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Evaluation of Acclimatize

Final Report

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Evaluation of Acclimatize: Final Report

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Glossary

Acronym/Key word	Definition
UCD	University College Dublin
AU	Aberystwyth University
Southern Regional Assembly (SRA)	Programme Partner with responsibility for First Level Control in Ireland
Department of Public Expenditure and Reform (DPER)	Member State representatives from Government of Ireland and the national authority in Ireland for ERDF co-financed programmes
Welsh European Funding Office (WEFO)	Part of the Welsh Government that delivers European Union structural funds in Wales
European Regional Development Fund (ERDF)	A European Union fund to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions
The United Nations Educational, Scientific and Cultural Organization (UNESCO)	Specialised agency of the United Nations aimed at promoting world peace and security through international cooperation in education, the sciences, and culture
World Health Organisation (WHO)	An agency of the United Nations responsible for coordinating international health activities, aiding governments in improving health services
Project Advisory Group (PAG)	Group consisting of the main project partners and stakeholders of the Operation with non-executive, advisory and oversight responsibilities
Scientific and Technical Management Board (STMB)	Consisting of AU and UCD principle investigators and the Project Manager. Responsible for the executive management of the Operation
Non-Governmental Organisations (NGOs)	A non-profit organization that operates independently of any government to address a social or political issue
Faecal Indicator Bacteria (FIB)	Microorganisms that are natural inhabitants of the gastrointestinal tracts of humans and other warm-blooded animals
Quantitative microbial source apportionment (QMSA)	A tool to determine the relative contributions of individual streams, rivers and sewerage discharge in or near bathing waters
Microbial Source Tracking (MST)	A method determining the origin of pollution by tracking the FIB

Smart Coasts	An Ireland-Wales inter-regional Project focused on developing a new system to give real time water quality information
Ireland Wales 2014-2020 European Territorial Co-operation (ETC) programme	A maritime programme connecting organisations, businesses and communities on the West coast of Wales with the South-East coast of Ireland to work together to address common economic, environmental and social challenges.

Executive Summary

- i. This report represents the findings of the final evaluation of Acclimatize in 2023. The Operation was delivered by University College Dublin (UCD) in Ireland and Aberystwyth University (AU) in Wales. The Operation was funded through the Ireland Wales Territorial Cooperation Programme 2014-2020 (hereafter referred to as the Programme or Ireland Wales Programme) which is delivered by the Welsh European Funding Office (WEFO) in partnership with the Southern Regional Assembly (SRA) and the Government of Ireland’s Department of Public Expenditure and Reform (DPER) with a total budget of €9,184,911.70 including match funding.

Table i: Operation output indicators

Ireland Wales Programme Indicator	Phase I Target	Phase I Achieved	Phase II Target	Phase II Achieved	Total Target	Total Achieved
Number of research institutions participating in cross-border, transnational or interregional research operation	2	2	N/A maximum target reached	N/A maximum target reached	2	2
Number of new awareness raising initiatives targeting coastal communities	20	28	5	19	25	51
Cross-Cutting Themes Indicators						

CCT Number of organisations cooperating in enhancing the marine and coastal environment	20	20	6	4	26	26
CCT sustainable development - Adopt a travel plan	2	2	N/A maximum target reached	N/A maximum target reached	2	2
CCT Equal Opportunity - Minimum 40%/ 60% female / male balance on the operation research teams, boards and committees	40%/60%	Total ratio as of 31/10/20: 29% / 71% (6F / 15M) Ratio of appointees since start of project, as of 31/10/20: 68% / 32% (21F / 10M)	40%F/60% M	Ratio of current team members appointed since the start of project, as of 31/10/22: 55% / 45% (11F / 9M)	40%/60%	Total ratio as of close: 42% / 58% (13F / 18M). Ratio of current team members appointed since the start of project, as of 30/04/22: 50% / 50% (6F / 6M).
CCT Equal opportunity - Number of recruitment	N/A	34	N/A	1	N/A	38

and job opportunities made available to all.						
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Source: Acclimatize monitoring data

Key findings

- ii. Acclimatize has successfully achieved its objectives:
 - To improve knowledge on the impact of pollution events on bathing water quality
 - To produce modelling that predicts the effect of climate change on the use of bathing waters
 - To increase capacity and knowledge of Climate Change adaptation for the Irish Sea and coastal communities
 - To further collaboration between stakeholders in Ireland and Wales in the field of climate change
- iii. The Operation has been well managed, delivering work packages as planned. Indicator targets have been achieved and cross-cutting themes integrated as a matter of course.
- iv. Outcomes have been delivered due to Acclimatize with a strong contribution made to lasting impacts. One consequence, unintended at the start, has been development of a number of wastewater SARS-CoV-2 in wastewater surveillance projects and the establishment of the National Wastewater Surveillance Programme in Ireland which are direct results of the Operation.

Coherence and relevance

- v. The design of Acclimatize and its objectives were fit for purpose and highly coherent with the policy context. The need to increase the available knowledge of at-risk bathing waters and the effects of climate change in order to protect and enhance the local communities is evident. Acclimatize has been relevant to these needs in Dublin Bay,

rural bathing areas in Wales, and according to stakeholders increasingly further afield.

Efficiency

- vi. The Operation has been delivered efficiently by a highly competent and experienced team. Serious challenges, even the impact of Covid-19, have either not materialised or had a minimal effect on the overall Operation, due to the careful planning and management by the Operation team.

Effectiveness and added value

- vii. Acclimatize has been effective in collaboratively delivering new research and in disseminating the scientific findings that increase the levels of knowledge around adaptation to climate change amongst community bodies, including local authorities.

1. Introduction/Background

1.1 In April 2020 Miller Research in association with Fitzpatrick Associates were appointed by University College Dublin to undertake the evaluation of the Acclimatize Operation (referred to as Acclimatize or the Operation). The evaluation was in two stages, interim and final evaluations. This report presents the findings of the final evaluation phase.

About Acclimatize

1.2 Acclimatize was a joint research project undertaken by University College Dublin (UCD) in Ireland and Aberystwyth University (AU) in Wales. The Operation was funded through the Ireland Wales Territorial Cooperation Programme 2014-2020 (hereafter the Programme or Ireland Wales Programme) which was delivered by the Welsh European Funding Office (WEFO) in partnership with the Southern Regional Assembly (SRA) and the Government of Ireland's Department of Public Expenditure and Reform (DPER). The Programme focused on connecting organisations, businesses and communities in the Irish Sea region that face shared economic, environmental and social challenges. Acclimatize came under Priority Axis 2- Adaptation of the Irish Sea and Coastal Communities to Climate Change and contributed towards the Specific Objective to increase capacity and knowledge of climate change adaptation for the Irish Sea and coastal communities. The indicator for this objective at the Programme level is "Levels of knowledge of adaptation to climate change amongst communities and businesses".

1.3 The Operation had a budget of €9,184,911.70 from European Union and match funding across two phases of delivery. Phase II represented an extension of both activity and fundings from the original application. Acclimatize aimed to close the knowledge gap relating to the pollution of 'at risk' bathing waters in urban areas (Dublin Bay in Ireland) and rural areas (Anglesey, Ceredigion, Pembrokeshire in Wales) by quantifying pollution streams, identifying

the contributors to pollution, and determining pollution's impact on waters through climate change.

- 1.4 Acclimatize focused on the effects of climate change on faecal pollution of bathing waters and the river catchments that discharge into these. Acclimatize thus sought to identify what sources of pollution are (e.g. geographical sources, biological sources) while also quantifying their contribution to the problem.

About the evaluation

- 1.5 Operations that are supported by European Union funds through the Welsh Government and Government of Ireland are required to commission an external evaluation.
- 1.6 This report is the main output of the final stage of the evaluation, which was undertaken between October 2022 and April 2023.

Report structure

- 1.7 The remainder of the report is structured as follows:
- Chapter 2 sets out the methodology for the evaluation
 - Chapters 3-5 present the evaluation findings:
 - Operation drivers
 - Progress since the interim report
 - Outcomes and impacts
 - Chapter 6 presents the final conclusions for the evaluation of Acclimatize.

2. Methodology

- 2.1 The design for the final evaluation stage followed a similar method to the previous interim stage. The evaluation was based on Theory of Change approach built on guidance from the UK Treasury Magenta Book¹ and the EU Better Regulations Framework². This theory-based evaluation approach demonstrates how the effects (short term outcomes and longer-term impacts) are contributed to by the Operation's delivery and how the original drivers (policy and needs) have been addressed. This relationship is visualised in a logic model in Annex C.
- 2.2 The logic model and evaluation framework were developed during the interim evaluation. These were reviewed at the beginning of the final evaluation to ensure they were still appropriate, and where necessary adapted to meet the purpose of the final evaluation to measure impact as well as progress. All of the research materials produced for the fieldwork activities were based on the questions posed in the evaluation framework.
- 2.3 Management and monitoring data gathered by Acclimatize was reviewed to develop an understanding of the progress achieved since the interim stage. This was followed by in-depth qualitative interviews, four in Ireland, and five in Wales, with key strategic stakeholders including beneficiaries of project funding and Operation partners. In Ireland and Wales, we interviewed local government officials alongside environmental and natural resources organisations.³ A site visit was carried out at UCD which included a workshop with members of the Operation team.
- 2.4 In line with the non-experimental approach to the impact assessment, 'deadweight' questions were included in the interview topic guides. These included the extent to which wider stakeholders have gained

¹ <https://www.gov.uk/government/publications/the-magenta-book>

² https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulation-guidelines-and-toolbox_en

³ A list of organisations interviewed can be found in Annex A

knowledge of adaptation to climate change as a result of Acclimatize and to what extent they believe that they would have been able to gain this without the Operation.

3. Drivers

3.1 Acclimatize has been relevant and coherent to its drivers throughout its delivery. The design was tightly aligned with the policy and need with the result that there was a clear rationale for the Operation. The objectives were relevant, and in the view of stakeholder proportionate, and have been successfully achieved.

Policy

3.2 The interim evaluation found that Acclimatize was coherent with the policy context at European, Irish, Welsh, and wider international levels. This remained unchanged throughout the Operation, with consistency between the policies at all levels, the delivery, and outcomes of Acclimatize.

Table 3.1: Policy context

European policy	
Action Plan for a Maritime Strategy in the Atlantic Area ⁴	Acclimatize supported the local tourist sectors with improved water quality, which worked towards the Plan’s aim to create sustainable and inclusive growth in coastal areas
Bathing Water Directive ⁵	The Directive places a responsibility on Member States to try and ensure that all inland and coastal waters meet certain criteria and reach at least “good status”. The Operation sought to avoid the declassification/de-designation of beaches in coastal areas in Ireland and Wales.
Irish Policy	

⁴ European Commission (2013), Action Plan for a Maritime Strategy in the Atlantic Area, https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/publications/maritime-strategy-atlantic-ocean_en.pdf

⁵ BWD (2006) Council of the European Union (CEU), Directive 2006/7/EC of the European Parliament of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC. Official Journal of the European Union No L 64 4.3.

<p>Bathing Water Quality Regulations 2008⁶</p>	<p>EU Bathing Water Directive transposed into Irish law. Local authorities are required to put in place management plans to control and ameliorate bathing water quality. Acclimatize has provided better knowledge of the pollution pressures.</p>
<p>National Adaptation Framework⁷</p>	<p>National strategy to reduce vulnerability to the negative effects of climate change. Makes specific reference to several projects funded under Priority Axis 2, including Acclimatize.</p>
<p>Climate Action Plan for Ireland⁸</p>	<p>Prioritises national climate research capacity as one of the key measures needed in order to address decarbonisation targets and the impacts of climate disruption.</p>
<p>National Development Plan⁹</p>	<p>Covers the period 2018-27 and is focused on promoting investment towards a low-carbon and climate resilient society. By increasing knowledge of climate change adaptation, the Operation has increased resilience.</p>
<p>Our Sustainable Future – A Framework for Sustainable Development for Ireland¹⁰</p>	<p>Acclimatize aligned with the identified challenges of conservation and management of natural resources and tackling climate</p>

⁶ S.I. No. 79/2008 - Bathing Water Quality Regulations 2008, <http://www.irishstatutebook.ie/eli/2008/si/79/made/en/print>

⁷ Department of Communications, Climate Action & Environment (2018), National Adaptation Framework: Planning for a Climate Resilient Ireland, <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>

⁸ Department of Communications, Climate Action & Environment (2019), Climate Action Plan 2019, <https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/>

⁹ Department of Public Expenditure and Reform (2018), National Development Plan 2018-2027, <https://www.gov.ie/en/policy-information/07e507-national-development-plan-2018-2027/>

¹⁰ Department of Environment, Community and Local Government (2012), Our Sustainable Future: A Framework for Sustainable Development in Ireland, <https://developmenteducation.ie/media/documents/Our%20sustainable%20future%20irish%20framework.pdf>

	change, while also contributing to protection and enhancement of Ireland’s green infrastructure.
Local authority development plans: Dublin City, Dún Laoghaire-Rathdown and Fingal	These plans recognise the importance of the Dublin Bay area as a UNESCO-designated biosphere, and include objectives to improve water quality, bathing facilities and other recreational opportunities in the coastal, estuarine and surface waters around Dublin Bay. Acclimatize has contributed directly to actions in support of these plans.
Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region ¹¹	Acknowledges the strategic importance of Dublin bay as a natural asset in the region, which Acclimatize has supported.
Welsh policy	
Well-being of Future Generations (Wales) Act 2015 ¹²	The Operation supported the goals of ‘A Globally Responsible Wales’, ‘A Healthier Wales’, and ‘A Prosperous Wales’ by improving knowledge, and supporting the opportunities for coastal communities by improving tourism.
Environment (Wales) Act 2016 ¹³	The Act underpins the Welsh Government’s environmental strategy and ambitions, and was addressed by the Operation with the need to build resilience in the environment to extreme weather events.
Water Strategy for Wales ¹⁴	The contents of the Strategy reflect the essential rationale for Acclimatize.

¹¹ Eastern and Midland Regional Assembly (2019), Regional Spatial and Economic Strategy, <https://emra.ie/final-rses/>

¹² <https://www.futuregenerations.wales/about-us/future-generations-act/>

¹³ <https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>

¹⁴ <https://www.gov.wales/sites/default/files/publications/2019-06/water-strategy.pdf>

<p>Welsh National Marine Plan¹⁵</p>	<p>The vision of the plan aligned with Acclimatize, seeking to ensure Welsh waters are clean, healthy and safe.</p>
<p>Wales Marine Evidence Strategy 2019¹⁶</p>	<p>In coherence with Acclimatize, this Strategy targets the development of more accurate water quality assessment and monitoring techniques including an improved ability to determine causes of diffuse pollution in catchments and an improved understanding of the dynamics of bacterial pathogens to enhance management of Bathing and Shellfish Waters.</p>
<p>International Policy</p>	
<p>UNESCO strategy for action on climate change¹⁷</p>	<p>States the urgent need to take action to combat climate change and its impacts through education, sciences, culture and information and communication. The thematic focus areas of the strategy include developing and implementing climate change public awareness programmes and policies and promoting scientific cooperation for climate change mitigation and adaption. These activities were captured in the Acclimatize.</p>

Needs

- 3.3 With the stability of the policies, the rational for Acclimatize also remained unchanged throughout.

¹⁵ <https://www.gov.wales/welsh-national-marine-plan>

¹⁶ https://www.gov.wales/sites/default/files/publications/2019-09/welsh-marine-evidence-strategy_0.pdf

¹⁷ <https://unesdoc.unesco.org/ark:/48223/pf0000259255>

- The quality of coastal bathing waters and classification of beaches is important to the economic sustainability of coastal communities.¹⁸
- There is a lack of knowledge of the pollution streams that stifles the ability to take the necessary decisions to improve compliance levels.¹⁹
- Having an awareness of the levels of pollution in coastal bathing waters is essential in ensuring the public health of the population.²⁰
- Climate change is predicted to produce more extremes of weather, but there is minimal understanding of the impact this will have on bathing water quality.²¹
- To build on the existing data and findings on bathing water pollution, primarily the Smart Coasts project.²²

3.4 The Operation was clear that it addressed a knowledge gap on bathing water pollution and the effects of climate change on pollution levels through collaboration between academia and local government. Previous to Acclimatize, there was a lack of understanding where bathing water pollution sources have come from and what causes variance in those levels. This is more acute as weather events, more unpredictable and probable due to climate change, can increase the concentration of pollution in coastal bathing waters.

3.5 Stakeholders agreed with the rationale for Acclimatize. A strong link was evident to them between the research carried out by UCD and

¹⁸ http://ec.europa.eu/maritimeaffairs/policy/sea_basins/atlantic_ocean/documents/com_2013_279_en.pdf

¹⁹ Identified in stakeholder interviews

²⁰ Fewtrell, L; Godfree, A F; Jones, F; Kay, D; Salmon, R; Wyer, M D (1994) Results of the first epidemiological pilot investigation into the possible health effects of slalom canoeing on two fresh waters of contrasting quality. *The Lancet* 339, 1587-1589.

²¹ Kay, D., Lowe, C., McDonald, A.T., Figueres, M., and Lopez-Pila, J. (2011) *Impact of Climate Change on Recreational Water Use: Climate Change Risk of Bathing in Coastal Waters* Framework Service Contract. Project Preference: OJ/2009/09/25-PROC/2009/045/, European Centre for Disease Control, Stockholm, Final Report, 30th June 2011. 72p.

²² INTERREG-IVA 'Smart Coasts = Sustainable Communities', <http://www.smartcoasts.eu/>

AU, and the actions of local authorities to support communities and the environment.

- 3.6 A new area that the additional work packages were able to address was tracing the sources of pollution in bathing waters upstream. Whilst there is still more work to be done here, it was natural for the Operation to expand in this way as rivers and streams are some of the main carriers of pollution into coastal bathing waters and the pressures are also present in freshwater bathing waters. There is support amongst stakeholders for further research to support remediation and prevention activities.

Objectives

- 3.7 The core objectives for Acclimatize were:
- To improve knowledge on the impact of pollution events on bathing water quality
 - To produce modelling that predicts the effect of climate change on the use of bathing waters
 - To increase capacity and knowledge of Climate Change adaptation for the Irish Sea and coastal communities
 - To further collaboration between stakeholders in Ireland and Wales in the field of climate change
- 3.8 These objectives have been achieved. Indicator targets have been met or exceeded. The effects of delivery are discussed in more detail in section 5. Stakeholders, both internal and external, expressed that the Operation had been a success, with the wider stakeholders placing a high value on the support and knowledge generated by Acclimatize.

4. Operation Progress

Input

- 4.1 Inputs are the resources available to an operation to carry out its activities. This evaluation aims to assess whether the resources available enabled the Operation to carry out its activities to achieve its objectives effectively.
- 4.2 The Acclimatize Operation was well resourced, and inputs were effectively utilised. During interviews stakeholders responded that the Operation was adequately resourced to meet its objectives, and progress reports did not raise any concerns around resourcing. Further, the Operation met its objectives with the inputs considered below.

Funding

- 4.3 Acclimatize had a total budget of €9,184,911.20 for its delivery. Phase I of the Operation had a total budget of €6,722,945.20 receiving €5,378,356.64 funding from the ERDF and €1,118,197.29 in match-funding from University College Dublin and Aberystwyth University. With the confirmation of the extension of Acclimatize Phase II had a budget of €2,461,966 receiving €1,969,573 from the ERDF, and €492,393 in match-funding from UCD, AU, Dublin City Council (DCC), Dún Laoghaire-Rathdown County Council (DLRCC) and the Environmental Protection Agency (EPA) with the DCC, DLRCC and EPA components taking the form of time in kind. Due to the impact of Covid-19, some elements of the budget, such as travel, have been drawn on less than anticipated.
- 4.4 Stakeholders commented that the level of funding available to Acclimatize was sufficient for its objectives and that the delivery team delivered the Operation on time and on budget. They were also confident that the Operation was of significant benefit to the rural and urban coastal communities in which it was active.

Skills, Knowledge and Experience

- 4.5 The Acclimatize Operation utilised the skills and knowledge of the academic staff at University College Dublin and Aberystwyth University, as well as stakeholders in local government and organisations linked to coastal water quality. The research group for Acclimatize, on both the Irish and Welsh sides, has a reputation in the scientific community for excellence in their chosen field. Professors David Kay and Wim Meijer were widely regarded by stakeholders as major assets for the Acclimatize Operation. Furthermore, the fieldwork experience of the staff deployed was viewed as key in ensuring the accurate capture of data relating to bathing water pollution. During Phase II the addition of Dr Arwyn Edwards and Dr Aliyah Debonnaire for Work Packages 8 and 9 added significantly to the Operation as they are both recognised as experts in the field of molecular microbiology, and the Interdisciplinary Centre for Environmental Microbiology, to which they belong, is regarded as an internationally leading pioneer in portable nanopore DNA sequencing.
- 4.6 Related to the skills and knowledge of the individuals and institutions involved in the Operation was the synergy between this Operation and other Operations. Stakeholders identified Smart Coasts²³ as most closely linked to Acclimatize, through the personnel involved and the research. The pre-existing working relationships between researchers in Ireland and Wales (partly established during the Smart Coasts project and the wider Ireland Wales Programme) were also seen as a key component in making sure there was sufficient collaboration and cooperation throughout the Operation.

Management and Governance

- 4.7 The management and governance structure of the Acclimatize Operation was cited by stakeholders as being effective and efficient in ensuring Acclimatize achieved its objectives. Acclimatize was delivered by an operational management team of delivery staff and academic staff, who are all highly skilled and experienced. The

²³ <http://www.smartcoasts.eu/>

Project Advisory Group (PAG) met twice a year to discuss the Operation and engage with external partners. Stakeholders were confident that the Operation's staff were amply qualified for their roles and have the skills and knowledge to undertake them effectively. Furthermore, the delivery team stated that collaboration on previous projects made the governance of Acclimatize easier.

- 4.8 The governance of Acclimatize slightly varied in structure between Ireland and Wales, with a multi-disciplinary approach adopted in Ireland manifested in a 4-person team to discuss progress at a higher level, with group leaders managing teams working on the various work packages at the lower levels. Conversely, the Welsh side was organised under a single unit. Despite slightly differing governing structures there was frequent Project Management interaction between the Irish and Welsh sides.

Resources

- 4.9 Stakeholders were satisfied that the Operation had sufficient resources and assets available to achieve its objectives. The contribution of stakeholders providing match-funding as well as fieldwork experience and assistance has significantly contributed to the Operation's activities.
- 4.10 Despite the external factor of Covid-19, there were no significant resource issues during the course of the Operation that had a major impact on project progress. This evaluation has found that the Operation achieved its objectives within its allocated resources, and that it would have been difficult to achieve more with those resources given the efficiency of the Operation.

Monitoring Plan

- 4.11 Careful monitoring was required by the Operation to evidence outputs, including Programme cross-cutting themes. The evaluation has found clear evidence of detailed monitoring of Acclimatize's activities and evidenced outputs. The results of this monitoring are present in the detail of the progress reports submitted by the

Operation to WEFO. In conversation, the Operation delivery team were able to reference evidence readily and discuss in-depth cross-cutting themes giving specific examples. This evaluation is satisfied that the monitoring systems were more than sufficient to identify and record the necessary result indicators and cross-cutting themes.

Activity

WP1: Operation Management

- 4.12 The management and governance arrangements of the Operation have not changed since the interim evaluation. Operation management has continued to be smooth and agile, particularly in relation to the Covid-19 pandemic which was integrated into the Operations risk register the status of which altered depending on the restrictions in place in either Wales or Ireland. They kept close attention to the changing circumstances throughout the remainder of the Operation, modifying activities where necessary to continue delivery, and communicated risks and issues to the Project Development Officer on a weekly basis. In addition Operation management was flexible when managing work packages affected by undesirable weather patterns.

WP2: Bathing water characterisation

- 4.13 The purpose of WP2 was to characterise bathing water areas and the associated beaches in relation to pollution events by quantifying faecal indicator bacteria (FIB) from different sources; namely the levels of E. coli and enterococci. While WP2 was essentially complete prior to the interim evaluation, sampling has continued in Ireland to inform other work packages.
- 4.14 In Wales WP2 has taken a step further during Phase II by sampling transect position which reflects tidal state at the time of sampling, on FIO concentrations and corresponding compliance outcomes. They found that the water with lowest FIO concentrations was at the offshore end, while the near-shore had the highest FIO

concentrations. Regulatory agencies may have encouraged sampling during higher tidal states at the near-shore end to reduce sampler travel and potentially sampler cost, however, the Operation has shown this may result in poor quality outcomes. WP2 has demonstrated that it may be both important and beneficial to sample the full range of exposures and provided a sample along the whole tidal transect.

WP3: Quantitative microbial source apportionment (QMSA)

4.15 WP3 determined the relative contributions of individual streams, rivers and sewerage discharge in or near bathing waters. This included the difference between regular flow and storm surge events caused by rainfall as these make up 10 percent of time but cause 90 percent of the fluctuations in microbial levels in bathing waters.

4.16 Progress since the interim evaluation was straightforward for WP3 with delays in Ireland to the launch of the autosampler due only to insufficient rainfall. Once the autosampler was launched monitoring and analysis was completed in an efficient manner. In Wales progress of WP3 was focussed on maintenance of sites and the development of multivariate predictor models based on the data collected at each site. In addition, WP3 has provided useful insight into microbial loading across the four sites.

WP4: Microbial source tracking

4.17 Microbial source tracking (MST) determined the origin of pollution by tracking the FIB identified in WP3. By using genetic markers, it was possible to determine with what species and where detected microbial life originated. The analysis of streams and rivers complements and enhances the efforts of WP3. This work was largely completed during Phase I, however, sampling and analysis of samples continued during Phase II.

WP5: Linked models of catchments and the near-shore zone

4.18 WP5 translated the input data from WP2-WP4 into impacts at bathing water sites through the design and calibration of prediction models.

Each bathing water in the Operation is unique with a clear difference between urban bathing waters in Ireland and rural catchments in Wales.

4.19 During Phase II the model in Ireland was enhanced to include links to weather forecast data, improvements to rain forecasting, and integration of faecal bacteria model and QMRA model. Further changes were made to integrate machine learning, and the development of a data manager app for Dublin City Council. In Wales enhancements were made to the security of monitoring stations after an act of vandalism to the Afon Wygr river level monitoring stations. Working with Natural Resources Wales a second, less accessible, monitoring station was installed. The operational utility of this work package was demonstrated by the change in classification of Cemaes bathing water from EU Poor in 2016 and 2017 to EU Excellent in 2021, as well as presentation of the enhancements to the Water and Health Partnership bathing waters group.

4.20 How the relevant local authorities use the models produced by Acclimatize is beyond the scope of the Operation. Some stakeholders, whilst glad to have the tools available, were concerned about the relative resource intensity, in terms of work hours, to have them running, as well as potential concerns around availability of a suitably qualified workforce. For these stakeholders finding a way to automate the models continues to be a priority. From the point of view of the stakeholders these models are the most important output of the Operation as they are tangible products that can be used by others.

WP6: Climate change effects on near-shore microbial water quality and health risk

4.21 WP6 assessed the impact of climate change on bathing water pollution by investigating the link between faecal impacts and climate change. It utilised the models produced in WP5 together with future climate change scenarios, for example forecast rainfall changes at specific sites.

- 4.22 In Ireland, Acclimatize used the climate rainfall and flow data from an Environmental Protection Agency funded project WaterFutures to develop flow indices to 2100. These were integrated with the water quality and QMRA models for risk assessment to complete a model for health risk assessment under climate change scenarios.
- 4.23 In Wales, multiple regression models were developed for each study site to determine the proportion of “Poor” outcomes between two rainfall thresholds. These thresholds were then applied to predicted rainfall sequences from the UK Meteorological Office for bathing seasons up to 2080. The results demonstrated that due to the significant decline in bathing season rainfall there are statistically significant changes in the mean number of days with consistently “good” water quality in the future. These results suggested a significant improvement in public health related gastrointestinal illness rates from marine recreational water exposures across the Interreg area in Wales.

WP7: Communication

- 4.24 Communication plans for Operations in the Ireland Wales Programme are integral to achieving the ‘Levels of knowledge of adaptation to climate change amongst communities and businesses’ programme indicator and vital for Acclimatize to share its findings widely with a variety of audiences. The Operation had several specific audiences targeted for communications including the general public, policy professionals, politicians and water and health professionals at the local to the international levels.
- 4.25 Throughout delivery, communication and outreach has been consistent. Key stakeholders’ presence on the PAG has kept them informed with regular formal and informal communications as laid out in WP1. Outreach events to local and wider communities have been successful. For local communities, stakeholders commented on the risk of alienating key figures (such as farmers) who are an important part of any consequences of Acclimatize’s work. The presence of

senior members of Acclimatize at community meetings to discuss the issue of bathing water quality with the general public was noted as bringing considerable subject authority and useful by removing the stakeholders as a go between 'middleman'.

- 4.26 The team has consistently communicated the Operations findings at the highest level to inform policy both internationally and nationally. During Phase II they met with the International Blue Flag director to provide advice on water quality, contributed to the EU evaluation of the Bathing Water Directive (i.e the Melieu report) and spoke at the International Water Association with the World Health Organization to explain the findings of Acclimatize. At the national level they have met with An Taisce, NRW, the Welsh Government, Anglian Water Services, UK Water Industry Research and Dŵr Cymru Welsh Water to share insights into water quality and lessons learned from the Operation, as well as the potential further utilisation of the data collected and models developed. This advice has been at the cutting edge of policy with the Operation providing advice on freshwater bathing, and meeting regularly with the River Wharfe Partnership Board to discuss the first EU designated riverine bathing water in the UK. The Operation team have also been generous with their time in supporting other Operations, meeting with the Digital Water City team, a EU Horizon 2020 project, to share experiences and lessons from Acclimatize.
- 4.27 Presentations have been made by the Operation team to scientific and bathing water management conferences, and the European Committee and World Health Organisation (WHO), to disseminate the findings throughout the field. Twelve articles have been published in peer reviewed journals.²⁴ Online communication were also present through social media and a regularly updated website and the Acclimatize team also collected metric data on social media and other outreach activities included in Table 4.1. There were additional

²⁴ A list of academic journal publications can be found in Annex B.

Acclimatize communication activities for which metrics were not available, including news articles in the Daily Post, Irish Examiner, Newstalk, public meetings and presentations, inclusion in government communications, and inclusion in a popular natural history book, “Dublin Bay: Nature and History by Richard Nair, David Jeffrey and Rob Goodbody.”

Table 4.1: Outreach activities with metrics

Date	How was target achieved?	Partner	Type of initiative	Target recipients	Metrics
12/10/2017	Acclimatize operation launch	UCD & AU	Operation launch	Operation stakeholders	65 attendees
11/04/2019	UCD ENGAGE 2019 outreach laboratory – the Acclimatize team welcomed three transition year classes from different schools to the UCD Science Centre outreach lab where they gave a talk about the project and demonstrated some of the laboratory techniques used in the project.	UCD	Outreach lab	Transition year students (age 15 - 18)	c. 50

	Article about the Acclimatize project in the Environmental Protection Agency's Catchments newsletter	UCD	Newsletter article	EPA newsletter subscribers, distributed via 12 Community Water Officers to local communities, local authorities amongst others.	4808 recipients
08/06/2019	Acclimatize stand at UCD Festival	UCD	Acclimatize stand at UCD Festival	Local community	13,000 Science Centre, 20,000 UCD campus
30/09/2019	Article about the UCD Acclimatize team's fieldwork during the 2019 bathing season in the UCD SBBS Newsletter 2019	UCD	Newsletter article	University community - students, staff and alumni	606 students, 107 staff, 2,400 alumni
19 - 21/11/19	Presentation by David Kay, Mark Wyer and Carl Stapleton at the UK Bathing Water Conference, Belfast	AU	Presentation - professional outreach	Bathing water practitioners, members of the scientific community	180 delegates

17/06/2020	David Kay gave an invited presentation titled The Complex Challenges of Dealing with Bathing Waters at the EPA National Water Event 2020 Online Conference Restoring Our Waters with approximately 1,200 attendees	AU	Presentation - professional outreach	This is a key forum for Local Authorities, Regulators and Water professionals.	1200
12/05/2022	Twitter coverage from Acclimatize, Dublin City Council, Dún Laoghaire-Rathdown County Council and Fingal County Council accounts resulting in 3,994 animation views	UCD	Twitter	General public	3,994 animation views
03/06/2022	Acclimatize team members Niamh Martin and Tristan Nolan appeared on the Jennifer Zamparelli radio show (138,000 listeners ³) on	UCD	Radio interview	General public	138,000 listeners

	2FM. Listenership				
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4.28 Communications have played a role in the Operation’s contribution towards cross-cutting themes. Materials have been made available in Welsh, Irish, and English where appropriate. Venues sought for public information meetings strive to be accessible to people with disabilities and, whenever possible, were held in areas close to public transportation. The project website is also trilingual, which internal Operation stakeholders have suggested is probably unusual for a science-based website.

WP8: Detailed catchment characterisation

4.29 WP8 examined the streams and rivers that WP2, WP3, and WP4 have identified as important sources of pollution affecting the quality of bathing waters. This work package identified the routes of contamination into these catchments, essentially following the FIB upstream from the bathing waters. The knowledge gained increased the detail of the models in WP5 as well as those focused on climate change in WP6 and WP10.

WP9: Identification of the biological sources of faecal contamination in catchments

4.30 WP9 has strong links to WP4 and WP8 in that it expands the MST activities to a full forensic analysis of the catchment close to the source of the faecal contamination. This work included greater refinement of the modelling developed in WP5, In Wales WP9 provided one of the largest collections of environmental microbiome samples from any UK environment with analysis carried out by Dr Arwyn Edwards and Dr Alyiah Debonaire who are recognised experts in this field which led to a clear understanding of the species contribution to faecal loads.

4.31 In Ireland this workstream contributed directly to the SARS-CoV-2 Surveillance of Sewage project funded by Science Foundational

Ireland with sampling of wastewater to determine primary biological sources of faecal contamination. The conclusion of this work led directly to three additional projects, continued wastewater surveillance of Dublin's sewerage network, UPCOM, wastewater surveillance of meat plants, and UniCoV, involving wastewater surveillance of four university campuses. In addition, the findings of the initial project led to the establishment of the National Wastewater Surveillance Programme in Ireland with UCD working in collaboration with the Health Protection Surveillance Centre (Health Service Executive), the Health Intelligence Unit (Health Service Executive), the National Virus Reference Laboratory and Uisce Éireann.

WP10: Climate change effects on catchment microbial water quality and health risk

- 4.32 WP10 added to the delivery of WP6 by incorporating the findings of WP8 and WP9 into climate change effects models. In Wales UK Meteorological Office data was analysed for the four modelled sites which determined the lower number of summer storms in the period up to 2100. This allowed for model enhancements integrating rainfall thresholds and hydrological thresholds to increase the scope for both water quality and health risk predictions going further than current systems including those used developed by the European Centre for Disease Control in 2011. In particular, they noted specific catchment impacts of climate change. In Ireland WP10 developed climate change scenarios and incorporated into the existing catchment and coastal models developed by the Operation.

Outputs

- 4.33 As part of the Ireland Wales Programme, Acclimatize had three formal output indicator targets and three CCT case level indicators. All of the indicators were achieved by the close of the project.

Table 4.2: Operation output indicators

Ireland Wales Programme Indicator	Phase I Target	Phase I Achieved	Phase II Target	Phase II Achieved	Total Target	Total Achieved
Number of research institutions participating in cross-border, transnational or interregional research operation	2	2	N/A maximum target reached	N/A maximum target reached	2	2
Number of new awareness raising initiatives targeting coastal communities	20	28	5	23	25	51
Cross-Cutting Themes Indicators						
CCT Number of organisations cooperating in enhancing the marine and coastal environment	20	20	6	4	26	26
CCT sustainable development - Adopt a travel plan	2	2	N/A maximum target reached	N/A maximum target reached	2	2

CCT Equal Opportunity - Minimum 40%/ 60% female / male balance on the operation research teams, boards and committees	40%/60 %	Total ratio as of 31/10/20: 29% / 71% (6F / 15M) Ratio of appointees since start of project, as of 31/10/20: 68% / 32% (21F / 10M)	40%F/60% M	Ratio of current team members appointed since the start of project, as of 31/10/22: 55% / 45% (11F / 9M)	40%/60 %	Total ratio as of close: 42% / 58% (13F / 18M). Ratio of current team members appointed since the start of project, as of 30/04/22: 50% / 50% (6F / 6M).
CCT Equal opportunity - Number of recruitment and job opportunities made available to all.	N/A	34	N/A	1	N/A	38

Source: Acclimatize monitoring data

Contribution towards Programme Indicator: Levels of knowledge of climate change amongst communities and businesses

4.34 Stakeholders in Ireland and Wales attributed having a greater understanding of the effects of climate change on bathing waters to Acclimatize. Stakeholders also attested to the presence of better understanding amongst community bodies, including local authorities. The increase in the understanding of the main pollution pressures

(see section 5 below) and the likely effects of different climate events caused by climate change have informed models that give real time updates on bathing water quality. These updates are available to the general public, and stakeholders were certain a better understanding of climate change is an effect that local businesses will gain from their use.

Integration of cross-cutting themes

- 4.35 Ireland Wales Programme Operations must address cross-cutting themes that aim to improve the quality and legacy from operations. There are two cross-cutting themes aligned to three targets each that Acclimatize must work towards in addition to main delivery.
- The Sustainable Development CCT aims to ensure that programmes and operations/projects work to meet social, economic and environmental objectives simultaneously.
 - The Equal Opportunities and Gender Mainstreaming CCT aims to reduce injustice and promote social cohesion by providing the opportunity for all eligible beneficiaries to participate. In Wales, this Theme includes promotion of and support for speakers of the Welsh language.
- 4.36 Acclimatize has made excellent progress in addressing these cross-cutting themes with indicators achieved or on course to be achieved.
- 4.37 By its nature, the Acclimatize project was closely aligned with the Ireland Wales Programme's wider sustainable development objectives, as it seeks to improve knowledge regarding the impact of climate change on water quality. In addition, the project's activities adopted wider practices that promote sustainable development objectives, where possible, although these tended to be practices that are being more commonly adopted in general. These included the travel plans that encouraged car sharing and other ways of reducing the impact of travel, for example, or taking account of environmental considerations in its use of supply chains.

- 4.38 For Equal Opportunities and Gender Mainstreaming, both University College Dublin and Aberystwyth University adopt equal opportunities policies that do not discriminate on the grounds of gender, marital status, family status, sexual orientation, religion, age, disability or race. Recruitment opportunities have been advertised widely using a range of methods, including job centres, agencies, national, local and specialist press, third sector organisations and other websites where appropriate and affordable. Recruitment since the start of the operation has been overwhelmingly in favour of female appointees which has addressed the initial heavily male team.
- 4.39 The Operation has made vital contributions to the Welsh and Irish languages by providing scientific information in Welsh and Irish, as well as in English, which is unusual in the scientific field.

5. Outcomes and Impacts

- 5.1 The effects of Acclimatize included its outcomes (the medium-term change arising from the outputs of its activities) and its impacts (the longer-term and much more indirect change, partially arising from the Operation).
- 5.2 The interim evaluation found evidence of indicators that effects of the Operation were creating positive outcomes from an early stage which was encouraging for the potential of longer term impacts. As the Operation comes to a close there are clear indicators for positive outcomes, and evidence of direct contributions to longer term impacts. Stakeholders noted that the communication from Acclimatize to the stakeholders was the key factor in allowing them to act on the findings of the activities.

Table 5.1: Operation outcomes and impacts

Outcomes	Impacts
OC.1 Understanding of the main pollution pressures on bathing waters in urban and rural settings	IM.1 Coastal communities that are better equipped to combat the emerging challenges from climate change
OC.2 Tools to assess the impact, risk and vulnerability of climate change on the Irish Sea (particularly bathing waters)	IM.2 A marine and coastal environment that is preserved and enhanced
OC.3 Transfer of knowledge, expertise and best practice on adaptation measures for 'at-risk' bathing waters	IM.3 Policy making and infrastructure decisions to protect and improve coastal bathing waters are informed by a better evidence base
OC.4 A knowledge-sharing platform about risks and opportunities from climate change between stakeholders in Ireland and Wales	IM.4 Sustainable coastal bathing waters that provide economic and social benefits to coastal communities
OC.5 Awareness and understanding of Acclimatize and its research amongst stakeholders, local	

communities, NGOs, the scientific community and the Joint Secretariat

OC.6 Cooperation between organisations to enhance the marine and coastal environment

Understanding of the main pollution pressures on bathing waters in urban and rural settings

- 5.3 Before the delivery of Acclimatize the understanding of pollution pressures was limited. Stakeholders interviewed for the evaluation admitted that although there was knowledge of the factors that affected bathing water quality this was restricted to a qualitative understanding. Without a quantitative understanding of the amount and severity of pollution from different sources remediation activities could not be targeted effectively. There was also a risk of previous understandings being influenced by what local communities felt were important issues rather than being led by scientific information.
- 5.4 The interim evaluation demonstrated improved understanding of the main pollution pressures, however, this understanding was different in Wales and Ireland contributing differently to the impacts of the Operation.
- 5.5 In Ireland both the 24-hour sampling and genetic analysis of samples allowed for identification of pollution pressures generally as bird, human and canine, as well as the specific identification with misconceptions in particular urban developments. This outcome led directly to IM.3, 'Policy making and infrastructure decisions to protect and improve coastal bathing waters are informed by a better evidence base'. The local authority and development owner were able to use the evidence produced by Acclimatize to make infrastructure decisions, in particular, developing solutions to reduce pollution identified by Acclimatize, this contributed to both IM1. and IM2. Finally, due to the importance of bathing waters as an economic

resource through tourism an improved understanding of pollution has laid the groundwork for IM.4.

- 5.6 In Wales, similarly, the sampling from Acclimatize was used to identify specific sources of pollution leading to one of the major impacts, the protection of the coastal environment through the investment in infrastructure in nine farms. By preventing cattle entering the Afon Wygyr in Anglesey the amount of pollution that reaches Cemaes Bay will be reduced.²⁵ Thus this outcome has directly led to positive impacts from the Operation, particularly IM.1 and IM.4.

Tools to assess the impact, risk and vulnerability of climate change on the Irish Sea (particularly bathing waters)

- 5.7 The improved understanding of pollution pressures led by increased frequency of data sampling, installation of data collection tools, and model development has successfully met this outcome. Through increased knowledge around the contribution of UV rays, adverse weather events, and changing daily patterns, the Acclimatize Operation has developed tools to assess the impact, risk and vulnerability of climate change on the Irish Sea, particularly on bathing waters. In addition, Work packages 6 and 10 developed specific models to assess the vulnerability of Irish and Welsh waters to climate change. Building upon the other work packages WP6 evaluated climate change scenarios on the Dublin Bay area through the effects of sea level rise, light intensity and radiation, and temperature change. In particular focussing on the effect these scenarios would have on faecal bacteria decay rates. WP10 tested the validated catchment and coastal models developed by Acclimatize against different climate change scenarios to simulate the effect of climate change and the future efficacy of these models directly contributing to IM1. and IM3. Ensuring the evidence base for decision making is robust, and coastal communities are aware of and prepared for the effects of climate change. WP10 developed climate change scenarios

²⁵ <https://naturalresources.wales/about-us/news-and-events/news/small-changes-for-a-cleaner-river/?lang=en>

to simulate the effects these would have on the validated catchment and coastal models.

- 5.8 This included the development of the MÉRA Data Extraction toolkit which enables intuitive, fast extraction and preprocessing of data from the Met Eireann dataset. This culminated in an article published in *Meteorological Applications* outlining the toolkit, its uses and potential for application elsewhere.²⁶
- 5.9 In Wales WP10 assessed and analysed Met Office data for the 4 modelled bathing waters. Building on this the Operation used their prediction models to identify hydrological thresholds which may trigger water quality deterioration. They have determined that both WP6, focussing on near-shore climate change impacts, and WP7 focussing on catchment impacts, will be driven by changes in river flow due to the modelled reduction in high flow events. These analyses offer scope for both water quality and health risk prediction which go further than current systems. This outcome means that coastal communities will be better informed, and policy making is informed by a better evidence base, leading to better protection for both environment and communities in the future.

Transfer of knowledge, expertise, and best practice on adaptation measures for 'at-risk' bathing waters

- 5.10 The knowledge developed by Acclimatize spread wider than the project team with local decision makers in the local authorities across departments, Natural Resource Wales and the wider community gaining an increased understanding of pollution pressures. This has resulted in the establishment of the Water and Health subgroup in the Welsh Government and a much-improved evidence base for policymaking.

²⁶ Levent Görgü et al., "The MÉRA Data Extraction Toolkit," *Meteorological Applications* 30, no. 1 (2023): e2111, <https://doi.org/10.1002/met.2111>.

5.11 Importantly, this understanding was spread beyond the project team to the wider teams working in the area, and the public through publicity campaigns reinforcing IM.2.

5.12 The knowledge and expertise developed during the Operation has been transferred far beyond the project team and local community with the evidence used by the WHO to inform Recreational Water Quality Guidelines, and the EU to inform their evaluation of the Bathing Water Directive. Additionally, the UK Environment Agency, An Taisce, the International Blue Flag Director and UK Water Industry Research met with the project team to inform their practices. The Acclimatize team have also been generous with their time informing other projects including the EU Horizon 2020 project “Digital Water City”, as well as providing advice to the River Wharf Partnership.

A knowledge-sharing platform about risks and opportunities from climate change between stakeholders in Ireland and Wales

5.13 Through the leadership of Acclimatize, 26 organisations have collaborated to enhance the marine environment, and developed knowledge about the risks and opportunities from climate change. Acclimatize has acted as a platform for raising awareness about these risks and opportunities, and through presentations at conferences, academic articles, the website and social media have created an informal central hub for knowledge about climate change impacts on the marine environment.

Awareness and understanding of Acclimatize and its research amongst stakeholders, local communities, NGOs, the scientific community and the Joint Secretariat

5.14 As well as the aforementioned inputs into both WHO and EU guidelines and laws, the Operation has been salient amongst stakeholders including the local and scientific communities.

5.15 Stakeholders were extremely happy with the approach taken by the project team in their engagement with the local community. The project team attended open meetings in Anglesey with the Cemaes

Bay Community Council (see Table vi) to discuss the aims and progress of the operation, and how it would affect the local community. This engagement was effective with over 100 members of the local community attending to understand the change in water quality classification in Cemaes Bay. Stakeholders in interviews stressed the accessible way this was presented by the operation team, and the trust developed between the team and the local community through having operation leads present to the community. The operation is highly regarded in Anglesey for their community engagement, and effective communication.

Table 5.2: Community outreach in Wales

Date	Event	Type of initiative	Target recipients
09/05/2017	Europe Day presentation - Cemaes Bay Real-Time Prediction: to deliver public health protection	Europe Day - presentation	Local community
30/11/2017	Presentation to Cemaes Bay Community Council (open to members of the public)	Presentation	Local community
30/04/2018	Production of information booklet about the Acclimatize project for distribution to members of the public in English and English / Welsh.	Acclimatize brochure	Local community, stakeholders

5.16 In Ireland the Acclimatize team used their findings to engage with the public through a behaviour change campaign delivered with their partners, the Leave only Paw Prints campaign. This was an effective campaign to encourage dog-walkers to engage in better sanitation practices. This involved the development of an animation highlighting the effects of dog fouling on water quality, raising awareness of Acclimatize research, and aiming to ensure coastal waters were better protected. As shown in Table vii the production of the animation as well as the co-ordination of a well evidenced publicity campaign was effective in achieving recognition in both national and regional media. Social media campaigns by the Acclimatize Operation and their local authority partners was also effective in garnering further views for the campaign, the animation specifically.

Table 5.3: Leave only Paw Prints campaign success

Date	Event	Type of initiative	Target recipients
12/01/2022	Article in the Dublin Inquirer 'Dog owners don't understand the damage a single poo can do to a bathing beach, researchers say'.	News article	General public
12/05/2022	Twitter coverage from Acclimatize, Dublin City Council, Dún Laoghaire-Rathdown County Council and Fingal County Council accounts resulting in 3,994 animation views	Twitter	General public
May-22	Professor Wim Meijer appeared on a number of radio stations including Newstalk, Today FM, Classic Hits, East Coast FM, Radio Kerry, C103 Cork Radio and Highland Radio.	Radio interview	General public
03/06/2022	Acclimatize team members Niamh Martin and Tristan	Radio interview	General public

	Nolan appeared on the Jennifer Zamparelli radio show (138,000 listeners ³) on 2FM. Listenership		
10/05/2022	Article on nova.ie 'Dopey dog-owners leaving dog poo on beaches are menace to society'	News article	General public
12/06/2022	Article in Sunday Independent (Ireland) 'We want to make people aware of the impact of dog poo' – UCD's Acclimatize project is tackling fouling on beaches'	News article	General public

5.17 With regards to the scientific community in addition to a stellar reputation resulting in invites into policy making, the Operation has seen the publication of twelve academic articles (included in Annex B), presented at academic conferences, and proven influential in future academic projects. As an example an EU Horizon 2020 project Digital Water City met regularly with the Acclimatize team to share learnings and inform their future approach.

Cooperation between organisations to enhance the marine and coastal environment

5.18 The Acclimatize Operation is a co-operative operation between UCD and Aberystwyth University to enhance the marine and coastal environment. Building upon this foundation the Operation has taken a partnership approach with Irish partners including Dublin City Council, Fingal County Council, Dún Laoghaire County Council, Uisce Éireann (formerly Irish Water), the Irish Environmental Protection Agency and Waterways Ireland. In Wales the operations official partners are Natural Resources Wales and Environmental Health Wales. However, they have worked closely with both Isle of Anglesey County Council and City and County of Swansea Council, as well as Welsh Water.

Additionally, this outcome was cemented in Wales with the establishment of the Water and Health Sub-group.

- 5.19 The Operation has contributed to the ongoing increased co-operation between organisations to enhance the marine and coastal environment through their influence on the River Wharfe Partnership Board which represents the first EU designated riverine bathing water in the UK, as well as the extension of the Acclimatize approach to further bathing waters such as is happening on Barry Island.

6. Conclusions

Coherence and relevance

- 6.1 Due to the combination of successfully going through WEFO's application/planning process, and the skills and experience of the Operation team, the design of Acclimatize and its objectives were fit for purpose and highly coherent with the policy context. The need to increase the available knowledge of at-risk bathing waters and the effects of climate change in order to protect and enhance the local communities is evident. Acclimatize has been relevant to these needs in Dublin Bay, rural bathing areas in Wales, and according to stakeholders increasingly further afield.

Efficiency

- 6.2 The Operation has been delivered efficiently by a highly competent and experienced team. As during the interim stage, stakeholders have been impressed by the delivery of Acclimatize and it should be considered as an example of best practice in the field, and for the Ireland Wales Programme overall. Serious challenges, even the impact of Covid-19, have either not materialised or had a minimal effect on the overall Operation, due to the careful planning and management by the Operation team.

Effectiveness and added value

- 6.3 Acclimatize has been effective in collaboratively delivering new research and in disseminating the scientific findings that increase the levels of knowledge around adaptation to climate change amongst community bodies, including local authorities. Remediation work has been carried out for at-risk bathing waters resulting in dramatic improvements of bathing water quality in some areas. All stakeholders interviewed, including local authorities and both environment agencies, stated that they now have the knowledge to better understand bathing water pollution and prepare for the potential effects of climate change. In each interview stakeholders directly attributed this increased knowledge to the Acclimatize Operation. .

Policy decisions at both national and international levels are being informed by Acclimatize. Notably efforts to support the response to Covid-19 led directly to a number of SARS-CoV-2 wastewater surveillance projects in addition to the establishment of the National Wastewater Surveillance Programme in Ireland.

- 6.4 Acclimatize represents an excellent design and execution for tackling the issues of bathing water quality. The design of the Operation and models used will continue to form the basis of bathing water management in the areas the Operation was active in, as well as expand into other coastal waters depending on need, as evidenced by the extension of the modelling approach to sites at Barry Island. Further the legacy of the project extends beyond coastal bathing waters with the project team proving influential in the emerging protection of inland bathing waters.

Recommendations

- 6.5 It is recommended that Acclimatize is used as an example of a successful Operation in the design and planning of future interventions. The original Operation plan had clear targeted aims. The development of Phase II allowed Acclimatize to capitalise on early successes and produce additional outputs that carried forward into outcomes and impacts that were achieved to a better extent than would have been the case without Phase II. This phased approach allowed for flexibility to take advantage of opportunities arising from the Operation. Phased approaches should be considered for future interventions to drive increased impact.
- 6.6 Similarly, it is recommended that an interim review of targets be implemented in future interventions. Doing so with Acclimatize has extended the value of the Operation.
- 6.7 The presence of senior Operation staff at engagement events lent credibility to community outreach. This approach aided partners, including local authorities, in disseminating the findings, and

integrated the different work packaged together. It is recommended that this approach is replicated in future interventions.

- 6.8 The use of multiple channels for dissemination is an approach that should be replicated. Leave only Paw Prints is an excellent example of sharing scientific findings with everyday implications with the general public. This campaign was of great value as it was picked up by mainstream media and spread organically. Multiple channels to pursue in future interventions include, town hall meetings, traditional and social media, branded marketing campaigns, as well as published journal articles aimed at the scientific community.
- 6.9 With regards to future work on bathing water quality, there is considerable value to using the model of Acclimatize in other bathing water areas and catchment areas. One potential area to further the achievements is to continue pursuing catchments upstream and include freshwater bathing waters, as well as other coastal areas.

Annex A – Organisations interviewed during final fieldwork

- Dublin City Council
- Dun Laoghaire Rathdown County Council
- Environmental Protection Agency
- Fingal County Council
- Natural Resources Wales
- Swansea City and County Council
- Anglesey County Council

Annex B

- Reynolds, L.J., Sala-Comorera, L., Martin, N.A., Nolan, T.M., Stephens, J.H., Gitto, A., O'Hare, G.M.P., O'Sullivan, J.J., Meijer, W.G., 2020. Correlation between antimicrobial resistance and faecal contamination in small urban streams and bathing waters. *Science of the Total Environment*. 739, 140242
- Laura Sala-Comorera, Liam J. Reynolds, Niamh A. Martin, John J. O'Sullivan, Wim G. Meijer, Nicola F. Fletcher, Decay of infectious SARS-CoV-2 and surrogates in aquatic environments, *Water Research* (2021), doi:<https://doi.org/10.1016/j.watres.2021.117090>
- Sala-Comorera, L., Reynolds, L.J., Martin, N.A., Pascual-Benito, M., Stephens, J.H., Nolan, T.M., Gitto, A., O'Hare, G.M.P., O'Sullivan, J.J., Garcia-Aljaro, C., Meijer, W.G., 2021b. crAssphage as human molecular marker to evaluate temporal and spatial variability in faecal contamination of urban marine bathing waters. *Sci. Total Environ.* 147828
- Reynolds LJ, Martin NA, Sala-Comorera L, Callanan K, Doyle P, O'Leary C, Buggy P, Nolan TM, O'Hare GMP, O'Sullivan JJ and Meijer WG (2021) Identifying Sources of Faecal Contamination in a Small Urban Stream Catchment: A Multiparametric Approach. *Front. Microbiol.* 12:661954.
- Sala-Comorera L, Nolan TM, Reynolds LJ, Venkatesh A, Cheung L, Martin NA, Stephens JH, Gitto A, O'Hare GMP, O'Sullivan JJ and Meijer WG (2021) Bacterial and Bacteriophage Antibiotic Resistance in Marine Bathing Waters in Relation to Rivers and Urban Streams. *Front. Microbiol.* 12:718234
- Reynolds, L.J.; Sala-Comorera, L.; Khan, M.F.; Martin, N.A.; Whitty, M.; Stephens, J.H.; Nolan, T.M.; Joyce, E.; Fletcher, N.F.; Murphy, C.D.; Meijer, W.G. Coprostanol as a Population Biomarker for SARS-CoV-2 Wastewater Surveillance Studies. *Water* 2022, 14, 225.
- Liam J. Reynolds, Gabriel Gonzalez, Laura Sala-Comorera, Niamh A. Martin, Alannah Byrne, Sanne Fennema, Niamh Holohan, Sailusha Ratnam Kuntamukkula, Natasha Sarwar, Tristan M.

- Nolan, Jayne H. Stephens, Megan Whitty, Charlene Bennett, Quynh Luu, Ursula Morley, Zoe Yandle, Jonathan Dean, Eadaoin Joyce, John J. O'Sullivan, John M. Cuddihy, Angeline M. McIntyre, Eve P. Robinson, Darren Dahly, Nicola F. Fletcher, Michael Carr, Cillian De Gascun, Wim G. Meijer (2022) SARS-CoV-2 variant trends in Ireland: Wastewater-based epidemiology and clinical surveillance. *Science of The Total Environment*. Volume 838, Part 2, 155828
- Görgü L, Hawtree D, O'Grady MJ, Muldoon C, Masterson B, Meijer WG, O'Sullivan JJ, O'Hare GMP. 2023. The MÉRA data extraction toolkit. *Meteorological Applications*. 2023;30:e2111
 - Martin NA, Gonzalez G, Reynolds LJ, Bennett C, Campbell C, Nolan TM, Byrne A, Fennema S, Holohan N, Kuntamukkula SR, Sarwar N, Sala-Comorera L, Dean J, Urtasun-Elizari JM, Hare D, Liddy E, Joyce E, O'Sullivan JJ, Cuddihy JM, McIntyre AM, Robinson EP, Dahly D, Fletcher NF, Cotter S, Fitzpatrick E, Carr MJ, De Gascun CF, Meijer WG. 2023. Adeno-Associated Virus 2 and Human Adenovirus F41 in wastewater during outbreak of severe acute hepatitis in children, Ireland. *Emerging Infectious Diseases* 29:751-760
 - Tristan M. Nolan, Liam J. Reynolds, Laura Sala-Comorera, Niamh A. Martin, Jayne H. Stephens, Gregory M.P. O'Hare, John J. O'Sullivan, Wim G. Meijer (2023) Land use as a critical determinant of faecal and antimicrobial resistance gene pollution in riverine systems. *Science of The Total Environment*. Volume 871, 2023, 162052
 - Gao G, O'Sullivan JJ, Corkery A, Bedri Z, O'Hare GMP, Meijer WG. 2023. The Use of Transport Time Scales as Indicators of Pollution Persistence in a Macro-Tidal Setting. *Journal of Marine Science and Engineering*. 11: 1073
 - Martin NA, Sala-Comorera L, Gao G, Corkery A, Reynolds LJ, Nolan TM, Whitty M, O'Sullivan JJ, Meijer WG. 2023. Inclusion of hydrodynamic properties of bathing waters is critical in selecting

faecal indicators to assess public health impacts of faecal contamination. Water Research 242: 120137

Acclimatize: Evaluation Logic Model

