

Outline for the progress report of UN Ocean Decade

UN24 Explore the strongest ocean current in the Western Pacific: the 2nd Cooperative Study of Kuroshio and Adjacent Regions – from its sciences to human well beings (CSK-2)

1. Introduction

(Background and why this programme/project is needed for the UN Ocean Decade)

It has been half a century since the IOC/UNESCO organized the first study of the Kuroshio and its adjacent regions (1965-1979). Given the importance of the Kuroshio to many Asian countries, and the drastic changing condition under global warming and escalating human activities, many countries in the region called for the 2nd cooperative study of Kuroshio at the 14th intergovernmental session of IOC/WESTPAC.

The Kuroshio, one of the strongest currents in the world, is a warm ocean current on the west side of the North Pacific, with originated from the North Equatorial Current near the east coast of Luzon, the Philippines. The Kuroshio flows northward along the east Taiwan Island into the East China Sea, returns to the Pacific Ocean through the Tokara Strait, and finally diverts eastward as the Kuroshio Extension (KE) off the east coast of Japan.

The Kuroshio holds vast cultural, social-economic value to most of countries in the North Pacific. It transports large amounts of heat and salt from the tropics to mid-latitudes, interacting and exchanging energy with atmosphere along its path, and thus moderating the global and regional climate. The Kuroshio, together with its adjacent current systems and the topography, forms a unique environment for material exchange between the land, marginal seas and the open ocean. The transportation of nutrients and organisms by the currents and associated ocean processes gives way to a high level of marine biodiversity along their paths, and contributes to abundant marine fishery resources in the Western and North Pacific.

Despite its importance, most of our knowledge about the Kuroshio mainly comes from the Cooperative Study of the Kuroshio and Adjacent Regions (CSK), the first international ocean research program that the Intergovernmental Oceanographic Commission of UNESCO (IOC) conducted in the Western Pacific during 1965-1979. This program primarily focused on hydrography and fisheries along the Kuroshio path, with a number of observations and relevant studies conducted by participating countries. Since then, several oceanographic observation transect lines, such as the 137°E repeat hydrographic section, have been routinely observed. These time-series observations give an initial description of the climatological mean current patterns and volume transport of the Kuroshio and its branches. The CSK also enabled participating countries to establish infrastructure and build institutional capacity for ocean research, including oceanographic data sharing and management. The implementation of CSK stimulated ocean science cooperation among countries in the region, and finally led to the establishment in 1977 of a former IOC Working Group for the Western Pacific that is now the IOC Sub-Commission for the Western Pacific (WESTPAC).

Over the past decades, the Kuroshio region has been known as one of the most responsive areas to the global warming. Its drastic changes seem to directly affect the regional weather and climate patterns. Moreover, it is becoming evident that the distribution of many organisms is changing and some of them are even at risk of becoming endangered as a result of global warming and escalating human activities. These changes to the Kuroshio are affecting various marine ecosystem services on which our society has been dependent.

In this context, substantial knowledge gaps become increasingly prominent, and urgently need to be filled in the understanding of the Kuroshio, its changing conditions, and associated implications for regional and global climate change, biodiversity conservation and resources management in the Western Pacific. Moreover, in view of the remarkable progress on observation and modelling technologies since the first CSK, the need for a new Kuroshio research program becomes more pronounced against the backdrop of the ever-growing challenges for the sustainable development, especially for marine and coastal resources.

In this context, the WESTPA), over the past four years, engaged a broad range of ocean research communities and diverse stakeholders into a thorough review of marine science development since the 1st CSK (1965-1979) and identified present knowledge gaps of Kuroshio against societal needs (e.g. doi.org/10.1016/j.pocean.2021.102513). Considering the results and demands of its member states, the WESTPAC finally decided to initiate the 2nd Cooperative Study of Kuroshio and Adjacent Regions (CSK2) at its 13th Intergovernmental Session of IOC/WESTPAC in April 2021. The CSK 2 aims to promote the generation of knowledge products connecting knowledge generators and users, which is in line with the UN Ocean Decade.

2. Timeframe and objectives

(Specific, Measurable, Achievable, Relevant, and Time bound)
What was expected to achieve over the project timeframe?

There are two major high-level objectives formulated for its initial development, which are:

Objective 1: to understand the Kuroshio and its impact on global and regional weather and climate, with a societal outcome to achieve improved regional weather forecasts and climate predictions;

Objective 2: to understand the Kuroshio in relation to its marine ecosystem, with a societal outcome to achieve better management of regional fisheries and aquaculture along the Kuroshio and in its adjacent regions.

To achieve the two objectives will rest on multi-faced science disciplines, including enhanced ocean–atmosphere, biological and biogeochemical observations, establishment and analysis of *in situ* and satellite datasets, model development, intake of local and indigenous knowledge. It will also involve science-innovation and science-policy interfaces, as well as capacity development and transfer of marine technology among participating countries and their institutions. The establishment of a multinational and multidisciplinary framework for cooperation among countries and their institutions is essential for the CSK-2 to identify, generate and use required knowledge to achieve its societal outcomes. Therefore, the well-coordinated international implementation of multidisciplinary projects, multi-sourced data and information management and efficient exchange and outreach among relevant stakeholders, communities and public will constitute important cornerstones of the cooperation framework.

In this contexts, International Steering Group of CSK-2 was established to take necessary actions toward the two objectives, which include promotion of scientific activities, development of necessary guidelines, engagement of stakeholders and young scientists etc in the time frame of project until 2030.

3. Activities and progress made from 2022 to April 2023

(The activities and progresses made since it was registered till April 2023)

Before registered as the Decade Action Programme, CSK-2 was established by IOC/WESTPAC in April 2021, Since then, International Steering Group (ISG) was established by the nominations of its members via National Focal Points of the member states of IOC/WESTPAC. There are 16 members from 8 countries. The 1st ISG meeting was held in December 2021, and at the meeting the ISG decided to submit the CSK-2 plan to the 2nd call for UN Decade Action. Finally, CSK-2 was registered as UN-24 in April 2022. ISG also decided to develop its Science Action Plan and Data Information and Management Plan at the 1st meeting. These two documents are guidelines for initiations of multinational and multidisciplinary actions under the UN Ocean Decade, and finalized before the 2nd ISG meeting.

The 2nd ISG meeting was held in July 2022. At the meeting, ISG decided to call new initiatives as UN Decade Action Projects, with a criteria to select proposals. The call for proposal was done in November 2022, and finally 12 proposals were submitted to the IOC/WESTPAC office. It was also discussed to promote marine science of Kuroshio. The first international symposium on CSK-2 was held in February 2023 in Bangkok, Thailand hosted by Qingdao National Laboratory for Marine science (QNLN) and the IOC/WESTPAC office. The symposium followed by the 3rd ISG meeting at the same place.

At the 3rd ISG meeting, most of project proposals were endorsed after presentations by PIs. Several national and institutional annual reports were also presented. Most of national and institutional annual reports were also presented and exchanged among members and invited resource persons. In this discussion, importance of CSK-2 data system was well recognized and ISG fostered to develop portal and nodes in the capacity. It was also discussed the enhancement of the activities of ECOP, and small group for ECOP was developed. After the 3rd meeting, 2nd call for project proposal will be taken place. The 4th ISG will be hosted by Laoshan Laboratory in Qingdao, China.

4. Objectives to be achieved, if applicable, over the next intersessional period (May 2023- April 2025)

- a. Several scientific papers to be published from endorsed projects/initiatives
- b. Some data nodes in operation
- c. Data portal sites in operation
- d. More engagements from operational agencies in member states
- e. More dialogues with stakeholders
- f. Start co-design (or re-design) processes with dedicated stakeholders

5. Planned activities for May 2023- April 2025

To achieve the short term objectives above, ISG will conduct several meetings by using the opportunities of WESTPAC IMSC, regional Decade Conference, AOGS, and national meetings of scientific societies etc.

[provide, in tabular form, the action items that should be included in the work plan and budget]

Program	Activities	Objectives	Expected outputs/outcomes	Date and place	Funding Required		Remark
					IOC	Other sources (i.e., from national or international)	
CSK-2	1. 4 th ISG and 2 nd science symposium	Discuss way forward	Engagements of operational agencies and young experts.	Fall in 2023	0	200K	Laoshan Laboratory
	2. 5 th ISG	Exchange scientific information Discuss way forward	Papers and reports	Spring in 2024	0	200K	Host not determined yet
	3. Session at the WESTAPC Conference	Exchange scientific achievements	Papers and reports	Spring in 2024	0	0	
	4. Decade Incubator at the regional Decade Conference	Develop framework to sustain dialogues with stakeholders	Framework	Spring in 2024	0	0	
	5. 3 rd international symposium and 6 th ISG	Exchange scientific information Discuss way forward	Papers and reports	Fall 2024 to January 2025	0	200K	Host not determined yet