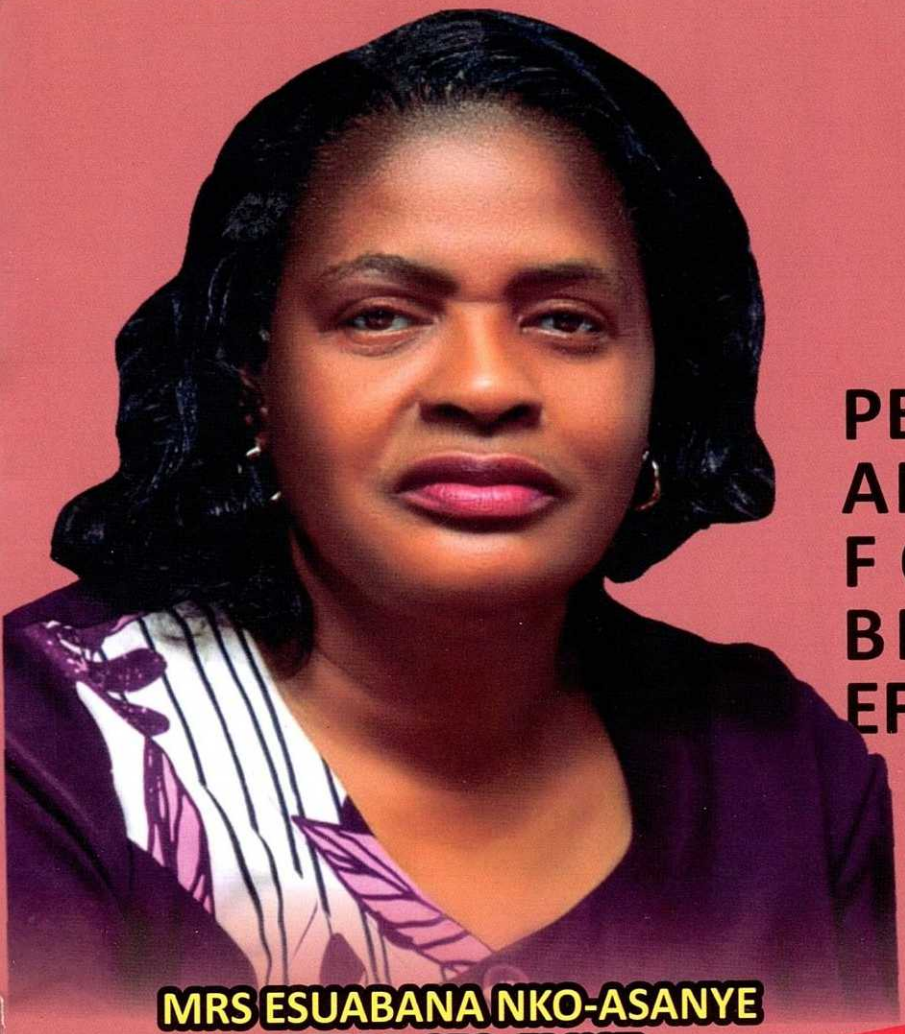
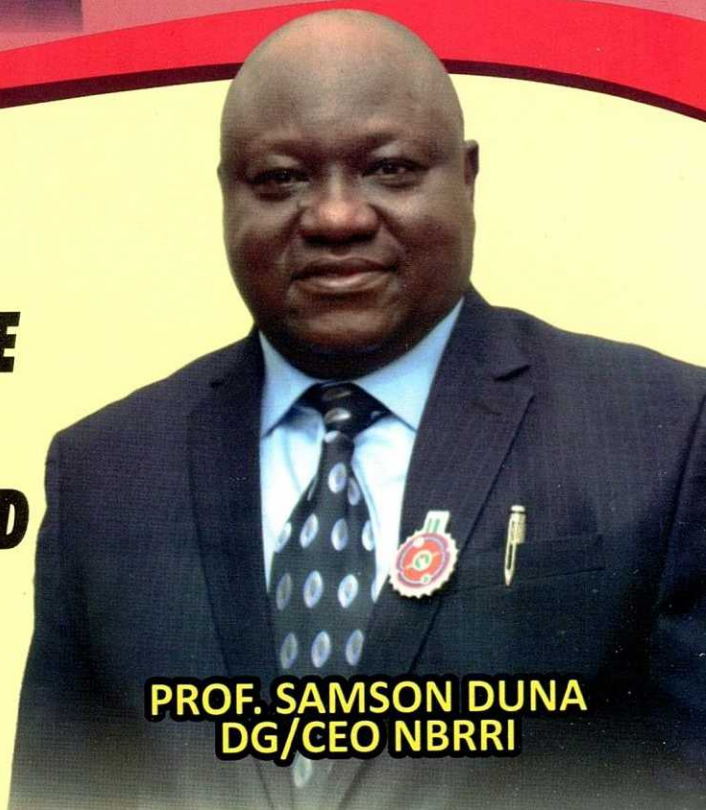
NBRRI NEWSLETTER
Vol: 16 No 1, Jan-March, 2024 1st Quarter Edition



MRS ESUABANA NKO-ASANYE
PERM. SEC. FMIST

PERM SEC, FMIST, APPLAUDS NBRRI FOR GROUND BREAKING R & D EFFORTS

FACILITATING AFFORDABLE HOUSING, FINANCE AND DELIVERY IN THE RENEWED HOPE AGENDA



PROF. SAMSON DUNA
DG/CEO NBRRI

NBRRI NEWSLETTER

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NBBRI

(Vision, Mission & Core Values)

Building capacity and setting the pace in indigenous construction technology development.

VISION

To evolve and use a comprehensive and integrated approach in capacity building and investment promotion so as to foster the application of environment friendly and energy efficient innovation, construction materials, manufacturing technologies and cost effective building and road construction practices, which will enhance job creation, wealth generation and poverty reduction as well as nurture the emergence of vibrant, knowledge based and highly competitive indigenous construction companies capable of meeting global standards.

MISSION

Integrate R & D, Capacity building and robust extension services in which technology innovation and knowledge based practices in the fields of building road and engineering materials will be used to provide adequate and affordable housing and road infrastructure as well as increased economic empowerment.

CORE VALUES

- Professionalism
- Resourcefulness
- Commitment and Integrity
- Innovativeness

Editorial

We are delighted to have you with us as we kick off the first quarter of the 2024 NBRRI Newsletter. This publication has continuously served as a reliable source of information and a means of raising awareness about NBRRI's activities to our stakeholders, the construction industry, and the nation as a whole.

In this edition, we bring you a comprehensive overview of our recent endeavors, actively engaging with the built environment through informative and practical means.

One highlight of this edition is our participation in the 2024 Science, Technology and Innovation Expo as facilitated by the Ministry of Innovation, Science and Technology which we are excited to feature. Additionally, we are pleased to share the Permanent Secretary's familiarization visit to NBRRI and our successful MoU signing with the Nigerian Institute of Transport Technology (NITT). We are especially proud to have had COREN express their willingness to collaborate with us in reshaping the engineering sector in Nigeria.

Our Administration and Personnel Department also organized a thought-provoking mental health seminar, and we have included photos from the event in this edition. For your reading pleasure, we have curated a selection of stories and articles, including "Unlocking Economic Value: The Promise of Polymer Based Interlocking Blocks in Construction," "Exploring the Benefits and Applications of NBRRI Cement Paint," and "NBRRI's Acquisition of the Cutting-Edge Scanning Electron Microscope (SEM) and Other World-Class Equipment."

We also bring you our regular social diary, filled with enjoyable content that also sheds light on the camaraderie and productivity of our workforce. All of this and more is included in this edition, free of charge. We hope you have a pleasant reading experience!

Daniel Makava
Editor-in-Chief

Published by Nigerian Building and Road Research Institute (NBRRI)

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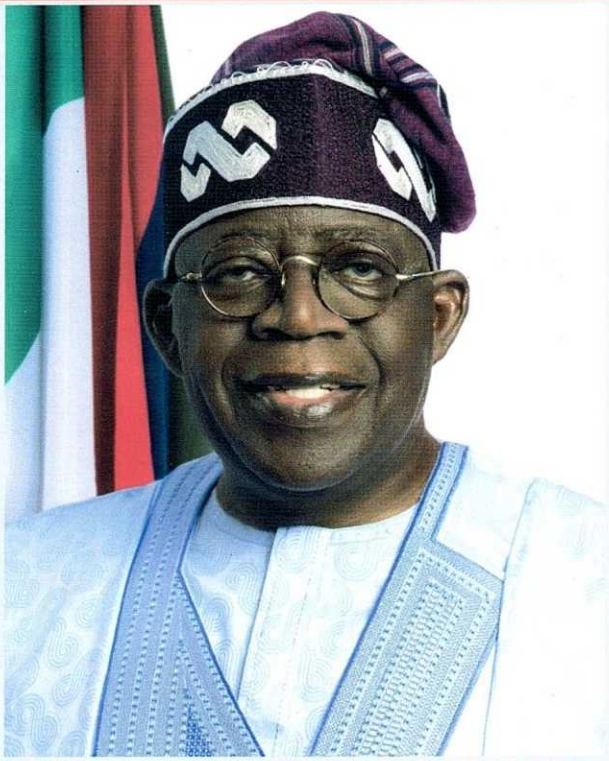
Vol: 16 No 1, January-March, 2024

PRESIDENT TINUBU OPENS 8TH SCIENCE AND TECH EXPO



It was a display of scientific and technological innovations at the Eagle Square in Abuja on 11th to 15th of March 2024 as the Federal Ministry of Innovation, Science and Technology hosted the 8th edition of the Innovation, Science and Technology Expo.

The 2024 Science and Tech EXPO which is tagged "Science, Technology and Innovation: Solution to National Economic Challenges" was declared opened by the President and Commander-In-Chief of the Armed Force of the Federal Republic of Nigeria, Bola Ahmed Tinubu represented by the Hon. Minister of Innovation, Science and Technology, Chief Uche Geoffrey Nnaji. In his remarks, the President said this groundbreaking event that brought together experts, innovators, inventors, developers, and leaders of thought in science, technology, and innovation is unique and strategic towards the development of the country's economy. He further stated that the Science, Technology, and Innovation Expo will indeed remain a memorable experience for those who visited the exhibition pavilions of various research agencies, inventors, academic institutions, and the military. It was a forum that brought forth what the best brains in the country could invent in the form of finished products and prototypes of a variety of fabricated industrial equipment, drugs, building materials, handcraft, agricultural equipment, military hardware, and security gadgets, to mention but a few.

The 17 agencies under the aegis of the Federal Ministry of Innovation, Science and Technology showcased various research findings that are very germane to the growth of the country's GDP and the promotion of local contents which is one of the focal drives of the ministry in area of local contents promotion.

The Nigerian Building and Road Research institute (NBRRI) wasn't left out in showcasing its recent R&Ds to the world at the EXPO. NBRRI showcased several R&Ds which are very relevant to the development of the country's construction and engineering sector.

NBRRI stood out with its innovations at the EXPO as it caved out a unique theme: "Addressing Economic Challenges in the Road Sector Using Nigerian Natural Bitumen". The Green Bitumen was the major R&D presented at the NBRRI day event which took place on Monday 11th March. Other R&Ds displayed as part of NBRRI's recent breakthroughs which includes;

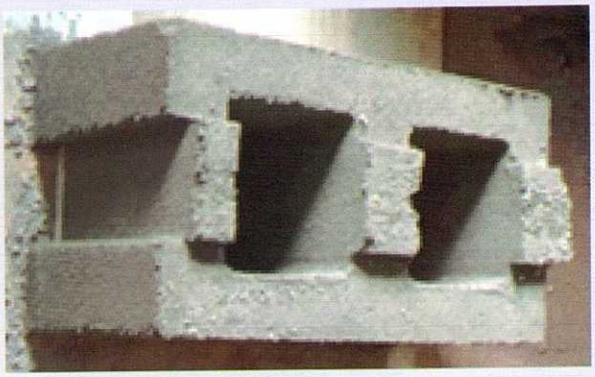
1. **DEVELOPMENT OF GREEN BITUMEN FOR SUSTAINABLE ROAD CONSTRUCTION.** This project is aimed at developing an eco-friendly or sustainable bitumen to be used in road construction. This will incorporate recycled materials such as waste tyres from automotive and bio-oil such as neem oil extracted from the seed of neem tree. Studies have shown that incorporating this waste and bio-oil into petroleum bitumen will yield the following benefits: (A) It will lower carbon footprint. (B) Improve durability (C) Reduce environmental impact.

2. **NBRRI TERMITE REPELLANT.** This work relates to the herbal formulation that consists of non-polar active extracts of two plants: (i) Jatropha Curcas (ii) Allium Savitum (Garlic). This is for the purpose of repelling termite attack on wood used for doors, windows, roofing and other housing components made of wood by employing environmentally safe and sustainable methods.

3. **NBRRI CRACK DETECTOR (NCD).** Engineers often rely on error prone and time-consuming manual inspection of cracks on pavements and buildings surface. The NBRRI Crack Detector (NCD) imaging and processing system is a hardware and software

solution that captures and processes infrastructural images (bridge decks, pavements surface and building walls) for cracks.

4. **NBRRI INTERLOCKING SANDCRETE BLOCK MAKING MACHINE.** NBRRI developed a simple Interlocking Sandcrete Block Making Machine, using locally sourced raw materials. An interlocking concrete block is a prefabricated building element made from sand and cement, specially developed for use in constructing walls.



The blocks manufactured possess a substantial compressive strength of 0.76 N/mm², enabling them to endure and resist damage and abrasion throughout the process of assembling. Application of the blocks for both temporary and permanent walling will result in the quick construction of the building wall, therefore minimizing the construction time, saving money with a reduced expenditure on labour, and guaranteeing the safety of workers.

5. **NBRRI CEMENT PAINT.** The NBRRI cement paint is used on concrete, brick, and soil-stabilized block surfaces to improve their beauty and offer protection. It can also be referred to as concrete paint. It contains a variety of components, including cement, water, colours, extenders, and additives. As it is specially developed to cling well to concrete surfaces, cement base paint offers a finish that is both strong and long-lasting.

The five-days long ceremony came to a close with a resounding applaud and accolade from all participants and dignitaries including the Hon. Minister of Innovation, Science, and Technology, Chief Uche Nnaji who was represented by the Permanent Secretary of the Ministry Esuabana Nko-Asanye as he expressed confidence in what was on display, saying Nigeria would not only be industrially advanced but capable of exporting technology. He then urged the private sector not to allow the spirit to die but to endeavour to make the available technology a source of sustainable economic development through investment. Overall, the Science, Technology and Innovation EXPO 2024, according to participants, was a resounding success, and a shining spotlight on the exciting innovations and advancements in Nigeria's quest for technology development.

PHOTO SPLASH AT THE 2024 SCIENCE & TECH EXPO

FMIST Minister, Uche Nnaji

DG NBRRI Prof. Samson Duna

Senator Iya Abbas Science Tech Committee Chairman

Engr. Julian Tyoden NBRRI Staff

PHOTO SPLASH AT THE 2024 SCIENCE & TECH EXPO

Cross Section of dignitaries at the NBRRI Day of the Expo 2024

DG NBRRI Prof. Duna and FMIST Minister Uche Nnaji

DG NBRRI Prof. Duna with a guest at the expo

DG NBRRI Prof. Duna, Senator Iya Abbas with FMIST Minister

Some NBRRI Staff at the Expo

PHOTO SPLASH AT THE 2024 SCIENCE & TECH EXPO

DG NBRRI Prof. Duna,
with Senator Iya Abbas
Senate Committee Chairman Science Tech

DG NBRRI Prof. Duna,
with NBRRI Staff at the Expo

The NBRRI Staff at the Expo 2024

Student at the NBRRI Stand

Director CES, Mr. D. Makava with his Deputy Mrs. V. N. Obidozie

Director PIT, Mr. KP Arabi with Mrs Oneshi Umoche

NIGERIAN SOCIETY OF ENGINEERS ABUJA CHAPTER VISITS NBRRI

The Engr. Ikechukwu Benjamin Okoh's led executives of the Nigerian Society of Engineers' Abuja Chapter were at the Nigerian Building and Road Research Institute administrative head office in Abuja on the 6th of February, 2024 for a special courtesy visit to the Director-General/CEO of NBRRI and the institute at large.

Standing on the existing relationship between the Nigerian Society of Engineers and NBRRI, the Chairman, Engr. Ikechukwu Okoh, stated that the current executive of NSE was elected on the 20th of August, 2022 and since then, due to serious engagements they have not had the opportunity to visit NBRRI. He explained that there is a need to focus on the professional competence of Engineers as this affects the stakeholders of the construction industry, the Engineering sector and the country at large.

Engr. Okoh stated that the purpose of the visit was to further strengthen the relationship between the Nigerian

Society of Engineers and the Institute. He commended the Director-General/CEO for his various contributions to the society and the Engineering sector. He urged the DG not to relent in his pursuit for excellence and he also pleaded that it would be a brilliant idea if Engineers who are registered members of NSE and are out of employment be employed by NBRRI even as casual staff in order to

curb the menace of unemployment in the society. Okoh urged the Director-General to permit Engineers to be given opportunities to use the science laboratories for soil testing and other kind of Engineering tests and equipment in the laboratories. He also mentioned that there are couple of sub-branches within the organization that have pressing needs to be met; and there are some ongoing projects by NSE that need to be completed which he pleaded for NBRRI's intervention.

The Director-General/Chief Executive Officer of NBRRI, Engr. Prof. Samson Duna in his response welcomed the executives to NBRRI and he assured them that he has noted all concerns brought before him by the executives. Prof. Duna assured them that he would continue to work hand in hand with the organization

capacity building. He also mentioned that the society's request of using NBRRI's laboratories for scientific research is highly welcome and commended the idea of creating employment opportunity for Engineers belonging to the society saying that management will look into it.

Engr. Ikechukwu Okoh appreciated the Director-General for his swift response to the needs of the society and he also noted that he will be honoured to have the Director-General as the keynote speaker for the workshop coming up soon.

PERMANENT SECRETARY FMIST ON FAMILIARIZATION VISIT TO NBRRI

It was indeed a huge privilege and honour as the management and staff of The Nigerian Building and Road Research Institute (NBRRI) welcomed the new Permanent Secretary of the Federal Ministry of Innovation, Science and Technology, Mrs. Esuabana Nko-Asanye to the administrative headquarters of NBRRI in Abuja.

Welcoming the Perm Sec. to the Institute, the Director-General/CEO of NBRRI, Engr. Prof. Samson Duna expressed his heartfelt joy and gratitude towards the visit stating that it will serve as an avenue for better working relationship between the Perm Sec. and NBRRI. Duna highlighted some of the various achievements and ongoing projects of the Institute, as well as various activities and future plans and projects of the NBRRI. This according to him is to create affordable construction materials using locally made products and fabricated machines that will foster affordable housing and bring about a lot of benefits to Nigerians at large.

In her response, Mrs Esuabana thanked the DG/CEO and Staff for the warm welcome. She promised that crucial discussions will be held with the government on how to boost the construction industry via effective and proper usage of NBRRI's technologies.

Speaking further, Mrs. Esuabana stated that the purpose of the visit was to hear and learn from NBRRI as the Ministry of Innovation, Science and Technology is a vibrant ministry which if properly handled can help in reducing the housing deficit problem of the country. Consequently the Perm Sec said visiting NBRRI is of a top priority hence, the reason she made it her first point of call. She acknowledged the great role the Institute has played and still playing in driving Science and Technology towards boosting the nation's economy. Mrs Nko-Asanye stated that science is a vibrant part of the economy and if anyone wants to change the narrative of the construction industry to positively, all hands must be on deck to achieve the set goals. The Perm Sec hoped that the relationship between the Institute and the Ministry will continue to yield good results for the progress of the nation.

In a vote of thanks on behalf of NBRRI, the Director of Administration and Personnel, Mrs. Ifeoma Jude-Iloma thanked the Permanent Secretary for making out time to visit and know more about the Institute. She mentioned that the foot soldiers i.e. Staff of NBRRI were the bedrock of the Institute and without them, the activities and progress of the Institute will be in Jeopardy. Iloma thanked the staff for their unwavering support to the growth of the Institute since its inception.

The highpoint of the visit was a facility tour by the Perm Sec to the NBRRI's laboratories and display Centre.

NBRRI SIGNS MOU WITH NITT ZARIA

With the purpose of making the Nigerian roads better for safe transportation, the Nigerian Building and Road Research Institute, NBRRI has signed a Memorandum of Understanding (MOU) with the Nigerian Institute of Transport Technology (NITT) Zaria.

The historic signing ceremony took place when the Director General of NITT, Dr. Bayero Salih Faran paid a courtesy visit to NBRRI headquarters in Abuja.

Welcoming the NITT team, the Director-General/Chief Executive Officer of NBRRI, Engr. Prof. Samson Duna expressed satisfaction with the level in which the MOU has undergone leading up to the final stage of the signing. He stated that to build any better society, agencies and private bodies with similar objectives need collaborate so as to use their vast wealth of knowledge for the growth of the country's economy.

Prof. Duna promised to ensure that the contents of the MOU is fully implemented for the objective to be achieved. He urged all staff involved in actualizing the objective of the collaboration to do so and make both institutes proud. Prof. Duna used the opportunity to inform Dr. Bayero about NBRRI's Annual International Conference and the coming International Workshop and Training on Road Pavements as he gave NITT an open invitation to participate in the forth coming conference and workshop.

While deliverig his address, Dr. Bayero stated that NBRRI is home due to his relationship with Prof. Samson Duna and owing to the fact that both Institutes have similar goals in area of road. He went further to state his readiness to ensure all hands are on deck towards actualizing a positive result with the implementation of the MOU.

Dr. Bayero also accepted the open invitation to the International Conferences and promised to make good use of these opportunities. He further appreciates the DG and management of NBRRI for the warm welcome and hoped for future collaborations.

ADMIN DEPARTMENT HOLDS SEMINAR ON MENTAL HEALTH FOR STAFF

Recognising the crucial role mental health plays in humans life, particularly among Civil Servants, the Nigerian Building and Road Research Institute's, Administration and Personnel Department organised a seminar to address this vital issue.

A one-day workshop was organised for staff of the Institute in Abuja focusing on their overall well-being, encompassing human, emotional, psychological and social aspects.

Specialists were engaged by the Administration to deliver several lectures on the topic "Mental Health and Self-Discipline within the Work Place".

Declaring the seminar opened, the Director-General/CEO of NBRRI, Engr. Prof. Samson Duna stressed on the importance of mental health for productivity. He went further to enjoined the staff to take the seminar serious for their benefits.

The resource persons who are vast in the topic gave perfect lectures on the topic following sub-topics:

1. Family tree of Mental Health
2. Positive feeling
3. Emotional well-being
4. Positive functioning
5. Psychological well-being
6. Social well-being
7. Self-discipline

Giving the closing remarks, the Director of the Department, Mrs. Ifeoma Jude-Iloma appreciated the DG for granting the staff this opportunity as she also acknowledged the great job of the resource persons and encouraged the staff to abide by the ethics of healthy living.

RESHAPING THE ENGINEERING SECTOR IN NIGERIA: COREN TO COLLABORATE WITH NBRRI

The Council for the Regulation of Engineering in Nigeria (COREN), led by its President, Engr. Prof. Sadiq Zubair Abubakar paid a courtesy visit to NBRRI headquarter in Abuja on the 21st of March, 2024.

Welcoming the visiting team to the Institute, the Director-General of NBRRI, Engr. Prof. Samson Duna acknowledged their presence saying that NBRRI is home to all engineers in the country and beyond.

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The President of COREN in his address, appreciated the interventions of NBRRI in curbing the menace of building collapse and other areas of Research and Development in the Construction Industry. Prof Abubakar encouraged the Institute to keep the flag flying and gave assurances that COREN would be open for any productive collaborations especially in areas of infrastructure failures in the industry.

The repackaging of COREN is the main point of the President's speech, he pointed out that COREN has been restructured and the council in the bid of decentralization created seven regional offices across the geopolitical zones.

COREN is tasked with the following responsibilities;

1. Training and Licensing of Artisans in order to aid the construction industry.
2. Retraining of registered engineers to aid validation of the professional and engineering certifications.
3. To establish engineering failures and Forensic Investigation Centres across its regional headquarters.

4. Formation of engineering technology task force and intelligent whistleblowers in order to curb corrupt practices in the construction sector.
5. R&D aspect of some critical information.
6. The Council will also look into building collapse and other failures to prevent subsequent occurrence.
7. To implement they Continuing Professional Development Unit approved by the Nigerian Society of Engineers (NSE) to capture issues of updated practices of engineers in Nigeria.
8. To put in place checks and balances in renewal of licenses to avoid domicile competency.

Prof. Sadiq urged NBRRI to join hands with COREN in order to implement presidential executive order No. 5; which states "Planning and execution of projects, promotion of Nigerian content in contracts and science, engineering and technology", this and more makes it necessary for the two bodies to collaborate. He concluded by saying COREN is open to synergy with other bodies to achieve its mandate.

Prof. Duna, in his response appreciated COREN for identifying with NBRRI, stating that the achievements being attributed to the institute is as a result of hard work and dedication of its officers. Prof. Duna urged the president to feel at home because NBRRI is its constituent. He noted that this is the first time the council is visiting NBRRI under his administration.

The DG appealed with COREN to help in marketing NBRRI's technologies, saying that the Institute has quite a number of technical reports based on investigations carried out but are laying on the shelves without patronage. In the same vein, he appealed with universities on researches that can be practical, add Value to the nation and research materials that are available (local content) and practically accessible. The DG advocated for engineering salary structure to be upgraded, the idea of presidential order will be implemented and fully supported by NBRRI, noting that the Presidential Order No. 5 on Local Content is domicile in the Federal Ministry of Innovation, Science and Technology of which NBRRI is a parastatal under the Ministry. He commended COREN for the restructuring efforts that is ongoing.

UNLOCKING ECONOMIC VALUE: THE PROMISE OF POLYMER BASED INTERLOCKING BLOCKS IN CONSTRUCTION

Housing stands as a cornerstone of any thriving economy, addressing the basic need for shelter. However, in Nigeria, the construction industry faces multifaceted challenges, from financial constraints to environmental concerns. Amidst these challenges, the emergence of Polymer Based Interlocking Blocks presents a beacon of hope, offering not just structural integrity but also economic advantages that can reshape the landscape of affordable housing.

Derived from recycled plastics, Polymer Based Interlocking Blocks represent a sustainable solution to the mounting environmental crisis of plastic waste. These blocks leverage the inherent qualities of plastics - durability, lightweight, and strength - to provide a viable alternative to traditional building materials.

The economic benefits of adopting Polymer Based Interlocking Blocks are manifold. Firstly, their production utilizes readily available plastic waste, thereby reducing the burden on landfills and cutting down raw material costs.

This translates to cost-effective construction solutions, making housing more affordable for both developers and end-users. Moreover, the streamlined production process of these blocks allows for faster deployment, addressing the

pressing issue of housing deficit with greater efficiency.

However, despite their potential, the widespread adoption of Polymer Based Interlocking Blocks in the construction industry faces hurdles. The lack of comprehensive policies on waste management and recycling, coupled with limited awareness among professionals in the construction sector, inhibits their uptake. Additionally, the initial capital investment required for setting up manufacturing facilities poses a challenge.

Nevertheless, the tide is turning. Governments and international organizations are increasingly recognizing the urgency of addressing plastic pollution and are investing in initiatives to promote recycling and sustainable construction practices. Technological advancements are also driving down production costs, making Polymer Based Interlocking Blocks more accessible.

In Nigeria, the Nigerian Building and Road Research Institute is at the forefront of pioneering research and development efforts to optimize the production and application of Polymer Based Interlocking Blocks. Through collaborative partnerships and targeted investments, they aim to unlock the full potential of these innovative building materials.

As we navigate the complex terrain of urbanization and sustainable development, Polymer Based Interlocking Blocks offer a glimmer of hope - not just as bricks and mortar, but as agents of economic empowerment and environmental stewardship. By harnessing the economic value of plastic waste, we can build not just structures, but communities that thrive in harmony with nature.

In conclusion, the prospects of Polymer Based Interlocking Blocks in the construction industry are promising. With concerted efforts from stakeholders across sectors, these blocks have the potential to redefine the way we build, paving the way for a more sustainable and prosperous future.

EXPLORING THE BENEFITS AND APPLICATIONS OF NBRRI CEMENT PAINT

Paint is a liquid pigment that after applied to solid material and allowed to dry, adds a film like layer on object to improve the aesthetic and durability of such objects. The 13th century distemper paints were made from the combination of pigment chalk, lime, water and animal or plant glue like resins. The major disadvantage of this paint was efflorescence, none availability of animal or plant oil as resin. It was during the World War II that there came about the artificial resins or alkyds which brought about the production of major chemical-based paint used today. Most chemicals used in the painting industry are toxic, this includes Harmful chemicals in Paints, Formaldehyde, Ammonia, Biocides, Phenol etc. This has affected the health of human on Irritations of the eyes, nose or throat, Headaches, Feeling dizzy and nausea.

The coating used on concrete, brick and soil stabilized block surfaces to improve their beauty and offer protection is known as cement paint. It contains a variety of components, including cement, water, colours, extenders and additives. It is specially developed to cling well to concrete surfaces; cement base paint offers a finish that is both strong and long-lasting. The emulsion paint used in Nigeria easily fades off due to salt content during raining season and it has no Ultraviolet (UV) shield ability for concrete surfaces.

ABOUT THE NBRRI CEMENT PAINT

Cement paint is primarily used to enhance the aesthetics of concrete surfaces. The concrete's color and texture can be altered using a technique to improve its aesthetic appeal. It can be used on interior or exterior surfaces, including brick and concrete. It is used to paint the surface of exterior walls primarily to stop water infiltration and reduce dirt accumulation. As cement paint is available in a number of hues, you can select a colour that best suits your preference.

It can also be applied in a variety of ways, including brushing, rolling, or spraying, giving the process of application flexible.

In addition, it protects concrete surfaces and prevents water from leaking into them. Ultimately, cement paint is a multipurpose coating material that protects concrete surfaces while improving their look

ADVANTAGES OF NBRRI CEMENT PAINT:

1) Cement paint provides excellent UV protection for all types of wall surfaces exposed to the sun's rays.

2) It protects all sorts of cemented walls and surfaces against harsh climatic conditions such as rain, heat, water, humidity, and salt environment near seashores.

3) It prevents fungi and germs from growing on brick surfaces.

4) It gives all kinds of surfaces a beautiful colour and appearance.

5) Cement paint hides surface imperfections such as hairlines and roughness, offering all cemented surfaces where it is given a smooth and appealing look.

6) Cement paints are often smooth and matt in appearance.

7) Machines and equipment for the production of cement paints are readily available and are also reasonably cheap in prices.

8) When painting no need for primer before painting.

THE ADVANTAGE OF CEMENT PAINT TO NBRRI STABILIZED BLOCK

- ✓ The initial colour of the blocks can be changed to a variety of colours
- ✓ Its water proof qualities help protect the wall from excessive rain effect which makes the wall lose its beauty
- ✓ It can be used for painting since its composition has a better mineralogy than laterite.

Most chemicals used for paint production are mostly exported. Chemicals used in the production of this NBRRI paint such as cement, kaolin, dolomite, mica, calcium carbonates are abundant in Nigeria. This will improve the value of this raw materials processing which will affect our economy positively.

KEY PERFORMANCE INDICATOR

- Fast drying paint
- Monetary savings can be gotten if invested on
- Easy handling and transportation
- 80% local content
- 30-50 percent usage of cement

OUTCOME

- The outcome will lead to improve value for mineral resources in the county.
- Employment opportunities
- Better paint production for tropical areas.

PRODUCTION DESCRIPTION

The product comes in 2 types.

Powdered and powered with a liquid concentrate attached.

The powdered paint is 85 percent local content and 15 percent imported content. With the high inflation in our country, it will be expensive to afford it, until the chemicals are produced here.

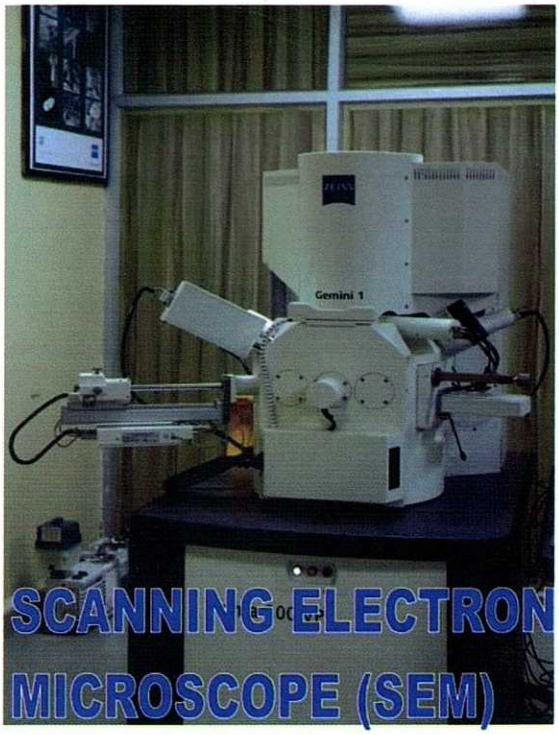
The powdered paint attached with a liquid concentrate is 90% local content which gives options for choice such as matt, satin and text coat paints and very affordable.

APPLICATION.

The ratio for application is 1:2, that's 5kg of paint to 10 liters of water. The liquid concentrate is determined on what you want to achieve. If you want emulsion, 1-2kg is ok, for satin 3-4kg is ideal.

SAMPLES OF FINISHED WORK WITH THE NBRRI CEMENT PAINTS

NBRRI ACQUIRES CUTTING-EDGE SCANNING ELECTRON MICROSCOPE (SEM) AND OTHER WORLD-CLASS EQUIPMENT .



The Nigerian Building and Road Research Institute (NBRRI) is a leading research organization dedicated to advancing scientific knowledge and innovation in building and road construction, materials science, and related fields. With a commitment to excellence and a passion for discovery, NBRRI continues to push the boundaries of what is possible.

State-of-the-art technology enhances NBRRI's research capabilities, driving breakthroughs in materials science, biology, and nanotechnology.

The Nigerian Building and Road Research Institute (NBRRI) is proud to announce the acquisition of a cutting-edge Scanning Electron Microscope (SEM) and other vital equipments needed for testing, characterizations and standardization of construction materials as it meets the global standards. Significantly enhancing its research capabilities and positioning itself at the forefront of scientific innovation is the major goal of NBRRI, which drives the acquiring these world-class equipment.

The SEM is the most recently acquired and installed equipment in the institute is a powerful tool for scientific investigation, offering unparalleled resolution and imaging capabilities. With its advanced technology, NBRRI researchers can now:

- Study materials at the nanoscale, examining surface morphology and composition with unprecedented detail.
- Analyze biological samples, revealing intricate structures and mechanisms.
- Examine materials in-situ, observing their dynamic processes and behaviour.

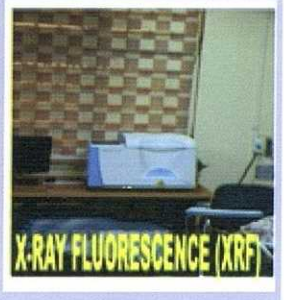
"This acquisition marks a significant milestone in NBRRI's history," said Engr. Prof. Samson Duna, Director-General/Chief Executive Officer of NBRRI. "The SEM will revolutionize our research capabilities, enabling us to make groundbreaking discoveries and drive innovation in materials science, biology, and nanotechnology. We are excited to collaborate with local industries, academia, and international partners to advance scientific knowledge and address real-world challenges."

The SEM will be instrumental in driving research forward in areas such as:

- Development of new materials and technologies.
- Understanding biological processes and disease mechanisms.
- Advancing nanotechnology and energy storage solutions.

NBRRI's acquisition of the SEM demonstrates its commitment to excellence and dedication to pushing the boundaries of scientific knowledge. The institute invites collaboration and partnership from local and international stakeholders to harness the full potential of this cutting-edge technology.

OTHER NEWLY ACQUIRED EQUIPMENTS



NATIONAL WORKSHOP ON "AFFORDABLE HOUSING IN RENEWED HOPE AGENDA" WITH THE THEME: "FACILITATING AFFORDABLE HOUSING FINANCE AND DELIVERY IN THE RENEWED HOPE AGENDA."

"PRACTICAL AND EMPIRICAL USE OF ALTERNATIVE LOCAL BUILDING MATERIALS TO ADDRESS RAISING COST OF HOUSING; A CASE STUDY OF 3 BEDROOM BUNGALOW"

BY
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ABOUT NBRRI

❖ The Nigerian Building and Road Research Institute (NBRRI), is a premier research Institution in Nigeria, that is dedicated to advancing knowledge, technology, and innovation in the fields of construction, building, and road infrastructure development.

❖ Established in 1978, the Nigerian Building and Road Research Institute (NBRRI) operates under the auspices of the Federal Ministry of Innovation, Science and Technology, playing a pivotal role in shaping Nigeria's construction and transportation sectors through cutting-edge research and development.

❖ The Institute was established to undertake integrated applied research and development, focusing on the diverse aspects of the building, road. and construction sectors, to drive economic growth and development.

❖ Several significant achievements were recorded in the last few years. These achievements were in the areas of new innovations, upgrading some existing NBRRI innovations, evolving and embarking on new R&D projects, embarking on aggressive outreach/extension programs, administration activities, etc.

❖ The ACT setting up NBBRI allowed it to conduct research and development within a given mandate.

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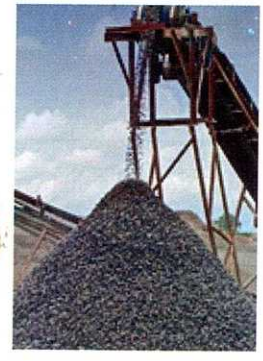
- As such, Stakeholders, in particular researchers and their institutions, bear enormous responsibility for consistently creating alternative building materials that are not only accessible but also acceptable, and inexpensive.
- The Nigerian Building and Road Research Institute (NBRRI) has intervened and achieved success in critical alternative building material development for affordable housing through Research and Development (R&D).
- However, the private sector and local industries involvement expected to promote and champion these solutions on a mass production scale has not materialized
- This paper highlights the challenges of alternative building materials, the most widely used conventional building materials, as well as the indigenous and affordable alternative building materials and technologies developed by NBRRI, which can be used in place of conventional materials to save money and speed up the delivery of housing solutions.

CONVENTIONAL BUILDING MATERIALS IN NIGERIA

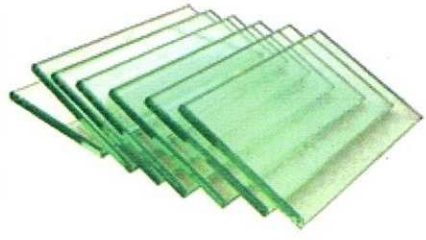
- There are many types of building materials used in construction, they include cement, aggregates, steel, wood & timber and so on.

Each material has different properties such as weight, strength, durability and cost which makes it suitable for certain types of applications.

Cement



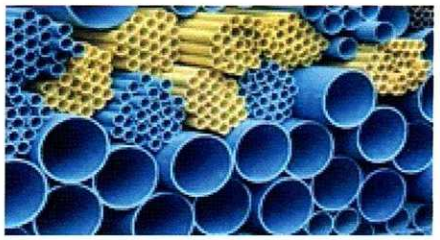
Aggregates: fine and coarse aggregate



Glass

Steel

Timber



Plastic

NBRRI ALTERNATIVE BUILDING MATERIAL

❖ Nigerian Building and Road Research Institute (NBRRI) was established in 1978 with mandate to conduct integrated applied research on: Construction materials, process techniques and structural designs to increase utilization, efficiency, effectiveness and also the development of design criteria, specification and codes of practices respectively.

❖ The mandate was later expanded to include R&D into all aspects of engineering materials related to the construction industry.

❖ Besides the production of suitable machinery for application, NBRRI have conducted significant research in the development of the following;

❖ Interlocking Compressed Stabilized Earth Blocks (CSEBs)

❖ Bamboo and Bamboo Products: Laminated Bamboo Panel (LBP)

❖ Fibre Concreting Roofing Tiles

❖ Recycled plastic waste into composite materialv Supplementary Cementitious Materials (Blended cement).

1. Interlocking Compressed Stabilized Earth Blocks (CSEBs)

❖ Walling accounts for approximately 40% of construction costs; therefore, it is critical to investigate less expensive wall construction materials such as drywalls and earth walls.

- The use of earth for construction is an old technology revisited in recent times because of the obvious environmental challenges that have resulted from the use of conventional building materials
- Compressed Stabilized Earth Blocks (CSEBs) are basically lateritic soils which have been stabilized with 5-10% cement and subsequently compressed in appropriate moulds
- Compared with alternatives, such as baked brick and sandcrete blocks, it offers lower construction costs at comparable quality; suitable for a wide range of environments while dramatically reducing the impact on the environment
- The construction process requires little training and is less labour intensive

Interlocking CSEBs and NBRRI Hydraform Machine

2. Bamboo and bamboo products

- In order to reduce deforestation, bamboo is a potential alternative building material and a replacement for the use of timber in the wooden industry.
- Bamboo possesses excellent qualities in terms of workability and appearance and can be used for roofing, walling, door and window shutters, and other building components
- However, despite its relevance in the construction industry in Nigeria, it has yet to be fully utilized as an alternative building technology, as it is mostly used for scaffolding

❖ NBRRI has reached another milestone in the development of a sustainable alternative building material by recycling bamboo used for scaffolding into laminated bamboo that can be used for flooring and ceiling finishes

➢ Laminated Bamboo Panel (LBP)

❖ The Laminated Bamboo Panel (LBP) are produced from bamboo strips and utilizes tongue and groove joints

❖ The material testing of the panels shows remarkable result and it has been successfully used in our moveable house.

NBRRI Laminated Bamboo Panel and its use as floor finish

➢ Bamboo as Reinforcement

❖ Attention of researchers and industries has turned to materials such as vegetable fibers including bamboo, and other wastes from industry, mining and agriculture for engineering applications.

❖ Bamboo proves to provide good reinforcement as it holds very good tension and compressive strength.

❖ The flexural strength of the beam having bamboo reinforcement shows greater strength which helps to improve the usage of bamboo

❖ To increase the amount of information concerning bamboo, NBRRI has demonstrated the use of Bamboo as reinforcement in concrete structures

❖ Setting and trying of the treated Bamboo as either column or beam reinforcement using a nominal sized steel as stirrups.

3. Fibre Concreting Roofing Tiles

❖ Roof coverings are another significant cost-cutting component in construction if alternative building material components are investigated.

❖ NBRRI developed fibre concrete roofing tiles (MADOR tiles) using locally sourced & readily available raw materials manufactured on specially fabricated machines to reduce production costs.

❖ The raw materials needed to manufacture the NBRRI MADOR tiles include fiber from plants such as coconut and a small amount of Ordinary Portland Cement.

❖ R&D on MADOR tiles is still on going to further improve its performance and setting it up for commercial production.

4. Recycled plastic waste into COMPOSITE MATERIAL

❖ Nigeria, like many other developing countries, lacks adequate infrastructure to address the rapid increase in waste generation and is confronted with the dual challenges of solid waste management & housing shortage.

❖ To enable large-scale production of composite materials from plastic waste; developing appropriate machinery to optimize the production/recycling process of plastic waste into useful building materials is critical.

❖ NBRRI has developed appropriate machinery, such as a plastic crushing machine and a plastic melter-densifier, to optimize the production process in order to reduce costs.

❖ NBRRI, by utilizing plastic wastes in combination with other materials, offers a viable alternative building material such as interlocking walling blocks, paving stone, and roofing tiles.

5. Supplementary Cementitious Materials: NBRRI Pozzolana

❖ Pozzolana are siliceous and aluminous materials which in themselves have little or no cementations properties, but in the presence of moisture, react with calcium hydroxide to form compounds possessing cementations properties (ASTM C618)

❖ The use of pozzolana in building construction as a partial replacement of cement presents cost savings and has potential in the actualization of affordable housing delivery

❖ It promotes healthier environment by reducing green gas emission and utilization of agro/industrial wastes

❖ NBBRI has successfully designed and produced some building elements using pozzolana, some of these elements include beams, slabs and so on; NBRRI is currently constructing a complete building using NBRRI produced pozzolana in Bokkos, Plateau State.

NBRRI Pozzolana




NBRRI has constructed two Pozzolana Plants in Ogun and Plateau States using clay and volcanic ash as its raw materials respectively.

Alternative Building Material Test Bed

To demonstrate the application of alternative building material, NBRRI's innovations through R&D and showcase alternative building material and construction;

- Development of the NBBRI Dismantlable House (NDH)
- Construction of a prototype storey building with Bamboo as reinforcement.

NBRRI DISMANTLABLE HOUSE

- To demonstrate the application of NBRRI innovations and its potential for modular construction, the NBRRI dismantlable house concept was designed
- The NDH is 100% indigenous from design (spatial considerations, aesthetics and function), materials selection (locally sourced), to construction (dry stacked/mortar-less) which has been tailored to suit the socio-economic peculiarities of the Nigerian clime
- It is a quick assembly of affordable housing model
- The NDH is a housing model that has evolved over the years from a simple One-Bedroom to a more robust Three-Bedroom and single storey structure with applications not restricted to the residential buildings
- It addresses the Nigerian housing needs as well as having the potentials to respond to emergency needs for temporary housing provision using the prefabrication technology while incorporating strategic NBRRI R&D outputs in materials and technological processes
- However, standards for the NBRRI dismantle House (NDH) is still not developed.

SINGLE-STOREY

ONE BEDROOM PICTURES

THREE BEDROOM

CONSTRUCTION OF A PROTOTYPE STOREY BUILDING WITH BAMBOO AS REINFORCEMENT

❖ To demonstrate the application of Bamboo and to increase the amount of information concerning Bamboo as reinforcement, NBRRI constructed a prototype one-storey office building with all structural elements using bamboo as reinforcement.

❖ The project placed special emphasis on sourcing, sizing, and treating bamboo that would be utilized as reinforcements.

❖ Evaluation of the use of bamboo as reinforcement in concrete has been practicalized and remarkable success recorded

Cutting and Slicing of Bamboo into required sizes for use as pad foundation Mat reinforcements and column starters

Careful Treatment / Coating of the Bamboo with Bituminous material for substructure

View of a composite starter (steel is used alongside at this level in order to give adequate supporting for the column as Bamboo cannot be bent or curtailed like steel)

Poured in concrete mix (1:2:4) in the bamboo reinforced column bases in the foundation

❖ Arrangement, Placement and Concrete working in Substructure

view showing the foundation with starter column being already filled with concrete (mix 1:2:4) and backfilling work in progress

Casting of the Over site concrete floor in progress

❖ Arrangement, Placement and Concrete working in Superstructure

Careful treatment of the Bamboo with sodium borate-based chemical before use in superstructure element such as column and beams

A stack of tied column bamboo reinforcements

A view showing concrete filled

Placement of sized Bamboo reinforcement bonded with iron rod in beam (lintel) formwork

View showing the current stage of works (concrete works in columns up to lintel level, and all lintels concluded) waiting to receive the upper floor beams and slab.

View of bamboo reinforcement for the first floor and stair case.

Complete NBRRI storey Building with Bamboo as Reinforcement

COST COMPARISON OF SANDCRETE AND NBRRI CSEB FOR 1 BEDROOM

S/N	DESCRIPTION	1 BEDROOM	
		CSEB	CONVENTIONAL BLOCKS
1	Preliminaries	580,000.00	580,000.00
2	Substructure	1,025,440.00	1,025,440.00
3	Wall and Partitions	750,733.41	1,333,120.00
4	Concrete	780,291.50	780,291.50
5	Roofing	990,559.30	990,559.30
6	Doors and Windows	593,000.00	593,000.00
7	Floor Finishes	595,092.00	595,092.00
8	Wall Finishes	238,570.00	1,315,493.94
9	Ceiling Finishes	501,304.56	501,304.56
10	Mechanical Installations	550,000.00	550,000.00
11	Electrical Installations	470,000.00	470,000.00
12	**Total**	**7,074,990.77**	**8,734,301.30**
	Savings	***1,659,310.53***	

COST COMPARISON OF SANDCRETE AND NBRRI CSEB FOR 2 BEDROOM BUNGALOW

S/N	DESCRIPTION	2 BEDROOMS	
		CSEB	CONVENTIONAL BLOCKS
1	Preliminaries	650,000.00	650,000.00
2	Substructure	1,313,398.40	1,313,398.40
3	Wall and Partitions	904,375.00	1,794,375.00
4	Concrete	1,049,377.20	1,049,377.20
5	Roofing	1,212,941.60	1,212,941.60
6	Doors and Windows	746,500.00	746,500.00
7	Floor Finishes	907,068.75	907,068.75
8	Wall Finishes	407,123.00	1,180,158.36
9	Ceiling Finishes	609,863.89	609,863.89
10	Mechanical Installations	720,000.00	720,000.00
11	Electrical Installations	630,000.00	630,000.00
12	**Total**	**9,150,647.84**	**10,813,683.20**
	Savings	***1,663,035.36***	

CONCLUSION

Alternative building techniques are excellent strategy to solving housing affordability problems and should be considered as they are much simpler, cheaper and easy to implement

Many research outcomes associated with alternative building materials have economic, social-cultural and environmental benefits. They are cost effective as established in the case of NBRRI House and other building materials listed in section above

Adoption of innovation and new materials in the construction industry will lead the path to enhancing the efficiency of construction operations and productivity with attendant ripple effects in economic growth

NBRRI developed alternative building material and technology are particularly suited for Nigeria clime with significant dearth of housing due to huge housing deficit. It also allows for more houses to be produced in less time while reducing influences of uncertainties associated with prolonged construction projects.

Findings from housing affordability studies in Nigeria led to the following recommendations as highlighted below

RECOMMENDATION

Increase funding for research institutes such as Nigerian Building and Road Research Institute to drive Research and Development to aid innovation, develop and improve on alternative building technologies to ease affordable housing delivery in Nigeria

Improve home grown and appropriate technologies that are sustainable. This will further help in make housing affordable

The inclusion of alternative materials to professional code of practice and building codes will encourage the use of indigenous technology

Governments should promote the use of locally available materials in an effort to make housing more affordable

The need for more awareness campaign and sensitization of the pubic on alternative Building Materials is highly recommended in order to increase its social acceptability

SOCIAL DIARY

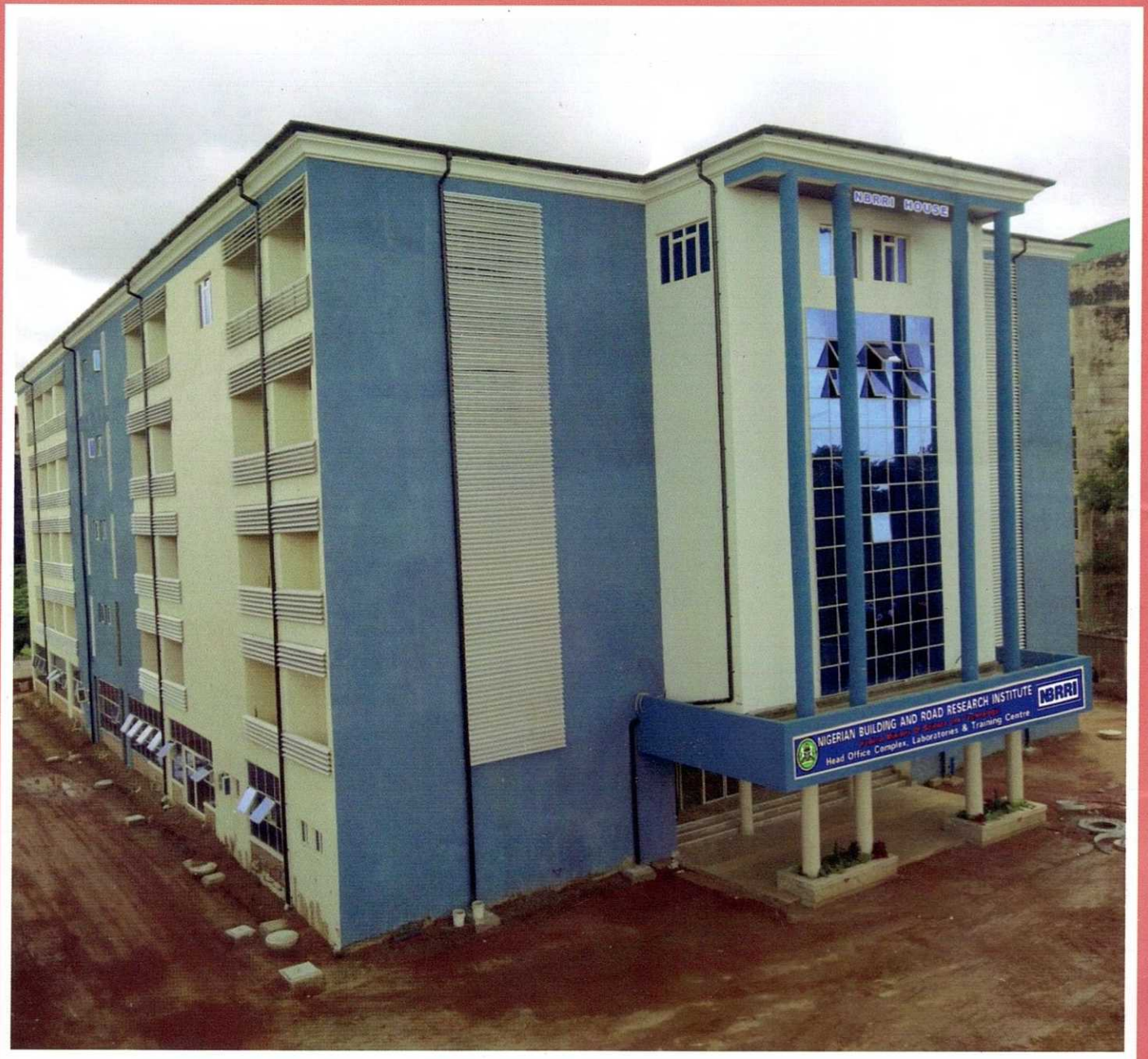
Baby Eyitayo David, born on 16th November, 2023 to the family of Mr. Ologun Sehinde of RRD, Ota

Baby Amina Salisu, born on 31st January, 2024 to the family of Engr. Salisu Ibrahim of RRD, Gombe

Baby Murjanat Ahmed Sani, born on 7th February, 2024 to the family of Mr. Ahmed Sani Kofar Bai of SLTRD, Kano Office

Baby Ojonugwa Wonders, born on 25th March, 2024 to the family of Mr. Salifu Blessed of PITD, Ota

Baby Abraham Edikan born on 20th March, 2024 to the family of Mr. Joseph Edikan Samuel of BRD Ota



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