MAKOKO FLOATING SCHOOL FAQS – ON COLLAPSE & REGENERATION PLANS

1. What is Makoko Floating School?
Makoko Floating School is a prototype floating structure first built for and by the historic water community of Makoko, located on the lagoon heart of Nigeria’s most populous city, Lagos. As a pilot project, it has taken an innovative approach to address the community’s social and physical needs in view of the impact of climate change and a rapidly urbanizing African context. Its main aim is to generate sustainable, ecological, alternative building systems and urban water cultures for the teeming population of Africa’s coastal regions (See NLÉ’s African Water Cities Project). The structure is designed to be replicable and adaptable for various residential, commercial, recreational and institutional uses (see full project description and previous FAQs: appendix A).

2. How did the project begin and who were the parties involved?
In 2011, while researching solutions for affordable housing for Lagos, Nigeria, NLÉ founder Kunlé Adeyemi visited the water community of Makoko to see the building and living conditions of what appeared to be a predominantly low cost housing settlement on water in the heart of the city. Inspired by the challenges and opportunities he saw in the water community, NLÉ spent about a year engaging the community in terms of building trust, understanding their needs, assets and visions. In April 2012, NLÉ published its findings in ‘Makoko Research’ - a comprehensive report supported by the Heinrich Böll Foundation (see link to Research Report below). At the request of Adeyemi’s first host, the Shemede family, NLÉ agreed to help with the design and construction of a new building structure. This structure would serve as an extension to the classrooms and play area to an existing private nursery and primary school, whilst also serving as public space for the community’s social needs. This project evolved to be known as Makoko Floating School - a prototype for a larger vision for African Water Cities and communities.

The first floating structure was a collaborative design and build effort by a project team consisting of: Makoko youth and community leaders (primarily through the committed leadership of Baale Emmanuel Shemede), 8 expert local carpenters, local/international collaborators and NLÉ. Construction began in 2012, with urgency in a moment of crisis after parts of the community - declared an illegal settlement - were demolished by the Lagos State task force (see eviction notice: appendix B). NLÉ and several other organizations such as the Social Economic Rights Action Center (SERAC) and Heinrich Böll Foundation were at the forefront of advocating the preservation of the community (correspondences with LSG may be provided upon request). For NLÉ, advocacy was best expressed through intervention as manifested by a physical structure - Makoko Floating School - that could demonstrate an alternative and inclusive way of improving and developing waterfront communities through socio-economic, political and environmental impacts.

3. How was Makoko Floating School structure funded and who owned it?
The project was initially self-funded by NLÉ. A grant was later received from Heinrich Böll Foundation to carry out comprehensive research on the community (see link to research report below). Then in 2012, NLÉ applied and received funding for the project design development, construction, supervision and evaluation from the UNDP/Federal Ministry of Environment’s Africa Adaptation Programme (AAP). This funding was based on the fact that the project goals were in line with the objectives of the climate change programme.

The structure was officially handed over to Makoko/Iwaya waterfront community in August 2015. A detailed handover document was provided by NLÉ containing health and safety notes, technical drawings, maintenance plan, logbook and a draft contract for potential donors, sponsorships and funding. From thereon, the structure was under the responsibility and management of the community, and its use was at their full discretion. At the time of the initiation of the project however, a unified leadership and management of the various ethnic groups in the entire area was yet to be properly established. Consequently, communal ownership of the structure was difficult to institute. Ownership therefore remained unresolved and by default in the care of NLÉ’s first host – the Shemede family - one of over 9 community leaders of the different ethnic groups involved in the process.

---

1 African Water Cities Project - Concept Note: http://www.nleworks.com/publication/test-2/
4. **Why did Makoko Floating School structure collapse?**
Makoko Floating School structure collapsed due to deterioration resulting from a lack of proper maintenance and collective management.

5. **Who was responsible for the maintenance of Makoko Floating School?**
Broadly speaking, the project was a collective responsibility of all its stakeholders. Specifically, NLÉ was primarily responsible for the design, execution and maintenance of the structure in the first 2 years after completion (a post-occupancy evaluation phase within NLÉ’s agreement with UNDP/Federal Ministry of the Environment). In this period, all repairs and maintenance of the structure were paid for by NLÉ even beyond the allocated budget. Such repairs were carried out by the community carpenters and building team, which provided them with substantial income.

After the testing and evaluation period, and having received formal endorsement from Lagos State Government, in August 2015 the structure was formally handed over to Makoko/Iwaya Waterfront Community. Thereon, it was under the responsibility of Noah Shemede, the director of Whanyinna Nursery and Primary School - a privately run, donor funded school. He was responsible for the operational, maintenance, financial and management of the structure, while NLÉ remained in an advisory and assistance role on technical issues.

6. **What maintenance and safety measures were carried out?**
In the two years of following the structure’s completion (post occupancy evaluation period), NLÉ frequently met with technical partners, community leaders and the local construction team to collectively devise locally appropriate and economically viable solutions for any issues with the structure such as the repair of damages to the platform, barrels, anchors, vandalism and theft. Solutions advised by the community members were given precedence, and agreed by the team for testing on the structure. After Lagos State Government’s initial resistance to the project, several government officials were sent to visit and assess the structure. The officials gave a positive report to the State and made minor recommendations for improvements to the structure’s safety and regulatory compliance, such as adjustments to the handrail heights and improvement in the roof covering. NLÉ also secured an annually renewable permit from the National Inland Water Authorities (NIWA) for the structure.

In April 2015, after NLÉ’s several meetings, negotiations and correspondences, Lagos State Ministry of Physical Planning and Urban Development published its 2015 Press Briefing. This briefing finally and formally announced a proposed urban regeneration plan for Makoko, citing Makoko Floating School as a potential prototype for the redevelopment (see press briefing extract: appendix C). The structure was formally handed over to Makoko/Iwaya waterfront community on 7 August 2015 and it remained under their care thereon.

7. **How was the structure used?**
After its completion and opening ceremony in March 2013, members of the community for used the structure intensively for a variety of purposes, while NLÉ monitored its performance. The structure served as a popular community space and a tourist destination in the city during this period. It was publicly accessible for informal uses such as playground, fish trading, event hosting, crafts workshop, film shoot location and much more (see photos of use: appendix D). Following approval by the National Inland Water Authorities (NIWA) and an official endorsement from Lagos State Government in 2015 (see Question 6), the structure was formally handed over to Makoko/Iwaya waterfront community on 7 August 2015. Thereon it remained under their care and responsibility and was used primarily used as an extension to Wyninna nursery and primary school and as an event space.

8. **How and when did the structure collapse?**
There was no technical expert present at the instance of its collapse to provide an empirical report. However, it was not completely unexpected as we know that a number of events progressively compromised the base structure over the course of three months (for more details see Question 9). We suspect that the deterioration and absence of maintenance led to a final failure of the upper structure, worsened by a strong breeze of only 27 knots recorded at 09:52 am on June 7th 2016 around the time when it finally came down (See weather chart: appendix E). Several buildings in the community were flooded and severely damaged in that event.

9. **What events led to the structure’s deterioration?**
During a heavy wind and rainfall in March 2016, a chain link on one of the anchors broke. A community member alerted NLÉ and after several verbal notifications to the school director, NLÉ sent a written notice to replace the broken chain to avoid further damage and risks (see email notice and following email after damage: appendix F). Several days later, in the absence of the required maintenance, the structure drifted in another strong wind and sustained major damages from collisions with existing buildings and floating timber logs in the area. The floating base and parts of the upper frame were severely damaged and the long-term integrity of the structure was jeopardized and in question. NLÉ was notified again and several meetings were held with the community leaders to preside on the decision to dismantle the structure, in anticipation of an upgrade MFS II - an improved iteration already being developed in Venice at that time. The damaged structure was shored up with a timber perimeter barrier, in preparation for repairs or disassembly. The weeks of abandonment must have accelerated its deterioration to the point of collapse just before it was dismantled.
10. Were children or other users ever in danger when the school was still in use?
To our knowledge, no one was in danger while the school was in use. The structure went through an intensive 2-year period of informal use and to evaluate its performance and to evaluate its safety before students were permitted to use it in November 2015. The community members often reported its remarkable stability and resilience during heavy rainstorms. Given the floating nature of the structure, it was unusual to experience some movements whilst on it, during rough tidal conditions. The anchoring system deployed also allowed some movements. In the event of damage, there were always early warning signs that would alert any risks to lives, if addressed promptly. For this reason, after the structure was severely damaged in March 2016 (see Question 9), it was decommissioned as a school and the children were relocated to the old school building to avoid any risks.

11. Did the structure sink or collapse due to heavy rainfall, storm or severe weather conditions?
The structure did not collapse directly due to rainfall or a storm. Moreover, it did not sink and its flotation system did not completely fail even when the upper frame collapsed. It had previously withstood weather conditions of greater severity in the past, than the conditions on the day of its collapse: a wind speed of only 27 knots (strong breeze) was recorded at the time of its collapse, whereas wind speeds of over 60 knots (violent storm) were recorded on numerous occasions in the period of its use between 2013 and 2016. (See wind chart: appendix E)

12. Was the design perfect or did its flaws cause its collapse?
The design or construction of the structure was not perfect. Given the first and prototypical nature of the project, the structure was built as a proof of concept and a minimum viable product. The project stakeholders understood its main purpose as an innovation and an intervention for social and environmental change. NLÉ frequently communicated these facts at public presentations.

It was built quickly, with some improvisations and the quality of construction and materials were yet to be perfected. It was built with the collective goal of learning from the local environment, for educating and improving the building system through product development. The project team was constantly aware of the imperfections and collectively worked to devise locally appropriate and innovative solutions. The imperfections may have triggered events that led to the collapse but these did not directly cause the collapse. Had the management decision to repair or dismantle the structure been made soon after it was damaged, its lifespan would have been prolonged or it would not have collapsed.

13. What were the technical challenges, imperfections and how were they addressed?
The structure had problems of anchoring, leakage, misuse, vandalism and theft. Following its construction in 2013, a project team comprising local builders, community leaders, NLÉ and collaborators worked closely to develop solutions for these problems. As a prototype, it had to be kept within a regulatory framework as a ‘non-permanent structure’ with no fixed location. Thus a permanent anchor was not used from its onset. Locally fabricated grapnel anchors were initially recommended by the community building team as a good solution, based on their shipbuilding knowledge. These anchors were not effective and failed, causing the structure to drift in strong winds. NLÉ immediately effected repairs to these anchors and sought better solutions. In 2014, the project team devised another solution involving the use of timber poles to restrain the grapnel anchors in the mud bed. These also did not hold adequately and later failed. In 2015, upon the advice of community experts and further consultation with our Dutch collaborators/naval architect Dykstra, it was collectively agreed to introduce an anchor system comprising of concrete filled steel piles, galvanized steel chains with concrete weight dampers. This was an effective solution until 2016, when a chain link broke and the missing link was not replaced (see Question 9). For future developments, we believe conventional anchoring/docking systems made of steel/timber piles directly connected to the base platform with fixed guides, will provide a fool proof solution.

14. What has been improved with the MFS II model?
MFS II is an improved, prefabricated and industrialized iteration of Makoko Floating School prototype. It is more robustly engineered, with an improved anchoring system and designed for rapid assembly and disassembly should it need to be flat packed and relocated. The structure was launched at the 15th International Exhibition - La Biennale di Venezia on May 28, 2016. The Exhibition was titled Waterfront Atlas - a knowledge platform to gather and bring the intelligence of waterfront communities such as Makoko to the world (see images in link1 below and: appendix G). The project was awarded the Silver Lion prize. Our plan is to continue improving the product design with new iterations, through value engineering.

15. What actions were taken after its collapse?
NLÉ was notified of the collapse by one of the youth leaders and we confirmed with relief that there were no casualties. NLÉ visited the community to directly assess the situation and discuss next actions. A press statement was released to concisely state the circumstances surrounding the collapse and plans for its replacement (see press release: appendix H). NLÉ further provided the project stakeholders and Lagos State Government with a detailed report, formally notifying them of the events and future plans. Baale Emmanuel Shemed, the community leader directly responsible, led the disassembly and recycling of the salvaged materials from the structure back into the community. The technical equipment such as the solar power system and barrels were taken into his care for reuse in future reconstruction.

1

16. Was Makoko Floating School illegal?
Based on our understanding, Makoko School was not illegal. At the time of its construction, there did not seem to be clear policies forbidding or regulating the existence of a structure of that nature, which was neither a fixed building nor a fully mobile vessel. It was neither a house nor a boat but a new typology that seemed to straddle land-water policy gaps and state-federal territorial boundaries. Although there was a comment in the media in 2013 by the then-Commissioner for Waterfront pronouncing it an illegal structure, neither NLÉ nor other stakeholders ever received any formal notice to that effect, or an order for its demolition. NLÉ maintained regular correspondence and meetings with Lagos State Government until it was endorsed in 2015, and continues to do so presently towards future developments.

17. What is NLÉ’s role in Makoko Floating School project?
NLÉ is the lead project designer, researcher and executor of Makoko Floating School (Lagos Water Communities project and African Water Cities Project), in close conjunction with Makoko/Iwaya Waterfront Community, local and international collaborators and other stakeholders. With this role and as a custodian, NLÉ remains committed to the project.

18. Who was responsible for funding or managing the operations of the school?
After the formal handover to the community in August 2015, Noah Shemede, the director of Wyninna Nursery and primary school took over the management, maintenance and operations of the structure as a school extension, which resumed in November 2015. NLÉ continued to assist the school to secure funds to furnish the classrooms from, for instance, a private donor. In April 2015, a renowned Lagos Fashion brand and NGO offered to help manage Makoko Floating School but this was declined. In December 2015, NLÉ helped secure funding to provide solar power and lighting from One Lagos Fiesta for the school operations and for the community over the New Year (see photos of use: appendix D). In addition to these, NLÉ continued to directly contribute cash for the building maintenance and student events. Several other donations were made by tourists, visitors and corporate organizations - and the school and community continued to receive much good will from the popularity of the structure.

19. What are the future plans?
The community leaders have sought NLÉ’s continued assistance to rebuild the structure and/or other public structures for schools, hospitals, markets, community centers, water, power, sanitation infrastructures etc. The project stakeholders such as UNDP and several other supporters have reaffirmed their commitment to continue supporting the project. We are working to help consolidate these financial, political and technical supports necessary for further improvements, mass production and scaling up the project as part of an urban regeneration plan for waterfront communities, in conjunction with other support organizations and partners. The critical elements needed are:

a. The community’s establishment of a trained, accountable management structure based on a wider level of community consultation and participation b. Consolidation of funds from non governmental organisations, corporate sponsors, institutions, private donors including reasonable equity contribution from the communities through labour or other resources within their means and c. Public endorsement and support from Lagos State Government with the approval of a policy framework to support viable regeneration of waterfront settlements.

NLÉ is also developing other building prototypes, infrastructure, and urban solutions for waterfronts globally.

20. How will another collapse be prevented in future?
On the technical side, we have taken the lessons learned towards greatly improving the design into a properly tested industrial product. Our second prototype MFS II already incorporates major improvements to reinforce the structure, anchoring and increase its robustness. On the operational side, standards will be established for a team that must be trained to be professionally accountable for the operations, finance, management and maintenance of such public structures being built within the community.

21. What was learnt from the experience?
For all the parties involved and we believe for many people around the world, the project has been and continues to be an important learning process in terms of building on water in areas with scarce resources. In the last 5 years we learned the challenges, opportunities and impacts of conceiving and developing a physical intervention within a socially, politically and economically complex environment. We have developed several solutions to the technical challenges in the construction. And through loss, the community has experienced the importance of an accountable management/ownership structure needed to maintain their public facilities.

22. Did the structure meet the educational needs of a school?
The structure met the needs of a school for a very short period only - following its handover until a few months before the collapse (see Guardian & Reuters documentaries: appendix I). It provided infrastructure - classrooms plus playground extensions to Whanyinna nursery and primary school, which was privately and independently managed. It also attracted interest and financial support for the education of the children. Although it only met the local needs of a formal school temporarily, we have received numerous feedback on
Makoko Floating School’s long term impact as an education/research platform, inspiring students and people globally about building and living on water (see some videos and reference examples: appendix I).

23. Was the structure fit for its environment?
The structure was inspired by Makoko buildings and living conditions. It was designed and built for its environment, using the same but improved local materials, techniques, resources and labor. It was developed to float specifically to reduce dependence on the weak ground conditions and to address the environmental challenges of the changing climate - rising tidal levels, increasing rainfall and flooding.

24. How did the structure address climate change, urban and social development?
Makoko Floating School is an urban catalyst for social change. The structure represents an alternative method of development in rapidly growing regions that are vulnerable to climate change. It also encourages people to think differently, build differently and hopefully, live differently.

25. What is your response to Noah Shemede's comments about the viability of the structure?
Noah Shemede's position on the project has been overplayed and misrepresented in the media. His comments about the long-term relevance of the structure were mostly personal and understandably, expressed in grievance and defence of his responsibilities. It is unfortunate that his views were reported as a victim or antagonist of a personalized situation. Whereas, it was in fact a collective communal effort, with several representatives/leaders more responsible for speaking objectively for the community, not consulted. Some of his practical concerns were valid and were part of challenges being addressed by the team.

26. How has Makoko Floating School been affected by the media and public interest?
Makoko Floating School project continues to spark public interest and media attention due to its complex, unfolding nature. Given the delicate status of the community, it is crucial that the actions and communications of all parties continue to empower and legitimize the community, towards social and economic change (see selected press clippings, publications and link below: appendix J)

In some media reports of its collapse, we note the misconceptions of some critics or journalists that hastily question the integrity or appropriateness of the project, the motives, the emerging practice of architecture, and the people that support it. While we appreciate this as an opportunity to expand intellectual discourses, our response remains our focus, actions and results in catalyzing change - towards more inclusive, social and environmental practices needed to address some of the most pressing challenges of our time. We do these with the people we serve, our supporters, collaborators and with advocacy through public interest. To this end, Makoko Floating School continues to be a project committed to improving the quality of life by bridging gaps and shaping the architecture of cities and communities.

27. How has Makoko Floating School influenced your thinking on water-based development?
It has strengthened our motivation to address the issues of waterfront urbanism with greater urgency. Water-based settlements are intrinsic to human civilization, and now more so with the pressures of urban growth, scarcity of resources, and vulnerability to the impacts of climate change. Rather than preventing the continuation of water-based settlements, we believe a pertinent question to ask is:
What if we harness this momentum and intelligence into inclusive and sustainable growths for the 80%+ of the world’s major cities, capitals and communities that now host the largest trends of urbanization and are all located on waterfronts?

Notes:
Questions were compiled from various inquiries mostly from journalists, researchers and the public. Responses are mainly by NLÉ with reviews/inputs from Makoko/Iwaya community leaders/representatives, project stakeholders and advisors.
Additional inquiries should be directed to contact@nleworks.com with the subject: "Makoko Floating School FAQs"

Other relevant contacts include:

1. Francis Agoyon (Leader of Community Elders) - +234 805 049 2917
2. Mrs. Christina Adeyemi (Community Representative) - +234 802 635 7153
3. Baale Emmanuel Shemede (Community leader) - +234 805 620 5162
4. Baale Yusuf Kumayon (Community leader) - +234 809 139 4134
5. Ewajane Osowo (Community member) - +234 708 010 8331
6. Muyiwa Odele (UNDP) - muyiwa.odele@undp.org
7. Monika Umunna (Heinrich Böll Foundation) - monika.umunna@ng.boell.org
8. Felix Morka (SERAC) - seracnig@aol.com
9. Erik Wassen (Dykstra Naval Architects) - erik@dykstra-na.nl
10. Joe Addo (Architect/advisor) - joe@constructsllc.com

---

APPENDIX
Makoko Floating School is a prototype structure that addresses physical and social needs in view of the growing challenges of climate change in an urbanizing African context. It is a movable ‘building’ or ‘watercraft’ currently located in the aquatic community of Makoko in the lagoon heart of Africa’s second most populous city - Lagos, Nigeria. It is a floating structure that adapts to the tidal changes and varying water levels, making it invulnerable to flooding and storm surges. It is designed to use renewable energy, to recycle organic waste and to harvest rainwater.

An estimated 100,000 people reside in Makoko in housing units built on stilts. Yet the community has no roads, no land and no formal infrastructure to support its day-to-day survival. In many ways, Makoko epitomizes the most critical challenges posed by urbanization and climate change in coastal Africa. At the same time, it also inspires possible solutions and alternatives to the invasive culture of land reclamation.

Until now Makoko has been served by one English speaking primary school, built on uneven reclaimed land, surrounded by constantly changing waters. Like many homes in Makoko, this has rendered the primary school building structurally precarious and susceptible to recurrent flooding. Sadly, the inability of the building to effectively withstand the impact of increased rainfall and flooding has frequently threatened local children’s access to their basic need – the opportunity of education.

In response to this and in close collaboration with the Makoko community, NLÉ has developed a prototype floating structure that will serve primarily as a school, whilst being scalable and adaptable for other uses, such as a community hub, health clinic, market, entertainment center or housing. The prototype’s versatile structure is a safe and economical floating triangular frame that allows flexibility for customization and completion based on specific needs and capacities.

The 220m A-frame or pyramid building is 10m high with a 10m x 10m base. It is an ideal shape for a floating object on water due to its relatively low center of gravity,
which provides stability and balance even in heavy winds. It also has a total capacity to safely support a hundred adults, even in extreme weather conditions.

The building has three levels. The 1st level is an open play area for school breaks and assembly, which also serves as a community space during after hours. The 2nd level is an enclosed space for two to four classrooms, providing enough space for sixty to a hundred pupils. A staircase on the side connects the open play area, the classrooms and a semi enclosed workshop space on the 3rd level.

The simple yet innovative structure adheres to ideal standards of sustainable development with its inclusive technologies for renewable energy, waste reduction, water and sewage treatment as well as the promotion of low-carbon transport. Furthermore a team of eight Makoko based builders constructed it using eco-friendly, locally sourced bamboo and wood procured from a local sawmill.

Construction began in September 2012 with floatation mock-ups and testing. Recycled empty plastic barrels found abundantly in Lagos were used for the building’s buoyancy system, which consists of 16 wooden modules, each containing 16 barrels. The modules were assembled on the water, creating the platform that provides buoyancy for the building and its users. Once this was assembled, construction of the A-frame followed and was completed by March 2013. Makoko Floating School is now in regular use by the community as a social, cultural and economic center and recently welcomed its first pupils who now use it as a primary school.

The project was initiated, designed and built by NLÉ in collaboration with the Makoko Waterfront Community, in Lagos State. The project was initially self-funded by NLÉ and later received research funds from Heinrich Boll Stiftung as well as funds for its construction from the UNDP/Federal Ministry of Environment Africa Adaptation Programme (AAP).

In December 2015 it received funding from Lagos State Ministry of Tourism, Arts & Culture through One Lagos Fiesta to install solar power and lighting to the waterfront. The installation was also supported by Tafeta.

Makoko Floating School is a ‘prototype’ building structure for NLÉ’s proposed ‘Lagos Water Communities Project’ and its ‘African Water Cities’ research project.

On NLÉ:

NLÉ is an Architecture, Design and Urbanism practice focused on developing cities. Founded in 2010 by Nigerian-born architect, Kunlé Adeyemi, founded it currently runs its operations from Amsterdam, the Netherlands and Lagos, Nigeria.
One of the megacentury’s dominant and unstoppable trends is urbanization. The outcome is a growing number of megacities worldwide, all of which face the same challenges. Within this context just as Silicon Valley acts as the home for new technologies it is the cities of the developing world that will generate responsible solutions for the larger world. As thinkers, creatives and agents of change, NLÉ’s role is to reveal these solutions and apply them so that we shape the physical, human and commercial structures that are critical to the near future of human civilization. Our activities encompass city development research and strategy advisory service, conceptualization and creative structuring, architecture and product design, infrastructure design, arts and cultural urban interventions.

**PROGRAM:** School, Community Building

**AREA:** 220 m2

**END USER:** Makoko Waterfront Community

**PROJECT TIMELINE:**

- Project initiation: May 2011
- Consultation, Research & Design: June 2011-September 2012
- Mockups and testing: September-October 2012
- Flotation platform construction: November 2012
- A-frame structure construction: December 2012-January 2013
- Completion preview event: March 2, 2013
- Project completion: March 2013

**PROJECT TEAM:** NLÉ, Makoko Community Building Team, BKVV Architects, Dykstra Naval Architects, Pieters Bouwtechniek, SPCIT, Roel Bosch Architecten, Ikeyi & Arifayan, Matrix Designs, Solarmate Engineering Nig Ltd.

**NLÉ TEAM:** Kunlé Adeyemi, Lisa Anderson, Thijs Bouman, Leslie Ebony, Marije Nederveen, Segun Omodele, Adekunle Olusola, Chryso Onisiforou, Martin Oreoluwa, Berend Strijland, Monica Velasco

**Makoko Waterfront Community:** The Baales of Makoko/Iwaya Waterfront Community, with special mention of Baale Emmanuel Shemede, Noah Jesutin Shemede, Jeunbete Shemede, Makoko Community Development Association & Youth Leaders and Makoko Floating School building team.

**TECHNICAL COLLABORATORS:** Blok Kats van Veen Architects, Dykstra – Naval Architects, Thieu Besselink, Roel Bosch, Urhahn + Borra, Pieters Bouwtechniek, Ikeyi & Arifayan, Matrix Design & Works Nig Ltd., Solarmate Engineering Nig Ltd.

**E:** contact@nleworks.com

**W:** www.nleworks.com
What is Makoko Floating School?
Makoko Floating School is a prototype floating structure that addresses physical and social needs in view of the growing challenges of climate change and an urbanizing African context. It is a movable 'building' or 'watercraft' currently located in the waterfront community of Makoko on the lagoon heart of Nigeria's most populous city, Lagos. Makoko is a cluster of communities living on water. For nearly 100 years it has thrived on the fishing and sawing industries. The community is largely built on stilt structures and transportation is only by canoes. It is a highly dense and urbanized area, yet it has almost no roads, no land and no modern infrastructure. It is believed that over 100,000 people currently live in Makoko. The community is full of social and cultural opportunities, at the same time, faced with severe physical, environmental and political challenges.

How did the project begin and why?
In May 2011, Founder of NLÉ and architect Kunlé Adeyemi visited Makoko and met members of the community. Inspired by the environment and their way of living and building, he subsequently volunteered to work with them to meet one of their needs - the expansion of a nursery and primary school built on reclaimed land. The school was inadequate, dilapidated and prone to serious flooding that frequently hindered the children’s access to education. For Kunlé Adeyemi and NLÉ, meeting this need was an opportunity to learn and to contribute. For the Makoko community, it was an opportunity for development.

Adeyemi and NLÉ's relationship with the community resulted in a holistic, innovative architectural solution as well as a wider urban vision that addresses the challenges of urbanization, climate change, energy, waste, water and food facing many African coastal regions.

How was the design developed, built and how long did it take?
The design was developed by the NLÉ team, the local community building experts with international collaborators on specific technologies. One of the key challenges was finding a solution to building relatively cheap and reliable foundations that could support larger structures in the muddy and weak topography of Makoko area. This issue combined with the changing tidal/water level informed a solution to float the building. A number of design options were considered through several consultations with Makoko community experts and NLÉ’s international collaborators. The final preference was a solution based on the use of locally available materials, labour and vernacular building techniques, combined with...
relevant global technologies for improvements. This consultation, research & design phase started in June 2011.

Construction began in September 2012 with flotation mock-up and testing. Recycled empty plastic barrels found abundantly in Lagos were used for the building’s flotation system, which consists of 16 wooden modules, each containing 16 barrels. Starting in November 2012, the modules were built and assembled on the water, creating the 100m² platform that provides buoyancy for the building and its users. Once this was assembled, construction of the A-frame followed, led by a team of eight Makoko based builders using eco-friendly, locally sourced bamboo and wood procured from a local sawmill. The frame was completed by December 2012 and the enclosure and roof by February 2013. Development and installations of the building energy, waste and water systems continued until May 2013.

What is the size and the capacity of the floating school?
The 3 floor triangular A-frame or pyramid structure is about 10m high with a 10m x 10m (100m²) open base. The frame holds an enclosed rectangular box of about 55m, creating a semi-enclosed rooftop of the same size on the third level. The resulting building/watercraft has a total capacity to safely support up to one hundred adults, even in extreme weather conditions.

How does the design of Makoko Floating School address the issue of climate change and flooding?
Due to the increase in rainfall and rise in sea levels, Makoko’s buildings that are based on fixed stilts, are still prone to occasional flooding although better protected than many buildings on land. Makoko Floating School is built on a floating platform that adapts to the tidal changes and varying water levels, making it invulnerable to flooding and storm surges.

Why a triangle?
A triangle or pyramid is an ideal shape for a tall floating object on water due to its relatively low center of gravity, which provides stability and balance even in heavy winds. The triangle is also a fundamental roof form, which is also ideal for the wet and rainy regional climate.

Is the Makoko Floating School fixed or mobile?
The building is currently anchored into a static position. It can also be made mobile and moved via tow.

How is Makoko Floating School powered/energy use and how does it handle waste?
The building/watercraft has an electrical system, which is to be powered through solar energy panels installed onto the roof of the building. A compost/urine diversion toilet adapted to the local practices has been incorporated into the building. The resulting compost will be recycled for vegetation and planting on the structure.

What are the potential risks?
Due to the movable nature of this prototype, there is a minor risk of drift in heavy storms if improperly anchored. There is also a risk of fire spread due to the use of wood. As with risks in any building, both issues have been carefully assessed and mitigated through design. Makoko Floating School employs a combination of temporary posts and retractable steel anchors. A fixed anchoring system is proposed for its long term docking. The wood used is treated to resist rot and fire.
Who is the school built for?
The school was initially conceived as an extension to the only existing English speaking school on water - Whanyinna Nursery and Primary School, which served mainly the 'Egun' community in Makoko. However its wider community acceptance has brought about a desire for its inclusiveness to serve the entire Makoko/Iwaya Waterfront Community and various ethnic groups. The building is used both for children's educational needs and for communal use by adults outside of school hours.

Who are the key project stakeholders?
The current stakeholders are Makoko/Iwaya Waterfront Community, NLÉ, the United Nations Development Programme/Federal Ministry of Environment Africa Adaptation Programme (AAP), Heinrich Boell Foundation and NLÉ’s technical collaborators, and more recently Lagos State government.

How were the community members carried along?
The project has been carried out with the collaboration of community members, leaders and building experts from inception. NLÉ organized regular face-to-face meetings with Makoko/Iwaya Waterfront Community representatives for dialogues, design workshops, progress updates and management issues. Representatives of the community were also copied into key project correspondence.

Is there a community management team involved?
The Makoko/Iwaya Waterfront Community Secretariat is the current community focal point on the building management.

What is the cost of the building and how is it funded?
The final cost of the building is yet to be available. The project was initially self-funded by NLÉ since 2011 and later received research funds from Heinrich Boll Stiftung as well as funds for its construction from the United Nations Development Programme / Federal Ministry of Environment Africa Adaptation Programme (AAP) in 2012.

In view of the state government’s partial demolition of Makoko settlement, what will happen to the building and community?
In April 2015, the Lagos State Ministry of Physical Planning and Urban development announced its consideration for incorporating the internationally acclaimed prototype structure ‘Makoko Floating School’ in a regeneration plan for Makoko Waterfront community.

Since its completion in March 2013, several government delegates from various ministries have carried out due diligence assessments of the structure and have reported positively on its performance. The global recognition of the project has further raised its awareness as a potential solution for developing the waterfront community. The state government has since taken steps to engage with the community and other stakeholders in developing a conceptual plan and proposal presented to the State Executive Council (EXCO) for consideration and approval.

Can the project be replicated in other places?
The prototype could be replicated in its form and materials. The structure is a safe and economical floating frame that allows flexibility for variations, customization for different recreational, institutional, commercial and residential uses and for completion based on specific needs and individual capacities. As a project, NLÉ is developing expertise in this
community development process, approach and technology, to enable contextual replication, variations and improvements in other water-based communities.

'Makoko Floating School' is a prototype building/watercraft for the proposed 'Lagos Water Communities Project' - a holistic urban development vision for water-based communities in Lagos, applicable to other waterfront cities and communities in Nigeria and the rest of Africa.

NLÉ is also undertaking a comprehensive research project entitled ‘Africa Water Cities’ which explores and documents the realities, challenges and opportunities at the intersection of urbanization and climate change in water-based cities/communities throughout Africa.

For further inquiries please email contact@nleworks.com, visit our website www.nleworks.com or follow our facebook page.
MWFD/ EST. 621/ | 2 July, 2012

The Occupier/Owner
Makoko/Iwaya Waterfront
Yaba.

NOTICE TO VACATE AND REMOVE SHANTIES / ILLEGAL
DEVELOPMENTS ALONG THE WATERFRONT

You have continued to occupy and develop shanties and
unwholesome structures on the waterfront without authority thereby
constituting environmental nuisance, security risks, impediments to
economic and gainful utilization of the waterfront such as navigation,
entertainment, recreation, etc.

2. The Lagos State Government is desirous of restoring the amenity and
value of the waterfront, protect life and property, promote legitimate
economic activities on the waterfront, restore security, improve water
transportation and beautify the Lagos waterfront/coastline to underline
the mega city status of Lagos State and has decided to clear all illegal and
un-authorized developments on its waterfront and water bodies

3. Therefore, notice is hereby given to you to vacate and remove all
illegal developments along the Makoko/Iwaya Waterfront within 72
Hours of receipt of this notice.

4. Thank you.

Akin Tijani
For: Honourable Commissioner

LAGOS STATE MINISTRY OF WATERFRONT
INFRASTRUCTURE DEVELOPMENT

...to create wealth through the provision of world class waterfront infrastructure, facilities and services for all
MAKOKO FLOATING SCHOOL IN USE
Local events spanning the years 2012-2016

Christmas Party
December 2012

Fish net repairing
May 2013

Kina Buti Christmas Event
December 2014

Solar powered lighting funded by One Lagos
Fiesta, December 2015

School ongoing, Reuters
February 2016

Solar powered lighting funded by One Lagos
Fiesta, December 2015

Amnesty International 'Urban October' Film
Screening - October 2015

Amnesty International 'Urban October' Film
Screening - October 2015

Where We Live Exhibition and Event
November 2013

Makoko Community Construction Team
2013

Gidi Blues Film, Filming Location
2016

Makoko Floating School Opening
March 2013

Makoko Floating School Opening
March 2013

Makoko Floating School Playground, Aga Khan
Film - March 2016

Gidi Blues Film, Filming Location
2016

Appendix D
MAX WIND SPEED PER DAY
WIND SPEED MEASURED JUNE 7th 2016

DATA SOURCE: WEATHER UNDERGROUND DATA COLLECTED SEPTEMBER 2016
Hi Noah,

Following the meeting with you, the baales and members of the community today, and the appeal to assist after the storm incident last week, I have now sent you N80,000.00 to carry out works to restrain the structure, which drifted from its location as we warned below.

The money is to be immediately disbursed as follows:
1. N45,000 - 15 Eki poles
2. N20,000 - Labour cost
3. N3,000 - Boat transportation
4. N2,000 - Cutting saws
5. N5,000 - Jeunbete and the boys that helped when the school drifted
6. N5,000 - For the Baales
Total - N80,000

As agreed, after the permanent anchoring and repair of the leakage, the continued maintenance of the school will be the full responsibility of yourselves and a community committee.

Regards,

Kunlé

On 19 Mar 2016, at 11:13, Kunlé Adeyemi - NLÉ <kunle@nleworks.com> wrote:

Good morning Noah,

I’m writing you to express our deep concern about the state and the lack of adequate attention to Makoko Floating School. It’s now over 3 years since the completion of the Floating School. As you know since that time a lot has happened with the school, the community and of course with Lagos State government.

We have since been supporting the development, maintenance and repairs of damages, vandalism and theft on the school, even after the handover to you and the community, last year July. These repairs have cost us a significant amount with no contribution of time or efforts from you or the community. Yet we remain committed and last December even helped get support from Lagos State Government to install solar power & lighting worth millions on naira on the school for the students that you now have attending.

Just last week, we have had to spend money and time again to make additional repairs. And yesterday you called Farooq to inform him that some of the chains anchoring the structure have broken and are missing/stolen. We have tried to reach you since and you are not reachable.

We can not continue to carry out repairs on the building, particularly with little or no efforts or contributions of time or resources from you or the community. The structure belongs to you and the community. It is your responsibility and it is up to you to manage it as we have discussed many times extensively.

Please be advised that the current state of the structure is dangerous and at risk of causing major damage to properties and lives. It requires your urgent attention to mobilise people to find those chains and make the repairs immediately. As you know, Daniel is available in the community and knows exactly what to do.

Regards,

Kunlé
NLÉ has developed MFS II, an improved, prefabricated and industrialized iteration of the Makoko Floating School structure, adapted for easy prefabrication, rapid assembly should it need to be flat packed or relocated and affords a wide range of uses. It is more robustly engineered, with improved connections and anchoring points. MFS II is currently being exhibited at the 15th International Architecture Exhibition in Venice, Italy for which it was awarded the Silver Lion. The project was recognised as a “powerful demonstration, be it in Lagos or in Venice, that architecture, at once iconic and pragmatic, can amplify the importance of education”.

MFS II moored in the Venetian Arsenale

The lifting process of MFS II

Transportation of MFS II through Venice
MFS II IN VENICE, 2016
Technical Improvements

Fast paced assembly
Steel-to-wood designed connections
Sturdy steel connection elements
Widely used mooring method

Prefabrication process off-site
Screen printed marine board facade
Stronger corners for anchoring
Securely moored to poles

Read more about MFS II here
PRESS RELEASE
June 8, 2016

MAKOKO FLOATING SCHOOL COMES DOWN FOR UPGRADE

After 3 years of intensive use, and exceptional service to the community, the first prototype structure Makoko Floating School has come down on June 7, 2016. Following its decommission since March, the structure has been out of use in anticipation of reconstruction. We confirm that there were no casualties and the students had been relocated to the main school building since its decommission & pending reconstruction.

NLÉ, Makoko waterfront community and potential stakeholders were already considering the upgrading of the structure with a copy of MFS II - a new, improved iteration, which was recently launched at the 15th International Architecture Exhibition - La Biennale di Venezia. The project was awarded the Silver Lion prize for “a powerful demonstration, be it in Lagos or in Venice, that architecture, at once iconic and pragmatic, can amplify the importance of education”.

NLÉ principal Kunlé Adeyemi said “NLÉ and Makoko community greatly appreciate the concern and support received from so many people following the news alarm about Makoko Floating School. We are glad there were no casualties in what seemed like an abrupt collapse. The prototype had served its purpose in time and we look forward to the reconstruction of the improved version amongst other greater developments of the community”.

END

With kind regards,

NLÉ Team and Makoko community.

For enquiries or more details, please email contact@nleworks.com
MORE MAKOKO FLOATING SCHOOL IN FILM...

My Africa is: Lagos Chronicles, June 2013
AFP News Agency, February 2014
TVC News, March 2014
Africa News, March 2016

AWARDS

Makoko Floating School nominated for Aga Khan Award for Architecture 2016.
Makoko Floating School Highly Commended in Architectural Review’s Design Awards for Emerging Architecture.
Mention in the UIA category of the Vassilis Sgoutas Prize for 2014
Makoko Floating School nominated for UN Habitat’s Scroll of Honour Award.
Makoko Floating School shortlisted for the London Design Museum’s Design of the Year Award.
Makoko Floating School wins 2015 International Award for Public Art.

NOMINATIONS
ONLINE PUBLICATIONS (CLICK TO VIEW)

DOMUS - August 2016

FINANCIAL TIMES - March 2016

THE UK GUARDIAN - October 2012

QUARTZ - September 2015

BBC CULTURE - February 2014

THE GUARDIAN - February 2016

SKY NEWS - March 2013

NBC NEWS - March 2016

ARCHDAILY - March 2013

DEZEEN - December 2015

DESIGN BOOM - March 2013

NEW YORK TIMES - May 2013

OTHER ONLINE HIGHLIGHTS
Huffington Post, February 2013
Harvard Gazette, March 2013
Daily Mail, March 2013
Design Indaba, February 2014, August 2013
Inhabitat, August 2013
Ventures Africa, February 2014
Dezeen, March 2014
Uncube Magazine, date unknown
Architizer, date unknown
PRINT PUBLICATIONS (CLICK TO VIEW)

AFRICA RISING
August 2016

ATLAS OBSCURA
September 2016

JOCKS & NERDS
May 2016

BEYOND PATRONAGE
April 2015

ARCHITECTURE NOW!
November 2015

FIFTY UNDER FIFTY
October 2015

ARCHITECTUR
May 2014

ARCHITECTURAL REVIEW
September 2013

ICON MAGAZINE
January 2014

GLATT! FROM SUBURB TO CITY?
May 2014

TRA!
January 2014

ARCHITECTURE & URBANSIM
May 2014

MARK MAGAZINE
October 2013

PROTEIN JOURNAL
September 2013

ABITARE
May 2013

AND: