

Lessons from a low cost ecological approach to sanitation in Malawi

Low cost Ecological Sanitation programs in Malawi have led to the building of over 11,000 compost-producing toilets since 2003. While the toilets are affordable and simple to construct, the fact that they convert human waste into valuable odour-free compost, enables cost recovery for households and is a prime driver in popularizing EcoSan designs.



Summary

In Malawi an innovative sanitation initiative is combining local toilet construction practices with ecological approaches to develop, popularize and market a new range of pit toilets. The toilet design enables communities to safely use human waste as a fertilizer.

Under Malawi's Ecological Sanitation (EcoSan) program, well over 11,000 EcoSan units have been built in areas supported by the initiative since 2003. There are two basic design options: the simplest and most widely used is the "Arborloo", which is popular particularly among women because it is relatively simple to construct; and a more durable structure called the "Fossa alterna".

The construction cost of these two design types is comparable to that of upgrading a traditional pit latrine. However the fact that EcoSan toilets generate valuable compost allows for the possibility of cost recovery for households in the long term and has proved to be a more important driver than either hygiene or convenience.

To popularize ecological sanitation a diverse range of promotion methods is being used, including advocacy campaigns and the use of media, however the most effective forms of promotion remain word of mouth and physical demonstrations of the technology.

This field note summarizes the lessons learned thus far in Malawi's efforts to popularize ecological sanitation.



Inspecting a pawpaw tree growing on Arborloo pit, Embangweni

Photo Credit: Peter Morgan

Introduction

The pit latrine is the most commonly used toilet in Africa. In its simplest form it consists of little more than a pit with a covering of wood or concrete and a structure mounted above for privacy. Such toilets exist in their millions. At their worst pit toilets are a health threat, due to contamination of groundwater, but if they are well maintained they are hygienically safe and pleasant to use. In Malawi the best aspects of the traditional pit latrine – its low cost, ease of construction and use of local materials – have carried over into the new generation of shallow pit compost latrines.

The Ecological Sanitation Program in Malawi has its origins in a 2001 field trip, jointly made by WaterAid Malawi and

Mozambique, to study the ecological sanitation work in Zimbabwe¹. Although both the Malawian and Mozambican teams were experienced in sanitation, they were impressed by the evidence presented to them, which demonstrated the capacity of the composting process to break down faeces into an odorless, easy-to-handle substance when soil and ash were added. Despite this first-hand evidence, after their visit to Zimbabwe the Malawi team admitted to still being somewhat skeptical about ecological sanitation in general, and in particular about the claims of a rapid rate of faecal decomposition. However, repeated successful trials soon dispelled these doubts and the team members were ready to launch their own EcoSan initiative in Malawi.

¹ The Mvurumanzi Trust and the work of Peter Morgan.

Box 1: The two most popular types of composting toilet for Malawi

Arborloo

This is the compost toilet that eventually becomes a tree. A shallow pit (1 metre depth is recommended) is dug and a concrete slab and easily movable superstructure is placed on top. The family uses the latrine, adding a mixture of soil and ash after each use, until the pit is nearly full – this usually takes between four and nine months. After this, both the slab and superstructure are moved to another pit. A thick layer of soil is added to the full pit and a young tree is planted in the soil. Sometimes tree planting is delayed until the rains begin. The tree grows and utilizes the compost to produce fruit. After a few years the result is an orchard producing fruit with a good economic value. The Arborloo is the simplest of all EcoSan latrines because it is easy and cheap to construct. Importantly, it requires minimal behavior change in relation to using a traditional pit latrine. A further advantage is that the compost is never physically handled.

Fossa alterna

This is the alternating pit compost toilet. Two shallow pits (about 1.5 meters deep) are dug near to each other; these are often housed within the same superstructure. The pits are used like a twin pit latrine, i.e. one filling up whilst the other is maturing. When the first pit is full, the latrine slab is moved to the second pit. The first pit is then covered with soil. While the second pit is in use, the contents of the first pit are composting. When the second pit is full, the first pit is emptied of compost and used again.

The compost is either stored in sacks for future use or dug into the garden to increase soil fertility. This alternate use of the two pits can continue almost indefinitely. As with the Arborloo, a dry mixture of soil and ash is added after each use, which assists the aerobic decomposition process and also helps to reduce odors and discourage flies. This differs from the traditional toilet pit, which is saturated, anaerobic and smelly.

To ensure sufficient reduction in pathogens the compost should ideally be processed for at least 12 months before it is spread on the land. However in warmer climates a 6 – 9 month period has been found satisfactory.

The first important lesson learnt by the members of the team stemmed from their own initial scepticism: they realized that the old adage ‘seeing is believing’ holds true. Therefore in their popularization of the technology they actively promoted physical demonstration.

After the field trip, work began in Malawi to incorporate ecological

sanitation approaches into existing water, sanitation and hygiene programs – initially in Embangweni, a town in the northern district of Mzimba, and then in the districts of Phalombe, Thyolo and Salima. This paper tracks the development of these initiatives and describes how the low-cost ecological sanitation approach has spread to other programs.

Low-cost ecological latrines – theory and designs

Human excreta are rich in nutrients that can greatly benefit crop growth and food production. Unfortunately this valuable resource is rarely available for use on crops since human faeces is typically regarded as an unhygienic waste product. In most cases latrine pits are simply covered over once the pit is full. The EcoSan approach recognizes that human waste is a valuable resource, and designs latrines that enable faeces to be effectively and safely utilized.

EcoSan is based on three main principles:

- **Hygienic practice:** It offers a safe sanitation solution that prevents disease and promotes health by successfully and hygienically removing pathogen-rich excreta from the immediate environment.
- **Environmental soundness:** It does not contaminate groundwater or use scarce water resources.
- **Resource preservation:** It creates a valuable resource that can be productively recycled back into the environment. Over time, through proper management and storage, excreta are transformed from a harmful product into a productive asset.

In practice low-cost compost toilets operate like the familiar pit toilet, but with three fundamental differences:

- A mixture of soil and wood ash is added to the latrine pit after each use



to accelerate the composting process. Leaves can also be added. This mix also reduces odors and fly breeding.

- The addition of garbage, plastic and other refuse is cut down to a minimum.
- Pits are shallow – 1.5 meters is the maximum depth.

In Malawi two main designs of composting latrine are used – the Arborloo and the Fossa alterna, described in Box 1. The ‘urine diversion’ toilet is also promoted but its high cost has precluded widespread use.

The evolution of EcoSan programs in Malawi

Creating the right context

After the visit to Zimbabwe, members of WaterAid in Malawi approached the Church of Central Africa Presbyterian (CCAP) at Embangweni in the Mzimba district. The church had previously expressed an interest in developing a sanitation program to complement its water supply program and was keen to test whether EcoSan could work in its client communities. WaterAid then conducted a baseline survey which showed that the concept of ecological sanitation was not alien within the region, as households had been planting banana trees on abandoned latrine pits for generations.

Finding a champion

The Embangweni project got off to a slow start, as the task of promoting and developing the EcoSan concept was given to WaterAid’s already



Installing small slab on bring ring beam for Arborloo
Photo Credit: Peter Morgan

over burdened water supply officer. Unfortunately, but all too typically, this officer’s existing interests and work pressures often meant that the installation of new water points took precedence over sanitation activities. This was an important lesson for WaterAid in Malawi, which demonstrated that for sanitation to be driven forward a dedicated individual was needed. As a result WaterAid engaged the services of a sanitation coordinator who became enthusiastic about EcoSan. This officer’s ability, willingness and determination to overcome problems greatly contributed to the rapid growth of the EcoSan concept at Embangweni.

Expanding the EcoSan network

As the sanitation project grew, other organizations became interested in EcoSan and visited Embangweni to

gain first-hand experience. As with the initial visit by EcoSan members to Zimbabwe, most people arrived feeling skeptical and some left just as skeptical. However, the representatives of some visiting organizations could see the merits and decided that it was worth trying in their own projects.

As a result of these visits EcoSan began to spread to the following districts:

- Tholyo and Phalombe in the south of Malawi, through a project funded by the Canadian International Development Agency (CIDA) in southern Malawi.
- Dwangwa, with the Malawi Wildlife and Environmental Society.
- Salima district with the District Assembly.
- Lilongwe rural, with the French non-governmental organization, InterAid.
- Ekwendeni near Mzuzu in northern

Malawi – the Church of Central Africa Presbyterian (CCAP) has extended its operations to here.

Advocacy and demonstration

The initial attempts to promote ecological latrines consisted primarily of a series of workshops with community leaders, along with the setting up of demonstration toilets within the project areas. While these efforts succeeded in raising community awareness, the number of latrines that were built was disappointing. The project then began to work closely with local small-scale providers of cement products, encouraging them to become involved in both the slab manufacture and the promotion process. From a small group of initial providers a larger network of promoters/manufacturers has developed together with the addition of a group referred to as ‘agents’. These agents are based in geographic areas that the promoters cannot reach, where they sell the products and assist the promoters. As an area develops, successful agents can be elevated to promoters, thus encouraging an entrepreneurial spirit.

Sanitation clubs

Sanitation clubs have been a mainstay of the approach in Phalombe and Thyolo (see Box 2). The advantage of these clubs is that they are easy to form and relatively democratic. Their survival depends either on an initial stimulus from an outside agent or a strong sense of need resulting from, for example, an outbreak of water-borne disease. The clubs are more likely to thrive if they have a good local champion who can devote time and energy to motivating members.

Box 2: Phalombe and Thyolo – the role of sanitation clubs

The program in Phalombe and Thyolo is supported by the Canadian government, and mainly uses sanitation clubs to promote EcoSan and improved hygiene. The process starts with the government Health Surveillance Assistants from the Ministry of Health (MOH) convening meetings with the villagers and village leaders and facilitating discussion about excreta disposal and related practices of the people in the village. Participatory Hygiene and Sanitation Transformation (PHAST) and the ‘sanitation ladder’ are tools used to help communities decide what key hygiene practices and sanitation problems they would like to address.

If the village members agree, a village sanitation club is formed, usually incorporating members from the Village Health Committees. The sanitation club takes a leading role in the promotion of latrine building and use of latrines. It forms an avenue for the supply of advice and subsidized latrine slabs. The club makes links with the local masons and also selects one male and one female to be trained as latrine masons.

Over 400 sanitation clubs have been formed in the Phalombe and Thyolo districts. Each club receives a ‘starter pack’ of five bags of cement from which it is possible to construct forty 80-cm diameter concrete toilet slabs. The aim is to use the income that these generate to re-invest into the purchase of more cement. Families are given a range of technical options to choose from, and the advantages and disadvantages of each design are discussed with the householders. Arborloos are the most popular unit in Phalombe, while the Fossa alterna is more popular in Thyolo.

While the program is being developed and the technology is being introduced, sanitation clubs have a strong role to play, but after this stage they tend to lose support. Because they are generally ‘single issue’ clubs, they tend to become dormant once the most active members have acquired their subsidized slabs.

The combined activity of sanitation clubs, demonstration centres and promoters (champions) has led to considerable demand for ecological latrines and improved traditional latrine technologies.

Demonstration sites

Following the Embangweni lead, a total of 22 demonstration sites have been built in the Phalombe and Thyolo districts, which display a range of

different latrine technologies, including the Arborloo, Fossa alterna, urine diverting technology and improved traditional latrines. The sanitation clubs are encouraged to hold sanitation shows and open days at the demonstration sites to assist in their promotion work. Posters and leaflets have been produced and provided to households, and a latrine construction manual has been produced to guide the sanitation clubs.

Additional designs and their use in promoting hygienic practice

The children’s latrine

An important development was the introduction of the children’s latrine by WaterAid. This is a miniature slab 60cm in diameter, mounted over a pit that is slightly smaller and shallower than the

Box 3: Cost sharing in Phalombe and Thyolo

In Phalombe and Thyolo householders pay MK 180 (US\$ 1.3) towards the construction of the latrine slab. Of this amount, MK 150 (US\$ 1.1) is paid to the mason for labor and MK30 (US\$ 0.2) goes to the club's sanitation fund which is used to assist the more disadvantaged householders of the community in purchasing slabs. The project contribution (five bags of cement) for the first 40 latrines in the community, equates to MK 169 (US\$ 1.2) per latrine. The householders provide the unskilled labor, dig the pit, and provide the superstructure and any additional work recommended by the mason, such as lining the pit.

standard Arborloo pit. It is not fitted with any form of structure for privacy. Children are encouraged to use these units and therefore become accustomed to the use of toilet slabs at a young age. The children are also encouraged to plant trees on the filled pits, an activity that generally has a fascination for them. This method has the effect of tidying up the homestead, training young people about toilet use and further encouraging women to get involved in the program.

Hand-washing facilities

Hand-washing facilities are strongly promoted. Most of these facilities are made by drilling holes in a plastic cup or tin and filling a reservoir nearby with water, which is decanted into the

dispenser. It could be argued that hand washing and personal hygiene has a greater impact on personal health than the latrine itself, and project sponsors are well aware of the need to promote hand washing.

Costs and subsidies

It should be emphasized that this EcoSan initiative in Malawi was primarily about testing the cultural sustainability of simple EcoSan options. To this effect, more focus was placed on getting slabs made, distributed and used than on creating a viable 'self-standing' supply stream. A number of different approaches have been used (see for example Box 3) that rely



Basic Arborloo unit, Phalombe plain, Malawi
Photo Credit: Peter Morgan

on varying degrees of subsidy and different levels of incentive for masons, promoters and agents, which can only be sustained with donor assistance. With EcoSan now established, the key stakeholders recognize the importance of evaluating the current promotion and supply mechanisms to develop a comprehensive system which exploits commercial finance and minimizes selective subsidies.

Number of units built

By mid 2006, a total of 6,523 household EcoSan latrines had been built in the CCAP projects in Embangweni, Ekwendeni and WaterAid projects in the Salima/Dwangwa/Chipoka project areas. Most of these were Arborloos (55%), with slightly fewer Fossa alterna (44%) with less than 1% urine diverting toilets. In Thyolo and Phalombe, 6188 EcoSan toilets had been built through project support between mid 2003 and mid 2006. Once again most of these were Arborloo's. One difficulty in monitoring was the common tendency for families

Table 1: Number and type of ecological latrines built by WaterAid, CCAP and COMWASH in Malawi by mid 2006

Location	Ecological Sanitation		
	Arborloo	Fossa alterna	Urine Diversion
Embangweni, Ekwendeni (CCAP) Salima/Dwangwa/Chipoka (WATERAID)	3,601	2,883	39
Thyolo (COMWASH)	265	1,045	18
Phalombe (COMWASH)	3,357	1,445	58
TOTAL	7,223	5,373	115

to upgrade their Arborloo's to Fossa alterna during the project period. The figures also reveal that very few urine diversion systems were built (less than 1%), although the technology was on display in demonstration areas. This was due to their relatively high cost and complexity of construction.

Key lessons from the Malawi EcoSan experience

Advocacy

Champions are important. In Malawi the initial champion was the country representative of WaterAid, but with the passage of time more champions emerged at both project and village level. Without these champions, EcoSan would not have become established in Malawi.

Women make excellent promoters, as well as slab and latrine makers; and the process provides an income generation opportunity not normally available to them. They are good at encouraging other women to build their own latrines when the men in the family are reluctant or slow to dig a 3-meter pit.

Gender roles

EcoSan has had an interesting effect on the gender roles associated with latrine construction. During the baseline survey the men and women were asked separately why they did not have a latrine. The men tended to give technical reasons such as a lack of wood or tools, or sandy soils causing pits to collapse. The women were more direct and thought it was more to do with the laziness or unwillingness of



Arborloo on Phalombe plain, Malawi
Photo Credit: Peter Morgan

their husbands. The project found that digging a 3-meter deep latrine pit was a well defined man's role, and when the men refused to do this, the women and the family were in effect denied access to any form of sanitation. With the Arborloo the pit depth is only one meter and the women in Embangweni recognized that digging this was not a difficult task. Many of them dug their own pits then built their own latrines, which meant the constraint of unmotivated and inactive men had effectively been overcome. It could be argued that this is an empowering process for women, but equally it could be argued that it is placing an additional burden onto women's already busy lives. Anecdotal evidence suggests that there can be an interesting knock-on effect: when men see the 'power' of the faeces as a fertilizer, they reconsider their need to use a latrine and 'reclaim' the role of family latrine builder.

Drivers of change

Incentives for the adoption of improved latrines are usually related to increased prestige, comfort and convenience. In the case of EcoSan at Embangweni the main driver for a household to change from a traditional pit latrine to an ecological latrine was the financial benefit that came from utilizing pit compost and not having to buy fertilizer. For householders that were changing from the practice of open defecation to the use of an ecological latrine, prestige and well-being were seen to be an additional bonus, secondary to that of obtaining the manure (D'Souza 2005). Therefore the value of compost is the attribute that the promoters stress most during the marketing of EcoSan latrines.

Improving degraded soils

Poor soils cannot produce a good yield no matter how hard a farmer



Making concrete slab for eco-toilets, Malawi
Photo Credit: Peter Morgan

works, which means there are good opportunities for promoting ecological sanitation. Embangweni lies in an area where soil fertility has been steadily declining for a number of years and population pressure means that new fertile land is unavailable. The land is such that maize will not yield any cobs unless artificial fertilizer is applied, but the price of commercial fertilizer has increased to unaffordable levels after the removal of subsidies. Subsistence

farmers therefore find themselves in a downward spiral of declining yields and decreasing ability to buy fertilizer. In such circumstances the free fertilizer that EcoSan provides is a powerful driver for adoption and explains some of the reasons for the growth and ready acceptance of using human waste to grow food.

Many farmers who had used this human waste manure indicated that there was

a good response when it was applied to their crops (verbal report of WaterAid Sanitation Coordinator). Adding toilet compost seems to improve the soil in two ways: it provides nutrients to the soil, and the organic matter improves the soil's water retention qualities, which results in the nutrients remaining longer in the soil and being available to the plants for a longer period. As one farmer reported, "Manure is more powerful and long-lasting than fertilizer – one bag of inorganic fertilizer finishes in five weeks, but one pit of manure, even after five months...it is still in the soil."

Although the Embangweni project started from a desire to improve health, the impact at household level has been more far reaching, as the comments in Box 4 from three EcoSan users demonstrate.

Agricultural opportunities

Granadillas, kabuthu (a variety of dwarf banana) and papayas have all been found to grow exceptionally well on the full pits of an Arborloo. The granadilla is one of the fastest fruits to produce a crop – at around ten months. Citrus trees (orange, nartjie, lemon) are popular choices. Banana, mango, avocado, gum trees and a wide variety of indigenous trees also grow well on Arborloo pits. Tomatoes grow well when planted on the same pit with fruit seedlings or any other seedling.

Households have been able to grow good crops of maize and tobacco using the contents of the Fossa alterna as a fertilizer. As one farmer reported, "My crops are stronger and healthier and grow more quickly. Before, my tobacco crop gave a low 50kg yield, but now that

Box 4: What the farmers say about EcoSan

"Before, it was very difficult to find money. Now that I am growing fruits, it is easy, and I recently bought a radio with my earnings. In three years, I already have 21 trees. I want 100 trees!"

"Before, I used two 50kg bags of inorganic fertilizer, which would cost me over 6000 MK. Now I just use about 25kg to top up, the rest is human manure."

"I think one year's worth of manure contents of my latrine equals four bags of inorganic fertilizer. Manure is more effective. I can use one application for two seasons so it's twice as effective. Even if I use the same quantity, the quality is better because I can use it for twice as long."



Traditional latrine, Lilongwe suburb
Photo Credit: Peter Morgan



Pumpkin growing on Arborloo pit
Photo Credit: Ned Breslin, WaterAid UK

I use manure, my yield is 150kg. And it is very good tobacco with more weight for fewer leaves.”

Safety and ease of construction

The fact that the Arborloo is safer than the traditional pit latrine and easy to construct consistently ranked as a high advantage, close to that of compost production. Many people reported having major problems, such as pit collapse, with their traditional latrines and cited this as a reason for change.

Finance

The cost of the two simpler EcoSan designs that were promoted is no more than that of a traditional pit latrine improvement program, and may even be less. If the demand for fertilizer in the area is high, then the production and distribution of latrine slabs should be able to operate on a full cost-recovery basis, including a profit for the mason. Further

work is needed to review the different promotion, production and marketing strategies applied to date and to identify more sustainable funding mechanisms and supply streams so the slabs are more affordable and available to all.

Supervision and follow-up

The problem of people not adding enough soil and ash because they are afraid that the pits may fill up too quickly was common to all three projects. This resulted in smelly latrines. Follow-up visits were needed to advise householders how to remedy the problem.

Design and construction related considerations

Upgrading

Households with satisfactory traditional latrines were in no hurry to change to a new design and stated that they would

wait for their current latrine to fill before making the change to EcoSan.

The Arborloo as an entry point

All the non-EcoSan designs promoted on the sanitation ladder require the digging of a 3-meter pit, and this is regarded as being the man’s role. If the men are not interested in constructing or using a latrine, even if the women are, then the traditional pit latrine remains unobtainable for the family. However, the Arborloo, with its shallow pit, can easily be dug by women, so this major constraint can effectively be overcome.

The simple design, the speed of construction, and the highly observable nature of the results, make the Arborloo an ideal entry point with which to introduce EcoSan into a community. Many families tend to build this type of latrine first, however, it is not regarded as ‘permanent’. Over time the users



Drama used to promote eco-toilets and tree planting, Embangweni
Photo Credit: Peter Morgan

become convinced by the evidence provided by accelerated rates of fruit tree growth and want to use the fertilizer on their main crops. When this occurs they place a higher value on both the permanence and the appearance of the superstructure and become interested in 'upgrading' to the Fossa alterna (D'Souza).

In areas where the supply of tree seedlings is problematic, Arborloo users

often excavate their pits after 12 months and use the contents on their main crop. This shows an acceptance and understanding of the EcoSan concept rather than simple adoption of a specific design of latrine.

Promotion of EcoSan

EcoSan does not suit everybody. It is important to offer a range of technology options and to allow people to make an

informed choice based on their specific needs. People can weigh up the merits of different systems and if EcoSan offers the benefits they are seeking, they will select that option.

The EcoSan programs use a variety of promotion techniques including sanitation clubs, village committees, posters, Participatory Hygiene and Sanitation Transformation (PHAST), drama, radio, and demonstration sites,



Simple Fossa alterna. Salima project
Photo Credit: Peter Morgan

as well as advocacy by entrepreneurs and masons. No one method can be said to be more effective than any other, however in all cases community structures play a central part in the promotion of the EcoSan concept. Anecdotal evidence suggests that 'word of mouth', particularly from woman to woman, has been the most important communication channel.

Summary of key lessons

- Ecological sanitation works well when it builds on existing practice.
- Champions are important to ongoing success – women make good champions.
- Word of mouth and observation are effective communication strategies.
- People need time for experimentation.
- Cheap 'home produced' fertilizer is a

powerful selling point.

- EcoSan boosts declining soil fertility and is more acceptable to farmers who experience this problem, cannot afford chemical fertilizer and recognize the EcoSan potential.
- Ecological sanitation does not suit everybody.

Conclusion

It has been observed that the growth of this latrine program is not so much related to perceived health improvement, as to the need for a more stable and hygienic toilet facility which can be built easily and cheaply with the added benefit of a regular supply of valuable compost.

Since there is a natural scepticism about the re-use of human waste as fertilizer,



Twin pits in a Fossa alterna, Thyolo.
Photo Credit: Peter Morgan

projects need to allow time for local experimentation and for acceptance to grow within communities. There is no doubt in this case that 'seeing is believing', with the big turning point happening when the first pit is emptied and the compost is examined. Usually people find it difficult to believe that such excellent compost comes from human waste.

The programs described are still young and evolving. Within a few years over 12 000 low cost ecological toilets have been built in Malawi. This program offers a source of inspiration to those whose aim is to extend the coverage of simple yet effective sanitation in Africa. .

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Acknowledgements

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The text was peer reviewed by Jon Lane (consultant to WSP-Africa in Malawi), Luis Macario (Water and Sanitation Analyst at WSP-Africa in Mozambique), Madeleine Fogde (independent consultant and part of EcoSanres network) and Barry Jackson (Adviser, Development Bank of Southern Africa and consultant to WSP-Africa). Steven Sugden (London School of Hygiene and Tropical Medicine) and Simon Bibby (consultant WSP-AF) are sincerely thanked for their editorial work on this Field Note. Detailed feedback and overall guidance were provided by Piers Cross (Principal Regional Team Leader, WSP-Africa) and Andreas Knapp, who was the overall task manager of this knowledge product.

Funding for this Field Note was provided by the Austrian Development Agency (ADA) and the Swedish International Development Cooperation Agency (SIDA).

June 2007

Funding Partners:

The Governments of Australia, Austria, Belgium, Canada, Denmark, France, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, the United States of America, the Bill and Melinda Gates Foundation, the United Nations Development Program and the World Bank

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Layout: Lawrence Fick
Printing:
Production Supervision/Assistance: Toni Sittoni, Sarah De Villiers Leach and Sylvia Maina
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