

Providing Alternate Energy Solutions to Ensure Safe Drinking Water in Flood-Prone District of Odisha

NO. 30 | DECEMBER 2017

In the months of July and August in 2017, floods wreaked havoc in Bihar, Assam, Manipur, Gujarat, Uttar Pradesh, and parts of Odisha.¹ Nearly 40 million people, in these states, were affected, many lives were lost — both human and livestock, livelihoods were swept away, farmlands swamped, crops destroyed.²

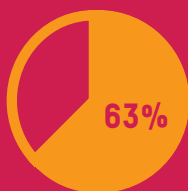
The government, through the National Disaster Response Force and the State Disaster Response Force, set up relief camps and flood posts, deployed rescue boats to bring the evacuees to a safer place, and distributed food and dry ration. However, once the water recedes the survivors will have to deal with the problem of waterborne diseases like cholera, typhoid, jaundice, and diarrhoea; this is due to lack of access to safe drinking water and sanitation facilities.

As part of its Humanitarian and Disaster Risk Reduction (DRR) programmes, Oxfam India has reached out to a few of the flood-affected districts. Though stress, during emergency, is laid on holding public health promotion activities — safe handling of water, hand washing, diarrhoea prevention and reducing incidents of open defecation, there is a need to establish sustainable flood-proof systems of safe drinking water and toilets for all times. This will bring down the incidence of waterborne diseases through the year; and this was evident in Ogalpur and Suhagpur village, in Kanas block in Odisha's coastal Puri district (see Box 4).

Innovative Water, Sanitation and Hygiene (WASH) models like Iron Removal Plant and Pond Sand Filtration unit, were set up by Oxfam India along with SOLAR, through the DRR programme. The programme works towards making communities resilient to disasters and reducing their vulnerability from potential shocks, by mitigating risks to their lives and livelihoods. One of the key components is ensuring access to safe drinking water at all times. Though these WASH models were set up under the DRR programme, they were made more sustainable by linking them to alternative and renewable energy. These models showed a sharp contrast in the incidence of waterborne diseases before and after the interventions were staged.

In Odisha, Oxfam India works in flood-prone settlements of Subarnarekha, Mahanadi, and Daya river basins providing safe drinking water, at all times including emergencies. Puri, with almost 150 km of coastline, is prone to cyclone and floods. Moreover, the district lies in the waterlogged area, have high saline and iron levels in the groundwater, and high biological contamination in the surface water. Between the groundwater and surface water, the community is stuck between the 'proverbial' devil and the deep blue sea (See Box 1). The groundwater, though not toxic, has a foul taste and smell while the surface water carries the risk of waterborne diseases, and skin ailments and allergies. This is further exacerbated during floods.

BOX 1: BETWEEN THE DEVIL AND DEEP BLUE SEA



DATA SHOWS THAT ALMOST 63 PERCENT OF PURI'S POPULATION ARE DRINKING IRON-CONTAMINATED GROUNDWATER.³ THOUGH IRON IS NOT TOXIC AS OTHER HEAVY METALS SUCH AS LEAD OR ARSENIC, A HIGHER CONCENTRATION OF IRON IS UNDESIRABLE IN POTABLE WATER.⁴ IT LENDS AN ODD TASTE AND ODOUR TO THE WATER AND TURNS RED ON SETTLING DOWN. PURI IS ONE OF THE 11 DISTRICTS IN ODISHA WHERE DRINKING WATER (GROUNDWATER) HAS IRON CONTENT WELL ABOVE THE PRESCRIBED LIMITS.⁵

TO AVOID IRON-CONTAMINATED WATER, COMMUNITIES OPT FOR SURFACE WATER I.E. PONDS AND RIVERS. THESE CONTAIN HIGH LEVELS OF BIOLOGICAL CONTAMINATION DUE TO RAMPANT OPEN DEFECTION. HUMAN AND ANIMAL WASTE IS DRAINED INTO PONDS AND RIVERS DURING RAINS AND IT GETS WORSE DURING FLOODS. FURTHER, RIVERS FLOWING THROUGH THESE VILLAGES ARE POLLUTED BY URBAN AND INDUSTRIAL WASTE.⁶ FOR INSTANCE, A TIER II CITY LIKE BHUBANESWAR (THE STATE CAPITAL) GENERATES, APPROXIMATELY, 10 LAKH LITRES OF SEWAGE EVERY DAY AND DISCHARGES IT INTO THE KUAKHAI RIVER AND DAYA RIVER; DAYA FLOWS THROUGH PURI AND IS THE LIFELINE FOR THE VILLAGES ALONG ITS BANK.⁷

BOX 2: OUTREACH SINCE 2008 (KANAS BLOCK, PURI)



**TOTAL OUTREACH
37513 PEOPLE IN 44
VILLAGES**



**21 SCHOOLS AND 3582
STUDENTS COVERED
THROUGH SCHOOL
SAFETY PROGRAMMES**



**329 WASH COMMITTEE
MEMBERS TRAINED**

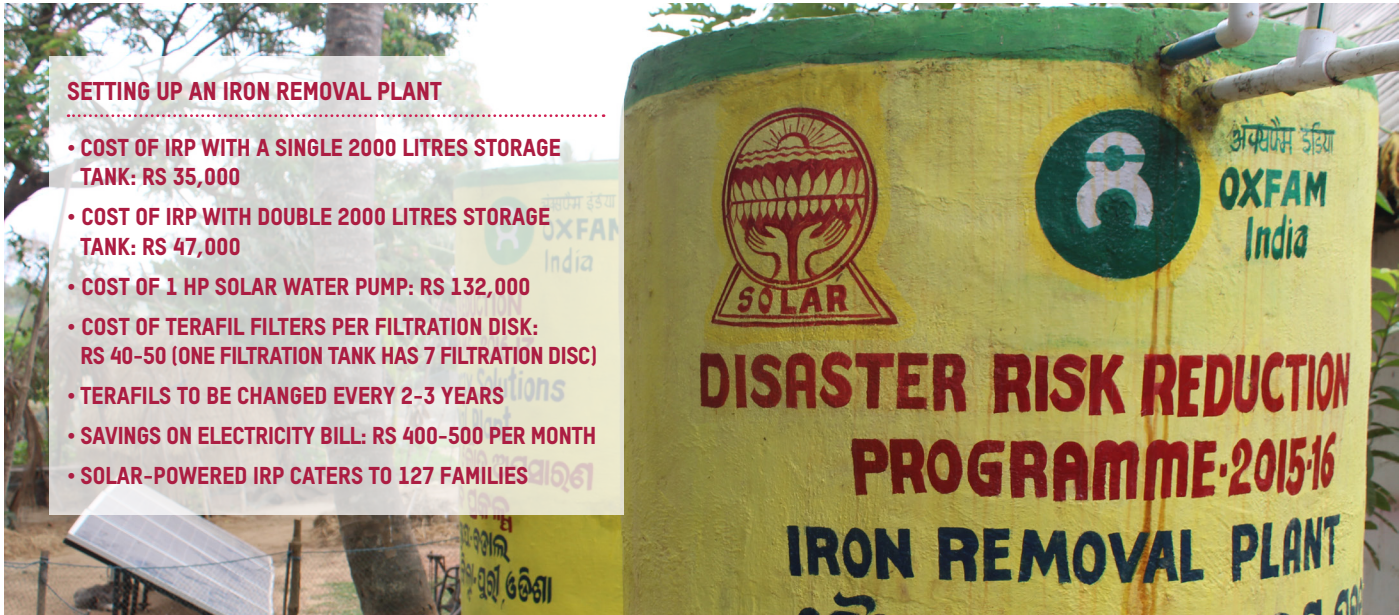


**13 FLOOD-PROOF
RAISED TUBE WELLS
PLATFORMS TO ENSURE
ACCESS TO SAFE
DRINKING WATER
DURING EMERGENCIES**

In Puri, Oxfam India and SOLAR have been working in 15 villages in three Gram Panchayats of Kanas block since 2008 (see Box 2). Access to safe drinking water at all times, including emergencies, is key to building resilience against waterborne diseases. Since 2013, 13 raised hand pumps, two Iron Removal Plant (IRP) and two Pond Sand Filtration (PSF) Units were set up. Though these have helped in providing safe water largely, the dependence of IRP and PSF on an erratic electricity supply from the grid meant it didn't reach its full potential. During emergencies it became worse due to the complete failure of power supply from the grid, making these units unsustainable.

In order to keep them functional at all times, Oxfam India and SOLAR have added alternative energy options — carousel or play pumps and solar energy. These have been established as sustainable models. The success of these units can be gauged from the fact that there is a growing demand from neighbouring villages.

Oxfam India plans to scale up the initiative; either by replicating these models or by introducing new designs. Oxfam India and SOLAR are engaging with local government officials and the PRIs for scale up using local funds. The 14th Finance Commission has allocated funds at panchayat level and this will be mobilised to set up IRP and PSF units.



SETTING UP AN IRON REMOVAL PLANT

- COST OF IRP WITH A SINGLE 2000 LITRES STORAGE TANK: RS 35,000
- COST OF IRP WITH DOUBLE 2000 LITRES STORAGE TANK: RS 47,000
- COST OF 1 HP SOLAR WATER PUMP: RS 132,000
- COST OF TERAFIL FILTERS PER FILTRATION DISK: RS 40-50 (ONE FILTRATION TANK HAS 7 FILTRATION DISC)
- TERAFILS TO BE CHANGED EVERY 2-3 YEARS
- SAVINGS ON ELECTRICITY BILL: RS 400-500 PER MONTH
- SOLAR-POWERED IRP CATERS TO 127 FAMILIES

RAISED HAND PUMPS

To ensure that during floods, the only available and reliable source of drinking water remain accessible, 13 tube wells were raised by Oxfam India and SOLAR between 20018-2013. By raising the hand pumps, they were made flood-proof. This meant that the community would have access to drinking water during emergencies.

IRON REMOVAL PLANT

Once access was ensured, there was a need to ensure safe drinking water. Though the hand pumps were raised and flood-proofed, the water had high levels of iron and salinity. This forced the villagers to continue taking water from ponds and river, which had biological contaminants. In 2015, Oxfam India and SOLAR set up an Iron Removal Plant in two villages – Ogalpur (Badal Gram Panchayat) and Jaguliapadar (Gopinath GP).

The IRP is a 2000 litre cylindrical water tank built alongside the raised hand pump and retrofitted with terra filters or terafil. The filters divide the tank into two parts. The motor pump, operated four times a day, draws water and collects it into the top section of the IRP. The water passes through the terafil – discs made of locally available red clay, river sand and saw dust – into the lower chamber of the IRP (See Box 3). Filtering out suspended particles, iron and other heavy metals purifies water. The filtered water collected in the lower chamber is then collected through two taps. The water collected is free of foul smell, taste and biological contaminants.

SOLARISING IRON REMOVAL PLANT

Though the communities in these villages continue to use surface water for cooking, the IRP largely reduced their dependency on ponds and rivers for drinking water. There was a sharp decline in the reported incidences of diarrhoea, typhoid and dysentery in these two villages. However, the IRP is dependent on electricity, which is erratic, it meant that there were times when the village had to rely either on the tube well or the pond and river.

In order to make the IRP sustainable, solar panels and an additional 2000 litre IRP was installed in Ogalpur village on a pilot basis in 2017. The solar panels – four panels of 250 watts each – was installed to provide electricity at all times; they were raised on stilts to make it flood-proof. The panels were attached to a 1 horsepower (HP) motor pump.

The solar energy powered motor now runs twice a day; earlier they were run four times a day. The increased capacity of the twin tanks has reduced

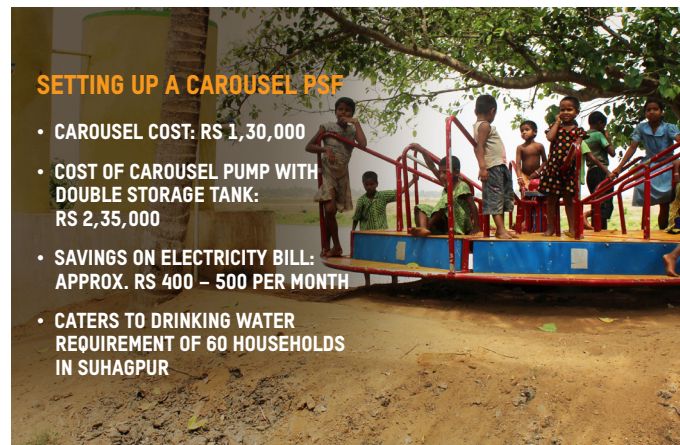
the long lines, which had become a huge deterrent for the communities. The WASH committees continue to run, clean, and maintain the solar-powered IRP. The terafil are cleaned once weekly unlike twice in the past; the twin tanks have reduced the burden on the terafil as well.

POND SAND FILTRATION UNIT

Where the groundwater is undrinkable, the village pond is their only source of drinking water. However, the ponds with their close proximity to open defecation spots are rife with biological contamination and a breeding ground for waterborne diseases. To ensure that biological contaminants are removed and the water is made fit for drinking, Oxfam India- SOLAR introduced two models of Pond Sand Filtration Unit.

The first, in 2014, was an overhead flood-proof pond sand filtration unit built in Harasapara village. This 10000-litre tank was built on 10 feet high stilts to make it flood-proof. A motor pump drew water into the tank. The tank, divided into six chambers, contained two types of stone chips (20 mm and 10 mm), sand and charcoal; this helps remove the biological contaminant. The water, through the inlets, moves from one compartment to another before the filtered water is stored in the last compartment. This is then attached to outlets/taps, through which the community draws water. The PSF unit takes care of turbidity and physical contaminants.

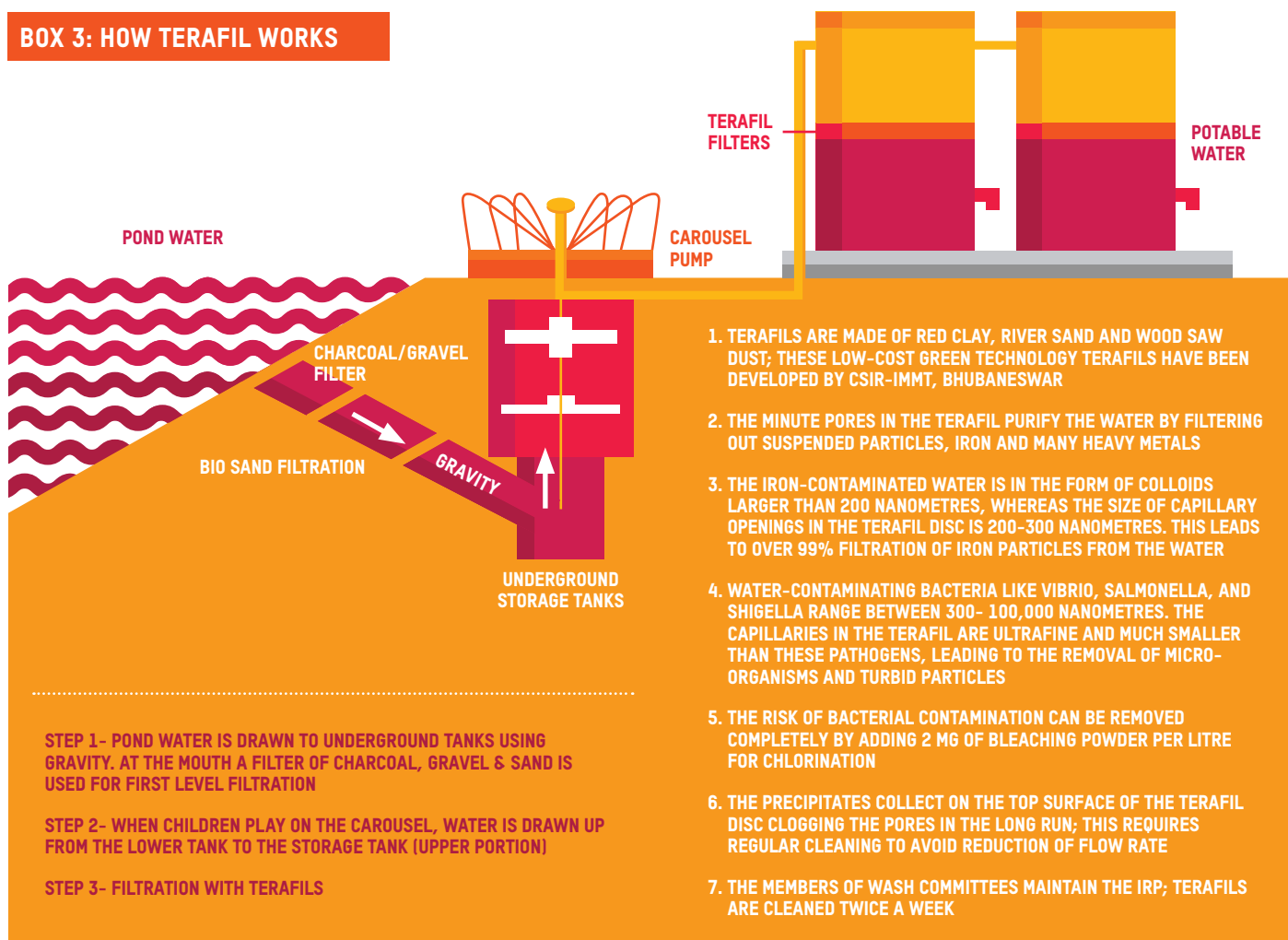
Though the water is drawn to the tank through an electric motor, there is an alternative hand pump installed to draw water. The hand pump is used when there is no electricity and is especially useful during floods. Though the WASH Committee members often run these hand pumps, it is a feasible option as it can be operated by everyone in the village.



SETTING UP A CAROUSEL PSF

- CAROUSEL COST: RS 1,30,000
- COST OF CAROUSEL PUMP WITH DOUBLE STORAGE TANK: RS 2,35,000
- SAVINGS ON ELECTRICITY BILL: APPROX. RS 400 – 500 PER MONTH
- CATERS TO DRINKING WATER REQUIREMENT OF 60 HOUSEHOLDS IN SUHAGPUR

BOX 3: HOW TERAFIL WORKS



CAROUSEL POND SAND FILTRATION (PLAY PUMP PSF)

The second and an improved version of the PSF was piloted in 2017 in Suhagpur (Khandahata GP). This is a combination of the PSF and IRP. The water is collected through a gravity canal fitted with bio sand filtration system consisting of stone chips (20 mm and 10 mm), charcoal and sand. The gravity canal replaces the motor pump, which would have been used to lift water into the tank.

The filtered water is stored in a collection tank underground. This filtered water is then lifted into two 2000 litres IRPs by a carousel or a play pump; the IRP is set up close to the carousel. Every time children play at the carousel, water is drawn into the upper chamber of the IRP.

The carousel serves dual purposes: one, it is attractive to children as a playground equipment, and two, the community is not dependent on electricity to get safe drinking water. The play pump is often the only piece of playground equipment in their village and provides the children with a constructive and rewarding way to use their energy. Children play at the carousel, usually twice a day – once before they leave for school and once after school is over.

Like in the IRP, the WASH committee is responsible for maintenance and cleaning of the PSF and the play pump as well. The tank is cleaned every Sunday. The youth in the village is trained, by Oxfam India and SOLAR, to clean the tanks through the backwash technique. All outlets are opened, the water is let out, and the sediment is cleared. The filters - pebbles, gravels - are cleaned with fresh water. Once clean, the outlets are shut tightly and the tank is ready to be used.

The advantages of the carousel PSF are that: a) the water is filtered twice, b) the carousel, the only play equipment for children in the

village, operates every time children play on it, and c) it reduces their dependency on electricity to access safe drinking water. Neighbouring villages have approached the Suhagpur village head and SOLAR to install similar units in their village.

JOB HALF DONE, UNLESS

Providing technical solutions to water contamination is a job only half done. In isolation, it will have little or no impact unless the overall sanitation and hygiene situation improves. Personal hygiene and behavioural changes are paramount and need to be bolstered. Oxfam India's DRR programme focuses on bringing about these changes.

For instance, the WASH committees, trained by Oxfam India-SOLAR, ensure that latrines are made in every house and subsidies availed under the Swachh Bharat Abhiyaan. These committees engage with both the local government bodies and communities. It helps the former to identify eligible beneficiaries under the scheme; with the latter, it engages to influence and encourage to construct individual latrines. Open defecation is one of the primary sources of surface water contamination and the communities are beginning to understand this and ensure that pollution of ponds and rivers stop.

The WASH committees also emphasise on safe collection, storage and handling of water to prevent post-collection contamination. Oxfam India promotes hand washing during critical times. Collection and storage containers with either lids and spigots or narrow necked containers and ladles are promoted to limit environmental contamination. The community is encouraged to regularly clean containers. Communities are also trained in household water treatment methods, including boiling and chlorination for safe use of water at all times.

WHY SAFE DRINKING WATER MATTERS

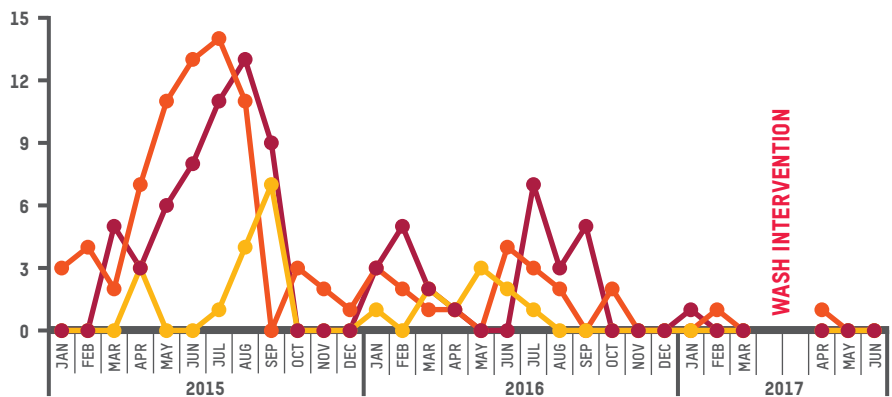
During Oxfam India's visit in August, the community recalled that in the last few months the incidence of diarrhoea, typhoid, and jaundice had reduced drastically. This was corroborated by the data collected by the Auxiliary Nurse Midwife of the two villages. For instance, in Suhagpur, during the first four months in 2016, 11 cases of diarrhoea were reported. For the corresponding period in 2017, only 1 case was reported. In Ogalpur, too, there has been a drastic drop in the trend of incidence of waterborne diseases. (See Box 4)

The high demand for these innovative WASH models from neighbouring villages is a clear indication that the model is a success and should be replicated in the coastal villages prone to flooding. Solar panels and play pumps have substantially brought down the recurring cost of electricity bills; these pumps have ensured a consistent supply of clean drinking water even during long power cuts.

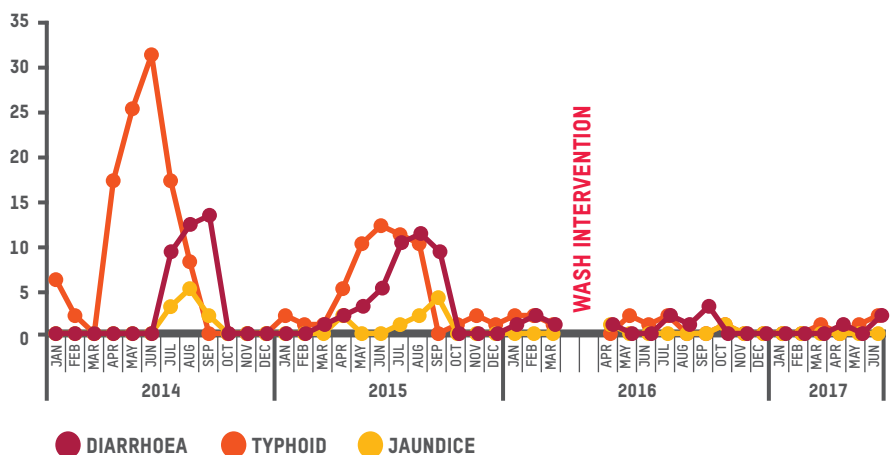
Though the pilot models were set up by Oxfam India and SOLAR, the community has played a big role in its maintenance and upkeep. For instance, a significant portion of the village fund collected in Ogalpur is dedicated to maintaining the IRPs; the community constructed a platform for the solar panels. Moreover, the affordability of the WASH models in these villages have encouraged neighbouring villages to consider sourcing village funds for setting up similar plants.

BOX 4: DISEASE SURVEILLANCE DATA (PRE & POST-INTERVENTION)

DISEASE SURVEILLANCE DATA FOR SUHAGPUR



DISEASE SURVEILLANCE DATA FOR OGALPUR



Source: Data collected by ANM in the two Villages

NOTES

¹ Oxfam India, along with its partners, is responding in 10 districts in Uttar Pradesh (1), Bihar (1), Assam (4), Gujarat (2) and Manipur (3).

² Oxfam Sitrep issued on September 7, 2017 prepared by Oxfam India's Humanitarian Hub, Kolkata

³ <http://indiawater.gov.in> (till Dec 31, 2014)

⁴ WHO approves 0.3 mg/l to 1 mg/l as the agreeable levels of iron contamination

⁵ The other districts are Balasore, Khurda, Kendrapada, Angul, Boudh, Kalahandi, Gajapati, Mayurbhanj, Keonjhar and Dhenkanal; Vision 2017: RWSSS, Rural Development Department, Government of Odisha

⁶ According to a study, per capita usage cities and towns people use about 335 litres of water daily for different domestic purposes. About 70-80 per cent of this water drains out to the nearby ponds, tanks or rivers through the drains or nallahs, carrying loads of harmful bacteria and viruses. (Source: Contamination of Drinking Water

Sources in Odisha; 2014-15; Supported by: Inter Agency Group)

⁷ Contamination of Drinking Water Sources in Odisha; 2014-15; Supported by: Inter Agency

AUTHOR: SAVVY SOUMYA MISRA

INPUTS: ANIMESH PRAKASH, RAJITA KURUP, DIYA DUTTA, RANU KAYASTHA BHOGAL

PHOTO CREDIT: ANIMESH PRAKASH

© Oxfam India, December 2017

This publication is copyright but the text may be used free of charge for the purposes of advocacy, campaigning, education, and research, provided that the source is acknowledged in full. The copyright holder requests that all such use be registered with them for impact assessment purposes. For copying in any other circumstances, permission must be secured. E-mail: savvy@oxfamindia.org. Oxfam India, a fully independent Indian organization, is a member of an international confederation of 20 organizations. The Oxfams are rights-based organizations, which fight poverty and injustice by linking grassroots interventions to local, national, and global policy developments.

Oxfam India | 4th and 5th Floor, Shriram Bharatiya Kala Kendra, 1, Copernicus Marg, New Delhi 110001

Tel: +91 (0) 11 46538000 | Web: www.oxfamindia.org

Oxfam India is a member of a global confederation of 20 Oxfams and is registered as a company under section 8 of the Indian Company Law.



ऑक्सफैम इंडिया

OXFAM
India