

Project Endorsement Form

1. PROJECT TITLE

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|--|---|
| Full title | Vulnerability Of Kenyan Coastal Ecosystems under climate and non-climatic stress |
| Acronym | VOKCE |
| Website | |
| Keywords (up to 10, describing the project research) | Paleoclimate, Common Era, Holocene, biomarkers, pollution, PAHs, microplastics, MSP |
| New initiative or continuing programme? | New project |

2. APPLICANTS

Lead applicant / Project Leader / key research contact person:

| | |
|-----------------------------------|---|
| First name | Marie-Alexandrine |
| Last name | Sicre |
| Affiliation | CNRS, Sorbonne Université, Campus Pierre et Marie Curie |
| Postal address | 4 place Jussieu, 75252 Paris cedex05, France |
| Country | France |
| Telephone | |
| Email address | Marie-alexandrine.sicre@locean.ipsl.fr |
| Institutional or personal website | |

Other key participants / research team leaders: (repeat as needed)

| | |
|-----------------------------------|-------------------|
| First name | Jacqueline |
| Last name | Uku |
| Role in the project | Co-PI |
| Affiliation | KMFRI |
| Country | Kenya |
| Email address | juku988@gmail.com |
| Institutional or personal website | |

N.B.: Please note that all these names and contact details will be added to the IIOE-2 membership database.

3. ABSTRACT– Brief description of the project: (1/4 page maximum)

This will be placed on the IIOE-2 Website after endorsement.

The project builds on a collaboration between French and Kenyan research institutions aiming at investigating the impact of climatic and non-climatic stressors on blue ecosystems (mangroves and seagrasses) that act as buffers for climate mitigation and adaptation. The project focus on 1/ building capacity in **climate science** using paleo-reconstructions from marine sediment cores and corals and on 2/ assessing **non-climate stressors**, such as Polyaromatic Hydrocarbons (PAHs) and microplastics in surface waters and sediments resulting from the growth and development of coastal cities driven by blue economy to inform marine spatial planning (MSP). In addition, the impact of land use in the coastal regions of Gazi and Malindi will also be evaluated to assess the role of sedimentary

IIOE-2 Joint Project Office (JPO)

Perth Australia Node
IOC Perth Programme Office
c/o Commonwealth Bureau of Meteorology
3rd Floor, 1 Ord Street
West Perth, Western Australia, 6005, Australia.
Phone: +61-8-92262899
Email: iioe-2@bom.gov.au

<https://iioe-2.incois.gov.in/>

Hyderabad India Node
Indian National Centre for Ocean Information Services (INCOIS)
Pragathi Nagar
Hyderabad, Telangana 500 090, India.
Phone: +91-40-2388 6142
Email: iioe-2@incois.gov.in

processes, e.g. erosion, linked to hydrological changes on the health of these ecosystems. The approach will be developed across multiple sites and is expected to advice policy making process.

OBJ1- Future climate scenarios suggest that in low latitude regions, drought and flood severity will increase. East African countries are already facing food crises due to more frequent droughts. Between 2008 and 2010, devastating droughts had consequences on food security affecting over 13 million people in Eastern Africa contributing to socio-economic instabilities. These droughts are associated with negative phases of the Indian ocean Dipole (IOD), the dominant climate mode in the tropical Indian Ocean (IO). According to climate simulations the African continent will likely face more extreme droughts in the future. In contrast, positive IOD results in warmer SSTs in the eastern IO and catastrophic floods in the eastern Africa. The VOKCE project aim at generating the first time series beyond the instrumental period in the WIO to fully capture the low frequency SST variability of the IO using biomarker proxy in order to explore the role of the SST variability at multidecadal to century timescales on the hydroclimate using available paleo-data and data/ model simulations comparison.

OBJ2- Kenyan coastal regions are transitioning due to anthropogenic activities linked to the economic development and growing coastal cities. Port cities like Mombasa and future oil terminals in Lamu and Shimonu are expected to lead to socio-economic development with subsequently impacts on coastal environment. Marine coastal ecosystems that support the existing local economy (artisanal fisheries, tourism, mariculture) will be affected. Other coastal sites, such as Gazi and Malindi, are exposed to environmental stresses related to land use. Causes of degradation and loss of habitats also include infrastructure development, land conversion, water withdrawal and eutrophication. Both non-climatic pressures are climatic drivers impact the resilience of coastal habitats and will also affect human well-being, and thus need to be monitored in the long-term. **This project aims at providing scientific background information on these multiple stressors that can guide coastal governance and management plans.**

4. LINKS TO IIOE-2 SCIENCE PLAN: (1/2 page maximum)

How do you anticipate your project to contribute to the IIOE-2 strategy and science delivery, with reference to which (either one or more) of the six IIOE-2 Science Plan themes that your project responds. Please state the specific issues and questions addressed by your project in the context of the IIOE-2 Science Plan themes and key issues.

VOKCE will contribute to ST1 and ST6

- **ST1:** PAHs and plastics will be measured in water and surface sediments along a wide range of sites from port, cities and estuaries (Sabaki, Tana,...) to natural parks along the Kenyan coast to assess contamination levels. These data will provide a basis for future monitoring and advising efficient policy to reduce their environmental levels. Downcore sediment profiles of plastics and PAHs will also be acquired to shed light on the rates of contamination at different locations along the Kenyan coast and their temporal evolution over the last decades to centuries.
- **ST6:** VOKCE will produce the first time series beyond the instrumental period in the WIO (Common Era: last 2000 years) to fully capture the frequency range of variability and long-term climate trends using proxy and explore the role of SST variability on precipitation in E Africa at multidecadal to centennial timescales. The generated paleo-data will also be used to investigate the role of ENSO and IOD through spectral analyses and data/ model simulations comparison.

5. INTERNATIONAL COLLABORATION(S):

Is the project part of a related multi-national activity? **YES**

If No, would you welcome international collaboration in your project? **YES/NO**

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6. REGION(S) OF STUDY

Provide a description of 'where' the research is to be conducted (for field-based activities) and/or the region or regions to which the research pertains (you are encouraged to consider providing either the coordinates of the area of studies or the coordinates of the planned cruise tracks, as well as a figure as an addendum to your proposal).

- Sediment collected for contamination assessment for PAHs and microplastics are located along the Kenyan coast (ST1).
- The marine sediment core used for generating the SST reconstruction is located in the Mozambic channel (ST6).

6. TIMETABLE OF THE PROJECT

Start date: Jan 2023

End date: December 2027

7. LINKAGES WITH OTHER PROJECTS / PROGRAMMES / INITIATIVES

Is the project part of a related national or multi-national activity?

If yes, provide the related activity title and website for reference, if available:

This project is a bilateral research project between Kenya and France funded by the Centre de la Recherche Scientifique (CNRS) for 5 years, which includes two training field camps. The first one will be held at KMFRI, Monbasa, Kenya, in September 8 to 14, 2024 in collaboration with COLaB.

Is your project part of, or affiliated to, another SCOR, IOC or IOGOOS activity or project?

If "yes", please indicate which activity or project:

NO

8. DATA MANAGEMENT AND SHARING

1. Will new data be collected as part of this project (yes or no?)

Yes

2. Contact information if any, of the person in charge of the data management from whom the metadata can be accessed by interested IIOE-2 stakeholders.

Please note that for all IIOE-2-endorsed projects, IIOE-2 will have developed its own metadata portal. Once the project is endorsed, the project leader will be asked to provide the metadata information of the project.

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Dr. Marie-Alexandrine Sicre

2. Recognizing the need for an initial period of exclusive data use, would you be willing to provide timely access to all data generated under this project and associated metadata in accordance with relevant national and funding agency data sharing policies? **YES**

9. FUNDING

Please note that IIOE-2 strongly encourages funded/resourced projects. However, IIOE-2 may endorse projects yet to receive funding/resourcing if IIOE-2 endorsement can be clearly shown to significantly aid in prospects for funding/resourcing.

Has funding and resources to successfully achieve and undertake the project been obtained? Indicate the sources of funding and resources that have been approached and/or secured.

VOKCE has been successfully funded by the centre de la Recherche Scientifique (CNRS) for 5 years (2023-2025). Additional travel support was also acquired by PAMOJA WIO-Coast (2022-2024).

10. BENEFITS FROM IIOE-2 ENDORSEMENT (1/4 page maximum)


Specify why you are seeking endorsement and how the activity would benefit from endorsement, and how the IIOE-2 SC could assist in the implementation of your project.

Endorsement of VOKCE by IIOE2 should help stimulate and network with other projects focussed on paleoclimate. With regards to pollution (SDG14.1), we foresee the development of common approach and share data to contribute to MSP and, on the long-term, Blue Economy.

11. OPTIONAL: OTHER COMMENTS/INFORMATION/MATERIAL (length and detail may be at the discretion of and as deemed necessary by the applicant)

Please feel free to provide any other comments, information or materials that you feel relevant to your proposal for the IIOE-2 Steering Committee's information and benefit. You may provide this as general information or provide the additional comments/information/materials as relevant to any of the specific Sections above.

We intend to create synergies and collaborations on paleoclimate within IIOE2; we also anticipate interactions with ST4 to foster climate research within IIOE2.
The endorsement will also give visibility on microplastics and hydrocarbon contaminations in coastal waters in the WIO which are two major issues in the region to develop a network and initiate a synthesis/community paper.



(Signature of the PI)

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