

## **INTRODUCING ECOLOGICAL SANITATION: SOME LESSONS FROM A SMALL TOWN PILOT PROJECT IN MOÇAMBIQUE**

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### **Abstract:**

The paper explores the development of ecological sanitation (EcoSan) within the small-town context of Lichinga, Niassa Province, Moçambique. The paper looks at how ESTAMOS (a Mozambican NGO) and WaterAid introduced EcoSan in Lichinga, how families and communities have responded to EcoSan, and key lessons learned during the process to date that could be relevant to others within and beyond Moçambique.

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### **Keywords:**

Ecological sanitation, ESTAMOS, PHAST, small-town sanitation, WaterAid

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### **Introduction**

WaterAid has been working in Niassa Province, northern Moçambique since 1995. Niassa Province is the most sparsely populated province in Moçambique, bordering Malawi, Tanzania and the Mozambican Provinces of Nampula, Zambézia and Cabo Delgado. The Province is characterised by poor infrastructure, a weak cash-based agricultural economy, and political and social isolation.

In the past year, WaterAid and its government and NGO partners have increasingly turned their attention to the problems of environmental sanitation in the Province. Interest in sanitation has grown in Niassa as diseases such as cholera and diarrhoea continue to undermine local health, and as water sector agencies have more clearly recognised the limitations of development interventions that focus solely on water supply.

Historically, government and donors have promoted the “Improved Latrine” (“Latrina Melhorada”) which generally consisted of a SanPlat latrine slab placed over existing traditional latrines, or over a new 3-metre deep pit. Alternatives to this system were not considered or promoted. SanPlats were built at slab construction centres slabs in cities and small towns throughout the country. Despite some successes, this initiative has faltered considerably with the suspension of donor funds. Many slab construction centres like the one in Lichinga, the Provincial capital of Niassa, have effectively closed.

The collapse of the country’s centralised slab-construction programme has left the sanitation sector somewhat uncertain about how to move forward. Sanitation policy is currently unclear, particularly at Provincial level. It is into this policy environment that ecological sanitation has been introduced with considerable and, to some people, surprising success.

This paper focuses on how ESTAMOS (a Mozambican NGO), with the support of WaterAid, introduced ecological sanitation into the small-town of Lichinga. ESTAMOS’ programme promotes improved water and sanitation in the town.

Families are, among other things, given a range of options to consider when attempting to improve their water and sanitation situation, including “Improved Latrines” and EcoSan systems. Importantly, people consistently prefer ecological sanitation to others when offered a choice.

The paper begins with a brief overview of Lichinga. A section follows on how ecological sanitation has been promoted and introduced in the bairros of Lichinga alongside more familiar technologies such as traditional and “Improved Latrines”. A section follows on how the M&E system we use has clarified problem areas and allowed us to reconsider aspects of the programme. Key lessons on why EcoSan seems to be valued over other alternatives are documented in the fifth section of the paper. Finally, the paper highlights some of the greatest threats we perceive that can undermine EcoSan both in Niassa and beyond.

### **Sanitation in Small Towns: The Case of Lichinga**

Lichinga is located in the northwestern part of Niassa Province. The town encompasses an area of 290 km<sup>2</sup>, is surrounded by pine forests and is located on the top of a mountain. Undeveloped road networks and deteriorating roads during the rainy season (December – April) make access to Lichinga difficult. Rainfall in Lichinga averages between 1200-1350 mm per year. Five rivers border Lichinga and a series of swamps exist within the perimeter of the town.

The municipality of Lichinga has approximately 85,000 inhabitants living in four Localities further subdivided into 12 bairros. Two densely populated Localities surround the city centre, with two less populated Localities extending into the more rural areas of the Municipality. A small piped water supply distribution system serves a small numbers of families in the first two Localities. Water-borne sanitation, where it exists, is limited to septic tanks. The Municipality does not have the capacity to desludge septic tanks and “private sector” desludging capacity is hard to find.

A majority of Lichinga families continue to farm, even if one member of that family is formally employed by government, NGOs or private sector companies.

Each bairro includes informal and formal political structures, which can create divisions and conflict. The formal political structures comprise representatives of the governing party FRELIMO. Informal structures include *Regulos* (Chiefs) whose political alliances are mixed between FRELIMO and the opposition party RENAMO.

A recent study by ESTAMOS (2001) found high sanitation coverage rates in Lichinga. They found that 93% of families interviewed have latrines in their yards, and 65% of these latrines are traditional pit latrines. Traditional pit latrines have depths that range from 4-5 metres, in contrast to the smaller pits traditionally promoted by the government and donor-sponsored latrine programme.

Families with latrines value their convenience, and many mentioned during focus group discussions that a latrine “dignifies the family”. Families would feel shame if a visitor had to use a neighbour’s latrine because the host family was without a toilet.

Yet, participants in the ESTAMOS study raised a number of concerns about latrines in Lichinga. These concerns are contributing to the introduction of ecological

sanitation and its uptake in an environment that, at one level, seems to have quite considerable basic sanitation coverage. Concerns commonly expressed include problems of flies, mosquitoes, and smell in conventional pit latrines. Another common problem cited is that conventional pit latrines often collapse during the rains, and concerns about groundwater contamination are considerable.

The ESTAMOS study showed that 59% of households with family wells in their yards had their latrines at what would be considered an unsafe distance from the water point (sometimes less than 5 metres). Straw fences that separate neighbours' yards do little to protect wells from latrines on the other side of the fence. People in a number of bairros speak of how latrines are contaminating their wells because the latrine depths are either too deep or equal to the depth of the wells.

And finally, Lichinga is a growing town and has been experiencing a greater influx of people over the past 10 years due to the end of the war and the general development of the Provincial capital. Pressure on land around the city centre is therefore great. Incoming families now build their houses in swampy areas on the fringes of the bairros. These families experience problems with high water tables and consequently struggle to build adequate latrines. Therefore, the need for a greater range of sanitation options than have been historically offered is clear.

Lichinga is a particular case, but it has many of the characteristics that are common to small towns (and many cities) throughout the developing world. The infrastructure of the town will remain limited despite elaborate plans to extend the piped water system throughout the bairros, pave the roads, and electrify more homes. Small towns like Lichinga have dreams of flowing water and flush toilets like the "modern" cities they aspire to be, but the financial and management capacity to attain such dreams simply does not exist. The town struggles to maintain the water supply network they have now and breaks in service are common. And the town can not adequately manage the few septic sewage systems that already exist. Erratic water supplies and limited treatment capacity characterise Lichinga and many other small towns throughout Africa, and the capacity to manage and treat sewage remains a distant prospect.

Development planners and practitioners continue to allocate resources to fight rural poverty and urban squalor but often overlook the needs of small towns. Yet, small towns are growing at a considerable rate internationally, and residents of small towns often face the same problems found in cities and distant rural economies. Infrastructure is poor and unable to meet the needs of local residents. Families live in close proximity to one another, and water and sanitation problems are acute. Economies are weak and still dependent on agriculture, and government plans to address infrastructure needs await willing donors who do not arrive.

Flush toilets, while alluring to town planners, make little sense in small towns. And, as discussed above and further below, Lichinga residents who value latrines for a range of practical reasons recognise that problems with their current systems exist. They seek alternatives and ways to improve their sanitation situation. EcoSan makes sense to them, as ESTAMOS and WaterAid are learning.

## **Introducing EcoSan in Lichinga**

At its simplest, EcoSan is the conversion and reuse of faeces and urine for productive purposes. Many see excreta as wastes that need to be disposed of down pits or through sewers. But advocates of ecological sanitation recognise that faeces and urine are productive resources that, when properly managed, can increase crop yields, strengthen the soil's water-holding capacity and facilitate the growth of trees.

EcoSan is based on three main principles:

- It offers a safe sanitation solution that prevents disease and promotes health by successfully and hygienically removing pathogen-rich excreta from the immediate environment
- It is environmentally sound as it doesn't contaminate groundwater or use scarce water resources
- It creates a valuable resource that can be productively recycled back into the environment. Over time, through proper management and storage, excreta is transformed from a harmful product into a productive asset

EcoSan was originally introduced to Niassa during a sanitation workshop held in March 2000. Many participants found the concepts interesting but wondered how to actually initiate a programme that offered households EcoSan options. ESTAMOS has attempted to do just that in the bairros of Lichinga with the support of WaterAid (Moçambique).

To begin, ESTAMOS held a series of meetings with key leaders and activists residing in various Lichinga bairros. The intention of the meetings was to identify how to proceed with water and sanitation initiatives within the Municipality.

Sanitation issues were discussed and it emerged that participants had problems with their current latrines as discussed earlier. ESTAMOS then introduced EcoSan as a possible alternative to consider. The concepts that underpin ecological sanitation were surprisingly well received. Leaders were asked if they would be willing to test EcoSan in their homes, and to identify others in their bairros who may also be interested in similar types of latrines.

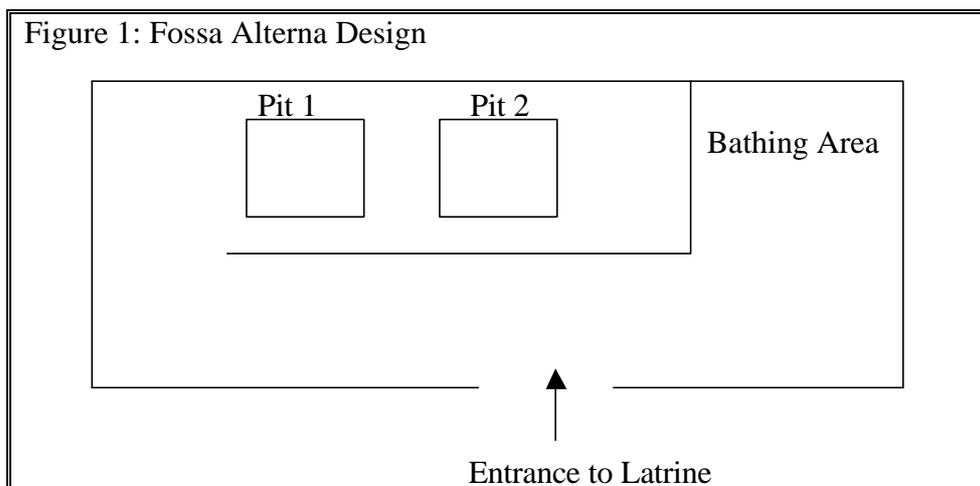
The response was considerable. Families were interested in testing EcoSan in their homes. ESTAMOS constructed the first 35 *Fossa Alternas* and in these houses before and during the rains of 2000/2001. Six *Arbour Loos* were also constructed.

The *Fossa Alternas* uses two permanent shallow pits that are partially lined. A moveable latrine slab is placed on the first pit. Once the first pit fills, the latrine slab is moved to the second pit and the first pit is covered with an additional layer of soil and left to transform into compost. When the second pit is full, the contents of the first pit are removed to a secondary composting point or, if enough time has passed, used directly as compost. The latrine slab is then returned to the first pit, and the process starts again (See Morgan, 1999 and 2001 for further details on the *Fossa Alternas*, *Arbour Loo* [described below] and other EcoSan systems being tested and implemented in southern Africa and elsewhere).

EcoSan programmes strongly encourage households to add a mixture of soil and ash after each use of the latrine. This mixture helps to eliminate odour and flies are no

longer attracted to the toilets as the ash and soil help dry the pit contents. Most importantly, the regular addition of meaningful quantities of soil/ash is essential to the conversion of excreta to useable compost. Soil and ash also raise pH levels, which accelerates the destruction of pathogens.

Interest in EcoSan grew following the installation of demonstration models at leaders' houses. Households with new latrines spoke with their neighbours about these odourless, shallow latrines. The latrines are aesthetically pleasing as well, as the two shallow pits are housed in one superstructure linked to a washing area, as outlined in Figure 1 below. Walls are made of traditional materials and a roof covers the latrine area to prevent rainwater from entering the latrine. The slab is the only part of the system that needs to be moved (from one pit to the other).



Interest in EcoSan was further enhanced through a series of radio interviews with a woman who had received a *Fossa Alterna*, and who spoke eloquently about the numerous advantages of the system over her previous “Improved Latrine”. She spoke about how her toilet no longer smelled and was fly-less. She spoke with pride about how her neighbours admired her new latrine, and how she will one day transform her yard with the compost produced in the latrine. The radio show continued for a few weeks, with listeners asking for more details about these new latrines.

In addition, 4 *Arbour Loo* models were constructed for a weekend festival that drew hundreds of people over a 2-day period. The *Arbour Loo* is a simple ecological sanitation system that does not require families to directly handle transformed excreta. A latrine slab covers an unlined pit, and a moveable superstructure surrounds the pit. It should be noted that the 60 x 60 square SanPlat slab is proving to be an excellent slab option for the *Arbour Loo*. Soil/ash mixtures are included after each use to facilitate the transformation of the excreta. Once the pit is two-thirds full, after about four to six months, the slab is removed and the pit is topped up with garden compost, kitchen wastes and/or soils. The contents are then watered down and a young tree is planted the following day. Trees currently being tested in *Arbour Loos* in Niassa include guava, mango, orange, avocado, as well as a range of local fruit trees.

ESTAMOS has responded to this interest by initiating pilot projects in 2 Lichinga bairros – Sanjala and Ceramica. A PHAST process began that created the space for participants to explore a range of local water- and sanitation-related health problems

in their bairros. Participants told stories about their lives in the bairros through “Unserialised Poster” exercises. Health problems emerged as a key concern among local residents. Other exercises explored local health problems in greater detail, and clarified local routes of transmission for diseases that residents want to reduce in the coming year. It was found that men and women in Sanjala worry about the high rates of malaria that afflict the bairro, while women are primarily concerned about diarrhoea and men worry most about malaria in Ceramica.

As participants analysed their health problems in greater detail, they pointed out – through exercises on transmission routes, family dynamics and transect walks – that their latrines are contributing to the health problems being analysed. Water wells are being contaminated, flies breed freely inside toilets, and mosquitoes like the humid environments of the latrines. Rocks prevent people from digging deep pits in Ceramica while latrines are waterlogged for much of the year in Sanjala due to high water tables.

Sanitation ladders explored options that people could consider. Families with traditional latrines argued that SanPlat slabs would improve the hygiene of their latrines, but would not eliminate the problems of flies, smell or change the environment of the latrine enough to prevent mosquitoes from living inside. “Improved Latrines” would also not protect groundwater, as the pits are too deep. And deeper pits are not an option for many residents of Ceramica. Participants then asked how the “two pit latrines” were different.

ESTAMOS explained how the *Fossa Alternas* and *Arbour Loo* work, and suggested that the contents of the toilet could eventually be discarded, used for agricultural purposes after it is transformed into compost, or used to plant a tree (in the case of the *Arbour Loo*). Participants were interested in this concept, and wanted to know more about such latrines.

A field trip to households with *Fossa Alternas* was organised. Men and women from Sanjala and Ceramica visited households with *Fossa Alternas* and discovered that they did not smell, did not have fly problems due to the inclusion of ash/soil, and did not create the humid environment that mosquitoes prefer. Families with *Fossa Alternas* confirmed that groundwater did not enter their latrines during the rainy season, and that well depths were considerably greater than the depths of these latrines.

Representatives from Sanjala and Ceramica reported on their findings with residents of the two bairros. Responses have been overwhelming positive, and it is expected that over 80% of participating families will have changed to a *Fossa Alternas* by the end of the year rather than either opting for a SanPlat slab over their existing traditional latrines or continuing on with their current systems. The remaining participants may eventually opt for a *Fossa Alternas* as well, but want to see the systems in practice before committing.

*Arbour Loos* are not proving to be very popular in the Municipality of Lichinga, although many see great value in these latrines in their distant fields. Land space is too limited in the bairros, and the *Arbour Loo* will not resolve the problem people experience with space limitations in their yards.

ESTAMOS is now finalising plans with residents on the local production of slabs and *Fossa Alternas* in the two bairros. Subsidies are low (less than £5/latrines) and households will have to contribute local materials, and either contribute their own or buy local labour to construct their systems. Local educational campaigns, along with dance and drama, will continue to reinforce the process.

The programme is still in its infancy, but initial signs are positive. ESTAMOS has combined participatory methodologies like PHAST with social marketing approaches in a sound manner. Choice has been given, and people are choosing EcoSan over better known and more intensely promoted alternatives in Lichinga. Moreover, people have to contribute more of their human and financial resources to secure a new *Fossa Alternas* than they would if they simply decided upon a SanPlat slab. They still are choosing EcoSan. It seems that the desire to build an aesthetically pleasing latrine that eliminates problems of smell, flies and mosquito habitats while protecting groundwater is proving to be powerful enough to overcome cost considerations. EcoSan, combined with ESTAMOS' family well improvement project in the bairros, could have a considerable health impact over time.

### **Improving Understanding and Programme Design Through On-Going M&E**

There is a great deal of talk about M&E, and why it is valued. Yet, as we all know, M&E remains elusive in many programmes throughout the world. In contrast, WaterAid and its partners have put M&E at the centre of our water and sanitation programmes so that we can constantly learn and modify future field initiatives based on past field practices.

The M&E programme used for sanitation focuses on whether systems are being used and managed properly. We are conducting M&E surveys every 3-4 months to see how the systems are being used. Problem areas are identified at household level and across households, which then informs our thinking on hygiene education and technology modifications.

When we started, a number of problem areas were identified. First, a considerable number of households had odour problems because they were afraid to fill their pits too quickly and therefore were not including enough soil/ash after each use. They would put a small handful of ash/soil down the pit, which never covered the excrement. This behaviour has since been modified, and smells have been reduced or eliminated altogether.

We have also worked to allay fears that the latrines will fill too rapidly and thus do not allow enough time to pass for the latrine contents to transform into compost. We are deepening the alternating pits from 1.3 metres to 1.5 metres. This has proven to be important because the first sets of *Fossa Alternas* that we built were filling too quickly. One family filled their first pit in less than 6 months. The reason for this is that neighbours were using these latrines as well. So, three families were using a latrine designed for a family of seven.

We have also learned that men do not use the *Fossa Alternas* when they need to urinate only. Instead, they urinate in the bathing area adjacent to the latrine, and this

can cause offensive smells. We are now considering urinals in the washing area as well to reduce smell and to divert urine away from the system as a whole.

Finally, we discovered that EcoSan requires greater management and care during the rainy season, when Lichinga becomes quite damp. Families have a difficult time identifying dry soil to include in the ash mixture, and we are finding that ash alone does not kill smell as effectively as ash/soil mixtures. It should be remembered that the smell associated with conventional toilets increases as well during the rains, and that a well managed EcoSan system is certainly less odorous than its alternatives.

That said, the M&E system is showing that people like their systems, generally show them off to neighbours, and are keeping them extremely clean (free of urine and faeces). Ash/soil mixtures are present within the toilet and the systems are being used correctly. The second pit is covered so we are no longer worried that children will hurt themselves inside the latrine. We also know that some pits have filled quickly while others – which are not being used by neighbours – should take about one year to fill. We know that groundwater did not enter *Fossa Alternas* during the last rainy season.

The question that remains is whether people will actually excavate their pits once the faeces and urine have been converted to compost, and once the second pit is full. None of the participating households have expressed concerns or fears about this eventuality, but we will only know this once the second pits fill. And we will also need to find out if people will excavate deeper pits (1.5 metres) or stop after the first metre.

### **Responses and Lessons: EcoSan as a Viable Alternative**

Uptake and interest in ecological sanitation is growing in Lichinga. There appear to be a number of reasons for this, which are described below.

First, families do not have a great deal of space in their yards for toilets, yet EcoSan provides people with a legitimate alternative that addresses this problem. People think of the *Fossa Alternas* as a permanent solution, in sharp contrast to pit latrines that eventually fill and need to be relocated. New latrine sites inside small yards will not have to be found with a *Fossa Alternas*.

As one woman whose family has a *Fossa Alternas* recently stated, “I will have this latrine for the rest of my life. I had no more room in my yard for new pits. I no longer need to worry about space in my yard for new latrines because I will never need to relocate my *Fossa Alternas*”. And it is this sentiment which is proving to be a powerful incentive for people to choose a *Fossa Alternas* over other conventional pit latrines.

Second, EcoSan offers people the potential for added economic value, and this too is proving to be a considerable incentive for people who depend on farming for at least some of their economic well being, and who are generally quite poor. Compost from an ecological latrine can be used for small vegetable plots within a family’s yard, and some are now considering the *Arbour Loo* in their main fields outside of town.

As one user comments, “I now have a latrine (*Arbour Loo*) in my machamba (field). During the agricultural season my family can use this latrine which is an improvement on our situation in the past. But what is most important is that we can plant a young tree there at the end of each harvest. In the future we will have many fruit trees because we will make a new pit each year and plant a new tree when we are finished for the year”.

Third, the concepts behind ecological sanitation make sense to people, as these concepts are simple and easy to understand, especially with demonstration models in place. People living in Lichinga generally have some experience with pit latrines (usually traditional latrines). Including ash/soil mixtures in the process is proving less difficult to do, especially with regular follow-up support as discussed above. Improved management practices are evident over time as people see the value of introducing ash/soil mixtures, as their systems do not smell, do not attract flies, and lack the humidity to entice mosquitoes as is the case with other pit latrines in the area. It is hoped that families will also see the value of soil/ash at a later stage when they have transformed the faeces and urine into useable compost. Moreover, few have said they think the use of excreta is culturally unacceptable – instead many families insist that it is “logical”.

Fourth, and as discussed above, there is a growing sense that the shallower pit depths of EcoSan systems will ensure that groundwater is not contaminated. This is an important issue among Lichinga residents, especially as more people link poor health with poor drinking water quality from their household wells.

The challenge we are facing is that we still have to consider ways to limit the potential spread of pathogens to family water points, as family yards are quite small as stated above. This will mean, among other things, that we have to consider lined and closed pits. The costs of this would be prohibitive with conventional sanitation systems but is reasonable and affordable with EcoSan. Experiments will begin on this during the current year.

### **Conclusions**

Threats to EcoSan development exist. The most obvious threat is related to pathogen destruction and excreta re-use. Capacity to test the contents of pits for pathogens does not exist in Niassa. While we are confident that harmful pathogens will die-off in a year, we do not have evidence from Lichinga to support this hypothesis, and we are therefore easily put on the defensive when trying to defend EcoSan against health sector personnel who are wary of this approach.

ESTAMOS and WaterAid will monitor how families use their compost and whether they excavate it at all or abandon their latrines when full. We will also monitor whether families experience health problems immediately after excavating their pits or after eating crops grown with the aid of human compost. Evidence will be somewhat subjective and will lack the scientific certainty so many aspire for, but these are the constraints we face in Lichinga.

Another more subtle threat sadly comes from EcoSan practitioners and advocates themselves. WaterAid (Moçambique) supports the development of EcoSan, and has

actively promoted it in Niassa. However, we do not believe that EcoSan is the “only” correct sanitation option that some advocates would have us believe.

Pit latrines have saved millions of lives worldwide, and are a safe alternative for many. “Improved Latrines” have had a considerable impact in Moçambique, and we are certainly not promoting the exclusion of these valuable and cost-effective systems. Groundwater contamination is quite possible in the bairros described above, but other bairros do not face this threat. The threat to groundwater contamination can be easily overstated, as we all know. Residents in bairros such as Lulimile may well choose SanPlat slabs on their traditional latrines over EcoSan because groundwater contamination is not a threat. This should be applauded as addressing sanitation problems – regardless of technology – is the goal as long as household health is improved without harming the environment in other ways.

The overzealous promotion of EcoSan has the potential to alienate advocates of more traditional systems who have dedicated their lives to addressing sanitation problems globally. They may resist EcoSan because their work is being, at times, wrongly dismissed. These are potential EcoSan advocates that should not be ostracised.

What we are seeing in Lichinga is that people can make informed choices, and the end result is what we all seek – a reduction in the number of people worldwide without adequate sanitation. EcoSan can stand on its own merits without the need to condemn other technologies. Families in Lichinga and elsewhere in Niassa are choosing EcoSan over others. Yet, EcoSan is threatened when proponents claim that there are no valid alternatives, and undermine household choice in the process, which occurred when Moçambique claimed that the only alternative for families was an “Improved Latrine”. Our approach is to let people decide, and to marvel at the fact that so many in Lichinga are choosing EcoSan over their better known comrades.

### **Acknowledgements**

The author wishes to thank the staff of ESTAMOS, the Niassa Department of Water and Sanitation (DAS), Nick Burn, Peter Morgan, Lindsey Breslin, Vicky Blagbrough, Steve Sugden, John Kelleher, Ingvar Andersson, and Ron Sawyer for their invaluable support in the development of this paper and for their immense contributions to the development of EcoSan in Niassa.

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