

Background Note on The ways ahead

Kharash Vistarotthan Yojana (KVY) Initiative

Background:

Inherent salinity of land and its rapid ingress from the seaward side due to human abuse of natural resources, especially groundwater, along the coast of Gujarat has been a well accepted phenomenon now. In the last two decades, this phenomenon has snowballed into a social crisis of sorts, its impact well dispersed and rapidly increasing. Environmental degradation of the coastal area has led to out-migration of the agrarian communities, decline in cattle population, acute scarcity of quality drinking water for the communities. Prolonged use of saline water for irrigation has resulted into a decline in agricultural productivity and has decreased soil fertility further.

Experience has indicated that tackling salinity requires a mixture of demand and supply side water interventions, the objective being to encourage farmers to change crop patterns and switch over to equally remunerative, less water consuming crops, leading to a decrease in groundwater extraction. Sporadic success stories arising out of this, initiated an organizational-processes consolidation resulting into the above mentioned unique initiative. It actually refers to a developmental initiative called Kharash Vistarotthan Yojna (KVY), initiated by Sir Ratan Tata Trust (SRTT) in 2002, in order to tackle this “salinity-led” environmental catastrophe through a series of interrelated projects.

At the time of its institution, KVY became a more formalized version of what was earlier known as the “Gujarat Coastal Salinity Prevention & Mitigation Initiative”. One of its unique features was the fact that a number of civil society organizations also became partners in this venture. Subsequently, within five years of its existence, the initiative has also helped evolve an umbrella organization viz. Coastal Salinity Prevention Cell (CSPC), its uniqueness further enhanced by the state government joining as a partner. Recognizing the complexity and multi-faceted nature of the problems lying within KVY’s purview, joint efforts of both, government and civil society organizations, seemed more pertinent in order to work towards effective and realistic solutions.

It is well known that coastal areas are productive and rich in natural resources. They support a significant proportion of India’s population as well as several important urban centers and ports. Coastal resources and natural habitats are, however, showing visible signs of strain and degradation. Among the important factors responsible for this are pollution from land- as well as water-based sources and the competing, often conflicting, demands placed on coastal resources by different sectors. Different Studies in India, has tried to list out the factors that contribute significantly to coastal degradation and therefore help in ushering salinity in the area, they are: (a) Pollution (b) Siltation (c) Coastal Erosion (d) Dredging (e) Construction of dams (f) Groundwater Mining (g) Destruction of natural habitats due to development and human encroachment, and (h) Tourism. Numerous experiences in the last decade or so indicate that the afore-cited threats have become severer and their levels more intense. In other words, unless the issue of coastal area management is made to leave the conference arena and taken to the application arena, to the communities and to the micro level environs, the threat factors will continue to loom and become more real.

Thus it appears that the coastal areas of India have been brought further close to a situation that could prove conducive for the earlier listed threat factors to get more severe and thus posing severe implications for the social and ecological integrity of the coastal zone and traditional livelihoods.

Salinity in Gujarat - is both a cause and an effect; it is also both natural and human-engineered. Over a period of time, the problem of salinity is attaining serious proportions and continues to severely affect the lives and livelihood of about 1/5 (10 million) of the total population of the state, living in approximately 1500 villages. The process of salinity ingress has adversely affected underground water aquifers making it unfit for human consumption. Moreover, the prolonged use of saline ground water for irrigation has led to a decline in agricultural and horticulture productivity and soil fertility, rendering the land unsuitable for future cultivation. This has resulted in all round hardship to local people forcing them to migrate in search of livelihood.

Table: Ecological Threat Factors in Gujarat

Threat Factors	Impact	Areas (Districts)
Agricultural Productivity	Increase in irrigated acreage in major crops, use of chemical pesticide and insecticide, over-exploitation of ground water	Along the entire coast of Gujarat
Soil salinity and Alkalinity	Soil degradation, Eight districts only account for 91% of salinity affected areas	Ahmedabad, Amreli, Bhavnagar, Porbandar, Jamnagar, Kachchh
Water-logging	Increase in surface soil salinity	Junagadh, Porbandar
Salinity Ingress	Lateral sub-surface intrusion of sea water, decrease in crop yields	Bhavnagar, Amreli, Junagadh, Porbandar, Kachchh
Soil degradation due to saline ground water	Soil salinity, Usage of deep aquifers, fall in agri. productivity	Ahmedabad, Amreli, Bhavnagar, Kachchh, Junagadh
Overexploitation of ground water	River basins get dry, groundwater balance negative	Ahmedabad, Amreli, Banaskantha, Bhavnagar, Junagadh, Mehsana, Rajkot, Kachchh
Reduction in groundwater recharge area	Net area suitability decreases, replaced by salinity	Ahmedabad, Amreli, Bhavnagar, Mehsana, Rajkot

Source: Gujarat Ecological Society Report, 2003.

Experiences of both, the Government as well as of NGOs' interventions have shown very clearly that to address this enormous and complex issue demands a systemic response combining efforts at micro as well as at macro levels with following broad understanding.

1. Salinity is a regional multi-dimensional issue and hence demands multi sectoral regional response, going beyond one village, taluka and district or an organisation.
2. For effective results, the physical interventions of constructing water harvesting and recharge structures should be combined with of judicious and efficient utilisation of water for industrial and agriculture activities as well as domestic purposes by promoting water efficient agriculture/horticulture, forestry and irrigation systems.
3. Need collective efforts of Government, civil society organisations and experts to simultaneously work at macro as well as micro level. This should lead to formulation of appropriate policy for salinity control and prevention at state and national level.

The various studies carried out by CSPC as well as by other agencies clearly bring out that for any effective solution to address the problems of salinity ingress needs to have the following approach as an integral component of its strategy:

- **Salinity a National Issue and Concern** - engagement with Government at national as well as state level. The need is to raise the level of debate on the issue, to draw attention and commitment of policy makers and executives.
- **Inter Sectoral and institutional Collaboration** - the problem of salinity is a consequence of several economic development activities which go beyond the purview of any single department or agency of the Government. Large scale effort will need to be made to promote efficient and judicious use of natural resources for economic purpose (industrial & infrastructure development), by taking sufficient care to ensure ecological balance and economic needs of the local people. Thus a coordinated effort of different Government agencies and departments, ensured through commitment at the highest level within Government.
- **Experimentation to Expansion** - The vertical and horizontal dissemination of knowledge and learning about micro level initiatives among various stakeholders is a useful and necessary strategy to initiate action and expand the areas of influence and impact of the programme.
- **Combating Salinity - A People's Movement** - The local people engaged in agriculture and allied activities suffer the severe consequence of the problem. Their life and livelihood are at stake and hence have to be the prime mover and focus of the process of attempting the problem. The need is to begin with their resources and knowledge base and strengthen it with external resources and knowledge base. Since the issue is closely linked with the survival (drinking water and health) and livelihood (reducing productivity and profitability) the responses have to take into account their basic as well as economic needs and resources.
- **Salinity linked with Economic Development** - Adaptation or change over to agriculture practices which are appropriate to arrest and reverse salinity problem will also have to make financial sense to the farmers. For this necessary research and technical support would have to be provided. The technological, financial and marketing support system would have to be created and made accessible to primary producers.
- **Building Partnerships with Communities and the other stakeholders** -Communities in the salinity affected regions of Saurashtra and Kachchh have suffered but they have survived also. The process of survival has drawn considerable strength and support from the resilience of the communities themselves as well as the non-governmental organizations active in this part of the state. They have used a variety of approaches to mobilize and organize the communities in dealing with salinity ingress and its control. These approaches have ranged from indigenous harvesting and storage techniques of drinking water to innovative livelihood methods such as lobster and prawns cultivation. In the late eighties and the whole decade after that, this part of the state has seen a proliferation in engaging non government organizations and village level institutions facilitated by them impacting natural resource management initiatives in the area in an unprecedented manner.

Keeping in view the above issues, and following the oft quoted adage “Analyzing is good. Acting on it is even better”, the next phase of the KVV programme tries to build up on the experiences of the various programme activities being implemented through its network of partner agencies over the last six years and would focus its interventions on four key thematic areas:

A: SALINITY INGRESS PREVENTION BY ENHANCING THE GROUNDWATER POTENTIAL THROUGH RECHARGE & OTHER NRM INTERVENTIONS;

Over exploitation of ground water, unscientific management of water resources, including use of saline water, inadequate recharge of ground water, deforestation, development of salt and other mining industries are some of the reasons for the development of salinity. But, in the coastal area, the major contributing reason is the ingress of sea water and transportation of saline coastal sands through wind. Some of the studies indicated that the sea water intrusion has increased from 2.5 to 4.5 km during 1971 to 5 to 7.5 km during 1977. In the coastal belt from Bhavnagar to Una the sea water intrusion has been reported to be 1.3 to 4 km interior, while in Una to Madhavpur section the figure was 2.4 to 3.2 and Madhavpur to Okha it was 1-2.6km. On an average, the annual intrusion of sea water has been worked out to be 0.5 km.

Enhancing Groundwater situation - Groundwater is often the primary source for domestic and industrial water supply. Secondly, it supports agriculture by providing large quantities of irrigation water, especially in zones with rather dry climate where crop production without irrigation is not possible. Thirdly, groundwater plays a key role in keeping wet ecosystems sustainable and sometimes as well in maintaining a suitable environment for human settlement. To gain full benefit from groundwater, substantial efforts are needed to explore the groundwater systems and to organize their rational exploitation. However, attention is not only required for its exploitation, but as well for controlling a wide gamma of problems related to groundwater. World-wide it is observed that pollution or Salinization threatens the groundwater's suitability for drinking or for other intended uses; that groundwater is becoming excessively expensive or scarce if the stored volumes are depleted or exhausted; that land subsidence occurs as a consequence of groundwater withdrawal; and that landscapes may turn dry and desolate by the decline of shallow water tables. Most of these problems tend to develop rather slowly, but controlling them is difficult and many of them are practically irreversible. Therefore, it is important to anticipate and recognize such problems in due time and to implement appropriate measures to control or mitigate them without delay. The expected intensification of groundwater use in coastal and deltaic regions leads to other points of concern. In the last half-century, population and economic growth have greatly increased fresh water demands. Coastal regions are important agricultural, industrial and tourism areas with high population densities. Unsustainable use of groundwater and surface water bodies leads to lowering of groundwater tables, salt water intrusion and land subsidence. Climate change and associated sea level rise will only aggravate this issue.

Ground water management would be the key to combat the emerging problems of water scarcity as well as enhancing the quality of the water. Ground water being a hidden resource is often developed without proper understanding of its occurrence in time and space and threatened by overexploitation and contamination. There is also an inherent linkage between development and management of ground water resources. Ground water development initiatives like Managed Aquifer Recharge, among other offer a mitigation measure to these issues. Controlled recharge and subsurface storage of water in aquifers, and recovery of this water in times when water is scarce, should be considered a serious alternative for maintaining water supply levels in the future. Recharge of aquifers can also alleviate the intrusion of salt water from the sea into coastal aquifers, and combat land subsidence caused by falling hydraulic heads due to overexploitation of aquifers. On a smaller scale, water harvesting techniques catch water during rainfall events in order to recharge an aquifer, thus impeding the quick runoff out of a catchment area. This is particularly important for people living in (semi-) arid regions characterized by erratic rainfall and prolonged periods of drought, where every drop of water counts.

Further agriculture in these regions has always been a gamble with the monsoon. Nearly, 70 % of the total cultivated areas are rain fed and therefore the fortune of agriculture fluctuates with the monsoon pattern. In recognition of the seriousness of the erratic behavior of

precipitation and natural calamities like drought bringing instability to our agrarian economy it is considered essential to adopt location specific measures to overcome the water stress condition. It is in this context that water conservation\ harvesting measures with suitable cropping are evolved as the right strategy to overcome the vagaries of monsoon to a great extent. There are a good number of ways to conserve the rain water and utilize the same during the distress periods so as to provide life saving irrigation to the crops. Pilots by CSPC has clearly shown that Farm pond's among other interventions has been one among the best alternatives for conservation and harvesting of rain water, especially in the salinity affected coastal village. Efforts will be put in to upscale the programme and also evolve financial models & linkages with appropriate institutions.

Geo-hydrological planning inputs - lack of proper management of natural resources has lead to severe exploitation of precious resources like groundwater in the coastal areas. Another aspect that also had contributed to such mismanagement is lack of knowledge about potential and limitations of natural processes which facilitates the maintaining of balances between different ecological parameters like saline water and fresh water regimes, water balance of watersheds etc. within community level as well as at planning levels. Particularly in the coastal areas characterized by dynamic groundwater fluctuations any water related planning requires in depth understanding on various geo-hydrological aspects of the area. Such geo-hydrological characters includes geological framework of the area, aquifer types, water table behavior, water quality fluctuation, water balance (i.e. demand and supply) study, etc. It has already experienced that land and water resource development and management are incomplete without such considerations since they are important components of balancing state of fresh and saline groundwater especially in coastal regions. Another important consideration about coastal Saurashtra and Kachchh is that they have various types of rock formation from igneous to sedimentary rocks ranging from Mesozoic to Recent ages. Along with lithological variation tectonic characters of the region are also playing major roles in defining the boundaries of different aquifers and connectivity with sea. Today major focus of water resource development in general is adopting watershed development only. Whereas, the aquifer is concerned it may have its extension across several watersheds, (as clearly brought out in the impact assessment study by AKRSPI - ACT in the Netrawati river basin areas of Junagadh). In such condition unless and until proper understanding of aquifer spread and total water balance for an aquifer is developed, the entire development efforts may become inefficient. To avoid this at planning stage and to define appropriate strategies, know how on regional geo-hydrological aspects in any water planer is equally important. Thus detailed geo-hydrological studies will be carried out in the different project locations and it will be an integral part of any activity planning. These studies will be essentially focussing on

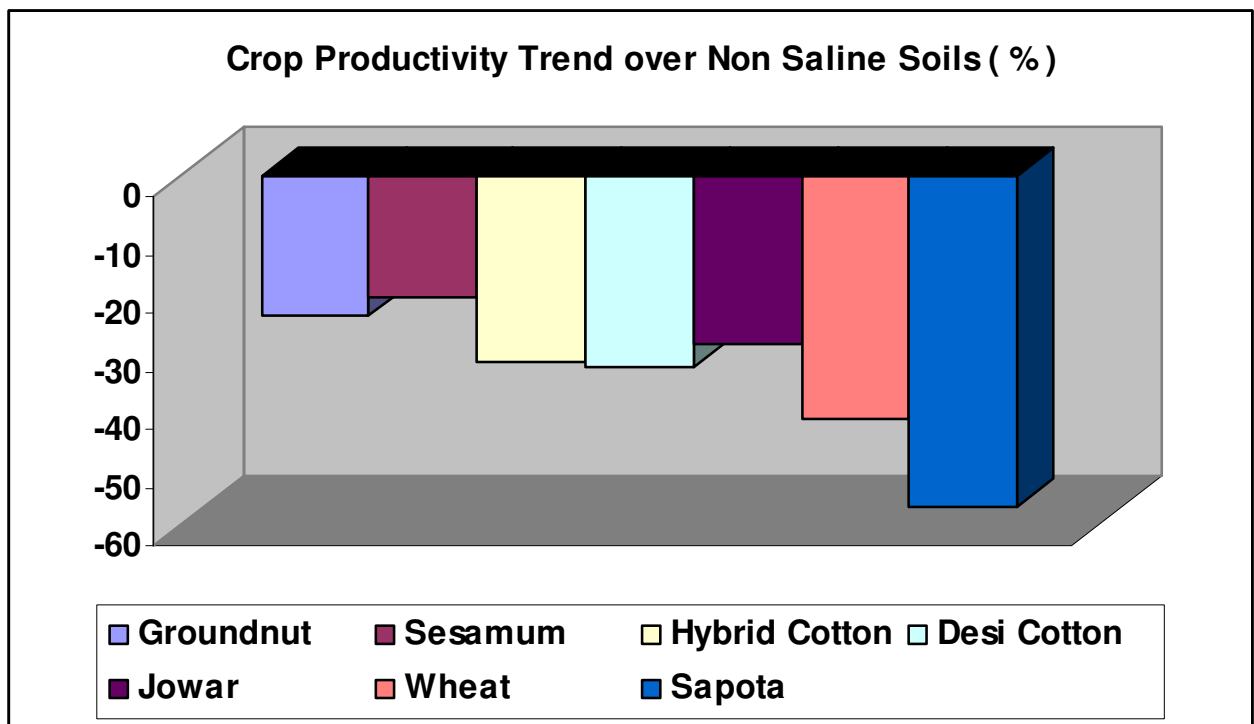
- Understanding geology and hydro-geological aspects of the area
- Understanding salinity pattern, process and impact in the study area
- Study water table fluctuation in the area.
- Calculate water demand of area
- Study supply scenario of the area
- Identification of potential groundwater recharge zone in the area.
- To understand present demographic and existing socio-economic conditions of the study area
- Understand current occupation and their economics

As part of the larger efforts to demystify the use of geo-hydrological information as tools in water resource planning a handbook on geo hydrological characteristics of coastal regions of Saurashtra and Kachchh is also being developed. The main *aim of the book is spreading awareness among various development workers, decision makers, local communities* on the use of geo-hydrological data as an effective planning tool.

B: PROMOTION OF REMUNERATIVE AND SUSTAINABLE FARMING SYSTEMS UNDER SALINE CONDITIONS;

Salinity is one among the important production constraint in the state of Gujarat. It is estimated that around 12 lakhs hectares are having one or the other type of salt affected problems. The District wise salt affected area has been estimated from time to time by different organizations. As early as in 1960 the Khar Land Development Board, Gujarat estimated the saline and alkali soils of the state to be 12.16 lakhs hectares. Subsequently, NBSS & LUP, estimated it to be around 25 lakhs hectares. But, the CSSRI, Karnal report put it as 11.4 lakhs hectares. The department of agriculture, Gujarat is in the process of conducting reconnaissance survey and as per the report for 15 districts for which the survey was completed the salt affected area works out to be nearing 30 lakhs hectares.

Impact of Salinity/ Sodicty on Crop Productivity: The salinity /sodicty of the soil adversely affects the crop productivity. The reduction in the crop yield will be more if the crop/variety grown is not tolerant to salinity/ sodicty.



The salt affected soils in the state are more in the Saurashtra and Kutch areas. A perusal of the productivity of horticultural crops indicates clearly that the average productivities are lower in these zones as compared to the state average. The average productivity of fruit crops is lower than the state average in all the districts of these zones. Regarding the productivities of vegetable crops and spices and condiments, in 5 out of the 8 districts they are lower than the state average.

Ways and Means to Improve the Crop Productivity in Coastal Area:

To make the agriculture viable and sustainable in the coastal environment, improved technologies on the following aspects have to be adopted.

- Appropriate soil management

- Suitable technology for use of poor quality water
- Crop and Varietals selection to suit saline environment
- Appropriate agro technique including water management and irrigation technologies
- Adoption of moisture conservation practices
- Adoption of appropriate rainwater harvesting Techniques.

Technologies for some of the areas have been generated for some crops and situations by the agricultural universities in the state and the process is continuing for the remaining ones.

Some of the related activities that will be simultaneously looked at while addressing the issues of regaining agricultural activities in the coastal areas through the KVV programme / partners are:

- **Promotion of Improved Package of Practices:** Research also shows that there are ways to cut down groundwater use in agriculture without compromising on the farm economy. Introduction of water efficient crops and efficient water use technologies for irrigating high valued crops are some of them. They can substantially reduce water use per unit area, while raising the net returns from every unit of land considerably. Land management practices are the other. Vermi composting and scientific compost pits can help increase efficiency of utilization of available biomass to get high quality manure. The nutrient management measures such as organic manuring would improve moisture-holding capacity of soils and irrigation water utilization through improvements in soil structure. On the other hand, efficient irrigation devices would cut down water application rate substantially, along with it achieving soil salinity reduction. Increase in soil nutrient levels would invite more of microorganisms. Use of bio pesticides would reduce the risk of destroying the insects in the plants and soil micro organisms that are farmer friendly and necessary for sustaining plant ecosystem, but also save the cultivators from health hazards due to exposure to hazardous chemicals used as pesticides.
- **Promotion of Micro-Irrigation Systems:** One of the greatest opportunities for increasing agricultural production is in the efficient use of irrigation water. Efficient use of water for irrigation will help to bring more area under irrigation and further, studies and field experiments has shown that regularized and controlled irrigation increases crop production, reduces water cost, conserve soil and is one of the best interventions to manage salinity in the soil. There also exists a need to redefine and bring in a paradigm shift in defining the productivity from Kgs / Hectare to Kgs / unit of water used for irrigation.
- **Promotion of market linkages as well as promotion of farmer's based institutions to help market the agriculture produce:** Generally it has been observed that trade and markets have been ruled over by the rich and the resourceful, while those who contribute most to the trade and markets are the least benefited. The recent years have seen growing concerns over this issue. These problems assume greater importance especially with small and marginal farmers, who do not have the wherewithal in terms of technology to improve production, and infrastructure to market their produce. Agriculture and allied sectors engage the largest number people from rural areas even today. Still, this sector has not been able to address the livelihood concerns of the poor. Often the produce of small farmers does not find the appropriate markets. The middlemen always take the larger chunk of the total profit. The situation is likely to be exacerbated further in the wake of integration of agricultural trade in the global system, unless immediate corrective measures are taken. Under such circumstances, there is a need to develop innovative models to make the markets work for the poor and to make the trade fair.

Gujarat is one of the most industrialized States in the country. Since 1997, the State has maintained constant lead in terms of new industrial investment. Agro Industrial Sector has been one of the identified thrust areas in the successive State Industrial Policies. However, sizeable investments have not flowed in this sector. Currently, less than 1% of the agricultural produce is processed in the State against nearly an average of 2% in the country. An encouraging feature is that among a variety of agricultural and horticultural products, the State enjoys competitive advantage in several items such as castor, fennel, cotton, tobacco, groundnut, sesame, banana, sapota, onion, guar seed and cumin. On the other hand, the Agro Industries are perceptibly low-margin high-risk industries mainly because of unsuitable and inconsistent supply of raw materials; Infrastructure both in the form of supply chain and cold chain has been lacking. Consequently, the desired integration of farmers with the entrepreneurs has not taken place owing to which middlemen have continued to hold the sway. The situation is more severe in the coastal regions of the state, where the farmers have to deal with the dual problems of sustainable production as well as remunerative marketing of the produce. Innovations are also needed to develop post-harvest handling, agro-processing and value addition technologies not only to reduce the heavy post-harvest losses but also to improve quality through proper storage, packaging, handling, and transport.

- **Establishment of Salinity Resource Centers:** The concept of SRC is based on the following understanding:
 - ❖ There is a need to synergize between internal and external information, knowledge, financial resources and efforts in order to effectively understand, articulate and address the problem of salinity.
 - ❖ There is a need to provide demand driven, result oriented and cost effective services to different stakeholders, particularly primary producers through efficient workforce (salinity Soldiers) supported by well equipped salinity resource centre

SRC is visualized as a technical service provider, focusing on salinity as a challenge and operating on the principles of fees for services basis. Since 70% of the rural households are engaged in agriculture and animal husbandry, initially, SRC would service the demands of farmers. Gradually, the services related to other occupational groups would be added which would include enterprise development activities in farm and non farm sectors; and services leading to increase in employment opportunities among educated and un-educated youth. The experiences of the Salinity Resource Centre being operationalized by Vikas - Centre for Development, as part of the KVV initiative in Talaja Taluka of Bhavnagar district will be further refined and scaled up across different locations of the coastal areas. The proposed certificate course for promotion of Salinity soldiers will also help provide for appropriate human resource base for the effective functioning of the Salinity Resource Centres. Appropriate linkages with the existing facilities at the Panchayat / Taluka / District will be established for further improvement in the efficiency and outputs of the SRC and also to establish itself as an enterprise planning centre that would provide comprehensive services to villages and help them to plan salinity reducing, resistant and compatible economic activities.

Over a period (5 to 6 years) of time, it is visualized to create chain of such SRCs in all the 25 coastal talukas across the districts of Saurashtra, Kutch and South Gujarat. It would cover and serve about 3.60,000 families engaged in primary sector activities and living in 1500 salinity affected villages of Gujarat state.

C: PROMOTION OF NON-FARM BASED LIVELIHOOD OPPORTUNITIES FOR COASTAL COMMUNITIES;

Salinity and its impact on coastal livelihoods - Salinity ingress in coastal areas of Gujarat is one of the major issues concerning large population along the coast affecting their lives and livelihood. The Coastal Saurashtra consisting of nearly 924 (kms) of the entire Gujarat coastline of 1669 kms, faces the serious problems (decreasing crop yield, non-availability/stress on safe drinking water/resources, large-scale migration out of the region, deterioration of soil, loss of vegetation cover, biodiversity, occupational health and safety) due to rising salinity. The risk associated with the livelihoods of the coastal communities has been a peculiar feature with these coastal areas subjected to various threats and constant changes in the environment. It is in this context that viable options for non-farm based livelihood opportunities needs to be tapped into, innovations piloted and institutional mechanisms evolved to adapt to the changing situations.

Studies and interaction with the coastal communities also indicate that vulnerability and the social impacts associated with degradation in natural resources and climatic variability are heavily influenced by different factors like:

1. The nature of livelihood systems within a region, in particular the extent to which individuals and households are able to diversify income strategies and incorporate non-farm components many of which are less vulnerable to disruption via natural disasters than agriculture.
2. The ability of people to migrate or commute in order to obtain access to non-farm or agricultural sources of income outside of drought and flood affected areas.
3. The ability of information, goods and services to flow into and out of affected areas;
4. The differential social capital and institutional checks and balances that households have access to including education, community institutions such as self-help groups, formal institutions such as government departments and banks, non-government organizations, the media and social networks;
5. Existing patterns of differential vulnerability created by gender, income and social position;
6. Natural resource conditions, particularly the degree to which ground and surface water systems have been disrupted.

Communities enhance their adaptive Capacities through income diversification, particularly the development of non-farm sources of income. Diversification whether through development of a business, obtaining access to outside jobs or simply participation in regional labor markets, provides access to secure income streams that can be used to maintain consumption, avoid debt, and rebuild agricultural activities. As a result, the ability to diversify is of fundamental importance to the maintenance of rural agricultural livelihood systems.

Enhancing Adaptive capacities: Adaptation or enhanced resilience of the communities is not, however, only dependent on the presence of market and other systems that enable flows to occur. Social capital and the institutional checks and balances present in rural areas are equally central to adaptive capacity. Unless people have the skills required to identify and take advantage of alternative income opportunities, their ability to adapt is limited. Access to capital and that intangible good 'social organization' are equally central since many activities, however small, require both an initial source of finance and the support provided by others. This underlies the central importance of community based organizations such as self help

groups. It also underlies the importance of formal institutions. The development of institutions that, by providing families access to credit for whatever investments are essential to rebuild livelihood systems, creates a critical check on money lenders and other informal capital markets. Such checks and balances along with education and the access to information and critical services organizations such as NGOs, the media and government departments can provide, are central components of the social capital underpinning adaptive capacity. The presence of diverse, competing, organizations and sources of information is essential to both 'keep such organizations honest' and provide the diverse array of services required for adaptation to unexpected events.

The KVV programme also tries to look at various options available to the communities in enhancing the non farm based livelihood options and through them look at enhancing the coping mechanisms and the resilience of the communities to adapt to the situation. The two important factors that influence or govern the activities aimed at promotion of non-farm livelihood opportunities are;

1. The long coastline of Gujarat that offers a set of opportunities - in terms of fishing and aquaculture related interventions and;
2. The industrial policy of the state which has adopted the strategy of Port Led Development / Special Economic Zones in the coastal areas and the huge industrial investments that are already in place and is in the pipeline all along the coast of Gujarat;

Aquaculture and fisheries, which has been registering an annual growth rate of over six per cent, has become important enterprise in both coastal and inland states contributing to food baskets and employment generation as well as the economy of different regions. "India stands fourth in the world in fish production with annual production of about 6.57 million tonnes with the marine and inland sectors contributing 2.9 million tonnes and 3.67 million tonnes respectively"[6] . The annual export earnings from fish and shellfish was more than Rs 8,000 crores, accounting for 18 per cent of the agricultural exports and over two per cent of total exports" [7]. According to a vision formulated by Marine Products Export Development Authority (MPEDA), the seafood export from India is targeted to reach US \$ 4 billion by 2009-10. The contribution of aquaculture sector is expected to rise from the current level of US \$ 0.7 billion to about US \$ 1.5 - 2.0 billion for making this vision in to a reality.

Income and jobs from fish farming and aquaculture:

Aquaculture has advantages over the target fish catch approach and would give the communities higher incomes by rearing the cultivable marine species. Profitable coastal fisheries help reduce rural population migrations to already overcrowded cities. Fish farming plays very important role by supporting people's livelihoods especially for the largely rural based societies. Aquaculture provides many opportunities for low income earners to diversify their livelihoods to obtain a larger income. Fishing and related activities not only provide livelihood for fishermen families but also for others in the fishing industry, including boat builders, trap and net makers, packers, distributors, and retailers - all of which enhances social, cultural, economic, and political stability in the coastal areas. A strong domestic fishery promotes self-sufficiency and reduces the outflow of foreign exchange.

Aquaculture promotion: - Lobster fattening: The development and progress of coastal aquaculture efforts in India have been concentrating mainly on shrimp or scampi so far especially in the coastal areas on the landward side due to their economic importance, as well as the ready availability of technology and ready market for the produce. Pilot or experimental trials have been attempted for other species of commercial importance. The Indian research institutes have already standardized the breeding technologies for many of the potential species in our waters. However, commercialization of such efforts has not

materialized due to various reasons. The potential candidates for Mariculture in Indian coast are listed in the following table (Vishnu Bhatt and Vinod, n.d.):

Table: Potential Aquatic species for sea farming in India

Sl. No.	Name of Species	Scientific name
1	Asian sea bass	<i>Lates calcarifer</i>
2	Grouper	<i>Epinephelus spp</i>
3	Milkfish	<i>Chanos chanos</i>
4	Mullet	<i>Mugil cephalus</i>
5	Silver Pomfret	<i>Pampus argenteus</i>
6	Cobia	<i>Rachycentron spp.</i>
7	Tunas	<i>Thunnus sp, Euthunnus sp.</i>
8	Mud Crab	<i>Scylla serrata</i>
9	Rock lobster	<i>Panulirus spp</i>
10	Edible oyster	<i>Crassostrea spp.</i>
11	Pearl oyster	<i>Pinctada fucata, P.margaritifera</i>
12	Mussels	<i>Perna viridis, P. indica</i>
13	Clams	<i>Anadara granosa, Paphia malabarica</i>
14	Sea cucumber	<i>Holothuria scabra</i>
15	Sea weeds	<i>Gracilaria, Gelidiella, Kappaphycus etc.</i>

It is estimated that cultured shrimps constitute 63% of the quantity of shrimps exported from India. Therefore, in order to diversify the export basket, the Marine Products Export Development Authority (MPEDA) has set out an action-oriented plan which envisages increasing the share of non-traditional cultured varieties to about 50% of the total production from aquaculture. MPEDA has therefore, constituted a separate Society viz, **Rajiv Gandhi Centre for Aquaculture (RGCA)**. RGCA has embarked upon various missions to standardize and popularize the aquaculture of potential species in Indian waters, which have commercial significance (*op.cit.*)

The following are some of the activities recently taken up by this organization.

- a) Breeding of Asian Seabass (*Lates calcarifer*)
- b) Cage culture of Asian Seabass
- c) **Fattening of Rock Lobsters**
- d) **Breeding and culture of Mud Crabs (*Scylla serrata*)**
- e) Artemia production
- f) Breeding and culture of Groupers
- g) Tilapia culture

On the basis of a survey commissioned by MPEDA, it was concluded that about 2000 sq. km. of sea surface is ideally available to take up offshore farming and a production potential of 8 million tones of high quality marine fish is harvestable through cage culture practices. According to a vision formulated by MPEDA, the seafood export from India is targeted to reach US \$ 4 billion by 2009-10. The contribution of aquaculture sector is expected to rise from the current level of US \$ 0.7 billion to about US \$ 1.5 - 2.0 billion for making this vision in to a reality.

Opportunities available in the coastal belts of Gujarat for up scaling of the Lobster farming programme as a sustainable alternative / supplementary source of income

- Lobster is a high value produce, which fetches a good price in the local market itself.
- There is scope to move up the value chain over time and keep on improving the price realization through collective marketing. Veraval located about 100 kms away

is a major center for exporting fish. It has at least two large processing houses, which deal with lobsters.

- Even when consumed locally it is good as it has high nutritive value
- The local shore-line has some good spots where juveniles are found in adequate quantities
- Plenty of suitable sites are available on the local shoreline for both the methods of lobster fattening - pit method and cage method. The use of alternative methods and materials e.g cement pits can further extend the scope of this activity in other sites as well.
- There is scope and interest among the target communities to develop this activity as this can save them from distress migration. Opportunities for diversifying into other forms of mariculture also exist and remain to be tapped.
- Similar experiments are being conducted in Tuticorin with support from the Department of Biotechnology. In other countries such as Vietnam lobster fattening is a big industry. There is much to learn from these and other such experiences.
- The overall trend in coastal areas shows that agricultural productivity is affected due to salinity ingress and fisheries is declining. In arid coastal areas such as Bhavnagar-Amreli this is leading to severe migration and alternative livelihood options need to be generated to restore the lives of these families to normalcy.

Economic Development Activities along the coastal belt of Gujarat: Coastal regions are increasingly being identified as “engines of growth”. Coastal regions are attractive for carrying out a large number of economic activities such as tourism, mining & quarrying, salt manufacturing, petroleum and chemical industries, port led development, ship building & ship breaking, export based manufacturing units etc. The setting up of these new industries has resulted in demand for skilled and semi-skilled labour both in the formal as well as informal employment sectors. There exists scope and opportunity to tap into these demands and build up the skill and human capital base of the local youths in the coastal villages and explore possibilities of engaging them with the industrial units. Specific sectors will need to be identified and appropriate skill up gradation programme organized to cater to the demands of the market.

D: ACCESS TO SAFE DRINKING WATER AND SANITATION

Based on the current drinking water situation, it may be concluded that the coastal region needs a special strategy as far as drinking water is concerned. This is because the entire region has specific constraints as well as specific potential with regard to drinking / domestic water that need to be addressed collectively through a well-designed strategy. The entire coast suffers from salinity ingress from the seawater, intruding from underground channels and / or from surface flows. Salinity also is advancing due to strong saline winds blowing to the coast. The salinity ingress is largely due to the over drafting of ground water on the coast by agriculture, industries and others, depletion of vegetation and reduced flow of sweet water. The low and erratic rainfall in most of the coast adds to the problem. Since the coast is an attractive region for a large number of economic activities like salt works and other industries, agriculture, mining and quarrying, trading and shipping, ports, jetties and other infrastructure, tourism etc, these activities have grown at a very rapid rate, particularly after the economic reforms, on the coast. They have put a huge pressure on the coastal and marine environment, including water resources, right from Jamnagar to Junagadh to Bhavnagar. This has intensified

the problem of drinking water on the coast. There is a need to address these issues through a common strategy.

Similarly, towards securing better health of the communities, protection of drinking water sources is the first step towards meeting the demand for drinking water in rural areas. A large section of the population does not have access to adequate quantity of water of desirable quality and is exposed to various water borne diseases. The major sources of groundwater pollution in the rural areas of the coastal districts is from human and animal sources, inadequate access to safe sewage and sanitation services - resulting from indiscriminate defecation and urination, inadequate storage and disposal facilities of animal wastes and application of nitrogenous fertilizers and pesticides.

Further, Sanitation needs to be understood in a comprehensive concept, in fact it is a "way of Life" which is expressed in clean home, community, institutions for better health and safe environment. Moreover safe sanitation practice is a crucial indicator qualifying improvement in standards of Living. The concern is triggered by the fact that approximately 80% of the rural population still reports open defecation in almost all the proposed six districts. Improving the situation calls for sustained commitment and a comprehensive programme to effectively address the issue of sanitation. A direct relationship exists between water, sanitation, health, nutrition and human well being. Consumption of contaminated drinking water, improper disposal of human excreta, lack of personal and food hygiene and improper disposal of solid and liquid waste have been the major causes of diseases in the rural areas. The issues related to sanitation have further manifestations in the coastal areas and need to be addressed through adoption of appropriate technical designs.

Sectoral Engagement and collaboration with the State Agency - Coastal Areas Development Programme (CADP)

While acknowledging the need to have a special focus on the drinking water issues in the coastal salinity affected villages of Gujarat, especially in Saurashtra region, CSPC and WASMO has launched a special collaborative initiative - Coastal Areas Drinking Water programme in different coastal districts of Saurashtra and South Gujarat. The project actively engages the services and involvement of the local partner agencies, existing Implementing Support Agencies and communities in developing detailed village action plans for addressing the drinking water security in the quality affected villages. Accordingly, the project had short listed 21 coastal blocks and 10 facilitating agencies to help in the planning processes and based on which funds would be leveraged from the on-going water supply programme to finance the implementation of these village action plans.

It is envisaged that based on a detailed community level discussion and geo-hydrological & technical survey of the villages an action oriented proposal will be submitted for developing a comprehensive plan for addressing the drinking water security.

All the NGOs / ISA's involved will not only emphasize on the technical aspect while working on the salinity issue but also take facilitate linkages for implementation of sanitation measures both at the individual household level as well as at the village level, so that an overall development of the village takes place. The situation is dynamic in these coastal areas so there should be multiple local sources available for drinking water. Along with the existing programmes the plan also needed to consider other alternative ideas for providing regular water which is safe and in adequate quantity. The severity of the problems is understood by the villagers hence they are prepared to contribute. The various activities for enhancing the drinking water security & safe sanitation has been proposed to be classified as follows:

1. Enhancing the community based decentralized water storage & supply systems;

2. Identification of local intervention to enhance the alternate ground water sources in the villages
 - a. Water harvesting / recharge structures;
 - b. Revival of old traditional structures - step wells etc.
 - c. Renovation of ponds and other water bodies
 - d. Explore possibilities of RO based technological options
 - e. Any other appropriate water harvesting and recharge structure
 - f. Individual Roof Rain Water harvesting Structures
3. Explore possibilities of piloting Non-conventional sources of energy (wind and solar) for powering the water supply systems;
4. Improved sanitation measures - individual household as well as village level environmental sanitation;
5. Exploring viable options for domestic waste water treatment on a pilot basis in select villages;
6. Providing scope and potential for piloting innovative activities related to improved sanitation - institutional mechanisms at the village level, provision of revolving funds, designing incentives for the masons for promotion of individual sanitation, provision of inputs package for promotion of individual sanitation units;

To bring in a greater sense of urgency, enhance synergies and catalyst action among the various partners, the collaborative project between WASMO and CSPC envisages strong engagements with various stakeholders including the village level communities, Civil society institutions, Technical support agencies in the above initiative and explore possible linkages to:

- Synergize the efforts of the various players;
- Explore possibilities of incorporating additional activities like enhancing the project planning processes, focused technical support, providing for more community mobilization & capacity building initiatives, strengthening the O&M activities;
- Strengthen the Research, Monitoring & Documentation components of safe drinking water and sanitation programme;
- Explore possibilities of establishing linkages for individual Household level sanitation and village level environmental sanitation.

Objectives

The primary objectives of the programme are:

- Ensure safe drinking water supply to all salinity affected villages by establishing decentralized, demand-driven, community-owned rural water supply and sanitation systems, planned, approved, implemented, operated and managed by the local community, thus ensuring sustainability;
- Provide drinking water security through an integrated combination of pipe, local traditional water sources and multiple sources for alternative use;
- Conserve water through water resource management that includes rain-water harvesting and artificial recharge, conservation and renovation of traditional water sources;
- Build effective community institutions at the local level by supporting capacity building and empowerment;
- Ensure that all community groups, including women, are able to participate in the decision making processes and benefit from programme improvements;

- Improve household and community environments with sanitation improvement and increased hygiene awareness in communities; and
- Provide implementation support to communities through independent civil society organizations who will function as Implementation Support Agencies (ISAs).

Goals / Outputs

The identification of the above key thematic interventions is also in line with the observations made in the SP 2011, which had recommended:

- *“Regaining Agricultural Dynamism - reclamation of un(der)utilized land resource, improving the natural resource base, diversification of agriculture and agri-business development along with a strong emphasis on the research for newer income generating activities based on the natural resources for specific regions; and*
- *Focus on Inclusive Growth - inclusion of new regions , new initiatives, revision of existing programs, targeting specific sections of the rural community, empowering communities through RTI etc besides building partnership with the Governments through specific programs like TSP, NREGA etc.*

Areas Of intervention:

- Reclamation of salinity affected farmland
- Conservation, protection and judicious use of resources through establishment of strong governance at the community level;
- Promotion of diversification of crops and suitable cropping practices in salinity affected areas;
- Creation of assets for sustainable production and income generation for landless and small /marginal land holder families.
- Appropriate technologies and alternatives for ensuring drinking water security and safe sanitation;
- Promote sustainable fishing / aquaculture development related activities and strengthen the market linkages;
- Establish support system for technology, markets and credit needs of marginalized families;
- Skill enhancement training and other linkages for establishing employment opportunities for the rural youths;

It has also been articulated that Coastal Salinity Prevention Cell (CSPC) as the nodal agency will have the following as the broad targets to be achieved in the next four to five years:

- To formulate a national policy on the salinity problem through a consultative process at the regional and national level and to garner support from the public institutions for the implementation.
- To expand the scope of engagement with State Government and enlist involvement of other relevant departments in the ongoing and future programs.
- To strengthen the ongoing project activities to expand the scale and scope of KVV in terms of increasing number of stakeholders from NGOs, CBOs and primary producers.

- To increase awareness about the issue and establish two-way channel of communication between people and policymakers and planners engaged with the salinity problem.
- To strengthen CSPC as an organizational instrument by building up its human resources and operational systems to carry out its ascribed roles i.e. networking, facilitating and leveraging.

Apart from the above, CSPC will continue its work on data base development and developing itself as a knowledge centre on salinity related issues, carry out / organize studies which will help to rigorously assess the impacts of the various salinity mitigation and coping mechanisms, apart from identification of new projects / partners, provide inputs for strengthening of the partner organizations, networking with the government and other resource agencies including the private sector corporate entities active in the coastal regions, establish linkages with research & academic institutions and through its various studies, publications and events try to mainstream the problems related to salinity and invoking larger dialogue and developmental interactions on sustainably addressing the problems of salinity ingress prevention and mitigation.

Activities / Outputs:

- Insitu moisture conservation measures adopted in over 5000 Hectares;
- Land development and soil amendments to enhance the productivity of over 5000 hectares of salinity affected land;
- 1000 vadi's of salinity tolerant horticulture crops established;
- Establishment of shelter belts and mangrove plantations - 1000 hectares;
- Construction of 1000 farm ponds directly impacting 1000 hectares of agricultural land;
- Revitalization of the dairy related activities through Linkages established with Saurashtra Kutch Dairy - 100 villages;
- Community based institutional and financial mechanisms evolved for facilitating market linkages in over 150 villages / 2 field crops / 2 horticulture crops;
- Salinity tolerant crop (Wheat & Bajra) & fodder - 3 varieties promoted in over 150 villages / 1500 farmers;
- Promotion of improved package of practices through training programme & other IEC activities - 200 villages / 10,000 farmers;
- Promotion of vegetable cultivation including net houses - 100 villages / 5000 farmers;
- Micro Irrigation systems adopted in over 2500 hectares of agricultural land;
- Aquaculture based activities promoted in over 50 villages / 100 Self help groups, enhancing the HH income by at least Rs. 5000.00 every year ;
- Skill enhancement trainings and placement with industrial units - 500 youths;

- At least 150 youths trained as Salinity Soldiers through the certificate course;
- Establishment of at least 50 salinity resource centres with each centre providing information / extension support to at least 3 - 5 villages;
- Community based drinking water supply systems established in 300 villages and at least 30,000 HH impacted;
- Safe Sanitation practices adopted and individual HH sanitation units established in 300 villages / 30,000 HH;
- Partnerships established with NGOs, Resource agencies and Community based institutions;

These set of activities will help Kharash Vistarotthan Yojana to realize its larger goal of:

“Evolving Sustainable approaches to Salinity Ingress Prevention & Mitigation and Enhancing Livelihood Resilience of Coastal Communities affected by Salinity”