GOVERNMENT OF KERALA
REBUILD KERALA INITIATIVE
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NOTICE

Reference No: RKI/NT/02/2019 **Dated 13/08/2019**

The Rebuild Kerala Development Programme (RKDP) has identified technical studies and assessments across various sectors to support the State's progress towards achieving its VISION of a green and resilient Kerala.

The Rebuild Kerala Initiative (RKI), in close collaboration with the different departments across sectors, is facilitating the engagement of competent and credible organizations to undertake the studies. As part of preparation of the Terms of Reference (ToR), we invite your observations on the scope of work outlined for the studies within the Fisheries sector. The scope of work for the studies is hereby enclosed in the subsequent section. You are requested to send us your inputs at **rkisecretariat@gmail.com**, latest by **6 PM on 20th August, 2019.**

For further clarification, Shri. K.Sunil Kumar, Joint Secretary – RKI may be contacted at 9496154103 (Mob.).

Awaiting your valuable feedback,

Sincerely,

Sd/-

Dr. Venu V
Chief Executive Officer, RKI
Government of Kerala.

I. Study for Marine Spatial Planning (MSP) in Kerala

1. BACKGROUND: The Rebuild Kerala Initiative (RKI) and its sectoral priorities

The State of Kerala went through the worst-ever floods in history since 1924 between the period of June 1 and 19 August 2018. One-sixth of the State's population (about 5.4 million) were affected. The floods and the accompanying landslides were catastrophic in terms of loss of lives, livelihoods, property and infrastructure.

In its response to recover from flood devastation and to develop a green and resilient Kerala, the Government of Kerala developed an inclusive and comprehensive roadmap, which was transitioned into the Rebuild Kerala Initiative (RKI). The RKI's mandate is to develop, coordinate, facilitate and monitor the Rebuild Kerala Development Programme (RKDP) through a participatory and inclusive process. The RKDP encompasses crosscutting and sector-based policy, regulatory and institutional actions as well as priority investment programs that are critical for resilient and sustainable recovery and rebuilding of the State. It aims to catalyze the rebuilding of Kerala in a way that addresses the key drivers of floods and other natural disasters and climate change risks and strengthens preparedness against future disasters. Through the RKDP, the Government of Kerala (GoK) aims to ensure a resilient recovery and development pathway for a *Nava Keralam*.

The key responsibilities of the RKI include:

- Developing and coordinating the implementation of the RKDP;
- Facilitating transformative policy, institutional realignments and critical programme investments that address the fundamental drivers of floods and other natural disaster so that to better prepare Kerala for future disasters and climate change risks;
- Mobilizing public, private and community-based resources for the implementation of the RKDP;
- Supporting Government departments & agencies in effecting agreed policy and institutional changes, project preparation and implementation and, in select cases, directly undertake activities and projects that are critical for recovery and resilience;
- Entering into and enabling partnerships with nongovernmental and civil society entities, development partners, financing partners, the private sector, academia and think tanks for the implementation of the RKDP;
- Ensuring an inclusive, participatory and consultative process of implementation of the RKDP;
- Undertaking monitoring and evaluation, and conducting performance review of RKDP

Despite the significant contribution of fisheries to nutrition, food security, sustainable livelihoods and poverty alleviation in the State, the issues constraining the sustainable development of fisheries remain poorly addressed. To add to this, the 2018 floods badly affected the fisheries sector. Inland capture fisheries and aquaculture sectors were particularly affected. The State is attempting to rehabilitate and rebuild this sector. Aquaculture has been recognized as one of the fastest growing food production sectors in the world but is vulnerable to climate change and this sector is a prominent source to be relied on for increasing the fish production in the State. Aquaculture has a vital role in contributing to food security and poverty alleviation in India and many other developing countries. Specifically considering the prevailing climate change conditions in Kerala, the production efficiency needs to be increased in both capture and culture fisheries in a resilient manner, while keeping in check the possible vulnerabilities

to the natural resources of the State. This, in turn, necessitates development of strategies for enhancing and increasing food production without damaging the environment and disturbing ecological balance.

The aggregated loss due to recent floods for aquaculture and inland capture fisheries is estimated to be Rs. 10,304 lakh and the aggregated damage is estimated to be Rs. 8450 lakh. In terms of breakup, the losses and damages were Rs. 8866 lakh and Rs. 6584 lakh respectively for aquaculture, and Rs. 1058 lakh and Rs. 348 lakh respectively for inland capture fisheries. The hatcheries, fish farms and field offices owned by Government also suffered losses and damages worth Rs. 380 lakh and Rs. 1518 lakh respectively. The worst affected districts in the State were Thrissur, Alappuzha, Kottayam, Ernakulum, Malappuram, Wynad, Pathanamthitta and Idukki. The losses and damages were mainly as a result of breaches of bund, overflow and damage to pumps and other farm equipment.

The recovery vision for the fisheries sector is to develop a sustainable, responsible, inclusive, eco-friendly and resilient aquaculture and fisheries resource management measures consistent with the policies of the GOK and the GOI. To realize this vision, it is essential to develop a strategic plan for sustainable fisheries sector development with short-, medium- and long-term goals. The immediate to short-term measures for the recovery of fisheries will focus on the revival of aquaculture and inland fisheries system and cleaning of water bodies. In the medium term, it is essential to strengthen the Kerala Inland and Aquaculture Act, development of fisheries co-management in marine sector, systematic management of aqua farms, insurance compliance and de-siltation of water bodies and lakes. Medium- and long-term activities could also focus on building resilience through environmentally sustainable community-based management of water resources, setting up of early warning systems, and enhanced GIS/technology backed capabilities for tracking and management of the sector assets.

The RKDP outlines a detailed set of actions for addressing the challenges in the fisheries sector, and revive and modernize the sector to meet the needs of people and the economy. These are aligned to five key themes: (1) Creating an enabling environment for growth, (2) managing marine capture fisheries for long-term sustainability, (3) Ensuring sustainable inland capture fisheries, (4) Supporting the development of an environmentally-responsible aquaculture industry, and (5) Optimizing the benefits of a productive fisheries sector – including the value chain – and for social goals.

2. CONTEXT

Over the last decade, marine spatial planning (MSP) has become an increasingly accepted approach to achieve multiple objectives for ocean management. MSP works across borders and sectors to ensure that the human activities at sea take place in an efficient, safe and sustainable way. It reduces conflicts between different sectors – fisheries, shipping, tourism, renewable energy, transportation and others – and creates synergies between different activities. At least 13 countries have approved marine plans covering 7% of the world's Exclusive Economic Zones and Territorial Seas. MSP presents several significant challenges including choosing appropriate data, models and decision support tools to inform the planning process. Advances in approaches to, and spatial tools for, multi-objective marine planning are necessary to address particular challenges posed by the different spatial, temporal and socio-economic scales of uses and activities in a given planning context.

Several studies have been conducted in Belize, Canada, South Africa, Seychelles, the United Kingdom and the United States on a number of topics related to advancing MSP. According to the Frontiers in Marine Science[1], the following themes are broadly relevant to any multi-objective MSP process:-

- Indigenous and local knowledge should inform planning goals and objectives
- Transparent and evidence-based approaches can reduce user conflict
- Simple ecosystem service models and scenarios can facilitate multi-objective planning
- Trade-off analyses can help balance diverse objectives

India has an Exclusive Economic Zone (EEZ) of 2.02 million square kilometers. Of this 0.22 million square kilometers is adjacent to Kerala coast. The territorial waters, where the State has exclusive right for fishing extending to 12 nm from the coast. Besides the territorial waters, Kerala could utilize, by formulating appropriate policy and adopting suitable technologies, off shore/open sea areas in the EEZ contiguous to the coast for aqua farming.

The Government of Kerala has, within the RKDP Policy Framework and Action Plan, reiterated its commitment to implementing Ecosystem Approach to Fisheries Management (EAFM), and MSP towards demarcation of marine areas for multiple users of the ocean to avoid conflict of interest in the use of resources. In this regard, the services of a professional agency are required to support the Department of Fisheries to undertake MSP exercises, and facilitate optimum utilization of the marine areas by the different stakeholder groups.

3. OBJECTIVES

The broad objectives of the proposed assignment is to undertake a comprehensive Marine Spatial Planning (MSP) exercise which shall enable informed and coordinated decisions about how to use marine resources sustainably, facilitate the synergistic functioning and operations of multiple users of oceans and waterbodies, and facilitate effective conservation and recreation.

4. SCOPE OF WORK

The broad scope of work shall include:-

- Mapping of the multiple users of the ocean with clear indication of their roles, and challenges faced by each of the user/stakeholder groups
- Mapping of the multiple utilization patterns of the ocean, and the present status and challenges of utilization, and suggest new/alternate patterns of utilization and recommendations to mitigate the challenges so as to facilitate enhanced and effective utilization of the oceans
- Preparation of maps which highlight where and how the ocean area is being used, and what natural fisheries resources and habitat exist
- Identification of new potential areas for mariculture

[1] www.frontiersin.org

- Review of the State's policies and guidelines, and provide recommendations to address the gaps and challenges which hinder effective MSP, and provide options for conducive MSP legislations for the State
- Establishment of a detailed inventory of MSP frameworks and implementation in the world
- Review of the global and national best practices on marine spatial planning, and provide recommendations for contextualized adaptation within local conditions
- Preparation of a MSP Framework
- Preparation of an time-bound implementation plan and road map for implementation of the MSP framework
- Development of strategies for mitigation of the risks associated with mariculture, including creating awareness, capacity building of fishermen, fish farmers and other stakeholders
- Assessment of the prospects of utilizing reef areas as protected area for breeding and habitat enhancement and suggest recommendations for regulation and conservation
- Assessment of the prospects of seaweed cultivation, Integrated Multi-trophic Aquaculture and other means to favorably impact the water current to make the marine areas more conducive for mariculture
- Conduct high-level consultative workshops (minimum 3) for facilitating discussions on the MSP Framework, implementation plan and road map
- Preparation of a Monitoring & Evaluation (M&E) plan for the Department of Fisheries to tracking the implementation and progress of the MSP
- Explore possibilities of application of new and innovative technologies such as Geospatial and satellite imaging etc for efficient data collection and increased accuracy
- Develop conceptual framework for enhanced involvement of stakeholders in MSP and its components through ICT (e.g. mobile apps)

II. Study for Inland Fisheries Spatial Planning in Kerala

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to the natural resources of the State. This, in turn, necessitates development of strategies for enhancing and increasing food production without damaging the environment and disturbing ecological balance.

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The recovery vision for the fisheries sector is to develop a sustainable, responsible, inclusive, eco-friendly and resilient aquaculture and fisheries resource management measures consistent with the policies of the GOK and the GOI. To realize this vision, it is essential to develop a strategic plan for sustainable fisheries sector development with short-, medium- and long-term goals. The immediate to short-term measures for the recovery of fisheries will focus on the revival of aquaculture and inland fisheries system and cleaning of water bodies. In the medium term, it is essential to strengthen the Kerala Inland and Aquaculture Act, development of fisheries co-management in marine sector, systematic management of aqua farms, insurance compliance and de-siltation of water bodies and lakes. Medium- and long-term activities could also focus on building resilience through environmentally sustainable community-based management of water resources, setting up of early warning systems, and enhanced GIS/technology backed capabilities for tracking and management of the sector assets.

The RKDP outlines a detailed set of actions for addressing the challenges in the fisheries sector, and revive and modernize the sector to meet the needs of people and the economy. These are aligned to five key themes: (1) Creating an enabling environment for growth, (2) managing marine capture fisheries for long-term sustainability, (3) Ensuring sustainable inland capture fisheries, (4) Supporting the development of an environmentally sensitive aquaculture industry, and (5) Optimizing the benefits of a productive fisheries sector – including the value chain – and for social goals.

2. CONTEXT

Kerala is endowed with natural resources to support a fisheries sector that has significant potential to make a much larger contribution to economic growth and social development, while ensuring its sustainability and resilience to climactic-shocks. Kerala's fisheries contribute to economic growth and social development, but their full potential has not been realized. Prior to the 2018 devastating floods, the fisheries sectors' contribution to State GDP was Rs. 7086.32 crore, or 1.36%. It accounts for 11.49 % of primary sector and has dependent population of 11 lakh. The inland aquaculture sector is growing, albeit slower than it could as it lacks crucial planning and governance arrangements.

Kerala stands 4th among the Indian states in total fish production. The annual total fish production of the State has grown from around 3.50 tonnes in 1978-79 to 7.28 lakh tonnes in 2015-2016. During the last

decade, however, total fish production of the State has stagnated between 6.77 and 7.28 lakh tonnes, the figure being 6.76 lakh tonnes in 2016-2017.

Marine capture fisheries is always dominating the total fish production in Kerala. With an average annual production of 5.44 lakh tonnes (2007-08 to 2016-17) the State is in the forefront in marine fish production in India. Marine fish production of the State during the last three decades fluctuated between 2.86 lakh tonne (1987-88) and 6.60 tonnes (1996-97). Fish production in the marine sector over the last 10 years presents a more or less stagnant trend with an average production of 5.44 lakh tonnes. It may be noted that the marine fish landing of the State has almost attained or even exceeded the optimum level of production. There is little scope for further increase in fish production from inshore marine capture fisheries sector by increasing the fishing effort.

Kerala is yet to make a noteworthy contribution in the field of inland aquaculture. While the aquaculture sector contributed more than 50% of the total fish production in the country, the share of the sector in total fish production of Kerala is less than 10%.

With marine catches stagnating and aquaculture not really taking off, Kerala's pre-eminence in the fisheries sector is slowly diminishing. Kerala's fish processing industry is still dominated by shrimp and the capacity utilization is estimated to be about 20%. Shortage of raw material is one of the major reasons for this low capacity utilization. In spite of this, Kerala has one of the highest per capita consumption of fish in the country. The per capita consumption of fish in Kerala is around 24 kg which is much above the national average (3.3 kg) and is slightly above the global average (20 kg). Around 87% of the people of Kerala take fish regularly as part of their diet.

The key issues constraining the potential of inland capture fisheries in the State are listed below:-

- Unscientific fishing methods and increased fishing pressure resulting in the depletion of resources
- Degradation of the environment due to climate change, pollution, poor effluent treatment on land, plastics (especially, micro-plastic particles) in the water, ghost fishing, habitat modifications, sand mining, loss of breeding grounds, shrinkage of inland water bodies, mangrove deforestation, etc
- Inadequate management of inland fisheries due to lack of integrated approach, lack of blending traditional knowledge and science with business principles, ineffective engagement of both primary stakeholders, and also those engaged in ancillary activities
- Inadequate Monitoring, Control and Surveillance (MCS) system

The key issues constraining the potential of inland aquaculture in the State are as follows:-

- Inadequate diversification of species with excess focus on culture of carps in spite of limited demand
- Use of under sized seed as stocking material in farming
- Non-utilization of brackish water ponds/fields year-round
- Low productivity of existing aquaculture farms
- Non-diversification of farming systems
- Neglect of reservoir fish production
- Lack of support for creation of common facilities especially in the Kuttanad, Kole, Pokkali and Kaippad lands which are important areas for the development of aquaculture

In this regard, it is required to undertake a comprehensive inland aqua spatial planning for sustainable inland capture fisheries and aquaculture.

3. OBJECTIVES

The broad objective of the proposed assignment is to undertake a comprehensive, inland aqua spatial planning for sustainable Inland capture fishing and aquaculture using remote sensing techniques, to ascertain the availability and potential of water bodies to support proper management of natural fish stock, fish farming, and also to ear-mark zones for fish culture

4. SCOPE OF WORK

The successful agency is expected to undertake the following services:-

- Using remote sensing techniques, conduct a detailed survey and collect data on water bodies available for fish farming
- Undertake demarcation of the water bodies into zones on the basis of sites, regions, species, seasons, resource/input requirements and other relevant parameters
- Propose zone-specific measures to be adopted to achieve higher and sustainable fish production
- Ear mark zones which are suitable for aquaculture, protected area and furnish the reasons for the same
- Propose measures to be adopted in zones not suitable for aquaculture to make them conducive for aquaculture or capture fisheries
- Review of the global and national best practices on zonation of water bodies for fish production purposes, and provide recommendations for contextualized adaptation in Kerala
- Identify risks and develop strategies for mitigation of risks associated with mariculture and aquaculture in the demarcated zones
- Conduct a high-level consultative workshop for facilitating discussions on the demarcation of zones and the way forward to facilitate higher fish production

III. Facilitating Ecosystem-Based Fisheries Management (EBFM) in Kerala

1. BACKGROUND: The Rebuild Kerala Initiative (RKI) and its sectoral priorities

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to food security and poverty alleviation in India and many other developing countries. Specifically considering the prevailing climate change conditions in Kerala, the production efficiency needs to be increased in both capture and culture fisheries in a resilient manner, while keeping in check the possible vulnerabilities to the natural resources of the State. This, in turn, necessitates development of strategies for enhancing and increasing food production without damaging the environment and disturbing ecological balance.

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2. CONTEXT

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due to overfishing and poor surveillance programme. The aquaculture industry is growing, albeit slower than it could as it lacks crucial planning and governance arrangements.

Kerala stands 4th among the Indian states in total fish production. The annual total fish production of the State has grown from around 3.50 tonnes in 1978-79 to 7.28 lakh tonnes in 2015-2016. During the last decade, however, total fish production of the State has stagnated between 6.77 and 7.28 lakh tonnes, the figure being 6.76 lakh tonnes in 2016-2017.

The key issues constraining the potential of capture fisheries in the State are listed below:-

- Unscientific fishing methods and increased fishing pressure resulting in the depletion of resources
- Degradation of the environments due to climate change, pollution, poor effluent treatment on land, plastics (especially, micro-plastic particles) in the sea, ghost fishing, habitat modifications, sand mining, loss of breeding grounds, shrinkage of inland water bodies, mangrove deforestation, etc
- Inadequate management of fisheries due to lack of integrated approach, lack of blending traditional knowledge and science with business principles, ineffective engagement of both primary stakeholders, and also those engaged in ancillary activities
- Neglect of deep sea fishing with the restriction of marine fishing to inshore areas
- Inadequate Monitoring, Control and Surveillance (MCS) system

The key issues constraining the potential of aquaculture in the State are as follows:-

- Inadequate diversification of species with excess focus on culture of carps in spite of limited demand
- Use of fry as stocking material in farming
- Under-utilization of brackish water ponds
- Low productivity of existing aquaculture farms
- Non-diversification of farming systems, and limited integration of nutrition-sensitive agri-fish farming and/or fish-livestock farming
- Lack of intensification of farming technology
- Neglect of mariculture, seaweed farming, brackish water cage farming and reservoir fish production
- Lack of support for creation of common facilities especially in the Kuttanad, Kole, Pokkali and Kaippad lands important areas for the development of aquaculture
- Inadequate finance for aquaculture development

Ecosystem-based fisheries management (EBFM) is a holistic way of managing fisheries resources by taking into account the entire ecosystem. The goal of ecosystem-based management is to maintain ecosystems in a healthy, productive, and resilient manner so that they can be utilized for multiple and multifarious purposes.

The Government of Kerala is committed to the establishment of a strategic programme of support where increased fisheries production (both captured and cultured), and improved value-addition drive both domestic as well as export-oriented growth, while maintaining an ecosystem-based focus for resilience and sustainability. The focus will be on sustainable management of natural inland aquatic resources in the delivery of economic and social benefits, while minimizing environmental degradation, biodiversity loss, and the non-sustainable use of resources, while maximizing the economic and social benefits that build strong communities. The RKDP highlights the implementation of the ecosystem approach to fisheries management (EAFM) with due consideration to the well-being of all living and non-living constituents of the aquatic ecosystem and the social attributes of stakeholders. It also promotes participatory management or co-management in fisheries, which is recognized globally as one of the successful management systems for multi-stakeholder, multi-species and multi-fleet fisheries. Such a co-management system, which could include local, regional, inter-state and national fisheries councils

would also play a key role in resolving conflicts among different groups of fishermen. The norms for introducing these management measures will be worked out in consultation with the fisheries research institutions, local governments, fishers and their associations and other concerned stakeholders in the sector.

Improved ecosystem management will also facilitate the productive and sustainable management of inland fisheries

3. OBJECTIVES

The broad objective of the proposed assignment is to prepare plans for the development of inland ecosystems in Kerala, and provide recommendations to ensure an effective, efficient, holistic and sustainable EBFM.

4. SCOPE OF WORK

The broad scope of work is outlined below:-

- Prepare a framework and checklist to be used for undertaking a detailed assessment of the traits of 5 fisheries ecosystems - (i) Vembanad, (ii) Ashtamudi, (iii) Valapattanam Kayal, (iv) Kayamkulam Kayal and (v) Valiyaparamba Kayal
- Review, study and document the specific characteristics, influential factors, attributes, risks, issues, users and stakeholders pertaining to these ecosystems. A mix of primary as well as secondary research is expected to be undertaken
- Prepare a draft Fisheries Ecosystem Plan (FEP) for each ecosystem, which will also include a plan for conservation of fisheries resources
- Prepare an EBFM Implementation Plan and Road Map with specific projects, interventions, activities and timelines, among others
- Conduct a high-level consultative workshop (minimum 2) for facilitating discussions on FEPs, and the EBFM Implementation Plan and Road Map
- Identify short-term (3 years), medium-term (5 years), and long-term (10 years) targets for each ecosystem, and devise strategies and prepare operational guidelines to achieve these targets
- Review of the global and national best practices in EBFM, and provide recommendations for contextualized adaptation in Kerala
- Design training and capacity building programs for acquainting different stakeholders with EBFM processes and interventions; Draft a detailed plan to build knowledge base on EBFM and dissemination of knowledge to the stakeholders.

IV. Feasibility Study for Establishment of an Integrated Aqua Park in Kerala

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- Supporting Government departments & agencies in effecting agreed policy and institutional changes, project preparation and implementation and, in select cases, directly undertake activities and projects that are critical for recovery and resilience;
- Entering into and enabling partnerships with nongovernmental and civil society entities, development partners, financing partners, the private sector, academia and think tanks for the implementation of the RKDP;
- Ensuring an inclusive, participatory and consultative process of implementation of the RKDP;
- Undertaking monitoring and evaluation, and conducting performance review of RKDP

Despite the significant contribution of fisheries to nutrition, food security, sustainable livelihoods and poverty alleviation in the State, the issues constraining the sustainable development of fisheries remain poorly addressed. To add to this, the 2018 floods badly affected the fisheries sector. Inland capture fisheries and aquaculture sectors were particularly affected. The State is attempting to rehabilitate and rebuild this sector. Aquaculture has been recognized as one of the fastest growing food production sectors in the world but is vulnerable to climate change and this sector is a prominent source to be relied on for increasing the fish production in the State. Aquaculture has a vital role in contributing to food security and poverty alleviation in India and many other developing countries. Specifically considering the prevailing climate change conditions in Kerala, the production efficiency needs to be increased in

both capture and culture fisheries in a resilient manner, while keeping in check the possible vulnerabilities to the natural resources of the State. This, in turn, necessitates development of strategies for enhancing and increasing food production without damaging the environment and disturbing ecological balance.

The aggregated loss due to recent floods for aquaculture and inland capture fisheries is estimated to be Rs. 10,304 lakh and the aggregated damage is estimated to be Rs. 8450 lakh. In terms of breakup, the losses and damages were Rs. 8866 lakh and Rs. 6584 lakh respectively for aquaculture, and Rs. 1058 lakh and Rs. 348 lakh respectively for inland capture fisheries. The hatcheries, fish farms and field offices owned by Government also suffered losses and damages worth Rs. 380 lakh and Rs. 1518 lakh respectively. The worst affected districts in the State were Thrissur, Alappuzha, Kottayam, Ernakulum, Malappuram, Wynad, Pathanamthitta and Idukki. The losses and damages were mainly as a result of breaches of bund, overflow and damage to pumps and other farm equipment.

The recovery vision for the fisheries sector is to develop a sustainable, responsible, inclusive, eco-friendly and resilient aquaculture and fisheries resource management measures consistent with the policies of the GOK and the GOI. To realize this vision, it is essential to develop a strategic plan for sustainable fisheries sector development with short-, medium- and long-term goals. The immediate to short-term measures for the recovery of fisheries will focus on the revival of aquaculture and inland fisheries system and cleaning of water bodies. In the medium term, it is essential to strengthen the Kerala Inland and Aquaculture Act, development of fisheries co-management in marine sector, systematic management of aqua farms, insurance compliance and de-siltation of water bodies and lakes. Medium- and long-term activities could also focus on building resilience through environmentally sustainable community-based management of water resources, setting up of early warning systems, and enhanced GIS/technology backed capabilities for tracking and management of the sector assets.

The RKDP outlines a detailed set of actions for addressing the challenges in the fisheries sector, and revive and modernize the sector to meet the needs of people and the economy. These are aligned to five key themes: (1) Creating an enabling environment for growth, (2) managing marine capture fisheries for long-term sustainability, (3) Ensuring sustainable inland capture fisheries, (4) Supporting the development of an environmentally-responsible aquaculture industry, and (5) Optimizing the benefits of a productive fisheries sector – including the value chain – and for social goals.

2. CONTEXT

Kerala is endowed with natural resources to support a fisheries sector that has significant potential to make a much larger contribution to economic growth and social development, while ensuring its sustainability and resilience to climactic-shocks. Kerala's fisheries contribute to economic growth and social development, but their full potential is not being realized. Prior to the 2018 devastating floods, the fisheries sectors' contribution to State GDP was Rs. 7086.32 crore, or 1.36% but 11.49 % of primary products such as agriculture and allied activities and employed a reported 11 lakh people directly and indirectly. Yet, even before the floods and significant damage to the sector, parts of the sector were struggling. The marine capture fishery has been suffering decreases in production and per-unit value due to overfishing and poor quality. The aquaculture industry is growing, albeit slower than it could as it lacks crucial planning and governance arrangements.

Kerala stands 4th among the Indian states in total fish production. The annual total fish production of the State has grown from around 3.50 tonnes in 1978-79 to 7.28 lakh tonnes in 2015-2016. During the last decade, however, total fish production of the State has stagnated between 6.77 and 7.28 lakh tonnes, the figure being 6.76 lakh tonnes in 2016-2017.

Kerala has the lowest aquaculture productivity among all Indian States. By scientifically designing farms, adopting scientific management practices, species diversification, crop rotation and by intensification of farming activities, the productivity of aquaculture units in the State can be improved perceptibly. Good quality fish seed is a pre-requisite for the success of any aquaculture venture. To ensure quality of seed and sustainability in its production process, it is essential that the hatcheries use brood stock, breeding and husbandry practices as per scientific norms. Similarly, it needs to be ensured that seed farms use spawn obtained from reliable hatcheries that follow the norms of quality and sustainability.

It is required to assess the feasibility of establishment of an Integrated Aqua Park that will have brood stock management system, multi species hatchery, rearing, feed processing unit, disease control mechanism, innovative demonstrative units, etc.

3. OBJECTIVES

The broad objective of the proposed assignment is to conduct a feasibility study to assess the prospects of establishment of an Integrated Aqua Park.

4. SCOPE OF WORK

The broad scope of work is outlined below:-

- Conduct of site survey statewide and to propose the most suitable location for the establishment of an Integrated Aqua Park, different components to be included in the same and preparation of a detailed report (DPR).
- Conduct of an Environment Impact Assessment study and to prepare a report.
- Prepare a business model and an operational plan for the establishment of an Integrated Aqua Park.
- Prepare a detailed financial plan with details of the expected investments to be made, plan for phasing and scaling up, expected revenue streams and cost structure, expectations of scale and surplus, potential sources of investments for the establishment of different components such as brood stock management systems, multi species hatchery, rearing systems, feed processing unit, disease control & Management system, innovative demonstrative units, farm tourism, marketing outlets, recreation areas/cafeterias etc.
- Review of the global and national best practices, and provide recommendations for adaptation in Kerala for establishing an Integrated Aqua Park.
- Define the partnerships – both institutional as well as individual – and linkages to be established to ensure successful implementation.

- Preparation of an ISO manual including Quality Management System Certification, Environment Management System Certification, Occupational Health and Safety System Certification modalities to be adopted in the Integrated Aqua Park.
- Prepare a Detailed Project Report (DPR) which details the requirements of inputs, resources, technology, manpower, funds, logistics, equipment, and others

V. Feasibility Study to Develop Kerala as a Hub for Ornamental Fish Production

1. BACKGROUND: The Rebuild Kerala Initiative (RKI) and its sectoral priorities

The State of Kerala went through the worst-ever floods in history since 1924 between the period of June 1 and 19 August 2018. One-sixth of the State's population (about 5.4 million) were affected. The floods and the accompanying landslides were catastrophic in terms of loss of lives, livelihoods, property and infrastructure.

In its response to recover from flood devastation and to develop a green and resilient Kerala, the Government of Kerala developed an inclusive and comprehensive roadmap, which was transitioned into the Rebuild Kerala Initiative (RKI). The RKI's mandate is to develop, coordinate, facilitate and monitor the Rebuild Kerala Development Programme (RKDP) through a participatory and inclusive process. The RKDP encompasses crosscutting and sector-based policy, regulatory and institutional actions as well as priority investment programs that are critical for resilient and sustainable recovery and rebuilding of the State. It aims to catalyze the rebuilding of Kerala in a way that addresses the key drivers of floods and other natural disasters and climate change risks and strengthens preparedness against future disasters. Through the RKDP, the Government of Kerala (GoK) aims to ensure a resilient recovery and development pathway for a *Nava Keralam*.

The key responsibilities of the RKI include:

- Developing and coordinating the implementation of the RKDP;
- Facilitating transformative policy, institutional realignments and critical programme investments that address the fundamental drivers of floods and other natural disaster so that to better prepare Kerala for future disasters and climate change risks;
- Mobilizing public, private and community-based resources for the implementation of the RKDP;
- Supporting Government departments & agencies in effecting agreed policy and institutional changes, project preparation and implementation and, in select cases, directly undertake activities and projects that are critical for recovery and resilience;
- Entering into and enabling partnerships with nongovernmental and civil society entities, development partners, financing partners, the private sector, academia and think tanks for the implementation of the RKDP;
- Ensuring an inclusive, participatory and consultative process of implementation of the RKDP;
- Undertaking monitoring and evaluation, and conducting performance review of RKDP

Despite the significant contribution of fisheries to nutrition, food security, sustainable livelihoods and poverty alleviation in the State, the issues constraining the sustainable development of fisheries remain poorly addressed. To add to this, the 2018 floods badly affected the fisheries sector. Inland capture fisheries and aquaculture sectors were particularly affected. The State is attempting to rehabilitate and rebuild this sector. Aquaculture has been recognized as one of the fastest growing food production sectors in the world but is vulnerable to climate change and this sector is a prominent source to be relied on for increasing the fish production in the State. Aquaculture has a vital role in contributing to food security and poverty alleviation in India and many other developing countries. Specifically considering the prevailing climate change conditions in Kerala, the production efficiency needs to be increased in

both capture and culture fisheries in a resilient manner, while keeping in check the possible vulnerabilities to the natural resources of the State. This, in turn, necessitates development of strategies for enhancing and increasing food production without damaging the environment and disturbing ecological balance.

The aggregated loss due to recent floods for aquaculture and inland capture fisheries is estimated to be Rs. 10,304 lakh and the aggregated damage is estimated to be Rs. 8450 lakh. In terms of breakup, the losses and damages were Rs. 8866 lakh and Rs. 6584 lakh respectively for aquaculture, and Rs. 1058 lakh and Rs. 348 lakh respectively for inland capture fisheries. The hatcheries, fish farms and field offices owned by Government also suffered losses and damages worth Rs. 380 lakh and Rs. 1518 lakh respectively. The worst affected districts in the State were Thrissur, Alappuzha, Kottayam, Ernakulum, Malappuram, Wynad, Pathanamthitta and Idukki. The losses and damages were mainly as a result of breaches of bund, overflow and damage to pumps and other farm equipment.

The recovery vision for the fisheries sector is to develop a sustainable, responsible, inclusive, eco-friendly and resilient aquaculture and fisheries resource management measures consistent with the policies of the GOK and the GOI. To realize this vision, it is essential to develop a strategic plan for sustainable fisheries sector development with short-, medium- and long-term goals. The immediate to short-term measures for the recovery of fisheries will focus on the revival of aquaculture and inland fisheries system and cleaning of water bodies. In the medium term, it is essential to strengthen the Kerala Inland and Aquaculture Act, development of fisheries co-management in marine sector, systematic management of aqua farms, insurance compliance and de-siltation of water bodies and lakes. Medium- and long-term activities could also focus on building resilience through environmentally sustainable community-based management of water resources, setting up of early warning systems, and enhanced GIS/technology backed capabilities for tracking and management of the sector assets.

The RKDP outlines a detailed set of actions for addressing the challenges in the fisheries sector, and revive and modernize the sector to meet the needs of people and the economy. These are aligned to five key themes: (1) Creating an enabling environment for growth, (2) managing marine capture fisheries for long-term sustainability, (3) Ensuring sustainable inland capture fisheries, (4) Supporting the development of an environmentally-responsible aquaculture industry, and (5) Optimizing the benefits of a productive fisheries sector – including the value chain – and for social goals.

2. CONTEXT

India's share in ornamental fish trade is estimated to be Rs 158.23 lakh which is only 0.008% of the global trade. The major part of the export trade is based on wild collection. There is very good domestic market too, which is mainly based on domestically bred exotic species. The overall domestic trade has crossed 10 crores and is growing at the rate of 20% annually[2]. The earning potential of this sector has hardly been understood and the same is not being exploited in a technology-driven manner. Considering the relatively simple techniques involved, this activity has the potential to create substantial job opportunities, besides helping export earnings.

[2] www.agritech.tnau.ac.in

In a major effort to develop the ornamental fish industry, an All-India network project on ornamental fish breeding and culture, a collaborative research project involving 7 fisheries research institutes has been launched in 2018. The joint research initiative is mainly aimed at developing adequate technologies in breeding, seed production and culture of freshwater and marine ornamental species and helping maintain the sustainability of the industry. One of the major objectives of the project is the development of ornamental fish villages with strong marketing ties. The Central Institute of Freshwater Aquaculture (CIFA) in Bhubaneshwar, Central Inland Fisheries Research Institute (CIFRI) in Barrackpore; National Bureau of Fish Genetic Resources (NBFGR) in Lucknow, Central Institute of Brackishwater Aquaculture (CIBA) in Chennai, Central Institute of Fisheries Education (CIFE) in Mumbai and Directorate of Coldwater Fishery Research (DCFR) in Uttarakhand are the research institutes involved in the network project.

Kerala, Tamil Nadu and West Bengal are the major States practicing ornamental fish farming in India. Though the potential for the development of ornamental fish trade in Kerala is immense, proper mechanisms are yet to be established to boost both the overseas and domestic trade of the native as well as exotic varieties of ornamental fish in the State.

In this context, there is a need to develop strategies to augment the production and sales of ornamental fish in Kerala, and study the feasibility for establishment of the State as the biggest hub for ornamental fish production in the country.

3. OBJECTIVES

The broad objective of the proposed assignment is to conduct a feasibility study to develop Kerala as a hub for ornamental fish production and trade.

4. SCOPE OF WORK: An indicative list of the services to be performed within the proposed study

The broad scope of work is outlined below:-

- Review of the global and national best practices, and provide recommendations for contextualized adaptation in Kerala for making the State the most preferred destination for ornamental fish production and trade
- Study the local, regional, national as well as international trends in demand and supply of ornamental fishes; consumer preferences and drivers of purchase decision-making process
- Undertake a SWOC Analysis to define the strengths, weaknesses, opportunities and challenges for the ornamental fish industry in Kerala
- Define the requirements of inputs, resources, technology, manpower, funds, logistics, equipment, and others
- Define the value proposition for all the stakeholders – government, fish farmers, fishermen, industry/private sector players, research institutes, academic institutes, etc

- Prepare a business model and an operational plan for the leveraging the under-tapped market for ornamental fish production and sales in Kerala, nationally and in the international markets
- Prepare a detailed financial plan with details of the expected investments to be made, plan for phasing and scaling up, expected revenue streams and cost structure, expectations of scale and surplus, potential sources of investments (Central and State government schemes, CSR, debt, etc)
- Prepare an implementation plan and roadmap with short-term (3 years), medium term (5 years) and long-term (10 year) strategies and milestones with clear definition of risks, and mitigation measures
- Define the partnerships – both institutional as well as individual – and linkages to be established to ensure successful implementation of the plan
- Prepare a Detailed Project Report (DPR)