Technical Stakeholder Consultation

as part of ‘Nammal Namukkayi’ Programme, RKI

Dates: 29-30 January 2020
Venue: Symphony Hall, Mascot Hotel,

Rebuild Kerala

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Executive Summary

Untold lives and livelihoods were lost in the floods of 2018 and 2019 in Kerala have highlighted the urgent need to instill the principles of resilience in every walk of life in the state. The Rebuild Kerala Initiative (RKI), under the Honorable Chief Minister, has led comprehensive flood recovery efforts to accelerate the State's progress in rebuilding and reconstruction in the most resilient manner. The calamity occurred has taken up as a challenge and an opportunity to rebuild the State with better standards of living to all sections of the society.With the participatory approach towards "Building Back Better", Hon'ble Chief Minister has envisioned for '*Nammal Namukkayi*' that aims to reach out to a wide range of stakeholders to be able to participate and voice their opinions in the resilient rebuilding process.

The *Nammal Namukkayi* Programme identifies technical agencies/experts as one of the key stakeholders in the consultation process to drive the resilient rebuilding process. The consultation event was organized on 29th and 30th January at Symphony Hall, Mascot Hotel, Thiruvananthapuram. The first day was scheduled with presidium introduction and orientation of experts to thematic areas and the second day for consolidation of findings and presentation for each theme in the plenary session. The thematic areas of discussion include: Land Management, Water Management, Forest Management, Local Community and Resilience and Transport Communications and Technology. Altogether, from all sectors, representatives from around 73 stakeholders were participated for the session.

The discussions were streamlined in a well- defined methodology which began from identification of key problems/challenges of particular thematic areas followed by identification of reasons for the problems concluding with plausible solutions to problems at hand. The conversations brought together the wider domain of experience and understanding of the data in the respective sectors of the different business and technical agencies to drive the resilient rebuilding process. The key outcomes from the session include: The consultative process could contribute much into the policy reforms for the key sectors which can instill resilience in planning and development process.

Contents

Introduction

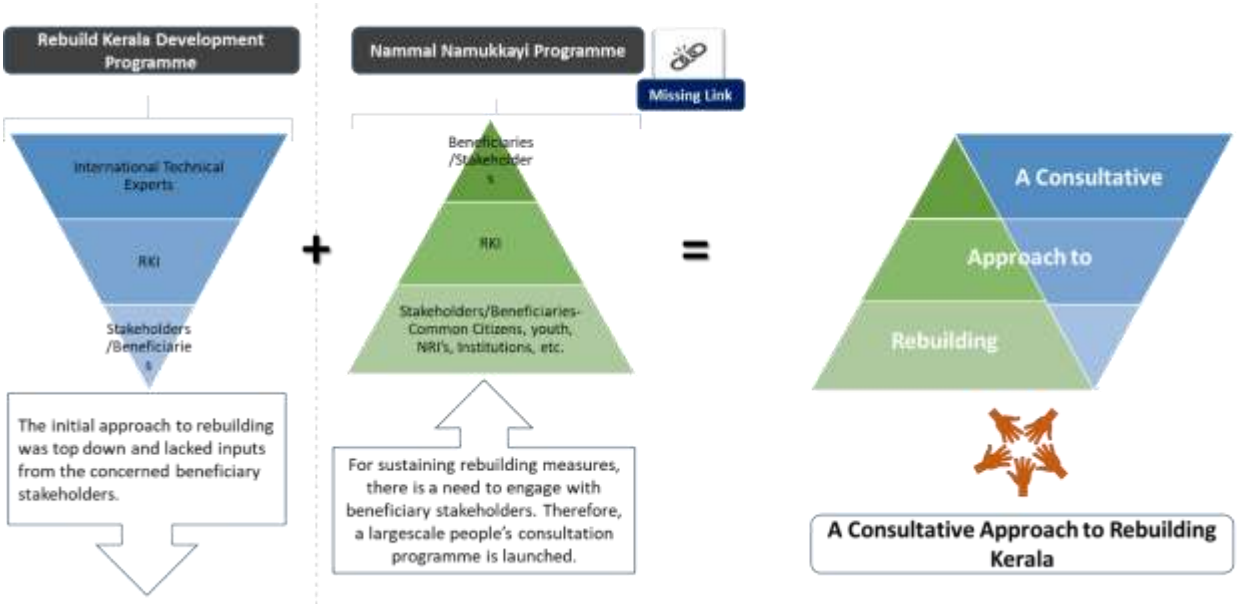
The 2018 floods of Kerala which reoccurred in 2019 with higher water levels at certain places weretwo of the most hazardous climatic events in the known memory of Keralites. The floods and the accompanying landslides were catastrophic in terms of loss of lives, livelihoods, property and infrastructure. With the unprecedented scale of disaster, the social and economic fabric of our people was torn apart. The State Disaster Management Plan identified Kerala to be highly exposed to the risk of extreme precipitation and flooding in future and highlighted the dire need to enhance the resilience of the state against such events.

Post-Disaster Needs Assessment (PDNA): Study led by GoK and supported by the United Nations to assess and estimate the damage, loss and needs to critical sectors and districts from the 2018 floods, complementing Joint Rapid Damage and Needs Assessment (JRDNA). The recovery needs were estimated at ~35k cr.

Rebuild Kerala Initiative (RKI): In response, to the 2018 floods, the Government of Kerala saw opportunity in the calamity to rebuild a more resilient State. The Rebuild Kerala Initiative was hence incepted by the GoK in November 2018, to drive the resilient rebuilding philosophy in Kerala.

Rebuild Kerala Development Programme (RKDP): A detailed sector specific rebuilding initiatives to drive interventions for enhancing resilience against natural hazards launched by Rebuild Kerala Initiative.

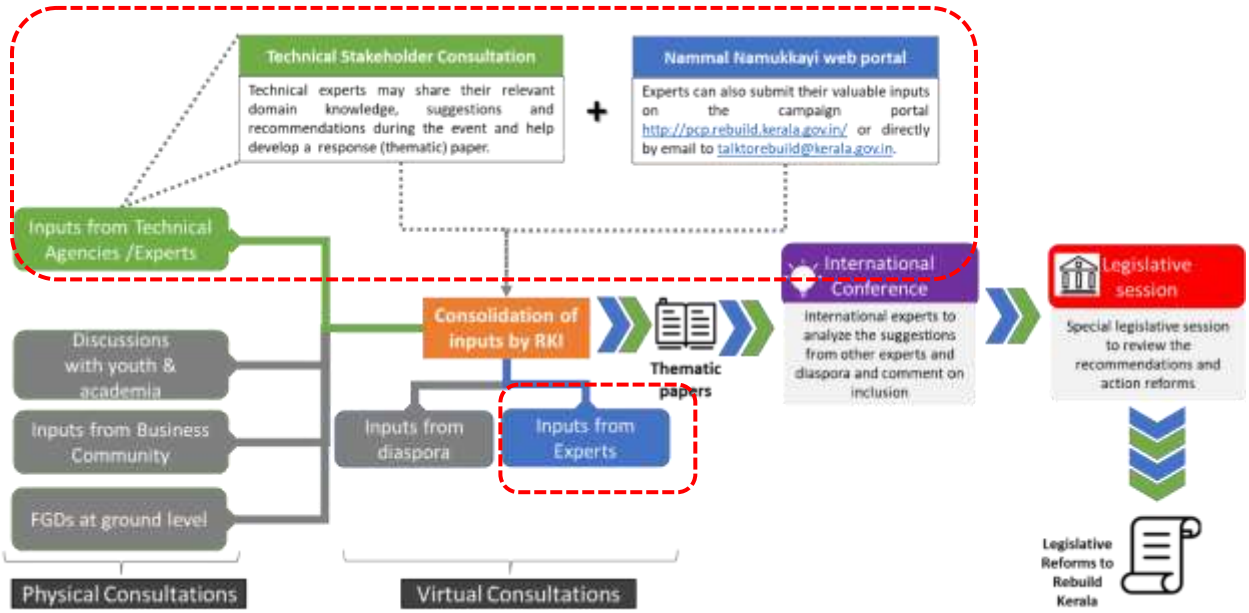
From the thought that the activities aimed at improving resilience can only be successfully sustained if the State adopts a participatory approach towards “Building Back Better”, Hon’ble Chief Minister has envisioned for *Nammal Namukkayi* Programme. The people participation Programme aimed to reach out to wide range if stakeholders to gather their opinions and suggestions in resilient rebuilding process of the state.



Approach and Methodology – '*Nammal Namukkayi*' Programme

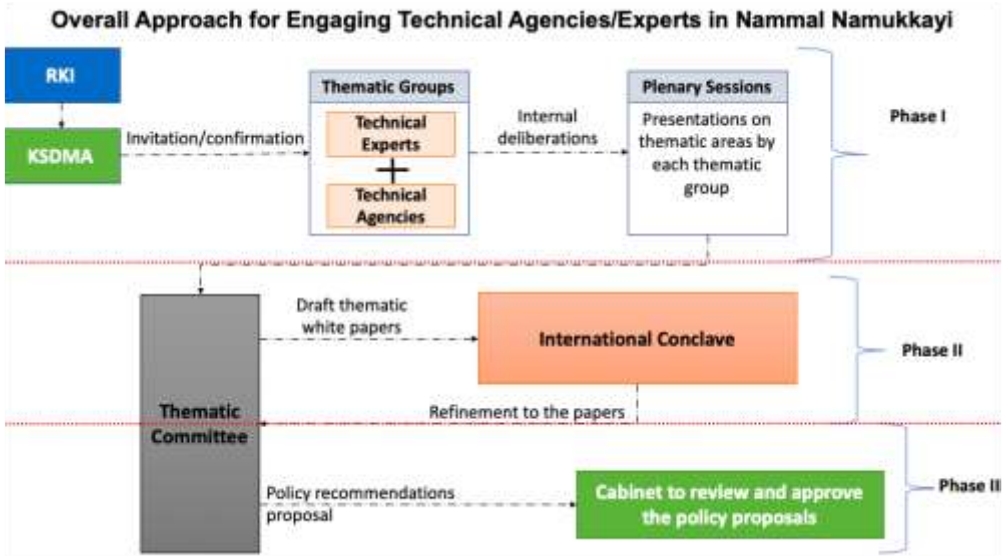
Nammal Namukkayi is a people's consultation program hosted by RKI to seek inputs and insights from people - across geographies, sectors and professions - on key themes which influence the approach to be adopted by the Government towards enhancement of the State's resilience to natural calamities and climate change. The Programme is a three-phase process aimed towards making a shift in the policy paradigm of the State. The three phases of the Programme are listed below:

— Extensive Stakeholder Consultation
— International Seminar
— Policy Proposals for the Cabinet



The Programme will engage with different categories of stakeholders using different platforms and media seeking their views and opinions on key focus areas. Five thematic areas include: Land Management, Water Management, Forest Management, Local Community and Resilience and Transport Communications and Technology.

The overall approach for engaging technical agencies/ experts was streamlined as follows:



Technical Consultation Session *(The event)*

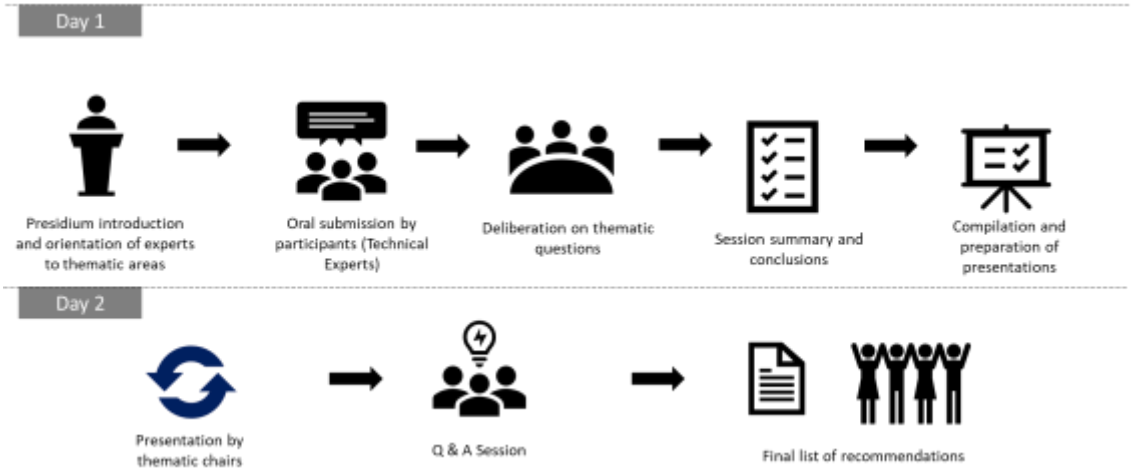
The Technical Session scheduled on 29th and 30th January hosted by RKI in association with Kerala State Disaster Management Authority (KSDMA) aimed in carrying out the consultation process with

the Technical Agencies/Experts constitute the first phase of the engagement. The event was scheduled for two days, 29th and 30th January 2020.

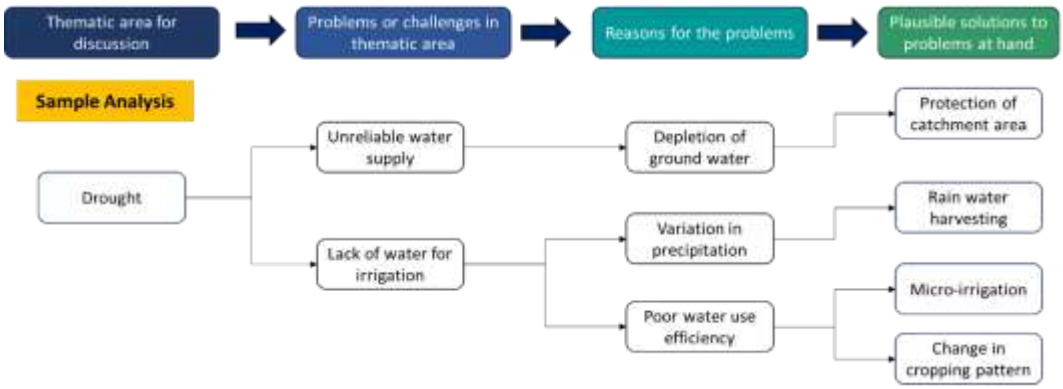
The timeline for each milestone led to the plenary session is as follows:

Sl. No.	Activity	Date
1	Confirmation and Identification of Single Point of Contact (SPOC)	January 10
2	Submission Deadline for the First Assessment	January 25
3	Arrival of Experts	January 28
4	**Thematic Group Discussions**	**January 29**
5	**Consolidation of Findings and Presentation for Each Theme in the Plenary Session**	**January 30**
6	Departure	January 30
7	Consultation Proceedings Report to be shared with experts	February 10

The detailed course of event for both the days can be graphically represented as shown below:



The presentations and discussions followed an organized structure which begins with '**Key problems /Challenges'**followed by **'Reasons for the problems' and** then **'Possible Solutions'.** For example:



Agenda of the Programme

DAY 1 - 29/01/2020
Venue: Symphony Hall, Mascot Hotel, Thiruvananthapuram

On the first day of thematic group discussion, each thematic group had to identify a chairperson who would serve as a moderator for the internal deliberations on the issues and potential policy solutions within their theme. The internal discussion followed the discussion template, which will be provided to the organization after receiving confirmations.

The agenda of the programme for the day was as follows:

Sl.No.	Time	Agenda
1.	09.30 – 10.00	Welcome & Registration
2.	10.00 – 10.30	Orientation by Dr. Sekhar Lukose Kuriakose, MS KSDMA
3.	10.30 – 11.00	Tea Break and dispersal of participants to respective thematic rooms
4.	11.00 – 11.15	Chair/Presidium Introductions and orientation of experts to thematic areas
5.	11.15 - 13.00	Oral Submissions by the participants
6.	13.00 – 14.00	Lunch Break
7.	14.00 – 16.00	Deliberation on thematic questions moderated by the thematic Chairs
8.	16.00 – 16.15	Tea and health break
9.	16.15 - 17.00	Session summary & conclusion
10.	17.00 – 17.30	Compilation & preparation of presentation with support from rapporteurs.
Dinner – 7.00 pm onwards at respective lodging Stations		

DAY 2 - 30/01/2020
Venue: Symphony Hall, Mascot Hotel, Thiruvananthapuram

On the second day, each thematic group will have to make a brief presentation on their key findings during a plenary session. Between every presentation, time was allotted for raising queries and discussion.

The agenda of the programme for the second day was as follows:

S.No.	Time	Agenda
1.	10.00 - 10.10	Opening Remarks – Dr. Venu V. IAS, CEO, RKI
2.	10.10 – 10.30	Presentation on Thematic Area- Land Management

3.	10.30 – 10.40	Q&A
4.	10.40 – 11.00	Presentation on Thematic Area- Agriculture
5.	11.00 – 11.10	Q&A
6.	11.10 – 11.20	Tea & Health Break
7.	11.20 - 11.40	Presentation on Thematic Area- Town & Country Planning
8.	11.40 - 11.50	Q&A
9.	11.50 – 12.20	Presentation on Thematic Area- Mining
10.	12.20 – 12.30	Q&A
11.	12.30 - 12.50	Presentation on Thematic Area- Susceptible Zones
12.	12.50 – 13.00	Q&A
13.	13.00 – 14.00	Break for Lunch
14.	14.00 – 14.20	Presentation on Thematic Area – Water Management
15.	14.20 – 14.30	Q&A
16.	14.30 – 14.50	Presentation on Thematic Area – Forest Management
17.	14.50 – 15.00	Q&A
18.	15.00 – 15.20	Presentation on Thematic Area – Local Community & Resilience
19.	15.20 – 15.30	Q&A
20.	15.30 – 15.40	Tea and Health Break
21.	15.40 – 16.00	Presentation on Thematic Area – Transport, Communication & Technology
22.	16.00 – 16.10	Q&A
23.	16.10 – 16. 30	Summary & Way forward by- Dr. Sekhar L. Kuriakose
24.	16.30 – 16.45	Valedictory Remarks by Hon'ble Chief Minister
25.	16.45 – 16.50	Vote of Thanks by – Dr. Venu V. IAS
Dinner – 7.00 pm onwards at respective lodging Stations		

The programme was concluded with the remarks by Hon'ble Chief Minister.

Detailed Summary of the Sessions

Day 1

Session 1: Introductory session

The introductory session began with the opening remarks by Dr Venu V IAS, CEO, RKI who introduced the aim of this consultation to the gathering. Chairpersons of the thematic groups were present on the dias. This was followed by a detailed orientation by Dr. Sekhar L. Kuriakose, Member Secretary, KSDMA. He explained to the audience the context, the challenges ahead and the need for a cross sectoral approach. The 'Problem Tree analysis' methodology was elaborated upon and the template for preparing the presentation was introduced by him.

Session 2: Thematic group discussion

After the introductory session, each thematic group proceeded to their respective conference halls for detailed deliberations. Each group was led by a chair and a co-chair. Detailed review of the key issues faced in the sectors in relation to the disaster scenario of Kerala was carried out in the thematic groups. Reasons behind these issues were explored in the detailed discussion that followed. Possible solutions or possibilities were chalked out and concluded as recommendations for the Rebuild Kerala process. The aim was to arrive at pragmatic solutions for a resilient state. This process was facilitated through a 'Problem Tree analysis' methodology in each thematic group.

By the end of the day, the key problems/ challenges, reasons for the problems, possible solutions and overall recommendations that emerged from the deliberations were compiled in the form of a power-point presentation by each team with the help of a rapporteur.

1. *Land management*




Key Problems/ Challenges	Reasons for the problems	Possible solutions
• Land degradation • Soil erosion • Habitat loss • Forest land fragmentation	• Unscientific land alterations • Government policies • Development activities • Conversion of natural forest into plantations especially for mono-cropping • Mining • Tourism • River valley projects • Alien invasive species • Cultivation along slopes • Internal migration (from midlands to highlands)	• Restoration programme with community participation in riverine areas, industrially polluted areas etc. River Management Committees to be formed. • Policy interventions • Ensure that the East-West surface hydrology is not curtailed by North-South constructions (roads, railway lines) • Agricultural cropping patterns based on agro-ecological zones to be followed. • Watershed Management: Integrated scientific soil and water conservation measures to be implemented. • Buffer zones for critical habitats.
Land laws	• Multiplicity of land laws (Kerala Land Utilization Order, Land Conservancy Act etc.) • Complexity of numerous land laws and legislations. • Ineffective enforcement of existing regulations.	• Revenue Department should have a dedicated wing to look after land resources. Routine works may be separately handled. • Proposed Land Resources Department/ Wing should devote to scientifc land management of the state and plan for

		allocation and re-allocation of land for different sectors. • Review of all land laws by a competent committee • Simplified comprehensive land code has to be prepared.
Tourism • Unregulated tourists flow • Unplanned development in tourist destinations. • Construction activities in ecological fragile zones (hotels, resorts, widening of roads etc.)	• Lack of proper policy • Lack of guidelines in present building rules with respect to ecological fragile zones (Eg: flood plains, hilly regions etc.)	• Carrying capacity assessment for regulating the number of tourists. • Policy intervention for Tourist Circuit Developments. • Site specific building rules and regulations should be prepared (Amendment to the present KMBR)
Pressure on land resources for settlements	• Dispersive nature of the built-up. • Unavailability of room for river. • Unoccupied houses and flats.	• Cluster/ vertical housing should be actively promoted for efficient land use. • Survey of flood plains: Relocate houses in flood plains (*Puzha purampokku*)– Vulnerability Linked Relocation (10 Lakhs Scheme) • Regulate the construction in flood plains • Avoid construction in fragile eco system (Site specific building rules- Eg: Hill area building rules) • Revisit individual land holding limit and no. of houses owned by an individual.
Degradation of river bank ecosystem	Encroachments cultivation on the flood plains.	• Integrated farming with livestock and fisheries. • Vegetative protection should be encouraged. • Indigenous species of plants and trees should be used along with geo-textiles for river bank protection. • Survey of river *purambokku* on river

		banks should be carried out. • Zone regulations should be strictly followed.
Land use issues– unavailability of open spaces in cities	Unregulated urbanization	• Potential based resource planning • Revisit existing government land for providing more planned open spaces
Paddy and wetland conversion	• Economic reasons and development pressure. • Globalisation and economic liberalisaion has direct impact on conversion. • 2018 Amendment of Wetland and Paddy Conservation act seems to be counter productive. • For construction of roads and other infrastructure.	• Final data bank of paddy and wetland to be completed and should be published within a specified timeline • Integrated farming: animal husbandry, poultry and fisheries may be integrated with potential plantation cultivation • 2018 Amendment should be withdrawn • Farmer's Co-operative Society should be formulated with small scale farmers
• Land use issues: monoculture of exotic species • Use of pesticides/ weedicides and fertilizers • Linear intrusions	• Economic reasons and livelihood benefits • For installation of power lines, roads	• Commercial monoculture plantations should be stopped. • Organic farming should be promoted. • Cleared land under power lines may be repurposed for grounded crops in collaboration with Kerala Agricultural Uuniversity.
Pollution due to industrial land use	• Lack of data on the spatial distribution and area covered by industries. • Effluent discharge leading to soil and water pollution.	• Identification of suitable land for siting different types of industries. • Effluent treatment plants and enforcement of regulations by Pollution Control Board. • Buffer zones around specific industries should be defined for residential and ecologically sensitive zones. • Ensure eco-restoration of industrially contaminated areas.

2. *Human settlement/ Town and Country Planning*




Key Problems/ Challenges	Reasons for the problems	Possible solutions
Urban content of Kerala is 50% (2011 Census) but not manifested either physically or economically. Such an urban spread causes dilution in economic base of both urban and rural areas of the state.	Lack of proper policy for streamlining the urbanisation of Kerala.	• Revitalize urban areas to compact urban form. • To perform urban functions complimentary to the rural hinterland and act as an engine of development. • A settlement policy maybe formulated at state level. • Development Plan for all districts may be prepared. • Preparation of Master Plan and Execution Plan for all settlements in Kerala.
Kerala has a very high Generic (Universal/ Global) Floor Area Ratio (F.A.R.) of 4. In other parts of India, the Global F.A.R is 1.5 to 2 at the maximum.	• It paves way for a huge disaster if a calamity occurs. It makes all spatial plan including Disaster Management Plan ineffective. • Pressure on environmentally sensitive land to convert build-up area will be high.	Global F.A.R of the Kerala Municipality Building Rules/ Kerala Panchayat Building Rules to be reduced to 2.5 as maximum. However, higher F.A.R may be permitted only through town planning schemes.
Scattered built-up without sufficient area for water retention.	Construction is carried out everywhere.	Restrict construction in safe zones at a high density.
Lack of proper drainage facility.	The water courses are reclaimed and built	Revive the drainage system by giving proper

	over.	linkages wherever missing.
Water is not retained due to destruction of forests.	Since forests are destructed, the rain water is not held in forest areas and this results in flow of all rain water into rivers/ water bodies leading to floods.	Conserve forests and plant more trees.
Settlement in ecologically sensitive area.	Land in ecologically sensitive areas made available at lower prices and through schemes.	Revisiting Land Use Policy based on hazard maps and relocating communities to safe zones.
Lack of evidence for planning and decision making.	Data quality, data input and collection mechanism leading to issues with aggregation and coordination.	State level observatory integrating all relevant datasets and models may be proposed. UA and LSG level platforms could be built on the state level observatory/ platform. This acts as focussed early warning and emergency management system. Such platform will support dynamic plan making process for data collection, dissemination and course corrections.
	Unavailability of accurate, up-to-date information. High resolution is unavailable for research purposes.	• Open repository for R&D and active contribution from scientific community and other stakeholders. • High resolution satellite imagery for high risk zones for specific risk reduction measures.
Need for new development	Incentives supporting asset accumulation for particular segment of society influencing the overall affordability of housing.	• Rent control acts to unlock the idle housing stock open it up to the market at affordable process. • R&D for promoting and incentivising alternative building technologies.
High economic losses in disaster.	Lack of affordable insurance and other safety nets.	Promote region specific risk insurance schemes and build awareness on such schemes.
Disconnect between development plans and ecology.	Scope of plans limited to administrative boundaries, ignoring or regulating the impact	Re-imagining planning boundaries beyond administrative demarcations and considering

	of the region to the settlement.	water shed boundary, hazards, coastal regulation and other large impact regions.
Usage of high embodied energy materials in building industry which causes high carbon emission and eventually climate change. The architecture which came into our lifestyle as part of globalisation spoils the habitat and we are dependent on the artificial comforts using electrical and mechanical equipments like air conditioners.	Ordinary people are unaware of the materials used in traditional buildings, renewable materials etc. The marketing strategy of MNCs is such that false information is provided to the people about sustainable materials as they intend to promote only high embodied energy materials. Use of high embodied energy materials in architecture does not ensure thermal comfort and hence increases the energy consumption (electricity) causing further carbon emission.	• Building codes/ laws should also cater to the aspect of building materials. • Sanction for the building may be subjected to the use of sustainable construction materials (natural materials, renewable materials, low embodied energy materials) so as to reduce the usage of high embodied energy materials such as steel, cement, glass, composite materials etc.
Organic development of human settlement.	No policy	High density and low rise construction may be encouraged.

3. Agriculture



Key Problems/ Challenges	Reasons for the problems	Possible solutions
Plantation		
• Crop loss/ Reduction in yield • Soil erosion • High pest & disease incidence	• Erratic weather pattern • Improper agricultural practices/ no disaster preventive practices	• Adopt soil conservation practices like terracing, contour planting etc. • Cover crops and fruit crops in non-

• Water stagnation within the plantation • Dwindling production in cashew	• Inadequate soil and water conservation measures • Plantation crops are cultivated in more than 30% slope areas	cultivated areas. • Management of shade tree and crop canopy • Crop diversification • Effective pest/ disease management • Agro-Ecological Unit (AEU) based effective management practices to improve productivity. • Tea: Subsidy schemes for small farmers
Plantation: Tea		
High intensity of rainfall in short times	Change in climate for the last five to six decades causing the erratic rainfall pattern	• Proper discharge system for removing excess water from the field; • Maintaining the drains and creation of water bodies within plantation
Prolonged drought months	Less shade trees, rainless months and uneven distribution of rainfall	• Drip or sprinkler irrigation wherever possible; • Planting adequate shade trees to combat drought effect
Soil erosion and landslides in plantations	More vacant patches in the field and no proper soil and water conservation	• Vetiver planting along the contour; having staggered trenches; contour drains, boundary drains and vertical drains; • Infilling: So that there is zero vacancy in field.
High incidence of pests and diseases	Climate change turned minor pests into major pests; Also there is more incidence of diseases	• Integrated pest and disease management; • Incorporation of organics and biologicals to reduce pesticide loads; better cultural practices
Plantation: Spices		
• Top soil erosion in High ranges and deposition of silt and clay in low lying areas	• Root exposure, and nutrient deficiency • Hard pan formation • Toxicity is increased	• Soil health improvement, nutrient management/ bio inputs/ Micro irrigation facilities

• Prolonged water logging • Crop loss • High disease incidence in cardamom	• Disease incidence • Lack of quality planting material	• Hard pan– Removal with machines • Replanting programmes– tolerant/ early bearing varieties through PPP Mode/ Seed Village programme like Micro rhizome technology in ginger • Standard operating protocol for nurseries • Spice regeneration mission projects for Wayanad and Idukki districts
Plantation: Horticulture		
Low productivity (Vegetables, Fruits)	• Lack of export market • Lack of possibility of year round production • Reduced farm income • Inadequate water and irrigation management and in turn flood management • Environmental issues	• Streamlining AEU based production technology • Adaptive trials/ introduction of new crops and varieties • Supply of quality, disease free planting materials • Supporting public sector hybrid seed production in vegetables • Genetic conservation of land races • Export protocol for fruits and vegetables • Promotional land research interventions in production of winter crops in rain shadow region • Special agri-zones for specific horticultural crops • Community nurseries to cater the needs of farmers • Canopy management for improving the fruit crop production. • Exploiting the flood tolerant potential of minor fruits
Wetlands		
• Flooding of rice fields (Eg:	• Intense rainfall	• Strengthening/ construction of outer

Kuttanad) • Breach of bunds and crop loss • Reduction in yield		bunds • Use of flood tolerant varieties • Limiting additional crop cultivation to 30 % area • Increase income by Integrated Framing System (IFS) • Enforce crop calendar
Capacity of water channel is reduced	• Silting • Invasion of water weeds	• Desilting for enhancing flood flow • Mechanised removal of weeds periodically. • Streamlining the operation of Thanneer Mukkom Barrage.
Salinity in rice fields.	• Tidal influx as in Pokkali • Lack of base flow and storage	• Use saline tolerant/short duration varieties • Ensure location specific seed hubs • Adaptive trials with new varieties • Regulate multi sectoral buildings and ensure they are optimally distributed to different locations. • Policy on land use as townships/ agriculture/ water bodies/ forest etc.
Drought	Lack of summer showers	• Use of drought tolerant/ short duration variety • Addition of organic manure • Water spray with drones once in a week (during drought) • Mechanised harvesting in Pokkali
Soil and Land Management		
• Soil erosion • Land slips and landslides	• Impeded drainage • Piping: super saturation at subsurface	• Proper drainage and disposal of water in high range areas • Constructing terraces/ bunds/ trenches • Water harvesting structures: Farm ponds/ infiltration tanks/ percolation ponds

		• Irrigation facilities: Micro irrigation in areas of water shortage. • Fertigation • Open field precision farming and rain shelters instead of high-tech poly houses. • Soil health management and nutrient balancing through micro nutrient supplements/ site specific soil amendments/ enhancing soil microbial diversity.
Fisheries and Aquaculture		
• Flood Loss • Disease Incidence	• Crop loss and low yield • Increase in incidence of pathogens • Surreptitious introduction of exotic breeds	• In lowland and flood prone area: Farming to be restricted to post and pre monsoon seasons • Stocking of advanced fingerlings and stunted seeds • Popularisation of fast growing breeds (to be harvested in 6-8 months.) • Development of waste fed aqua culture systems • Massive stocking of all reservoirs in Kerala • Establishment of hatcheries for supply of Specific Pathogen Free (SPF) seeds in each district. • Disease diagnostic lab in each district and quarantine system in air ports and check posts for invasive species. • Integrated farming & crop rotation
Livestock		
• Loss of livelihood for people • Increase in diseases & loss of meat production	• Contributor for methane gas emission • Food-feed competition is increasing as our food is given to animals	• Methane mitigation measures: Introduction of methane reduction drugs as food additives/ Low methane

• Erosion of indigenous breeds • Zoonotic diseases	• Non adapted breeds/ varieties	producing breeds/ Research on sea weeds as cattle feed supplements • Gene bank for promoting conservation of indigenous breeds like Vechoor Cow/ Kuttanad Buffalo/ Malabari Goat/ Parent stock maintenance and propagation • Seed stock nurseries- Calf nurseries/ hatcheries for ducklings • Value addition for enhancing income of farmers • Climate specific animal zones • Integrated Farming System
Below Sea Level Farming		
• Acidity problems • Salinity problems • Floods		• Strengthening of Kuttandu under Globally Important Agricultural Heritage Systems (GIAHS) • Establishment of natural heritage museum • Promoting silt based agriculture to support coconut and other garden land crops • Promoting of floating raft agriculture • Adoption of coated and slow release fertilizers in Kuttanadu to reduce nitrification of water bodies • Base flow augmentation round the year by linking Muvattupuzha river with Vadayar - Kavanar • Increase environmental flow to deter salinity intrusion, so as to avoid Thanneer Mukkom Bund operation.
• Flood • Inland flooding	Water management	• Increasing the efficiency of Thottapally spill way

• Low water table in Vembanadu induce saline intrusion		• Desilting all the canals in Kuttanad to ensure drainage and free flow of water. • Utilisation of polders as flow through structures by establishment of inlet and outlet sluices • Utilisation of derelict padasekharams as harvesting structures, for drinking water purpose., utilizing the unique, impervious nature of soil • Carbon foot printing of farming practices so as to encourage farming that mitigates carbon emission • Demonstrate good agriculture practices by enhancing carbon in soil , render agriculture soil as carbon sink- promote organic farming and good agricultural practices

4. Mining



Key Problems/ Challenges	Reasons for the problems	Possible solutions
Granite Quarrying		
Unable to prevent illegal quarrying.	• Revenue authorities and police who are competent but not vigilant.	• Department of Mining and Geology to be strengthened.

	• Various licensing agencies are unable to take proper actions against mining without their license.	• Directions to be issued to Mining and Geology, Revenue, police and other licensing agencies. • Enhance the number of experts in SEIAA from 13 to 16. SEIAA may be provided with 3 zonal environment officers.
Unscientific mining and blasting.	Lack of permanent qualified persons like mines manager, mines mate, blast man, foreman etc.	Academic programmes (degree/ diploma in mining engineering) may be initiated in the state.
Widespread quarries near settlements.	Lack of notified areas exclusively for mining.	• Delineation of prospective zones after geo-environmental appraisal. • Distance of the settlement from quarry may be increased up to 100 m.
Environmental degradation on account of illegal mining	Lack of competent officers to implement Environmental (Protection) Act, 1986	Power to implement the Act shall be delegated to District Collectors.
Public nuisance, destruction of infrastructure like roads, bridges, irrigation canals, and revenue leakages connected with transport of minerals.	Overloading of minerals beyond goods permit, use of very large vehicles in narrow roads, alteration of vehicles for increasing the carrying capacity.	Stringent actions from Mining and Geology, Motor Vehicles Department & Police.
Improper closure of mines	Meager amount has been stipulated as financial guarantee for proper closure of mine.	Enhance the amount at par with central government mining rules.
Depletion of ground water recharge.	Removal of overburden greater than 2 m.	Quarrying should be limited in such a way that recharge zone is not compromised.
Lack of social auditing of quarrying operations.	No empowered committee exists.	Local Empowered Committee consisting representatives of LSGI, Revenue and civil societies shall be constituted with proper guidelines.
Unprotected and unutilized abandoned granite quarries	Improper utilization of the abandoned quarries.	Fencing, sign/warning boards, proper utilization of quarries for activities like drinking/irrigation water supply, fish farming, recreation, groundwater recharge etc.

Depletion of natural resources	Reuse and recycling is not being carried out.	Effective implementation of construction and demolition Waste Management Rules 2016 .
Abnormal hike in price of building materials	All quarries are under private sector	• Setting up of Natural Resource Corporation as envisaged in the state mining policy. • Govt. can subsidize materials supply to BPL categories.
River/ Beach Sand Mining		
Non availability of construction grade natural sand and resulting over exploitation of granite for manufacturing M- sand.	No mining takes place for want of Environment Clearance (EC).	Steps may be taken to obtain EC and to resume river sand mining as done earlier.
Under-utilization of known available resources.	Silt accumulated in the reservoirs are not utilized properly	De-siltation of reservoirs
Coastal Erosion	Unscientific mining and over extraction.	Ban beach mining in erosion prone areas and adopting manual methods for mining in permitted areas.
Laterite and Ordinary Earth Mining		
Uncontrolled illegal laterite mining leading to groundwater depletion.	Lack of proper law enforcement	• Law enforcement should be geared up. • Use the existing abandoned laterite quarry pits for groundwater recharge.
Uncontrolled, unscientific and illegal excavation of ordinary earth material leading to slope failures.	• Toe cutting of slopes without proper protective measures • No proper assessment in granting development permit by LSGI and lack of monitoring of excavation activities.	Proper assessment is needed before granting permit and stipulation of protective measures to prevent slope failures.

5. *Susceptible Zones*




Key Problems/ Challenges	Reasons for the problems	Possible solutions
Coastal Erosion		
• Obstruction/ interception of sediments • Cliff retreat • Artificial engineering structures (break water groin etc.) • Sea level rise • Saline intrusion • Threatened livelihoods of fisherman communities • Displacement of communities • Loss of land and property • Hampered access to the beach • Poor aesthetics	• Unscientific human interventions in coastal area– structural and mining etc. • Natural and anthropogenic processes.	• Preparation of micro level maps of the coastal area through participatory approach. • Preparation of action plan based on micro level maps. • Identification of stable zones for the rehabilitation of community in consultation with revenue department. • Construction of cost-effective houses in stable zones with the help of expert agencies/ professionals (Experts- Geotechnical and Structural Engineers, Water and Sanitation, coastal engineers etc.) • Updating Disaster Management plan • Improving the quality of life of the people in the coastal area through appropriate means such as eco-tourism, value addition of products, cage farming, displacing fisherman community towards inland waterways (livelihood)

		• Sedimentary Cell Approach as a unit for conservation and management • Promotion of indigenous vegetation
Landslides		
The following factors pose challenges: • Physiographic aspects • Anthropogenic activities • Vegetation • Settlements • Groundwater • Drainage choking • Housing and livelihoods • Early warning	• Intense Rainfall and Precipitation • Land use change • Mono cropping/ cropping pattern • Construction of structures (modification of slopes) • Water table change • Blockage of natural drainage	• Zonation of Susceptible Areas in cadastral level– High and Medium • Clearance from the geologist to be made necessary for constructions. • Site specific consultation from the geologist before and after a landslide. • Relocation of people in vulnerable locations to stable locations. Clustered village level settlements preferred. • Site specific actions to be taken on relocation during the recovery and rehabilitation stage. • Bring restrictions on agricultural activities- Alternate agricultural activities • Rainfall threshold forecasting • Building awareness at local level • Community based disaster management plans to be prepared. • Local community to be sensitized on natural indicators of hazards. • Interstate governance approach to be adopted in data sharing.
Drought		
• Post Flood Drought • Seasonal Drought • Agricultural Drought • Variations in stream flow • Ground water extraction	• Climate change: Rainfall variations (Significant decrease in annual rainfall– The number of rainy days has decreased) • Changes in evapo-transpiration due to various reasons • Water scarcity	• Conservation of traditional water recourses. • Need based subsidies (limit subsidies based on land crop and requirements). • Rejuvenation of closed fresh water bodies and surface water through a

	• Land use change (agricultural to plantations) • Population density (over exploitation of resources)	participatory approach. • Regulation in ground water extraction. • Development of adequate number of critical zone observatories (CZOs) in different agro-climatic zones for monitoring long term changes. • Direct recharging in drought prone zones– recharge streams • Water harvesting measures • Ensure quality water supply and awareness of reuse and recycling of water. • Terrain based approach: It should adopt long term measures: source identification, quality assurance etc.) • Prevention of reclamation of wetlands. • LSGD based drought management system

6. *Forest Management*



Key Problems/ Challenges	Reasons for the problems	Possible solutions
Forest and Tree Resource Management		
Decline in the ecological services	Anthropogenic pressures on forests,	• A holistic landscape level management

such as water, air, soil and climate.	fragmentation, climate change, spread of invasive species and so on.	by harnessing various components of ecosystem functions. • Enrichment by planting native species in degraded and denuded forest areas. • Conversion of monoculture plantations to natural forests. • Taking over the expired and unused private lease holdings and reverting back to natural forests. • Managing existing leased out areas to ensure ecological functioning of the landscape. • Eviction of illegal occupation and encroachments in the forest areas. • Relocation and rehabilitation of tribal communities from core forests to periphery or mainstream based on FPIC principles. • Long term in-depth studies for monitoring ecosystem services from forests.
Decline in the carbon sink potential of forests	Decline in forest health – increased prevalence of insects, pests and pathogens, soil health and edaphic changes, mortality and poor growth, poor regeneration and recruitment, forest fire, extreme climate events, water inadequacy	• Soil and water conservation measures • Enrichment planting of ecologically suitable species. • Species specific control and eradication of invasive species. • Promotion of conservation practices in private landholdings in the forests. • Long term climate change impact studies in different forest types.
Decline in the resilience to combat climate extremes such as flood, drought, landslides etc.	Climate extreme such as intensive rainfall, loss of closed canopy systems and degradation, anthropogenic activities that	• Identification and mapping of vulnerable areas. • Preventive measures to contain the

	reduce the functional quality of forest systems.	possible impacts of climatic extremes. • Enhancing the water holding capacity of forests. • Soil stabilization measures in fragile areas. • Developmental activities to be permitted based on multi-hazard vulnerability analysis. • Eco-restoration of impacted areas.
Increase in human wildlife conflicts and road kills	• Encroachments, fragmentation and isolation of wildlife habitats and corridors • Developmental projects including hydel, infrastructure and tourism, • Natural habitat deterioration leading to water and food inadequacy. • Imprudent agricultural practices along forest fringes	• Habitat improvement for ensuring food and water within forests • Restoration of wildlife corridor. • Avoidance of night traffic in forested areas • Elevated pathways across wildlife corridors • Effective early warning and deterrence systems • Selective cultivation of crops in the fringes of forests. • Incentivisation for non-cultivation could be considered.
Extensive spread of invasive species to natural habitats	Forest degradation– canopy opening, linear intrusions by means of electric lines, roads, railways etc., tourism, forest fire, edge effects.	• Physical and bio-control of invasive species. • Adherence to quarantine laws to be strictly implemented. • Need for location specific studies on ecology, phenology and reproductive biology of invasive species.
Increase in forest fire and associated damages to the forest ecosystems	Human induced, persistent drought, climate change.	• Operational monitoring of forest fire and weather indicators, vulnerability maps, fire fighting squad– department and civilian squad with advanced fire fighting

		tools. • Restriction of human entry in vulnerable areas during dry season, awareness programs.
Inadequacy of the forest to meet the timber and non-timber forest products requirements	Increase in the demand and lower productivity of forest, unscientific and selective overexploitation of NTFPs.	Promotion of tree farming in TOF (Trees Outside Forests) sector through agroforestry, farm forestry, social forestry practices, sustainable harvesting protocols, and value addition of forest products at source, improve market and supply chain.
Lack of socio-economic upliftment of forest dwellers	Educational and economic backwardness, remoteness from main stream developmental agenda, tradition bound lifestyle, exploitation by the middle men, reluctance to adopt modern farming techniques, lack of proper training and skill development.	Conscious efforts for mainstream integration with particular emphasize on education, health and employment.
Increased infrastructure developments in the forest fringes	Anthropogenic pressures for developmental activities along forest fringes as well as in enclosed human habitations	Strict adherence to forest and other land laws, enforcement and zero tolerance to violations.
River and stream bank erosion leading to flash floods.	Loss of natural riparian guard vegetation, illegal sand mining, unscientific check dams and water ways, blockage of first and second order water channels.	• Protective measures both for watersheds in forests and downstream areas, river bank stabilization measures preferably by bio-enegineering methods such as vegetation grids, live staking, etc., • Restoration of riparian buffers in river banks in downstream agricultural landscapes.
Unscientific mining and quarrying along the fringes of the forests.	Anthropogenic pressures for developmental activities	• Need based assessment should be conducted before granting permission. • Strict enforcement of laws. • Housing policy should be adopted. • Adherence to mine/quarry reclamation

		guidelines. • Employing technical experts and consultants for guidance and effective management in quarry operations. • State ownership may also be considered
Waste disposal in forest areas	Urban sprawl and lack of facilities for waste disposal, transition to consumerist society	• Point source management • Legislation • Awareness creation.
Mono-culture plantations in fragile forest landscapes, lowered productivity and associated ecological issues	Improper site-species matching, poor management and policy compulsions	Phasing out monoculture plantations in fragile landscapes through effective eco-restoration measures.
Loss of mangrove habitats, and unique ecosystems such as sacred groves, laterite hillocks, cliff vegetation, fresh water swamps	Population pressure, urbanization, and developmental activities, pollution and land filling	• Afforestation and reforestation, • Acquisition of mangrove areas from private owners, • Strict adherence to wetland laws and CRZ rules, • Restriction in clay mining, • A new law to be framed for conservation of sacred groves, laterite hillocks and other unique ecosystems
Homegardens: Deterioration of functional diversity of traditional homegardens.	Changes in socio-economic milieu, lack of proper economic models, urbanization, fragmentation and increase in small land holder systems	• Revitalization of traditional homegardens through judicious mix of viable Integrated Farming Systems (IFS) components including commercially valuable tree species, fruit bearing species, spices, and medicinal plants. • Developing market chains, value addition, branding, and certification (organic). • Development of specific economic models suited to different agro-ecological units and farmer categories.

Removal of large timber trees from the homesteads.	• To meet urgent financial obligations, increased demand for wood, • Lack of market and price awareness.	• Incentivizing to retain large trees, planting of native species (both fast and slow growing). • Adopting short and long term economic models by training and awareness, proper market intelligence through online and offline media. • Deployment of trained tree and landscape managers at every LSGI.
Lack of quality planting materials	Lack of authorized supply agencies/ nurseries to meet the large scale demand.	• Use of planting materials from authorized sources. • Awareness and training on decentralized nursery practices at the Local Body level.
Vanishing of urban and peri-urban green spaces, and the deterioration in the microclimate	Population pressure, urban spread and developmental activities.	• Keeping aside land parcels for greening • Green protocol for new building constructions • Master plans for urban forestry • Implementation of *pacha-thuruth* protocol.
Fallowing and abandonment of land in the rural areas	• Undesirable socio-economic changes • Search for blue and white collar jobs • Labour cost outpace the economic returns	• Encouraging agri based start-ups, entrepreneurship and business incubations, • Employment bank and ensuring of labour through MNREGS and other mechanisms.
Lack of Institutional mechanisms in the TOF sector	Trees and other components in the TOF sector are controlled by neither agriculture nor forest department, hence they remain unattended.	• Establishment of Farm forestry boards at the state and district levels. • Developing standards and certification procedures in similar lines with American Tree Farm System Standard, USDA National Organic Standard and so on. • Deployment of exclusive man power for the scientific management of trees in the public and private sectors.

7. *Water Management*



Key Problems/ Challenges	Reasons for the problems	Possible solutions
Floods		
• Extreme weather events • Flash flood, landslides • Loss of lives • Structural damages of public and private assets • Epidemic out break/ health issues • Sanitation problems • Agricultural loss • Economic loss • Annual floods in Kuttanad	• High intensity rain fall for consecutive days • Impact of climate change/ occurrence of extreme events • Shrinkage of lakes, canal and wetlands • Conversion of paddy fields and wetlands (Land Management) • Drainage blockages/reduction in water holding capacity and encroachment of streams/rivers • Flood plain occupancy, loss of riparian Ecosystem (Land Management) • Loss/connectivity of stream network • Unregulated urbanization/ Increase in built up land (Land Management) • Deforestation, shift from multi-tier cropping system to mono cropping system and increasing landslides/flash flood	• Integrated reservoir operation plan at the basin level • Flood risk analysis during design of water retaining structures • Installation of better network of weather stations-explore involving schools and public institutions • Restoration of water bodies, wetlands , to enhance storage capacity • Enforcement of existing rules & regulations to control encroachment of water bodies • Restricting paved and built up area around buildings to facilitate infiltration • Enforce water harvesting system for all public institutions • Afforestation and encouraging multitier cropping pattern especially

	• Inadequate soil/ water conservation measures and lack of flood control structures • Absence of adequate weather data and warning systems • Lack of enforcement of existing regulations • Lack of public/ stakeholders awareness.	in mid land and high land • Watershed and basin level water budgeting/ water balance studies • Flood moderation by establishing flood cushioning mechanisms: play grounds, parking lots (sponge city, China) • Large scale Contour mapping for creating flood heat maps especially for urban areas • Flood mapping in cadastral scale/ implementation of early flood warning systems • Proper maintenance of infrastructure; spill way gates/ river regulators. — local capacity building • Risk informed development planning at Panchayath level
Droughts		
• Impacts of climate change and extreme weather events • Meteorological/ hydrological/ agricultural drought • Drinking/ agricultural and domestic water scarcity • Epidemic out break/ health issues • Sanitation problems • Agricultural loss • Forest fire • Economic loss • Recurring drinking water crisis • Livestock loss	• Climate change impacts/ occurrence of extreme events • Deficiency in North-east monsoon, deficiency in summer rain fall • Shift in rain fall pattern/ reduction in rainy days • Undulating topography and high relief leading to quick run off/ less opportunity time/ low ground water recharge • Reduction in natural ground water recharge: deforestation, wetland and paddy field conversion • Quick loss through base flow	• Increase the surface water storage systems: mini reservoirs/ river storages-*bandharas* • Linkage of reservoirs with domestic water supply schemes • Watershed management with Kattakkada and *mazhapolima* model • Basin level water budgeting/ water balance studies • Restoration of traditional water bodies • Recharge of wells, through roof top rainwater harvesting • Aquifer recharge through abandoned

	• Changing land use pattern: mono cropping • Urbanisation and increase in built up area • Declining water table/ increasing pumping cost • Lack of water conservation structures for catching monsoon rainfall • Sand mining from riverbeds/ mining of hillocks	quarries • Demand Management: Reuse and recycling of wastewater • Establishment of drought maps • Water budgeting and water literacy programs at panchayath level • More crop per drop by designing proper water management system/ micro irrigation systems • Crop water requirement based pumping to be designed • Enforce rain water harvesting system for all public and large private institutions • Regulation of ground water structures with strict compliance mechanisms • Enforcement of regulations in mining and quarrying
Pollution		
• Environmental degradation • Health hazards • Deficiency in fresh water availability • Economic loss • Eutrophication and ultimate destruction of water bodies • Sedimentation/ stagnation/ lean flow • Loss of flora and fauna	• Dumping of solid and liquid waste • Sources: bacterial, industrial, agricultural • Salinity intrusion • Septage • Quality Parameters: Low pH, Fluoride/ iron toxicity • Hot spots: Industry: Pilgrimage :tourism • Urban: Population density, inadequate OSS and ground water contamination • Low awareness/ discussion about serious water quality problems and hence low in political priority	• Participatory situational analysis: Identify sources of pollution, hot spots and arriving at contextual solutions for solid, liquid and septage treatment • Prioritise more natural treatment technologies **LSGI Level** • Convergence of sanitation and social auditing of schemes at LSGI • Enforcement of green protocol • Pollution Control Board to ensure compliance of regulations in industrial effluent and other discharges in to water bodies

		• Establishment of RO plants in appropriate locations with stringent regulations of waste disposal. • Continuous water quality monitoring/ establishing college & school level sanitation clubs/ labs. • Roof water harvesting/ well recharge in coastal belts for minimising salinity intrusion • Ensuring stream flows • Large IEC programme at state level.

8. *Local Government, Local Community and Resilience*




It was suggested during the thematic discussion that the name of the theme be changed from "Local Community and Resilience" to "**Local Government, Local Community and Resilience**".

Key Problems/ Challenges	Reasons for the problems	Possible solutions
Institutions and Institutional Mechanisms		
Lack of coordinated planned, inclusive action at the local level	• Multiple institutions and multiple lines of control • No clarity on roles and responsibilities • Certain communities left out like tribals, elderly, persons with disabilities (PWDs)	• LSGs to be given the mandate at the local level • Working Group on "Environment, Biodiversity, Climate Change, Disaster" constituted should include

	and responsibilities	representatives from the different communities- *Kudumbashree* and other SHG members, Elderly Groups, Tribals, *TheeraMaitri* etc. • Residents associations, libraries, literacy *preraks*, Community Based Organizations (CBOs) like youth organizations
Limited powers for local self governments at the local level	• Provision in the Disaster Management Act not reflected in the Panchayati Raj and Nagarapalika Acts • Lack of networking • No forward and backward linkages	• The Panchayati Raj and Nagarapalika Acts to be revisited and provisions made for legitimising the spaces and roles of these community based institutions • Ensure upward integration with Block Level and district level institutions, departments, state government, District Disaster Management Authority (DDMA), Kerala State Disaster Management Authority (KSDMA) • These linkages will ensure promoting synergy in utilisation of resources, neutrality, transparency and in effectively combating local level area specific biases and agendas
Challenge in incorporating technical, social and ecological factors into local development and Disaster Management (DM) plans	Lack of capacities at the local level	• Linking with block level and district level expertise available • Developing a list of empaneled experts at block/ district level who can be on call to support planning processes.
Capacity Building		
Challenge to make a local level DM Plan to be a "Living Document"	Lack of capacities for Risk and Vulnerability Assessments, planning for preparedness and mitigation	• Developing a comprehensive list of training modules by Kerala Institute of Local Administration (KILA) and KSDMA. • "Vulnerability/ Risk Assessment" to be

		considered under the list of "non-negotiables", and others as "desirables" eg. risk informed micro-enterprise planning • Local development plans to specify the modules it would like to take up in the DM Plan/ Local Development Plan.
Challenge to make local DM Plans as inclusive and participatory	• Lack of capacity/ awareness at community level. • Disaster Management Teams (DMTs) not formed and/ or capacitated.	• Individuals trained by KILA and KSDMA in disaster management, risk informed planning etc. to guide participatory planning processes • Special modules to be developed for DMT and all DMTs to be trained
Early Warning Systems (EWS)		
EWS, in its present format, not conducive to decision making at panchayat / municipal levels	• Decoding of technical jargon • Lack of clarity on actions to be taken	• Demystifying hazard specific warnings • Linking with actionable points • Standard Operating Procedures (SOPs) for responding to warnings to be evolved at panchayat/ municipality levels based on guidelines developed by KSDMA
Last Mile Connectivity often missing	• Inaccessible areas/ communities • Lack of ability specific EWS	• DMTs to include community specific/ need appropriate members from the community (Tribal Volunteers/ *Kudumbasree* members/ Youth/ Fishermen etc) • Ability specific IEC to be developed, especially for Early Warning Systems, Evacuation Procedures, Camp Management
Too many messages	Lack of clarity in roles and responsibilities	• Guidelines to be developed for early warning systems, triggers for actions like evacuation at state level and disseminated

		• LSGs to adopt/ adapt these guidelines as SOPs for their LSG
Depending on limited communication channels	Lack of awareness on effective utilisation of other media of communication	• Multiple channels of communication to be adopted • Social media to be utilised for effective communication in times of emergency with adequate safeguards in place to minimise confusion/ false information
Loss of productive working days due to generalised information	Predictions not area specific	• KSDMA to provide more localised predictions especially for coastal communities • R&D at state level for micro-level predictions/ trends • Predictions to also take into account the agro-climatic zones specified by the agricultural sector
Lack of clarity on dealing with localised disasters	Guidelines lacking on dealing with localised disasters	• EWS, Response plans to also take into account localised disasters • SOPs to be developed for localised disaster management
Vulnerability Assessment		
Multiple lists available of "Vulnerable families"	• Vulnerability assessment currently sectorally driven • Currently, identifying "vulnerability" is linked with sector specific benefits/ entitlements • Lack of transparency, ulterior motives currently affecting Vulnerability assessment due to its link with entitlements	• Defining "vulnerability" in terms of coping with identified hazards • Parameters to be defined at State level and used by the LSG • These state level parameters to be discussed and approved at Grama/ Ward Sabha • Involve community representatives in Vulnerability assessments • Vulnerability Index to be developed at state level for the LSG to understand their level of vulnerability

Non availability of current data	Prohibitive cost and lack of time required for survey/ data collection for periodic updation by LSG	• Making periodic updation a part of the system • Outsourcing survey/ data collection to *Kudumbashree*/ youth clubs on a payment basis • This activity to be budgeted in the Annual Development Plan of LSG
Confidentiality/ Privacy Issues	Some of the data collected, like Health issues, types of housing, vulnerability assessments, etc. may be sensitive and can be misused for private gains or can even have adverse effects like land prices crashing in areas that are conspicuously marked vulnerable, insurance rates increasing for vulnerable areas and vulnerable people	State to develop protocols on data storage/ utilisation/ sharing etc.
Data, Information and Knowledge Management		
Limited access to wealth of information already available	• Sectoral data not accessible • Confidentiality of information	• KSDMA to collect and collate all relevant and sector specific data • Provide an interactive, query based information portal that LSGs can access for data related to DM Planning
Risk Informed Planning		
LSG/ community not involved in assessing risks of sectoral development interventions	• Spaces not provided, not articulated as their mandate/ right • Lack of capacities	• LSGs to be given the right and responsibility of Risk Audits/ Environment Impact Assessment (EIA) of Sectoral development projects planned • Capacities to be built up for EIA • Skilled human resources to be made available and accessible to support PRIs in Risk audits and EIAs • Grama/ Ward Sabhas to be acknowledged as the representation of the communities and approval of Grama/

		Ward sabha to be taken to ensure "do no harm" approach • But for this to be inclusive, various CBOs need to be involved.
Livelihood and Risk Management		
Livelihood provided by the ecosystem and biodiversity it harbours. Both are exposed to disaster risk if not protected.	• Biological diversity is natural capital of every nation. • Rules and regulations are not followed meticulously.	• Thus, the prime responsibility of any citizen is the protection of ecosystem and biodiversity from disasters and to mitigate when disaster occur. • The protection must be done as envisaged in the environment act (1986) and biodiversity act (2002). • At the local level, BMCs to be strengthened.
Resilient Public Infrastructure		
There is a lack of risk sensitive planning.	• There is no mandatory hazard assessment and related understanding for risk sensitive infrastructure.	• Risk sensitive investment in infrastructure is required. • Public infrastructure may be made and maintained by LSG to be used for rehabilitation centres (located in safe places) when disaster strikes, the same can be used for other cultural event when not in use. • LSG may charge for its use for up keeping the infrastructure ready for use in disaster time. • Similarly public infrastructure needs to be strengthened including school, *anganwadi,* PHC, panchayat office (with essential services such as sanitation).
Finance		
Most of the finance goes to development or relief, not for	There is no mitigation and preparedness fund/ budget	• Availability/ creation of such fund at LSG level.

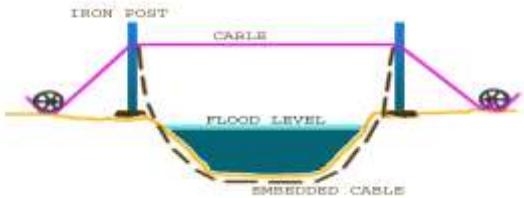
preparedness or mitigation		• Inhabitants/ property in flood (disaster) prone areas are to be insured at all times. • Insurance coverage needs to be ensured across all socio-economic class. • Not only availability but also related education and campaign of microfinance products for vulnerable groups. • Livelihood support to affected people may be ensured which will indirectly enhance local economy.
Social Security		
Interruption in the performance of the social security due to disaster	Risk and hazard assessment of social security is not available/ not linked with implementation.	• Social security continuity planning. • *Kudumbashree* Self Help Groups (SHGs) are to be empowered locally for resilience in terms of budget and capability for social security.
Grievance Redressal		
There is no place for submission of grievance or people do not know of it.	Non-availability and lack of awareness of grievance platform and processes.	Panchayat /LSG level grievance officer should be available and proper mechanism for redressal should be in place.
Mental Health		
• Acute stress reaction • People with existing mental illness • Lack of mental health services at the grassroot level • Long-term mental health issues like depression, PTSD • Substance abuse withdrawal symptoms	Lack of awareness about mental health issues in general public and stigma	• Mental health disaster management teams under District Mental Health Programme (DMHP) in each district. • Training/ capacity building on post-disaster mental health for volunteers, LSG elected representatives, officials, revenue, police, rescue workers etc. • Awareness creation in general public regarding post-disaster mental health issues through IEC. • Regular screening through house visits by ASHAs.

		• Strengthening the Primary Care Health System to deal with mental health issues long-term and Primary Care integration of Mental Health.
Migrant Population		
• Lack of exact data • Language and cultural barriers • Discrimination in camp	Lack of enforcement of existing rules and regulation on migrant workers.	• Strict enforcement of existing rules and regulation on migrant workers. • Provide IEC materials on Disaster Risk Reduction (DRR) in their own languages.
Community Role in Safety Audit		
• No provision for conducting safety audit at present • Non-adherence of rules on safety issues by general public	Lack of clarity on jurisdiction/ responsibility between line departments, roles not clarified.	• Safety audit should be done for all public buildings (schools, hospitals etc.) • Formation of people's committee with experts at local level to undertake safety audit • Awareness creation among target population (residents associations, *Kudumbashree*, other CBOs)

9. Transport, Communication and Technology



Key Problems/ Challenges	Reasons for the problems	Possible solutions

Alternate Routes and Vulnerability		
Absence of alternate routes will result in reducing the accessibility to lifeline facilities	Either there will not be any alternate route or the available one will not be usable	• Based on the flood map being prepared, the routes that are vulnerable may be identified • Geotag all the lifeline facilities in the region and identify the existing routes, and maintain them as all weather roads • If alternate routes are not available, develop alternate routes for the lifeline facilities which are to be planned at a height above the anticipated flood level
Continuity of Business/Multimodal Transportation/Rescue		
The disasters may result in reducing the accessibility and mobility of the residents.	• Washing out of roads • Failure of bridges and culverts • Calamities like landslips/landslides • Flooding of roads • Failure of power lines	• Power Charging systems • Portable bridges • Inflatable boats/ Fibre boats • Hovercraft/ Hydrofoil • Floating Jetties • Hot Air Balloon • Ropeway/ Cable car • Embedded Ropeway for Canals  • Drone/ Unmanned Aerial Vehicles • Development of canal bund roads • Helipads at strategic location • Revival of waterways
Social Mechanism		
• Absence of trained rescue personnel at local level and	• A proper training mechanism was unavailable.	• Formation of Special Task Force and regular updation

public awareness.		• Involvement of local NGOs and public • Involvement, participation and control of local bodies • Involvement of experts • Continued Evaluation • Sustainability to be ensured
Design Consideration		
• Failure of roads, bridges and Culverts • Slope Failure • Failure of bank protection for water ways	• Lack of Designed Roads • Reduction of Vent way at bridge locations in design • Debris accumulation leading to blockade of vent • Lack of drainage layer for roads • Inadequate number of CDs and side drains • Lack of maintenance of roads as well as drains • Inadequate land width resulting in unstable side slope	• Drainage layer should be provided to ensure sub surface drainage. • Design should include adequate number of CDs and side drain. • Additional land spans on either side of the bridges in future construction. • Alignment shall match the topography • Climate resilient pavement to be adopted • Eco-friendly bank protection measures • slope design and slope protection measures • Periodic inspection and maintenance of roads and other assets

Day 2

Session 1: Thematic group presentations

Each of the nine thematic groups presented the outcome of their deliberations to the rest of the groups. Each presentation was followed by a question and answer session which saw the active participation of the audience. This facilitated a discussion which was fuelled by experiences and perspectives from different sectors. The thematic group presentations and the Q&A session was moderated by Dr. Sekhar L. Kuriakose. These inter-sectoral and intra-sectoral discussions further enriched the output of the two-day technical consultation.






Session 2: Valedictory Ceremony

The valedictory ceremony started after the arrival of the Honorable Chief Minister Shri. Pinarayi Vijayan and the Minister for Revenue and Disaster Management Shri. E Chandrasekharan. The ceremony started with an introduction by Dr. Sekhar L. Kuriakose who explained the methods and steps followed during the consultation to the dignitaries. Minister for Revenue and Disaster Management then spoke about the need for building back better with the help of inputs from technical experts to support the legislators and government. Honorable Chief Minister welcomed the effort of the technical experts in coming up with recommendations for *Nava Keralam* which he said shall follow a participatory approach. Holistic solutions shall then be examined and carried forward in order to facilitate the development of the state. He concluded by seeking the expertise of the group members in the times to come. Dr. Venu V IAS concluded the ceremony and delivered the vote of thanks. Chairs and Co-chairs of all groups were given a memento as a token of appreciation.

Way Forward

Detailed review of the key challenges of the sector in relation to the disaster scenario was discussed in detail in the thematic groups. Possible solutions or possibilities were chalked out and concluded as recommendations for the Rebuid Kerala process were concluded. This process was facilitated through a 'Problem Tree analysis' methodology in each thematic group.

Recommendations

Recommendations or future implications by each thematic group is concluded as follows

1. *Land Management*

- Land has multiple uses and therefore there is trade off and choice for wise use.
- Land management is a multi-stakeholder business and it's linked with other sectors.
- Land management decision is not linear, there is temporality and multi-dimensional challenges.
- Participation of the stakeholders at the ground level is essential
- Finally, we suggest looking into WGEEP report and draft land policy proposed by Vijayan et. al (2019) to fine tune strategies and action plans.

2. *Human settlements*

Vision to be adopted:

"Revitalised urban areas of compact form, distributed in a balanced and orderly manner in the entire Kerala, that perform urban functions complementary to the rural hinterland and act as engines of development"

- Selective concentration of urban functions and rural functions through deliberate planning and to have compact urban form for the urban areas so as to contain the urban spread is the need of the hour. In other words the state has to thrive for integrated development of its urban and rural areas.
- Further spreading of developments at the cost of the potential rural lands is not justifiable in the context of low population growth rate. This reiterates the need for containment of urban development.
- As per the urban profile of the state delineated for 2021 and 2031, Kerala is proposed to have three categories of urban areas namely-Urban clusters/urban corridors, isolated higher order urban areas and small urban areas. Future investments in the state shall be streamlined supportive to the urban profile delineated.

- Limiting of the urban spread in Kerala within the delineated urban profile is a must for the conservation of agricultural land, prevention of dilution of rural economy and protection of the fragile eco system of Kerala.
- The land area left over after accommodating our urban areas, forest cover and water bodies is our rural areas where in our potential agricultural tracts are located. It is recommended to put this rural land to optimum utilization.
- Urban profile shall be a part of the general strategy for the comprehensive development of the State. Hence it is recommended to prepare the State Perspective Plan with inputs from all sectors of development and modification, if necessary, may be made in the urban profile formulated.
- Within the purview of the State Perspective Plan, each of the urban cluster/corridor is to be further detailed out through regional plans/inter district plan with planning area as the respective cluster/corridor with its influence area.
- Development Plan regional levels (Metro/ District) and Master Plans for Human Settlements shall be prepared in line with Kerala Town and Country Planning Act 2016.
- Control plot sub divisions in the peri-urban areas to make available large chunk of land for development. A policy backing and planning tools are necessary to conserve such existing lands and to pool such lands for future development
- Kerala is having a very high Generic (Universal/ Global) Floor Area Ratio (FAR) as 4. In other parts of India the Global FAR is 1.5 to 2 is the maximum. Thematic group, therefore, recommended a global FAR of the Kerala Building Rules to reduce to 2.5 as maximum. However, higher FAR may be permitted only through town planning schemes
- State Urbanisation Report (SUR) may be updated and revisit the recommendations in light with recent flood of Kerala, Based on SUR, a settlement policy may be formulated.
- Action plan may be formulated for the preparation for Development plans at regional (District) and settlements levels in the line with Kerala Town and country planning act 2016.

3. Agriculture

- Integrated farming and multi-tier cropping are to be adopted.
- Awareness programmes to be conducted.
- Pulse-based cropping system is to be promoted in entire Kerala.
- Technology mission for horticultural crops.
- Crop insurance for effective sustenance.
- Risk mitigation fund with production incentives
- 5 year planning as decentralised planning.
- Panchayath level micro planning
- Single window approach for famers
- Expanding and strengthening marketing networks
- Enforcing crop calendar to suit changed climate scenario

- Breeding protocol and enhancing production by poly culture and diversification
- Introduction of indigenous species and establishment of brood bank for germplasm conservation.
- Multi-commodity integrated farming system
- Co-ordinated programmes involving all line departments for Integrated Farming System (IFS) development and one stop centre for supply of inputs to farmers.
- Development of environmental surveillance and forecasting system for water bodies. Early warning and fisher friendly mobile app system.
- Fuel efficient solar vessels to be promoted in marine fisheries.
- Enforcement of closed seasons and mesh size regulation to prevent juvenile catch.
- Promoting open water mari-culture, cage farming etc.
- As for the plantation sector (especially, Tea) the following recommendations have been put forth
    - Multicropping with pepper and clove,
    - Promote organic cultivation
    - Fruit crops are suitable for Idukki and Wayanad zones

4. Mining

- Mining has to be brought under the public sector to regulate it in a sustainable manner.
- A mining/ quarrying institute (along the lines of the one in Malaysia) may be proposed so as to offer courses that would scientifically teach mineral technology.
- In order to address the lack of awareness on quarry restoration, necessary specifications and standards need to be set and quarry owners need to be made aware of the same.
- Eco-restoration of quarries could be done through MGNREGS and supported by the technical expertise of the Malaysian faculty.
- A single cadre of geologists from different departments of Kerala could be formed
- Programmes need to be planned according to scientific mining policy draft
- More R&D is required (Eg: To study the impact of quarrying and mining on the ground water table).

5. Susceptible Zones

- Susceptible areas need to be mapped in cadastral scale and zones should be demarcated.
- Communities from highly vulnerable areas should be relocated to stable zones.
- Land use changes in vulnerable areas are to be regulated and indigenous vegetation to be promoted.
- Community based disaster management approach is to be adopted.
- Policy interventions are to be made and strict enforcement of rules to be ensured.

6. Forest Management

- Forests are under pressure from anthropogenic pressures, fragmentation, climate variability, and extreme climatic events. The role of forests as a buffer for reducing risk

from disasters should be imbibed in the political agenda of the State. A holistic landscape level management is important in ensuring the functional quality of the forests, and to avail the ecosystem services uninterruptedly.

- Tree Resources outside the forests are equally important in sustaining the livelihood of the people and to maintain a stable climate system. Cryptic extinction of large trees and their associated ecosystem services are happening across the homesteads in Kerala. Agri-based entrepreneurships, start-ups, and business incubations are important to stop abandonment of land in rural homesteads.
- A pro-active institutional mechanism should be established with qualified hands for revitalizing the forest and tree resources management at the LSGI level.

7. Water Management

Policy should take into account and facilitate the following:

- Establishment of River Basin Authority and Kerala water Resource information system
- Periodic Assessment storage capacity of large lakes, wetlands/reservoirs
- Amendment of Town and Country Planning Act/ Building Rules on physiographical/ land use basis
- Amendment of Ground Water (Control and Regulation) Act 2002
- Establishment of Flood Zone and Drought Zone Maps at Cadastral scale
- Restoration of rivers and streams: *Ini Njan Ozhukatte* by Haritha Kerala Mission
- Regulation of subsidy on power usage based on crop water requirement
- Establishment of reuse and recycling plants at multi-storeyed buildings with dual plumbing systems
- Establishment of rainwater systems in all buildings for well recharge
- Usage of abandoned quarries for rainwater harvesting and community water recharge schemes
- Waste Management Policies: Draft Guidelines to be finalised. Need Convergence of agencies

8. Local Government, Local Community and Resilience

- Moving forward with LSG level DM plan and actions is necessary.
- LSG level DM plans need to be integrated with LSG Development Plans.
- Backward and forward linkages with all levels need to be ensured.
- Vulnerability mapping should be participatory.
- All development plans should take into consideration, the environment, climate change, biodiversity, vulnerabilities, hazards etc.
- Appropriate protocols and guidelines are to be issued.
- Early Warning Systems need to be augmented so as to provide timely accessible information.

- Grievance redressal mechanism should be strengthened.
- Communities are not homogenous. LSG should bring all of them in through various platforms (working groups, DM teams, Gram/Ward Sabhas, Kudumbashree, libraries, literacy groups, other CBOs)
- A mechanism for regular consultation, feedback, community led monitoring and evaluation should be in place.

9. Transport, Communication and Technology

- Upkeep and maintaining the transport infrastructure of the state to provide unhindered accessibility in the event of any disaster is the need of the hour.
- Since substantial investment is needed in this sector, careful planning, designing, construction and maintenance are needed.

Outcome of the discussions

The *Nammal Namukkayi* technical consultation provided a platform to bring various inter-sectoral as well as intra-sectoral challenges to light. The nine thematic discussions allowed for deliberation of concerns and solutions among the different departments involved in the respective thematic area, practitioners and academicians. It has paved way to a wide range of possible solutions and recommendations which could be broadly classified into:

- Policy level interventions;
- New legislation and amendments to the existing ones;
- Strengthening of existing institutional systems;
- Revival of appropriate traditional systems and encouraging sensible innovation;
- Capacity building of stakeholders at various levels; and
- Aligning of solutions with the larger framework of climate change adaptation.

These inputs shall then feed into the Rebuild Kerala Initiative and augment the larger idea of building a resilient *Nava Keralam* through.

Annexures

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