



Climate change, shellfish farming and STREAM

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Climate change is one of the most alarming problems facing our planet right now. The effects of climate change are already being felt worldwide, as is clear from the daily headlines, and unfortunately, they are only predicted to get worse. According to Met Éireann, over the last 120 years, Ireland's surface air temperatures have increased by over 0.9 C, with "a rise in temperature being observed in all seasons." The nation's annual precipitation was six per cent higher from 1989 to 2012 compared to the 30 years between 1961 and 1990. Higher ocean temperatures and sea levels are being observed in our coastal areas.



The STREAM project is part-funded by the European Regional Development Fund (ERDF) through the Ireland-Wales Cooperation programme



Climate heating effects are worldwide, but some countries are experiencing significantly more extreme impacts, necessitating immediate action. Meanwhile, nations less severely affected by climate change, like Ireland, have an essential role in reducing greenhouse gas emissions, mitigating its consequences and supporting more vulnerable regions. To this end, the government has set a target of reducing greenhouse gas emissions by 51% by 2030, but currently, we are falling short of this target. The country is also investing in renewable energy and working to improve energy efficiency, but there is much more to do. Our obligations will include, among other things, reducing Greenhouse Gas Emissions, providing Financial and Technological Support, and fostering Knowledge Sharing and Collaboration. Sensor Technologies for Remote Environmental Aquatic Monitoring (STREAM) is a collaboration between Ireland and Wales involving the South East Technological University (SETU), Swansea University, and Munster Technological University, which is partly funded by the European Regional Development Fund. The project is addressing some climate change challenges by collecting data to protect coastal environments.

The STREAM project exemplifies the way that Ireland/ Wales can use technology to address climate change challenges. The project uses commercial sensors and is also developing innovative device



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technologies to monitor the marine environment, measure changes, and broadcast live data. It is also developing tools to help seaside populations adapt to climate change. The project's data will help us better understand climate change's effects on the marine environment and allow for developing strategies to protect coastal communities. The STREAM project is also helping to build capacity in the cross-border region, which will be essential for addressing climate change in the years to come.

For example, Swansea Universities Welsh Centre for Printing and Coating (WCPC) are developing 2-D printed sensors as many commercial systems are accurate but come at a high cost. Printable sensors offer the potential for lower-cost solutions, which can be produced in several ways, such as screen



or aerosol jet printing. In the case of temperature and conductivity sensor types, aerosol printed units have been tried and laboratory tested and are being made ready for their first deployment. While screen printable pH (alkalinity) and Dissolved Oxygen sensors have been specified. Along with this work, they have also addressed data capture considerations and designed an electronics housing for deployment and a practical design for watertight connections. These components are projected to cost less than an order of magnitude than commercially available multi-parameter sonde's. Other water quality parameters may be measured by optical methods, such as nutrient loads developed by SETU.

“The STREAM project is a valuable contribution to understanding climate change and its impacts on the marine environment” says Dr Joseph O’Mahony the STREAM projects Principal Investigator. The project's data and tools will be essential for protecting coastal communities and developing strategies to adapt to climate change.

The Centre for Sustainable Aquatic Research (CSAR) has been investigating the impacts of temperature change as it is "altering species distribution and their associated ecology." They have found that there can be relatively large variations in temperature preferences for some individuals within a species group but surmised that elevated temperatures can increase respiratory stress, metabolic rate and oxygen demand. They have now identified the thermal niches for four fish species in the Irish Sea. However, their distribution range will change accordingly as the climate increases sea temperature.

Aquaculture production along the South East, South and Southwest of Ireland amounts to 19,445 tonnes of fish and shellfish, with a value of €54.6 million, employing 748 people at 136 production units (BIM 2023). STREAM is working with shellfish farmers along the south and east coasts of Ireland to better understand the growing conditions in particular bays and track water quality conditions in an effort to improve management techniques that increase the quality and growth of their oysters and mussels. In particular STREAM has sensors placed in Bannow Bay, Dungarvan and Castletownbere. These three bays are all significant contributors to the overall shellfish production of the country and STREAM is providing a monitoring system for safeguarding the marine environment, an online portal connecting a diverse user community, it is developing toolkits for coastal communities to enhance resilience and providing improved ICT and sensor development expertise.



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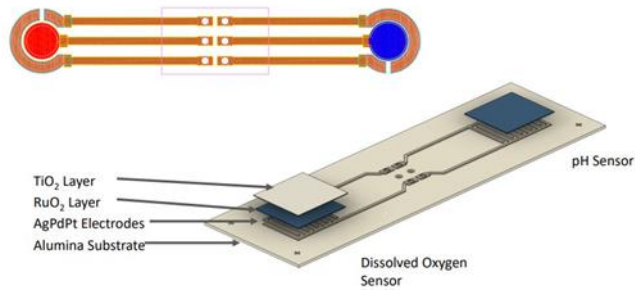


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The STREAM projects sensors are capable of measuring important indicators of water quality at these shellfish growing areas such as, temperature, salinity, nutrient levels, and pollutant concentrations in the marine environment. This information is critical for aquaculture operators, scientists and policymakers to gain a better understanding of potential threats and implement effective management and conservation strategies.



Screen Printed pH and DO Sensor



The website marinestream.eu provides an online portal for connecting the user community as a central hub for sharing information, related to the effects of changes on water quality. The portal facilitates collaboration among those that make their living from the sea, scientists and the general public, serving as a platform for knowledge exchange. The communities living along the coast, as well as the fishers and aquaculture businesses in the area, are at a higher risk of being affected by climate change because they are situated near the ocean.

STREAM is also in the process of developing custom toolkits to help coastal communities, fishers, and aquaculture businesses adapt to climate change. These will focus on creating a better understanding of the implications of water quality changes for groups at higher risk due to their proximity to the ocean.



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