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The Case Study of a UNESCO-Endorsed Initiative within the International Decade of Sciences for Sustainable Development: the STOPTIGRE project on the Mediterranean island of Procida, toward a community-based and science-art transdisciplinary approach for the control of insect disease vectors

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Abstract

The United Nations General Assembly proclaimed the years 2024–2033 as the International Decade of Sciences for Sustainable Development, designating UNESCO as the lead agency for its implementation. This global initiative underscores the pivotal role of science—basic, applied, social, and human—in advancing the 2030 Agenda for Sustainable Development

while ensuring that the benefits of scientific progress are equitably shared across societies. The Decade emphasizes the expansion of scientific literacy, the widespread adoption of open science practices, the strengthening of global research collaborations, and the transformation of national innovation systems. At the same time, it confronts crucial barriers, including the proliferation of misinformation, insufficient investment in basic sciences, and widening inequalities in access to scientific education and infrastructure. This paper discusses the vision, challenges, and expected outcomes of the Decade, while presenting an example of a UNESCO-endorsed initiative that successfully evolved from basic research to applied science and ultimately democratized access to scientific knowledge. STOPTIGRE is a pioneering project that combines eco-sustainable vector control methods, science-art transdisciplinary approaches, Citizen science and community engagement to contrast the spread of insect vectors, such as mosquitoes. Citizen science involves citizens in research activities promoting social inclusion, sustainable development, and active citizenship, but its application still faces significant challenges to ensure effective public engagement and fully value its contribution. The project specifically aimed at addressing this challenge by developing an innovative and transdisciplinary approach, based on integrated actions of participatory science and art, for citizen engagement in eco-friendly mosquito monitoring and control. The test in the field of this approach, on the Mediterranean island of Procida, Italy, produced a significant impact both in reducing the infestation of tiger mosquitoes and in enhancing community awareness and cohesion.

Keywords: Citizen science, community engagement, transdisciplinary science-art approach, mosquito monitoring, mosquito control

Introduction

Science has historically served as a cornerstone of human progress, driving technological innovation, improving health outcomes, and shaping more resilient societies. Yet, despite its contributions more than ever, societies face the dual challenge of harnessing science for transformative change while rebuilding public trust in scientific knowledge.

The proliferation of misinformation and disinformation poses a significant threat to collective understanding, while structural barriers limit equitable access to scientific infrastructure, training, and information. In many national contexts, basic sciences remain undervalued and underfunded, weakening foundations for innovation and curbing global capacity to address urgent, sustainable development issues.

In recognition of these challenges, the United Nations General Assembly adopted resolution A/RES/77/318 on 25 August 2023, declaring the decade 2024–2033 as the International Decade of Sciences for Sustainable Development (IDSSD) and mandating UNESCO to lead its implementation **[1]**. The IDSSD seeks not only to advance scientific frontiers but also to foster a culture of inclusivity and engagement in science. Its mission is to strengthen the dynamic relationship between research communities and society, positioning science as both a global public good and a driver of sustainability.

The objectives of the Decade are ambitious and multidimensional: to advance scientific knowledge across all fields, to enhance global scientific literacy, to institutionalize open science practices, to expand investment in basic sciences, and to realign national innovation systems with societal and environmental needs. Expected outcomes include democratization of knowledge, acceleration of evidence-informed policymaking, and the creation of equitable frameworks where all individuals have the right and capacity to participate in and benefit from science in accordance with the Universal Declaration of Human Rights.

To achieve these aims, UNESCO has established open calls for projects, launched twice yearly, to invite proposals from governments, academic institutions, civil society, industry, and other stakeholders **[2]**.

In this paper, we present a case study, the STOPTIGRE project, endorsed in 2025 by IDSSD and ongoing on the Mediterranean island of Procida since 2015 **[3]**.

The STOPTIGRE project

The STOPTIGRE project represents a pioneering approach to integrated, participatory, and sustainable mosquito control methods, strategically aligned with the United Nations Sustainable Development Goals 3 (Good Health and Well-being) and 15 (Life on Land), addressing the critical intersection between public health imperatives and environmental sustainability through innovative community engagement strategies **[4]**. Implemented continuously on Procida Island from 2015 to 2024 **[5, 6]**, the STOPTIGRE project aimed to revolutionize public engagement strategies through a transdisciplinary science-art approach that transcends traditional disciplinary boundaries, recognizing that effective vector control requires not only scientific rigor but also deep community involvement and creative engagement strategies that resonate with local populations.

The Asian tiger mosquito (Aedes albopictus) represents a significant public health challenge across Mediterranean regions, requiring comprehensive control strategies that go beyond conventional top-down approaches **[7]**. The STOPTIGRE project addresses this challenge by developing a replicable model that combines Citizen science methodologies with participatory art practices, creating unprecedented opportunities for community-driven vector control initiatives. The project's foundational phase (2015-2020) has been focused on establishing a comprehensive understanding of Procida Island's socio-environmental conditions and mosquito population dynamics through systematic assessment via structured questionnaires administered in 2015, providing baseline data on community awareness and existing vector control practices **[5]**. Subsequent monitoring activities during 2016-2017 involved detailed analysis of the spatial and temporal distribution of Asian tiger mosquito populations across the island's diverse microhabitats, while the 2018 density assessment per hectare provided crucial quantitative data for population modelling and control strategy development **[6]**.

The traditional Citizen science approach **[8]** during this initial phase emphasized one-to-one interactions between researchers and community members where, through collaboration with local municipal administration, about one hundred volunteers were recruited, including high-profile community leaders such as the mayor and municipal councilors. Volunteers, following comprehensive training programs, conducted annual mosquito monitoring using ovitraps—specialized devices designed to collect eggs laid by female mosquitoes in standardized conditions. This phase yielded significant scientific outputs with results published in two peer-reviewed papers **[5, 6]** that contributed to the broader understanding of community-based vector surveillance methods, while environmental education initiatives (2019-2020) expanded the project's reach through hands-on workshops with primary and middle school students that included development and field testing of "Vector Control", an educational game designed to enhance understanding of mosquito ecology and control methods, alongside a practical family manual for mosquito control providing accessible guidance for household-level interventions (Di Lillo et al., Manuscript in preparation). In addition, four annual editions of public scientific demonstrations during the European Researchers' Night engaged diverse audiences, demonstrating the project's commitment to public science communication and community education **[9]**.

Recognizing that sustainable vector control requires emotional and cultural engagement alongside scientific participation, the second operative phase (2021-2024) marked a paradigm shift toward innovative community engagement protocols by combining Citizen science with participatory art methodologies. Participatory art is an artistic practice in which the audience is no longer a passive spectator but an active participant in the creation, development, or interpretation of the work. The artist acts as a facilitator or accelerator of collective processes, where the relational, social, and political dimensions of the project are as significant as the final artistic outcome. In this sense, the artwork is often process-based, temporary, site-specific, and co-created with participants, who may include local communities, social groups, or casual audiences **[10-14]**.

Hybrid teams comprising researchers and artists conducted systematic exploration of Procida Island's social and physical landscape, building authentic relationships with community members through the strategic use of "gifts" and "Relational Accelerator Devices" (RADs)—innovative tools designed to facilitate meaningful interactions between project participants and local residents. Citizens were subsequently invited to participate as protagonists in portrait sessions and 3D scanning activities, creating a comprehensive digital archive of community participation that formed the foundation for two significant artistic representations: large-scale community murals that visually represented the island community's involvement in the project, creating permanent markers of collective engagement, and an innovative 3D census that documented the project's human dimension through advanced scanning technologies.

Building upon the relational network established through artistic activities, citizens participated in advanced mosquito monitoring using gravitraps—devices specifically designed to capture adult female mosquitoes **[15]**, with the remarkable efficiency of this approach demonstrated when hundreds of gravitraps were successfully deployed across approximately 400 private properties throughout the island within just five days. The project culminated in an innovative public event named "Opera-Event" conceived as a widespread "relational anthropological sculpture" co-created with community members, making visible the extensive network of relationships built throughout the project while celebrating the collective sense of community and care actions mediated through integrated art and science approaches, demonstrating the project's positive territorial impact and creating lasting memories while reinforcing community bonds and simultaneously advancing scientific objectives **[3]**.

In 2024, the established community engagement protocol was applied to support an innovative pilot experiment utilizing the Sterile Insect Technique (SIT) for Asian tiger mosquito population suppression **[16]**, representing a significant advancement in community-based vector control as citizen participation in SIT applications had not been previously documented in the scientific literature. The SIT is an environmentally-friendly, species-specific control method for insect pests that involves the mass-rearing, sterilization through ionizing radiation, and systematic area-wide release of sterile male insects to mate with wild females, resulting in population suppression over time [17]. Large-scale field trials have demonstrated the efficacy of SIT approaches against Aedes mosquitoes, with projects showing significant population suppression and, in at least one case, measurable reduction in diseases incidence [18, 19]. The success of SIT programs applied to mosquitoes requires effective sex-separation methods to ensure only male releases, as female mosquitoes are the disease vectors, making the development of genetic sexing strains a critical component of scalable implementation [20], and an effective community engagement. In fact, public acceptance and active community participation are essential not only for operational reasons—enabling the release and monitoring activities—but also for ethical considerations, ensuring that communities are properly informed and consent to the intervention [21].

In STOPTIGRE project citizens were engaged through newly developed RADs specifically designed for SIT implementation, expanding their roles beyond monitoring to include active participation in sterile male mosquito releases, an unprecedented approach that demonstrated the community's capacity to contribute to sophisticated vector control technologies when appropriate engagement strategies are employed (Varone et al., Manuscript in preparation).

The remarkable success of the 2022 and 2024 activities provides compelling evidence that integrating advanced vector control techniques like SIT with active community participation can effectively control mosquito populations while simultaneously enhancing public health outcomes and environmental sustainability, underscoring the critical importance of proactive citizen involvement over traditional reliance on top-down institutional solutions **[22]**.

The STOPTIGRE project establishes a new paradigm for community-based vector control that recognizes the essential role of cultural and artistic engagement in achieving sustainable public health outcomes, demonstrating that effective vector control requires not only scientific innovation, but also deep community engagement facilitated through creative methodologies. The integration of Citizen science, participatory art, and advanced vector control technologies creates a replicable model with potential for widespread application across Europe and globally, suggesting that future research should focus on adapting this approach to diverse ecological and cultural contexts while maintaining the core principles of community empowerment, artistic engagement, and scientific rigor that have proven successful in the Procida implementation.

In 2025 the project has been endorsed by the IDSSD with a proposed three-years long program with two key objectives in line with the UNESCO Decade of Sciences for Sustainable Development (2024-2033): 1) advancing basic scientific knowledge by studying Asian tiger mosquito behavior, ecology, and control methods, supporting SDG 3 (Good Health and Well-being) and SDG 15 (Life on Land) through integrated and sustainable approaches; 2) building an inclusive science culture by involving local communities in mosquito monitoring through Citizen Science, empowering individuals in vulnerable regions to participate in the scientific process and ensuring equitable access to scientific benefits. The program will start by focusing on the analyses of the medium-term effects of the activities performed in 2024 on the mosquito population by monitoring using traps managed partly by residents through a Citizen science approach. Then, by integrating participatory art initiatives, the project will scale up an SIT experiment to a wider island region, respect to the one of 20 hectares utilized in 2024, with weekly releases of sterile males, involving active community participation for access to release and monitoring sites, and using drones to reach difficult areas for comprehensive coverage.

Conclusion

The STOPTIGRE project strategically aligns with multiple EU priorities, including the 2019-2024 Strategic Agenda's "Building a climate-neutral, green, fair, and social Europe" **[23]**, the

European Green Deal's vision for a modern, resource-efficient economy **[24]**, and the 2024-2029 agenda priorities of "Sustaining our quality of life: Food security, water and nature" and "Supporting people, strengthening our societies and our social model" **[25]**. Addressing the climate change-driven invasion of European territories by Aedes mosquitoes, which have caused numerous epidemic outbreaks in the Mediterranean basin and transformed several European regions into suitable habitats for vector insects **[26-28]**, the project develops an innovative, eco-sustainable protocol for controlling disease vectors as an alternative to environmentally harmful chemical pesticides. Through an interdisciplinary approach that integrates Citizen science and participatory art, STOPTIGRE has created an innovative community engagement model that simultaneously combats mosquito populations while enhancing community spirit, environmental stewardship, and social cohesion, particularly empowering isolated communities such as small islands to effectively address climate-derived challenges. This innovative protocol, validated through field experience, constitutes a valuable conceptual framework with significant replication potential across European and international contexts and contributes effectively to the goals of the UNESCO IDSSD, fostering interdisciplinary collaboration, public engagement, and sustainable knowledge co-production.

Declarations

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Conflict of Interest

The opinions expressed in this contribution are personal and do not in any way commit to the Ministry of Foreign Affairs and International Cooperation.

The Authors declare that there is no conflict of interest.

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Author Contributions

MS: Conceptualization, Investigation, Writing, Review & Editing. **FI**: Conceptualization, Investigation, Review & Editing. **VN:** Conceptualization, Investigation, Review & Editing. **AAC:** Conceptualization, Investigation, Review & Editing. **MVC:** Writing – Review & Editing.

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