



# Faecal Sludge Management

Sanitation for all  
– a visual insight



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## Preface

We all know that a picture is worth a thousand words. But with our subject matter, we prefer to say it's worth ten thousand words. This book is about one of the biggest global challenges to human communities – the handling and treatment of faecal waste – which also happens to be a topic many people find repugnant. Yet, as you will see, it can sometimes be astonishingly simply beautiful. For this only images will suffice. As we approach our work on the ground, so we present our journey in FSM and sanitation – by showing rather than telling.

Official statistics suggest that worldwide about 2.6 billion people do not have access to “improved” sanitation. They rely instead on onsite options like septic tanks and pit latrines, with no sustainable Faecal Sludge Management (FSM) system in place to treat the waste or even control where it goes after the tanks and pits fill up. The waste is typically dumped untreated into fields, drains, bodies of water—places in urban environments where residents hope it may at least be “carried away”. And for a significant number of these 2.6 billion people, their only toilet option is an open area where they hope to find a bit of privacy. Needless to say, this lack of suitable sanitation systems contributes to significant health and environmental problems. Almost 1,000 children under five die each day from diarrhoea caused by

inadequate water, sanitation and hygiene. By improving how we deal with human waste, we can save lives, improve child health, ensure greater dignity, privacy, and personal safety – particularly for women and girls – and contribute to economic development.

At BORDA we have 40 years' worth of experience applying proven technical options and expertise to community-based sanitation solutions that work for everyone involved, most of all the community members themselves, and can be applied at scale in rapidly growing urban areas. In the field of FSM, BORDA and our Indian partner CDD Society are pioneers and leaders with over 10 years of boots-on-the-ground, hands-dirty project work starting in Southeast Asia (Indonesia) and expanding to South Asia, Africa and Latin America. Our competency lies in translating global learning to local implementation of the entire FSM value chain, from the capture of faecal sludge via improved toilets, to its storage, transport and treatment in bio-based localised Faecal Sludge Treatment Plants (FSTP), and finally to its reuse as non-toxic fertilizer, garden-ready water, and biogas energy. In other words, keeping faecal sludge out of the environment and transforming it into useable products. This full-cycle approach, plus our capacity for local and regional service provision, means that BORDA and CDD Society are able to





deliver town-scale FSM infrastructure and services that help communities, governments and their partners achieve the UN's 2030 Agenda for Sustainable Development Goal of ensuring the universal availability and sustainable management of water and sanitation.

With this book, premiering at the FSM4 Conference 2017 in Chennai, India, we want to bring you into our project work in India, Southeast Asia, Africa and Latin America. You'll see not only the FSM process and technology, but also the people involved and the local people who benefit.

You'll see images of our widely recognised FSTP in Devanahalli, India, supported by the Bill and Melinda Gates Foundation, implemented in partnership with CDD Society, and now operated and maintained by the local Municipal Council. It's a wonderful example of what happens when all stakeholders are involved: a sanitation solution that is locally, socially, politically, economically, environmentally and technically sustainable. You may even be pleasantly surprised by the unexpected beauty of its final, reusable products. In Indonesia, you'll see one of the oldest FSTPs and how it works. In Tanzania, your photo tour will include innovation of a different sort: getting the faecal sludge out of pits and into treatment

plants. Hint: no large trucks required. In Mexico, you'll see the early stages of FSM implementation, before a sanitation infrastructure is built.

By the time you reach the end of the book, we hope you'll have gained a greater appreciation of the widespread and urgent need for sustainable FSM – that sustainable sanitation means not only lives saved but also liveable communities. Dare we hope that you might have come to see the beauty in waste – that even the most taboo of wastes may be talked about in polite company and seen as a potentially valuable community resource? After all, waste is no longer waste once we've made it useful again. Perhaps most of all, we aim to engender a feeling of hope – hope that seemingly insurmountable urban sanitation challenges can indeed be overcome in low-cost, sustainable ways that are ultimately managed by the communities that need them.

Many thanks to our excellent photographers Janina Ahrendt, Alasdair Jardine and Julia Knop, who through their eyes and interactions have been able to set the FSM scene for us in such a compelling and accessible way.

Bangalore, Bremen, February 2017

Stefan Reuter  
Director, BORDA

Sasanka Velidandla  
CEO, CDD Society







## Seeing the Need

### Mexico

The story of FSM begins with need. The need for toilets. The need for potable water that is not contaminated with human waste. The need to reuse natural resources. Our images from Mexico illustrate this in communities we don't normally see: those on mountain tops, deep in forests, or in closed-off valleys.

In Mexico it is the rural indigenous population that is affected most by lack of basic sanitation services – particularly in the southeastern states of Oaxaca, Veracruz, Chiapas, San Luis Potosi and Campeche. Surrounded by biological richness, people live in extreme poverty. Homes are spread apart in remote areas, reachable only by dirt tracks. Villages rarely have a center. Indigenous languages hinder communication with outsiders. Sanitation and wastewater handling are a household affair – to each his own. Improvised, inadequate solutions are the norm.

Solutions that can be replicated house to house, developed with and managed by the people living there...this is the task of a pilot project undertaken by BORDA Las Américas and its partner Fondo para la Paz. Selected families in various communities will test and help evaluate the first generation of these solutions. In portraying some of those families and their living conditions, a key idea comes into focus: home is where FSM begins.





← Sierra Zongolica, Veracruz









← San Fernando, Pantelhó, Chiapas





Prototypes of improved  
toilets and washing stations







## Innovating the Transport Tanzania

In the FSM story there are emotional high points – the humanitarianism of safe toilets, the pride in treatment plants. And then there's transportation, the unglamorous key link in the FSM value chain. Big trucks with hoses are typical solutions. But what happens in places they can't go? Our images from Tanzania's capital Dar es Salaam share some answers to that question.

Dar es Salaam is one of Africa's fastest-growing cities, predicted to become a mega-city. The pattern is of unplanned growth unaccompanied by basic services. The majority of the city's 4 million inhabitants live in informal settlements where homes are closely spaced along narrow streets. In many of these areas, only small vehicles can pass through, and some homes are accessible only on foot. These tight confines complicate the collection of faecal sludge. Even when it is collected, residents often have to organise the dumping themselves.

Two BORDA FSM plants – one in the Kigamboni district and another in the Mlalakua suburb – have deployed innovative home-to-plant transportation solutions. For narrow streets, meet Sludge-Go, a small tractor with a tank-trailer and motorised pump. For even narrower paths, see the trike-wagon combo that carries individual waste containers. The message: when transportation goes everywhere, sanitation for all is within reach.





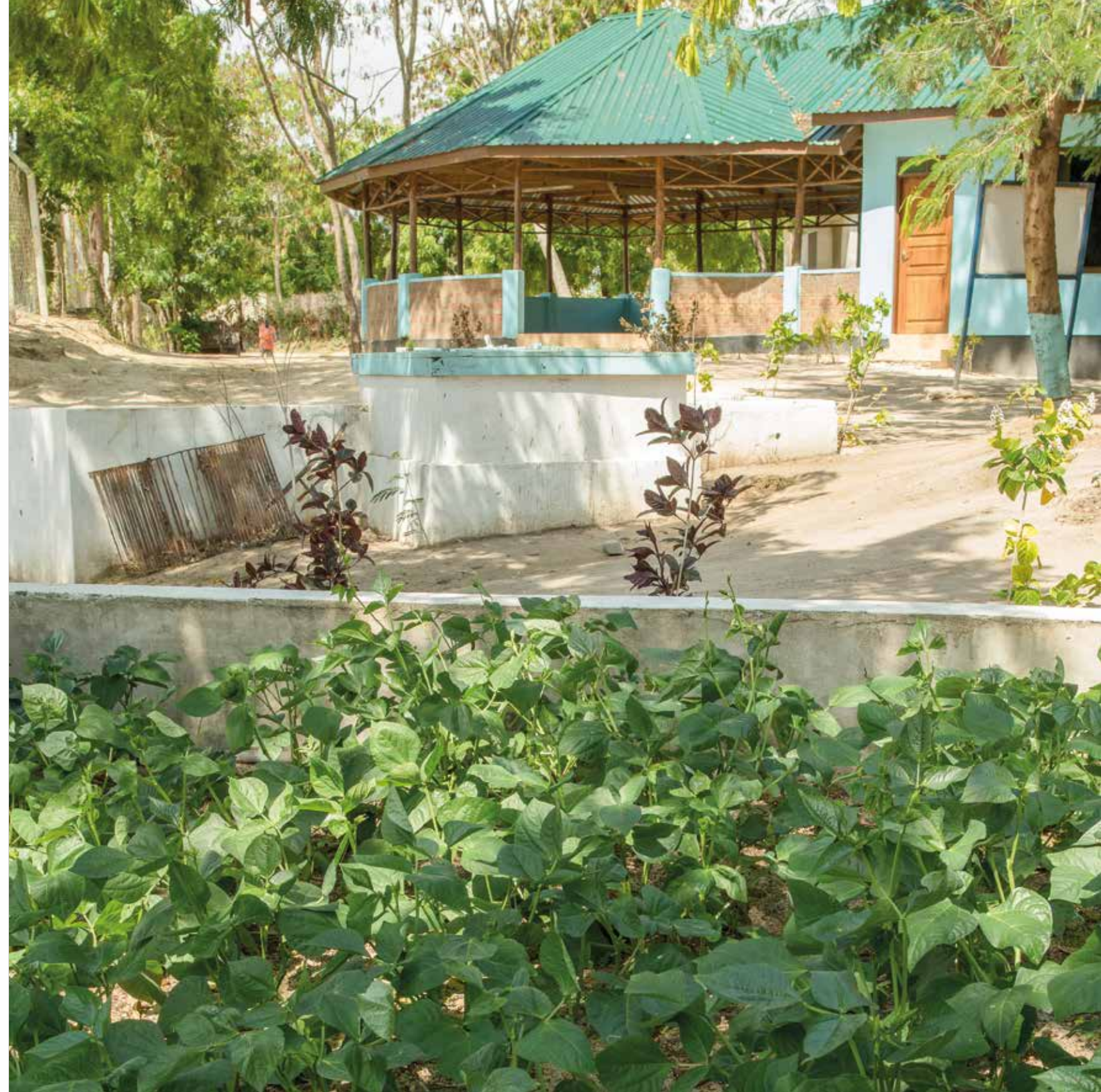
Advising a Kigamboni customer





Kigamboni treatment plant →







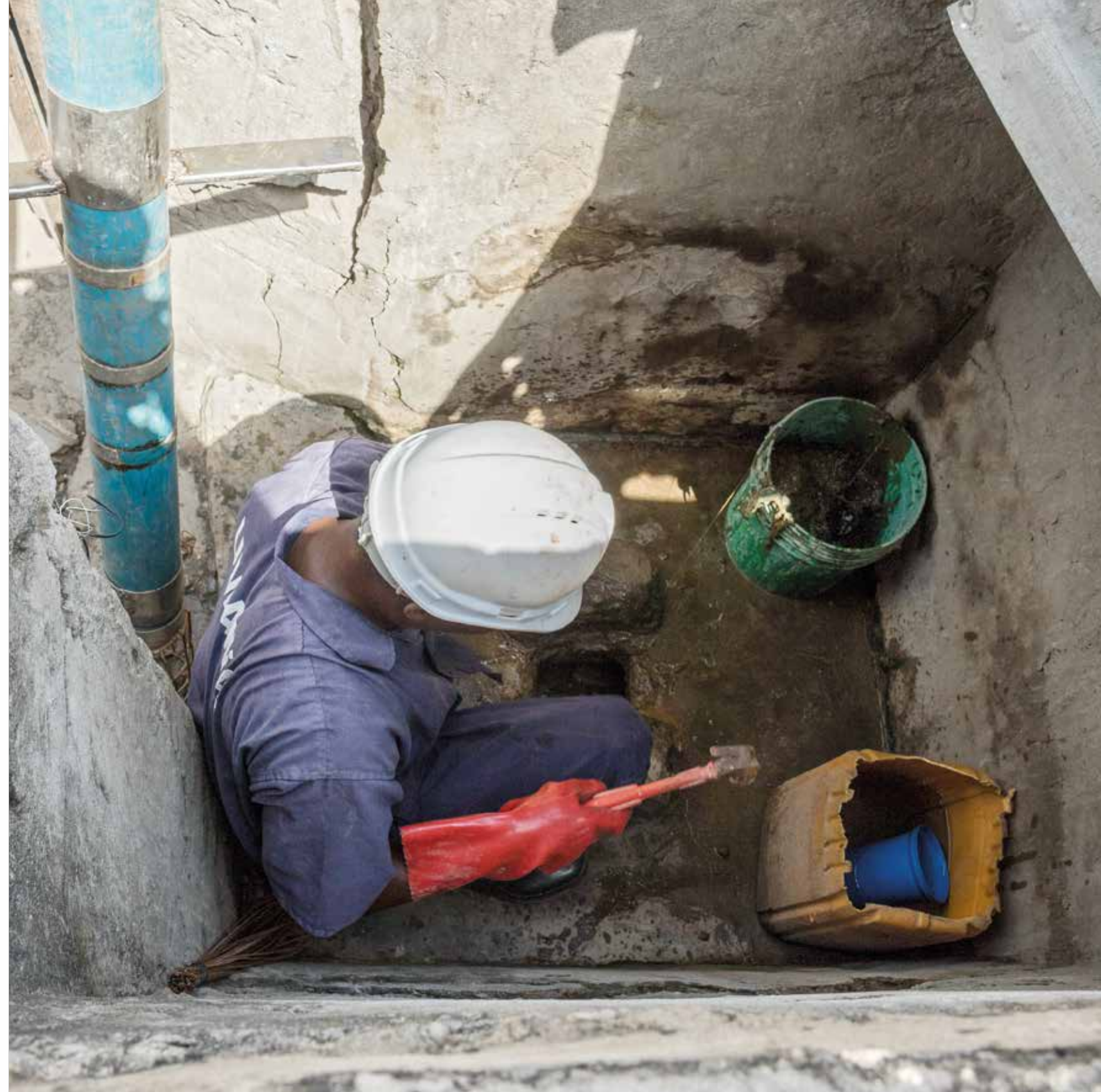
Mlalakua informal settlement







Removing plastic waste before pumping















Malakua treatment plant





## Pioneering the Treatment Indonesia

In FSM there's no getting around it: the yuck factor. Yet to treat faecal sludge sustainably – so it not only does no harm but also does good – is to engage with it, even to embrace it. These images from Banda Aceh, Indonesia show how that may be done for an entire city.

Banda Aceh is known around the world as the place hit hardest by the Christmas tsunami of 2004. Directly on the ocean in a flat coastal valley between two mountain ranges, the city was inundated and basic services destroyed. As disaster relief, large-scale sanitation was mission-critical. As post-disaster rebuilding, it had to be sustainable in an urban area at a low cost. Minimal odors, minimal space, safe for human health and the environment, wastewater that is safe to release, no reliance on electricity, low maintenance... all while serving 250,000 people.

In 2006 BORDA designed and supervised the construction of a faecal sludge treatment plant financed by Unicef that does all of the above for up to 15 daily truckloads of sludge. The images here give an inside view of that operation – with no yuck spared – but always with people in the frame: the customers who order sludge pick-up, the drivers who service the pits, the technicians who collect and test sludge samples. How does this engagement become an embrace? The opening and closing images offer a hint: farmers in rice fields, fisherman and their catch...





Banda Aceh



















Banda Aceh treatment plant











Biogas from the treatment plant











## Moving towards Reuse

### India

The FSM story doesn't end with waste treatment. When the input is faecal sludge, the focus is on transformation. From toxic to reusable: that is the FSM cycle. In the opening image, we see this illustrated on a wall in south India. A boy faces a choice between a field and a toilet: to foul or to fertilise?

Devanahalli, India, the scene of these images, is a growing town of 30,000 people near Bangalore's international airport. Water scarcity and high costs mean no centralised sewerage. In towns like these, most faecal sludge is dumped untreated into the environment. Sanitation and hygiene deteriorate while valuable water and nutrients are wasted. Women and children especially suffer the consequences. Declining water tables and rising fertiliser costs threaten agriculture. Taboos surrounding the handling of human waste hinder efforts to reuse it.

In Devanahalli, reuse is a demonstrated solution. The town's first-of-its-kind faecal sludge treatment plant, set up by BORDA and CDD Society, is a model for replication across South Asia. The blue-green of the treatment facility signals its clean and eco-friendly output: agriculture-safe water, dried-sludge fertiliser, biogas for cooking. In Beedi Workers Colony, Kengeri, on the edge of Bangalore, residents use the nutrient-rich treated water not just to irrigate but to fertigate. From "honeysucker" trucks to fresh vegetables, we see what FSM can achieve: human waste transformed into a renewable resource.





Beedi workers' colony





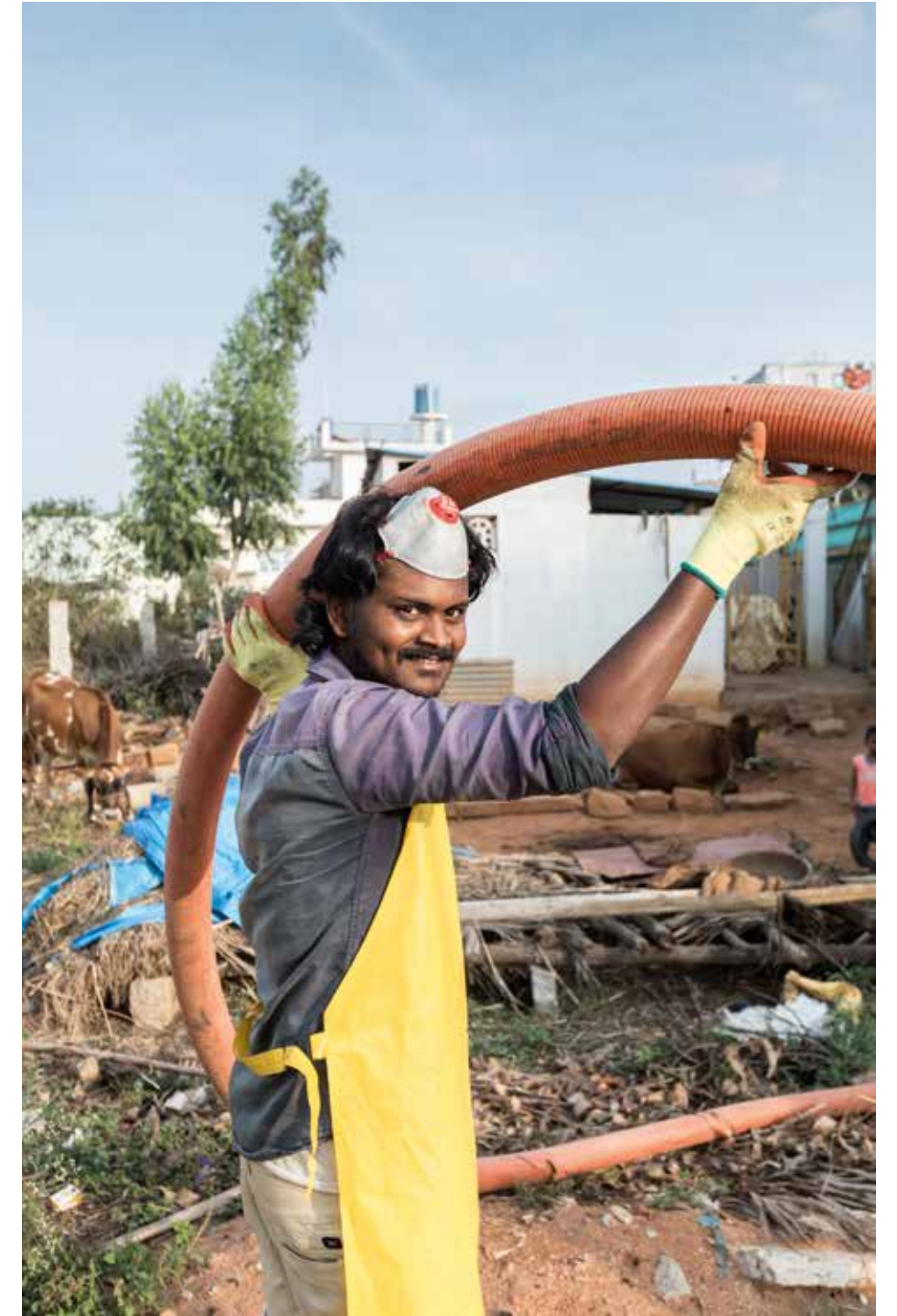
Visiting with Devanahalli Town Municipal Council's Senior Health Inspector (top right) and Chief Officer (bottom left) →







← "Honeysucker" trucks







Devanahalli treatment plant









A neighboring cornfield irrigated by treated water







Laboratory at the CDD Society  
in Kengeri, Bangalore











## Extending the Practice

### Nicaragua

Our FSM story extends beyond faecal sludge into a new setting: a slaughterhouse in Nicaragua. The photos here are not about handling human waste but rather the contents of cow stomachs and slaughter byproducts. Yet the underlying challenge is the same: how to manage organic wastes in sustainable ways that minimise their risk to human health and don't deplete natural resources. Our answer: capture the nutrients in this waste and use them to grow plants.

At the municipal slaughterhouse in León, Nicaragua, 60,000 liters of raw wastewater was illegally discharged every day. Bones, grease, hair, blood... first into the drainage ditch and river, later into the sewage system where it damaged pumps. Large volumes of manure and undigested grass from cow stomachs were sent daily to the municipal garbage dump 5 km away. Slurry and manure trailed onto city streets.

Here was an opportunity to demonstrate that in the middle of a city, it is possible to transform large amounts of organic waste of any origin into fertiliser and food. A slaughterhouse as agricultural production site: that is the BORDA project you'll see here. A gravity-based system treats wastewater for irrigation and sludge for fertiliser. Compost and vegetables sold to local businesses are now streams of income. This path-breaking approach – extended to all organic wastes – leads us to a new story: sustainable sanitation meets sustainable local economies.



Slaughterhouse in León

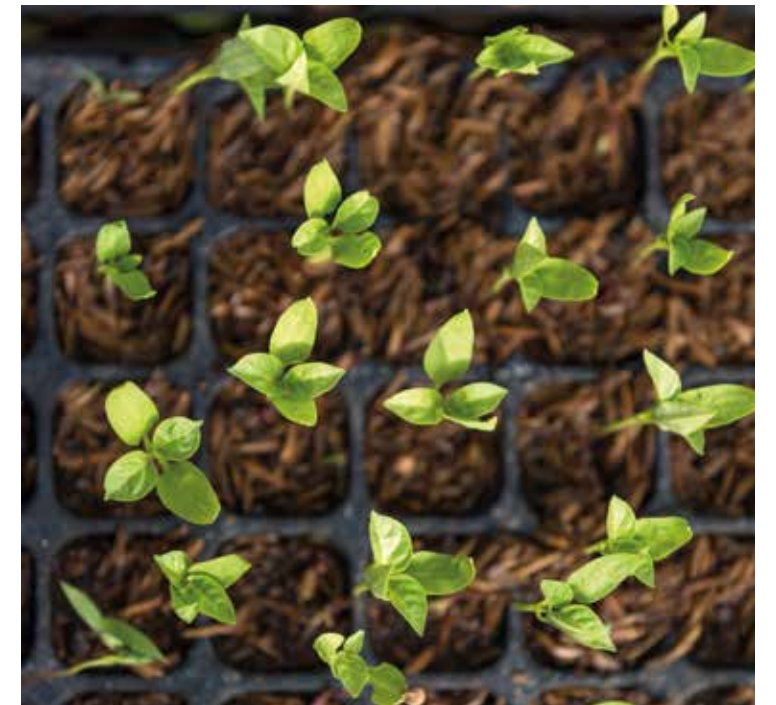






← Partially digested grass from cow stomachs

















## Achieving Liveable Cities

Sanitation for all – instantly agreeable yet still unachieved. Poverty, runaway growth, lack of education and expertise, over-reliance on the Earth's capacity to absorb waste, the instinct to send waste anywhere but here – these explain the gap but can no longer justify it.

Reflecting this change in perspective, the UN's 2030 Agenda for Sustainable Development sets a clear Goal (SDG 6): clean water and sustainable sanitation management, available to all. Meeting this goal means rethinking sanitation solutions in some of the ways portrayed here. Decentralised, bio-based, low-maintenance, locally tailored. Engaging with people in their own communities to make those communities more liveable.

The UN goal is a motivator, but it's not the only reason we get our hands dirty with FSM. We do it because all human lives – those now on this earth and those still to come – have equal value. We do it because all deserve a chance to thrive, and because if we can help then we must help. We do it because we are only as good as what we leave behind.













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[borda.de](http://borda.de)

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The Consortium for DEWATS Dissemination (CDD) Society is focused on implementing robust post-toilet infrastructure through a decentralised approach. CDD Society works with a network of like-minded partners to promote basic sanitation services and sustainable water management practices across India.

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