

PAMPA RIVER REJUVENATION PLAN-2030:
A People's Framework for Action Projects
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Background

1. The Pampa River in Kerala is sick to the extent that most of its vital ecological services are in a continuous state of decline! Despite several attempts from the part of government and non-governmental actors to rejuvenate its health, Pampa is being polluted more and more, and its feeding flow channels and the flood plains become narrowed and/or choked or in an altered state. According to various scientific studies, the vegetation and biodiversity of the catchment areas, instream and river banks of Pampa have severely degraded and it has impaired the natural environmental flow health of this river. Under the business-as-usual scenarios, this situation can worsen and the people of Kerala may lose this river in its pristine configuration and flow forever!
2. This Framework Action is formulated through consultations and meetings conducted at various levels with different stakeholder groups, mainly local community men and women engaged on a day-to-day basis in Pampa River utilization. The Plan sets out several strategies for practical actions that are of balancing the multiple roles of the Pampa River and the multiple objectives relating to specific human needs and natural river functions.

The purpose

3. This Plan is to provide insights and on-ground action targets based on a strategic system-based approach by recognizing physical, ecological, socioeconomic, cultural, and political aspects in Pampa River management. The strategies proposed will be of help to identify and respond to various links in the river system restoration portfolio for this river between external drivers, catchment and river functions, river health, ecosystem services, and societal priorities. The Plan is also to contribute to formulating specific action steps required to align and synergize various policies, strategies, and project-level plans already available in the state to restore Pampa, specifically to facilitate executing the powers and the key functions outlined in the Pampa River Basin Authority Act, 2009.

Conceptual Framework and Restoration Theory

4. River restoration is defined in this Plan as “the man-assisted recovery action of the ecological, socio-economic, and cultural roles and functions of a degraded, damaged, destructed, or abused river ecosystem”. The hitherto approach of responding to the single issue of water quality of the Pampa River in the rejuvenation plan has been shifted to a more inclusive approach that addresses the total quality of river health. The approach suggested here is based on multi-dimensional aspects of river health such as the *ecological*, consisting (i) river catchment area integrity; (ii) river channel configuration; (iii) river biota diversity and richness; (iv) river floodplain area and services; (v) river environmental flow intensity, (vi) river water quality, *the socio-economic and cultural*.
5. The Framework concept considers the fact that a river system consists of several components and utility aspects. The main river body that originates from the headwater source gets modified by its tributary streams, oxbow lakes, and flood plains, including the

groundwater table of the area to the delta and estuary in the river mouth region, and above all by the local community who depend on this system. It also recognizes that these components together with their relationship fabric function in totality, and it varies in the upstream, midstream, and downstream course of a river.

6. It acknowledges that the physical, chemical and biological processes of the river system components drive river health in totality and a scientific understanding of this performance is very critical in effective restoration measures. The word 'rejuvenation' is preferred over 'restoration' considering the fact that it will be challenging and uncertain to restore the original configuration and nature of this river ecosystem whereas it is feasible to vitalize or revive many of its "lost" functions and services.
7. Further, the framework theory broadens that working at the appropriate scale to address the limiting factors to river health in restoration is very critical and thus a coordinated delivery of planning, implementation, and monitoring is needed with both regional and local-scale delivery capabilities. Therefore, the role, traditional knowledge, and capabilities of the local community including their Local Self Government Institutions to ensure the delivery, monitoring, and sustainability of the restoration outcomes are fully recognized in framing up the targeted actions. It accepts that linking restoration with the socio-economic values and considering the priorities of various user groups of the river, and involving them from the beginning of planning is very critical for a strategic river restoration plan.
8. The proposed processes and action cover both *active restoration steps* -the physical changes needed, and *passive restoration steps* -the policy and behavioural changes required for river restoration. The goals and targets are framed by considering factors of possible changes to ecosystem functioning and the provision of ecosystem services as well as the socio-economic needs. The Framework also has taken into account the importance of building resilience to future changes in the river landscape over time due to changes in climate, hydrology, land use, and pollutant loads. The latter two aspects are expected to change to their extreme level in near future considering the pressure from the fast-growing pilgrimage and infrastructure development in the pampa river basin.

Pampa River

9. Pampa is the third-longest river in Kerala after Periyar, spanning about 176 km in total length and enriched by 13 tributary streams (Azhuthayar, Kakkiyar, Kakkattar, Kallar, AadhiPamba, Varattar, Kuttemperoor, Utharappally, Kolarayar, Njunungar, Madatharuvi, Kozhithodu, and Thanungattil thodu). The river, which emanates from Pulachimala on Peerumedu upper plateau of the Idukki district and flows through the midlands of the Pathanamthitta district, enriches the lowlands of Alappuzha-Kuttanadu, and eventually drains into Vembanad lake that joins the Arabian sea. The Pampa River is famous mainly for its sacredness associated with the Sabarimala Temple and Maramon Church pilgrimage. It is also known as the '*Dakshina Bhageerathi*'. Millions of devotees visit Sabarimala to carry out the ultimate ritual 'The Holy Dip' every year with the act of disposing of their clothes in the flowing river tainting the river significantly. Due to modern agricultural practices along the river basin and floodplain regions from the midstream to downstream areas, excess pesticides, herbicides, and fertilizer effluents are being discharged into the river, eventually ensuing in heavy metal accumulation, eutrophication, and algal blooms. There has substantial degree of sand mining been happened from the riverbanks of Pampa.

Goal and Targets

10. The Pampa River Rejuvenation Plan presented here has been proposed with one long-term goal and 10 restoration action targets that are to be achieved by 2030 through a mission mode implementation by the respective Local Self Governments of the Panchayaths along the pampa river corridor plan under the guidance of a dedicated cross-disciplinary team.

Goal 2030: Rejuvenation of Pampa River System health

11. Rejuvenation of Pampa River System health is ensured with enhanced quality of currently declined ecosystem services including the aesthetic functions, intact structural composition, balanced catchment, and environmental processes, supporting flow regime, connectivity, desired water quality, and rich habitat and biota diversity as well as the reduced rate of waste dumping, encroachment, invasion of alien species.

Table: The typology of measures suggested for the Pampa River restoration

River Ecosystem component	River restoration measures	Resultant changes
<i>Catchment area</i>	1. Catchment area land use-landcover management	<ul style="list-style-type: none"> Water percolation and recharge capacity of the ground improved; The quantity and quality of water and other matter that enter the river channel changed.
<i>Flow regime</i>	2. Flow modification	<ul style="list-style-type: none"> Flow volume, timing, frequency, and duration changed
	3. Stormwater management	<ul style="list-style-type: none"> Flow pattern and storage of runoff water changed
	4. Dam removal/retrofit	<ul style="list-style-type: none"> Movement of sediments, flow pattern, and biodiversity functions like breeding behavior of species improved
<i>Flood plain</i>	5. Land reconnection	<ul style="list-style-type: none"> Reduced flood risks Increase assimilation of pollutants Movement of sediments, other matter, and biota between the channel and floodplain improved
	6. Land acquisition	<ul style="list-style-type: none"> Acquired the encroached floodplain land to improve the floodplain functions
<i>River channel</i>	7. River bank protection	<ul style="list-style-type: none"> Reduced erosion and slumping off bank material into the river
	8. Channel re-configuration	<ul style="list-style-type: none"> Increased hydraulic diversity, habitat heterogeneity, and decreased river channel slope.
	9. In-stream habitat improvement	<ul style="list-style-type: none"> Enhanced biodiversity-friendly habitats
<i>Riparian habitat</i>	10. Riparian species management	<ul style="list-style-type: none"> Improved diversity and richness of the Keystone riparian species
<i>Biodiversity</i>	11. Instream species management	<ul style="list-style-type: none"> Improved species diversity and richness

	12. Removal of invasive species	<ul style="list-style-type: none"> Improved native species diversity and water quality
<i>Water quality</i>	13. Water quality management	<ul style="list-style-type: none"> Improved water quality and reduced chemicals and particulate load
<i>Other (eg. Cultural)</i>	14. Aesthetics and Recreation management and education	<ul style="list-style-type: none"> Increased community value, access to, and knowledge of the river and riverine ecosystem.

Source: Adapted from River Restoration: A strategic approach to planning and management by the United Nations Educational, Scientific and Cultural Organization 7, place de Fontenoy, 75352 Paris 07 SP, France © UNESCO 2016

Pampa River Rejuvenation -2030 Action Targets

12. A set of 10 action-oriented restoration targets are suggested by covering some 14 river ecosystem health components (See Table). Each of these measures is detailed with the necessary ground-level action required specific to the Pampa River. However, specific detailed actions that are required to synergize other relevant plans of the state-specific bodies like the Water Authority, the Disaster Management Authority, and of the proposed Kerala River Management Authority need to be formulated to reach these targets.

Target 1. Practice science-based Catchment area Land use-landcover management of Pampa

13. Ensure that the physical, chemical, biological, and socio-economic impacts on the Pampa catchment areas are reduced through strict enforcement of the law and regulations and make sure the authorities have good control over the negative behavior from the part of the user groups on the protection of the original vegetation, land use, and land cover profile. Undertake widespread education among the community live in close to the catchment and river corridor to convince them that any negative efforts on their part eventually affect the river's health and an unhealthy catchment can cause an unhealthy stream and eventually unhealthy people. With people's participation, the essential factors of a healthy river catchment area such as good geological conditions, climatic conditions, the chemistry of river water, the texture of the soil, etc. to be managed with a science-based package of practices, and thereby the water percolation and groundwater recharge capacity, and the quantity and quality of river water are improved.

Target 2. Maintain an optimum level for the Pampa River Environmental Flow regime

14. Ensure that the floodplains, catchment areas, river channels, vegetation cover, and the other physical features of Pampa together with its 13 tributaries all along the 176 KM stretch of length have been managed scientifically based on a well-defined package of practices and help positive influence on the water flow. Need to build adequate awareness among the enforcement officials as well as the public on the stormwater management, frequency, duration, and size of hydrological events (flood and drought), range of precipitation, seasonal discharge, etc in addition to the change in the physical features of drainage basins (like the dams, weirs, land use, and lifting large amounts of water for irrigation) that lead to changes in flow regimes. The activities in this targeted area will have to ultimately improve the flood and drought water management, movements of no hazardous sediments, healthy flow patterns, and healthy water life.

Target 3: Ensure improved Floodplain functions of Pampa

15. Ensure that the disconnected floodplain lands of pampa get re-connected and its encroached land gets reacquired and altogether stopped any further encroachment of the floodplain. The floodplains must be maintained in their natural conditions to improve the multiple functions of this habitat such as reducing the flood risks and increasing the assimilation of pollutants by controlling overbank floods, and lateral erosions. The floodplain land use for agriculture, infrastructures and other human activities must be stopped completely. Extensive loss and damage to the floodplains of pampa have already happened by the developmental activities including human habitations along its corridors. The management of flood plain has to be promoted as a community-based effort to cause changes in water quality and the recharging capacity of the aquifers. The rich nutrients, sufficient water quantity, and sustainable biological productivity by the availability of organic matter from the littering of vegetation attract farming in the floodplain areas. But on the other side, the floodplain land used for agriculture or other farming purposes will lead to the degradation of the environment due to the change in natural ecosystems. So, this trade-off has to be tackled prudently.

Target 4: Protect the geomorphology and hydrology of the Pampa River channel

16. Ensure that the disturbance and degradation that continuously occur in the downstream aquatic environment of Pampa become less severe and that changes in the geomorphology and hydrology of the channel due to sand/sediment/clay deposition frequency and slope of the river are reduced. The physical form of the pampa has changed and its riverbed slope has decreased over the years because of the deposition of sand and clay, which reduced the velocity of stream water flow of this river. Necessary steps like river bank protection by using locally adapted methods including natural barriers in longitudinal connectivity, and maintaining the habitat heterogeneity with enhanced instream biodiversity as well as control over the physical form stressors that adversely influence the health of this river channel will have to be urgently taken up. Implementation of such measures would help to control the instream free flow, riverbank erosion, disturbance in the river bed, deposition of materials, sediment transfer, and the barriers in longitudinal and lateral connectivity.

Target 5. Maintain a scientific portfolio for Pampa riparian vegetation management

17. Ensure that the historically present rich buffer zone along pampa river corridors has been restored scientifically by following the principles and practices recommended by restoration ecologists with suitable native riparian forest tree species which act as the major source of shelter, food, and shade for macroinvertebrates, periphyton, fish, riparian species of birds, diatoms, freshwater algae, etc.

Target 6. Ensure a rich river biota is maintained across the Pampa riverine ecosystem

18. Action steps are urgent to maintain a sufficient quantity and diversity of river life across the pampa riverine system to assess its health as many of them are the most suitable indicators for river health assessment. The management action steps will have to lead recovery and conservation of all the historically available species in this river with a sufficient level of genetic diversity in each species. Along with this intervention, steps are also urgently needed for the removal of the invasive species, which have already a big menace in many of the lower pampa river region affecting the water quality and paving way for the destruction of innumerable forms of instream plant and animal life, mainly species of families, *Gentianaceae*, and *Nymphaceae*, and fish, reptiles, and mollusks.

Target 7. Ensure water quality and reduced chemicals and particulate load to Pampa

19. It is urgent to place an effective water quality management and monitoring system for this river as this is the most critical aspect because the water quality turns out to be poor, especially during summer months, and in the case of downstream areas almost all the time. The poor water quality condition is mainly due to the increased amount of nutrients that come from runoff, leaching, and erosion from the fertilized agricultural area in the floodplains, effluent from industries, pilgrimage, and household, sewage waste, detergent waste, etc. Eutrophication in the lower stream areas because of the increased level of nitrogen and phosphorus compounds in water becomes a major problem, which adversely affects the natural environmental process and causes the depletion of oxygen in the water, and eventually, this condition creates a non-suitable environment for aquatic life. The common measurement indicator should be improved water quality and reduced chemicals and particulate load.

Target 8. Revive and enhance the cultural heritage functions of Pampa

20. Ensure the aesthetics and recreation aspects of this river and the cultural role and heritage functions of various faiths and communities in connection with the pampa river system are revived and enhanced. This approach will be of help to attract wider societal support for the rejuvenation action. The ongoing culturally significant events, festivals, and rituals to be done in an ecologically responsible manner, and the local community families to be incentivized for their role in the protection and upkeep of the river in its optimum health in their geographic boundaries.

Target 9. Revive the socio-economic development role of Pampa

21. Revival of the socio-economic development role of the pampa river is ensured through the formulation and implementation of environmentally responsible and biodiversity-compatible livelihood development projects including community-based river tourism. Such a project can be developed by the Local Self Governments of the Panchayaths along the pampa river corridor and contribute to the localization of each of the relevant global Sustainable Development Goals.

Target 10. Research, Education, Public Awareness, and Communication around Pampa

22. Research, Education, Public Awareness, Communication, and Capacity development with a focus on the local youth in particular, Media, and Political party leaders to ensure the rejuvenation outcomes of the Pampa River Ecosystem are sustained over the long-term through consistent exploration, monitoring, and reporting. Science-based assessment and long-term monitoring of the conditions of this river will help to build a knowledge base for making rational decisions for the rivers in general in Kerala, and for better monitoring as well as for adaptive management, especially in the light of climate change. School and College students are attracted to the pampa rejuvenation plan by organizing them through appropriate mechanisms and events.

Target 11. The Resource mobilization and Implementation support mechanisms

23. The importance of mobilizing the required funding support for achieving the above 10 targets is immense. The funding support for Pampa activities till recently has been largely through the plan funds of the state government and to some extent that of the LSGs of the respective Panchayaths for pollution management. The Fundraising should be against each of the proposed 10 high Impact Target Areas of river health, and in line with the sustainable development and climate mitigation priorities and agenda of the government of India. An **Implementation support team** headed by a senior-level River health expert with suitable

subject area personnel including community leaders as members to be constituted with the objective of long-term monitoring including raising funds from national and state governments, private industries, international donors, and the general public is urgent. It is crucial for this team to work with a clear division of tasks, set timetable, outcome indicators, and appropriate reporting mechanisms.

Conclusions

24. A healthy river Pampa can provide multiple benefits to the community through its societal, ecological, cultural, and economic values. The strategic targets that are built upon the understanding of the complexity of the relationship between river health and social benefits in river management will help to formulate scale-specific DPRs for reviving the healthy multi-potential pampa river. If we fail to see the system perspective and complexity of the relationship of the individual components in the river functions and management, it can only lead to further degradation and destruction of this riverine system, and greatly impact vulnerable communities such as smallholder farm families, the indigenous people, and those multi-user groups who depend on this ecosystem. It is suggested to campaign among individual households, Grama Panchayats, Block Panchayats, District Panchayats, various Departments of the Government, the committed NGOs, and civil societies, to individuals who have an interest and commitment to attract the attention of higher administrative authority of both the state and central governments for mobilizing necessary resource support for the implementation of this Plan.

Prepared/endorsed by a collective consisting of the representatives of:

1. Elected members of the LSGs
2. Community & NGO Leaders
3. Representatives of cultural groups
4. Officials of the Water Authority, DMA, and Health department
5. Media
6. Students and teachers
7. Scientists and Scholars

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