FUTURE KERALA MISSION

JGI JAIN DEEMED-TO-BE UNIVERSITY KOCHI

TACKLING KERALA'S WATER HYACINTH MENACE

DISCUSSION PAPER

Background

Recognizing the scale of the ecological, economic, and social disruptions caused by the unchecked proliferation of water hyacinth in Kerala's inland waters, JAIN (Deemed-to-be-University) has resolved to adopt its mitigation as a program under the Future Kerala Mission. In this regard, a brainstorming workshop was convened on 14th July 2025, at JAIN University, Kochi, bringing together scientists, community stakeholders, and organizations actively involved in water hyacinth value-addition and mitigation to deliberate on the manifold dimensions of the issue and explore pathways for sustainable solutions.

Subsequent to this workshop, Ambassador (Retd) Prof. Venu Rajamony, the Chairman of Future Kerala Mission, articulated the urgency of the matter through two widely published articles in Mathrubhumi (dated 13th August 2025) and The Hindu (dated 15th August 2025) newspapers. These writings underscored the grave ecological implications of water hyacinth spread across Kerala's freshwater systems, the formidable challenges inherent in its eradication, and the pressing need for integrated, sequential, and state-supported interventions. The initiative of Future Kerala Mission and its significance also received prominent coverage in Marunadan Malayalee (dated 17th August 2025), a leading Malayalam news portal on YouTube, further amplifying public awareness on the urgency of addressing the crisis.

മാതൃഭൂമി

ആപകടകാരിയായ

ആഫ്രിക്കൻ പായൽ

THE HINDU

INDIA'S NATIONAL NEWSPAPER SINCE 1878

Only united action can stop the hyacinth's invasion

Every monsoon, a quiet menace surges across India's waterways, turning glistening rivers, back waters and lakes into green deserts. This threat is the water hyacinth (*Eichhornia crassipes*), an innocuous-looking aquatic plant which has delicate lilac flowers that belies its destructive power. Nowhere is its impact more pervasive than in Kerala — a State renowned for its intricate network of backwaters and the famed Vembanad Lake.

Introduced in India during colonial rule as an ornamental plant, the water hyacinth's prodigious growth has since overwhelmed the very ecosystems and communities it decorates. Today, it is estimated that over 2,00,000 hectares of inland waters nationwide have been smothered by this weed, disrupting the lives and livelihoods of countless Indians.

Crisis in Kerala

Farmers and fishermen are among the hardest hit. For paddy cultivators along the Kuttanad region of Kerala — known as the 'rice bowl of Kerala' — water hyacinth mats block irrigation channels, impede water flow and choke fields, driving up the costs and efforts required to sustain agriculture. Fishermen find their traditional trade impossible as the dense mats strangle fish nurseries, undermine native fish populations, block access, and even damage nets and boats.

Worse, water hyacinth devastates aquatic biodiversity. By preventing sunlight and oxygen from penetrating the water's surface, these floating jungles suffocate everything below. Aquatic flora and fauna, already fighting pollution and over-extraction, are now forced to contend with ecological asphyxiation, unravelling entire food webs. The weed's unchecked proliferation is a direct threat to economies as well. Vembanad Lake, a Ramsar-recognised wetland of international importance and a lifeline for lakhs of people, is emblematic of this crisis, with tourism and transport now at risk.

Yet, the hidden danger of the water hyacinth extends beyond livelihoods and biodiversity. As the plant rapidly accumulates and then decays, it releases methane — a greenhouse gas over 25 times more potent than carbon dioxide at trapping heat.

Experiments that must be scaled up

Recognising the need for solutions, innovators and communities across India have experimented with turning this "pest" into a resource. In Odisha, imaginative women's self-help groups skilfully weave water hyacinth into handicrafts, baskets and furniture. In Assam and West Bengal, it has been transformed into paper and biogas production.

These experiments, though promising, remain isolated in scope and scale. What is urgently required is policy support, financial incentives and a robust value chain to scale them up.

Despite the creativity at the grass-roots, what is missing is a coordinated policy thrust in the effective management of the hyacinth menace. Currently, responsibility is diffused across multiple government departments — agriculture, fisheries, environment, irrigation — often leading to piecemeal and short-term efforts. The situation demands a single-point accountability mechanism and a national policy with region-specific implementation strategies. There is a need for coordinated removal drives using scientific methods and mechanisation with appropriate technology suited to local conditions in places such as Kerala where labour is not easily available. Innovations need to be incentivised and private sector partnerships established for value addition. Research into viable products (crafts, biofuels, compost textiles) also needs to be promoted and disseminated.

Solving the water hyacinth crisis is a mammoth task, but it is by no means insurmountable. Recently, Jain university in Kochi organised a brainstorming workshop under its Future Kerala Mission, bringing together experts, grass-roots practitioners, policymakers and businesses to reimagine water hyacinth as a bearer of sustainable livelihoods — rather than just viewing it as a pest.

The University has since decided to launch an awareness campaign and to release a discussion paper, inviting inputs that incorporate scientific and local knowledge systems. By fusing academic research, policy engagement, and community experience, the University hopes to spur a shift from sporadic experiments to systematic, sustainable solutions.

Need for united action

India's rivers and lakes are too precious to be stifled by neglect — or by a single invasive plant. The water hyacinth menace calls for urgency, accountability and united action. Let every community, government department, entrepreneur and citizen recognise that this is not just an ecological problem but a crucible for rural livelihoods, food security, climate resilience and a green economy.

Let us, together, drain the swamp — not just of water hyacinth, but of the inertia that allows such a menace to flourish. The time for action is now.

Venu Rajamony
is Chairman, Future Kerala Mission, Jain (deemed-to-be) University, Kochi and a former Ambassador of India to the Netherlands

This discussion paper authored by Dr Lakshmi Devi, Assistant Professor-Marine Science, JAIN (Deemed-to-be University) and Prof Venu Rajamony, Chairman- Future Kerala Mission, follows up on the above initiatives and seeks to consolidate in one document existing information on water hyacinth mitigation and value-addition efforts at regional, national, and global levels, with a view to making this knowledge accessible for broader public understanding and engagement. The intent is to stimulate public dialogue and draw the attention of policymakers as well as stakeholders.

JAIN University, Kochi invites critical inputs and suggestions from the public for this discussion paper including experiential accounts, research insights, and community-driven innovations, that could enrich and refine ongoing discussions. We hope that the information contained within the paper will inspire multi-sectoral community efforts at the grassroot level to address the menace.

JAIN University, Kochi plans to convene a high-level conference by the end of this year, which will discuss actionable recommendations for the state government, local self-governments and political parties for large scale and sustainable water hyacinth mitigation in Kerala. It will also highlight the urgent need to adopt a comprehensive roadmap.

Context & Imperative of Water Hyacinth Infestation

Kerala's inland waters are increasingly threatened by the proliferation of three invasive aquatic weeds namely, *Eichhornia crassipes* aka water hyacinth (Kulavazha in Malayalam), *Salvinia molesta* (African payal in Malayalam) and *Pistia stratiotes* aka water lettuce (Kudukkappayal in Malayalam)

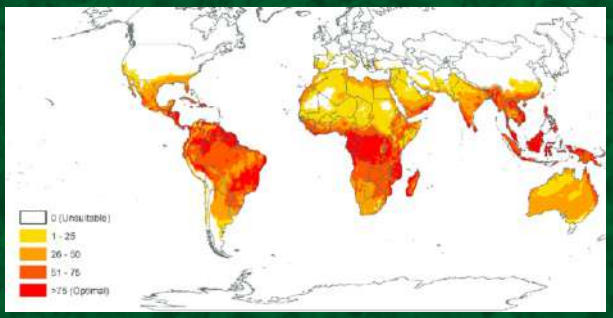
All three species are exotic introductions that have established themselves as invasive species, disrupting the freshwater ecosystems to varying extents. Of the three, *Eichhornia* or water hyacinth is the major menace.

Eichhornia crassipes

Salvinia molesta

Pistia stratiotes

Water hyacinth, a free-floating plant native to the Amazon basin in South America, is quick to spread due to its extraordinary growth rate, adaptability to diverse aquatic conditions and efficient vegetative reproduction. Introduced as an ornamental plant in the late 19th and early 20th centuries, it spread rapidly across continents. Now, massive biomass accumulation of water hyacinth can be seen across the five continents.



This weed clogs rivers, canals, reservoirs, and wetlands across India, disrupting inland navigation, reducing fish catch, and hampering the use of water for irrigation and daily needs. Its thick mats also create stagnant pools that serve as breeding grounds for mosquitoes, & worsening the spread of water-borne diseases. Similar large-scale problems caused by this weed have also been reported from several other countries across Asia, Africa, and North America.

In the Indian context, water hyacinth has become a recurring ecological menace in almost all major states, particularly in West Bengal, Assam, Bihar, Odisha, Uttar Pradesh, Tamil Nadu, and Kerala. It has invaded reservoirs, irrigation canals, and lakes, significantly obstructing inland water transport and irrigation efficiency. States such as Assam and West Bengal, where wetlands and floodplains form a critical part of the agrarian economy, have reported substantial agricultural losses due to clogged irrigation systems and reduced aquatic biodiversity.

THE KERALA CONTEXT:
Escalating Water Hyacinth Infestation

Kerala's vast network of rivers, canals, lakes, and backwaters function as the arterial system of the state, sustaining its ecological balance and socio-economic vitality.

In recent decades, Kerala's inland waterbodies have been increasingly choked by water hyacinth, posing a serious ecological and socio-economic challenge. The infestation now directly undermines several critical sectors of the state like

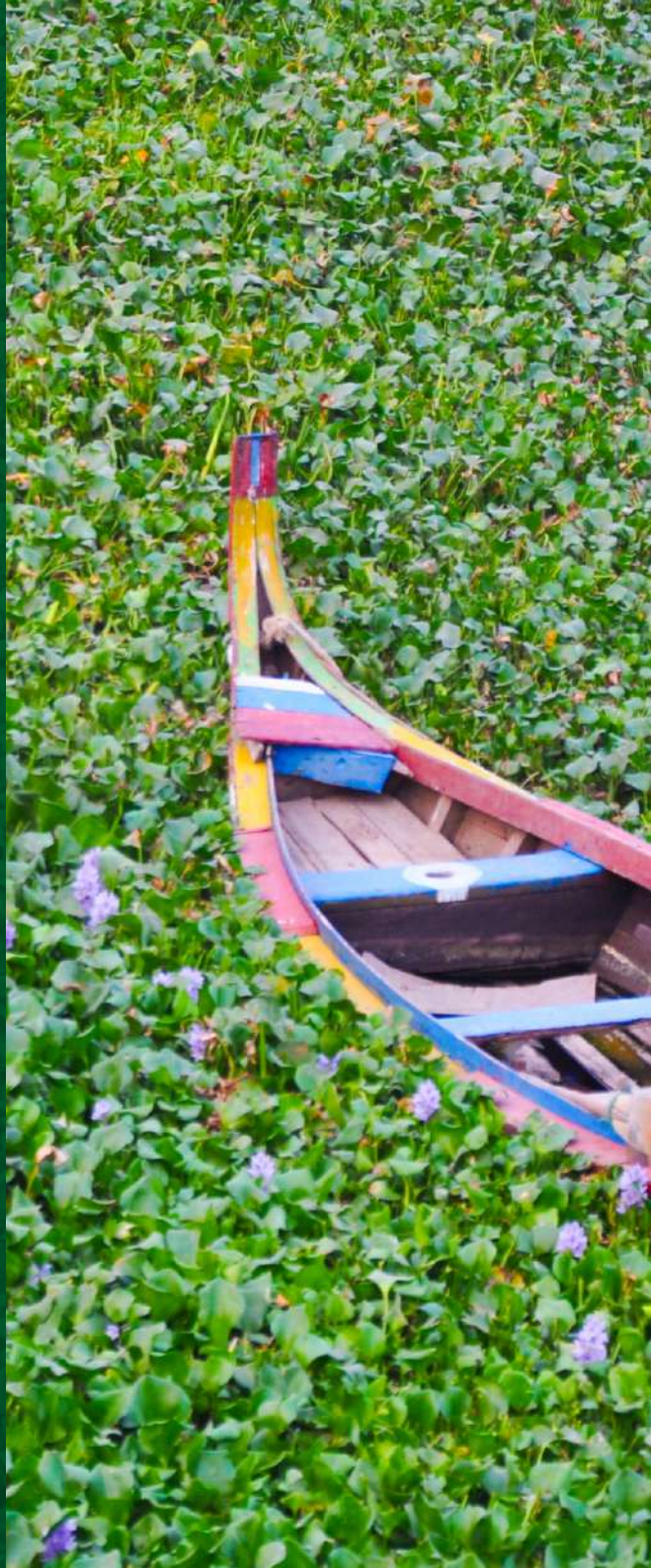
- **Agriculture**
- **Fisheries**
- **Irrigation**
- **Inland water transport** (including National waterways)
- **Drinking water**
- **Public health**
- **Tourism**

APPROACHES TO WATER HYACINTH MANAGEMENT

Over the years, diverse efforts have targeted water hyacinth through eradication, mitigation, and value–addition strategies, ranging from mechanical and biological control to bio-methanation, composting, handicrafts, and industrial applications. While these interventions demonstrate potential, they remain fragmented and face challenges in scalability, economic viability, and environmental sustainability.

The International Conference on Water Hyacinth held in Hyderabad, organized by United Nations Environment Programme (UNEP) in collaboration with CSIR, in 1983, brought global attention to the critical challenge posed by water hyacinth infestations, consolidating scientific insights and discussing potential control mechanisms. However, despite the deliberations, their has been little follow-up and effective action on the ground even after 42 years. Several regional symposia were also convened on this matter, yet they too failed to translate into concrete solutions or meaningful mitigation measures.

Today, there is an urgent need to adopt coherent policies at both the Centre and State levels, with governments taking the lead in formulating and implementing effective mitigation strategies.



Three broad approaches for water hyacinth mitigation

Chemical Control

Application of herbicides (e.g., 2,4-D, glyphosate) can achieve large-scale suppression. However, the ecological risks like fish kills, non-target damage to aquatic vegetation, toxin accumulation, and deterioration of water quality, have led to strict regulations or outright bans in many regions.

Physical/Mechanical Removal

This involves the use of manual labour, cutting machines, harvesters, and booms to physically clear water hyacinth from infested water bodies. While effective for short-term clearance, regrowth is rapid if biomass is not continuously harvested or nutrient inputs remain unchecked. A common practice is to dump the cleared hyacinth along the banks of water bodies, where it is often left to decay; this not only creates disposal challenges but also results in the biomass eventually washing back into the water, further aiding its proliferation. Moreover, the high capital and operational costs associated with removal make this method difficult to sustain in the long term.

Biological Control

Classical biocontrol using weevils (*Neochetina eichhorniae* and *N. bruchi*) and moths (*Sameodes albiguttalis*) has provided long-term suppression in some areas (e.g., Lake Victoria, Africa). In India, *Neochetina* weevils were released beginning in 1983–86 in Karnataka; Loktak Lake, Manipur (1987–88) and Kolhapur (2024) in the Panchganga river. However, biological control tends to suppress rather than eradicate the weed. Its success varies depending on climate, predator establishment, habitat conditions, and the need for integrated monitoring. Mechanised removal was also attempted extensively, using harvesters, shredders, and conveyor-based systems to clear large-scale infestations of water hyacinth.

Mechanised Removal Efforts

In Kerala, several attempts have been made for mechanised removal of water hyacinth, especially when the weed mats become extensive. Municipalities in affected regions such as Alappuzha, Thrissur, and parts of Kottayam have occasionally resorted to mechanised techniques. However, these efforts are not carried out on a regular or systematic basis. The collected biomass is usually dumped along the banks or discarded without effective follow-up, which often results in the material washing back into the waterbodies and proliferating again, rendering the process ineffective.

Recently, Nemom Panchayat in Thiruvananthapuram initiated mechanised removal of the weed with technological support from CSIR-NIIST. They also propose to convert hyacinth fibre into value-added products, providing livelihood opportunities for economically weaker sections.

മാതൃഭൂമി

വെള്ളായണിക്കായലിലെ കുളവാഴ നീക്കും

നേമം ബ്ലോക്ക് പഞ്ചായത്തിന് പദ്ധതി

THE HINDU

INDIA'S NATIONAL NEWSPAPER SINCE 1878

Tech tie-up likely to remove water hyacinth from lake

Nemom block panchayat eyeing collaboration with CSIR-NIIST to remove the plant from Vellayani Lake. Proposal involves extracting fibres from it to make value-added products

The Hindu Bureau
THIRUVANANTHAPURAM

The Nemom block panchayat is eyeing a tie-up with the CSIR-National Institute for Interdisciplinary Science and Technology (NIIST) for removing the invasive water hyacinth from the Vellayani freshwater lake in Thiruvananthapuram district.

The proposal involves extracting fibres from water hyacinth for the manufacture of value-added products, which would serve as a means of livelihood for the economically-weaker sections in the locality.

The idea was mooted at the Block Innovation Cluster meeting held at the Centre for Human Resource Development, a regional centre of the Kerala Institute of Local Administration at Kottarakara, earlier this week. Though water hyacinth is a weed, the fibre extracted from it can be very useful as a natural fibre.

At the meeting, the Nemom block panchayat was entrusted with the task of coordinating the activity with technical support from the CSIR-NIIST.

Cottage industry

A cottage industry based on the hyacinth fibres offers employment opportunities, especially women, according to the block panchayat. "Large-scale invasion of water hyacinth has been a major problem in the freshwater lake for years. Though the panchayat has had schemes in the past, a sustainable solution continues to remain elusive," Ajaghosh P.R., Block Development Officer, Nemom, said.

R.S. Praveen Raj, senior principal scientist, represented the CSIR-NIIST at the block innovation cluster meeting. To extract the fibres, a technology called "closed retting" has been proposed. It eliminates the pollution-related issues and produces good quality fibre in a short period. An added advantage is that it recovers biogas as an additional resource. Also, the waste material produced in this process can be used as a soil conditioner.

Meanwhile, Plan@Earth, an NGO based in Kochi, has launched Vembanad's Macro Fight (Project VMF) funded by the HCL Foundation. The project combines manual and mechanical removal of water hyacinth, with the harvested weed being dried, powdered, and enriched with biomass to produce briquettes, while involving the local communities.

The Kerala State Agricultural Mechanization Mission (KSAMM), in collaboration with the Agricultural Research Station, Mannuthy, developed a prototype aquatic weed shredder in 2021, intended to fragment dense mats for composting or energy use. However, the present status of the prototype suggests it has not been scaled for widespread adoption.

Kerala is also home to companies such as Kelachandra Aquatic Machines, based in Kottayam and MatProp, based in Kochi who manufacture harvesting equipment. Yet, mechanised removal has not proven to be a successful solution due to high operational costs, lack of regular monitoring, and zero follow-ups.

Project VMF, Plan@Earth

Beyond Kerala, several Indian states have adopted mechanised interventions. In West Bengal and Assam, artisan-led fabrication of mechanical harvesters and containment booms is underway to manage infested wetlands and rivers. Odisha is experimenting with solar-assisted hyacinth harvesters developed by ICRISAT, aimed at delivering continuous de-weeding in stratified water channels. In Maharashtra, municipal bodies deployed industrial aquatic harvesters to clear over 1,400 tonnes of hyacinth from Powai Lake as part of a multi-crore remediation effort. States like Uttar Pradesh (Lucknow) and Bihar (Bhagalpur) are piloting shallow-draft dredgers for removal in riverine systems, integrated with composting for disposal. While Karnataka experimented with mechanised cutters in Bengaluru's urban lakes, Tamil Nadu has adapted agricultural dredging equipment for similar weed clearance in irrigation tanks. 'Eunoia Innovations', a Telengana-based tech firm, has also emerged as a key player, employing its Aquaskimmer technology to efficiently remove floating hyacinths from urban lakes, supporting large-scale weed management in densely populated areas.

Global efforts towards the mechanised removal

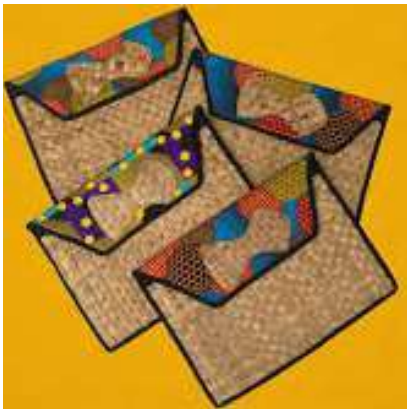
Mechanised hyacinth removal has also been attempted in different countries. Uganda and Tanzania, in collaboration with international development agencies, have jointly used harvesters and cleared large infestations in Lake Victoria.. Bangladesh has introduced floating conveyor systems to clear navigation channels in coastal and floodplain areas. In China, hydraulic dredgers harvest hyacinth for use in constructed wetland systems, wastewater phytoremediation, and fibre processing units. Brazil and Paraguay, have deployed riverine weed harvesters adapted from sugar cane cutting technology in large inland waterways.. Similarly, in the Philippines, government programs utilize cutter boats equipped with conveyor belts to cleanse docks and passageways in inter-inland waterways.

While these technologies offer scalability and efficiency compared to manual methods, their high operational costs, logistical constraints, and challenges in managing harvested biomass limit widespread success. Moreover, most of these interventions appear to be ad hoc responses rather than part of a coherent, long-term implementation strategy.

Given the recurring growth and high biomass regeneration of water hyacinth, value addition offers the most feasible and sustainable solution, enabling economic utilisation of the weed while reducing ecological impact. Several case studies of best practices and innovative attempts across India and globally highlight its potential for scalable socio-economic and environmental benefits.








Value-added products made out of water hyacinth

Best Practices and Innovations

Kerala

Kerala has undertaken several sporadic efforts to mitigate and transform water hyacinth through value addition, eradication, and community engagement. Notable interventions include:

Centre for Research on Aquatic Resources (CRAR), S.D College, Alappuzha

The most significant and successful efforts in water hyacinth value addition have been carried out by the Centre for Research on Aquatic Resources (CRAR), guided by Dr. Nagendra Prabhu, Professor and Former Head, Postgraduate Department of Zoology, SD College, Alappuzha, and his team. Their pioneering work includes the development of beds using three invasive weeds, water hyacinth, *Salvinia, and Pistia* for mushroom culture. They have also showcased a wide range of value-added products, including compost balls, handicrafts, paper, canvas, coasters, mats, fridge magnets etc. They have identified the potential of organic dyes derived from water hyacinth flowers, signalling opportunities for scalable commercialization. These value-added products made from water hyacinth were successfully marketed through 'Eicchotech', a student start-up initiative of SD College. Beyond product innovation, CRAR conducted extensive community training through its Community Training Centre at SD College, empowering women self-help groups, entrepreneurs, teachers of special schools, and inmates of district jails, thereby linking ecological restoration with livelihood generation.

Value-Added Products

Processed Water Hyacinth

Beds for Mushroom Cultivation

Fruit Tray

Organic Dye from the Flowers

Handicrafts

Briquettes

Pen Holder

Kettinatti

Egg Tray

Decors

Biomass Briquettes

Biodegradable Plant Pots

Decors

Seed Balls

Fridge Magnet

Toys

Canvas for Paintings

Handicraft

THE HINDU

Woman crafts eco-friendly invitation cards for her wedding to highlight aquatic weed problem in Kuttanad

Kainakary native makes handmade paper from the pulp of water hyacinth and used paper to print invitation cards; she says weed infestation has affected day-to-day life of people of Kuttanad and the threat is getting bigger with time

Published - January 20, 2024 10:24 pm IST - ALAPPUZHA

SAM PAUL A.

Everyone wants to make their wedding memorable. A young woman, Kalyani B. from Kainakary in low-lying Kuttanad in the district, has ingeniously used the "most important event" in her life to bring attention to the problems caused by water hyacinth (*Eichhornia crassipes*), one of the most troublesome aquatic plants, and highlight the importance of its value-addition.

Wedding Invitation Card made from the pulp of water hyacinth

Kottapuram Integrated Development Society (KIDS)

KIDS, the official organ for social action of the Diocese of Kottapuram, through its Natural Fibre Craft Department has organized a collective of around 70 women, including differently-abled individuals, who collect, process, dye, and weave hyacinth-based products such as bags, mats, purses, and other items. Women artisans from the surrounding coastal areas of Thrissur and Ernakulam districts are actively involved in this initiative. The finished products are mainly marketed through the Natural Fibre Emporium, established by the Ministry of Textiles and through regular exhibitions, providing artisans with structured outlets and sustainable livelihood opportunities.

Neelamperoor Panchayat, Alappuzha

Under the Navakeralam Karma Padhathi, an initiative by the Government of Kerala, the Panchayat facilitated a collaboration between Kudumbashree, MGNREGS workers, and Rope Enterprises, a Madurai-based startup, to collect and sell hyacinth stalks at ₹7–10/kg. Local women generated significant income (~₹7.3 lakh) through this Public-Private Partnership (PPP) model. However, this initiative did not progress further.

Kottayam District Administration

An initiative for the collection of hyacinth stalks was undertaken under the Meenachil–Meenanthara– Kodoor River Restoration Project, launched in 2017 by the Kottayam District Administration in collaboration with the NGO Tropical Institute of Ecological Sciences (TIES), local panchayats, and community groups. As part of this broader river restoration effort, local workers collected hyacinth stalks and supplied them to natural-fibre units in Tamil Nadu at about ₹10/kg, generating income. However, this activity was not targeted specifically towards water hyacinth mitigation, but rather implemented as one component of the wider river rejuvenation programme.

National Institute of Advanced Studies, Indian Institute of Science (NIAS-IISc) Bengaluru

In 2019, researchers from the NIAS, IISc Bengaluru in association with S.D College, Alappuzha, launched a pilot project in the Kuttanad region aimed at empowering rural women by converting the invasive water hyacinth into bioenergy, compost, fish and cattle feed, and handicrafts. The two-and-a-half-year initiative involved training women's self-help groups on enterprise development and creating sustainable income sources. As of now, there is no widely available follow-up information or reports which indicate that the project has continued beyond its initial phase.

THE TIMES OF INDIA

Project explores resourceful use of hyacinth

Sudha Nambudiri / TNN / Updated: Sep 9, 2019, 08:04 IST

In an attempt to convert a menace into a resource, researchers from National Institute of Advanced Studies (NIAS) of Indian Institute of Science, Bengaluru, have initiated a project on empowering rural women by exploring resourceful use of water hyacinth for bioenergy production and income-generation activitie ...Read More

MENACE TO RESOURCE: NIAS project explores resourceful use of water hyacinth for bioenergy production and income-...

KOCHI: In an attempt to convert a menace into a resource, researchers from National Institute of Advanced Studies (NIAS) of Indian Institute of Science, Bengaluru, have initiated a project on empowering rural women by exploring resourceful use of water hyacinth for bioenergy production and income-generation activities at Kuttanad in Alappuzha.

Hyacinths are a threat across waterbodies in Kerala, leading to stagnation and zero bio-life in the waters as they are aquatic weeds threatening both water and environment, eradication of which is next to impossible.

Innovative International effort in Kerala

Satellite imagery detects water hyacinth in Kerala lake

Study involves researchers in India, U.K.

SAM PAUL A.
ALAPPUZHA

A novel study involving researchers in India and the U.K. has succeeded in using satellite images to detect water hyacinth in Vembanad Lake in Kerala's Kuttanad.

The results of the study, which used the Synthetic Aperture Radar (SAR) data provided by the European Space Agency satellite Sentinel-1, show significantly greater positive detection ratings compared to more traditional detectors.

The researchers, who have published their study in the journal *Remote Sensing*, say they have shown for the first time that SAR could be used to detect water hyacinth with a high level of accuracy. They prepared a heatmap, a first of its kind, showing the water hyacinth presence/coverage over a two-year time frame, which could be used to aid the weed management practices. "The synoptic coverage provided by satellite imaging and other remote-sensing practices makes it convenient to find a solution using this type of data," reads the study.

The team collected satellite images of an area near the Thanneermukkam bund between January 2019 and April 2020 and studied the spread of water hyacinth. SAR is a type of active data collection where a satellite sensor produces radiation and then records the amount of that energy reflected back after interacting with objects on the earth. Unlike the normal optical imagery, in SAR, the signals are responsive to surface characteristics such as the structure and moisture of the objects on which the radiation falls. Water hyacinth increases the surface roughness of the lake and therefore introduces a difference in backscattering in the image.

"A clean water surface causes the electromagnetic wave to bounce back in a particular direction, making those areas of the lake appear dark. However, the presence of a mat of water hyacinth causes the signal to scatter in different directions," says G. Nagendra Prabhu, principal investigator, Centre for Research on Aquatic Resources (CRAR), Sanatana Dharma (SD) College, Alappuzha, who is a collaborator for the project.

"Since SAR microwaves penetrate most weather conditions, the technique can produce images of the study area and monitor changes in the growth of hyacinth throughout the seasons."

The study was carried out as part of the project 'Multimodal data analysis for monitoring invasive aquatic weeds in India'. Savitri Maharaj of the University of Stirling, Scotland, is the principal investigator of the project. Other team members include researchers from the International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, National Institute of Plant Health Management, Hyderabad, Central Scientific Instruments Organisation, Chandigarh, SD College, Alappuzha and University of Strathclyde, Scotland.

Clear picture: Satellite images of Vembanad lake taken at different times. The one on the right shows weed infestation.

അന്താരാഷ്ട്ര ഗവേഷണപദ്ധതി വിജയത്തിലേക്ക്

An international collaborative effort, involving the University of Stirling and University of Strathclyde (UK), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), National Institute of Plant Health Management (NIPHM) and SD College Alappuzha, supported by the Royal Academy of Engineering's Global Challenges Research Fund, undertook an initiative 'WeedWatch' in the Kuttanad region to monitor and forecast weed spread and biomass in real time employing satellite imagery, drone surveys, IoT sensors, and AI-based analytics, during the period 2020-2024.

Though impactful, these initiatives have remained fragmented. Long-term mitigation requires integration into a structured framework led by the government by aligning academia, industry, and community efforts.

Strategies for Water Hyacinth Management in other states of India

Several Indian states have undertaken similar initiatives to address water hyacinth, that include composting, bio-methanation, floating agriculture, and value-added products like paper, textiles, and handicrafts. These efforts showcase scalable models for sustainable management and policy support.

Odisha

The Odisha Livelihoods Mission (OLM), in coordination with the Department of Agriculture and Farmers' Empowerment, Government of Odisha, launched the project *"Sustainable Valorisation of Water Hyacinth Biomass through Aerobic Composting as a Rural Enterprise—A Waste to Wealth Initiative"* and executed it through the following key initiatives, transforming invasive hyacinth into ecological and economic value:

A **Compost Production:** Women's SHGs in Puri district, backed by International Crops Research Institute for the semi-arid Tropics (ICRISAT), produce nutrient-rich compost "**Jalaja Poshak**" by blending water hyacinth with paddy straw and cow dung.

B **Solar-Powered Harvester:** ICRISAT introduced an affordable (~₹2 lakh) harvester to mechanize hyacinth removal, enabling the SHGs to convert biomass into compost, feed, paper products, and handicrafts.

Jalaja Poshak

Solar-Powered Harvester

Regional Centre for Development Cooperation (RCDC) and Society for Women Action Development (SWAD):

In Puri's flood-prone areas, a pilot study led by NGOs RCDC and SWAD supported by United Nations Development Programme (UNDP) and Australian Agency for International Development (AusAID) implemented floating gardens using hyacinth-based rafts to cultivate vegetables. This empowered around 145 landless families across blocks like Satyabadi and Kanas to grow short-rooted, edible produce even during floods.

West Bengal

Biswa Bangla

The Biswa Bangla brand, an initiative of the Government of West Bengal to promote the state's traditional crafts and handlooms, has also extended support to water hyacinth value addition. Under this platform, water hyacinth coasters have been retailed, giving local artisans market access through a state-backed outlet.

Eco Craft, Nadia

The Eco Craft initiative in Nadia, driven by women's self-help groups with local institutional support, has promoted eco-friendly product development from water hyacinth. As part of this, the groups crafted rakhis from processed hyacinth stems, priced at ₹5, ₹10, or ₹15 depending on size, providing both an eco-friendly alternative and livelihood support.

SEEDIN + NABARD (South 24 Parganas)

The SEEDIN–NABARD programme in Kakdwip and Namkhana focuses on women's livelihood enhancement through water hyacinth value addition. It trained 120 women across 15 SHGs to produce marketable utility goods such as bags, baskets, mats, and coasters, linking craft skills with rural enterprise.

Bengal Eco-Craft

The Bengal Eco-Craft volunteer initiative launched the brand “Bengal Jalkachuri” to develop water hyacinth-based product lines. It provides training, production support, and marketing avenues for handicrafts and allied goods, enabling local women to turn wetland plants into sustainable livelihoods.

Swanirvar + Earth Craft (North 24 Parganas)

Swanirvar, a grassroots NGO working on sustainable agriculture, education, and women’s empowerment in West Bengal, partnered with design collective Earth Craft to pilot water hyacinth-based paper and derivative handicrafts. Supported by NABARD’s Rural Innovation Fund, this initiative trained women to craft biodegradable kitchenware, cups, plates, and eco-packaging from hyacinth pulp, expanding the scope of plant-based alternatives to plastics.

Assam

Kumbhi Kaagaz

The Assam-based social enterprise 'Kumbhi Kaagaz' has pioneered the conversion of water hyacinth fibre into chemical-free handmade paper products such as notebooks, calendars, and souvenirs. Praised by the Prime Minister in one of his 'Mann Ki Baat' episodes, the startup employs over 100 community members and produces 150–200 sheets per day, with each kilogram of hyacinth yielding ~18 sheets.

RIGBO (Majuli)

The NGO RIGBO, founded by Ms Momee Pegu, trained 32 women in Majuli to convert 11,000 kg of water hyacinth into organic compost. The product quickly gained popularity among farmers and received recognition from the Government of Assam for its potential to boost sustainable farming practices.

DST- NECTAR

Supported by the North East Centre for Technology Application and Reach (NECTAR), Department of Science and Technology (DST), six young women from a fishing community near Deepor Beel designed the Moorhen Yoga Mat, a handwoven eco-friendly mat made from ~2 kg of dried hyacinth petioles. The initiative not only provides livelihoods but also builds community skills in sustainable craft production.

Assam State Rural Livelihood Mission (ASRLM)

Under ASRLM, sixty women from Borchila village in the Sonai River Basin have transformed dried water hyacinth into handicrafts such as yoga mats, laptop bags, dustbins, and dining mats. The initiative has enabled women to earn over ₹10,000 per month, with products reaching markets in Delhi, Mumbai, Bengaluru, and even export destinations like the US and Bangladesh.

Azadi Ka Amrit Mahotsav

Ministry of Housing and Urban Affairs
Government of India

From Weed to Wonder: Water Hyacinth a Swachh Green Resource

Women from flood-prone Borchila in Assam's Morigaon and two young entrepreneurs from Deepor Beel are turning the tide by transforming Water Hyacinth into eco-friendly products and job opportunities under the Swachh Bharat Mission-Urban

Posted On: 24 OCT 2024 5:16PM by PIB Delhi

The recently concluded MoHUA-led Swachhata Hi Seva campaign under the Swachh Bharat Mission-Urban gained strong traction across the nation, with the Northeastern States leading the charge in improving health and sanitation, especially as the festive season approached. These States are taking innovative steps to promote circular economy, prioritizing swachhata through a variety of proactive initiatives. Water hyacinth is a non-native aquatic plant that has become widespread in India. It features attractive purple flowers. However, despite its aesthetic appeal, water hyacinth has become a problematic weed, overcrowding freshwater bodies such as rivers, ponds, and lakes. Its overgrowth hampers activities like fishing, transportation and recreation, making these water sources less viable.

Local Self-Help Groups

Local SHGs across Guijaan and Dalang Ghat blocks have developed water hyacinth-based products including pen stands, bags, trays, and tissue boxes. These items are sold at affordable price points; pen stands at ₹180, bags at ₹1000, tissue boxes at ₹750 providing steady income opportunities for rural households.

Value Added Products out of Water Hyacinth

Manipur

NEDFi – Water Hyacinth Crafts (Imphal)

The Water Hyacinth Crafts Centre in Imphal, initiated by a self-help group trained by the North Eastern Development Finance Corporation Ltd. (NEDFi), has developed a sustainable livelihood model by crafting bags, cushions, boxes, and baskets from locally abundant water hyacinth, known as Kabowkang.

Loktak Development Authority

The Loktak Development Authority (LDA), the state agency responsible for conserving Loktak Lake, has facilitated initiatives to convert phumdis (floating biomass, including water hyacinth) into briquettes and biogas. Implemented with scientific collaboration from institutions like The Energy and Resources Institute (TERI) under government-supported programs. This effort provides clean energy alternatives to firewood and LPG while aiding the ecological restoration of the lake.

Jharkhand

Swacchata Pukare Foundation

Led by environmental engineer Gaurav Anand, the Swacchata Pukare Foundation in Jharkhand has pioneered a technology to extract cellulose fibre from water hyacinth and blend it with cotton to weave handloom “fusion” sarees. Each saree uses around 25 kg of hyacinth, and the initiative has scaled to involve nearly 450 women, with production expanding across Jharkhand and West Bengal.

Andhra Pradesh (West Godavari)

Andhra Pradesh Handicrafts Development Corporation (APHDC)

The state-run APHDC has organized training programs for artisans (e.g., in Machilipatnam, Krishna district), enabling them to craft bags, mats, baskets, furniture, and home décor items using water hyacinth fibre. These efforts, supported by award-winning artisans like Rita Das, connect traditional craft skills to formal marketing channels like the Lepakshi Emporium.

Women's self-help groups (SHGs) operate composting units that convert water hyacinth into organic manure, generating livelihood opportunities while supporting sustainable farming.

THE HINDU

AP Handicrafts Development Corporation to train artisans in water hyacinth crafts

Eco-friendly products such as baskets, bags, mats, furniture, and decorative items can be made with water hyacinth, say artisans

The Andhra Pradesh Handicrafts Development Corporation is planning to impart training to artisans in manufacturing eco-friendly products and decorative material with water hyacinth.

Telengana

Allika Ecoproducts is a social enterprise based in Hyderabad that converts water hyacinth into eco-friendly products such as bags, mats, coasters, placemats, and lampshades. They conduct training to local women and employ them in this venture.

Bihar

Bihar Agricultural University has developed a vermicompost system that integrates dried hyacinth with cow dung slurry, producing nutrient-rich compost for agricultural use.

Gujarat

Kachre Se Azadi Foundation has piloted a hyacinth-based composting and small-scale paper production, showcasing waste-to-resource models in local communities.

Uttar Pradesh

The Lucknow Municipal Corporation, with support from Babasaheb Bhimrao Ambedkar University (BBAU) and the Ecological Task Force, facilitates hyacinth-to-compost conversion as part of river-cleaning drives in the Gomti River.

Maharashtra

Nagpur Municipal Corporation has a pioneering initiative of turning hyacinth from Ambazari Lake into a livelihood generator. As part of a Social Welfare skill development program, around 100 women have received training to craft over 200 eco-friendly products including handbags, yoga mats, hats, coasters, fruit baskets, and water bottle holder, leveraging municipal support and local NGO guidance. The Brihanmumbai Municipal Corporation (BMC) leads large-scale mechanical hyacinth removal in the Powai Lake, with ecological oversight from Bombay Natural History Society (BNHS) and advocacy by groups like NatConnect Foundation.

Puducherry

Svarnim Puducherry

Eco Thozhi Initiative: Under the Eco Thozhi (Water Hyacinth Livelihood & Conservation Initiative) led by Svarnim Puducherry, rural women are trained to manually remove water hyacinth from local water bodies and weave it into eco-friendly products such as baskets, trays, coasters, and planters.

Tamil Nadu

Coimbatore Municipal Corporation is considering partnerships with local self-help groups to transform harvested hyacinth into eco-products such as handmade paper, handbags, baskets, and vegetable cultivation platforms.

Global Models of Water Hyacinth Management

Beyond India, several countries have piloted and implemented innovative approaches to manage water hyacinth, ranging from community-based utilization models to industrial-scale value-addition and biocontrol programs. These initiatives highlight both the versatility of the weed as a resource and the importance of coordinated institutional support in turning a pervasive problem into economic and ecological opportunities.

Kenya

Hyapak, a social enterprise, manufactures biodegradable packaging, paperboards, and sanitary products from water hyacinth pulp. The community cooperatives produce briquettes and handicrafts and is supported by Kenya Marine and Fisheries Research Institute (KMFRI) and United Nations Development Programme (UNDP) projects.

Bangladesh

Farmers in flood-prone regions of Bangladesh use water hyacinth biomass to build floating rafts (“dhap”) for crop cultivation, growing vegetables and seedlings during monsoon floods. Recognized as a climate-resilient farming practice, it is supported by local NGOs and the Food and Agriculture Organization (FAO) under its Climate-Smart Agriculture programs. In 2017, this practice was also inscribed on UNESCO’s Intangible Cultural Heritage list, highlighting its global significance.

Vietnam

In the Mekong delta, Vietnam, water hyacinth is widely used for weaving mats, baskets, and furniture through cooperatives and women’s groups, supporting cottage industries and tourism markets. Many of these products have received OCOP (One Commune One Product) certification, a government program that promotes locally made, specialty products to boost rural economies and connect them to wider markets.

Uganda & Tanzania (Lake Victoria)

Pilot initiatives along Lake Victoria focus on converting water hyacinth into eco-friendly products such as handmade paper, ropes, and biogas.

In Uganda, the Erudites Movement, an NGO with the support of UNICEF, addresses livelihood issues in communities on Lake Victoria by producing renewable energy from water hyacinths.

In Tanzania, the government has implemented the National Strategy and Action Plan for Invasive Species (2019–2029) to control the spread of water hyacinth and explore its utilization for sustainable development.

unicef | for every child

Uganda

Climate change advocates transform communities for a more sustainable future

Recycling Water Hyacinth as a source of green energy

One green innovation is blooming in a corner of the Bwaise Slum. The team, Erudites Movement is passionately addressing the livelihood issues of communities on Lake Victoria in Uganda through the production of renewable energy with troublemaking water hyacinths.

The team was established through the Youth Innovation Challenge for Climate Change by Outbox in support of UNICEF in 2023. The Challenge aimed to empower interested young advocates for climate change to develop and implement green solutions. Based on the i-UPSHIFT methodology, the Challenge started with the Inspiration Workshop, inviting the selected participants to join a 3-day intensive bootcamp. Through the pitch event, the selected teams proceeded to the four months of intensive mentorship period where they received further technical and financial support to develop and implement the solutions. Through participation in the Challenge, the team has successfully identified the issue they want to address, and designed and built a prototype innovative solution.

18 per cent of Uganda's land surface is covered by water bodies with the water hyacinth firmly established on its major water bodies Lake Kyoga, Albert, Lake Victoria and along River Nile. Its dense mat not only hinders navigation across the water affecting fishing activities but also lowers the transfer of oxygen from the air to the water surface, competes with the native aquatic species for oxygen consequently lowering available dissolved oxygen in the water affecting marine life. It is also a breeding place for mosquitoes attributing to high incidences of malaria in communities.

Nigeria

Along the River Niger and Benue, national programs led by the National Institute for Freshwater Fisheries Research, University of Ilorin, and the National Centre for Energy and Environment focus on converting water hyacinth into biogas, ethanol, and organic compost.

NGOs like MitiMeth, in collaboration with the Lagos State Waterways Authority (LASWA), train women and youth to produce handicrafts, ropes, and briquettes, linking biomass management with local livelihoods and renewable energy solutions.

Philippines

Women-led cooperatives, supported by agencies such as the Department of Trade and Industry (DTI) and Department of Science and Technology - Forest Products Research and Development Institute (DOST-FPRDI), transform water hyacinth into handicrafts, bags, and mats. The OTOP (One Town, One Product) program provides additional support, integrating these initiatives into community livelihood schemes and promoting sustainable income generation.

South Africa

Hya Matla Organics, a South African startup in collaboration with Mintirho Foundation, the social development arm of Coca-Cola Beverages South Africa (CCBSA) converts water hyacinth from the Hartbeespoort Dam into compost, fertiliser, and animal feed.

Thekga Women's Collective harvests hyacinth stems from Blesbokspruit Wetland and transforms into eco-friendly, hand-woven products such as baskets and décor. The collective uses other recycled materials like iron and plastic to reinforce and line its products. This effort is part of the Blue Deal partnership in South Africa and aims to restore the wetland's ecological status.

China

Since the late 1980s, constructed wetlands (CWs) using water hyacinth for phytoremediation have been deployed across China for wastewater treatment, supported by the Ministry of Ecology and Environment (MEE) and academic institutions like the Chinese Academy of Sciences. These systems have proven successful, achieving significant removal of pollutants such as nitrogen, phosphorus, and organic matter, with average ammonium nitrogen (NH_4^+-N) and BOD_5 removal rates of 59.8% and 81.8%, respectively, often meeting Class I B discharge standards. CWs continue to be a viable, environmentally friendly solution, with ongoing research enhancing their efficiency and adaptability for sustainable water management, and they remain actively in use today.

Netherlands

The Ocean Cleanup Initiative by the Dutch innovator Boyan Slat has deployed floating U-shaped booms and conveyor-based collection systems across the Great Pacific Garbage Gyre, enabling continuous concentration and extraction of plastics from open waters. The system demonstrated that passive, large-scale floating collection infrastructure, once deployed, can function efficiently with minimal energy input, guided by ocean currents and wind. Although this model is targeted towards ocean plastic, it can serve as an inspiration for water hyacinth mitigation, as similar floating collection technologies could potentially be adapted to control and harvest invasive aquatic vegetation in rivers, lakes, and wetlands.

Challenges and Limitations in Water Hyacinth Management Strategies

Despite the global efforts, combating water hyacinth at scale remains beset with multifaceted challenges that span operational, economic, and institutional domains.

Institutional Challenges

- Lack of coherent policies and weak inter-agency coordination.
- Low prioritization and insufficient funding.
- Absence of structured systems for hyacinth collection, processing, and commercialization.

Economic Challenges

- High capital investment needed for collection, processing, and value-addition units.
- Inconsistent biomass supply and product output.

Operational Challenges

- Labor-intensive removal and high operational costs.
- Mechanized removal requires costly infrastructure (boats, harvesters, storage, transport).
- Adequate land for processing, composting, or storage is often unavailable.

Possible Solutions

- Designating a nodal agency/department/Ministry to oversee policy and coordinate eradication, value-addition, and community engagement efforts.
- Initiatives by local self-Governments for community-led collection, monitoring, and utilization.
- Purchase of value-added products derived from water hyacinth by government agencies.
- Increased research and development to improve processing techniques, product innovation, and sustainable utilization.
- Private sector participation in commercialization and expansion of market opportunities for water hyacinth-based products.
- Identification of existing financial incentives and subsidies which could be used by startups and MSMEs engaged in hyacinth-based products.
- Facilitate CSR grants to support water hyacinth mitigation activities and community training programs focused on sustainable removal, disposal, and value-added reuse.
- Promotion of public awareness regarding solutions and encouragement of voluntary activities at the community level.

Effective mitigation of water hyacinth requires robust policy frameworks and coordinated institutional mechanisms. The invasive weed's persistence and rapid spread cannot be addressed through isolated efforts alone; rather, multi-level interventions, improved regulations, and inter-agency coordination are essential. Policies that integrate ecological management with economic utilization, while engaging local communities, are critical to achieving scalable and sustainable solutions.

Invitation for Public Engagement

Water hyacinth is no longer just a plant problem; it is a shared community challenge that affects livelihoods, ecosystems, and waterways across India and Kerala. As part of our ongoing efforts to build an informed and inclusive policy roadmap, we are inviting voices from the ground as well as experts, NGOs actively involved in water hyacinth mitigation and other stakeholders to share experiences, insights, and solutions.

We welcome contributions that include:

Community Experiences and Actions

Share first-hand experiences of how water hyacinth has affected you, your livelihood, or your community, such as disruptions to fishing, blocked waterways, impacts on agriculture, or changes in local biodiversity. Include stories of community responses, whether successes or struggles, such as transforming the plant into handicrafts, cooperative cleanup drives, or other local innovations that address these challenges.

Challenges faced

In removal, disposal, or repurposing efforts, including technical, financial, and policy hurdles.

Innovative ideas or practices

Showcase successful models or creative solutions that have worked elsewhere or could be adapted locally, including technological solutions, value-addition and collaborative approaches.

This document will be made available on the official websites of JAIN University Kochi and Future Kerala Mission as well as in print form. Please send your inputs to **waterhyacinthproject@futurekerala.org.in** Submissions can be in the form of short written notes, photos, or video clips of best practices. We encourage you to share your entries by **30 October 2025**. The policy document will be refined and updated on the basis of your inputs. The final document will be used to inform discussions in a conference planned for later this year.

“

Empowering Youth
Educating Minds &
Envisioning a Better Kerala

FUTURE
KERALA MISSION

The Future Kerala Mission (FKM) is an initiative by JAIN University to elevate Kerala to international standards.

Its vision is driven by four strategic pillars:

- **Education**
  Accessible, future-ready, globally aligned
- **Youth Engagement & Empowerment**
  Shaping leaders, building character
- **Entrepreneurship**
  Fuelling innovation and growth
- **Quality of Life**
  Advocating sustainability and inclusivity

FKM represents Jain University's commitment to the building of a better future for Kerala by contributing fresh thinking, world-class systems, and deeply rooted partnerships. Through the four strategic pillars, FKM aims to help build a future-ready Kerala that upholds international standards in all walks of life and stands as a beacon for inclusive, responsible, and visionary development.

JAIN
DEEMED-TO-BE UNIVERSITY
KOCHI

JAIN (Deemed-to-be University), with NAAC A++ accreditation and ranked among India's top 100 universities, is a leader in future-ready education. The campus at Kochi established in 2019, focuses on practice-based learning, research, and enterprise, offering 50+ futuristic programs across 10 different schools.

- School of Computer Science & Engineering
- School of Computer Science & IT
- School of Sciences
- School of Design, Media, & Creative Arts
- School of Humanities & Social Sciences
- CMS Business School
- School of Commerce
- School of Allied Health Care & Sciences
- School of Vocational Education
- School of Future

The University has been awarded Graded Autonomy Status by the UGC for maintaining exceptional academic standards and governance. Dedicated to nurturing future leaders, JAIN (Deemed-to-be University), Kochi is committed to meeting Kerala's social and economic priorities.

Accredited with Grade - 'A++' by NAAC

Ranked among the Top 100 Universities in India

Awarded Graded Autonomy Status by UGC

Ranked among the Top Indian Universities

AICTE Approved programmes

30+ Years of Educational Excellence

#TheFutureisHere!

FUTURE
KERALA MISSION
www.futurekerala.org.in

JGi JAIN
DEEMED-TO-BE UNIVERSITY
KOCHI
www.jainuniversitykochi.in

JAIN Deemed-to-be University, Knowledge Park - Kochi, Infopark P.O, Kakkanad-682030