Plastic waste to construction material

Our first hotseat session

6 April 2022

FOOTPRINTS AFRICA

Introducing the hotseat series

What do circular businesses need to scale sustainably?

We always ask this question to the entrepreneurs whose work we are mapping. For the most part, the answers are not surprising. [1]There is one, though, which has cropped up a lot more than we would have predicted. First and foremost, many of the businesses we speak to want to be connected to other businesses doing the same thing elsewhere across the continent. They want to learn from the experience of their peers. A close second has been the desire for access to technical expertise.

We began to realise the impact we could have as we started to uncover high numbers of similar business models being developed - often in parallel - across the continent. **EcoPost** in Kenya, for example, has been operating for several years. Meanwhile **Pyramid Recycling** in Ghana made a more recent pivot to begin selling construction materials made from waste plastic in an effort to reduce deforestation and clean up the streets of Accra.

Wouldn't it be great if we could bring them all together?

The idea for the hotseats

We developed the idea for a hotseat series to bring a group of entrepreneurs and experts together and invite them, through a rapid-fire series of questions, to help businesses with the toughest challenges they are facing.

On 6 April we held the first of these sessions, convening a group of 50 entrepreneurs, materials and investment specialists. We selected three of the challenges that were nominated by participants and put them to the wisdom of the crowd. And we were delighted with the intensity of the discussion and the generosity of people's contributions.

This document gives a summary of the exchanges, which we are sharing in the hope that more businesses can draw on them[2]. We followed the Chatham House rule (no comments are attributed) so that people could express themselves as freely as they like.

The hotseat series has been made possible through the support of **Sitra**, the Finnish Innovation Fund.

Why waste plastic as construction material?

We have mapped over 50 businesses squaring the problem of uncontrolled plastic waste together with people's growing needs for resistant, cost-effective building materials. We are fairly certain that this is a fraction of the real number out there.

Plastic is one of the most important inventions of the twentieth century. Across Africa it's been fundamental for the provision of safe food and drinking water. The problem, however, is that in most African contexts the infrastructure and services don't exist to manage plastics 'waste' effectively, and plastics producers have for the most part left the state and public to deal with the impacts of plastics in the environment. At the same time, every African country needs to address both their current housing shortfall[3] and the continent's massive infrastructure gap.

It's in this context that we have come across many innovative examples of people turning waste plastics into modular construction materials using a variety of different techniques, whether just plastic or plastic mixed with other reinforcing materials such as sand.

This is a very pragmatic approach to giving plastic waste a second life in a way that is arguably less polluting than, for example, concrete production. By that measure it appears to be circular and a win-win for everyone involved. Big questions remain, though:

- What happens to the materials at the end of their useful life? Can their value be retained through better design?
- Is it problematic to mix different types of materials together?
- How do we deal with problems of potential toxicity in the plastics that have been used, especially when considering air quality inside a home?
- How can the manufacturing process itself be managed to minimise emissions?
- Do buildings using plastics need additional air conditioning to keep them cool?
- Are there challenges in valorising waste streams that ultimately just need to be managed better?

Questions like this need to be addressed to make sure that this kind of solution is really sustainable in the long run and doesn't just postpone a problem to the future.

We also note that many people have struggled to get good quality data on the impacts of plastics in construction materials. The International Sustainable

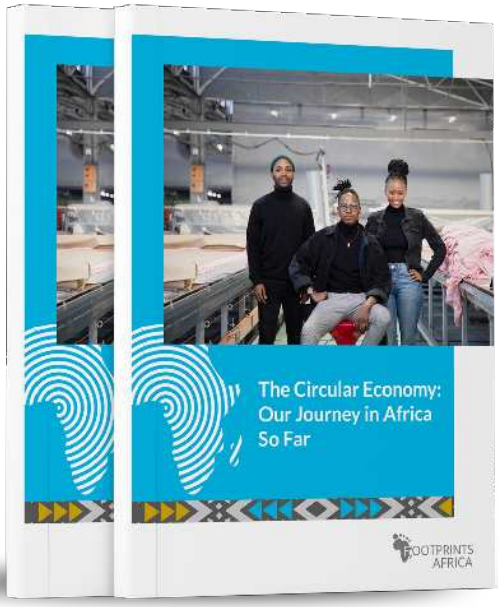
Chemistry Collaborative Centre (ISC3), whose representatives participated in the session, has produced a factsheet on this very theme that summarises their in-depth research, outlining specific issues to look out for.

Ultimately, Footprints' perspective is that this business model - like so many others - is a work in progress. The businesses we have mapped are mostly very young - just a few years into their operation. Our aspiration is that bringing together a group of people passionate about the theme in this forum will help accelerate - and then share - the unconstrained thinking that businesses need.

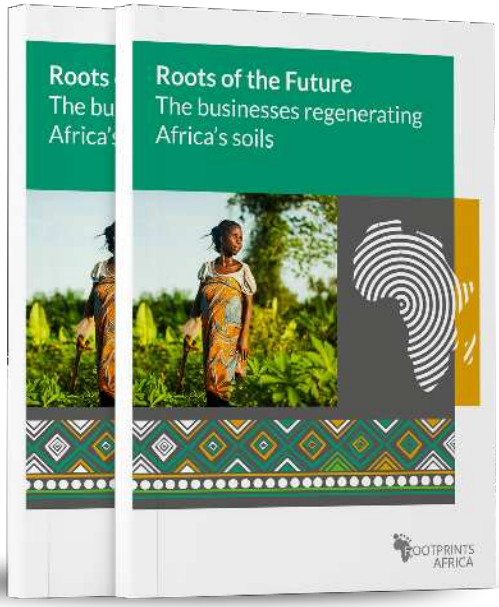
Footprints Africa's work on the circular economy transition

At Footprints Africa we are on a mission to prove business can be a force for good at scale. We have an ambitious circular economy programme which maps and measures businesses' circularity and their impact across the African continent, and run B Corp programmes to support small businesses.

Our first report showcasing circular economy businesses across Africa is here.



Our latest report on Regenerative Agriculture is here.



You can find more information and a presentation on our extensive case study work on our site: **www.footprintsafrica.co**.

How to read this report

Over the following pages we set out some key statistics on the hotseat participants, before sharing with you a simple summary of each challenge, the business' profile, and the questions that they provoked.

1 See page 8 of our first circular economy report: **The Circular Economy: Our Journey in Africa so Far**

2 Please note that the content of the summary has been lightly edited for clarity and length.

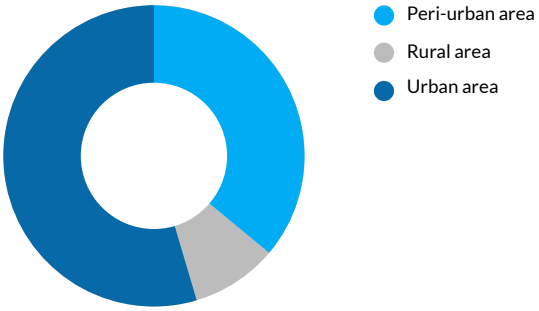
3 The current housing shortfall is estimated to impact **some 238 million people** in Sub-Saharan Africa, who mostly live in informal settlements (UN Department of Economic and Social Affairs). By 2050, because of population growth, the continent will have **over 25% of the world's urban inhabitants** (Oxford Business Group).

Profiling the hotseat participants

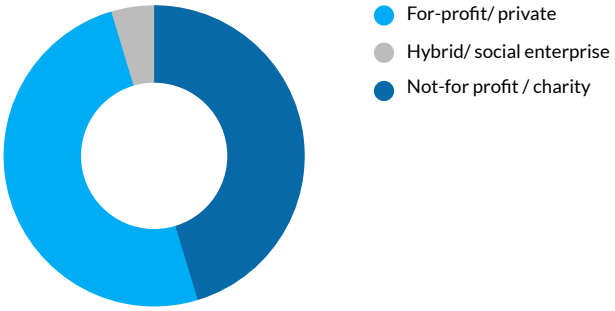
Key details on participants' businesses

These figures are drawn from 22 responses by participating businesses to the **Footprints Africa circular economy questionnaire.**

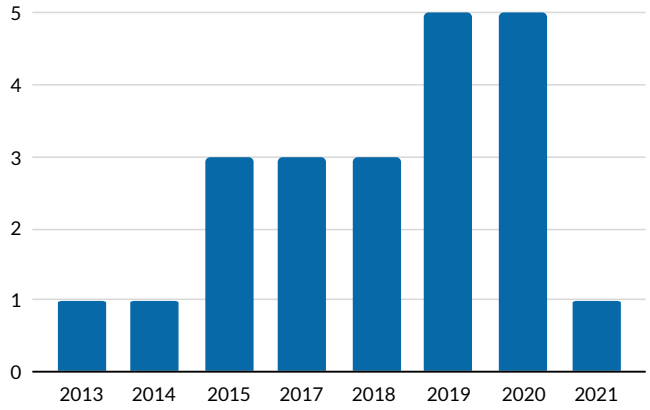
Context of operations



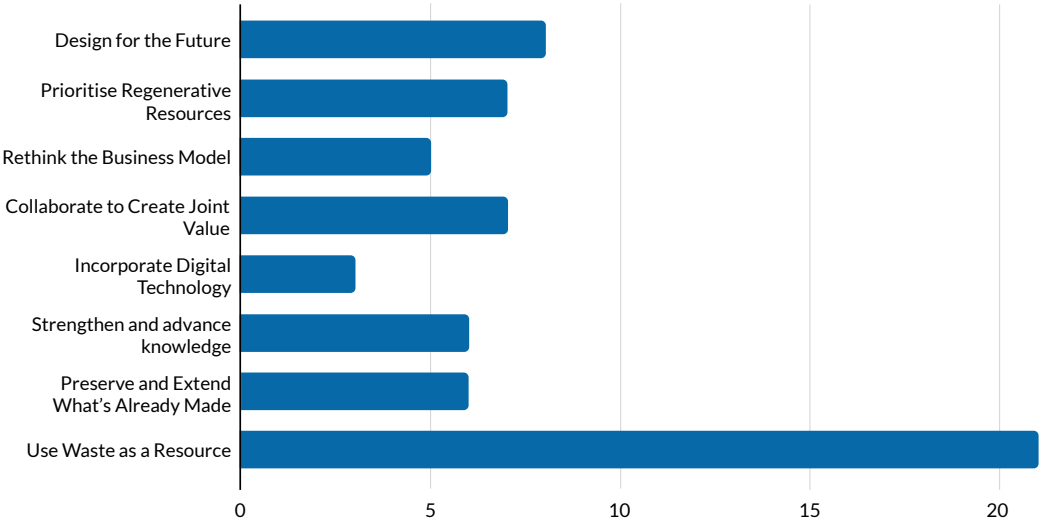
Business type



Businesses' start years

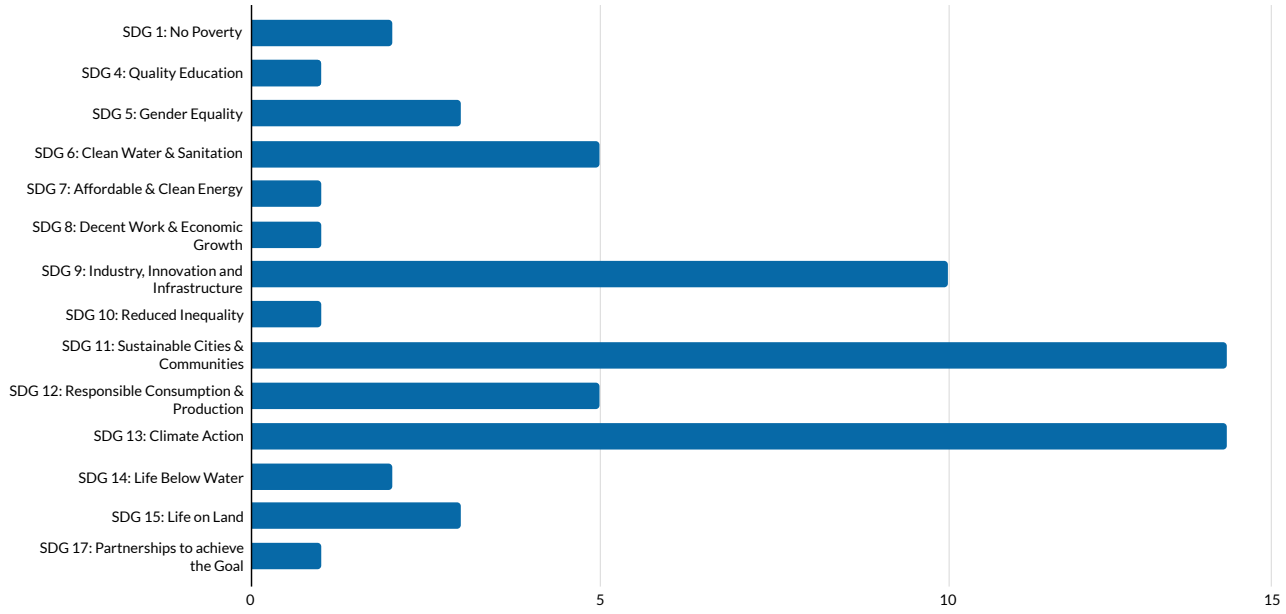


Circular economy strategies



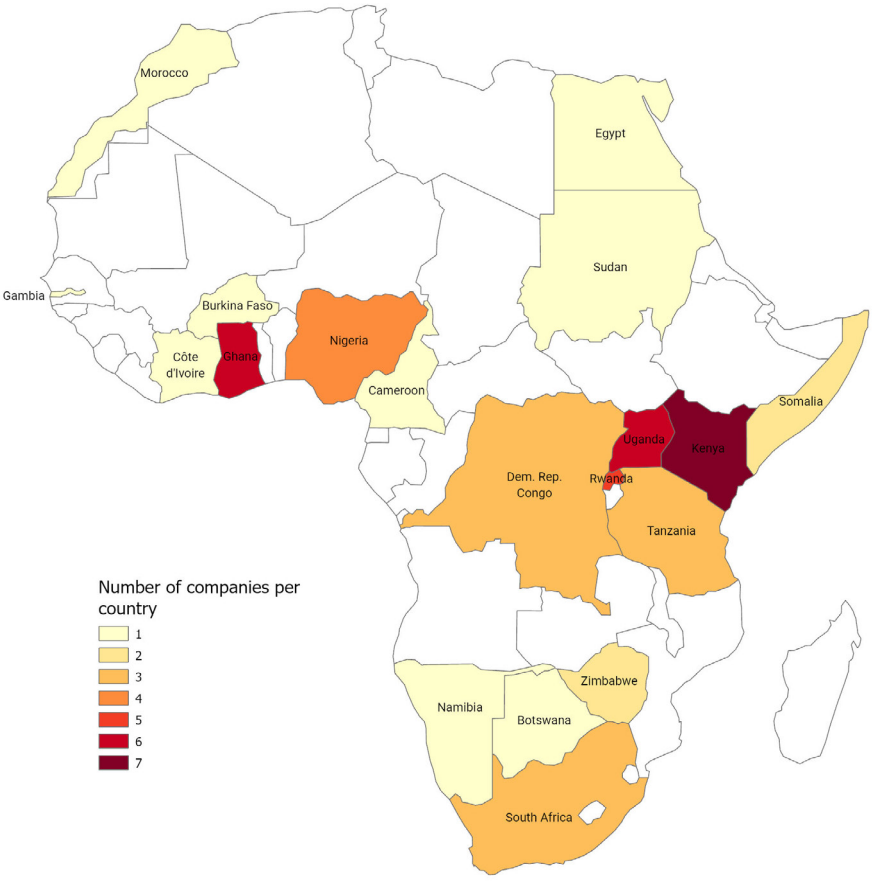
Definitions are drawn from Circle Economy's **Key Elements** of the Circular Economy

Priority Sustainable Development Goals



Mapping plastic waste to construction businesses across the continent

Summary of the top three SDGs selected by each business.



Map courtesy of GRID-Arendal plotting the locations of the 50 businesses we have identified across the continent.

Challenge 1

How do we create funding models for entrepreneurs who are pioneering the valorisation of waste in our value chain?

Business 1 background

Business 1 has been operating a waste recovery business in South Africa since 2006. Their container-based production model can convert plastics into building materials such as counter tops and paving stones. They have 20 employees and work with a network of 48 informal workers.

Their goal is to create more income for the waste entrepreneurs in their value chain and they are exploring a franchise-like model that will set up entrepreneurs to manage their own containers. They estimate that each unit can support six entrepreneurs' families.

More information on their challenge

- The entrepreneurs Business 1 works with have little by way of a financial track record or collateral to make them more eligible for loans; they have experience but few formally recognised skills.
- 'Waste' is generally stigmatised by financial institutions who don't understand the business model.
- Business 1 trains and vets entrepreneurs who run their containers. They hope to support them to get a micro loan to purchase 50% equipment. Business 1 would then provide a soft loan to cover the remainder.
- The current model for obtaining credit is relatively time- and people-intensive.

The questions that were asked

- Have you done some kind of scoping of the financial landscape to see what different types of financial sources may be available, some traditional and some non-traditional?
- How much money are we talking about, for each of these micro entrepreneurs, and do they own the equipment? Do you sell the equipment to the entrepreneurs, and if not is this something you might consider?
- Have you been able to quantify the quantity of carbon avoided, thanks to your technology, or your process, for the number of years that they have been in operation?
- On the point of non-traditional financial sources: are there other solutions? Such as to remove costs? Could there be any interesting partners who might be able to collaborate with, who could take on some of the costs?
- Do you have plans to work with those entrepreneurs who don't have a track record to begin to document it and reduce their risk profile progressively?
- What's the payback time for this investment? Have you considered raising a fund, centrally, so that you would have control of the money, in order that you could decide yourselves? That way you wouldn't have to rely on the bank making every single micro decision on loan applicants.
- How have you been able to handle some of the investors that might be interested to join you? The ones that might like to buy some equity, for example.
- What would your management look like if the government of South Africa were to impose a ban on plastic waste?
- For entrepreneurs' loans: what is the interest rate? And what is the duration of the payment?
- If you are looking at an impact investment model, have you considered alternatives to the bank route - ones that offer better interest rates?

Challenge 2

We based business decisions on secondary data on the availability of plastic feedstocks. We later realised that this did not reflect operating realities on the ground and so it affected all our business plans in terms of implementation and milestones. How should we go ahead?

Business 2 background

Business 2 was founded in 2021 in Rwanda and is at proof-of-concept stage. The business was born from an idea to reuse plastics waste in making standard pavers that are environmentally-friendly, reliable and at least as strong as concrete paving tiles.

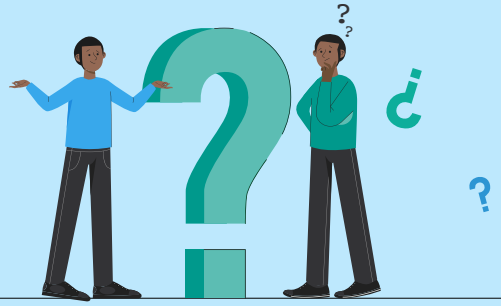
Their aim is to contribute to Rwanda's goal of reducing the use of non-biodegradable plastic, advance the government's 'Made in Rwanda' policy, and create social capital through job creation.

More information on their challenge

- Business 2's production method uses most consumer plastics apart from PVC.
- At ideation and prototyping stages they based their model on secondary, open-source data about potential volumes of suitable plastics in landfill available for recycling.
- As they moved to market validation they discovered that landfills manage much of the recycling themselves, meaning that the available supply to the business is much lower.

The questions that were asked

- Have you mapped the flows in your city to understand which types of polymers are available, what is the flow of the polymers, and from which sources they come?
- Does your product add enough value to the plastic waste so that you can buy it at a competitive price?
- Have you explored different models or approaches to source plastic waste? If the landfill itself isn't a lucrative option, perhaps going directly to communities themselves, such as churches, community groups - or directly to households. Have you looked at any of that and looked at the pricing model it would entail?
- Have you worked out which types of plastic nobody else wants to recycle in your city to see which types you might get cheaply or for free? Have you investigated landfills or even talked to the recyclers to understand what is thrown away?
- In your manufacturing process for pavers you use all plastics but for PVC. You're using PET, right? Have you looked at using, for example, PET, which is in high supply, and fusing it with the other plastic?
- Have you identified other types of plastics that you might use? As opposed to sticking to what is traditionally accepted for recycling, have you looked at how you might optimise the plastic that's more readily available to your manufacturing process?
- Have you looked at other products that would be suitable, as well, that could be more 'premiumised', to add to your portfolio? That means not just protective paving but other ones that could be more suitable for the kind of plastics that you're collecting?
- Paving stones will put microplastic out into the environment as a result of abrasion and environmental influences such as heat and rain. How do you avoid this postponement of the plastic problem into the future?
- Do you just recycle the materials or do you use it for a product? And if you do, what type of materials are being used for the production of the finished product?
- Have you tried getting materials from the source? Like, for example, from certain producers' factories - getting the waste directly from them? It might be an easier and more reliable source.



Challenge 3

How do I use data to prove the circularity of my business model and its sustainability?

Business 3 background

Business 3 is a Sudan-based startup that recycles plastic waste into paving and tiles that are durable as conventional alternatives. They aim for their products to be as environmentally-friendly as possible, with affordable prices and high quality. Their suppliers are both companies and informal waste pickers. In their production they work with most plastics apart from PVC.

More information on their challenge

- Business 3 applied for a grant which will require it to perform an Accelerated Life Cycle Test to prove the viability and sustainability of their products.
- They have not found a laboratory qualified to perform the test and are considering looking for other organisations with a similar model who have data on e.g. degradation, performance under heat, toxicity, and other information that can inform the best choices for circularity.
- Among other considerations they need to know:
  - The estimated life time;
  - To what extent the product is sustainable;
  - The options for products' disposal or repurposing.

The questions that were asked

- Have you thought about maybe testing your product, actually against concrete products, rather than trying to find the people that are just against plastic, but against concrete? Are there standards bodies you can already start to work with?
- You have thought about the lifespan of your products a lot. Have you thought about your source(s) as well to avoid your feedstock containing toxic products? In other words, how do you get your hands onto as clean a material as possible?
- Have you thought about asking the grant-making organisation to fund this part of the project, as a contribution to helping you to grow your business, and not just waiting for you to do this work, before they give you the money?
- Have you thought ahead? Have you given some thought to what the results might be, and what you would do if they are not what you expected or wanted?

- Have you looked at reaching out to academic institutions and maybe partnering with them?
- What's your backup plan if this falls through?
- You talked about a grant from certain companies to continue your work. I wanted to ask, apart from grants and support from big brands, are you able to sell your product to local customers?
- How is the market reacting? Can your business be sustainable without grants and support from big brands?
- Looking at the end product that will be produced, have you thought of what it will look like?
- What would you do if there is a problem - for example if your products do not pass the test? And have you been able to isolate the specific type of plastic that might make you fail your test?
- Have you thought about reaching local government, and what do you think about maybe working with local government, or maybe engaging the wider community in your work?

Hotseat participating organisations

Organisation	Country	Web
A C Plast Ltd	Rwanda	www.facebook.com/acplastltd
African Circular Economy Network	All of Africa	www.acen.africa
African Solution	Somalia	www.africansolution.so
Arena Recycling Industry	Tanzania	www.arena.co.tz
Biha Eco Venture	Uganda	www.https://bihaecoventure.wixsite.com/bihaecoventure
Brickify	Uganda	www.brickify.xyz
British International Investment (formerly CDC Group plc)	UK	www.bii.co.uk/en
Coped Waste Management Company	Rwanda	www.copedgroup.com
Eco Brixs	Uganda	www.ecobrixs.org
Ecocent Recycling	Ghana	www.ecocentrecycling.com
EcoPlastile	Uganda	www.ecoplastile.com
EcoTech DRC	Democratic Republic of Congo	www.ecotech-rdc.business.site
Full Development agency	Democratic Republic of Congo	www.http://fulldevelopmentagency.unaux.com
German Environment Agency	Germany	www.umweltbundesamt.de/en
Gjenge Makers	Kenya	www.gjenge.co.ke
Green Home	Uganda	www.greenhome.ug
Green Pavers	Kenya	www.greenpavers.co.ke
Greenventure	Tanzania	www.facebook.com/greenventuretanzania
Ifrique Eco Solutions	Nigeria	www.facebook.com/IfriqueEcoSolutions
Innovative Plastic Recyclers Gunjur	Gambia	www.gunjurplastics.com
International Sustainable Chemistry Collaborative Centre	Germany	www.isc3.org/en
Ivarest Global	Nigeria	www.instagram.com/ivarestglobal
Mckingtorch Africa	Mckingtorch	www.mckingtorchafrica.org
Nelplast Eco Ghana Limited	Ghana	www.nelplastgh.com
OGEL (UK)	UK	www.ogelworld.com
Operation 414	Rwanda	www.cogbo0.wixsite.com/operation414

Organisation	Country	Web
Philas Green Builders	Kenya	www.facebook.com/Philas-Green-Builders-613314955756433
Plastic Venture	Somalia	www.facebook.com/plasticventure
Polycare	South Africa/ Namibia	www.polycare.de
Protective Pavers	Rwanda	-
Pyramid Recycling	Ghana	www.pyramidrecyclinggh.com
Ramtsilo	South Africa	www.ramtsilo.com
Recoplast	Democratic Republic of Congo	www.recoplast-congo.com
Recycle 4 Africa Waste Management Pty Ltd	South Africa	www.r4awm.com
Red-Plast	Cameroon	www.red-plast.com
S-Tile	Sudan	www.linkedin.com/company/s-tile
Sitra	Finland	www.sitra.fi
Sons Development Company Limited	Ghana	www.facebook.com/sdclghana
Sustainable Development Planning LLC	Ghana	www.linkedin.com/in/troutmanheather
Systemiq	UK	www.systemiq.earth
Tecocarre	Burkina Faso	www.tecocarre.com
The Noble Savage	Zimbabwe	www.thenoblesavage-com.stackstaging.com
Toa House Company	Ghana	www.oanyi.com/toa-house-affordable-housing
Upcycle Africa	Uganda	www.upcycleafrica.org
Zelij Invent	Morocco	www.zelijinvent.com

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Front cover image courtesy of Arena Recycling Industries, Tanzania.

See www.footprintsafrica.co for more information on the programmes Footprints Africa runs to support businesses to develop purpose-driven cultures and so empower their employees to improve their social and environmental impact.

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