Threats, challenges and innovation technologies for sustainable balance between health of freshwater ecosystems, human health and wellbeing in urban contexts

07.12.2023 15:00 PM CET - 16:30 PM CET

Host: SYNYO GmbH

OneAquaHealth

IEEE Southern California Council

SYNYO

1290 UNIVERSIDADE D COIMBRA

SHINE 2Europe

TOULOUSE INP

EFMI EUROPEAN FEDERATION for MEDICAL INFORMATICS

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ENORA INNOVATION

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Dipartimento Medicina Veterinaria Produzioni Animali

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AGENDA

Key information

OneAquaHealth

Time	Topic	Presenter
15:00 - 15:05	Introduction to the webinar and expected results	**Alexander Nikolov** SYNYO GmbH, Austria
15:05 - 15:15	OneAquaHealth project	**Alexander Nikolov** SYNYO GmbH, Austria
15:15 - 15:45	Standards Expert Talk: "Role of Standards & Technology in OneAquaHealth"	**Dr. Maike Luiken** Chair, IEEE Planet Positive 2030, IEEE SA, USA **Gora Datta** HL7
15:45 - 16:00	ENORA Innovation	**George Koutalieris** Business and Innovation Officer at Enora Innovation, Greece
16:00 - 16:25	Open discussion	All participants
16:25 - 16:30	Final remarks	**Alexander Nikolov** SYNYO GmbH, Austria

HOUSEKEEPING RULES

The session will be entirely recorded and published on the OneAquaHealth Open Information Hub.

All participants except speakers and moderators will be **muted by default**.

Feel free to post your questionsions in the **chat**.

If you would like to speak, raise your hand and wait for the moderator to give you the floor.

FACTS AND FIGURES

Key information

Programme
Horizon Europe

Project Type
Research and Innovation Action

Project duration
48 months (01/01/2023 – 31/12/2026)

Partners
13 from 10 countries

Budget
€4,939,558

Project is expected to (Extract)

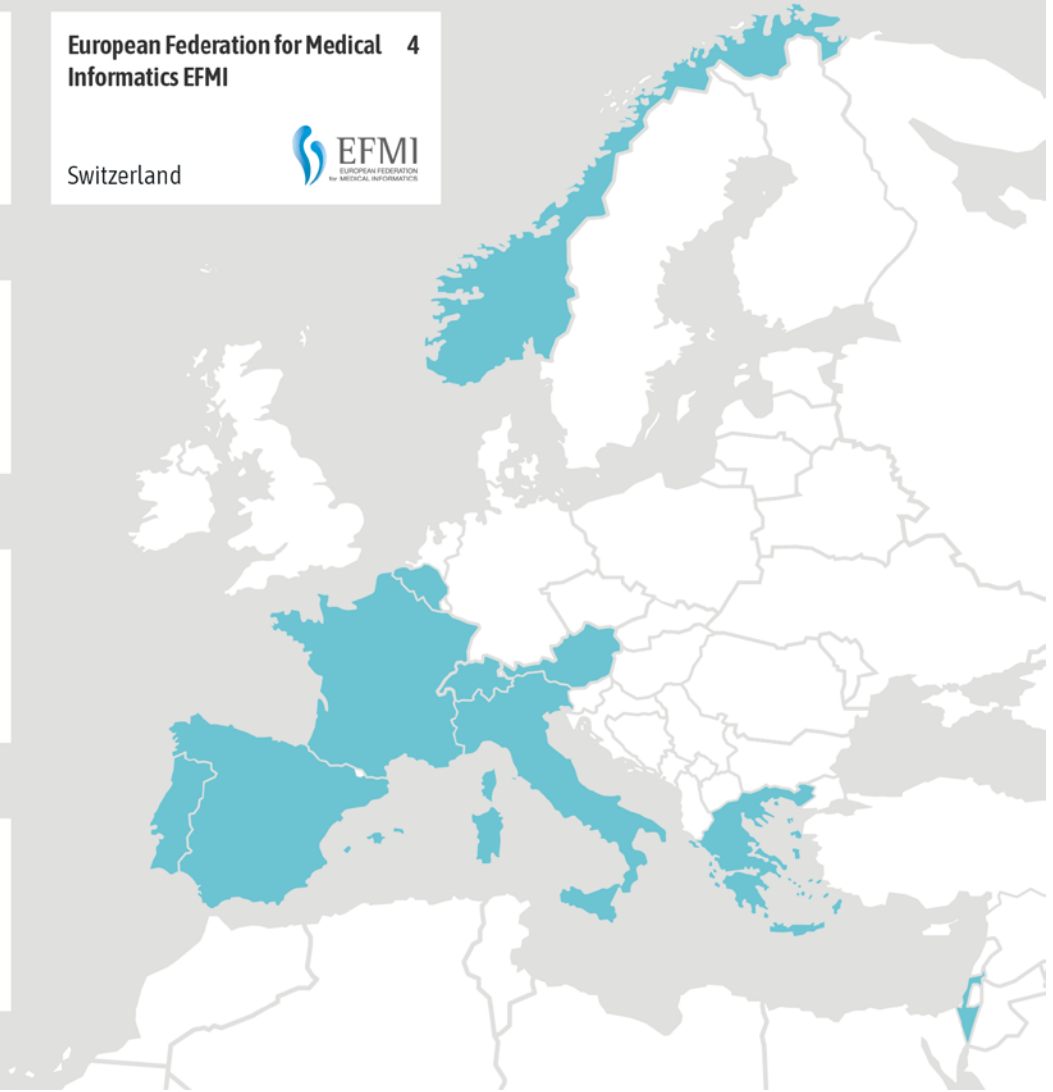
*„ The proposal should build on the **holistic integrative concept of 'One Health'** that includes not only the health of humans, but also of animals, soil and plants including ecosystems and environmental health. "*

*„A specific focus of the proposal should be on the **monitoring of the evolution of ecosystem barriers in densely populated, industrialised or agricultural areas**. The proposal should also investigate how environmental observations could provide information that can contribute to improving the effectiveness, sustainability and resilience of these ecosystem barriers in facing emerging diseases. The proposal should **include the reanalysis of long time series of environmental observations and their correlation with the emergence or spread of diseases**."*

*"It should also work on the **concept of alert or early warning systems** based on observation that would contribute* informing governments and authorities, and finally operators*, on the health risks related to the **destruction of ecosystems and biodiversity with a One Health approach**"*

CONSORTIUM

University of Coimbra UC 1 Portugal	SHINE 2Europe SHINE 2 Portugal	Institut National Polytechnique de Toulouse INPT 3 France
European Federation for Medical Informatics EFMI 4 Switzerland	University of Oslo UiO 5 Norway	ENORA Innovation ENORA 6 Greece
SYNYO GmbH SYNYO 7 Austria	Wise Angle WISE 8 Spain	National Research Council of Italy CNR 9 Italy
University of Naples Federico II UNINA 10 Italy	Holon Institute of Technology HIT 11 Israel	Health Level Seven International Foundation HL7 12 Belgium
University of Ghent UGent 13 Belgium		



KEY OBJECTIVES

OneAquaHealth

IDENTIFY the level of integrity of urban aquatic ecosystems.

DETERMINE adequate early warning indicators to assess ecosystem health and predict disease outbreak risks.

INTEGRATE live Earth observation data to monitor early warning indicators.

DEVELOP a tool to allow the selection of measures to act upon early warnings and ensure environmental monitoring.

ENGAGE stakeholders raising their awareness to the importance of urban streams.

SOLUTIONS

OneAquaHealth

Predictive models

The models will use machine learning approaches such as multilayer perceptron-artificial neural networks and discriminant function models. Their adaptation will require new machine learning methods.

Open Information Hub

The Hub will contain all the project information and allow the visualization of outputs and support tools for decision making.

City dashboards

The dashboards represent web applications that enable citizens and public institutions to access the data and their statistics through an optimized search graph and a graphical visualization.

Decision Support System (DSS)

The DSS will be implemented through a web server system and use data provided by ESA's Copernicus Program and NASA's Landsat images. The DSS is based on R packages conceived to implement PROMETHEE methods and support the Multiple Criteria Decision Analysis (MCDA).

Citizen Science Application

A mobile and desktop application for environmental observation will designed and supported by a back-office, which will enable citizens and public institutions to access data and statistics through an optimized search graph and a graphical visualization.

RESEARCH CITIES

OneAquaHealth

ITALY

PORTUGAL

BELGIUM

NORWAY

FRANCE

RESEARCH ACTIVITIES

TEST INDICATORS

DEPLOY EXPERIMENTS

FILL KNOWLEDGE GAPS

CITIZEN SCIENCE ACTIVITIES

TEST TOOLS

DIFFERENT CLIMATIC AREAS

CULTURAL BACKGROUNDS

DIFFERENT EXPERIENCES

20 SAMPLING SITES

EXPECTED PROJECT IMPACTS

Better insights in how to foster the **use of environmental observation in** the large domain of **One Health** and the areas within this domain that could benefit the most from environmental and Earth observation.

An **increase of the capacity to trace environmental parameter changes** on how they impact on the emergence of diseases.

Monitoring of the evolution of ecosystem barriers and reinforcement of their sustainability, specifically in densely populated or intensively used areas.

Contributing to **understanding the emergence and tackling the spread of new infectious diseases** affecting human, animal or plant health, and the interlinkages that may exist between them and building up of more resilient ecosystems.

Better **insights into the concept of alert and early warning systems**, including, where possible, the next steps taken (e.g. exploitation/scaling up) in working with the outcomes of the EIC Horizon Prize on Early Warning for Epidemics.

Questions & Answers

IEEE SA
STANDARDS ASSOCIATION

Role of Standards & Technology: Why? For What? How?

IEEE STANDARDS ASSOCIATION
RAISING THE WORLD'S STANDARDS

Dr. Maike Luiken
Chair, IEEE Planet Positive 2030, IEEE SA
OneAquaHealth Webinar
Virtual, Dec 7, 2023

IEEE

ADVANCING TECHNOLOGY FOR HUMANITY

ABOUT IEEE

- World's largest technical professional organization
- Trusted voice for engineering, computing and technology information around the globe
- Over 420,000 members in 190+ countries
- Inspiring a global community through its
  - Cited publications
  - Humanitarian work
  - Technical standards

- **2,000+** Annual Conferences
- **5M+** Technical Documents
- **200+** Periodicals
- **1,200+** Active Standards

- **Global Public Policy**
- **Global Humanitarian Efforts**
- **Continuing Education & Certification**
- **Ethics in Technology**

IEEE SA STANDARDS ASSOCIATION

planet positive 2030
Imagine The Future We Can Build Together

IMAGINE THE FUTURE
WE CAN BUILD TOGETHER

Our Two "Impossible" Goals

Transform society and infrastructure to achieve Planet Positivity.

Identify the technological solutions we need to design, innovate and deploy to reach Planet Positive 2030.

Our Planet Positive 2030 Projects

Planet Positive 2030 Compendium:
Strong Sustainability by Design

Impact Accountability / Assessment Framework:
Accountable Sustainability by Design

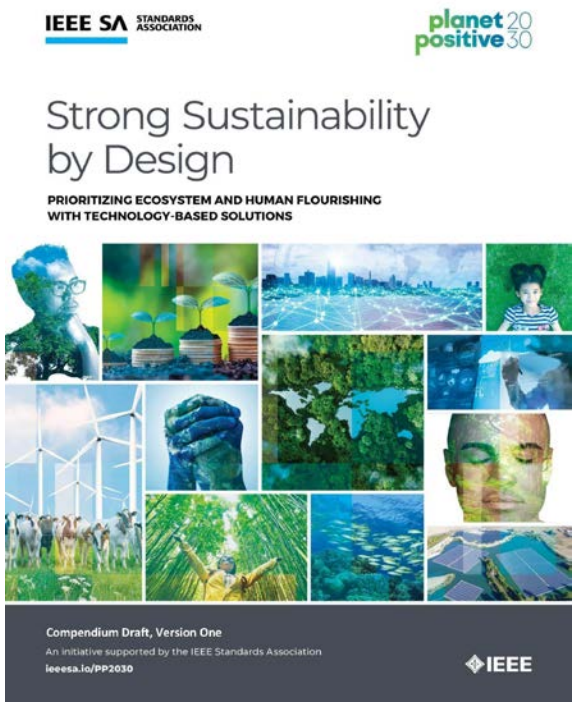
-> Change how technology and standards are <u>designed and created to prioritize planet and people first</u>

Chair: Maike Luiken
IEEE SA Staff Lead: John C. Havens

Planet Positive 2030

Planet Positive 2030 Compendium:
Strong Sustainability by Design

- Guiding Principles
- Metrics / Indicators
- Economics / Regulation
- Global Methodologies
- Ecosystems:
  - Forests and Trees
  - Rivers and Lakes
  - Towns and Cities
  - Ocean and Coasts
  - Farmlands and Grasslands, Mountains and Peatlands



Impact Accountability / Assessment Framework:
Accountable Sustainability by Design

Measuring What Matters

- Utilizing **metrics** such as the UN SDGs and/or ESG metrics is how to best **measure progress** towards PP2030 goals.
- IEEE 7010™-2020 Standard - Wellbeing Impact Assessment (used in conjunction with tools like Basic Sustainability Assessment Tool (BSAT)".

Impact Assessment Framework

- The Impact Assessment Framework will complement the Strong Sustainability by Design compendium and will be based on UN SDGs, ESGs and/or other available Impact Assessment tools (environmental, infrastructure, climate, …) and reporting systems / templates.

IEEE PP2030 Chapter on Rivers & Lakes: Issues

- Water access rights are overly human centric as humans control access to many clean water sources through legal arrangements impacting numerous species, not just humans.
- Humans treat water as an endless resource that causes unnecessary waste, especially in regions where water is scarce or is under threat of becoming so.
- Community overexpansion can overtax water resources where the scaling effect, while seemingly efficient from a financial sense, may have the unexpected result of overtaxing available water resources.
- City infrastructure detracts from healthy river and lake ecosystems
- Excess fertilizer, pesticide, and animal waste pollute water sources and increase the chances for toxic harmful algal blooms (HABs).
- Water flow diversions disrupt critical ecosystems
- Growing water-intensive crops in arid zones accelerates water scarcity
- Physical trash/plastics pollute freshwater ecosystems and plays a significant role in ecosystem degradation and destruction
- Chemical and hazardous waste adversely affects river and lake ecosystems
- Raw human sewage pollution causes degradation of river and lake ecosystems
- Invasive species threaten freshwater ecosystems

-> Many of these issues affect human and animal health and wellbeing

Outcomes: Standards Development - Examples

- **P7800** Recommended Practice for Addressing Sustainability, Environmental Stewardship and Climate Change Challenges in Professional Practice: https://standards.ieee.org/ieee/7800/11039/
- **P7801** Recommended Practice for Technical Knowledge Commons Initiatives and Platforms: https://standards.ieee.org/ieee/7801/11197/
- **P7802** Standard for Measurement and Verification of Reduction of Greenhouse Gases for Climate Action Projects and Solutions: https://standards.ieee.org/ieee/7802/11238
- **P7803** Recommended Practice for Inclusive Sustainable Smart Cities: https://standards.ieee.org/ieee/7803/11412/

You are invited to participate! Interested? Please contact: maike.luiken@ieee.org

IEEE SA STANDARDS ASSOCIATION

IEEE FUTURE DIRECTIONS

IEEE SusTech Initiative
Sustainability Through Technology

planet positive 2030
Imagine The Future We Can Build Together

IEEE SusTech Initiative
Sustainability Through Technology

The **IEEE SusTech Initiative** seeks to contribute technical expertise and solutions to address sustainability challenges, including climate change. This initiative is growing rapidly and new volunteers are always welcome.

Graphic credit Maike Luiken

In-person and virtual workshops are offered free of charge throughout the year. These fascinating, interactive workshops engage technical professionals and academics from around the world to map technology development needs according to gaps identified by the work of the Planet Positive 2030 Compendium.

- In-person and virtual workshops to identify gaps between needs and available technologies
- White papers and technology roadmapping focus in 2023

Sign-up today!
c.graas@ieee.org

https://cmte.ieee.org/futuredirections/projects/climate-tech/

IEEE SA STANDARDS ASSOCIATION

IEEE

STANDARDS:

An unseen force behind technological innovation and adoption.

You can't see standards, but they are at work behind the scenes everyday.

From device to device, network to network, across borders and around the world, almost all products, services and technologies in use today are created, connected or enabled in some way by standards.

WHAT IS A STANDARD?

Standards are published documents that establish technical specifications and procedures designed to maximize the reliability of the materials, products, methods, and/or services people use every day.

A standard can be thought of as an agreed-upon norm used by people, industry, and government that outlines the best way to complete a task – whether it's about developing a product, providing a service, controlling a process, or interacting with the world.

Technology standards can also provide a framework that enables devices from different manufacturers to communicate with one another

WHY ARE STANDARDS IMPORTANT?

Standards help ensure products are:

- ☑ Reliable
  Secure
  Safe
- ☑ Compatibile
  Interoperable
- ☑ Efficient
  Scaleable

Standards enable technologies to work seamlessly, fostering smooth operations across industries and markets, and helping to build consumer trust.

Standards create mutual understanding by distributing knowledge and common guidance across industries and markets so products and services can be designed and manufactured to work together in a safe, secure, interoperable, compatible, reliable, scaleable and efficient way.

WHO DEVELOPS STANDARDS?

Standards Development is a voluntary, cooperative and collaborative effort.

Standards development work engages a diverse set of participants. Participants may include Standards Development Organizations (SDOs) like IEEE SA, industry, government agencies, consumer groups and other stakeholders who are interested in creating standards based on mutual agreement or consensus.

IEEE SA invites diverse, global participation in standards development from:

PEOPLE working in or engaged with many types of groups & organizations

- Industry Sectors, Groups & Companies
- Government Agencies & Authorities
- Academic Institutions
- Trade Associations
- Consumer Groups
- NGOs
- and MORE

PEOPLE from all discipilines, experiences & backgrounds

- Innovators
- Engineers
- Technologists
- Researchers
- Ethicists
- Policymakers
- Industry Leaders
- Educators
- Consumers
- PEOPLE like you ★

IEEE SA
STANDARDS ASSOCIATION

RAISING THE WORLD'S STANDARDS

ABOUT IEEE SA

Developing market relevant open standards and solutions:

- Advancing global technologies and technology platforms
- Promoting innovation
- Protecting public safety, health & wellbeing
- Contributing to a sustainable future

IEEE

IEEE SA Centers of Competence

Health & Life Sciences
- Pharma
- Clinical health
- Wellness

Mobility
- Safe autonomous driving
- Zero emissions
- MaaS

Energy
- Smart energy
- Energy efficiency
- Energy infrastructure

Sustainability
- Sustainability & Design
- Measurement & Accountability
- Energy Transition

New Frontiers
- Cybersecurity
- Emerging technology areas

Foundational Technologies
- Industrial IoT
- Consumer technology
- Infrastructure Application Technologies

Telecommunications & Connectivity
- Rural
- Next generation telecom
- Wired and hybrid communications

STANDARDS AND SOCIAL IMPACT

Our global community is developing sustainable, consensus-based technical standards and solutions for societal issues

Ethical AI Systems

Data Governance

Fairness in the Trade of Data

Child Online Rights

Digital Intelligence

Dignity and Agency in Identity

Clean and Sustainable Energy

Connectivity and Mobility

IEEE

IEEE standards span a broad spectrum of technologies

- Aerospace Electronics
- Broadband Over Power Lines
- Broadcast Technology
- Clean Technology
- Cognitive Radio
- Design Automation
- Portable Battery Technology
- Power Electronics
- Power & Energy
- Radiation/Nuclear
- Reliability
- Transportation Technology

- Electromagnetic Compatibility
- Green Technology
- Ethernet/Wi-Fi
- Medical Device Communications
- Nanotechnology
- Organic Components

IEEE SA Portfolio of Programs

Industry Connections

Exploring and incubating new technology and its use

Standardization

Creating markets and protecting public safety through standards development

Membership

Getting connected to experts and resources and enabling advanced participation options

Conformity Assessment & Certification

Providing confidence and assurance and accelerating market adoption

IEEE SA Open

Providing a community-powered platform to support open source projects

Alliance Management Services

Providing program support to alliances and trade associations

Registries

Providing and administering unique identifiers for electronic equipment to support global interoperability

Industry Affiliate Network

Assisting industry organizations in accelerating development and adoption of global standards

Training & Development

Empowering volunteers with the knowledge they need to help ensure their success.

Policy Engagement

Working with government bodies and policy makers on standards, policy & regulation matters

- IEEE Government Engagement Program on Standards (GEPS)
- IEEE SA Standards fellowship Program

thank you
danke
謝謝
ngiyabonga
teşekkür ederim
gracias
merci
obrigado
dziękuję
bedankt
go raibh maith agat
mochchakkeram
sukriya
kop khun krap
terima kasih
grazie
arigatô
dakujem
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Баярлалаа
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dank je
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I am Committed to a Better World for All

Maike Luiken, Ph.D.

- Chair, IEEE Planet Positive 2030, IEEE SA
- Co-Chair, IEEE SusTech Initiative - FDC
- Chair, IEEE P7800 Standards Working Group
- Vice-Chair, IEEE P7801 Standards Working Group
- IEEE Vice President - MGA, 2021
- IEEE Canada President, 2018 -19
- Managing Director - R&D, Carbovate Development Corp.
- Adjunct Research Professor, Western University, London, Canada
- Senior Member, HKN, IEEE
- Fellow, Engineering Institute of Canada
- Editorial Focus Advisor & Associate Editor, IEEE Canadian Review
- Member, IEEE Canadian Foundation Board of Directors

Education is the Catalyst of Sustainability
Interaction is the Catalyst of Innovation

maike.luiken@ieee.org

I live and work in Sarnia, Ontario, Canada
A community that continually transforms itself.

Sarnia-Lambton brings together Natural Beauty, Education, Industry and Agriculture on the shore of Lake Huron with easy access to the Canadian and US markets.

OneAquaHealth

Standards FOR ONEAQUAHEALTH

Gora DATTA, FHL7, SMIEEE, SMACM

- Engineering Faculty @ University of California Berkeley
- (founding) Co-Chair **HL7** Mobile Health Work Group
- Member, **HL7** TSC: Technical Steering Committee
- (founding) Member **HL7** Education Advisory Council
- (founding) Convenor **ISO/TC215** WG#10 Traditional Medicine
- (founding) Vice Chair **IEEE** Blockchain Technical Community
- (founding) Chair **IEEE** Standards P3228 WG on Recurring Transactions in DLT
- Chair **IEEE** Southern California Council

07 Dec 2023 Virtual Webinar

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101086521.

Focus on Standardization

OneAquaHealth

- Forging connections with Global Initiatives
  - IEEE Planet Positive 2030 – a key initiative of IEEE Standards Association
    - https://sagroups.ieee.org/planetpositive2030/
    - Key committees of interest
      - Rivers & Lakes
      - Oceans and Coasts
- Standardization efforts
  - IEEE-SA Standards
    - 11073 Family of Medical Device Standards
    - IoT Family of Standards (sensors, devices)
  - HL7 FHIR – Digital Health Interoperability Standard
    - Develop a new OAH-FHIR Resource?
    - Adding OAH attribute(s) to an existing FHIR resource?
    - Developing a OAH FHIR Implementation Guide?
    - Collaborate with HL7 Mobile Health WG, HL7 Patient Engagement WG
  - ISO/TC215 Health Informatics
    - WG#11: Personalized Digital Health
  - Other SDOs

IEEE SA STANDARDS ASSOCIATION

planet positive 2030

Strong Sustainability by Design

RIVERS AND LAKES

IEEE 11073

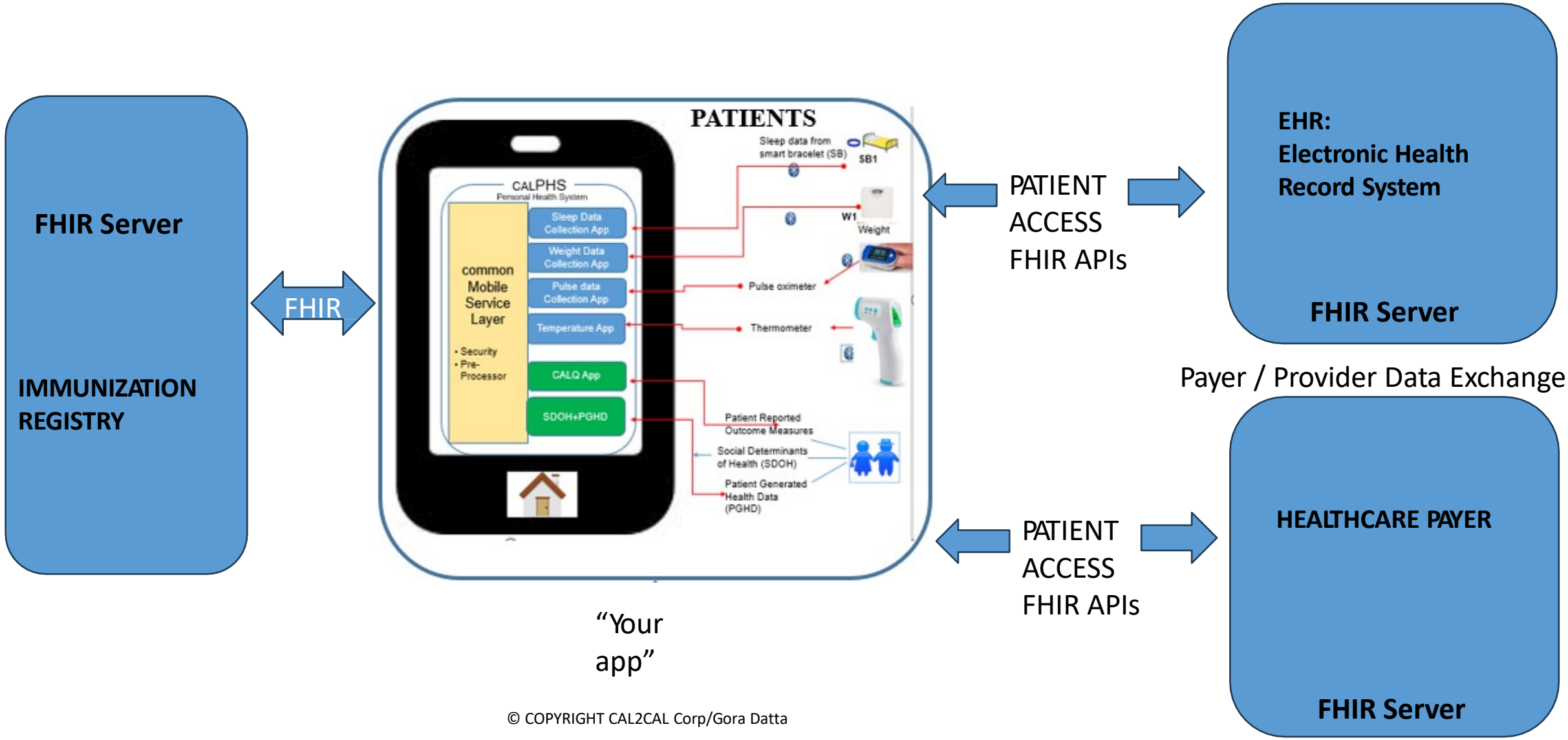
- Point-of-care medical devices (PoC)
- Personal health devices (PHD)

IEEE 11073 Personal Health Devices Standards Series

OneAquaHealth

HL7

HL7 FHIR Client – Server Example



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FHIR RESOURCES

FHIR RESOURCES

- Building blocks designed to be easily shareable
- standardized structure, including attributes and relationships,
- self-contained unit of information
  - with a specific structure and
  - defined set of elements that describe different attributes of the data

EXAMPLES

1. **Patient:** Represents a patient's demographic information, including their name, gender, date of birth, and contact details.
2. **Observation:** Represents the result of a clinical observation or measurement, such as a blood pressure reading, laboratory test result, or vital signs.
3. **Medication:** Represents a medication that a patient is prescribed, including details about the medication name, dosage, instructions, and route of administration.
4. **Condition:** Represents a patient's medical condition or diagnosis, along with relevant details such as onset date, severity, and status.
5. **Encounter:** Represents a healthcare encounter between a patient and a healthcare provider or facility, including information about the location, date, reason for the encounter, and participants involved.
6. **Procedure:** Represents a medical procedure or action performed on a patient, including details about the procedure type, date, and related participants.
7. **AllergyIntolerance:** Represents a patient's known allergies or intolerances to specific substances, medications, or foods.
8. **ImagingStudy:** Represents imaging studies like X-rays, MRIs, or CT scans, along with metadata about the study and the images produced.

An Resource Example: PATIENT…(1 of 2)

Structure | UML | XML | JSON | Turtle | R4 Diff | All

Structure

Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource	Information about an individual or animal receiving health care services Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension
identifier	Σ	0..*	Identifier	An identifier for this patient
active	?! Σ	0..1	boolean	Whether this patient's record is in active use
name	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown Binding: AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual
deceased[x]	?! Σ	0..1		Indicates if the individual is deceased or not
deceasedBoolean			boolean	
deceasedDateTime			dateTime	
address	Σ	0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient Binding: Marital Status Codes (Extensible)
multipleBirth[x]		0..1		Whether patient is part of a multiple birth
multipleBirthBoolean			boolean	
multipleBirthInteger			integer	
photo		0..*	Attachment	Image of the patient

An Resource Example: PATIENT…(2 of 2)

contact	C	0..*	BackboneElement	A contact party (e.g. guardian, partner, friend) for the patient *+ Rule: SHALL at least contain a contact's details or a reference to an organization*
relationship		0..*	CodeableConcept	The kind of relationship Binding: Patient Contact Relationship (Extensible)
name	C	0..1	HumanName	A name associated with the contact person
telecom	C	0..*	ContactPoint	A contact detail for the person
address	C	0..1	Address	Address for the contact person
gender		0..1	code	male | female | other | unknown Binding: AdministrativeGender (Required)
organization	C	0..1	Reference(Organization)	Organization that is associated with the contact
period		0..1	Period	The period during which this contact person or organization is valid to be contacted relating to this patient
communication		0..*	BackboneElement	A language which may be used to communicate with the patient about his or her health
language		1..1	CodeableConcept	The language which can be used to communicate with the patient about his or her health Binding: All Languages (Required) **Additional Bindings** | Purpose Common Languages | Starter Set
preferred		0..1	boolean	Language preference indicator
generalPractitioner		0..*	Reference(Organization | Practitioner | PractitionerRole)	Patient's nominated primary care provider
managingOrganization	Σ	0..1	Reference(Organization)	Organization that is the custodian of the patient record
link	?! Σ	0..*	BackboneElement	Link to a Patient or RelatedPerson resource that concerns the same actual individual
other	Σ	1..1	Reference(Patient | RelatedPerson)	The other patient or related person resource that the link refers to
type	Σ	1..1	code	replaced-by | replaces | refer | seealso Binding: Link Type (Required)

EVOLVING STANDARDS IN MOBILE HEALTH APP

ISO TS 82304-2: Quality Criteria for Health & Wellness Apps

- Technical Specification about quality criteria for health apps
- doesn’t cover the detailed process of an assessment schema

HL7 Standard for Trial Use STU2: cMHAFF – consumer Mobile Health App Functional Framework

- cMHAFF provides a standard against which a mobile app’s foundational characteristics -- including but not limited to security, privacy, data access, data export, and transparency/disclosure of conditions -- can be assessed.
- The framework is based on the lifecycle of an app, as experienced by an individual consumer, from first deciding to download an app, to determining what happens with consumer data after the app has been deleted from a smartphone.

NEW MOBILE HEALTH STANDARD IN THE MAKING

HL7 UMHAI: UNIQUE MOBILE HEALTH APP IDENTIFIER

HL7 UMHAI – newly approved HL7 standard project

- This is a unique identifier that uniquely identifies mobile health application instance as installed on a mobile device.
  - Single User Multiple Devices (e.g., Smart Watch, , CPAP, CGM)
  - Single Device Multiple Users (e.g., Digital Scale, SMBP, Digital Thermometer)
- Related data elements would included Application name, App Builder, version, build number, hosting device, unique identifiers [similar to a Vehicle Identification Number (VIN) used to track and identify individual vehicle BUT much more].
- Unique Mobile Health Application Identifier enables identification of application instance to facilitate recall, maintenance, transparency and traceability.

IN CONCLUSION

- OneAquaHealth project
  - Key Indicators
  - Effective Measures
  - Tools for decision support

- Identification of Gaps in Standards

- Design/development of relevant Standard(s)
  - a consensus driven process

Questions & Answers

OneAquaHealth

ENORA INNOVATION

Empowering Urban Aquatic Ecosystem Monitoring for Global Health: Integrating Ground Data with Earth Observation Methods

George Koutalieris

Chief Innovation Officer
ENORA Innovation
Greece

07.12.2023

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101086521.

Definition of Urban Aquatic Ecosystems

Urban aquatic ecosystems include rivers, lakes, streams, and wetlands located in or near urban areas

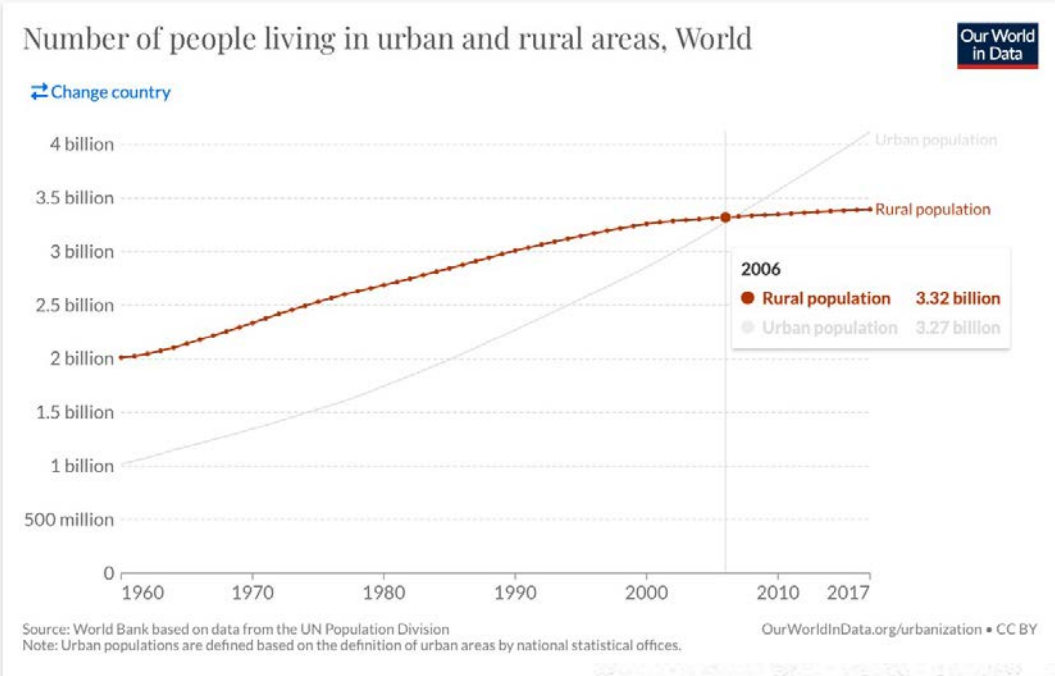
They are vital habitats for various species, supporting rich biodiversity within urban settings

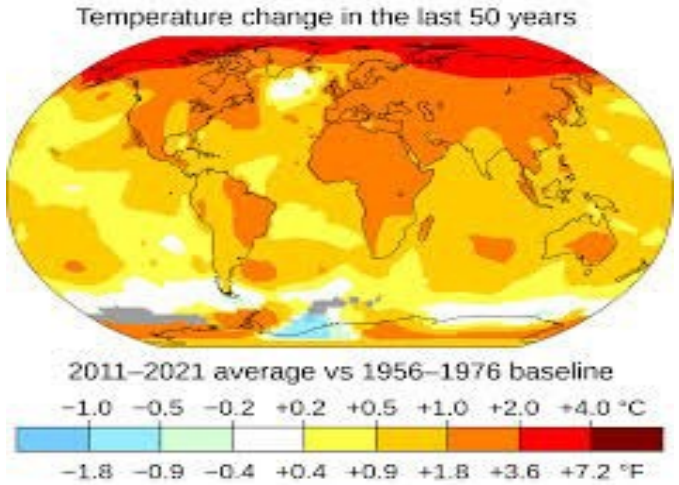
They act as ecological corridors, connecting fragmented natural areas and facilitating species movement

Urban aquatic ecosystems contribute to human health and well-being, offering recreational spaces and improving air quality

They often suffer from pollution, habitat destruction, and the impacts of urbanization, such as impervious surfaces and artificial channelization.

OneAquaHealth in a nutshell





Urban stream syndrome

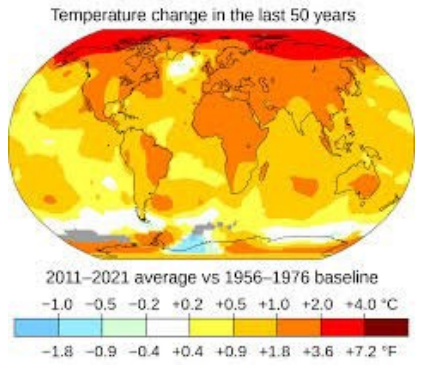
Project priorities

- Foster the use of environmental observation in the large domain of One Health
- Benefit from Earth Observation (EO) technologies
- Increase the capacity to trace environmental parameter changes on how they impact on the emergence of diseases
- Monitor the evolution of ecosystem barriers and reinforcement of their sustainability in densely populated
- Contribute to understanding the emergence and tackling the spread of new infectious diseases affecting human, animal or plant health
- Supp0rt the build up of more resilient ecosystems
- Provide better insights to support alerts and early warning systems

DEGRADED URBAN FRESHWATER ECOSYSTEMS are a source of diseases that affect animals, plants and humans

Human Health

- ❑ Water-borne and vector-borne diseases
- ❑ Public health and social welfare associated to environmental degradation



Climate challenges

Assessing the quality of urban aquatic ecosystems to promote One Health

Identify the parameters related to the health of freshwater ecosystems and human health and wellbeing in urban contexts

Reestablish the balance between nature and humans: improving results in one will result in the improvement of the other

OneAquaHealth 5 Research sites

- A notable achievement:
  - Selection of 100 sampling sites across the 5 research cities for data collection experiments

Sampling sites in Coimbra

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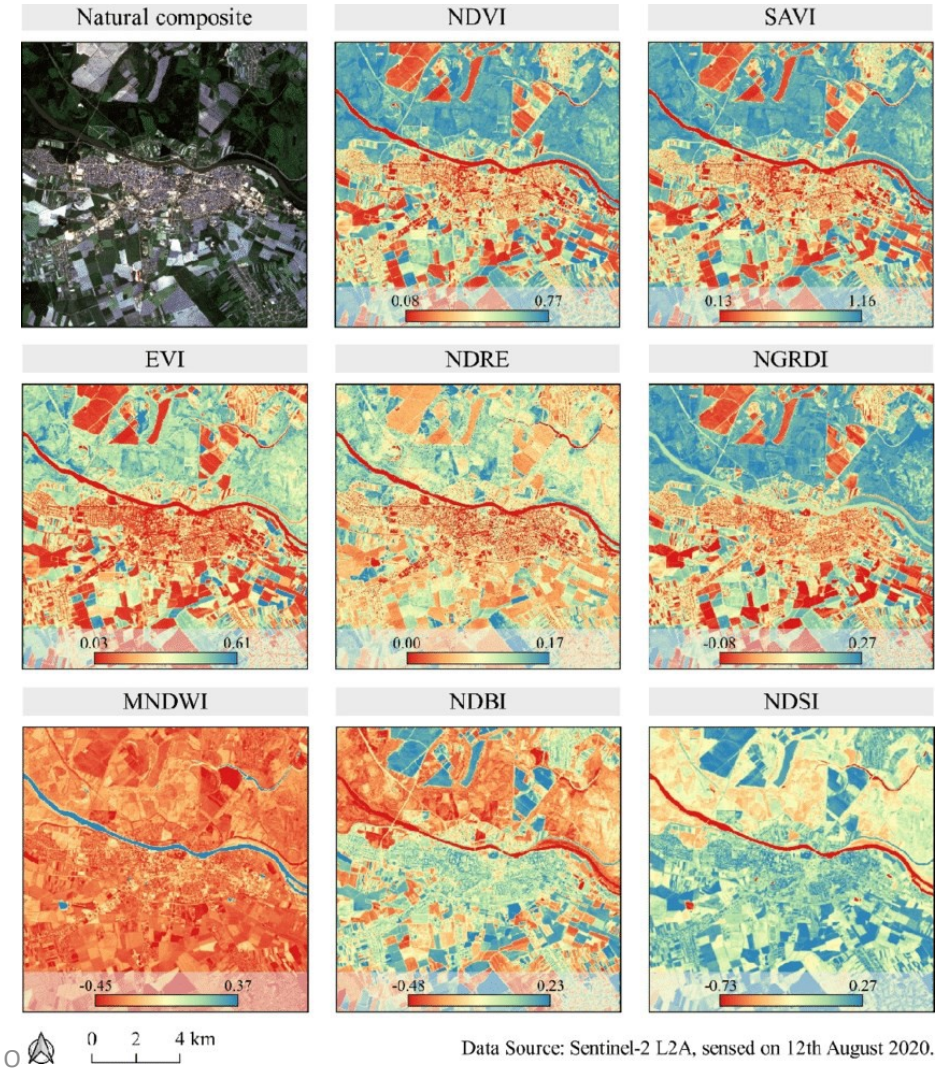
Geotagged scientific data collection

Code	Name	Latitude	Longitude	Existing historical information (which type of information, and dates)
C1	Exploratório	40.19787	-8.42865	Water FQ (conductivity, pH, O2, TSS, N, P compounds, pharmaceuticals), Ecological Assessment, Invertebrates, Diatoms, Hydromorphology (RHS)
C2	Estação Cbr-B	40.22483	-8.44135	Water FQ (conductivity, pH, O2, TSS, N, P compounds, pharmaceuticals), Ecological Assessment, Invertebrates, Diatoms, Birds, Fish, Hydromorphology (RHS)
C3	Vale das Flores	40.19307	-8.41945	Water FQ (conductivity, pH, O2, TSS, N, P compounds, pharmaceuticals), Ecological Assessment, Invertebrates, Diatoms, Birds, Fish, Hydromorphology (RHS)

Figure 3. Photographs of sampling sites in Coimbra

The Role of EO in Ecosystem Monitoring



- EO involves the gathering of information about our planet's physical, chemical, and biological systems via remote sensing technologies, such as satellites and aerial sensors.
- It is critical for tracking changes in landscapes, water bodies, and ecosystems over time, allowing for the detection of alterations due to natural processes or human activities
- It provides valuable data on the impact of climate change on urban aquatic ecosystems (rising temperatures, water level changes, and the frequency of extreme weather events)
- EO technologies enable precise spatial analysis of ecosystems, helping to identify areas of ecological significance, pollution sources, and habitat degradation
- Conservation strategies are informed by EO data is to manage natural resources, and to minimize environmental impacts during urban planning

Methodology - Annotating Areas of Interest (AoIs) by experts- Coimbra

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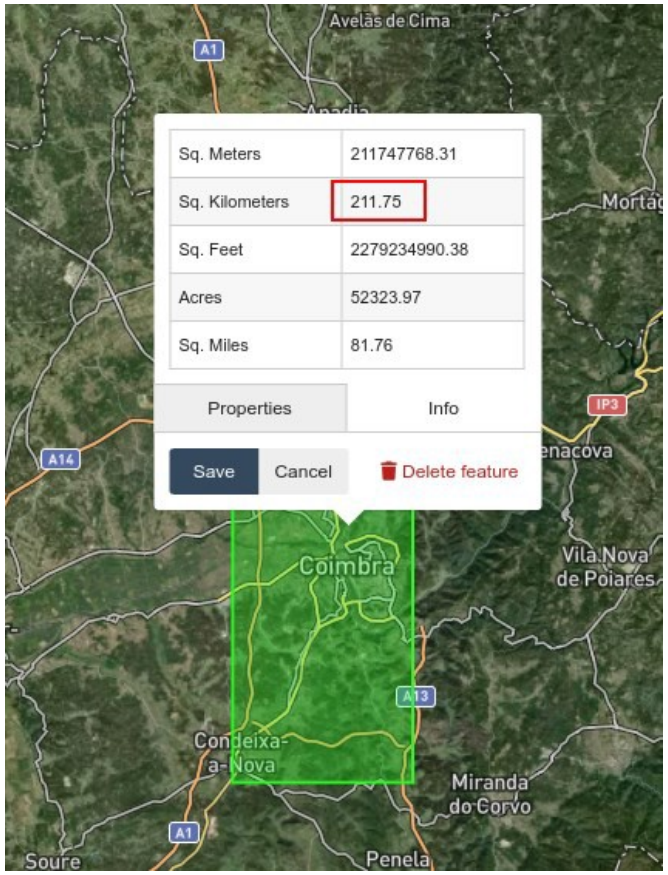
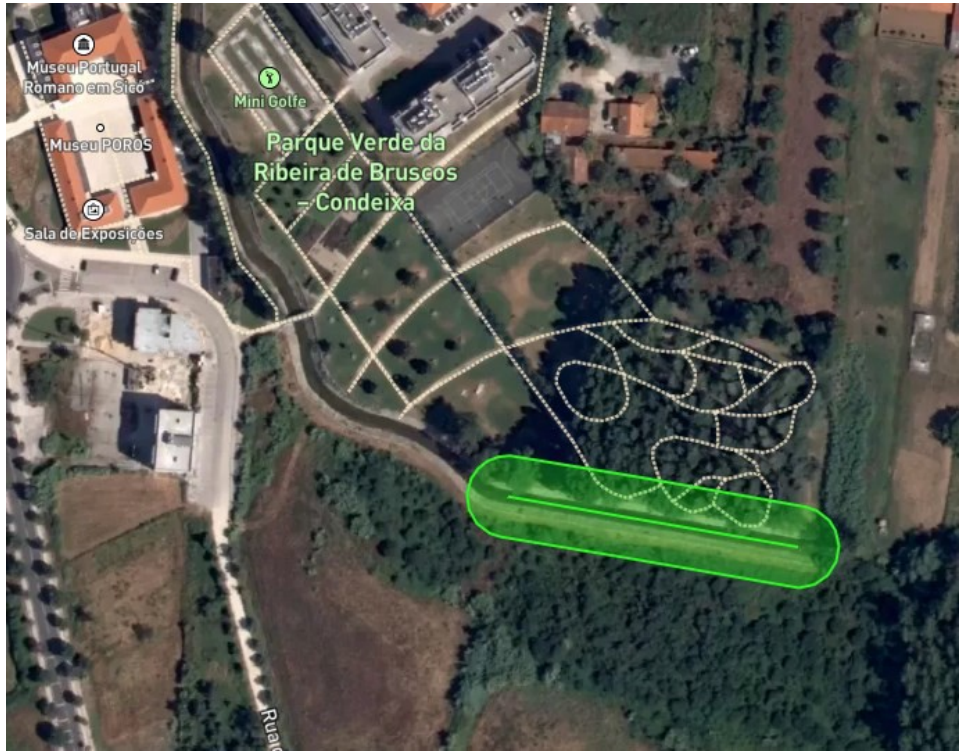
Annotation Tools

- Drawing lines following the stream flow
- Buffer the AoIs to include surrounding areas (15m buffer area on each side; 30m wide)
- Annotations are translated into standard GeoJSON format



Challenges of AoIs

- Satellite Image resolution (streams are narrow)
  - Lower orbit satellite images (Planetscope)
- Obstructed view due to Urban structures
  - Indirect measurements (vegetation health near streams, soil moisture, ambient temperature, etc)
- Dense vegetation covering the AoI
  - Only a few AoIs offer clear view



C13 sampling location in Coimbra. One of the “best” sites in terms of direct view

Conclusion and planned activities

- Data observations per sampling Location:
  - Including **ecological, biological, riparian & hydromorphological** parameters
- Correlation of EO resources with Ground Measurements:
  - Data integration of **onsite ground measurements with remote sensing**
  - Comprehensive development of the **OAH AI Prediction model for streams health assessment**
- **Development and validation** of the OAH AI Prediction model for streams health assessment

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ENORA Innovation in a nutshell

- Established in 2019 in Greece, with a mission to **bridge the gap** between **technological innovation and sustainable well-being**
- The company is focusing on the **convergence** of EO, IoE, and AI to exploit IT solutions for sustainable energy efficiency practices and enhanced environmental monitoring
- **Product and Software Development**: Known for developing smart device prototypes, AI applications to enhance IoT efficiency, integrating domain-specific data, and advancing AI/ML algorithms while adhering to international quality standards.
- **Environment and Global Health** Innovation: ENORA Innovation is actively involved in projects addressing healthcare transformation (ALAMEDA) and environmental monitoring (RESIST, OneAquaHelath)
- Strengthening **AI-driven environmental monitoring** and to support **climate change resilience**

Get in touch

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Follow us in

https://www.linkedin.com/company/enora-innovation/

Interested to work with us?
total-workforce@enorainnovation.com

New prospects and requests?
george.koutalieris@enorainnovation.com

Questions & Answers

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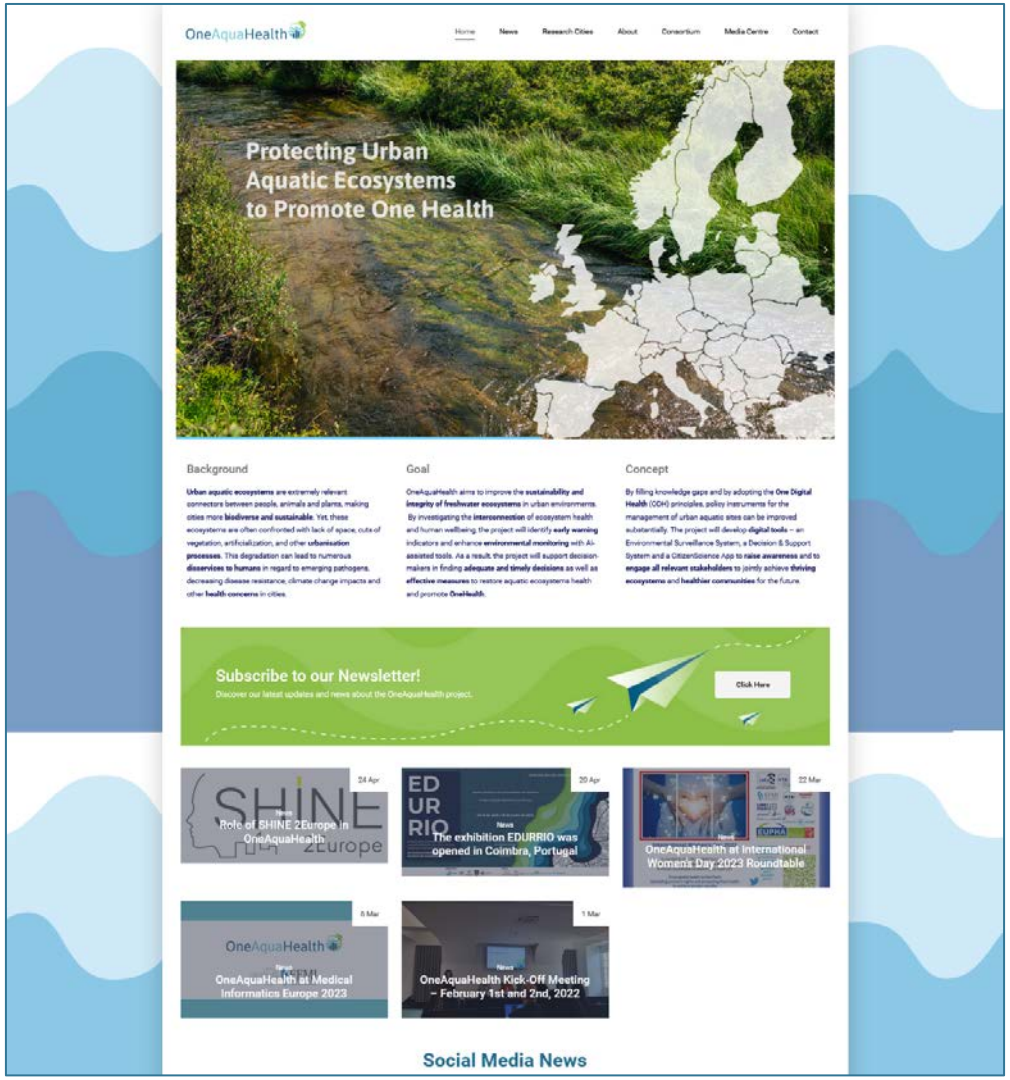

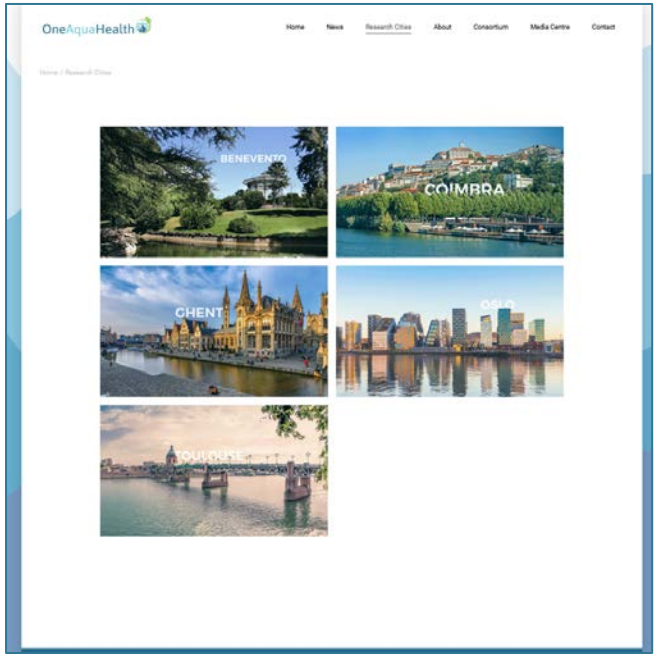

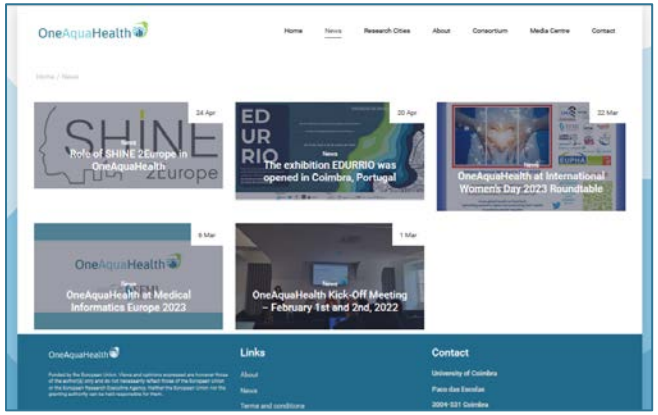

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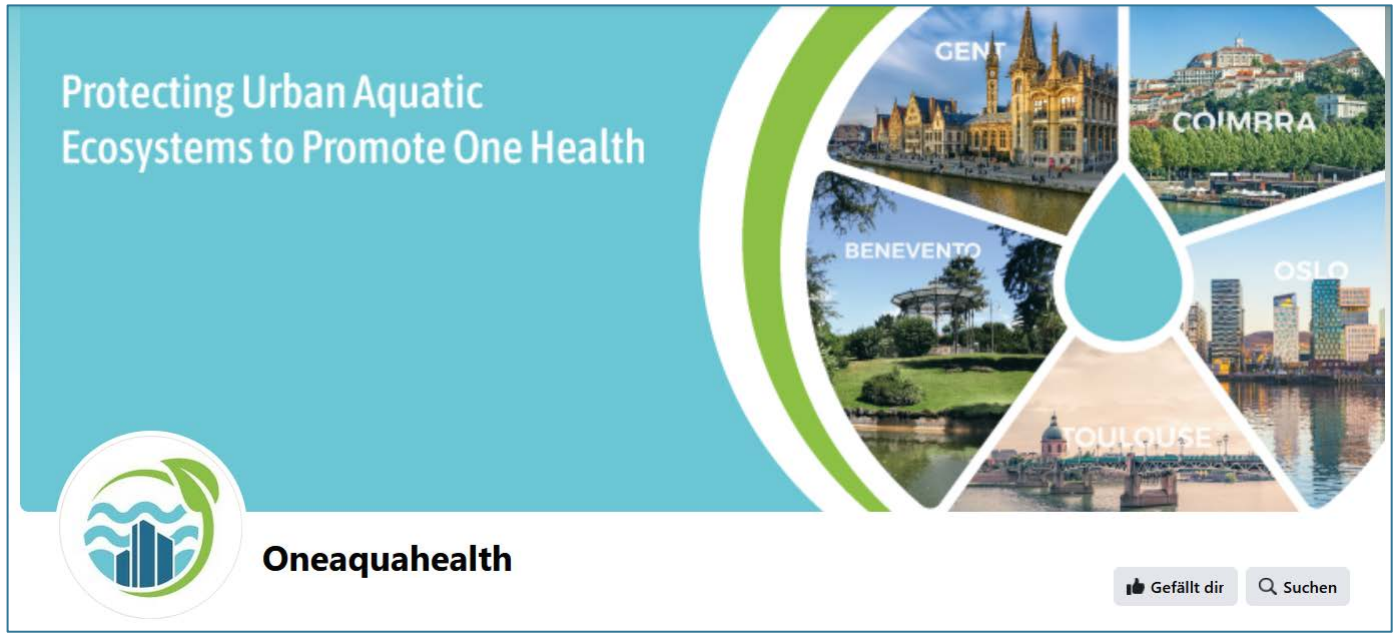

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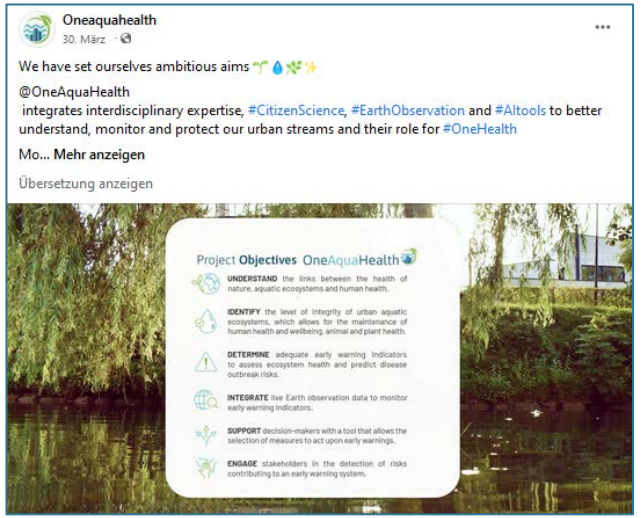

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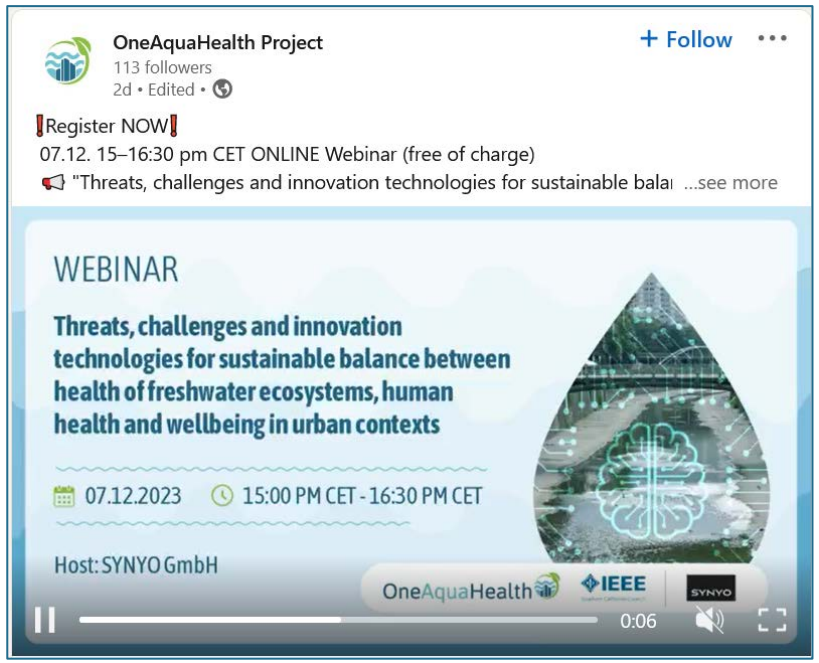

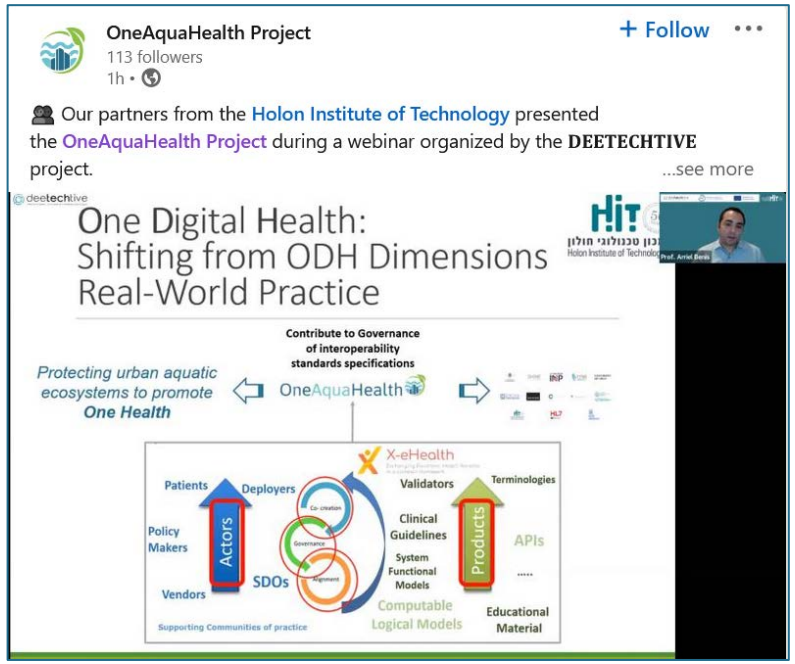

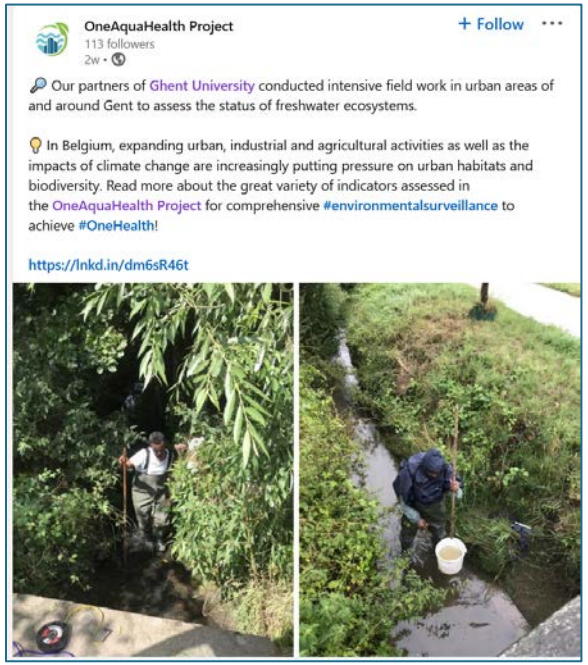

Thank you for your attention!
Contact us, get involved, stay updated:

office@oneaquahealth.eu

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