D6.11 Citizen science options

Joint European Research Infrastructure for Coastal Observatories
Science, Services, Sustainability

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APPROVALS

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1. Executive summary

The JERICO-S3 project aims at strengthening the European network of coastal observatories via developing a powerful and structured European Research Infrastructure dedicated to observe and monitor the complex marine coastal seas. It does this e.g. by supporting excellence in marine coastal research to better answer societal and policy needs.

Citizen science initiatives are more and more common, and also in the coastal marine area there are at national/regional levels some interesting concepts. Integrating Citizen science data, and connecting to the initiatives, fits in the main objectives of JERICO-S3 when it comes to innovative monitoring strategies and involvement of the citizen (communities) as stakeholder to the JERICO-RI.

Currently the "low-cost" (or better: "cost-efficient") technology movement has taken off. Cost-efficient technology for marine observation is technology, sometimes simple, sometimes technologically advanced, offered at a lot low pricing then traditional monitoring equipments. Cost-efficient technology makes use of basic components (like small sensors, chips, bandwidth) being available at affordables prices and allowing observations at a very good accuracy. This led to a change of focus of this WP6 action on citizen science, namely to: *Explore the available cost-efficient technology and how that can be used for coastal monitoring, by scientists, but also the citizen.*

The lower-cost concepts available on the market are actually a way to empower citizen scientists, because in this way valuable coastal observation becomes available to all. Citizen scientists have always run into skepticism among policy makers and scientists when it came to data quality, but using the right cost-efficient technology actually overcomes that barrier.

JERICO organised a dedicated cost-efficient technology workshop, in September 2023 in Brest in which interested colleagues from the JERICO network were brought together with some developers of and experts in cost-efficient technology. During the meeting concepts were presented, the potential and barriers for wide roll-out and integration of cost-efficient sensors looking 1/5/10 years ahead were discussed. This has contributed to the strategy forward for the coastal science community, and JERICO community specifically, e.g. in projects like HE LandSeaLot where the work can continue work on next steps.

Figure 1: Participants live and online in the JERICO cost-efficient technology workshop

2. Introduction

The JERICO-S3 project aims at strengthening the European network of coastal observatories providing a powerful and structured European Research Infrastructure dedicated *to observe and monitor* the complex marine coastal seas. One of the main objectives is to *support excellence in marine coastal research to better answer societal and policy needs*. Citizen science and cost-efficient technology has a direct relation to this objective.

Citizen science initiatives are more and more common in European countries, and also in the coastal marine area there are at national/regional levels some interesting concepts and active groups. Promoting citizen science data, and initiating connections to the initiatives, fits in the main objectives of JERICO-S3 when it comes to innovative monitoring solutions and involvement of the citizen (communities) as stakeholder to the JERICO-RI. Citizen science activities in the coastal area allow citizens to participate in monitoring their environment, leading to education, "empowerment" and a raise of awareness.

At an earlier stage in the project WP6 has provided in MS31 an initial overview of available citizen science initiatives and resources relevant to coastal observation. The document concluded with the approach how the list will be further expanded and analysed, and how citizen science will be promoted within the project. And this has been done, citizen science has been promoted and more partners in the network are in contact with or even running initiatives. What was not foreseen at the time was how much the "low-cost" (or better: "cost-efficient") technology movement would take off.

Cost-efficient technology for marine observation is technology, sometimes simple, sometimes technologically advanced, offered at a lower pricing then traditional monitoring equipments. Cost-efficient technology makes use of basic components (like small sensors, chips, bandwidth) being available at affordables prices and allowing observations at a very good accuracy. This led to a change of focus of this WP6 action: Explore the available cost-efficient technology and how that can be used for coastal monitoring, by scientists, but also the citizen. The lower-cost concepts available on the market are actually a way to empower citizen scientists, because in this way valuable coastal observation becomes available to all. Citizen scientists have always run into scepticism among policy makers and scientists when it came to data quality, but using the right low-cost technology actually overcomes that barrier.

JERICO is one of the communities that wants to support cost-efficient technology, explore the application cases, and promote its uptake in science and citizen science. The change of focus on this topic has led in this limited budget task to decide to organise a dedicated cost-efficient technology workshop, in September 2023 in Brest in which interested colleagues from the JERICO network were brought together with some developers of and experts in cost-efficient technology. This report provides insights in the content and outcomes of the meeting: Overview of the potential of the technology, and the strategy forward for the coastal science community, and JERICO, e.g. in projects like HE LandSeaLot can work on next steps.

3. Actions and change of focus

3.1 Earlier actions and document

Under task 6.1 an inventory has been made of existing initiatives that collect coastal data in close cooperation with WP3/4 and WP10. WP6 has documented an initial overview in MS31 "Inventory of coastal citizen science initiatives" with the available initiatives and resources relevant to coastal observation. Where possible references to a website with data archives has been provided.

The document was concluded with a list of foreseen actions on how citizen science integration could be promoted into the JERICO-RI, so for coastal research, with a focus on the higher potential concepts. Some of the most important steps:

- The MS31 document will be shared with PSS and IRS partners, and discussion in the JERICO All region workshop.
- This discussion will lead to updates, identification of new initiatives and selection of priority initiatives to contact.
- Communication will be opened with the selected initiatives.
- JERICO could focus on the dataflows of priority initiatives, their data management practices, and suggest solutions to enable the datastreams to be made accessible and useful for JERICO-S3 data products.
- Where possible, cooperation could be started with selected initiatives to feed their data as input to JERICO-S3. For the other initiatives the action will be to make a link, and promote them in the JERICO community. Due to a limited budget that is the maximum to be done.
- Product developers involved in WP3 IRS and WP4 PSS will check possible integration of the data in the foreseen products, and when done, the results will be published, or at least connected to, from the website or app of the citizen science initiative (D6.11).

The document has been shared and discussed during the JERICO week, and there are several PSS's and IRS's where there are links to citizen science initiatives.

3.2 Change of focus to cost-efficient sensors

Due to the hesitations about data quality and the very limited budget for this subtask, the WP6 team decided that more impact could be achieved via the "low-cost sensor route". As mentioned before, in the last years many low-cost sensors have been developed for marine and ocean observation, and the interest of using these has quickly increased. The low-cost sensor domain is due to well-available cheaper chips and other components quickly upcoming. But the domain is also large and diverse:

- It is a global market and the sensors and platform carrying them are at different Technological Readiness Level (TRL).

- Some concepts are still in research/prototype stage and struggling to find their users and scale up, while others are already commercially on the market.
- Technical concepts are diverse: Some concepts consist of off-the-shelf sensors to immediately deploy, others are open hardware and need to be assembled first.
- Costs: Some concepts are cheap, and easy to deploy (fit for citizen science), others not so cheap but still at lower costs than traditional sensors, so cost-efficient..
- Some sensors push their data automatically to a central location, other sensors leave it up to the user to collect the data first on their own PC/Network.

And this leads to many challenges and questions to be answered, e.g.:

- Where can a user find and buy such sensors?
- Which sensors fits for which purpose?
- How does a sensor developer find their users? How does a sensor developer find investors for large quantity production (if needed)?
- What is the quality of the sensors, and how does it relate to traditional high quality marine sensors?
- How can the metadata of a sensor be collected, stored and shared in such a way it is usable to determine the quality of data?
- How can the data flow of a sensor be managed in order to make sure it is FAIR, and therefore can be integrated into data products (if fit for purpose) and is traceable to the origin?
- How can citizen science be empowered by low-cost sensors?

From the situation analysis and the challenges above one thing is clear: the potential is enormous, but there are quite some steps to undertake to reach the full potential. What could the team in JERICO-S3 WP6 do with available resources as a first step from the JERICO coastal research domain adding value to the situation? The WP6 team decided to inform and involve its community on the topic, by organising a hybrid workshop with the topic of cost-efficient sensor technology for marine observation with a link to citizen science application (in Europe, and in Africa via the COLAB initiative). All JERICO-S3 partners were invited, especially those already working on, or working with, such technology. By organising the event in an informal setting, and inviting also external concept developers, this led to a very interesting overview of the domain and plans and ambitions for next steps.

4. Workshop report

4.1 Workshop on citizen science and cost-efficient technology

Organisation:

Figure 2: Overview of the meeting room

The workshop has been organised and hosted by IFREMER, with assistance from MARIS, SMHI and others. IFREMER has been closely involved with the international teams of COLAB and GEM, who both aim to provide cost-efficient sensors "without borders", so without financial barriers for citizen and researchers in e.g. Africa and India. Because of the overlap in topics and interest the JERICO WP6 team decided to co-organise meetings at the same location.

Dates:
13,14,15 September 2023.
Day 1 was reserved only for COLAB/GEM, and day 2 and 3 were focused on the JERICO-S3 topics. These days are the focus of this report.

Venue:

The workshop was kindly hosted by UBO Open Factory. A location aimed at collective idea shaping and very suitable for the informal style workshop.

UBO Open Factory
Université de Bretagne Occidentale
Faculté des Sciences et Techniques,
6 avenue Le Gorgeu
29238 Brest Cedex 3

Agenda:
An overview of the agenda is available below. A detailed agenda and list of participants can be found in Annex 7.1.

GEM/CoLaB **International Session (restricted)**	**Joint workshop GEM/COLaB - JERICO** **Global coastal knowledge via low-cost observation : a frugal approach to support ocan literacy ?**	
Monday, November 13th	**Tuesday, November 14th**	**Wednesday, November 15th**
General introduction	**Review of Coastal Observing needs**	**Raising engagement/ Data management solution**
NP-GAN Introduction	Low-cost technologes for observations in the coastal zone	Existing concepts/Solutions for interoperability/metadata/access
Coast Predict Introduction	Which low-cost technologies fit the requiirements of your country ?	Data visualisattion and how to bring accross information in such a way to information/engage/call-to-action
GEM-in-a-Box Introduction	Part 1 : Series of short pitches on existing and upcoming new technologies	
Review GEM instrumentation		
Lunch	Lunch	Lunch
Introduction to COLaB and kit designs	Part 2 :	
Identifying end users of kits	**Sensors/Instrumentations : Solution-oriented session incl. live demonstration of some concepts**	**Visualisation & Engagment**
Identifying similarities/differences in GEM/COLaB kits		
Opportunities for manufacturing instruments		**GEM/COLaB session**
	Feedback session : what is the potential, what is blocking and what can we do to overcome this ?	Training methods & training camps
		General conclusion & way forward
		GEM/COLAB Session :
	Social event at Brest, Museum for the Ocean, 70.8	Business & Implementation plan
		Budget and funding plans
		Timelines

Figure 3: session agenda overview

4.2 Session observations

Session 1: Review of coastal observation needs
This session setted the scene for the two day workshop. It started with an introduction to the JERICO-RI view on coastal observation, the big needs for monitoring data, and how cost-efficient sensors could fill a gap. This was followed by a presentation of the COLAB and GEM initiatives that focus on making marine observation available to all, also to scientists (and citizens) with restricted budgets. Cost-efficient sensors clearly fulfil a need here.
Then two US initiatives Synchro and DOOS explained their approach and status of work. Both focus on bringing cost-efficient sensors into practice, Synchro more general, and DOOS for the deep ocean. Important lessons learnt were shared, especially from Synchro regarding their approach to involving developers, and a recent DOOS workshop determining the strategy

for next year. The session concluded with an example of a local initiative in Brittany how the citizen can be involved via use of cost-efficient sensors.

Session 2: Sensors and instrumentations

The second session consisted of a series of short "pitches" of very interesting technical marine sensor concepts that are being developed, or already are on the market, with different Technological Readiness Levels (TRL). The main observation that can be made is that the diversity from this short series is already enormous, in application cases (buoy, handheld or on vessel), parameters measured (from temperature to waves to chemicals), cost (from a few euros to several hundreds, but still very cost-efficient!), ease of deployment (off-the-shelf and simple, to Do-It-Yourself kit). And even though this series is a tip of the iceberg, the session already raised big enthusiasm.

A selection of concepts are illustrated below.

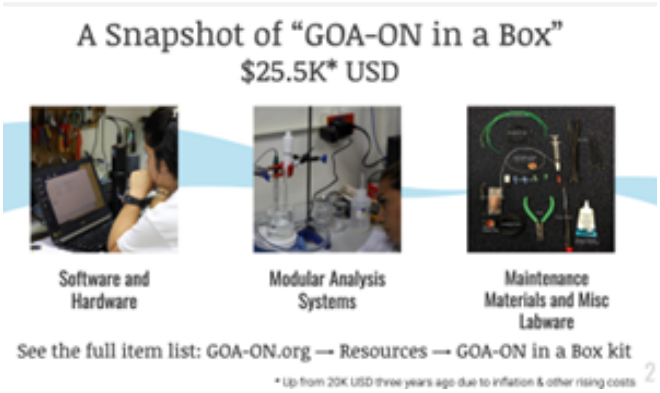

Figure 4: Goa-on kit in a box (Kaitlyn Lowder)

Figure 5: Sensors in use in Astrolab cruises

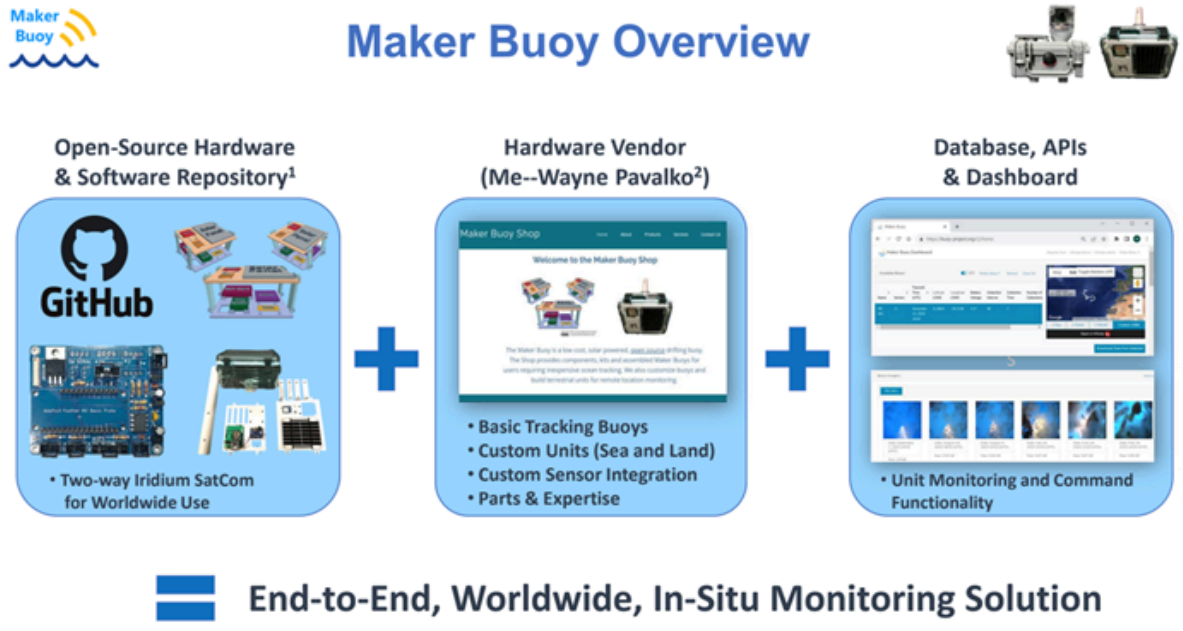

Figure6: Maker buoy concept - Wyne Pavalko

Session 3: Data management solutions

One of the bigger challenges of cost-efficient technology is the management of the data, and how the dataflow can be organised in such a way that it is reusable after it first use (by the citizen or the scientist) in order to make impact towards the larger user community (national,

EU wide, or even global). The short answer is that the data and the data access services should become FAIR (Findable Accessible Interoperable and Reusable). This session focused on several aspects of FAIR. VOTO and FVON specially showed their approach using ERDDAP as a method to make the incoming data from their cost-efficient sensors accessible for other users. EMODnet Physics showed how the data could be integrated into the European Data infrastructure via which it can be used in data products (from EMODnet and Copernicus) but can also reach other users like engineering companies and researchers.
In order to know how and if certain datasets can be used in a data product the data should be really FAIR, with also a focus on Interoperability and Reusability. A specific presentation was held on this aspect, which explained and discussed how important metadata of a dataset is, and that in the metadata internationally accepted vocabularies ("codelists with definitions") must be used, so the data can be understood (what is measured, by whom, how, with what) and quality can be assessed by the end-users and machines. Directions of solution: Developers of sensors need to be involved as early as possible to train them in FAIRness and improve/expand metadata and data format, a catalogue of registered sensors could be set up as "vocabulary" that can be used in the metadata (to answer by what sensor is this data measured).

Session 4: Visualisation and engagement
The final session focused on options for visualising the data, in a dashboard, a map interface or other way, to provide the end-users a direct view on the data. As example: Coastal-e solutions demonstrated a dashboard for the data from their observation buoy, that is connected via 5G network, and the data is streamed and immediately available on a dashboard.
The session ended with three brainstorm groups on topics regarding engagement: How can the citizen be engaged, which barriers exist, and how can they be overcome.

Lunch/break sessions: where do we want to be in 1-5-10 years?
During the breaks we offered the opportunity to use the inspiration from the sessions, as input for a brainstorm (via post-its and discussion board) on the question: where do you want to be (or where do you think we can be) with cost-efficient sensors in 1/5/10 years on the themes sensor technology, data management, visualisation, democratization? Which are the barriers and what are the problems to solve?

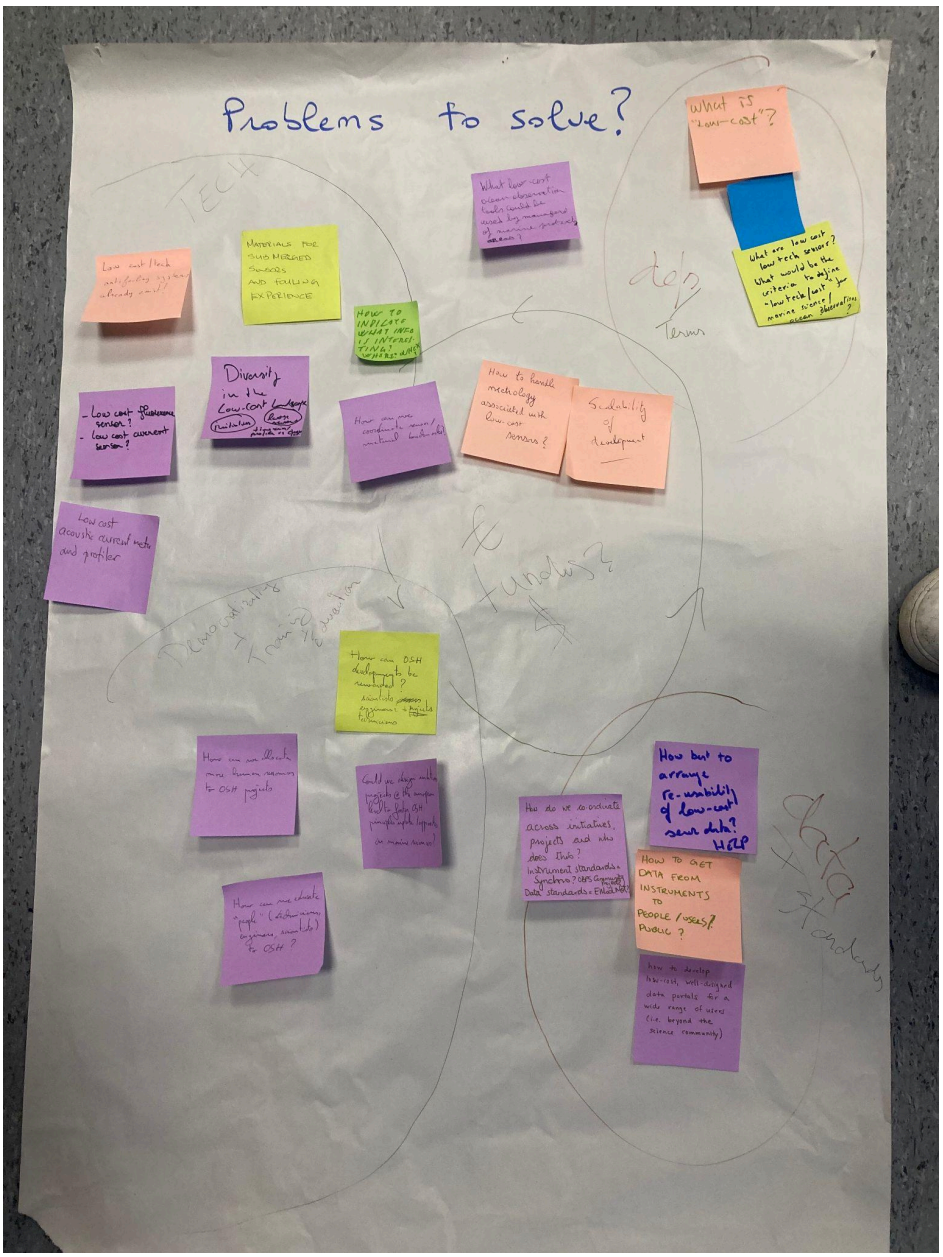

Figure 7: impression of one of the post-it boards, the one on problems/challenges to overcome

All the sessions led to interesting perspectives, plans and dreams, documented in chapter 6.

5. Outreach, dissemination, and communication activities

The deliverable will be available to the full JERICO community, and may be made available to the larger public..

6. Results and conclusions

6.1 Conclusions from the discussion boards

Where do you want to be (or where do you think we can be) with cost-efficient sensors in 1/5/10 years on the themes sensor technology, data management, visualisation, democratization?

Sensor technology

1 year

- Start a central community (global)
- Create an online catalogue of existing sensors/concepts
- Make a start with the content

5 years

- Active developers community
- Complete catalogue operational
- Self managed content by developers
- Best practices for deployment available for all, including Open-Source-Hardware

10 years

- Technology widespread
- Available at even lower costs
- Platform support technology providers to find possibility to either self upscale, or cooperate with larger industry
- Best practices and manual in many languages

Data management

1 year

- Vocabulary first version with persistent ID's of sensors
- First best practices and guidelines for FAIR data management shared on central platform
- Demo case of available data

5 years

- Full catalogue of sensors with ID's per version
- From sensor links available to their data access
- More and more data from concepts FAIR from the source

10 years

- Data from cost-efficient sensors is as common as traditional data
- Data is FAIR from the source

Visualisation

1 year

- Data from first concepts aggregated and visualised via a central platform
- Data not yet FAIR, but findable and accessible

5 years

- Data products based on cost efficient technology visualised on platform to demonstrate value
- First FAIR cost efficient sensor data available to EMODnet, GOOS, Seadatanet and others.

10 years

- Global map available of deployed cost-efficient sensors

Democratisation and engagement

1 year

- Making connections in the domain
- Create a community on developers, users and industry
- First sensors available and known to community

5 years

- Active community
- Project funding / First sustained funding available
- Large involvement in community from development countries
- In the field and online training courses on deployment
- First yearly conference

10 years

- Global important component of ocean observation
- Widespread acceptance of cost-efficient tech
- Lively, ever expanding community
- Continuous funding model, active secretariat

Looking to the above, which are the barriers and what are the problems to solve?

- Technology
  - Fouling on submerged sensors
  - Diversity in the cost-efficient sensors landscape (and its developers)
  - How to create quality benchmarks/indicators
  - Limited parameters possible at low cost at the moment (acoustics, fluorescence)
- Funding
  - Scalability of technical developments, how to go from 1 to 1000 products
  - Development of a central platform
  - A central secretariat
- Definitions and terms
  - Vocabulary of sensors
  - Vocabulary of cost efficient sensor terminology (What is const-efficient?)
- Democratization, training, education
  - How can Open Source Hardware be rewarded
  - How can trainings be organised, stored online for later viewing?
  - Education in the field may be hard to organise
- Data

- Organise FAIR data with sensor provider with own data hub is step 1, but how to organise this for data collected offline (with chemistry kits for example). How to get this data to a central location?
- How do we coordinate across initiatives
- Involve the OBPS for sharing standards
- How to develop use interfaces to access data for the citizen community, so beyond the science community

Concluding, there are big benefits and steps forward foreseen, but also barriers to overcome. Many are related to organisation, funding a central organisation, and close communication to the existing entities.

6.2 Outlook/next steps for the JERICO community

JERICO organised this first dedicated cost-efficient technology workshop in which interested colleagues from the JERICO network were brought together with some developers of, and experts in, cost-efficient technology. The potential and barriers for wide roll-out and integration of cost-efficient sensors looking 1/5/10 years ahead were discussed. This has not only triggered and demonstrated the interest of cost-efficient sensors for the JERICO community, but also resulted in input to a potential strategy for the coastal science community on this topic.

It is quite clear that there is a need for a cost-efficient sensor technology community, and JERICO partners will be part of this: As users of the technology, as developers in some cases, and with their expertise how to organise the FAIR data flows. The WP6 partners in JERICO aim to be involved in the development of such a community, and creating the boundary conditions for it. The first step is already taken: JERICO partners are participating in the HE LandSeaLot project, where cost-efficient technology, used by scientists and citizen, will be one of the methods to close observation gaps in the land-sea interface.

7. ANNEXES AND REFERENCES

7.1 Detailed agenda

	Agenda of Tuesday, the 14th				
	all times are in CET (GMT+1)				
	09:00				
				Session 1: Review of Coastal Observing needs	
			Objectives:	*Introduction of the landscape. What is currently existing, what are the needs, where are the gaps?*	
			Outcomes:	*Share the state of the art & Identify semantic challenges*	
			Deliverables:	*Presentation material - group photo*	
	Start time	duration			Facilitator
Beginning of zoom session	**09:00**	00:20	**Welcome & Ice breaker**		Julia Fougère
	09:20	00:05	Welcome, House keeping and Introduction of the Agenda		Lucie Coquempot
	09:25	00:05	Welcome and Introduction JERICO		Laurent Delauney
	09:30	00:10	General presentation from COLAB + GEM		Greg Cowie & Kacie Conrad
	09:40	00:00	**Inspiring talks**		
	09:40	00:15	Ocean discovery league approach and summary DOOS workshop		Jessica Sandoval (online)
	09:55	00:10	Decade Project, Synchro, https://oceansynchro.io/		Collin Closek/Amy West (recording)
	10:05	00:10	Example of community projects (FabLabs and other communities)		Yves Quere
	10:15	00:10	A Local point of view : The Ti Low Coast Initiative, an example from Brittany		Lucie Cocquempot

	10:25	00:15	**Live reaction from the audience and the chat**		
	10:40			**Session 2: Sensors/Instrumentation technology**	
			Objectives:	*Low-cost technologies for ocean observations. Which low-cost technologies fit the requirements of your community?*	
			Outcomes:	*Recommendations towards creating standards within the Low-Cost Ocean Instrumentation Community.*	
			Deliverables:	*Presentation material - Online Documentation*	
	Part 1: series of presentations of existing and upcoming new technologies and platforms. Some success stories, and promising concepts.				
	10:40	00:05	Observation from vessels - Fishing Vessel Ocean Observing Network (MOANA)		Julie Jakoboski
	10:45	00:05	Observation from vessels - OSHEN		Anahita Laverack (on-line)
	10:50	00:05	Observation from vessels - Sailing4Science		Martin Hassellöv (on-line)
	10:55	00:05	Coastal observation solutions - Low-cost in-Situ Sensing with Maker Buoys		Wayne Pavalko (on-line)
	11:00	00:05	Coastal observation solutions - IoT for Coastal and Ocean Observing Systems		Theo Moura
	11:05	00:05	Coastal observation solutions - Ocean Observation in Ghana		Benjamin Osei Botwe (online)
	11:10	00:05	Coastal observation solutions - Ocean Observation in India		Aneesh Lotliker (online)
	11:15	00:05	Monitoring ocean health - Opensource Fluorescence sensors		Lon Potter
	11:20	00:05	Monitoring ocean health - Marine optics and citizen science.		Carlos Rodero (CSIC)
	11:25	00:05	Monitoring ocean health - Remedies Project - marine plastics		Javier Delgado Gallardo
	11:30	00:05	Beyond in situ obs - Highlighting features on EO satellite image products		Timo Pyhälahti SYKE,
	11:35	00:05	Beyond in situ obs - Modelling tools supporting coastal observation activities		Emmanuel Hanert (online)
	11:45	00:25	**General discussion and introduction to the lunch activity**		all

	12:10	01:00	**Lunch with questions :** Where do you want to be on the topic in 1/5/10 years ? (sensor technology, data management, visualisation, democratization)	
	13:10	00:15	Feedback from questions to all, sharing boards with ideas	
	13:25	00:15	**Focus on sensor technologies challlenges**	
Zoom breakout rooms	**13:40**	02:10	**Solution-oriented - Breakout sessions (incl. hands on demonstrations)**	Moderator: Yves Queré
			- Challenges for biological sensors	Incl. Lon Porter, et al.
			- Challenges for physical sensors	incl. Andrew Thaler, Astroloabe Expeditions, et al.
			- Challenges for upscaling solutions	incl. Lucie Cocquempot, et al.
	15:50	00:40	**How fablabs can help ?**	
	16:30	00:30	**Final discussions => based on the board and breakout reports: where do you want to be in 1/5/10 years** -What are the low tech developments currently suitable/(accurate enough) for ocean monitoring? - Barriers for upscaling? - Which low-cost technology is suitable for adoption by citizen science initiatives? -What is the potential, what are the challenges, and what can we do to overcome this technology-wise? e.g. tech, training, best-practices for deployment, etc => how to approach?	Moderator: Patrick, Peter, MIRO Board : Lucie / Yves Quere
End of zoom sessions	**17:00**		End of day	
	19:00		Social event : 70.8	

Agenda of Wednesday, the 15th				
	all times			

	are in CET (GMT+1)			
	09:00			
			Session 3: Data management solutions	
		Objectives:	*Discuss:* *Requirements for data interoperability & metadata standards : State of the art, Challenges & Way forward* *Platforms for hosting data : "first use (locally), re-use central", communication tools and solutions for data access*	
		Outcomes:	*Identification of good practices and improvement process, solutions for data access*	
		Deliverables:	*Presentation material - Online Documentation*	
				Facilator
Beginning of zoom session	09:00	00:15	**Welcome coffee and introduction of the day**	Patrick Gorringe/Peter Thjsse /Jethan d'Hotman
	09:15		**Short pitches regarding existing concepts/solutions for interoperability/metadata/data access**	
	09:15	00:15	GEM/COLAB use case - current state of the art	Kacie Conrad
			Data flow examples	
	09:30	00:15	FVON incl ERDDAP	Julie Jakoboski
	09:45	00:15	VOTO approach incl ERDDAP	Callum Rollo
	10:00	00:15	EMODnet physics	Antonio Novellino
	10:15	00:15	OceanOps	Martin K
			Data flow specifics	
	10:30	00:15	FAIRness of sensor data for re-use, what to take into account	Peter Thijsse
	10:45	00:15	Technology for accessing and subsetting many different datatypes: BEACON	Peter Thijsse
	11:00		**Coffee break**	
	11:30	01:30	Discuss the data management roadmap, using GEM/COLAB as example	Patrick Gorringe /Peter Thijsse
End of zoom session	13:00	01:00	Lunch	
	14:00		**Session 4: Visualisation and engagement**	**Lucie Coquempot**

		Objectives:	*Share experience on the challenges of engaging wider communities in observation programs.* *The importance of visualization tools for generating engagement*	
		Outcomes:	*Awareness of shared responsibilities between the sensor and data communities* *Identification des challenges pour des successful multicultural projects on the coastal ocean?*	
		Deliverables:	*List of requirements for the upcomining european project Landsealot* *Presentation materials - Online documentation*	
Beginning of zoom session	14:00	00:10	Introduction to the session	Lucie Cocquempot
	14:10	00:15	**From local.**. Engaging citizens through a participatory marine science project	Charlotte Nirma
	14:25	00:15	**To Global**.. Coast "Predict Global Coastal Experiment" a contribution to the UN Decade Marine Science for Sustainable development	Mairead O'Donovan
	14:40	00:10	**Scientifics reaching for society** : Regional COLaB training camp in Mozambique	Bernardino Malauene (on line)
	14:50	00:10	**Society reaching for marine scientists :** Feedback from a French civil society association	Theo
	15:00	00:30	**Engagement & Visualistion Breakout sessions : What challenges do you identify to...**	**Lucie Cocquempot**
			- ...inform ?	
			- ...engage ?	
			- ...call-to-action ?	
	15:30	00:15	Session conclusion - synthesis and discussion	Yves Queré
	15:45	**00:15**	**Coffee break**	
	16:00	**01:00**	**Session 5: Feedback and plans forward**	Peter Thijsse
			Go back to the board of session 1: 1/5/10 years	
			Discuss how to move forward	
			What have we learnt	
			formulate take away messages	
Beginning of zoom session	**17:00**		**End of the Workshop**	

7.2. Participants

The audience was a mix of in-person and remote participation, with over 30 persons in-person.

			Remote							
Lowcost and citsci workshop					ONDAY	UES. AM	UES. PM	VED. AM	VED. PM	70.8
	T NAME	: name	itute	ail	9	50	52	52	50	37
1	ALLARD	Alexandre	IFREMER			1	1	1	1	
2	AMICE	Gaëlle	Sorbonne U.			1	1	1	1	
3	ELACOURT	christophe	IUEM			1				
4	DELAUNEY	Laurent	fremer - JS3			1	1	1	1	1
5	DURAND	Dominique	OVARTEC AS			1	1	1	1	
6	EPINOUX	Alexandre	fremer - JS3			1	1	1	1	1
7	AUVARQUE	Olivier	Ifremer			1	1	1		
8	GARELLO	René	EEE France			1	1	1	1	1
9	GODIVEAU	Léa	fremer - JS3			1	1	1	1	1
10	GORRINGE	Patrick	SMHI			1	1	1	1	1
11	JACQUET	Matthias	Ifremer				1	1	1	
12	LAES HUON	Agathe	Ifremer			1	1	1		
13	LE GUEN	Annaïg	CNRS			0	0	1	1	
14	LEFEBVRE	Alain	IFREMER			1	1	1	1	1
15	MATEESCU	Razvan	MRD, Romania			1	1	1	1	1

16	MÖLLER	Klas Ove	HZG							1
17	MOURA	Theo	Coastal-e Solutions			1	1	1	1	1
18	NOVELLINO	Antonio	ETT			0	0	0	0	
19	PAIRAUD	Ivane	ifremer			1	1	1	1	
20	PETTAS	Dionysios Emmanouil	HCMR			1	1	1	1	1
21	PONTE	aurelien	Ifremer			1	1	1	1	1
22	PYHÄLAHTI	Timo	SYKE			1	1	1	1	
23	RAMIS	Constanza	SOCIB			1	1	1	1	1
24	REPECAUD	Michel	IFREMER			0	0	0	0	
25	DERO GARCIA	Carlos	CSIC			1	1	1	1	1
26	ROMBOUTS	Isabelle	VLIZ			1	1	1	1	1
27	THIJSSE	Peter	MARIS			1	1	1	1	
28	VERNEY	Romaric	Ifremer			1	1	1	1	1
	VAN NGEN-VOGEL S	Virginie	EuroGOOS			1	1	1	1	1
29	WEERHEIM	Paul	MARIS B.V.			1	1	1	1	
30						0	0	1	1	
32	DEVLIN	Michelle	CEFAS, UK		1					
33	AMBANAGOU DA	Margoudar	onal Centre for astal Research CCR), MoES		1	1	1	1	1	1
34	O'DONOVAN	Mairéad	CMCC		1	1	1	1	1	1
35	MARTINEZ OSUNA	uan Franscico	CMCC		1	1	1	1	1	1
36	COWIE	Gregory	niv. Edinbourg		1	1	1	1	1	1
37	DHOTMAN	Jethan	SAEON		1	1	1	1	1	1

38	**CONRAD**	Kacie	isheries and eans Canada		1	1	1	1	1	1
39	**OCQUEMPOT**	Lucie	Ifremer		1	1	1	1	1	1
40	**VERBEQUE**	Vincent	STA Bretagne		1	1	1	1	1	1
41	**Laverack**	Anahita	OSHEN		0	0	0	0	0	
	Hassellöv	Martin	iling4Science		0	0	0	0	0	
43	**Pavalko**	Wayne	Maker Buoys		0	0	0	0	0	
44	**gado Gallardo**	Javier	REMEDIES		0	0	0	0	0	
45	**Sandoval**	Jessica	anDiscoveryLe auge		0	0	0	0	0	
46	**Closek**	Collin	ncro Decade Project		0	0	0	0	0	
47	**West**	Amy	ncro Decade Project		0	0	0	0	0	
48	**Rollo**	Callum	VOTO		0	0	0	0	0	
49	**Jakoboski**	Julie	oana Project		1	1	1	1	1	1
50	**QUERE**	Yves	blab Manager		1	1	1	1	1	1
51	**BABAU**	ean-Philippe	versity of Brest				1	1		
52	**BOTWE**	Benjamin	Jniversity of Ghana		1	1	1	1	1	
53	**HANERT**	Emmanuel	Jniversité de Louvain		1	1	1			
54	**LOTLIKER**	Aneesh	dian National ntre for Ocean Information Services		1	1	1	1	1	
55	**MALAUENE**	Bernardino	ituto Nacional Investigação Pesqueira,		1	1	1	1	1	
56	**PORTER**	Lon	abash college		1	1	1	1	1	1
57	**Thaler**	Andrew	eanology for all		1	1	1	1	1	1
58	**SHAW**	Katherine	isheries and eans Canada		1		1		1	

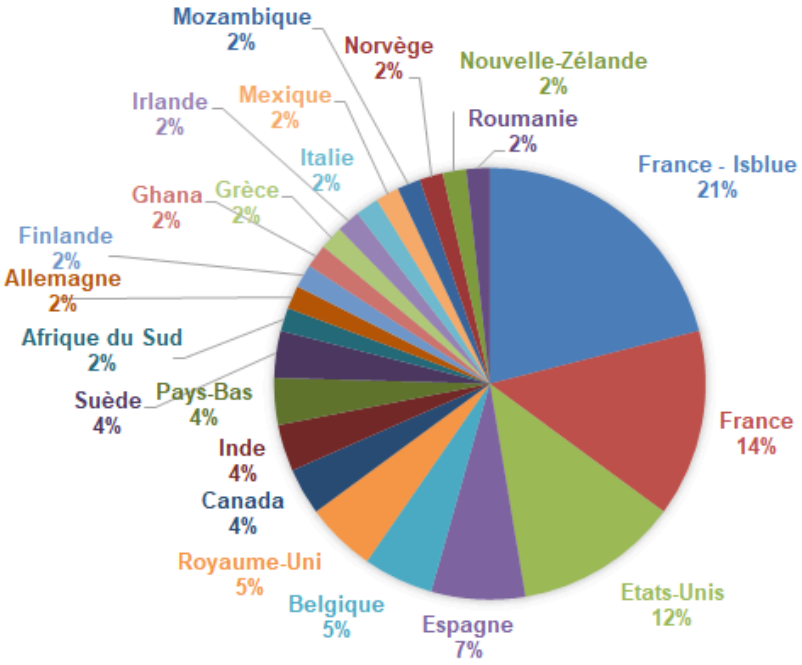

Figure 8: overview of origin of participants