



# POLICY BRIEF



**CARIAA**  
Collaborative Adaptation Research Initiative in Africa and Asia

DECCMA



**HI-AWARE**  
Himalayan Adaptation, Vulnerability and Resilience Research

**ASSAR**  
Adaptation at Scale in Semi-Arid Regions

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## CLIMATE ADAPTATION POLICY

### Key Findings and Recommendations

#### CONTEXT

The Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), a five-year research program (2013-2018), is targeting communities through the “hotspots” approach to help the most vulnerable and towards building resilient communities and systems. CARIAA is currently operating in three different hotspots in Africa and Asia, namely, Semi-arid regions; Deltas; and Glacier and snow-pack dependent river basins, and this research is being operationalized in India through three different consortia.

The main aim of the CARIAA research program in India is to, through rigorous research, inform adaptation policy and planning; at all levels. Our aim is to provide theme based, sectoral, cross-sectoral recommendations; which would be complementary to the existing adaptation policy architecture. The Intergovernmental Panel on Climate Change (IPCC), through its most recent Assessment Report 5, has emphasized huge impacts of climate change, and has recognized adaptation as central to climate change policy, partly due to large-scale differential impacts experienced by vulnerable populations. Having evolved from a narrow biophysical-based vulnerability to include the social dimensions of vulnerability, adaptation planning; in the emerging climate policy discourse in recent times, emphasizes mainstreaming climate change adaptation in development and thus argues for including climate risk and adaptation as a key element of the development process. In India, adaptation has been rooted in the development agenda and through various instruments like the National Adaptation Programmes of Action (NAPAs), the National Action Plan on Climate Change (NAPCC) and the State Action Plan on Climate Change (SAPCC).

## ADAPTATION IN THE SEMI-ARID REGIONS (SARS) OF INDIA

### Key findings and policy recommendations:

#### FINDINGS FROM KARNATAKA

#### Adaptation Planning to be enlarged from a narrow perspective towards a regional agenda

Climate-related vulnerability directly impacts material and subjective well-being across the Rural-Urban Continuum (insight based on the analysis in the Bangalore sub-region). It has been identified that,

in addition to climate drivers, structural drivers of vulnerability directly impact material and subjective wellbeing across the entire rural-urban continuum; partly driven by historical disparities.



#### KEY RECOMMENDATIONS:

- For urban development policies to be effective and inclusive, they require a deeper understanding of the nature of informal settlements — dimensions of differential vulnerability, particularly across multitude of social categories, the various actors involved, and the roles of social networks, local associations and social cohesion.
- Infrastructure, road and transport facilities should be improved to enable people to commute to their workplaces, thereby easing the absorptive capacity of the cities (particularly for rural areas that are not far from major urban centres).
- Viable employment options in rural areas should be developed through the strengthening of rural livelihoods and/or the natural resource bases upon which these livelihoods depend.

#### Land-use and livelihood transitions observed in peri-urban Bangalore

Within the peri-urban regions, rapid land use shifts and changing gendered norms has been observed to shape the livelihood transitions of these areas. The response to these changes have been in the form of adjusting, coping, adapting (e.g. livelihood diversification, migration, pooling resources, accumulating assets). Hence to reduce vulnerabilities, there is a need for introducing policies that protect local access to jobs. Welfare protection, such as support structure for women, is imperative. Additionally, skill development for better permeability into the job market in these transition regions and nearby urban centre, is important to support adaptation.



Livelihood transitions in peri-urban Bangalore

#### Policy Recommendation: Overview of enablers to Local adaptation

Table 1: Enablers to Local Adaptation in Bangalore sub-region (which includes districts of Gulbarga and Kolar)

RURAL AREAS	URBAN AREAS
<p><b>LOCATION</b></p> <ul style="list-style-type: none"> <li>• Access to markets (either by living close to them or by owning vehicles) enables better returns from agriculture.</li> <li>• Proximity to district headquarters enables greater awareness due to better information flows and market access.</li> <li>• Proximity to Bangalore (or major economic center) allows people to commute to diversify livelihoods.</li> </ul>	<p><b>RECOGNITION AND LENGTH OF RESIDENCE</b></p> <ul style="list-style-type: none"> <li>• Older settlements and legally notified settlements have better participation in local governance process, better access to basic services.</li> <li>• Education enables opportunities for secure jobs and increases awareness of rights.</li> </ul>

<p><b>INFORMATION &amp; ENABLING POLICY ENVIRONMENT</b></p> <ul style="list-style-type: none"> <li>• Peer-to-peer, network-based information sharing through mobile phones amplifies formal communication channels.</li> <li>• Dedicated government schemes on agriculture, watershed development and employment generation is building generic adaptive capacities.</li> </ul>	<p><b>SOCIAL FACTORS:</b></p> <ul style="list-style-type: none"> <li>• Kinship networks and employment contractors provide migrants with critical services to help them cope with disruptions in livelihoods</li> <li>• Local associations play an active role in empowering households in formal and informal settlements</li> </ul>
<p><b>SOCIAL AND FINANCIAL FACTORS</b></p> <ul style="list-style-type: none"> <li>• Social networks help gain entry into jobs, especially for migrants.</li> <li>• Credit facilitation through village-level self-help groups enables savings and, in some cases, more agency to women</li> </ul>	<p><b>OTHER ACTORS:</b></p> <ul style="list-style-type: none"> <li>• NGOs/ civil society/ citizen action groups intervention in certain settlements has led to increased awareness about rights, improved literacy rates and acts as a pressure group on the government</li> </ul>

### Water Governance:

Water shortage, plummeting groundwater levels, unchecked abstraction of groundwater with implications for farming and allied activities and thereby, impacting livelihoods has been extensively studied. Understanding local water governance as an analytical inquiry was carried out, which generated certain key insights.

Key findings	Recommendations
<p>Poor capacity within line departments as a key barrier to implementing water-centric schemes</p>	<ul style="list-style-type: none"> <li>• Regular skill-based, project specific trainings (design, budgeting) for staff</li> <li>• Capacity building for technology use: training staff to use modern communication tools, basics of GIS for better co-ordination and improvement in implementation of schemes.</li> </ul>
<p>Data for effective implementation and monitoring</p>	<p>Baseline data needs to be collected, updated and incorporated in decisions with regards to drilling, particularly with regards to government initiated public water supply projects. Also, better understanding of local hydrology is needed for effective management of groundwater resources in water stressed districts like Kolar.</p>
<p>Public awareness</p>	<p>More investment in public broadcast avenues such as local community-led radio programs, village level discussions for enhancing awareness about water-based public programs and larger issues of rural development and challenges.</p>
<p>Improving human development (technical) capacity</p>	<p>Leveraging on the private hiring sector (consultancies) to re-energize the people-capacity landscape in local government institutions and emphasize on specialized skills and clear incentives, coupled with visions of clear career trajectories to ensure skill retention.</p>

## FINDINGS FROM MAHARASHTRA

Watershed Organisation Trust led the research work in the Sangamner semi-arid sub-region.

Key Findings are listed below:

### **Differential vulnerability to climate change is experienced by communities in Ahmednagar and Aurangabad districts of Maharashtra**

Differential vulnerabilities exist across the various landowning categories, as well as among the different social groups within a farmer category in Ahmednagar and Aurangabad districts of Maharashtra. There has been a significant shift to high external input and water intensive farming systems in the region with dependence on groundwater.

A down-scaled assessment of groundwater vulnerability in selected villages in the Mula Pravara sub-basin of Maharashtra indicated that majority (i.e almost 87 %) of the region falls into 'high' to 'extreme' groundwater vulnerable zones. In such areas, use of inefficient and unsustainable irrigation practices like flood irrigation should be reduced.

Advent of farm ponds converted into storage tanks in Maharashtra in these vulnerable areas wherein groundwater is pumped out to fill the tanks resulted in further extreme stress on groundwater availability in the hard rock aquifers. Therefore, Gram Panchayat (village governing body) needs to proactively engage in monitoring and regulate extraction of groundwater to store in farm ponds as well as size of farm ponds. Farm ponds should only be used for harvesting rainwater and farming of water-intensive crops, such as sugarcane and sweet lime, should be avoided.



Farm Ponds in semi-arid Maharashtra

### **Heat stress accentuates the vulnerability of local rural communities of semi-arid Maharashtra**

There has been an increasing trend of heat wave related deaths in the last few decades. Future climate projections for India indicate that heat waves will likely be more intense, have longer durations, and occur more often and earlier in the year. Population in the age group of 31-59 years (Exposure to outdoor heat stress); women, children and elderly (Exposure to indoor heat stress) are the most vulnerable to impacts of heat stress. It was identified that the type of livelihoods and housing structures influence the exposure to heat stress i.e. tin roofed houses were more prone to heat stress. Apart from improving housing structures and preventing exposure due to certain livelihood practices, an appropriate health response mechanism should be set up.

### **Climate smart agriculture through agro-met services that are responsive to farmer needs**

Mobile based agro-met services play an important role in crop risk management. In the context of response of farmers to the advisories, there were differences depending on the type of crop grown. Some crop advisories received greater positive responses in terms of adoption as compared to others. Weather advisories had good uptake irrespective of type of crop (food or commercial). Among the advisories pertaining to fertilizer application, there was high follow up in case of advisories for application of DAP and complex fertilizers in case of onion and less in pearl millet. The content of specific advisories needs to be relevant to the location and to the specific crop to make an advisory system demand driven, that is based on farmer's needs.

### **Inclusion of Local Aspirations in the Village Development Plans illustrated through case studies from rural semi-arid Maharashtra**

The priorities of the communities are influenced by resource endowments of the village, awareness regarding the programmes and schemes of government, literacy and major occupations. Health care, sanitation, education and employment opportunities were most commonly identified priorities of the communities. In most of the cases, it was found that the GPDs reflect priority needs of the communities even though the satisfaction levels of the community members differed across the villages based on the quality of execution on the ground. In the context of local level governance, even though there are women sarpanches (under the reserved quota), the decision making in many cases still vests with men (such as the husband or the vice-president). Illiteracy and lack of knowledge about the roles and responsibilities hinder active participation of women in governance. Over burdening of gram sewaks (because of one single gram sewak catering to multiple villages) hampers smooth execution of programmes and schemes. Hence, it is important to understand whether the local governance mechanisms sufficiently address the needs and priorities of the local communities, especially in the context of village development plans and to identify constraints in functioning of village level institutions.

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### **FINDINGS FROM TAMILNADU (Moyar-Bhavani semi-arid sub-region)**

#### **Barriers and Enablers of vulnerability in Moyar-Bhavani Region:**

Groundwater (GW) overexploitation is endemic in Moyar region and has led to serious and widespread consequences at the HH and community level. A complex interplay of a range of barriers and enablers is emerging from the Bhavani region.



Table 2: Summary of key barriers and enablers in the Moyar-Bhavani SARs

BARRIERS	ENABLERS
<b>Physical and biological:</b> Depleting groundwater, increased surface runoff, and decrease in the number of tanks.	<b>Physical and biological:</b> Better road connectivity and infrastructure, Technology in agriculture
<b>Economic and financial:</b> High level of indebtedness, depleting asset base.	<b>Economic and financial:</b> Increased availability of jobs in industry, women's participation in the workforce.
<b>Institutional:</b> Unstable governments, decreasing support through welfare programs.	<b>Institutional:</b> Increase in participation of marginalised groups (SC/ST) in politics, spread of social enterprises.
<b>Informational:</b> Widespread unavailability of spatially relevant weather data, elite targeting of information programs.	<b>Information:</b> Widespread availability of cheap technology (mobiles and televisions)

#### Gendered costs of borewells in Moyar-Bhavani Region

- Borewell drilling has impacted women's assets, including livestock and gold and contributed to high level of indebtedness in the region.
- Shifting cropping patterns and changing divisions of labour:
- The expansion of groundwater irrigation has facilitated the shift to cash crops; this entails gendered costs and risks.



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## ADAPTATION IN THE “DELTA” CONTEXT IN INDIA

### ADAPTATION IN THE INDIAN BENGAL DELTA

Indian Bengal Delta (IBD) has less evidence based documentation on adaptation practices. The stakeholder perception about adaptation is not clear, often misinterpreted with development activities. There is strong absence of appropriate climate adaptation policy and role model from action-research in IBD. Information and clear understanding about nature of climate change and consequent adaptation is less in IBD (according to literature survey and stakeholder consultation), while from house-hold survey, a long list of adaptation activities was discovered.

The preliminary understanding on adaptation in IBD was generated from literature survey and stakeholder consultation and the findings are as follows:



Integrated farming with man-made ponds for rain water harvesting

Table 3: Preliminary understanding of Adaptation from secondary data

Sector	Issues	Adaptation practices	From Literature survey	From Stakeholder feed back	Un-/Successful (from both the literature and stakeholder feedback)
Agriculture	Loss in agriculture	Introducing salt tolerant crops	High	High	Unsuccessful (so far)
		Land conversion to aquaculture	Moderate	Low	Somewhat unsuccessful; further conversion to Brick Field
Infrastructure	Embankment breaching: Flooding and salt water intrusion	Embankment construction and maintenance (with introducing new protective materials)	High	High	Somewhat successful; needs continuous monitoring
Health	Limited health support facilities	Floating dispensary/medical unit	Moderate	Low	Not sure; short term benefits
Energy	Energy (Electricity)	Solar energy	Moderate to High	High	Somewhat successful

### Key Issues pursued

The IBD communities resorted to practicing varied adaptation options, either planned or autonomous, in response to climate change. Among the 21-observed adaptation options selected for the household survey in IBD, the most effective adaptation options are moving to a new house, Government or NGO assistance, climate tolerant crops, fishing new breeds/used new breeds in ponds and mixed farming/fishing production. Top five adaptation from adaptation inventory of IBD are not matching with the top five successful activities found from HH survey

## ADAPTATION IN THE MAHANADI DELTA

Communities within the Mahanadi Delta undertake a range of adaptation options, from planned to autonomous in response to climate change. From the survey results, 21 observed adaptations options were identified in the region. Amidst the 21-observed adaptation options, the most effective adaptation options include fishing new breeds/used new breeds in ponds, moving to a new house, training, protection measures, Government or NGO assistance and climate tolerant crops.

Sector	Adaptation Interventions
Agriculture	Crops (diversified/reduced variety), Climate tolerant crops, Fertilizer (increased/decreased), Irrigation (put in/taken out), Mixed farming/fishing production, Farming or fishing tools/equipment, Training (farming/fishing skills methods), Insurance, Loans and Cooperative - <b>(Sending area survey)</b>
Water Resource Management	Renovation of Canals, Construction of embankments, Water Councils (Pani Panchayat)- <b>(From Stakeholder meetings at the state and district level)</b>
Disaster Risk Reduction	Protection, House(Modification/Improvement) - <b>(Sending area survey)</b> , Disaster linked Insurance
Coastal Zone Management	Planted trees around Home- <b>(Sending area survey)</b> Construction of geo-tube to prevent shore-line erosion
Education/Research/Skill Development	Plumbing training and other skill driven initiatives' (such as coir-based products)
Forestry/Aquaculture	Fished new breeds/used new breeds in ponds- <b>(Sending area survey)</b>
Alternative Livelihood	Using hired labour, Women (working outside the village), Work outside the village, Returned Migrant (come back permanently) - <b>Sending area survey</b>

## Key Recommendations

INDIAN BENGAL DELTA	MAHANADI DELTA
<p><b>KEY POLICY RECOMMENDATIONS:</b></p> <p>The highest level of sensitivity to climate change impact in IBD is in 'agricultural sector', that is connected with 'embankment failure'. People are able to cultivate only during monsoons. Dry season cultivation is absent owing to lack of irrigation facilities despite high occurrence of rainfall. Owing to the shifting of rainfall pattern and increased salinization (due to embankment breaching and consequent inundation), there is a sharp decrease in agricultural yield. The increased cost of fertilizer and agricultural labour coupled with unavailability of labour force in the locality is leading to a serious decline in agricultural business. Additionally, sporadic marketing opportunities for retailing excess yield is creating reluctance in this activity. Thus, projected policy intervention need to focus on promoting agriculture with proper seed, adaptive water management, embankment stability and marketing facility for the IBD.</p>	<p><b>KEY POLICY RECOMMENDATIONS:</b></p> <p>The most sensitive sector within the Mahanadi Delta is the agriculture sector. Thus, policy interventions should be directed towards strengthening and scaling up of adaptation activities around agriculture, starting from climate tolerant crops, irrigation, crop insurance, cooperative and training activities of those who are engaged in agriculture. The percentage of kutcha house (earthen house) is very high in the hotspots, especially in Kendrapara and Bhadrak districts in Mahanadi Delta(MD). Thus, more concrete housing is desirable. The availability and potability of river water should be an important part of water resource management</p>

**KEY TAKEAWAYS ON POLICY RESEARCH:**

The policies of sectors like agriculture, water, energy do not have a linkage towards climate smart disaster risk management. Those are more sector specific, and isolated in function, with least thrust on climate change adaptation strategy. There is little or no benefits from the ongoing Government schemes like National Rural Livelihood Mission (NRLM) and Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), towards a more efficient adaptive and resilient society. Strong absence of effective Disaster Risk Reduction (DRR) initiative has emerged as a strong barrier towards efficient adaptation practices.

**KEY TAKEAWAYS ON POLICY RESEARCH:**

The policies of sectors like agriculture, water, energy do not have a gender dimension, though these sectors are highly associated with climate change impacts on women. Moreover, the policies are very sector specific and there is no convergence mechanism to link policies and schemes, for instance the flagship schemes like National Rural Livelihood Mission (NRLM), Odisha Livelihood Mission (OLM) and Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) which have both specific women and also climate change components.

As gender and climate change aspects in the flagship schemes are more or less stand-alone approaches, there is no cohesion among both these in terms of activity, planning, outputs, inputs and outcomes. However, over the last three decades a shift has been noticed in the Indian policy stance. (recognition of gender issues, vulnerabilities of women). There is also a recognition that the failure to link policy of climate change to gender could put women at high risk. This recognition is still to be converted to implementation **Thus, considerable work needs to be done in both conceptualization as well as towards also enacting gender sensitive action plan at state level.**

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## ADAPTATION PLANNING FOR MOUNTAIN SYSTEMS IN INDIA

### Glacier and snow-pack dependent river basins – Himalayan Adaptation, Water and Resilience (HI-AWARE) Research



#### Key issues pursued:

HI-AWARE uses a basin wide approach to study the underlying vulnerabilities and adaptation requirements with a focus on different elevations given the work surrounding mountain systems. The Upper Ganga basin and the Teesta basin were chosen for identification of our study areas with locations in the plains, mid-elevations and high elevation zones. The study areas for administrative convenience had been limited to the States of Uttarakhand in Northern India and Sikkim in the Eastern part of India. Results from models indicate a rather a higher rate of increase in temperatures in the mountain regions compared to the plains. While there are no clear trends in the overall precipitation change, extreme events have increased and the threats due to the increase have been multi-fold. There is also a definite decline in snowfall in most high elevation regions.

Farmer trainings in Uttarakhand

#### KEY FINDINGS

Impacts on water resources and its availability, agroecosystems and livelihoods are felt across different elevations. The mountain communities are extremely vulnerable and exposed to these threats with huge challenges surrounding access to basic services including land and water. There are issues related to floods in the plains, agriculture and livelihoods linked to adventure and religious tourism being affected to issues of drying up of springs and being prone to extreme events in the mid-elevations and flash floods, GLOFs, landslides, land loss, livelihoods in the high elevations. Damage to life and property and huge economic losses are being incurred.

Given the nature of these events and the threats to the regions and sectors, it was felt that two key issues were emerging as key issues within the two States. While in Uttarakhand, exposure to extremes in the high, mid elevations and water availability and access in the mid elevations were concerning in Sikkim the issues were largely surrounding to risk to agroecosystems especially cardamom farmers and glacial lake outburst floods. Multi-stakeholder consultation driven processes within the States helped identify possible interventions and their prioritisation to these threats. These include a mix of both hard and soft measures needed that are very specific to the threats being experienced. For instance, in case of the GLOFs, amongst the most prioritised options were public awareness and setting up of early warning systems.

Our study has also assessed context specific adaptation strategies through a participatory method, re-emphasizing the role of multistakeholder processes in adaptation planning. Moreover, we also find that a lot of strategies being employed at a household level are mere coping, and don't amount to adaptation. Addressing communities' adaptive capacities thus become an immediate need for policies given the changes being already experienced and anticipated.

## Adaptation Experiments

### Climate-appropriate sustainable agricultural practices

TERI, along with its local partner, the Society for Himalayan Agriculture and Rural Development (SHARD), had been working with community in Huddu village in the Rudraprayag district of Uttarakhand. The experiment aimed at facilitating communities to seek opportunities and sustain agriculture in a changing climate in the high altitudinal regions of Uttarakhand. As part of this pilot, a range of options were considered, including land consolidation, fencing, testing efficient/improved agricultural techniques to enable crop productivity (traditional and new). The pilot aimed to achieve livelihood augmentation through demonstration of agricultural practices, to help increase the income in this highly vulnerable location, where access to alternate livelihoods are limited. The pilot successfully demonstrated the production of potato crop that was later marketed, while other cash and horticultural crops have been planted for ensuring long-term sustenance of the project. However, a strong institutional support for further upscaling is needed and identified as a bottle-neck.

### Modified Roofs as an adaptation measure for indoor heat exposure in low-income neighbourhoods

As cities in the Global South grow, climate change threats to this growing populace will also increase exponentially, putting at risk lives and livelihoods of many. An increasing trend of heat waves impacting the cities in South Asia is being witnessed. In this light, TERI and Wageningen University and Research, in collaboration with ReMaterials and Mahila Housing Sewa Trust (MHST) are experimenting ModRoofs - an innovative solution to reduce indoor heat, in Savda Ghevra - a suburb in the sprawling metropolis of New Delhi. These roofing systems targeted at replacing corrugated cement sheets in the low-income house-holds exhibit opportunity to help build capacities of low-income neighbourhoods and communities, who do not have access to/cannot afford active cooling, in coping with/adapting to increasing temperature trends. Successful implementation of this strategy has potential in transforming the landscape around planning for housing for the Urban Poor.

### Key policy recommendations:

While these interventions have been identified, there is a need to study them in the context of the current policy framework for implementation in these areas. Understanding the barriers and bridges for uptake are crucial for the successful implementation of these measures. Both existing and new measures are needed to be designed. While some of these measures that are outlined may seem to be already a focus of the governments, however, they have been designed without including the risk related to climate change and therefore qualify for business as usual development measures. To be able to contribute to adaptation these programmes and schemes need to be reviewed and restructured to deliver for adaptation- this maybe in the lines of scaling up the activity aerially on one hand or on the other, enhancing certain components of the programme to deliver the desired results of overall risk reduction.

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## DISCUSSION

Various adaptation strategies and prospects have been discussed in this briefing note, across three important 'hotspots' in India. In the context of the existing global development (SDGs) and climate (Paris Agreement) frameworks, it becomes imperative to address local, context-specific adaptation needs and thereby build both generic and climate specific capacities of vulnerable people and systems. This would need to be managed within the concerns, imperatives and aspirations of systems and people, but would be necessary so as to improve prospects of achieving the SDGs and the Paris climate goals.

### Consortia Details:

- **Semi-arid regions – Adaptation at Scale in Semi-Arid Regions (ASSAR)** – Indian Institute for Human Settlements – In country partners – Watershed Organization Trust (WOTR), Pune; Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore; Indian Institute of Tropical Meteorology (IITM), Pune
- **Deltas – Deltas, Vulnerability & Climate Change: Migration and Adaptation (DECCMA)** – Jadavpur University – In country partners - National Remote Sensing Centre, Hyderabad; Chilika Development Authority, Odisha; Sansristi, Odisha; Centre for Environment and Development, Kolkata
- **Glacier and snowpack dependent river basins – Himalayan Adaptation, Water and Resilience (HI-AWARE)** – The Energy and Resources Institute (TERI) – In country partners – Centre for Ecology, Development and Research (CEDAR), Uttarakhand and The Mountain Institute (TMI), Sikkim

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