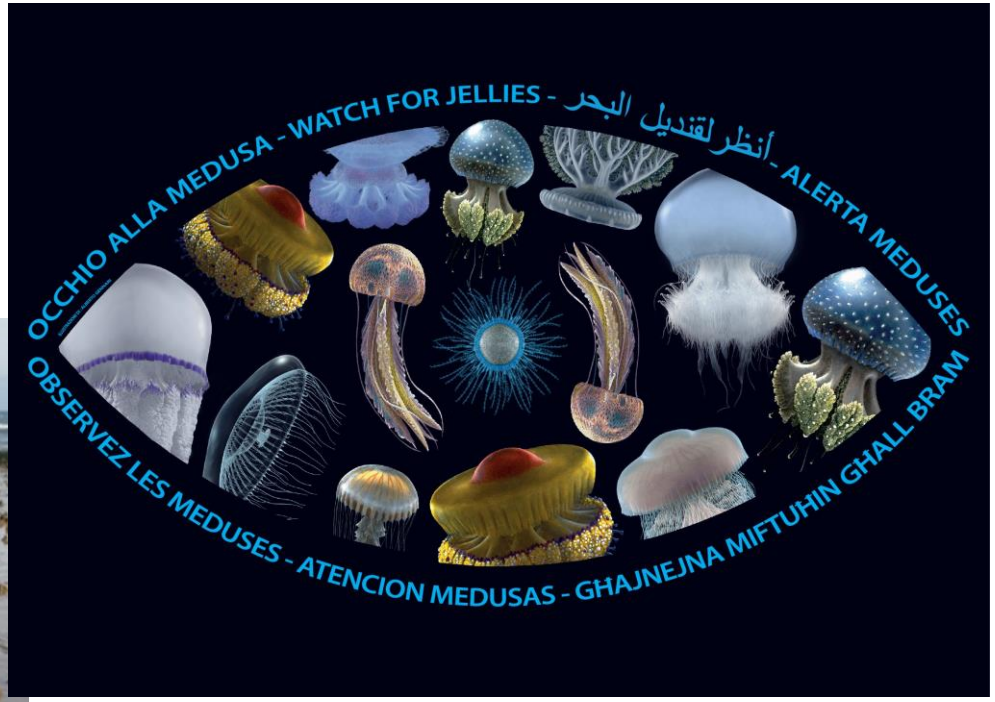
Source: Kania and Kramer (2011)

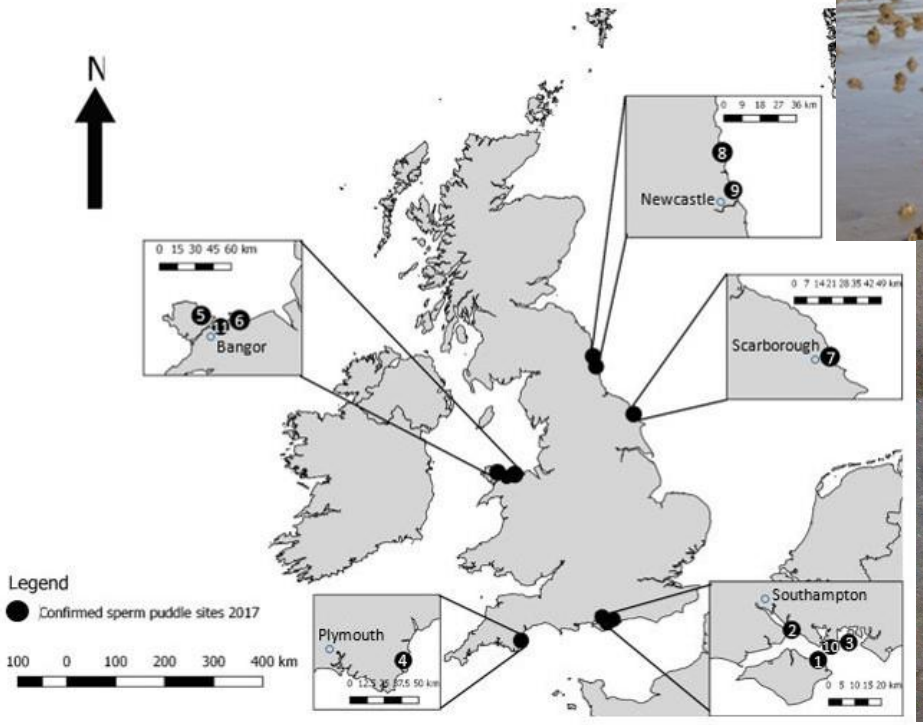
Large spatial and temporal scale: biodiversity mapping, invasives,

Newcastle University



Spermwatch!





Ensuring policy relevance: addressing MSP

NATURAL ENGLAND

Cyfoeth Naturiol Cymru
Natural Resources Wales

Marine Management Organisation

Cefas

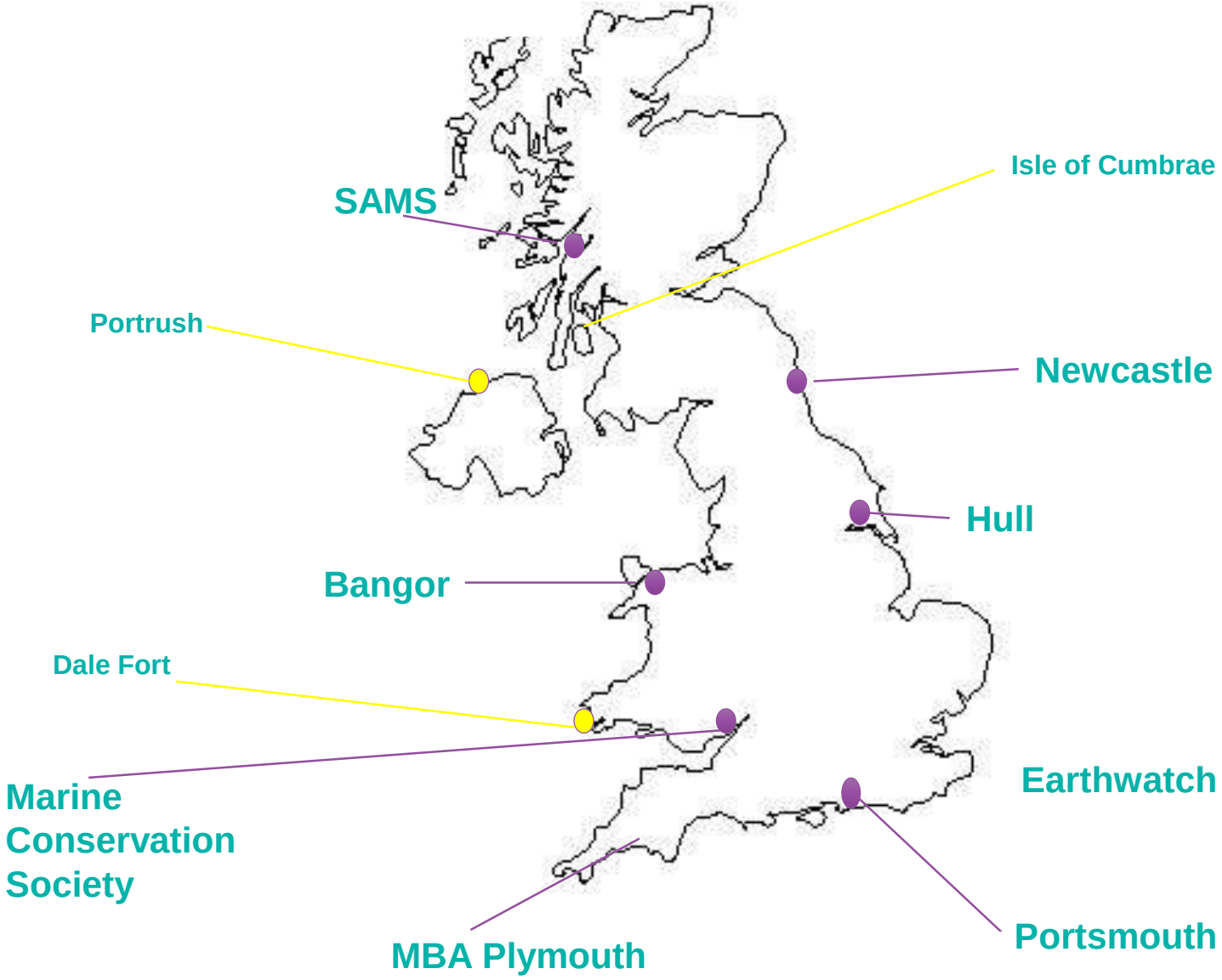
SEPA
Scottish Environment Protection Agency

Environment Agency

marine scotland

"… to explore the extent to which publics can contribute meaningfully to marine evidence gaps and address ecological hypotheses."

CAPTURING OUR COAST



Independent surveys of 8 species each (60 spp in total)

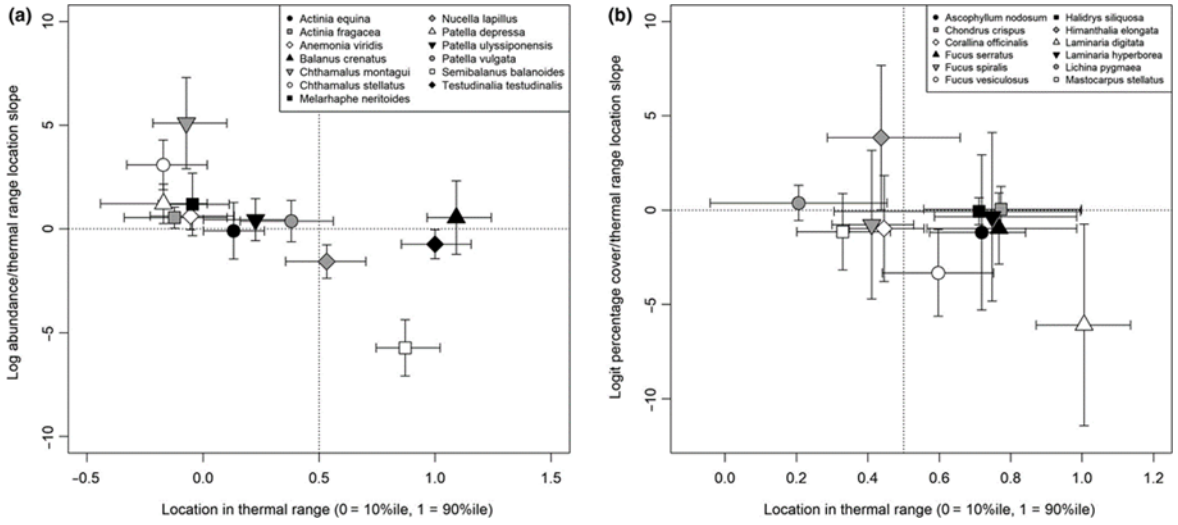
Manipulative experiments

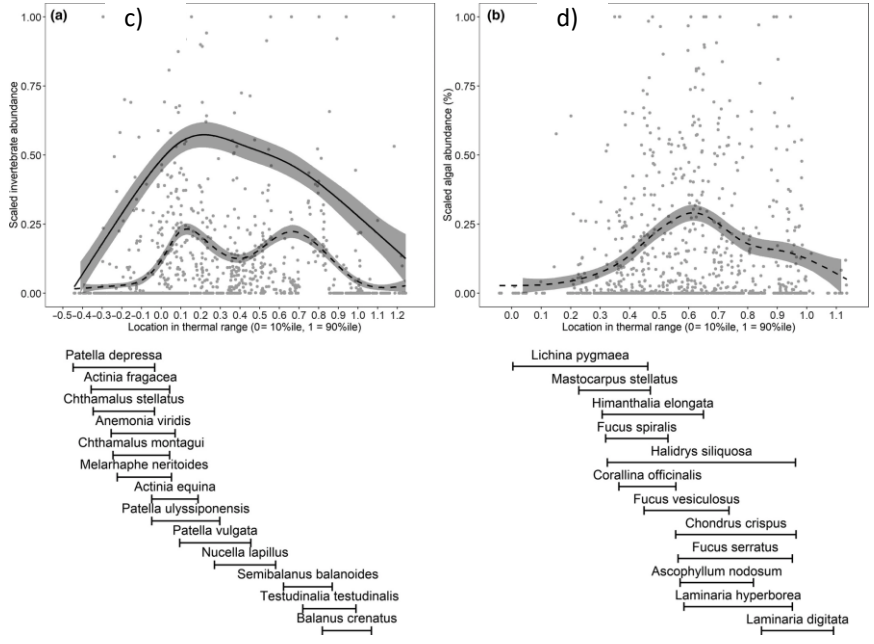
'Campaigns'

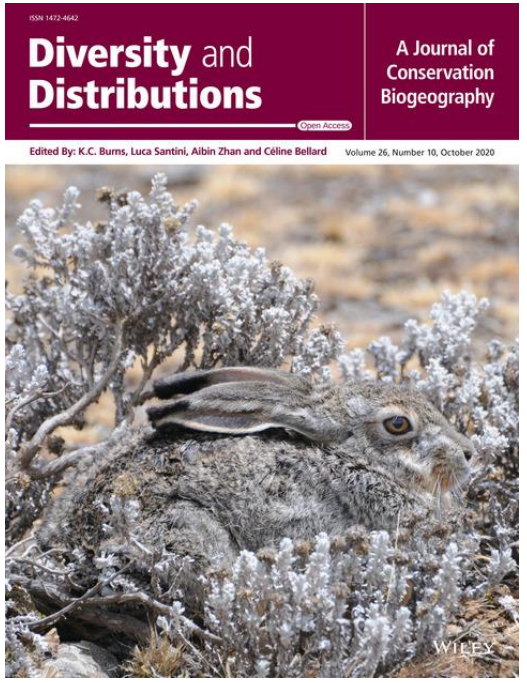
Coastal Usage App

Online '*zooniverse*'

Patterns of abundance across geographical ranges as a predictor for responses to climate change: Evidence from UK rocky shores



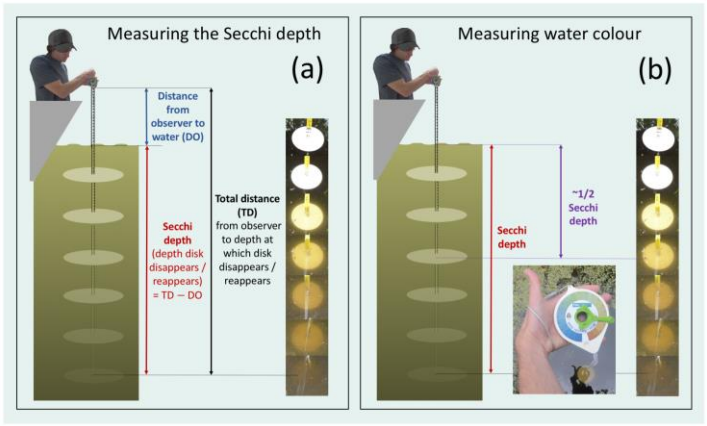




Vye et al., 2020. Diversity & Distributions, Vol 26, Issue 10, 1357-1365

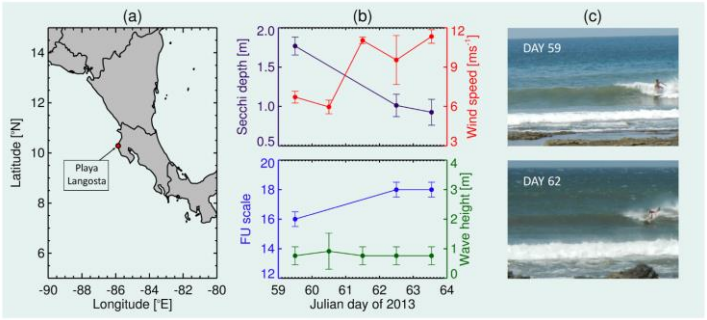
Technology and online crowdsourcing platforms: making the inaccessible accessible

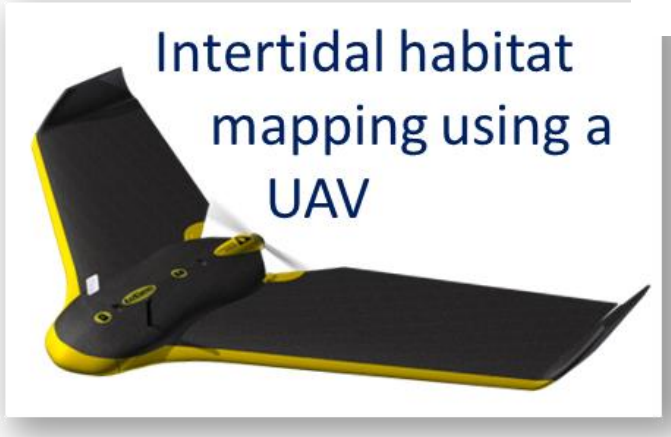
Newcastle University

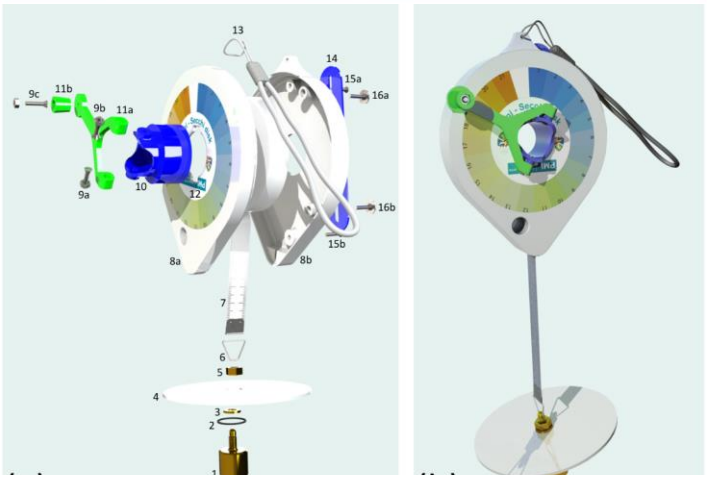


CiTCLOPS

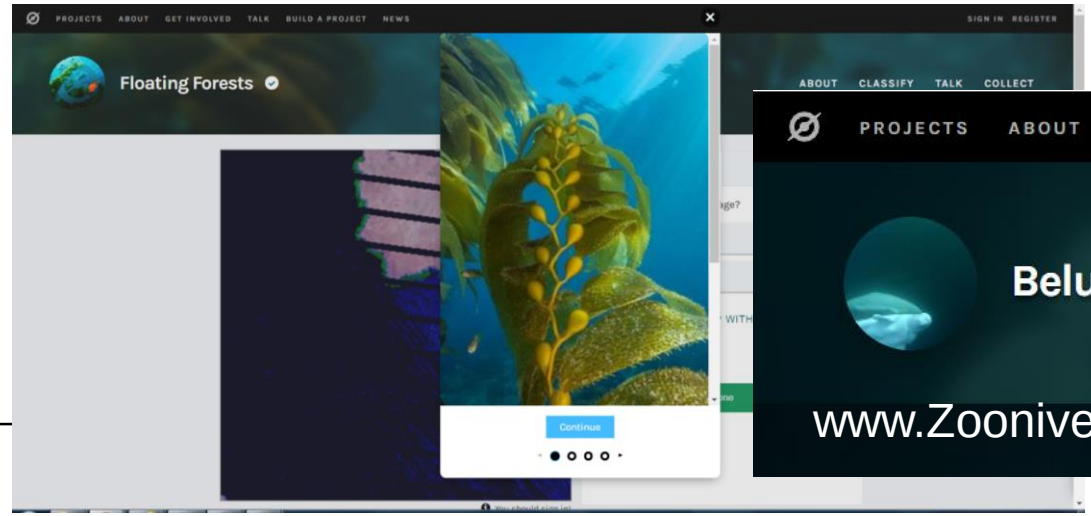
OSD Ocean Sampling Day

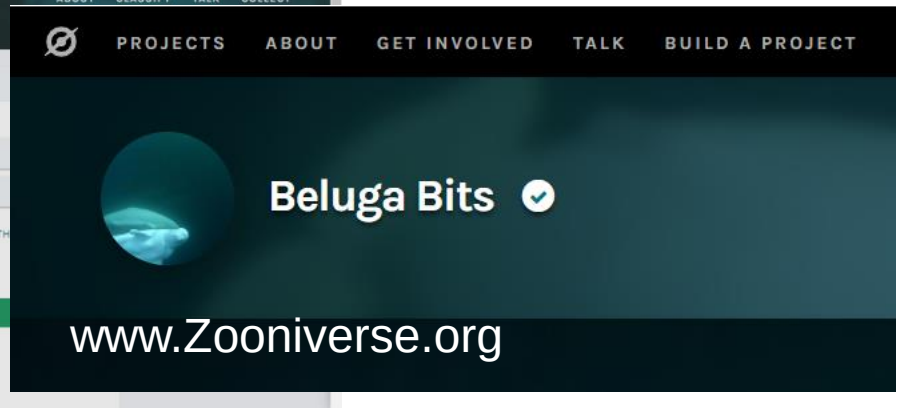


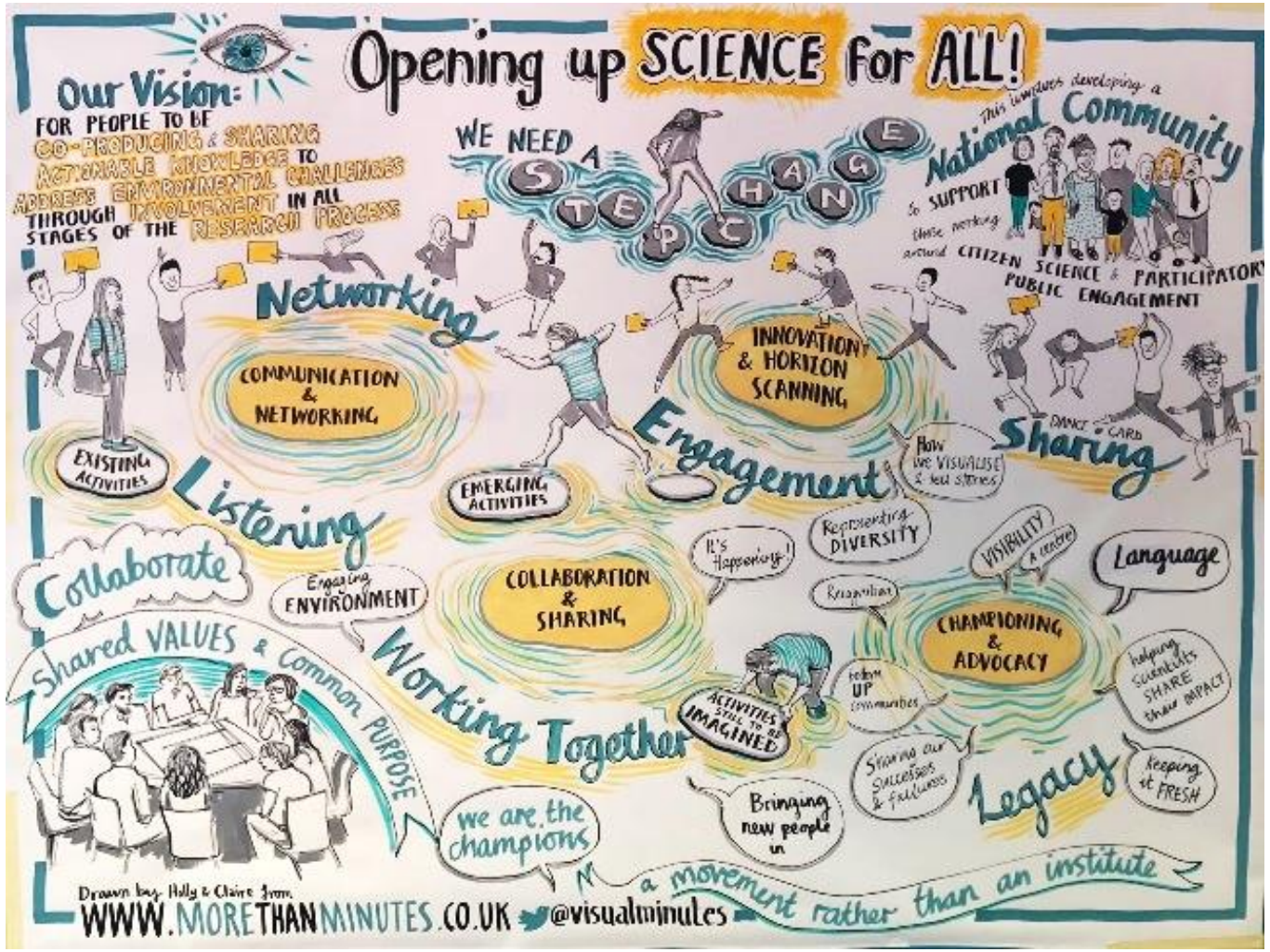




Brewin et al., 2019; 3-d printer water quality







NERC
SCIENCE OF THE ENVIRONMENT

NERC Community for Engaging Environments

University of Reading
UNIVERSITY OF BIRMINGHAM
University of Salford MANCHESTER
Newcastle University
ExCiteS Extreme Citizen Science
OPAL EXPLORE NATURE
EARTHWATCH INSTITUTE
Tekiu
CITIZENS UK
MANCHESTER 1824 The University of Manchester
UCL

Our Legacy

New capacities, tools and cultures



NERC SCIENCE OF THE ENVIRONMENT

Engaged diverse community leaders

Diverse communities feel they have a stake in environmental science research and have the capacity to tell stories about how environmental science connects to their everyday lives

Engaged research leaders

NERC research community regularly engages diverse communities in their research, supported by the NC4EE and self-sustaining local Communities of Practice

Inspiring future generations with tools, stories, approaches

Diverse communities and NERC researchers value each other

Team up to explore and debate contemporary issues in environmental science through listening, storytelling and citizen science

NERC as pioneer

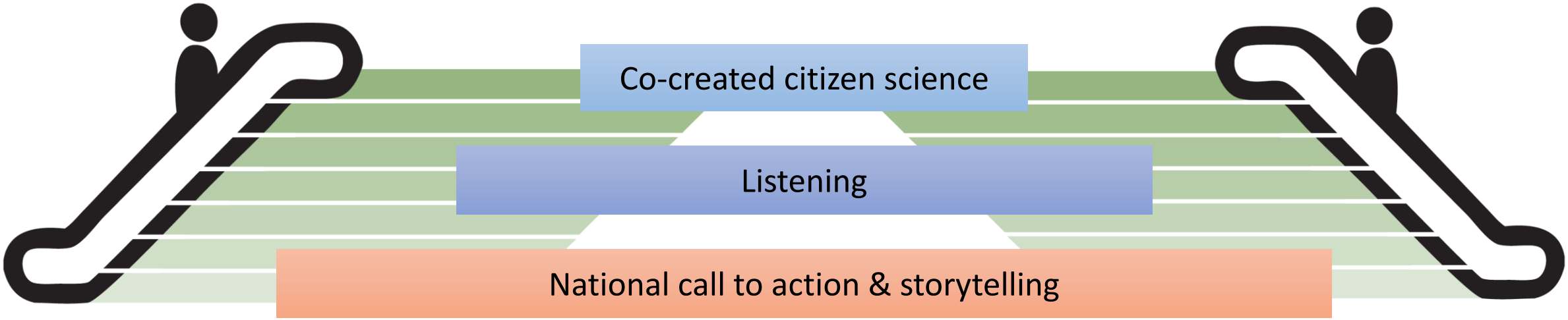
NERC leads the UKRI open science agenda with robust models for funding, reporting, and evaluating public engagement

Our approach

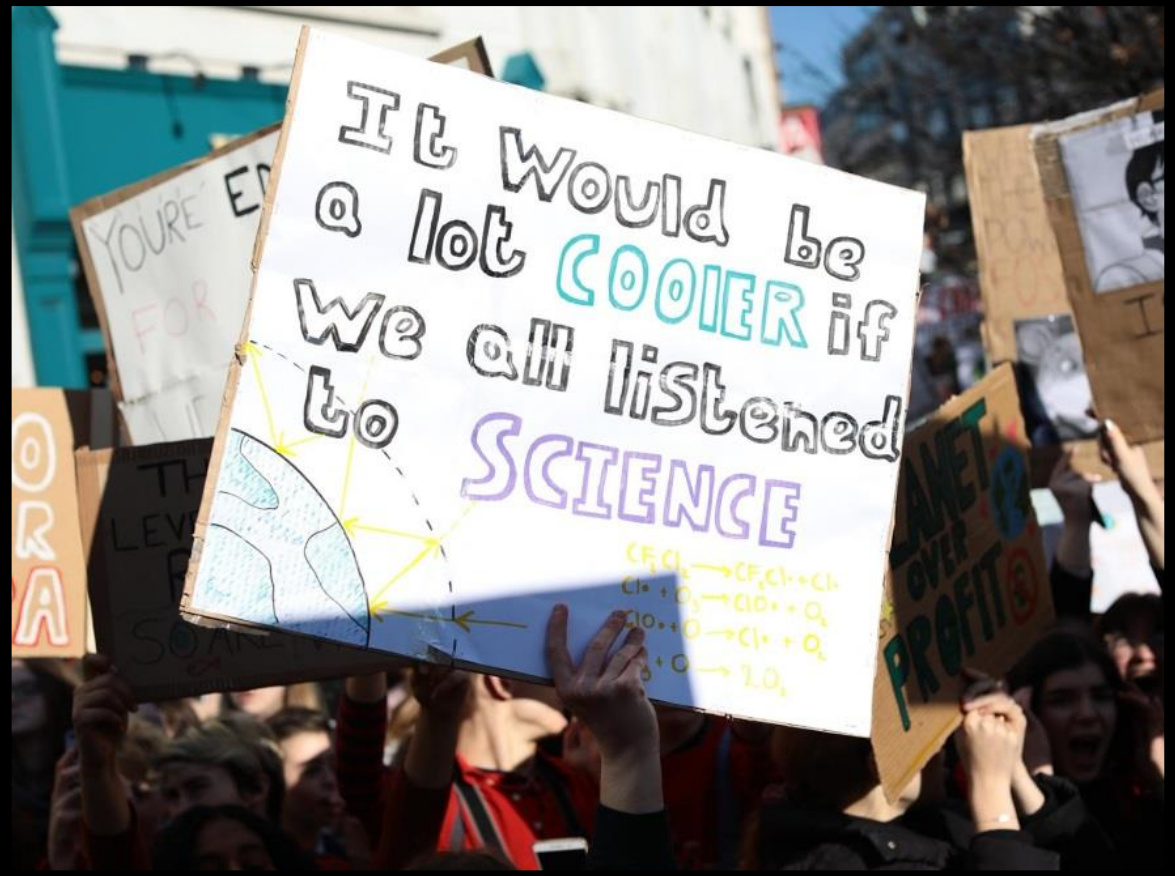
Lowering barriers to engagement to connect two communities to innovate public engagement together

Diverse communities

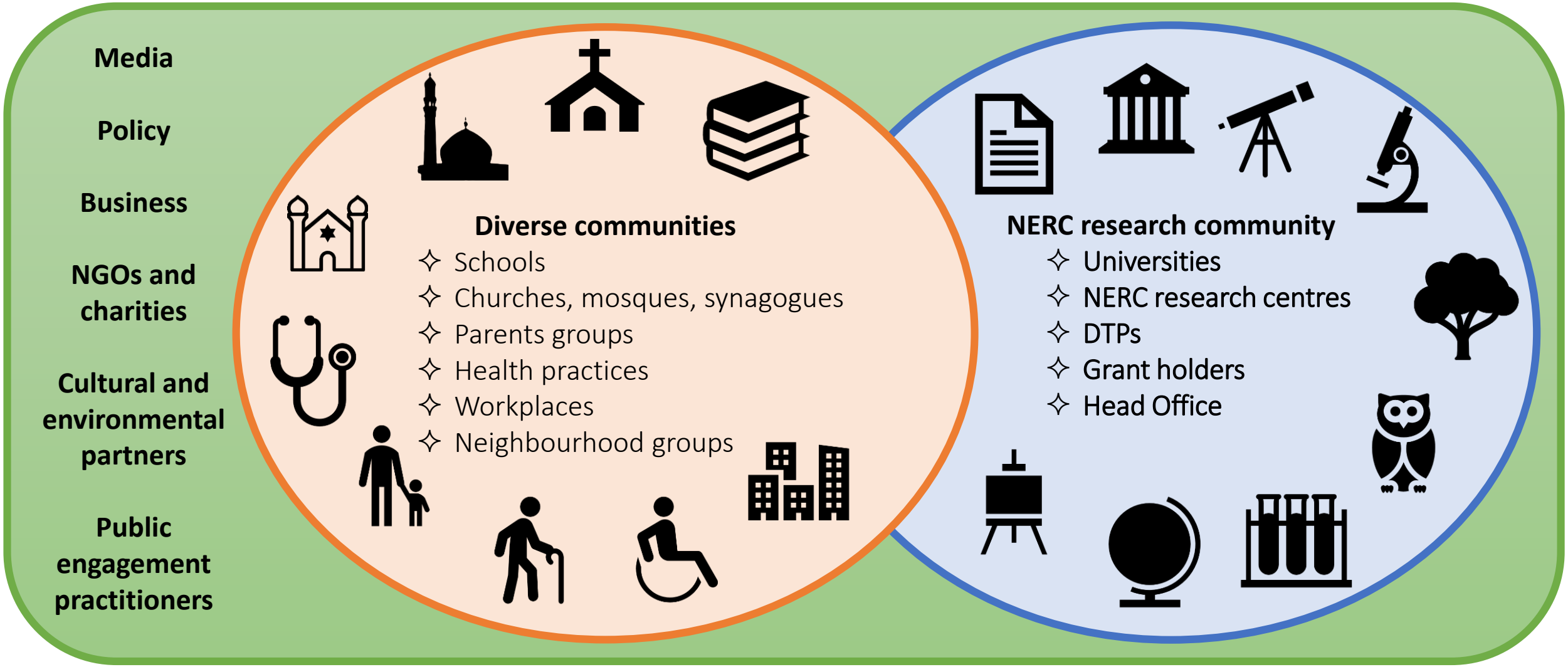
NERC research community



Why now?


It would be a lot COOLER if we all listened to SCIENCE
PLANET OVER PROFIT

Who we work with



What does Co-enquiry in Marine Citizen Science look like?

Diverse audiences

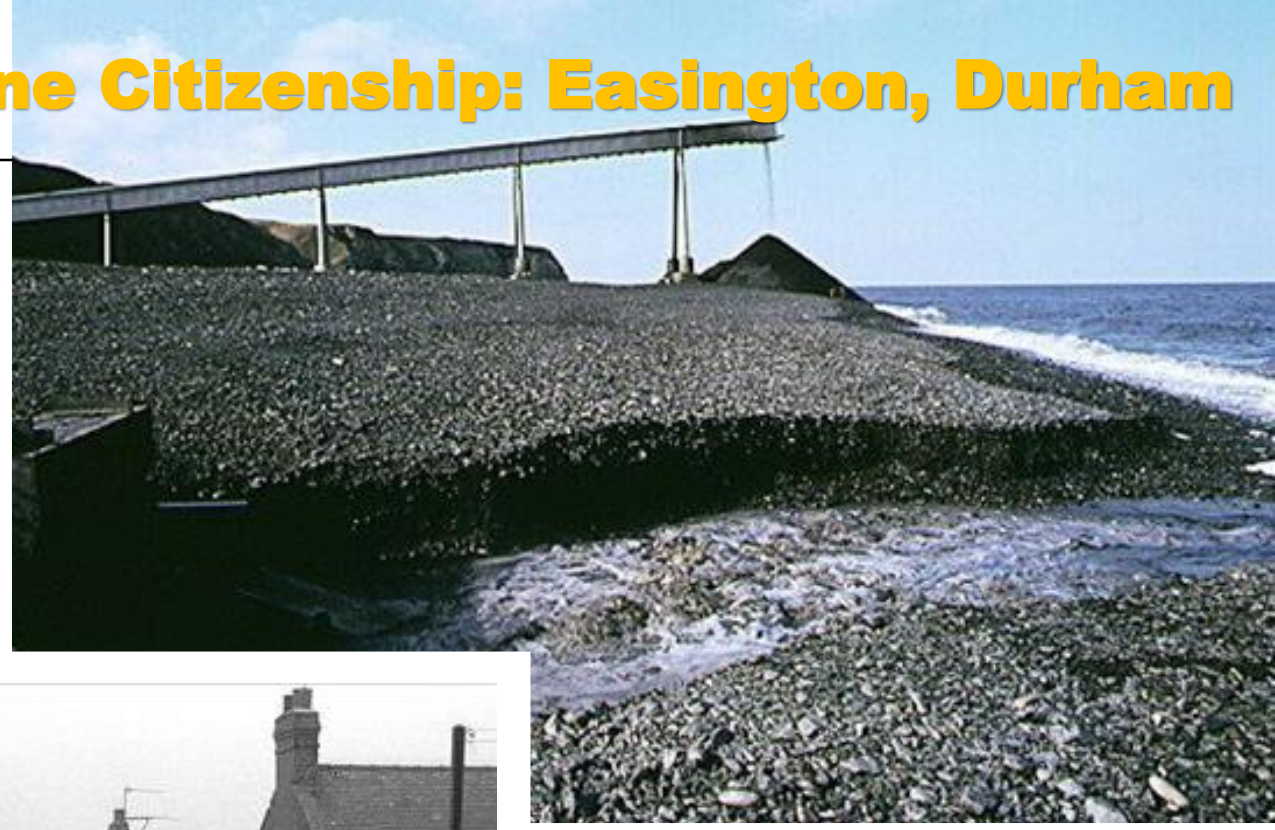
Ghana : building capacity through co-designed projects

Blyth Dunes Group: community ownership of the issues, support for data collection

School– industry – university partnership :

Gebbels et al 2011

Supporting development of a Marine Citizenship: Easington, Durham



@NCLDoveMarine

Position Paper recommendations:

Short-term Action Areas

- Understanding wider benefits
- Driving good practice
- Building competencies
- Cultivating Ocean Literacy

Longer-term Action Areas

- European MCS Platform
- Funding
- Improved Data Management
- Support Marine Policy

Marine Citizen Science

Positive outcomes for Science

Positive outcomes for the Global Marine Environment

Positive outcomes for Society

Bonney et al., 2014

Newcastle University

NUI Galway
OÉ Gaillimh

Thank you!

European MARINE BOARD
Advancing Seas & Ocean Science

NUI Galway
OÉ Gaillimh

Thank you.

FOR FURTHER INFORMATION CONTACT:

Christine Domegan
Christine.domegan@nuigalway.ie

Patricia McHugh
patricia.mchugh@nuigalway.ie