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0.3	Britest, Asphalion	27/05/26	Final Draft
1.0	AIMPLAS	28/05/26	Final Version

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1 Summary

This report is a deliverable of the ETERNAL project, funded under the European Union's Horizon Europe Framework programme (HORIZON) under grant agreement No 101057668. It provides a public summary showcasing the impacts that have been generated through the project's Change Labs, a series of sub-tasks conducted within Task 5.3 of Work Package 5 *Communication, Dissemination and Change Labs*.

This report has been prepared by BRITEST as WP5 lead with contributions from the partners and sub-contractor responsible for aspects of delivery of the relevant sub-tasks.

2 Links with other activities

This deliverable is part of Work Package 5 Communication, Dissemination and Change Labs, and is associated with its objective to define a roadmap for and to pilot elements of coordinated measures catalysing behavioural change in industry, regulatory, healthcare and public actors towards sustainable provision and use of medicines.

WP5 is a cross-cutting work package enabling results from across all the technical work packages to be integrated for communications and dissemination purposes in support of the project's exploitation plans and pathway to impact defined and managed in WP6. Together these measures will ensure that the outputs and learnings arising from all the project's activities are made available to the widest possible audience, can be learned from, and acted upon on a European scale.

Within WP5 Task 5.3, Change Labs relies upon, interacts with, and extends the foundational Communication and Dissemination activities running longitudinally throughout the project as Tasks 5.1 and 5.2 respectively, and nation is the project's primary means of engaging with our target stakeholder groups to promote *behavioural change* among business decision makers, policy makers, healthcare practitioners and consumers following awareness raising and engagement. By extension, the Change Labs represent an attempt to link and frame the scientific and technological innovation predominant in ETERNAL's work programme to a local, recognisable context within which affected stakeholder groups can understand their potential role in sustainable manufacturing, facilitation, use and disposable practices in line with a green pharmaceuticals strategy.

3 Business Change Lab: Green Pharmaceuticals and CSR (Corporate Social Responsibility)

3.1 Building the Bigger Picture

The focus of the Business Change Lab as initially conceived at the time of constructing ETERNAL as a research proposition was fairly specific, being geared towards two purposes: influencing pharmaceutical industry decision makers towards adopting and investing in the ETERNAL technological innovations on the one hand, and disseminating the results of the ecotoxicity and environmental assessment of pharmaceuticals towards industry decision makers. The common factor between these two purposes is the target group: (pharmaceutical) industry decision makers. While, not unexpectedly, this target group remained very valid in the light of the experience of executing the project and as we sought to build initial awareness of our activities and engage with people in the world beyond the immediate project partners, it also became apparent, both from our developing understanding of the broader supply / value chain within which pharma operates, and from the EU context within which ETERNAL had been selected for support, that pharma industry decision makers were a valid ***part* of a bigger picture**, and equally, so was the ETERNAL project.

The first point is perhaps best illustrated by consideration of Figure 1, a graphic derived from the work of the WP4 (Environmental Assessment and Ecotoxicity Studies) team, incorporated in this form as a graphical communications element within the project's keynote public communications video.

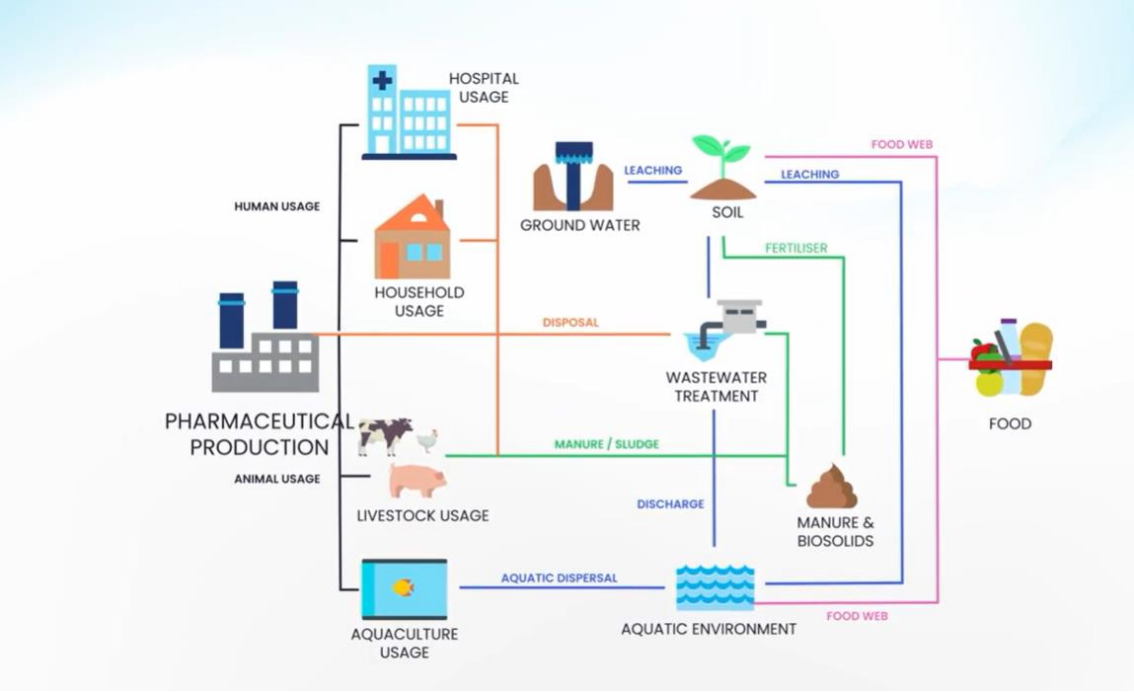

Figure 1 Graphic of potential emission pathways for the flow of APIs and their transformation products from usage to the environment

Here, it is evident that while changes in practice taken on board directly pharmaceutical production (i.e. adoption of new green manufacturing approaches) should certainly map onto corresponding environmental benefits through reduced challenge upon wastewater treatment infrastructure and hence the soil-based and aquatic environments, the nature of the *use phase* of the products made and supplied by the pharma industry is such that there are also important emission pathways through hospital and household usage (within the scope of ETERNAL) and agricultural and aquacultural usage (beyond the scope of ETERNAL).

Of the two pathways within ETERNAL's scope, we may distinguish hospital/healthcare usage as being "localised" i.e. predominantly tied to a set of identifiable (hospital site) locations while household usage is "dispersed" across domestic residences far and wide. The former therefore at least has the potential to be managed rather as a manufacturing site might be, with dedicated specialist wastewater treatments optimised for identified pharmaceutical APIs and transformation products of priority environmental risk. The latter, by its nature feeds into the general domestic wastewater treatment infrastructure where it is inherently more challenging to effectively optimize existing facilities for specific pharmaceutical risks within the duty of large, seasonally varying volumes, and heterogeneous challenges encountered by municipal water treatment plants. In this latter case, behavioural change interventions that prevent / minimize avoidable entry into the general wastewater stream, such as those explored within the Healthcare Practitioners (for green prescribing) and Consumers Change Labs (for safe use and disposal) below become of greater relevance.

The second point concerning ETERNAL's "place" within the context of the broader EU agenda, crystallised in practical terms with the voluntary establishment of the Green Pharma projects "cluster" initiative between ETERNAL and its sister projects ENVIROMED, IMPACTIVE, SusPharma and TransPharm on the one hand, and cooperation with the European Commission's Joint Research Centre on the other. Whilst these activities were primarily handled from a project management perspective under task within WP 6 (Task 6.3) and WP4 (Task 4.5) respectively, the first in particular added to the necessary messaging that the relevant "green innovation" with which we sought to engage pharma decision makers might indeed arise from elsewhere in the Green Pharma cluster, not just ETERNAL. Thus the Green Pharma projects mutually sought to amplify the impact of each other's results through their communications and dissemination activities at a tactical level, as well as pursuing the more strategic level goal of collaborating closely and effectively on formulating a set of common policy related messages through a jointly drafted single Policy Briefing (see Policy Makers Change Lab: Regulatory as an Enabler vs. a barrier to green innovation below).

3.2 From awareness to engagement to interest

With the context and target groups more clearly understood, much of the subsequent effort to construct conditions for ultimate behavioural change in these groups ties in closely with, and informed the nature of, the project's Communication and Dissemination activities over the course of the project lifetime.

The purpose of what follows is not to provide an encyclopaedic listing of every Communication / Dissemination activity carried out by consortium partners in fulfilment of the PDEC initially outlined in D5.2. (A second and final progress update will be provided separately as D5.7 at Month 48) but rather to illustrate and exemplify through selected highlights how these activities map onto the change journey from *initial awareness of the project* and its goals to *engagement with the emerging results* through *expressed interest* in potentially taking things further.

3.2.1 Awareness

(Q4 2022 – Q4 2025 approximately, ongoing at lower level)

Communications

From project onset, the earliest communications priority was to establish early awareness of the project as broadly as possible on the one hand, and to establish a place for any interested parties to visit for further information and ideally subscribe to further updates. To the first point, a first project press release (led by AIMPLAS / Britest and supported by social media relays by several partners) was issued to coincide with the project kick-off meeting. This resulted in nineteen articles appearing in external industry press magazine and websites between October and December 2022.

Figure 2 External press titles featuring articles based upon ETERNAL project kick-off press release

To the second aspect, the project website, including news blogs and newsletter subscription facilities was established according to plan for January 2023. This has set the foundation for regular news postings and 6-monthly e-mail newsletters to subscribers since April 2023 (led by Britest with content contributions from across the consortium).

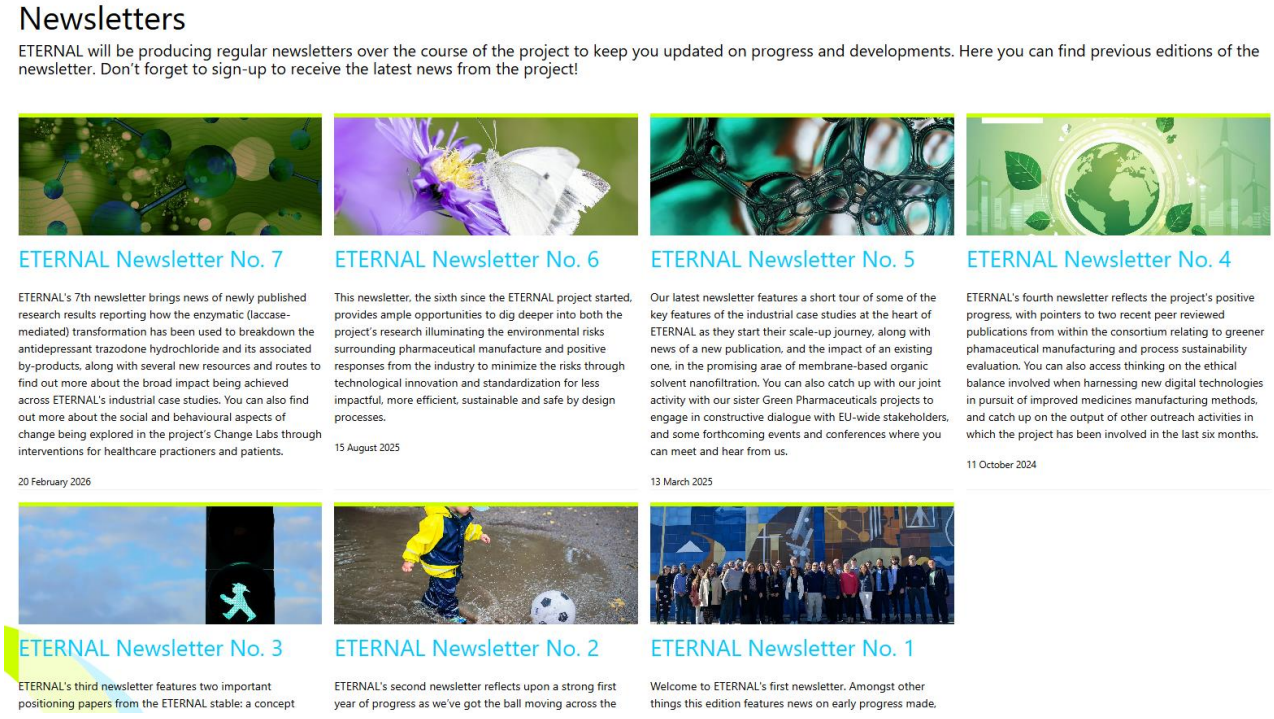

Figure 3 ETERNAL website page listing project newsletters

Events

Our straightforward priority in targeting events early in the project lifetime was to secure opportunities to present a succinct overview of the overall scope of ETERNAL, its motivations, and the general features of the intended research programme to potentially interested stakeholder audiences. Examples include presentations by Britest in March and April 2023 respectively to the IBioIC Annual Conference (Glasgow, UK) and Making Pharmaceuticals Conference (Coventry, UK), by AIMPLAS to the November 2023 Reunión Nacional de Grupos de Fotocatálisis (València, Spain) and in a *Preparing the calls for Work Programme 2025 Cluster 6 and 5* Webinar done by AIMPLAS February 2025.

Also, at this early stage in the project, efforts were made to ensure that project literature was made available at relevant trade shows / conferences / workshops and the like. Examples include Meetech Spain (Madrid, Spain) and the Equiplast Show (Barcelona, Spain) both in May 2023 (AIMPLAS), participation by Enviroeye in a June 2023 SEAI LIEN (Sustainable Energy Authority of Ireland Large Industry Energy Network) Group Workshop (Portlaoise, Ireland), and a further exhibition display including project literature by AIMPLAS in November 2023 at the Greener Manufacturing show (Cologne, Germany). Whilst we do not further list similar activities, it is worth noting that these have continued throughout the remainder of the project as what might be considered a "pump priming" activity for further engagement with the project.

An event of particular focus relatively early in the project was the major pharma industry show CPHI Europe, held in Barcelona, Spain in October 2023. Four project partners (Angelini, Arcinova, Reig Jofre, and Asphalion) exhibited in the show and Britest co-ordinated with each to ensure that that the project was well represented at each stand, variously with literature, pull-up displays, and video loops. Angelini's stand provided a location from which a team of volunteers from other project partners located in Spain (IRIS, AIMPLAS) and Britest could operate to meet with and introduce the project to visitors to the exhibition.

Figure 4 Scenes from CPHI Europe, Barcelona, October 2023

Whilst there was no question that CPHI provided massive scale and potential to engage with visitors with a truly international profile from right across all aspects of the pharma value chain, the sheer scale of proceedings also presented a challenge for a "new kid on the block" research project to establish visibility amongst all else that was going on, and to gain much traction with, for instance, the many very commercially focused visitors to the show. In retrospect, the timing of this show was probably a little too early in terms of available project results to really engage even with technically / sustainability focused visitors, but this was of course not a matter under the control of the project. Nevertheless, several useful contacts were made and additional subscribers to the project's newsletter recruited, and some early attitudinal survey data was captured concerning both green chemistry approaches to manufacturing and consumer behaviour for safe disposal (which was helpful in informing the initial stages of the later Consumers Change Lab). The possibility of a joint Green Pharma cluster projects initiative to co-exhibit at a later edition of CPHI was subsequently explored in the Communication working group within the cluster, with the thought of more effectively amplifying a joint message, but ultimately this proved to be impractical for a variety of reasons such as other calendar commitments, and lack of available budget.

In addition to these sorts of typically publicly accessible events, it is worth noting that even at an early stage in the project efforts were underway to raise awareness of ETERNAL with more exclusive / invitational communities of interest by way of seeding the ground to receive more detailed information later in the project. The Britest Innovation Strategy Committee, a body comprised of R&D representative of Britest's member companies, for instance received an initial briefing on ETERNAL in September 2023, and the following month a Britest organised conference for early-stage researchers in academia and industry Britest ECR 2023 featured a presentation by Professor Susanna Loureiro of the University of Aveiro reviewing the area of ecotoxicity studies in general and previewing research underway and planned in ETERNAL.

Dissemination

The ETERNAL team has sought to prioritise dissemination of results arising from the project as early as possible as a primary means of driving engagement and interest, and this even had a role to play in the first awareness-raising phase. Here, scientific posters provided a suitable means of making early, provisional results not yet at the point of being ready for full peer review available to the research community. The University of Aveiro presented such posters on mixture toxicity screening at the SETAC Europe 33rd Annual Meeting in Dublin, Ireland in May 2023, and on endocrine disruption in *daphnia magna* at Ciência 2023 (Aveiro, Portugal). Meanwhile Britest delivered an early public presentation of the thinking developing around green route selection at the Scientific Update Winter Conference in December 2023 (Liverpool, UK).

In addition to these event-based dissemination activities, the project also produced several public deliverables relatively early in its lifetime. As a general policy, once approved, these documents are made available through the project website and Zenodo persistent repository. By December 2023 in fact, five public deliverables were available on the website covering topics ranging from standardisation, PAT and Digital Twins, pharmaceutical Environmental Risk Assessment, and "Compliant by Design" strategies applying the concepts of "greener design" to be delivered in Europe.

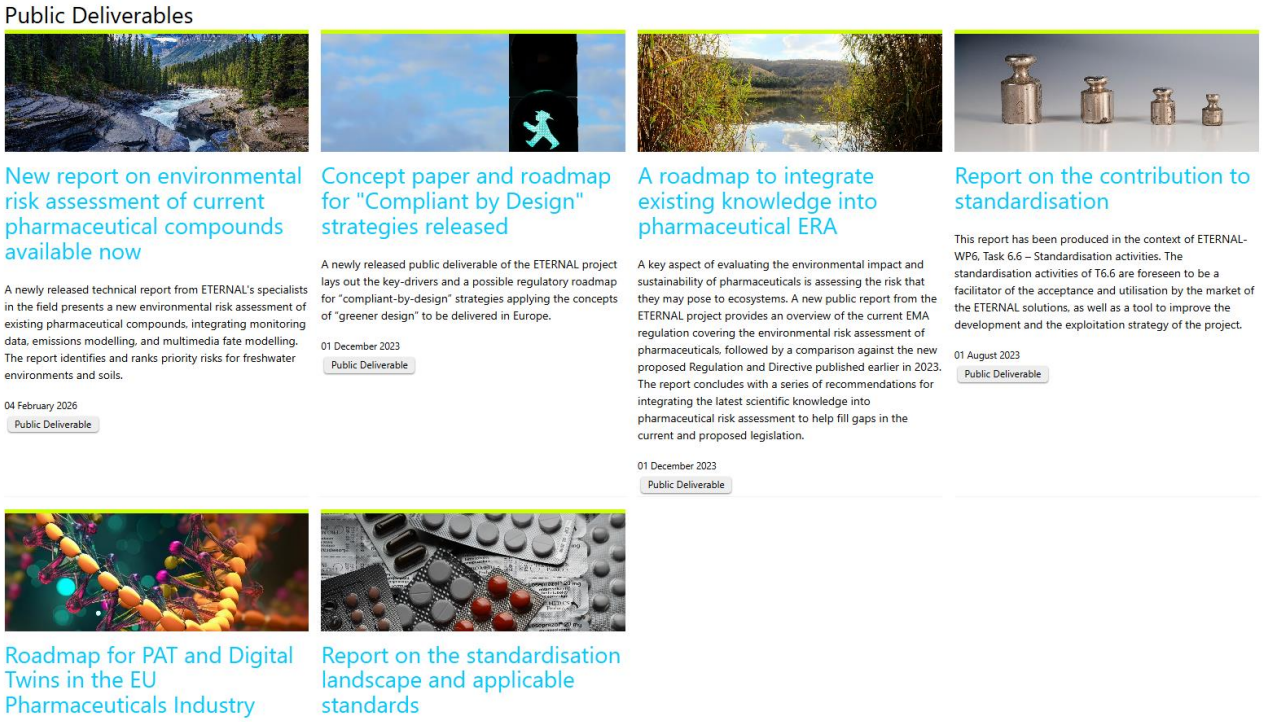

Figure 5 ETERNAL website page listing of public deliverables available from the project

3.2.2 Engagement

(Q2 2024 – Q2 2026, ongoing)

Communications

As the project's technical programme progressed, so too the emphasis in communications channels shifted from Year 2 onwards to punctuate the foundation of regular news, social media updates and six-monthly newsletters with a series of thematic campaigns built around specific announcements or activities.

In May / Jun 2024 (with resultant external media articles extending through to October 2024) a press release-led campaign to promote the formation of the Green Pharma projects cluster

was conducted. This campaign resulted in nineteen articles appearing in external industry press publications / websites.

Figure 6 External press titles featuring articles based upon ETERNAL'S Green Pharma cluster press release

In November 2025, ETERNAL featured as an "Impact Success Story" in the Horizon Europe National Contact Point online magazine Health-NCP-Net in the form of an interview with the project coordinator from AIMPLAS.

Figure 7 Excerpt from November 2025 Health-NCP-Net Impact Success Story Feature

In addition to conventional "press" media (both physical and online) multimedia and webinar channels have been employed to amplify the developing messages of successful progress and emerging results arising from ETERNAL. Britest delivered a webinar for the United Kingdom's professional society for Chemists Royal Society of Chemistry Process Chemistry Technical Group on Sustainable Route Selection in June 2024, and in July 2025 AIMPLAS participated in a webinar describing ETERNAL's aims, objectives and achievements to date in cooperation with the IMPACTIVE project reflecting additionality across the Green Pharma cluster. The recording of this webinar is available both at the ETERNAL website and on YouTube.

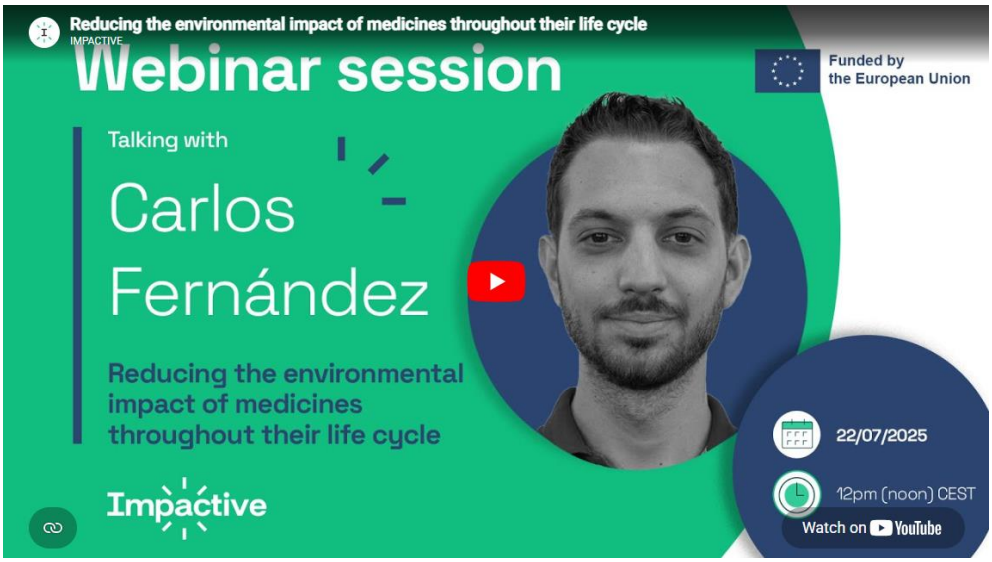

Figure 8 ETERNAL webinar hosted by Impactive

In September 2025 a dedicated project video 'Impact across the pharma value chain' was released. The production of this video by a specialist animation house was led and overseen by Britest to a script and concept co-developed in consultation with consortium partners. The video provides a flexible platform resource for succinctly communicating the project's key features and emerging achievements and has been used in multiple contexts since as well as being available to refer interested parties towards on the project website and YouTube.

Figure 9 ETERNAL project video preview frame

Most recently, February 2026 saw a concerted promotional campaign in support of UK-Spanish partnership with New Scientist (New Scientist CoLab production). Sponsored by the UK Government, IRIS and the UK industrial partners (AstraZeneca and Arcinova) were enabled to articulate and highlight both the activities and innovation arising from ETERNAL and the broader benefits of international collaboration through EU channels. This campaign combined written articles with video, an audio podcast, and a full interview format available to view.

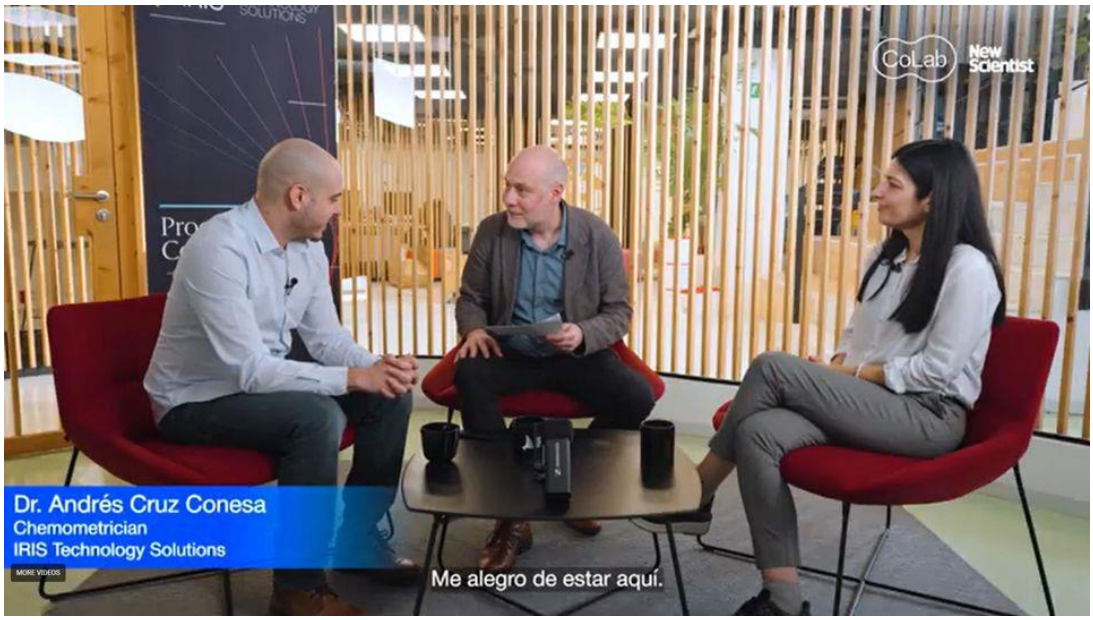

Figure 10 Scene from New Scientist 'UK-Spanish partnerships are solving pharma's toughest challenges' video feature

Dissemination

Dissemination of the project results to some extent naturally came to the fore with progress of the technical programme within the project: as more developed scientific results and innovation based upon them became available, these have been more fully presented in oral and poster form at numerous high profile conferences and similar fora by those leading the relevant research strands and industrial case studies, through peer reviewed publications, and targeting the business audience especially, through workshops, presentations and similar at industry relevant events and co-located conference programmes.

Research Posters and Presentations

In September 2024 AstraZeneca gave both an oral presentation and a poster at Euromembrane 2024 (Prague, Czech Republic). The presentation covered Homogenous palladium catalyst recovery and reuse using organic solvent nanofiltration and the poster featured Solvent exchange by application of membranes in the synthesis of AZD4625 – Inline monitoring by infrared (IR) spectroscopy.

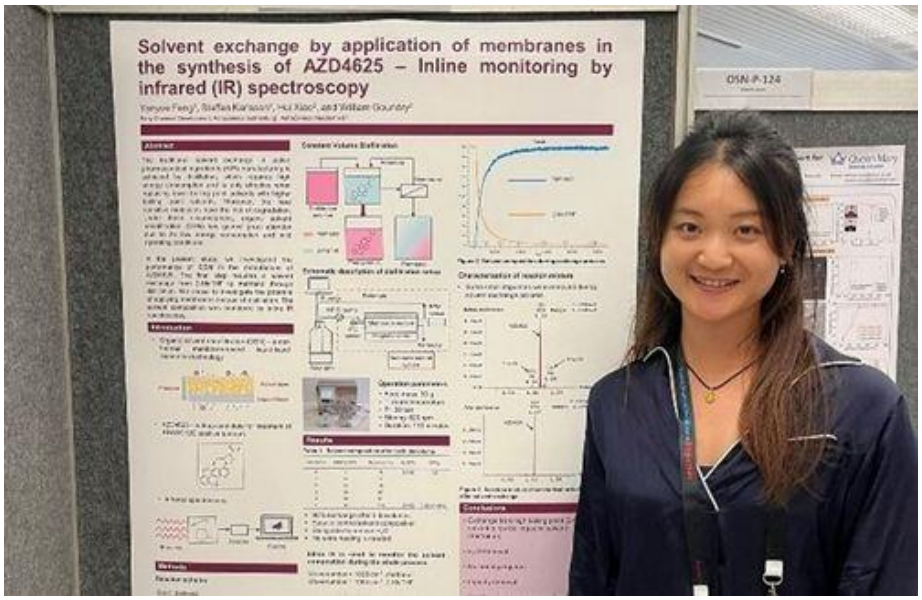

Figure 11 Dr. Yangyue Feng beside her poster presentation at Euromembrane 2024

An October 2024 poster from BOKU on Multi-Enzymatic Cascade Treatment for API Bioremediation was singled out as a prize winner by the 10th IUPAC International Conference on Green Chemistry held in Beijing, China).

Figure 12 Dr Filippo Fabri discusses his poster with visitors to ICGC Beijing, China (left) and receives a posetr prize from the organisers (right)

UKCEH delivered a poster on EU pharmaceutical legislation review in May 2025 for the SETAC Europe 34th Annual Meeting (Seville, Spain), while a November 2024 LIFE-GREENAPI: Innovating for the Future event (Aprilia, Italy) included two posters by Angelini on Twin Screw Extrusion processing in the development of pharmaceutical products and Optimized used of solvents in API production respectively.

The consistent theme of presenting results related to the ERA and ecotoxicity strands of ETERNAL to the key community environmental professional represented by the Society of Environmental Toxicology and Chemistry (SETAC) was reflected by a strong presence at the SETAC Europe 35th Annual Meeting (Vienna, Austria) in May 2025. Four presentations (three by UAVR and one by UKCEH) on Risk ranking of current in-use pharmaceuticals to the environment (UKCEH) and various aspects of ecotoxicological responses of various biota and associated risks associated with various pharmaceuticals were given on this occasion. SETAC also provided an opportunity to disseminate the project's work to an early-career researcher audience through participation in the 13th Young Environmental Scientists Meeting held in York, UK in August 2025 where a presentation was given by Carolina Machado from the

University of Aveiro on Environmental and Endocrine Risks of Diclofenac liposome encapsulation and its by-products.

Figure 13 Attendees at the 13th SETAC Young Environmental Scientists Meeting held in York, UK, August 2025

In September 2025 Laboratorio Reig Jofre presented posters at both the NanoThera Summit 2025 and the 12th Pharmaceutics and Novel Drug Delivery Systems conference (both Valencia, Spain) on the impact of manufacturing parameters on fabrication of DNA-LNPs for encapsulation of PPRH DNA sequence against HPV E7 protein and the physicochemical, biopharmaceutical, and in vitro efficacy properties of diclofenac-loaded liposomes respectively.

A focal point even for the project occurred in October 2025 when an ETERNAL Special Conference Session formed part of the programme at ICRAPHE 2025 – the 6th International Conference on Risk Assessment of Pharmaceuticals in the Environment (held in Aveiro, Portugal). Co-organised by the project and overall conference team from the University of Aveiro, this featured an overview of the project by AIMPLAS, alongside three technical/scientific presentations by the University of Aveiro / CESAM team on hazard assessment of pharmaceuticals and processes of production within ETERNAL, by Britest on Early-Stage Sustainability Assessment Methodology and by UKCEH on modelling the environmental emissions of pharmaceuticals.

Figure 14 Scenes from ICRAPHE 2025 Special Conference Session

December 2025 was the date for Scientific Update's 11th Winter Process Chemistry Conference which took place in Manchester, UK. This event saw two presentations highlighting progress made within two of the industry-led case studies in ETERNAL, respectively by Arcinova on Greener-by-Design synthesis methods applied to the characterisation, modelling, and optimisation of a challenging reaction in continuous flow, and by AstraZeneca on the application of Organic Solvent Nanofiltration membranes in pharmaceutical processes.

Publications

ETERNAL's first open-access peer reviewed publication, a review of Organic Solvent Nanofiltration in Pharmaceutical Applications produced by AstraZeneca appeared in March 2024, the first of nine such publications arising from the project to date. This first paper in fact has achieved notable traction in its field, first being selected as an "Editor's Choice" paper by the publishing journal OPR&D, reflecting the judgment that the paper would be of broad public interest. The editors' judgement has since been borne out by experience: in less than a year the review had received over 10,000 views online and been cited in 16 subsequent publications and was firmly established in OPR&D's Top 20 most downloaded articles for the previous 12 months. At the time of writing, these metrics stand at 20,804 views and no less than 83 onward citations.

A further paper by AstraZeneca researchers reinforced the high interest in OSN as an area of green technology development. Published in *Green Chemistry* in February 2025, 'Recovery and reuse of homogeneous palladium catalysts via organic solvent nanofiltration: application in the synthesis of AZD4625' was selected to be included in the journal's themed collection '2025 Green Chemistry Hot Articles'. This paper has been cited 22 times by other publications.

Britest's August 2024 publication in Open Research Europe of a framework for early-stage sustainability assessment of innovation projects set the foundations for the subsequent development of the recently published EU-standards related Collaborative Workshop Agreement CWA 18361:2026 - Methodology for Early-Stage Sustainability Assessment and Efficient Energy by Design which builds on both the FESSA framework and on recognised good practice standardised in the Irish Standard IS 399 for Energy Efficient Design (EED) Management. A second CWA arising from work done in ETERNAL is shortly due to be published at the time of writing (expected early June 2026). The development of CWA 18386 Determination of nucleic acid encapsulation efficiency in Lipid Nanoparticles using fluorometry has been led by Laboratorio Reig Jofre, and both collaborative review processes have been facilitated by the project's standard's specialist partner UNE.

ETERNAL's current full open-access, peer-reviewed publications list is shown in Table 1.

Table 1 Open access peer reviewed publications arising from ETERNAL

Title	Published	Citation / DOI
Organic Solvent Nanofiltration in Pharmaceutical Applications	22/03/2024	Xiao, H, Feng, Y., Goundry, W. R. F., & Karlsson, S. *Org. Process Res. Dev.* 2024, 28, 4, 891–923 https://doi.org/10.1021/acs.oprd.3c0047
A framework for early-stage sustainability assessment of innovation projects enabled by weighted sum multi-criteria decision analysis in the presence of uncertainty	05/08/2024	Henderson J., and Peeling R. *Open Res Europe* 2024, 4:162 https://doi.org/10.12688/openreseurope.18195.1

Recovery and Reuse of Homogeneous Palladium Catalysts via Organic Solvent Nanofiltration: Application in the Synthesis of AZD4625	28/02/2025	Xiao, H., Goundry, W. R. F., Griffiths, R., Feng, Y., & Karlsson, S. *Green Chem.*, 2025,27, 3186-3196 https://doi.org/10.1039/D4GC06334A
Continuous Improvement towards Environmental Protection for Pharmaceuticals: Advancing a Strategy for Europe	26/07/2025	Harrison, S., Barnett, C., Short, S., Uluseker, C., Silva, P.V., Pavlaki, M.D., Roberts, S., Vieira, M., Lofts, S., Loureiro, S., & Spurgeon, D.J. *Environ Sci Eur* 37, 128 (2025). https://doi.org/10.1186/s12302-025-01180-z
Laccase-mediated transformation of trazodone hydrochloride and its by-products	07/08/2025	Fabbri, F., Warne, C. M., Cassatella, P., Ruso, D., Doppler, M., Pellis, A., & Guebitz, G. M. (2025). *Renewable Chemistry*, 1(1), 4. https://doi.org/10.53941/rc.2025.100004
Advances and Challenges in Modelling the Environmental Fate and Exposure of Pharmaceuticals: A Comprehensive Review	05/11/2025	Uluseker, C., Lofts, S., & Harrison, S., *Environ. Sci.: Processes Impacts*, 2025,27, 3700-3724 https://doi.org/10.1039/D5EM00449G
Toxicity of Four Common Environmental Chemicals Across Caenorhabditis elegans Life Stages Supporting the One Health Concept	28/11/2025	Campos,F., Pavlaki, M.D., Soares, A. M. V. M., & Loureiro, S. *Environmental Toxicology* (2025): 1–16 https://doi.org/10.1002/tox.70002
Comparative Analysis of Sonication, Microfluidics, and High-Turbulence Microreactors for the Fabrication and Scaling-Up of Diclofenac-Loaded Liposomes	13/01/2026	Naveira-Souto, I., Fabrega Alsina, R., Rosell-Vives, E., Pena-Rodríguez, E., Fernandez-Campos, F., Malavia, J., Julia Camprodon, X., Schelden, M., Günday-Türeli, N., Cruz-Conesa, A., & Lajarin-Reinares, M. (2026). *Pharmaceutics*, 18(1), 105. https://doi.org/10.3390/pharmaceutics18010105
Process Simulation of a Microfluidic Micromixer for Pharmaceutical Production of DNA-Lipid Nanoparticles	08/04/2026	Nettleton, D.F., Naveira-Souto, I., Rosell-Vives, E., Cruz-Conesa, A., Fàbrega Alsina, R., & Poch, A. *Processes* 2026, 14, 1203. https://doi.org/10.3390/pr14081203

Industrial Case Studies

ETERNAL made seven industrial case study summaries publicly available in September 2025. These easily read two-page documents provide a concise summary of the key features, progress to date, and further steps involved, as several of the project's applied research efforts start to yield fruit in an at or near industrial ready state. Launched in hard copy form at the ICRAPHE 2025 conference the following month, these have proven to be useful vehicle for driving engagement and further interest in the project and its results.

Table 2 Titles in ETERNAL Industrial Case Study series

Continuous Pharmaceutical Manufacturing - Angelini Pharma has used Twin Screw Granulation successfully to produce granules for immediate-release tablets with fewer steps and less materials, avoiding water addition and energy-intensive phases, as a potential alternative to the current batch manufacturing process.
Early-stage Decision Making for Sustainability - Britest has developed a framework that teams can use to think systematically about the many criteria which go into deciding whether a proposed innovation enhances sustainability or not, coupling it with an improved method for multiple-criteria decision analysis in the presence of uncertainty. The combination can be used to guide a facilitated decision-making process towards clear, documented outcomes.
Green, Scalable Nanofiltration - Laboratorio Reig Jofre has introduced a continuous microfluidic platform to produce both diclofenac-loaded liposomes and DNA-loaded lipid nanoparticles (DNA-LNP). Design of experiments (DoE) combined with digital twin simulation of particle properties, enables predictive formulation, reducing the need for physical experimentation.
Membranes for Homogeneous Catalyst Recovery – AstraZeneca has developed a process using organic solvent nanofiltration (OSN) membrane technology to efficiently recover and reuse palladium catalysts during the synthesis of an important oncology drug. This minimizes energy consumption and waste production, promoting a more sustainable approach to catalyst management in pharmaceutical manufacturing.
Membranes for Streamlined Solvent Exchange - Organic solvent nanofiltration (OSN) offers an energy-efficient alternative to distillation, using membrane technology to achieve low temperature, low energy solvent exchange. Coupled with inline Fourier Transform infrared spectroscopy (FTIR), solvent composition can be monitored dynamically, enhancing the overall process efficiency.
Strain Engineering for Greener Bio-Manufacturing - Many microbial producer strains produce multiple by-products alongside their target compound. Preventing the expression of these by-products opens the way to safer, more stream-lined and sustainable pharmaceutical bio-manufacturing processes. A simple and straightforward genome editing platform for bacteria has been used at the University of Saarland to precisely delete targeted DNA regions in a producer bacterium used for making the immunosuppressant drug rapamycin. The method is potentially adaptable to any microbial system.
Sustainable Bioprocess Purification - Large quantities of environmentally harmful chemicals are generally required to purify active ingredients produced by bio-process based routes. MyBiotech GmbH has developed an innovative continuous end-to-end process which reduces the carbon footprint and the environmental impact of rapamycin production assessed by the toxicity of the process chemistry and products.

Other Events

In general, our approach to "other" events, i.e. those primarily extending beyond a primarily research-driven audience into business, have followed a similar trend of increasingly detailed presentations on new approaches to sustainable business innovation, environmental legislative trends, environmental risk assessment etc. and more interactive workshop style events to engage with and exchange perspectives and information with industry stakeholders. Some pertinent examples follow.

April 2024 Making Pharmaceuticals (Coventry UK): A presentation on MCDA for decision-making about process sustainability (Britest) and a workshop on EC Pharma legislation and the environment (Britest, and UKCEH, event co-organized with IChemE, the UK's professional society for Chemical Engineers). The output from this workshop is available through the project website.

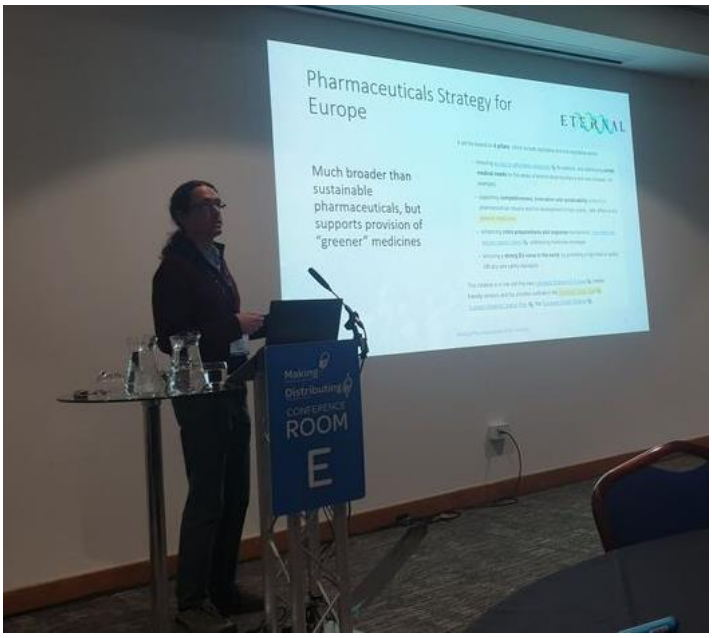

Figure 15 Dr. Sam Harrison (UKCEH) briefing the Making Pharmaceuticals 2024 workshop session about EU Pharmaceutical Strategy

June 2024 RSC Symposium at ChemSpec Europe 2024: ETERNAL & the Royal Society of Chemistry co-organized a special workshop session. This initiative was led for the project by Arcinova and featuring presentations by Britest on visualized whole system understanding for resource innovation in Speciality Chemicals and AIMPLAS on continuous processing applied towards greener downstream pharmaceutical manufacturing processes.

Figure 16 Dr. Paz Sebastia Luna (AIMPLAS) speaking at the RSC ChemSpec Europe 2024 Symposium

April 2025 Making Pharmaceuticals (Coventry UK): A mini-conference session consisting of three ETERNAL presentations on Innovative Solutions for Sustainable Drug Development (Britest), Continuous Improvement towards Environmental Protection for Pharmaceuticals: Advancing a Strategy for Europe (UKCEH) and the EU Energy Efficiency Directive & Methodologies for Greener Pharmaceuticals (Enviroeye) was delivered to the collocated conference accompanying this popular trade show for the UK pharma industry.

Figure 17 ETERNAL mini-conference speakers Sam Harrison of UKCEH (left), Rob Peeling of Britest (centre) and Micheal Galvin, Enviroeye (right) with co-exhibiting colleagues from the UK RESILIENCE Medicines Manufacturing Centre of Excellence at Making Pharmaceuticals 2025

October 2025 K FAIR: As part of its communication and networking activities, the ETERNAL project participated in the K 2025 international trade fair held in Düsseldorf, widely recognized as the world's leading event for the plastics and rubber industries. This participation provided an opportunity to showcase the project's progress in sustainable manufacturing and environmental impact reduction, while engaging with key industrial stakeholders and innovation actors. ETERNAL's presence at this global platform strengthened its visibility within the European innovation ecosystem and facilitated the exchange of knowledge with industry leaders, research organizations, and other relevant stakeholders.

Figure 18. Leaflets in K FAIR

July 2025 AIMPLAS Challenge Forum 2025 · From Science to Market (Valencia, Spain): An international event designed to address the significant challenges of the Plastics Industry and explore innovative solutions through research and collaboration. The event brought together 139 attendees from a diverse innovation ecosystem, including universities, research centres, packaging and plastics companies, technology providers, and public innovation entities. Participants represented expertise in advanced materials, sustainable packaging, plasma and 3D technologies, healthcare, and industrial digitalization. The strong presence of both academia and industry highlights the event's focus on collaborative R&D, technology transfer, and innovation-driven partnerships at an international level, included a

presentation by Britest on Trends in Sustainable Chemistry Applied to the Plastics Industry in the Healthcare Sector.

Figure 19 Scenes from AIMPLAS Challenge Forum 2025

External Stakeholder Group

ETERNAL's workplan included establishing an External Stakeholders Group as a complement to the capacities and knowledge available within the consortium, drawing on important actors from water treatment companies, solvent recyclers, and responsible waste disposal organisations for instance. From February 2024 onwards (Feb 2024, Jul 2024, Feb 2025, Mar 2026) a series of four meetings has provided a two-way forum for exchange of information and perspectives between the project partners and representatives of interested stakeholder organisations drawn from the pharma, healthcare and water / waste management industries. Further details on the background of participants in ESG / external advisory roles are provided in Section 3.2.3.

Figure 20 Full members of the ETERNAL External Stakeholder Group

We have also sought to engage with other relevant communities of interest, for example Britest participated in a March 2025 UK Fine Chemicals Sector Plan Round Table meeting thereby providing linkages into UK strategic planning to the direction of travel of the EU through REACH and Safe and Sustainable by Design, whilst in May 2025 AIMPLAS May 2025

took part in roundtable discussions about ETERNAL and the Green Pharma Cluster at XVIII Conferencia Anual De Las Plataformas Tecnológicas De Investigación Biomédica (Valencia, Spain).

Selected KPIs

All of the above-mentioned activity has been actively monitored and managed with respect to a comprehensive set of key performance indicators originally defined in the project's PDEC. Again, the purpose of this report is not to review the details of every indicator versus the plan's targets, but rather to highlight some key figures. Selected achievements over the course of the project to date (May 2026) are summarized visually in Figure 21.

Figure 21 Snapshot of Communication and Dissemination in numbers

3.2.3 Interest

(From Q2 2025 approximately and ongoing)

All the activity summarised above taken together represents a sustained and coherent joint effort by all partners across the consortium to maximise the visibility and availability of the project's results to interested parties from across the innovation ecosystem. This has provided solid foundations for exploitation of the project's results in the broadest sense: with value to be derived both through the ongoing use of data, results and insight in furthering scientific understanding in the field of environmental science, and onward into how the evidence of such science informs policy development, but also (especially relevant in the context of Business behavioural change) the uptake of results both within the pharma sector and in other key industrial / economic activities of the healthcare and water treatment industries.

In support of the impact of this effort, the project partners have defined and identified **25 Expressions of Interest** expressed by parties of relevance to the ongoing exploitation ambitions of the partners individually and collectively.

Five organisations have actively committed their time and involvement to **ETERNAL's External Advisory Board / Stakeholder Group**, see Table 3.

Table 3 Members of ETERNAL's External Stakeholder Advisory Group

Facsa - lead the Water and Environment department at Nealis (parent group with over 150 years of experience, present in sectors that improve people's lives and shape the evolution of cities: water and environment, facilities and services, infrastructure and hospitality). A family business with over 150 years dedicated to the management and care of water as an essential resource, Fasca is headquarted in Castellón, Spain, with operations distributed throughout the country.
Global Omnium Group - operates 28 drinking water treatment plants across Spain ,

supplying more than 400 cities and over 5 million people . It also manages 308 wastewater treatment facilities , 25 septic tanks, 155 external pumping stations, and 2 sludge treatment plants.
RISE (Research Institutes of Sweden) - is Sweden's research institute and innovation partner, and one of Europe's largest research institutes. As an independent government research institute, RI.SE work to develop technologies, products, services and processes that contribute to a sustainable society and a competitive business sector. RI.SE works in collaboration with industry, academia and the public sector – nationally and internationally.
Scottish Water – is a statutory corporation that provides water and sewerage services across Scotland. It is accountable to the public through the Scottish Government. Scottish Water provides drinking water to 2.46 million households and 150,000 business customers in Scotland. Scottish Water's interest in ETERNAL is linked to its role in addressing the environmental impact of pharmaceutical residues in water systems. Through the project, Scottish Water can access innovative approaches for the assessment, monitoring and reduction of contaminants, contributing to improved wastewater treatment and environmental protection. Participation also enables collaboration with industrial and research partners to develop scalable solutions aligned with regulatory and sustainability goals.
Sitra - is a company in industrial water management and bioenergy in Spain. With more than 250 completed projects, it offers comprehensive solutions ranging from the design and construction of water supply and purification treatment plants to the regeneration of wastewater and the generation of biogas. The company stands out for its technological innovation, its ability to design, build, operate, and maintain facilities, and its focus on sustainability and circularity.

ETERNAL has also benefited from engagement with and subsequent input to stakeholder meetings from representatives of various parties affiliated to the **One Health Breakthrough Partnership**, a cross-sector collaboration operating in Scotland bringing together interested parties from the Scottish National Health Service, the Scottish Environmental Protection Agency, and Scottish Water amongst others, committed to addressing pharmaceutical pollution through knowledge exchange, research and innovation, and cross-sector engagement. This partnership aims to stimulate innovation and impact to help achieve optimal health for people, animals, and our environment, following a One Health approach. Since 2017, this has supported research and knowledge exchange activity into areas including: monitoring pharmaceutical pollution; low-carbon and sustainable at-source treatment methods; environmentally informed healthcare and eco-directed formulary development; blue-green and social prescribing; and antimicrobial resistance in the environment.

Seven industrial businesses in the international pharma / fine chemicals sectors have received regular updates on the project's progress through the **Britest Innovation Strategy Board** and other member forums. The parallel activity under WP6 in furtherance of standardization objectives, has proved to be an effective means of driving interest and involvement in the project's impact from parties external to the consortium, specifically through the collaborative authoring process involved in the successful development of two CEN Workshop Agreements (CWA) led by Britest and Reig Jofre respectively, and in both cases steered by the secretariat expertise provided by UNE. Participants in the Early-Stage Sustainability Assessment Methodology CWA included **Verband Forschender Arzneimittelhersteller e.V. (vfa)** the association of research-based pharmaceutical companies in Germany. It represents the interests of 49 leading global manufacturers and their approximately 90 subsidiaries and affiliates in health, research, and economic policy. vfa members account for more than half of the German pharmaceutical market and employ around 100,000 people in Germany, approximately 20,000 of whom work in research and development. **BASF**, the German multinational company and the largest chemical producer in the world contributed to the development of CWA 18361:2026 (Early-Stage Sustainability Assessment) during the open commenting phase, and **Inside Therapeutics**, a French-based

provider of cutting-edge equipment & services for nanoparticles & RNA-LNP screening and production, attended the kick-off meeting for CWA 18386 on determination of nucleic acid encapsulation efficiency in LNPs by fluorometry.

In particular, regular meetings have been held with the companies **Hovione, Sitra, ECOVAMED and Chemipol** to provide updates on the progress of the project.

Hovione (Genopole) is a well-known Contract Development and Manufacturing Company (CDMO) with an international profile, dedicated to helping pharmaceutical customers bring new and off-patent drugs to market. Hovione's interest in ETERNAL lies in advancing sustainable pharmaceutical manufacturing through the application of green chemistry, process optimisation and digital tools such as Life Cycle Assessment.

SIGRE is a Spanish non-profit organisation responsible for ensuring the proper environmental management of medicines and their packaging generated in households. Established in 2001 through collaboration between the pharmaceutical industry, pharmacies and distribution companies, SIGRE expanded its scope in 2025 to include commercial and industrial pharmaceutical packaging, reinforcing the sector's commitment to sustainability and the circular economy. By the end of 2024, SIGRE involved 334 pharmaceutical companies, over 22,000 pharmacies and 147 distribution warehouses, managing approximately 105.6 g of pharmaceutical waste per inhabitant per year.

ECOVAMED is a technology-driven company focused on democratising sustainability in healthcare and chemical products through an innovative Life Cycle Assessment (LCA) solution. It supports the evaluation and reduction of environmental impacts of medicines, medical devices and chemical products, as well as healthcare eco-design initiatives.

Chemipol S.A. develops, manufactures and supplies biocides, additives and specialty chemicals for multiple industries. The company provides tailored formulations, laboratory services, complementary raw materials, logistics support and regulatory advice to its clients.

Other expressions of interest have arisen through conversations directly with partners, which in some cases were engendered by dissemination activities carried out by members of the consortium. As project coordinator, AIMPLAS has dealt with a variety of enquiries about ETERNAL, more recently including discussions with MARENOSTRUM, the Microfluidics Innovation Centre and Crystal Pharma.

Attendees from **Hovione** followed up with Britest at the ICRAPHE 2025 Special Conference Session, engaging with the project's published case study summaries, and AZ's membranes presentation at the Scientific Update Winter Process Chemistry Conference stimulated further conversations with **Carbogen Amcis**, a pharma CDMO who are investigating the application of OSN to ADC Drug Linker manufacture for solvent volume reduction post chromatography to avoid distillation.

4 Policy Makers Change Lab: Regulatory as an Enabler vs. a barrier to green innovation

Pharmaceutical products are essential to public health, but their life cycle from research and development, to synthesis, process development and disposal can carry high environmental costs. Traditional manufacturing often relies on hazardous solvents, energy-intensive processes, and long, linear supply chains. Meanwhile, after use, active pharmaceutical ingredients (APIs) and their metabolites can persist in the environment, contributing to pollution and risks to ecosystems. Addressing these challenges requires a systemic life cycle approach that integrates environmental sustainability into pharmaceutical research and development, production, use, and disposal.

Recognizing these challenges, the European Commission has launched an ambitious Green Pharma agenda, funding **five Horizon Europe projects—ENVIROMED, ETERNAL,**

IMPACTIVE, SusPharma and **TransPharm** that together form an informal *Green Pharma Cluster*.

These projects represent a multi-faceted effort to try to radically redesign how medicines are made, used, and disposed of in Europe. Their shared mission is to embed sustainability, safety, and circularity into every stage of the pharmaceutical life cycle.

- **ENVIROMED** (Next generation toolbox for greener pharmaceuticals design & manufacturing towards reduced **enviro**nmental impact) addresses a critical gap: the environmental fate and long-term impact of pharmaceuticals. Through monitoring campaigns, *in vitro* and *in vivo* studies, and *in silico* modelling, it seeks to understand how APIs and their derivatives persist, transform, and affect ecosystems—and to develop greener manufacturing technologies (*e.g.*, AI-guided biomanufacturing, sensing, continuous production) (https://www.enviromed.eu/).
- **ETERNAL** (Boosting the reduction of the environmental impact of pharmaceutical products throughout their entire life cycle) adopts a *full life-cycle* lens: from co-designing greener manufacturing processes (including mechanochemistry, solvent recycling, digital twins) to evaluating regulatory implications, to engaging stakeholders in safer use and disposal practices ensuring that sustainability is not just an afterthought, but part of the DNA of medicines (https://www.eternalproject.eu/).
- **IMPACTIVE** (**I**nnovative **M**echanochemical **P**rocesses to synthesize green **ACTIVE** Pharmaceutical Ingredients) fosters the implementation of a disruptive approach to manufacture pharmaceuticals based on *mechanochemistry*, where transformations are driven by mechanical forces applied by impact, shear, compression, or tension. This solvent-free (or low-solvent) alternative to traditional chemical processes drastically reduces or eliminates solvent use in key chemical transformations, with potential reduction of CO_2 emissions, energy and production costs, showcasing the unexpressed potential of this technology for pharmaceutical manufacturing (www.mechanochemistry.eu)
- **SusPharma** (Merging **Sus**tainable and digital chemical technologies for the development of greener-by-design **Pharma**ceuticals) is pioneering *safe- and green-by-design APIs and drug delivery systems,* using bio-based carbon sources, cleaner bond-forming chemistry through modern (single-atom) catalysis and photochemistry, continuous processing and purification, and digital platforms to minimize environmental footprints before a drug reaches the market (https://suspharma.eu/)
- **TransPharm** (**Trans**forming into a sustainable European **Pharm**aceutical sector) is driving the transformation of API development by harnessing AI and digital tools to identify greener-by-design active ingredients, optimize their synthetic routes (*e.g.*, via flow chemistry), and assess their life-cycle impact—including biodegradability and environmental consequences (https://transforming-pharma.eu/).

A major strand of active cooperation across the cluster has been to coordinate and amplify the messages emerging from their respective strands of work relating to informing policy making, through a joint policy brief document. This policy brief draws on the collective insights of these five Horizon projects to inform policy recommendations that can accelerate Europe's transition to a more environmentally sustainable and resilient pharmaceutical sector. Building on these core insights, the policy brief focuses on priority policy areas that are essential to foster the implementation of green and sustainable practices within Europe's pharmaceutical industry:

(i) developing new regulatory pathways that facilitate and encourage the adoption and uptake of innovative and sustainable manufacturing,
(ii) embedding environmental sustainability aspects into pharmaceutical regulation, and
(iii) ensuring that public and private stakeholders involved in the development, manufacture, and use of pharmaceuticals collaborate to establish harmonised and

commonly accepted environmental sustainability frameworks and assessment methods.

Currently (May 2026) the policy brief is being reviewed by the European Commission represented by Martin Uriarte a Policy Officer in Health Research & Innovation at the European Commission, based in Brussels.
The drafted policy is focused in five pillars:

(1) Green-by-Design Principles in Pharmaceutical R&D

(2) Accelerate Industrial Uptake of Green and Enabling Technologies

(3) Strengthen Monitoring and Regulation of Pharmaceutical Pollution

(4) Promote Circularity and Safe End-of-Life Management and

(5) Embed Sustainability Across the Pharmaceutical Sector through Education, Stakeholder Engagement, and Governance.

The transition toward a truly environmentally sustainable pharmaceutical system in Europe is no longer aspirational, but both necessary and achievable. The scientific and technological advances demonstrated by the ETERNAL case studies show that substantial reductions in the environmental footprint of medicines are possible without compromising either quality or patient safety. Achieving this transformation requires regulatory frameworks that remove barriers to innovation, systematically embed life cycle thinking, and continuing strengthen environmental risk assessment and transparency. Coordinated policy action will be essential to protect public health and ecosystems while enhancing the resilience, competitiveness, and strategic autonomy of Europe's pharmaceutical sector. Incentives, such the implementation of sustainable finance mechanisms via specific laws and defiscalisation tools, would encourage companies to embrace sustainability as a practise to tend to, potentially fostering post-approval changes for both sustainability and business reasons'.

5 Healthcare Practitioners Change Lab: Ambassadors for Green Pharmaceuticals, Sustainable Use and Disposal

The Healthcare Practitioners (HCP) Change Lab set out to explore how practitioners could be meaningfully engaged as advocates for sustainable pharmaceutical use and safe medicine disposal. The initial focus was on co-designing a "Greener Pharmaceuticals Pledge" and developing a network of ambassadors to promote best practice.

Through engagement activities, including an HCP survey and early stakeholder conversations, a different picture began to emerge. While there is broad alignment with the principles of sustainable healthcare, the primary barrier to engagement is not a lack of awareness or motivation. Instead, practitioners are operating within systems characterised by competing priorities, time pressure, and high cognitive load. In this context, additional initiatives, particularly those perceived as optional or extra, struggle to gain traction, regardless of their intent.

While the original plan envisaged co-designing a pledge with a pilot group of practitioners, engagement through the HCP survey exceeded this scale, with 36 responses providing structured insight into practitioner perspectives and constraints. This input offered a clearer picture of the day-to-day realities practitioners are working within, particularly the limits on time, attention, and capacity.

The survey also provided a more detailed view of the barriers practitioners experience when trying to act on sustainable practices, see Figure 22 and Figure 23.

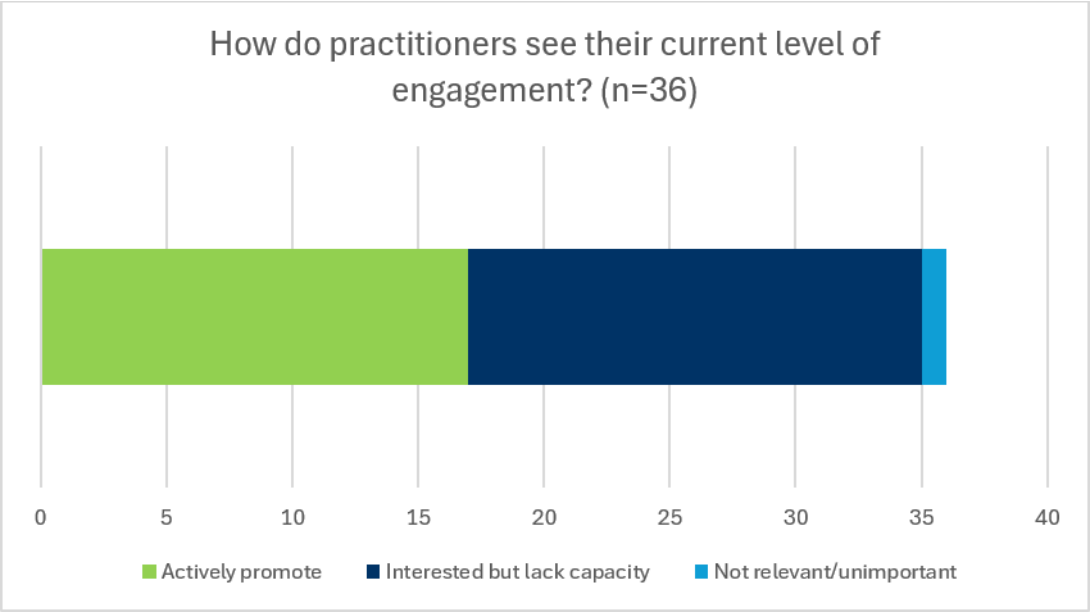

Figure 22 Healthcare practitioners' attitudes to green prescribing and actions to drive sustainable healthcare

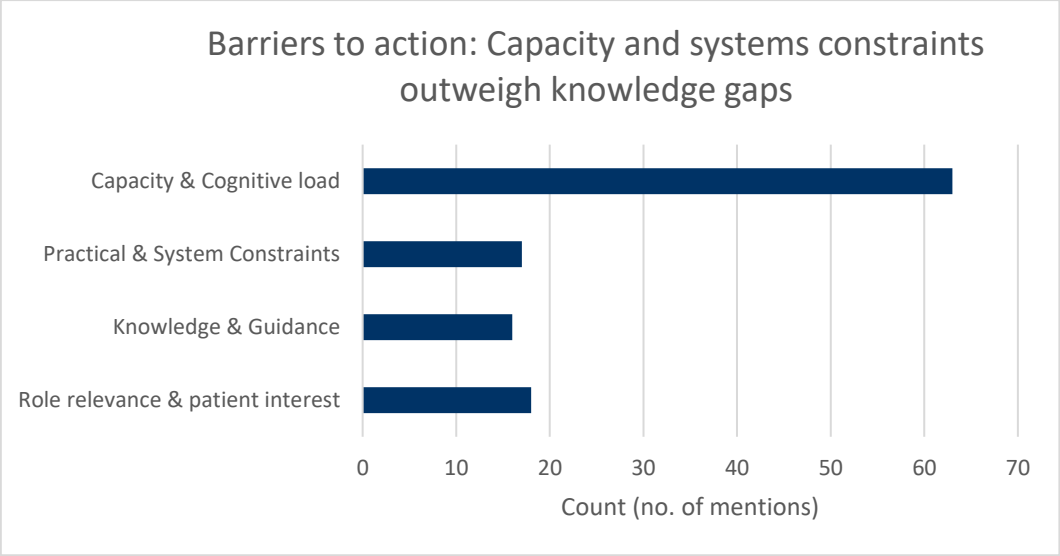

Figure 23 Categorised barriers to action identified by Practitioners

The pattern that emerges is clear. **Barriers related to capacity and cognitive load**—such as time pressures, competing priorities, and lack of headspace—**are reported far more frequently than other factors.** While other barriers are present, they appear at a similar and notably lower level.

While based on a relatively small sample, this finding is consistent with wider stakeholder conversations and suggests that the primary challenge is not one of awareness or intent. Instead, it reflects the practical realities of working within busy and complex healthcare environments.

This led to a **reframing of the challenge.** Rather than asking how to encourage practitioners to do more, **the focus shifted towards understanding how sustainable practices can fit within the realities of day-to-day clinical work.** The emphasis moved towards

approaches that can sit within existing workflows, rather than adding something new.

Early stakeholder engagement, including discussions with pharmacy professionals, reinforced the importance of keeping any proposed changes simple and workable in practice. These conversations highlighted that even well-intentioned initiatives need to align with system pressures if they are to be taken up.

The impact of this Change Lab lies in making these constraints visible and taking them seriously. It has helped move the work away from adding further demands, and towards finding ways of making sustainable practice easier to carry out in the flow of existing work.

Clarity in High Pressure – a workshop proposal

One emerging direction from this work is the development of a "Clarity in High Pressure" workshop. This was designed in direct response to the cognitive and emotional load identified as a key barrier to engagement. Unlike many existing approaches, which focus on providing additional tools, techniques, or information, this workshop is based on the insight that practitioners are often already operating at the limits of their time, attention, and mental capacity.

Through facilitated discussion and reflection grounded in participants' real-world experiences, the workshop explores how pressure, competing demands, and patterns of thinking can shape perception, decision-making, and day-to-day interactions in healthcare settings. Rather than focusing primarily on managing external circumstances, the emphasis is on developing a clearer understanding of how clarity, perspective, and insight naturally become more available when practitioners are less caught up in pressure-driven thinking.

The workshop is structured around four core elements:

- Creating space to step out of immediate pressure
- Exploring how pressure and thinking interact
- Reconnecting with clarity in decision-making
- Applying insights to real-world practice

The intention is not to introduce another framework or set of tasks, but to support practitioners in navigating complexity with greater clarity, perspective, and effectiveness within the realities of everyday healthcare work. In doing so, the workshop aims to create conditions in which sustainable practices are more likely to be carried out naturally, rather than experienced as an additional burden.

While this approach has not been piloted within the project timeframe, it represents a practical, insight-led direction that could be explored further.

In Summary

Looking ahead, this work supports the development of approaches that are simpler, more integrated, and more in tune with how healthcare is delivered in reality. It also aligns with wider healthcare approaches, such as Realistic Medicine, by recognising the need to reduce unnecessary burden and support more sustainable, appropriate practice within existing system constraints.

Overall, the Change Lab has contributed **a shift in understanding: enabling sustainable practice in healthcare is less about increasing intention, and more about making it easier for practitioners to do the right thing within the reality of their working environment.**

6 Consumers Change Lab: Social Innovation and Behavioural Change for Sustainable and Safe Use and Disposal

The Consumers Change Lab aimed to better understand behaviours relating to the use, storage, and disposal of medicines, and to identify practical opportunities to support safer and more sustainable practices.

Initial work included the design and distribution of a consumer survey, alongside a three focus groups to explore behaviours and attitudes in greater depth. Together, these provided both breadth and depth of insight into real-world behaviours and decision-making. While some awareness of correct disposal routes exists, it is not universal and does not consistently translate into action. This pattern is also visible when looking at behaviour across age groups.

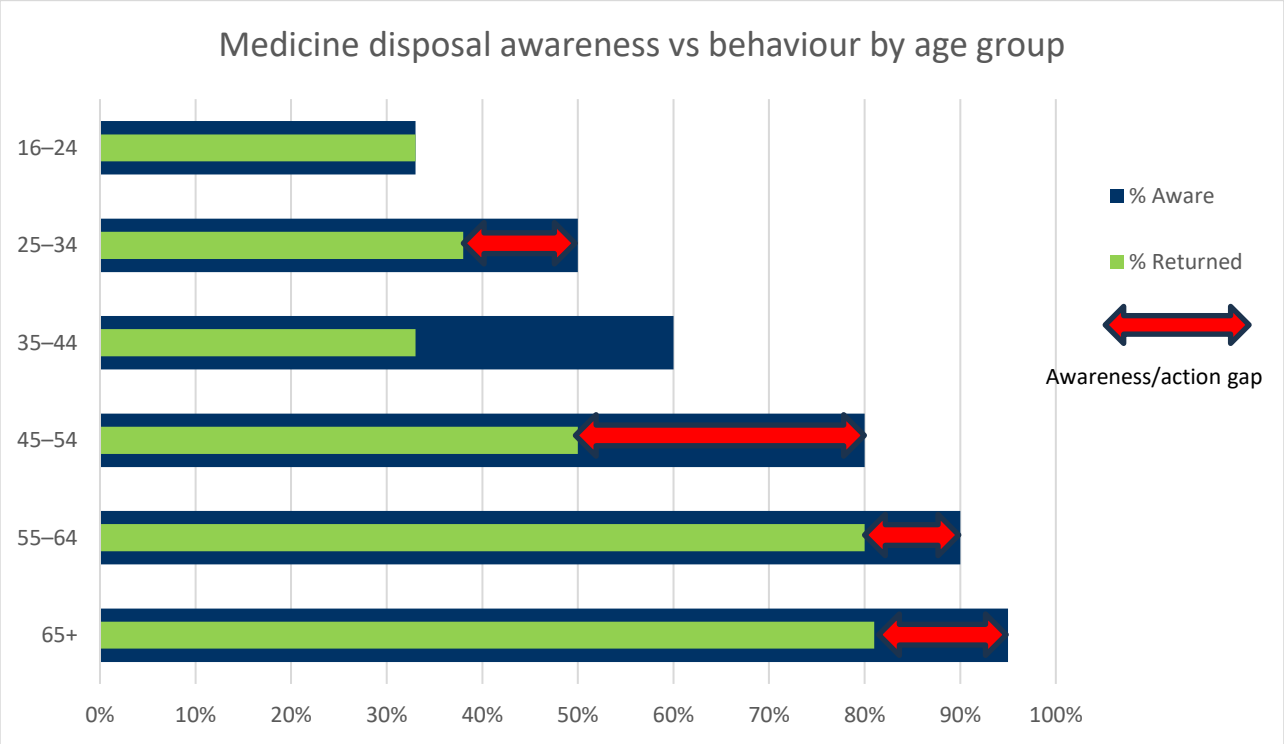

Figure 24 Consumer attitudes to safe disposal - the gaps between awareness and action

Table 4 Common Themes emerging from Consumer Survey Responses

Common Themes
Inconvenience and time pressure - queues, effort required, access
Intention does not translate into action - procrastination, low priority
Desire for easier alternatives - collection services, more locations
Frustration with waste and system limitations

Awareness increases with age, but this does not consistently translate into medicine return behaviour. The gap is most visible in the 35–54 age groups, where reported awareness is relatively high but reported return behaviour is notably lower. While based on a relatively small sample, this pattern is consistent with other findings from the Change Lab, suggesting

that competing demands and time pressure may play a role in whether action is taken. The focus groups added further context, illustrating how medicines are often stored, forgotten, and eventually disposed of in ways that do not align with best practice.

A key insight from this work is that behaviour is shaped less by intention and more by convenience and accessibility. Even where individuals understand the importance of returning unused medicines to pharmacies, this action is frequently deprioritised within busy daily lives. Small practical barriers—such as needing to queue, uncertainty about what is accepted, or simply forgetting—can significantly reduce follow-through. This was reflected clearly in how participants described their own behaviour:

> **"I know what I should do but there is usually a queue at the pharmacy and I'm not going to stand in it, especially with two kids, just to return my old medicines."**
>
> **"Returning to a pharmacy is somewhere between inconvenient and difficult. More accessible return points would be a lot more useful."**
>
> **"After my dad passed there were boxes of unused… medicine… we were told they would all just be destroyed. [It] felt like such a waste."**

These responses highlight how even small practical barriers can prevent action, particularly when returning medicines is seen as time-consuming, easy to postpone or pointless. This highlights the limitations of awareness-raising approaches in isolation. While clearer and more visible messaging may support behaviour change, it is unlikely to be sufficient without addressing the conditions in which behaviour takes place.

Building on these insights, potential pilot interventions were explored, particularly those aimed at increasing the convenience of medicine returns. However, attempts to progress these into implementation highlighted important system-level constraints. Limited capacity and buy-in from pharmacy stakeholders, driven by workload pressures and competing priorities, restricted the feasibility of introducing additional initiatives within the current system.

In addition, stakeholder input highlighted a further consideration: a successful awareness campaign could lead to a significant increase in returned medicines, potentially exceeding existing storage capacity and waste collection arrangements within pharmacies. Without corresponding adjustments to infrastructure and resourcing, this could create unintended operational and cost pressures.

While these factors limited the ability to implement a pilot within this phase, they generated important impact in their own right. They demonstrate that consumer-facing interventions cannot be designed in isolation, and that behaviour change efforts must take account of the wider system in which they are embedded.

Looking ahead, this work provides a foundation for developing more practical and effective approaches. It supports a shift from information-led campaigns towards solutions that make it easier for people to do the right thing, while also working within the realities faced by healthcare providers. Future pilots can build on these insights by considering not only how to encourage desired behaviours, but how to ensure the system is able to support and sustain them.

In summary, the Consumers Change Lab has contributed to **a clearer understanding of the gap between awareness and behaviour**, while also highlighting the interdependencies that shape what is practically achievable. This creates **a more grounded and actionable basis for future innovation in sustainable and safe medicine use and disposal.**

7 ETERNAL Change Labs – Infographic Summary

The information reported in the narrative part of this deliverable has been summarised visually through a set of **impact infographics**: four new visual digital assets to augment communication of the benefits and impacts of this aspect of the project's activities. The infographics are available as standalone pdf files from the project website and in hard copy. Careful stylistic consideration has been given for consonance with the visual / graphic styles already used by the project (colour schemes, logos and graphic elements used in. e.g. website, video, previous documents, presentations) and taking account of the purpose of the infographic.

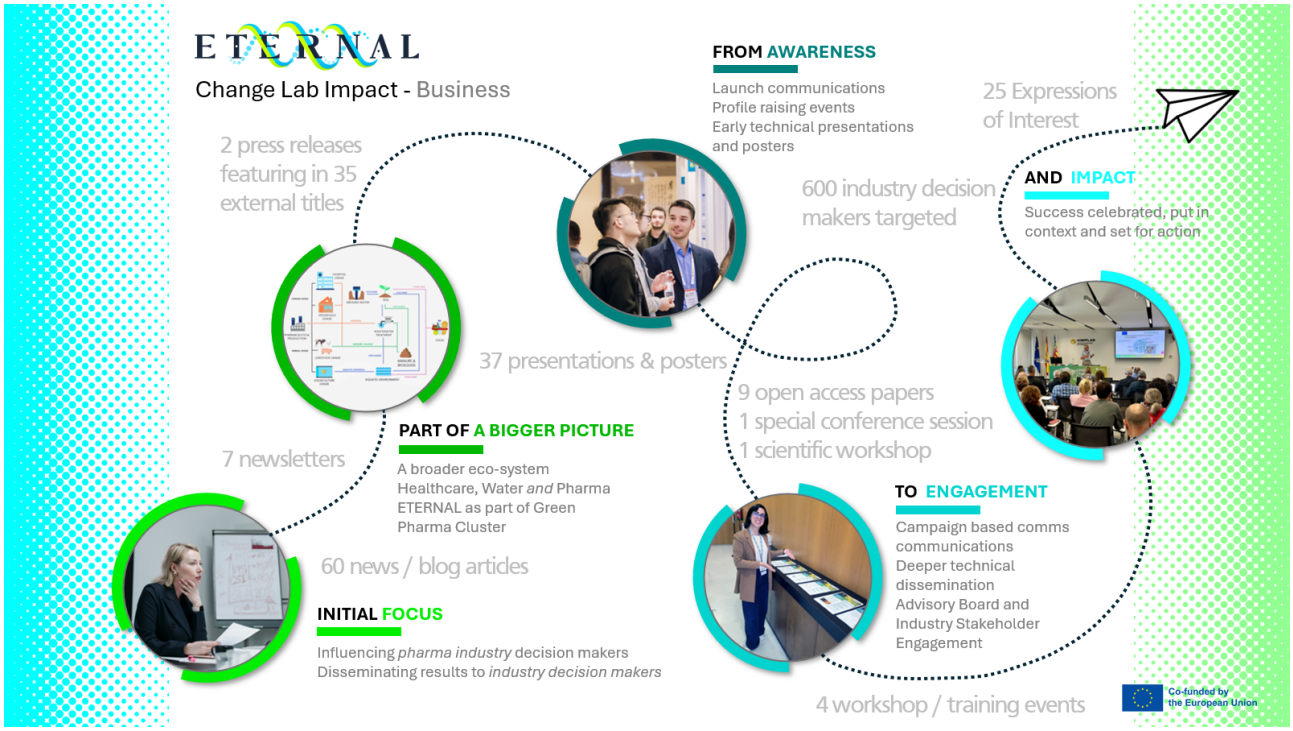

Figure 25 ETERNAL Business Change Lab Impact Infographic

Figure 26 ETERNAL Policy Change Lab Impact Infographic

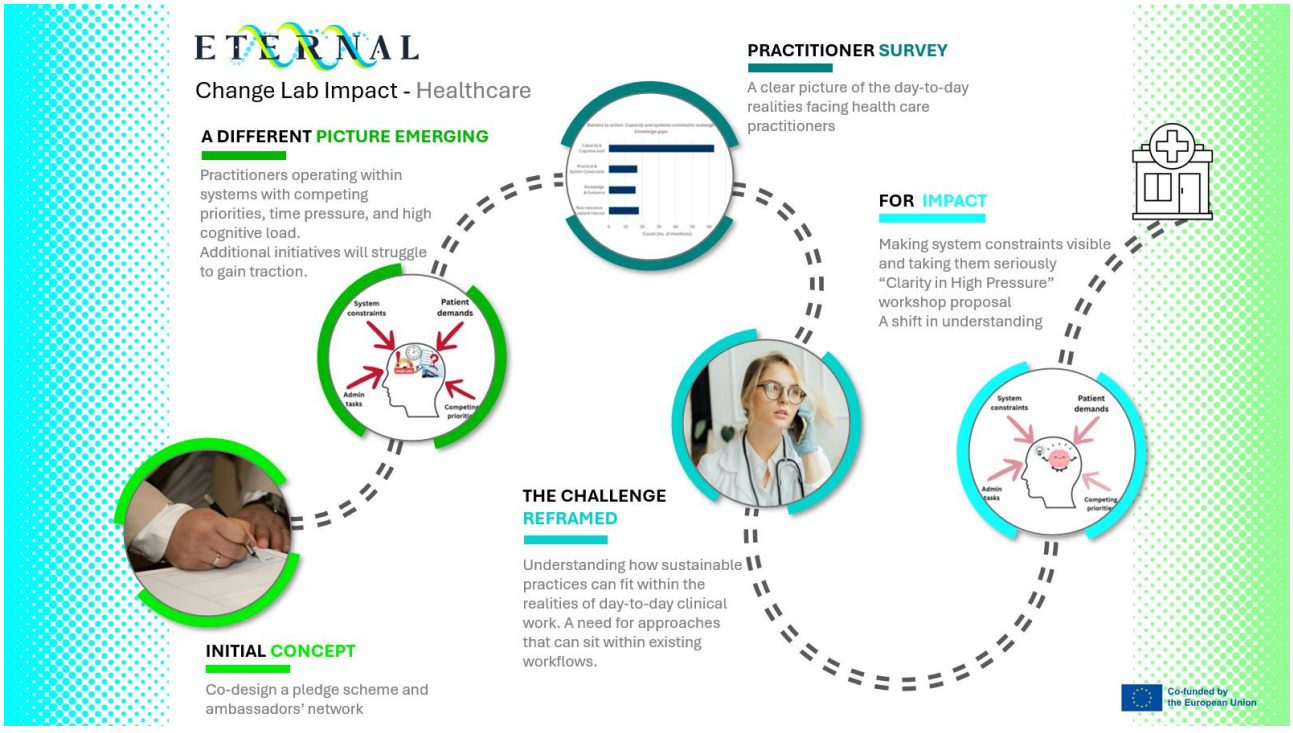

Figure 27 ETERNAL Healthcare Change Lab Impact Infographic

Figure 28 ETERNAL Consumer Change Lab Impact Infographic