PROPOSAL

ON

Nomination for " HP STATE INNOVATION AWARD SCHEMES: 2014-15"

Submitted to:

Planning Department(GoHP),
YojanaBhawan , HP Shimla 171002

Submitted by:-

Social Awareness ThroughHuman Involvement (SATHI)
VPO Thakurdwara -173024, via Sarahan ,
District Sirmour , HP (India).

CONTENT LIST

"Himachal Pradesh State Award Scheme for Innovations- 2014-15"

Application format

1	**Applicant / Organisation Name**	Social Awareness Through Human Involvement **(SATHI)** VPO.Thakurdwara, Via -Sarahan ,Distt. Sirmour -173024 , Himachal Pradesh
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5	**Title of Proposal/Project**	Removal of biological and physical impurities from drinking water through development &demonstration of affordable bio-filtration technology in Sirmour district of Himachal Pradesh.
6	**Project Details with photographs**	

(i) <u>Organisational Profile:</u>

Social Awareness through Human Involvement ***(SATHI)***is a Non–profit volunteer organization in Himachal Pradesh whose mission is to promote integrated rural development through combining indigenous knowledge and innovative & eco-friendly technologies. SATHI got established in 1992 by Dr. Anil Sharma (Founder/Director-SATHI) as a volunteer organization and registered under the Society Registration Act 1860 (21). SATHI Head office is located at remote & backward village Thakur Dwara of Pachhad block of District Sirmour (Himachal Pradesh). For the last 20 years, SATHI is diligently working for socio-economic upliftment of community resides in remote and backward hilly region of Sirmour district of Himachal Pradesh.

SATHI works with village level institutions such as SHG's, UG's & VMSand undertaken various demonstration programmes on rural technology such as organic farming , rain water harvesting from roof tops, Natural Resource Management, Artificial ground water recharge , Environment Conservation, Lantana utilization , Water and sanitation management, Mountain Livelihood promotion through farm and off-farm activities. In addition to this SATHI has always joining the hand with the government in implementing their programme. **For its unique and pioneering works, SATHI has been conferred <u>VikasRatan Award in 1998by IIFS New Delhi</u>, <u>National Ground Water Augmentation Award in 2008by Ministry of Water Resources, Govt. of India</u> , <u>PrernaSrotSammanPurskar in 2009 by Govt. of HP; Indira Gandhi ParyavaranPuraskar in 2010 from MoEF, Govt. of India; and Social Impact Award by ABP news in 2015.</u>**

(ii) Problem Identification (especially in context of safe drinking water)

Before providing a detailed description of SATHI's recent innovation in water management sector, is it necessary to highlight the pre-intervention status of project region & major problem identified. To find out status of safe drinking water availability, SATHI conducted a pre-feasibility study in remote villages of Pachhad block of Sirmour district (HP) in Jan- Mar'14. Study data revealed that unavailability of safe drinking water & occurrence of water borne disease is major concern in majority of villages in region. Due to badly managed water supply schemes & severe water scarcity (especially for drinking purpose), villagers have to travel long distances for fetching water from far distance natural sources. Most of these natural water sources are open, unprotected & polluted, therefore **Inhabitants are left with no alternative except to consume contaminated water from unprotected sources in which animal drink & defecate. Due to use of contaminated & polluted water, the occurrence of water borne diseases such as Jaundice, gastro entitles, cholera and diarrhoea etc is also prominent in region. During 2013-14, Pachhad block alone reported numerous cases of Jaundice & diarrhoea including 4-5 critical cases. Besides, similar number of cases of water borne diseases was also reported in some other block of Sirmour District (HP)**.

(iii) SATHI' s recent innovations in social development sector:-

The safe drinking water is basic human need. Over the past two decades, SATHI is raising public awareness on water management & environmental conservation issues and has developed varied innovative & low-cost practical solutions to provide access to safe drinking water & sanitation, biodiversity conservation & mountain livelihood promotion in inaccessible mountain region of Sirmour (Himachal Pradesh).

SATHI is also accredited to introduce & demonstrate Spring Recharge techniques and; specific water purification mechanism for rain water harvesting & Gravity W/s schemes first time in state. **In recent days,SATHI have developed & demonstrated very innovative& cost effective technologyfor domestic water filtration (popularly known as Bio-Sand Filter Technology).SATHI have demonstrated this innovative technology of water filtration in 15 remote village ofPachhad block of Sirmour district of Himachal Pradesh and got very encouraging results. After the adoption of this technology, a significant reduction in rate of water borne diseases is reported in project region.**Thekey features of these innovative

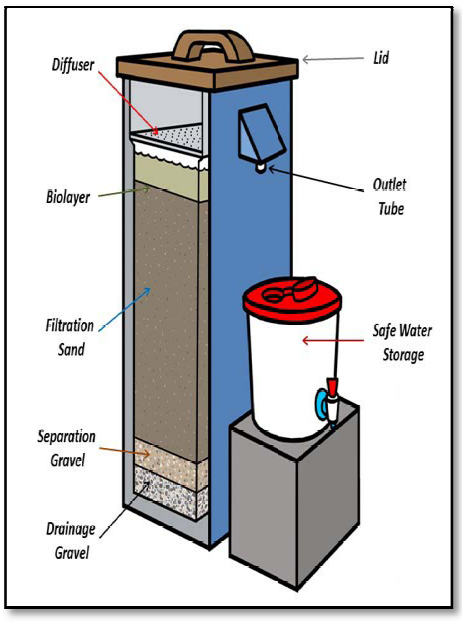
intervention are summarized as under:

- **Introduction of Bio-Sand Filter Technology in Himachal by SATHI**

The Bio-sand Water Filter technology is new in India and not yet introduced in many states of India including Himachal Pradesh. **SATHI is the only organisation in Himachal Pradesh who have developed &successfully demonstrated this innovative technology of Domestic water filtration in state.**SATHI made some modifications & advancements and demonstrated this technology in rural regions of Sirmour district of Himachal Pradesh.**So far, SATHI have developed two variant of bio-filters; - (i) Type-I : Concrete Bio-sand Filter (ii) Type:2 : Stainless steel Bio-sand filter. In Concrete Model , SATHI have further developed two variants i.e. Polythene tube filter Model & Copper Tube filter Model.**The filter has been tested by various government, research, and health institutions, as well as by non-governmental agencies across the world and found to be effective in water purification. **The bio- sand filters are effective at removing 98% of bacteria, viruses & protozoa, 95% of iron, amoebas,metals and worms.** Bio-sand filter technology is helpful in filtration/purification ofcontaminated water of natural sources such as rivers, lakes, wells, ponds,hand pumps and rainwater. Impact analysis of bio-filters shows that with help of this technology,**water borne illnesses such as typhoid, cholera, dysentery, among many other viruses and infections, have dramatically reduced in regions where this is being utilized.**

- **<u>Uniqueness of Bio-Sand Filter Technology of water filtration</u>**

The Bio-sand filter is an adaptation of the traditional slow sand filter, which has been used for community water treatment for almost 200 hundred years. The bio-sand filter is smaller and adapted for Intermittent use, making it suitable for households.



The key features of BSF are as under:-

- **Low cost, approximately Rs2400-2500 installed**
- **No electricity/ fuel required**
- **Maintenance cost is zero**
- **Life of up to 30 years**
- **Durable – made of concrete & Easy to maintain**
- **Relatively small, can be placed in kitchen or yard**
- **Nearly eliminates risk of waterborne illness**
- **High flow rate: up to 84 liters/ day**
- **Water tastes and looks good**

- **Development & Installation process of BSF:**

Bio-sand filter is made with the help of specially designed steel / MS mold (size 0.9 m tall by 0.3 m square, or about 0.3 m in diameter). This mold is filled with concrete mortar of ratio 1:2:2 (Cement 1: Sand 2: Gravel 2) of specific size. For development of filter, the recommended size of sand & gravel is : Concrete Sand : ≤ 1mm (0.04") , Small Gravel : 1mm (0.04") -6mm (1/4") and Large Gravel: 6mm (1/4")-12mm(1/2"). Water outlet tube is also fixed at bottom of mold. After filling, filter mold is kept undisturbed for 24-36 hrs and then de-framed. BSF are then tested for water leakage parameters for next 4-5 days. Another important process in development & installation of BSF is filling it with layers of sieved and washed sand and gravel (also referred to as filter media). For filter media, recommended size of sand & gravel is : Filtration Sand : ≤ 0.7mm(0.03") , Separating Gravel : 0.07 mm(0.03") -6mm (1/4") and Drainage Gravel: 6mm (1/4")-12mm(1/2"). Before placing in filter, filter media is properly washed & dried. A specially designed diffuser plate & lid are also placed/ fitted in filter. The filter is composed of a cast concrete container with layers of sand and gravel and a naturally occurring biological layer in the top few centimetres of the sand layer.The filters can be built on a small scale at low cost. There is no electricity required, no chemicals used, and no replacement parts, therefore no on-going costs for the user. Once installed, the filter will last 30 years, producing 84 litres per day of safe drinking water. The development & installation cost of filter is approximately Rs. 2400-2500 per filter, a one-time expense, which includes manufacturing, delivery, and ongoing support. The villagers are then able to use it for 30 years.

- **How Bio-sand Filter Works:**

In a BSF, small microbes live in the top of the sand. This is called the **BIO LAYER**. The bio layer contains microorganisms including bacteria, protozoa, algae, and diatoms. The bio layer is very important for making the water safe to drink. The bio layer takes about 30 days to grow. The bio layer helps the filter & treats water. The process of filtration is BSF occurs in following steps:-

- **Predation:** When a living thing (the predator) eats another living thing (the prey). In the bio sand filter, micro-organisms in the bio layer eat other microorganisms in the water.

- **Adsorption:** When a contaminant attaches or sticks to the surface of a solid, such as a grain of sand.

- **Mechanical Trapping:** The water can flow through the sand, but some dirt and pathogens are too big to fit through.They get trapped in the sand.

- **Natural Die Off:** Some pathogens die because there isn't enough food or air for them inside the BSF. As a result, they die.

The bio layer is the key component of the filter that removes pathogens.Without it, the filter removes about 30-70% of the pathogens through mechanical trapping and adsorption. The bio layer is not visible. The bio sand filter is most effective and efficient when operated intermittently (not constantly flowing) and used consistently (every day). There must be a rest period or pause period between uses. The pause period should be a minimum of 1 hour after the water hasstopped flowing, up to a maximum of 48 hours.Correct installation and operation of the bio sand filter requires a standing water depth of approximately 5 cm (2") above the sand during the pause period.

- **Demonstration of Bio-sand Filter technology by SATHI :-**

SATHI has gained professional expertisein development of BSF and is determined to promote this innovative & cost effective technology of water purification to remotest & needy parts of Sirmour as well as Himachal. First practical demonstration of BSF was set by SATHI at its Thakurdwara Campus. After testing of water quality & satisfying with other parameters, SATHI with its limited financial resources, initiated to demonstrate affordable water purification technology in villages *Kuina ,Katli, Mundad,Badyar, Amta, Malana, Dhangiar,Unner,Mangdoli,RamghatHadyana,Thakurdwara*&BharogBhaneri (Pudli) of Pachhad&Paonta Sahib Block, Sirmour (HP). Besides With deliberated efforts & support of local community, SATHI got success in construction & installation of aforesaid villages.

Photographs: Field demonstration of BSF Technology by SATHI in Pachhad block of Distt.Sirmour (HP)

Till date total 200 Nos. of such filters has been developed & installed by SATHI in 15 remote (Total Population covered: 1175)villages of Sirmour district of Himachal Pradesh. After development & installation of filters, next challenging task before SATHI was developing habit of regular use of BSF among beneficiary community. **SATHI field staff organises series of meeting with beneficiaries and educated them about process of water filtration in BSF & its advantages**. Community were informed that BSF has been tested by various government, research, and health agencies/institutions across the world and found to be effective in water

purification. Water filtered through BSF is 100% safe & disinfected. The families which were Regularity using filters have also motivated other beneficiaries. Thus **by persistent efforts , SATHI got success in changing mind set of community and now 100 % beneficiaries are using these filters regularly . Beneficiaries are satisfied by water quality of BSF and reduction in rate of rate of water borne diseases is also reported.**

(iv) Impact of Technology on lives of rural people :

Adoption of BSF technology has made significant impact in lives of rural people (particularly in SATHI project region). After affordable water purification technology interventions by SATHI, the community is now able to access purified drinking water at their doorstep. Local community have shown their keen interest in adoption of this simple & cost effective technology. **BSF technology of water filtrationhas not only reduced the number of diarrhoea cases & rate of other water borne diseases , even the medical bill related to water borne diseases has gone down by 75 -80%. As this technology is very simple, cost effective & environment friendly, people from other parts of state are also adopting the same.**To analysis the impact of this simple & cost effective technology of water filtration, SATHI conduct regular field visit of project villages. For the same, organisation has developed some specialised monitoring evaluation & feedback forms. During door –to –door visit of respective BSF beneficiaries, SATHI field staff note down the feedback in these specialised forms. It helps SATHI in impact analysing of BSF technology in lives of rural people.

(v) Authenticity ofeffectiveness of BSF technology:

The result of SATHI efforts in development & demonstration of affordable water filtration technology are quite significant, authentic & measurable. SATHI has measured authenticity of BSF technology through three ways:

- **Water testing report of HPSPCB, Paonta Sahib &Wadia institute of Himalayan Geology-Dehradun :**

To analyse the impact of BSF technology in water filtration, SATHI also got tested some sample of natural water source i.e. Hand Pump / Bawdi (major source of drinking water to community as well as BSF treated water from **HPSPCB (Himachal Pradesh State Pollution Control Board) Laboratory, Paonta Sahib&Wadia institute of Himalayan Geology-Dehradun which confirms that BSF reduces/eliminates Total Dissolved solids, Sulphate (SO4), Turbidity, Iron, Total Hardness and E-Coli bacteria from contaminated water & make it 100 % safe for drinking.**

- **Field review of project villages by external technical agency**

The SATHI intervention in affordable water purification technology are also reviewed by USA based organisation SAPWII (South Asia Pure Water Initiative, Inc) . SAPWII is engaged in transformation & dissemination of water purification technology in India as well as other parts of south Asia. During Sept'14, representative of SAPWII i.eMr. Mike Lipman, Mrs Shivani Kumar & Mr. LalitWadher(team accompanied by journalist from reputed national newspaper-Hindustan Times, Mint) reviewed 02 BSF project villages of SATHI.Expert team **visited Mundad&Kuina-Katli of Pachhad block of Sirmour district –HPand reviewed SATHI's Biosand filter development process& installation procedures, and also interviewed the village users. <u>Review team found that SATHI is implementing the affordable water technology with international standards established by the Centre for Affordable Water and Sanitation Technology, Inc (CAWST).</u>**

- **Follow-up with the users**

To analysis the impact of this simple & cost effective technology of water filtration, SATHI conduct regular field visit of project villages. For the same, organisation has developed some specialised monitoring evaluation & feedback forms. During door –to –door visit of respective BSF beneficiaries, SATHI field staff note down the feedback in these specialised forms. It helps SATHI in impact analysing of BSF technology in lives of rural people.

(vi) <u>Applicability of BSF technology in Himachal :</u>

In India (including parts of rural Himachal), more than half of the population consumes unsafe, contaminated and polluted drinking water. Due to poor water quality the occurrences of intestinal diseases are wide spread and households spend substantial portions of their income every year to cope with the diseases. Boiling the available water is a major expense and not a common practice of most of the households in India. Often many households buy bottled water fearing diseases and end up spending unnecessary additional money from their small incomes. In recent years the market for various commercially manufactured filters has grown in India. These filters are far too expensive for most of the Indian population (including rural Himachal community).

<u>Bio-sand water filter is veryinnovative, cost effective and best alternative to combat problem of contaminated Drinking water & occurrence of water borne diseases, especially in rural parts of Himachal Pradesh where availability of safe drinking water is still a major concern for local community</u>. Through practical training & demonstration, SATHI is continually spreading this affordable & innovative technology of water purification in remote & backwards rural regions of state. After affordable water purification technology interventions by SATHI, the community is now able to access purified drinking water at their doorstep. **Local community have shown their keen interest in adoption of this simple & cost effective technology.BSF technology of water filtration is very viable and can be easily replicated toother parts of the state.**

Other significant aspect:

In spite of rigorous development in many spheres of human life, availability of safe drinking water is still a major concern in many parts of globe. The WHO and CDC estimate 3.5 million people die per year from water-borne diseases, the #1 cause of death worldwide. This amounts to 10,000 people per day, among which 4,000 are children. **India lost more than 6 lakh under-five children in 2010 due to water, sanitation and hygiene (WASH) related diseases, such as diarrhoea and pneumonia. These diseases are caused by pathogens (biological contaminants). (Source: UNICEF India) .**To address this issue on a mass scale,Bio-sand water filter is very viable alternative. The filter has been tested by various government, research, and health institutions, as well as by non-governmental agencies across the world and found to be effective in water purification.