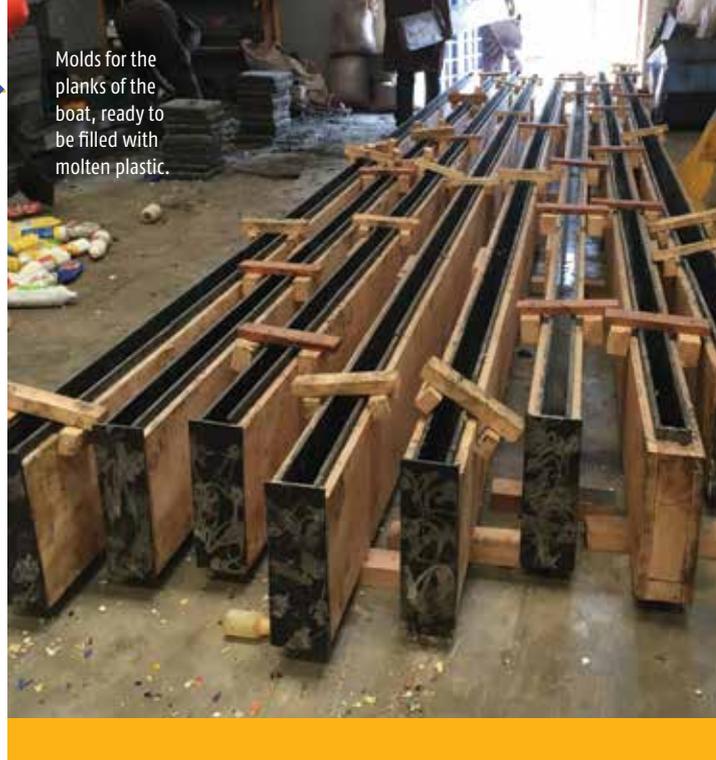


Flipflop dhow under sail,
headed for Zanzibar.

Inset: Flip-flops make up
about 30% of the waste
material found on the
beaches of Kenya.



Molds for the planks of the boat, ready to be filled with molten plastic.



Some 30 tons of waste are collected on a 7 km stretch of beach on Lamu island every year.

so strong that you can build boats out of it that are seaworthy. So we find it a pity that that material is just discarded as waste after one-time use.

We want to open the eyes of people for changing that. We want to get rid of single-use plastic. We don't necessarily want to get rid of plastic, because we think that plastic has great potential, if used properly and managed properly. With what is already there, we can actually solve this problem with everything that we already have and know.

KELLY: You're the design engineer on the project?

SCHÜRG: Yes.

KELLY: Where is the plastic waste gathered and where are the vessels built? Is it all on the coast of Kenya?

SCHÜRG: Yes, all on the coast of Kenya. The boat was built in Lamu, which is a traditional boatbuilding place, and we have collected the waste from Lamu, but also from other places. There are a lot of organizations that do beach cleanups, either voluntary or sponsored by donations, and we encountered many of them. They all collect the waste from the beach but they don't know what to do with it, so in the end it still ends up in a landfill. We took a lot of that waste and turned it into lumber for our boat. Turning it into lumber [involves] a kind of plastic recycling process where you shred it, wash it, melt it down, and cool it into molds. All of that has happened in Malindi, also a town on the coast of Kenya. So the waste is

collected from the South and the North, all along the coast of Kenya.

KELLY: It's gathered, cleaned, and processed by Kenyans?

SCHÜRG: Yes, and it's entirely a Kenyan project, all the boatbuilders are Kenyan...they come from generations of Kenyan boatbuilders. They have great knowledge in how to build sailing dhows, but they do it with wood. The design process is interesting because they do it much differently than we design engineers. They have the boat designed in their head. And then when they go to start to build it, they don't even make a drawing, they just start to build it and they know that when this dimension is this, then the next dimension is that. So it was a very interesting process to work with them, how to actually adapt the design in such a way that it would fit with the new material, which has slightly different properties than wood, which they're used to.

KELLY: Leonard, before we talk about the construction piece...the vessel is sail-powered and also uses a small outboard engine?

SCHÜRG: Yes. We did an expedition with this boat from Lamu to Zanzibar and back to Mombasa, which is about 700 km, I think. We added a little outboard motor because we want it to be maneuverable around reefs and in small harbors, but that's kind of a temporary solution. Obviously, we would prefer it to be entirely sustainable.

KELLY: What are the vessel's dimensions?

SCHÜRG: The boat is about 9½ m long. It depends a bit on from where to where you count. About 3 m wide and I think there's about, let's say, a draft of about 1 meter 20 on the water. It's relatively shallow. Traditional dhows don't have a keel, at least not like a traditional sailing boat. But because they're rigged in a different way, they can't sail against the wind, so a deep keel would not really add a lot of value for them. They



Fundi Hassan works on the keel of the boat.

have [what can be called] a keel beam, which holds the ribs together, that's all the keel it has.

KELLY: A moment ago, you started to talk about the plastic material and how the hull was constructed.

SCHÜRG: Right, we wanted to work with local knowledge. So we decided not to go with a modern yacht design where you could just build a very fancy boat...we instead wanted to go with traditional knowledge. The boatbuilders in Kenya know how to build boats in the traditional way and we wanted to show that their knowledge is still valid, still valuable, and that was a very important part. We wanted, basically, to bring those two industries together: the traditional industry of how things are made [in that region] and the new industry of recycling plastic. Therefore, we tried to find a low-tech approach that can result in a collaboration that is true to both of them.

KELLY: It sounds like the Flipflop Project has provided jobs for Kenyans both with the gathering of the plastic material and with the construction of the boat. Is that accurate?

SCHÜRG: Yes, that is accurate, although temporary, because

“Turning it into lumber [involves] a kind of plastic recycling process where you shred it, wash it, melt it down, and cool it into molds.”



we are not continuously building these vessels, but yes, it has given jobs to Kenyans. We want to continue it. We want to build a bigger boat, because this basically is our prototype. We want to build one double this size. That was the original aim. We wanted to build a big boat that is seaworthy enough to actually sail around the Cape of Good Hope and carry the message further. But we encountered quite a lot of technical difficulties in the recycling plastic part, and so we decided to settle for a smaller prototype to get a good understanding of what the issues are, how the material behaves, how



Master boat builder Ali Skanda, left, and Leonard Schürg inspect the inside of the boat during waterproofing.



Planks are fitted on the skeleton of the boat with messing screws.

we can work it, and then from there set out to actually build a bigger one.

KELLY: The dhow is constructed of wood but the hull and the deck are covered with the plastic material, is that right?

SCHÜRG: No, no, the whole boat is constructed from plastic material. The only wood actually used in this boat is the mast and the boom. All of that material that looks like wood is actually plastic.

KELLY: That's fascinating. It really does look like wood, like it's a wood structure that a layer of plastic is then put over. But it's what you call plastic lumber.

SCHÜRG: Yes, it's the hard plastic—bottle tops, plastic chairs, shampoo bottles, yogurt bottles, those kinds of things. The HDPE, high-density polyethylene, that's a material which is very versatile and so it's used in a lot of things, from plastic bags to bottle tops. You can select it very well compared to others from a waste stream. So we selected all of that material and mixed it and then melted it and poured it into molds that actually form the ribs, the beams, and all of the construction items. So those molds, we prepared those in the shape of the wood that they would usually try to find

so that they needed to carve off [as little] as possible to actually get the shape of the rib that's needed.

KELLY: I see, okay.

SCHÜRG: Then on the outside of the ribs, the skeleton basically, there's a layer of extruded plastic planks... a plastic that is extruded through a mold so that it actually gets a very consistent shape. It looks and feels like a plank.

KELLY: You mentioned earlier that the first voyage was from Kenya to Tanzania in January, is that right?

SCHÜRG: Yes. We went to Zanzibar.

KELLY: How did it go in terms of the vessel and also, what was the reception like to the project?

SCHÜRG: Well, the boat sailed like a charm. Because the plastic material is a little bit heavier and a little weaker than comparable size wood, we used a little bit more of it; so the boat lies a little deeper in the water compared to similarly designed boat made from wood. But that actually gives it really nice sailing properties because it's sturdy, it's heavy and it just glides very nicely...waves don't disturb it, almost not at all. We were very satisfied with the performance of the boat.

KELLY: Before going in the water, is the plastic material treated with anything? Do you seal it? Or once it's constructed, is it ready for the sea?

SCHÜRG: We did use the traditional way of sealing wooden boats. It's called kalfatere, in which basically they use little cotton strings that are squeezed into the gaps between the planks, which are sealed off with tar. The cotton swells up with the water and fills the little gaps that are leftover. Then there's the second layer of sealing, which is our recycled



The Flipflop boat with recycled plastic waste planking in place, before the flip-flop panels are fitted.

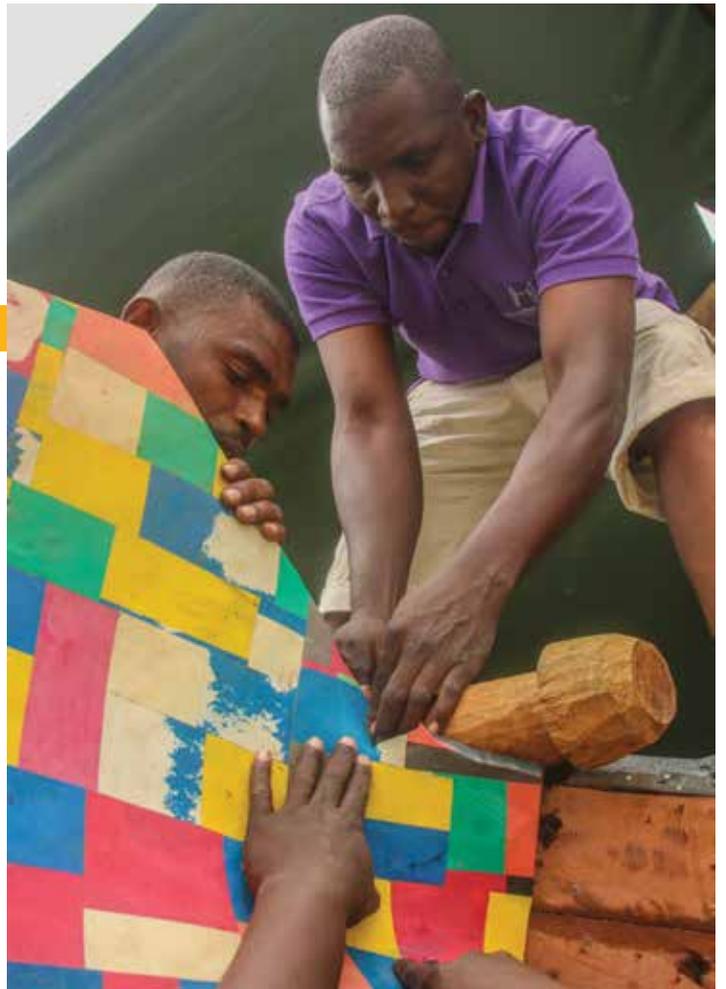
“The only wood actually used in this boat is the mast and the boom. All of that material that looks like wood is actually plastic.”



flip-flops. We worked together with a few artists who took the flip-flops, which are about 30% of the waste collected on the beach, and they cut them up into little squares or rectangles and they puzzle them together to fit in larger squares. Then they glue them together and polish them so that they get a smooth surface, and that layer is then placed and glued onto the outside of the boat. It actually seals off all of the gaps between the planks and gives it another sealing layer. That colorful skin that the boat has is not only functional—it helps prevent water from coming in—but it’s also bright and beautiful and it attracts the eye.

KELLY: Now I understand how that layer of flip-flops is attached to the boat and helps seal it. When I first looked at the photos, I mistakenly thought, “It’s an outer layer of plastic material on a wooden frame.” I understand now that the entire boat is made of the plastic material.

SCHÜRG: Yes, indeed. That was one of the big challenges we wanted to solve. We wanted to make something structural, something that shows the quality of the material. To come back to your



Flip-flop panel sheets are fitted to the surface of the boat.



“We’re working on a plan to actually build that initial ‘dream’ boat, the 20-m sailing dhow that would be capable of crossing the ocean.”

earlier question: the reception along our coast, the expedition as I call it, was overwhelming. It was beautiful how many people came together. We stopped in every little village and every little town, and we organized beach cleanups to come together with local communities. We talked about how to do plastic recycling and we gave workshops. We talked with school children and to local governments and politicians. There was a lot of commitment. During our trip, I think something like 20 restaurants and hotels that we visited or that were associated [with the event] actually started to ban straws and single-use plastics in their restaurants and bars, and continue to do so today. That kind of change is exactly what we were hoping for.

KELLY: Was there good media attention in Africa on the project, including when the boat finished up in Tanzania?

SCHÜRG: There was great media attention. We were covered by all the major news stations in Kenya but also worldwide, like the BBC, Reuters, and others came to cover the story. So, in Kenya now, I rarely encounter somebody who did not hear about the story.

KELLY: What would you say has been the toughest challenge that you and your team have faced in making Flipflopi a reality?

SCHÜRG: Obviously, there are a lot of organizational challenges, from finding money to ensuring quality. But I think for me, as an engineer, the technical challenges were the most interesting. And that is about getting the right quality of recycled lumber. The machinery that we’re working with is outdated, to put it nicely, and the knowledge available is not scientific. Many people working in the plastic industry know practical things. But often, to invent something new, you kind of need to be able to take a step back and look at it from a structural view. That was a big challenge to actually define the right processes and to actually maintain the quality so that we don’t get huge air bubbles in our parts, or that we don’t find shredded material that has not melted because it belongs to a different class of plastics. We saw those kinds of things in the beginning a lot. And then, obviously, if you have a beam that is 15 by 15 cm and there’s a one-inch diameter air bubble in the middle of it, your beam is worth nothing.

KELLY: Right [laughter].

SCHÜRG: And you can’t really see it until the moment that

you cut it open. We did a lot of work on that to define the processes correctly...to dry the plastic after washing it in the right way to make sure that there’s no humidity coming in to the process of melting it, to clean out all dirt and paper and whatever would be in a waste stream. When you collect the waste, everything is together. So you need to sort out the right things and then process them in the right way to actually get a beam that is consistent, where you know that when this one is good, the next one will also be good.

KELLY: The processing of the plastic waste, the cleaning of it and making it into the plastic lumber, is that all done close to where the first vessel was built?

SCHÜRG: Yes, most of it has been done in Malindi, which is about 100-and-something kilometers from Lamu, where the vessel was built. Because there was already a recycling factory that did some of those things, so we worked together with them to develop this process and material. Then it’s transported by truck to the island of Lamu.

KELLY: Going forward, what are the goals for the Flipflopi project? Is there a second voyage planned?

SCHÜRG: There is a second voyage planned. We’re currently looking at doing a round trip of Lake Victoria, which is a key [region of] East Africa, where a lot of countries come together that share the same problem, and the [plastic waste] problem with the ocean is even more apparent on the lake. In parallel, we’re working on a plan to actually build that initial “dream” boat, the 20-m sailing dhow that would be capable of crossing the ocean and carrying the message further around the world, the traditional sailing route to Oman and India or even outside of the traditional routes to South America or somewhere else. The Kenya Maritime Authority wants to support us in building the next vessel. They, along with the Kenya Ports Authority have been really helpful in getting the expedition going, and I’d like to thank them. I think we would like to collaborate further with them in building these East African boats. We are very interested in working together with them because they have in-depth knowledge of how the boating and shipping system works in Kenya and in East Africa, which is of essential importance. **MT**

For more information on the Flipflopi program, check out www.theflipflopi.com.