

Issue 14 - December 2023

Ceylon Institute of Builders

CIOB



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CONSTRUCTION
TODAY

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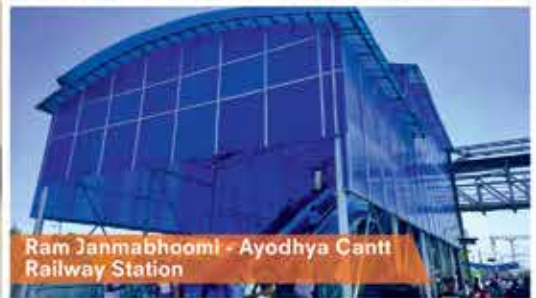
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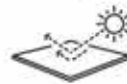
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SRI LANKA
CONSTRUCTION
TODAY

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Editor's Note

The construction industry is one of the key contributors with 8-9% to GDP of the Sri Lankan Economy. The industry was critically affected due to the global pandemic, political and economic instability in Sri Lanka

The construction industry has been showing signs of recovery over the past few months with the easing of the import restrictions imposed on materials. The people were enthusiastic on the import of items to the market which showed positive signs of the revival of the construction industry.

However, currently the construction industry is faced with another obstacle with the Value Added Taxes (VAT) and other taxes. The stakeholders of the industry are of the view that these impacts will negatively influence the restoration efforts.

The new 'property tax' among many other taxes imposed by the National Budget 2024 would also create negative impact on the industry. With the increase in VAT to 18% the property buyers will have to pay an additional cost and it will discourage buyers.

According to the Government sources there will be new property tax to be imposed in 2025 on the recommendations of IMF.

The badly affected sector in the industry is the small and medium scale construction contractors. They had managed with great difficulty during the Covid pandemic, but could not survive the economic crisis and continue with their jobs. The various taxes imposed on the budget will increase the cost of materials once again. Furthermore, this sector is mostly financing their business through bank loans. With such obstacles they would not be able to pay back their loans and not survive in the industry.

All these things are happening at a time the industry badly need the support of the Government to revive the construction industry. This situation may discourage the much awaited investor community in the property sector as well. It is evident that the industry will need to approach the authorities and find quick solutions for the revival of the construction industry in Sri Lanka.

Construction Tomorrow:

THE EVOLUTION OF NEW CONSTRUCTION MATERIALS

"We shape our buildings: Thereafter, they shape us." - Winston Churchill

The construction industry is undergoing a transformative shift, driven by advancements in materials science. The quest for more sustainable, cost-effective, and durable construction solutions has led to the development of innovative materials that promise to reshape the future of building. In this article, we explore the evolution of new construction materials and their potential impact on the industry.

Sustainable Alternatives

One of the key trends in modern construction materials is a focus on sustainability. Traditional building materials, such as concrete and steel, have long been associated with high carbon footprints. Today, researchers and engineers are exploring eco-friendly alternatives that minimize environmental impact.

- **Bamboo:** Known for its rapid growth and strength, bamboo is emerging as a sustainable alternative for construction. Its versatility makes it an attractive choice for various applications, from structural components to flooring and finishing.
- **Recycled Materials:** Recycling has moved beyond paper and plastic to include construction materials. Recycled steel, reclaimed wood, and recycled plastic are finding their way into buildings, reducing the demand for new raw materials and diverting waste from landfills.

High-Performance Composites

The integration of high-performance composites is revolutionizing construction by offering materials with superior strength-to-weight ratios and enhanced durability.

By - Shanika Gamage

Graphene Enhanced Materials:

Graphene, a single layer of carbon atoms, is finding applications in construction materials. Its remarkable strength and conductivity make it a potential game-changer in enhancing the performance of materials like concrete and asphalt.

Fiber-Reinforced Polymers (FRP): FRP materials, such as carbon and glass fiber composites, are gaining popularity for their high tensile strength and resistance to corrosion. These materials are being used to reinforce concrete and provide innovative solutions for structural components.

Smart and Responsive Materials

Advancements in technology have paved the way for the development of smart materials that respond to environmental conditions or external stimuli.

- **Self-Healing Concrete:** Researchers are exploring concrete formulations that can repair cracks autonomously. Microorganisms embedded in the concrete activate when cracks occur, producing limestone to fill the gaps and restore structural integrity.
- **Phase-Change Materials (PCMs):** PCMs are materials that can absorb, store, and release heat energy during phase transitions. Incorporating PCMs into building materials can contribute to better insulation and energy efficiency by regulating indoor temperatures.

Transparent & Aerogel Materials

Innovations in transparent and aerogel materials are changing the way we think about insulation and natural lighting.

- **Aerogels:** These ultralight materials with low thermal conductivity are being used for insulation. Aerogel windows, for example, provide effective insulation while allowing natural light to pass through.
- **Transparent Wood:** By removing lignin from wood, researchers have created transparent wood that retains its strength and offers new possibilities for energy-efficient windows and structural applications.

The Future Outlook

The evolution of construction materials is a testament to human ingenuity and our commitment to creating a more sustainable built environment. As these innovative materials continue to mature, they hold the potential to redefine construction practices, making buildings more resilient, energy-efficient, and environmentally friendly.

As the construction industry embraces these advancements, it is essential for professionals to stay informed and adaptable. The materials of tomorrow are not just about erecting structures; they represent a shift toward a more sustainable and technologically advanced future for the built environment. Embracing these innovations is not just a choice but a necessity as we build the foundations of a better, more resilient world.



- WIRED FOUNDATIONS -

NAVIGATING THE DIGITAL REVOLUTION IN CONSTRUCTION TECHNOLOGIES

*"In today's era of volatility, there is no other way but to re-invent.
The only sustainable advantage you can have over others is agility"*
- Jeff Bezos

By - Shanika Gamage

The construction industry, once characterized by manual labor and traditional methods, is undergoing a profound transformation through digitalization and the integration of cutting-edge technologies. This shift is redefining how projects are planned, executed, and managed, ushering in an era of increased efficiency, cost-effectiveness, and sustainability.

Building Information Modeling (BIM)

At the forefront of digitalization in construction is Building Information Modeling (BIM). BIM is a comprehensive digital representation of the physical and functional characteristics of a building. It allows stakeholders, including architects, engineers, and contractors, to collaborate on a shared platform, fostering better communication and reducing errors throughout the project lifecycle. From design to construction and maintenance, BIM enhances coordination and efficiency.



Internet of Things (IoT) in Construction:

The Internet of Things (IoT) has found a valuable application in the construction industry. Connected devices and sensors on construction sites provide real-time data on equipment, materials, and environmental conditions. This data can be leveraged for predictive maintenance, optimizing resource allocation, and ensuring the safety of workers. IoT-enabled wearables, for example, can monitor the health and well-being of construction workers in real-time.

Drones for Site Monitoring:

Drones have become indispensable tools for construction site monitoring. These unmanned aerial vehicles provide aerial views of construction sites, enabling project managers to assess progress, identify potential issues, and enhance overall project visibility. Drones also contribute to safety by inspecting hard-to-reach areas, reducing the need for manual inspections.

Augmented Reality (AR) and Virtual Reality (VR)

AR and VR technologies are revolutionizing the way construction projects are visualized and executed. AR overlays digital information onto the real world, allowing stakeholders to see virtual elements within the physical environment. VR, on the other hand, creates immersive virtual experiences. These technologies are used for design visualization, virtual walkthroughs, and training simulations, offering a more intuitive understanding of complex construction processes.



Robotics and Automation

The incorporation of robotics and automation is streamlining construction processes, particularly in repetitive and labor-intensive tasks. Robotic arms and autonomous vehicles can handle tasks such as bricklaying, concrete pouring, and material transportation.

Automation not only improves efficiency but also addresses labor shortages and enhances safety by reducing human exposure to hazardous conditions.

Artificial Intelligence (AI) for Project Management

AI is making significant inroads into project management within the construction industry. Predictive analytics and machine learning algorithms analyze historical project data to forecast potential delays, budget overruns, and other risks. AI-driven project management tools facilitate better decision-making, optimize resource allocation, and enhance overall project outcomes.

3D Printing in Construction

The advent of 3D printing has introduced groundbreaking possibilities in construction. Large-scale 3D printers can create entire building components or even entire structures. This technology allows for greater design flexibility, reduces material waste, and speeds up construction processes. 3D printing has been successfully applied in creating prototypes, building facades, and even entire houses.



Digital Twins for Lifecycle Management

Digital twins, virtual replicas of physical objects or systems, are becoming integral to construction project lifecycle management. By creating a digital twin of a building or infrastructure, stakeholders can simulate and analyze performance, monitor maintenance needs, and optimize energy efficiency throughout its lifespan. This approach enhances sustainability by allowing for proactive maintenance and resource optimization.

Blockchain for Enhanced Transparency

Blockchain technology is bringing increased transparency and accountability to the construction industry. Through decentralized and secure ledgers, stakeholders can track the provenance of materials, verify certifications, and streamline contractual processes. This not only reduces the risk of fraud but also enhances trust among project participants.

Sustainability through Smart Construction

Digitalization is playing a crucial role in advancing sustainable construction practices. Smart construction technologies optimize energy usage, reduce waste, and incorporate eco-friendly materials. Additionally, real-time data analytics enable efficient resource management, contributing to a more sustainable and environmentally conscious approach to construction.

Challenges and Considerations

Despite the numerous advantages, the integration of digital technologies in construction comes with challenges. These include initial implementation costs, the need for workforce upskilling, and potential resistance to change within traditional industry practices. Ensuring cybersecurity is also paramount, given the increasing reliance on interconnected digital systems.

Future Outlook

The ongoing digitalization of the construction industry is a trajectory that shows no signs of slowing down. As technology continues to advance, we can expect further innovations, including the refinement of existing technologies and the emergence of novel solutions. The integration of AI, IoT, and robotics is likely to become even more seamless, ushering in an era where construction projects are not only more efficient but also more sustainable and resilient.

Digitalization and technology are reshaping the construction industry, driving unprecedented advancements in efficiency, sustainability, and safety. From BIM and IoT to robotics and 3D printing, these technologies are not only transforming construction processes but also influencing the way we conceptualize, design, and manage built environments. Embracing these digital tools is no longer an option but a necessity for construction professionals looking to stay competitive and contribute to the future of sustainable and innovative construction practices.



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COVER STORY

Ambuluwawa Tower is located in the suburbs of Gampola Town in Sri Lanka. There has been an increased popularity in recent times especially due to the breathtaking views you can experience when you climb to the top of the Ambuluwawa Tower. It is also known for its narrow spiral staircase which some visitors find challenging to climb. It is one of the coolest places to visit in Sri Lanka if you are up for the challenge.

AMBULUWAWA MOUNTAIN

Ambuluwawa mountain peak has a height of 3567 feet above sea level. It is located over 1000 feet above from the Gampola Town. The tower is located on the summit of the mountain peak. Since there are no other mountains in the surrounding area and due to its unique location, Ambuluwawa Tower gets an undisturbed view from far away and vice versa. The tower is visible from Gampola Train Station.

AMBULUWAWA TOWER

The 48 meters tall, cone-shaped tower houses the Stupa (Pagoda) of the Buddhist Temple. As you climb up, it has several viewing platforms for you to enjoy the stunning views. The staircase gets narrower as you go up. The spiral staircase will be a challenging one to climb if you are not comfortable with heights.

BODIVERSITY COMPLEX

Ambuluwawa Biodiversity Complex is the first of its kind in Sri Lanka. It was opened in 2009. It is home to a variety of plants. It is considered as the fourth botanical garden in Sri Lanka.

It is a multi-religious centre where followers of all faiths practiced in Sri Lanka come to practice their religion. It consists of a Buddhist Temple, Hindu Temple, a Church, and a Mosque.

The creation of Ambuluwawa Tower was a vision of the Late Premier D.M. Jayaratne, who was an avid environmentalist. Ambuluwawa, his residential compound, was his way of paying homage to the environment. He developed Ambuluwawa as a biodiversity hotspot complex, which has now become a major tourist attraction in the hill country.

Courtesy : Internet



NEW
SYNTHESIS
REPORT PREVIEWS PARTIES'
BLUEPRINT
FOR DECISION ON GLOBAL
STOCKTAKE AT COP28



UN CLIMATE CHANGE NEWS, 4 OCTOBER 2023

A new synthesis report designed to help governments reach a decision on the global stocktake at COP28 has been published by UN Climate Change.

The report reflects the views of governments and their perspectives on the main elements that could constitute such a decision.

The global stocktake is part of the Paris Agreement and a key means to assess the world's global response to the climate crisis and chart a better way forward.

The synthesis report is comprehensive and includes the views

of almost all Parties. It is based on submissions received from 24 Parties

on behalf of Party groups or individual Parties, representing 180 Parties and from 44 non-Party stakeholders (as of 2 October).

Whilst there are divergent views on the details of how to reach the goals of the Paris Agreement,

governments expressed broad agreement that past climate action has been insufficient and that more action by all Parties and support for developing countries is needed to limit global warming to 1.5 degrees Celsius, to avoid loss and damage, and to adapt to climate change.

Simon Stiell, Executive Secretary of UN Climate Change, said: “This report puts the cards on the table - except this is not a game.

We know that we as the global community are not on track towards achieving the long-term goals of the Paris Agreement and that there is a rapidly closing window of opportunity to secure a livable and sustainable future.”

“This synthesis report is a blueprint of what the final outcome of the global stocktake could look like, based on Parties’ own words. Nations should make full use of the inputs to build consensus for an ambitious outcome towards action in this critical decade,” he added.

Dr. Sultan Al Jaber, COP28 President-Designate, said: “The report is again telling us the world is off track. COP28 is the moment for all Parties to come together and put actionable solutions on the table. We must be ready with real answers to tackle the challenges, eradicate 22 gigatons of emissions by 2030, strengthen global resilience and mobilize finance at the scale necessary to enable a just and equitable transition. Now is the time to Unite, Act, and Deliver a strong negotiated outcome on the Global Stocktake.”

The new report comes on the heels of the technical report on the global stocktake published in September which details

actionable solutions to climate change that are ready to be implemented.

The global stocktake is held every five years and is intended to inform the next round of climate action plans under the Paris Agreement (nationally determined contributions, or ‘NDCs’) to be put forward by 2025.

MORE INFORMATION

- Read the report (Views on the elements for the consideration of outputs component of the first global stocktake)
- See also “Views from Parties and non-Party stakeholders on the elements for the consideration of outputs” available on the UNFCCC submission portal
- Find out why the global stocktake is a critical moment for climate action

ABOUT UNFCCC

With 198 Parties, the United Nations Framework Convention on Climate Change (UNFCCC) has near universal membership and is the parent treaty of the 2015 Paris Climate Change Agreement. The main aim of the Paris Agreement is to keep a global average temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels. The UNFCCC is also the parent treaty of the 1997 Kyoto Protocol. The ultimate objective of all agreements under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.

Credit : 4 October 2023 - UN Climate Press Release

WHERE IS THE CONSTRUCTION INDUSTRY IN THE

BUDGET 2024?



Dr. Rohan Karunaratne.

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Overseas Training Academy-Chairman
Human Resource Development (Pvt) Ltd-Chairman
Hatton National Bank PLC-Director
Sino Lanka Hotels & Spa-Director
Helanko Hotels & spa (Pvt) Ltd-Director
Pinthaliya Resorts & Spa -Chairman*

From its outward appearance, it seems that the budget 2024 has no benefit for the construction industry. This is because over 500B government contracts have been halted, out of which only 55b has been allowed to recommence. This is 10-15% which makes it nearly impossible for the industry to survive.

However, if you look closely at the other sections of the budget, a large portion is attributed to the construction industry under these sections. Most importantly, there is 1.26 T allocated for development. As a country's construction industry is the main driver of development, we expect that a larger portion of this will be given to construction.

For example, construction and expansions of universities and conversion of private higher education institutes, the commencement of a National Education University along with , New Technology & State Universities in 2024, are given some billions. The same shall apply for SME sector development.

Drinking water projects, estate housing, the Bim-saviya program, rehabilitation of structures affected by natural disasters, will be given prominence in the budget and when acquiring foreign support. Under the 10-year multipurpose rural and community development program commencing from 2024, public infrastructure and services in the hill country are to be developed, for which 10B has been allocated with an additional 10 B for the maintenance of rural roads. The decentralised budget shall restart with Rs. 11,250 million for regional development.

Projects of USD 3 B have been halted by funding agencies such as ADB, JAICA, World Bank etc. which may restart next year after IMF has been streamlined. Along these lines, FDI's are also expected to come in especially the Port City Development.

Therefore if we, the construction industry stays alert and finds a way to draw out this budget allocations from the government, we may survive the coming years.

Building Construction Costs Sri Lanka Nov. 2023

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BUILDING CONSTRUCTION COST
SRI LANKA
2023 NOVEMBER

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NOTE FROM PRESIDENT CIOB

“This report is a result of the recent decline of the Sri Lankan Construction Industry as a direct result of the Economic crises.

It was at this time that the HE had appointed several sub- committees aimed at reviving the Sri Lankan Construction Industry.

As a member of this Task I had been forced to view the calamities of our contractors and stakeholders. It was clear the main problem was the abnormal price increases in construction cost.”

“CIOB volunteered to tackle this issue head on, for which senior professionals from various stakeholder institutes and groups were happy to support.

I thank all such invaluable persons both named and unnamed who have spent their selfless efforts to the betterment of Sri Lankan Construction, expecting nothing in return.”

“I am extremely honoured to say that this exercise has been very successful as the cost that had risen to the very top of the regions construction cost, we were able to bring down substantially to levels that are near normal.”

Special Thanks

CH. QS LALITH RATNAYAKE
for his continuous support.

DR. ROHAN KARUNARATNE

- President Ceylon Institute of Builders
- Past-president National Construction Association of Sri Lanka
- Vice-president Chamber of Construction Industry
- Chairman A.K.K Group of Companies- A.K.K. Engineers (Pvt) Ltd

INTRODUCTION

In 2015 Sri Lanka's construction cost was generally in par with our neighboring countries. By 2016 when the industry was booming, there were copious amounts of projects at hand such as FDIs via BOI, GoSL projects, funding agencies such as ADB, JAICA, private sector projects, commercial and house buildings etc.

Unfortunately, the Easter Sunday attacks in 2019 were the beginning of the decline of the Sri Lankan Construction Industry. The industry started to decline rapidly, amidst continuous hits from covid, economic and forex crises and such associated events.

Due to these and as a result of the fact that the construction industry depends highly on imported materials (Over 80% of the material consumption), Sri Lankan construction cost skyrocketed as exchange rates and dollar hikes crippled the already fallen industry. Therefore, our construction cost surpassed all our neighboring countries including India, Pakistan, Bangladesh, Malaysia, Vietnam and Indonesia. Due to this unrealistic cost our construction projects including FDIs, GoSL projects, funding agencies etc. came to a complete halt.

When CIOB held a discussion with HE. Hon. Ranil Wickremesinghe, at the time of handing over the Construction Industry Roadmap, the topic of construction cost in Sri Lanka was discussed very seriously. There is a huge cascading effect of high construction cost. For example, within given budget restraints restarting projects is difficult. FDIs are also reluctant to come to Sri Lanka due to high construction cost; funded projects cannot be completed within allocated funds; everyday house builders and commercial/apartment projects etc. have also been abandoned due to abnormally high construction cost.

Therefore, CIOB came forward to discuss with architects, engineers, contractors, and material suppliers to discuss how to bring down this abnormal construction cost in par with our neighboring countries.

It was identified that even from the initial design stage; over-designing, imported materials used by some designers, unregulated and costly unusual designs, the construction cost increases. Then the procurement systems which doesn't fully cater for competitive bidding, inappropriate procurement strategies, unsuitable contract types, making large contract packages giving opportunities to few and discourage the involvement of SME's

too contributes to higher costs. During the bidding documentation stages due to discrepancies and errors, cost increases are possible through variation costs, claims and disputes.

The interest rates also make a substantial impact on the construction cost and the high interest rates on borrowings have been reduced to somewhat affordable level.

For contractors the issues boil down to poor management, wastages, reworks, other inefficiencies, and poor decision making. In order to benchmark and to promote investments serious commitments must be given by the Contractors and Suppliers on the mark up levels, currently about 40% for both and shall maintain around 25%, if this benchmarking is to be achieved.

Such factors have led to about 24% increase in construction cost, which is clearly preventable, for example by using LEAN methodologies and local materials. Sri Lankan construction cost is significantly higher than that of India, Malaysia, Vietnam, Indonesia, Thailand, Bangladesh, and other such neighboring countries, which disrepute Sri Lanka as a developing nation.

When it comes to material suppliers, CIOB discussed abnormal price hikes of materials and prevention methods to reduce these. By identifying and targeting the causes of such price surges, for example due to taxation, foreign exchange prices, transportation, electricity, fuel price, shipping cost etc. these could be mediated by methods such as government policies. Encouraging the manufacturing and utilization of local materials is essential in this endeavor to reduce dangerous price hikes.

To this extent it is also necessary to deal with the bribery, corruption, commissions and harassment culture among some bureaucrats, which further inflames this problem.

If this is seriously considered and dealt with, cost reduces by about 24%, we can compete with our neighboring countries. Thus, we can restart halted projects, FDI's may come in, funded projects can resume, apartments and commercial projects shall re-commence and in short Sri Lankan development can continue.

To exercise this venture, CIOB gathered senior professional from Institute of Quantity Surveyors, Institute of Architects, Institute of Engineers, and formulated a critical analysis which proves that we could bring the construction cost down to near normal and to an acceptable price benchmark.

CONSTRUCTION COST 2018

Table 1 Costs of construction (Residential) in US\$ per m2 and their rankings in ascending order

City /Country	Individual detached or terrace style house medium standard		Individual detached house		Townho uses medium		Apartments low-rise medium		Apartments high-rise	
	Cost	Ranking	Cost	Ranking	Cost	Ranking	Cost	Ranking	Cost	Ranking
Bangalore	434.00	2	534.00	2	434.00	1	476.00	1	626.00	1
Ho Chi Minh City	430.00	1	480.00	1	614.00	5	740.00	5	800.00	3
Colombo	474.61	3	628.57	3	548.08	3	699.54	4	892.50	4
Jakarta	741.00	5	926.00	5	556.00	4	630.00	3	926.00	5
Kuala Lumpur	688.00	4	879.00	4	460.00	2	537.00	2	765.00	2
Seoul	1,384.00	6	2,047.00	6	1,637.00	6	1,324.00	6	1,685.00	6
Singapore	3,091.00	7	3,574.00	8	2,107.00	8	1,547.00	7	1,993.00	7
Tokyo	4,477.00	9	2,351.00	7	1,847.00	7	1,883.00	8	2,829.00	8
Hong Kong	4,360.00	8	8,333.00	9	3,865.00	9	3,197.00	9	3,488.00	9

Table 2 Costs of construction (Industrial/warehouses) in US\$ per m2 and their rankings in ascending order

City /Country	Construction Cost	Ranking
Ho Chi Minh City	350.00	1
Bangalore	403.00	2
Colombo	467.13	3
Jakarta	481.00	4
Kuala Lumpur	557.00	5
Seoul	1,083.00	6
Tokyo	1,523.00	7
Singapore	1,666.00	8
Hong Kong	2,180.00	9

Table 3 Cost of construction (Hotels and Resorts) in US\$ per m2 and their rankings in ascending order

City /Country	3 Star travellers		5 Star luxury		Resort style 5 Star	
	Cost	Ranking	Cost	Ranking	Cost	Ranking
Bangalore	736.00	1	1,628.00	3	1,279.00	1
Colombo	850.00	2	1,435.00	1	1,540.00	2
Jakarta	889.00	3	1,481.00	2	1,852.00	3
Ho Chi Minh City	1,300.00	4	1,900.00	5		
Kuala Lumpur	1,439.00	5	1,755.00	4	2,743.00	5
Seoul	1,805.00	6	3,853.00	7	2,468.00	4
Singapore	2,560.00	7	3,364.00	6	4,019.00	7
Tokyo	3,432.00	8	5,153.00	9	2,901.00	6
Hong Kong	4,069.00	9	4,941.00	8	5,522.00	8

Table 4 Overall cost of construction in US\$ per m2 and their rankings in ascending order

City (Country)	Construction Cost	Rank
Bangalore	631.24	1
Ho Chi Minh City	657.72	2
Colombo	695.62	3
Jakarta	860.80	4
Kuala Lumpur	1,033.52	5
Seoul	1,727.76	6
Singapore	2,171.48	7
Tokyo	2,793.88	8
Hong Kong	3,766.16	9

The construction cost in Colombo was the third lowest in the South Asian region.

CONSTRUCTION COST 2022

COST OF CONSTRUCTION IN US\$ PER M2

CITY/COUNTRY	APARTMENTS		HOTELS & RESORTS (Medium Rise)		WAREHOUSE	HOUSING			OFFICE BUILDINGS (Grade A)	
	MEDIUM RISE	HIGH RISE	3 STAR	5 STAR		TWO STOREYED	TWO STOREYED	SINGLE STOREY	MEDIUM RISE	HIGH RISE
						LUXURY	SEMI LUXURY	LOW INCOME		
Colombo - Sri Lanka	1,049	1,291	938	1,276	520	1,162	968	516	809	855

Exchange rate 1USD = Rs.350.00

CONSTRUCTION COST 2023 NOV

COST OF CONSTRUCTION IN US\$ PER M2

CITY/COUNTRY	APARTMENTS		HOTELS & RESORTS (Medium Rise)		WAREHOUSE	HOUSINGS			OFFICE BUILDINGS (Grade A)	
	MEDIUM RISE	HIGH RISE	3 STAR	5 STAR		TWO STOREYED	TWO STOREYED	SINGLE STOREY	MEDIUM RISE	HIGH RISE
						LUXURY	SEMI LUXURY	LOW INCOME		
Colombo - Sri Lanka	874	1,076	941	1,291	520	968	807	430	645	753

Note: Exchange rate 1USD = Rs.320.00- Excluding final taxes

IQSSL, Focus Journal., 2023. IQSSL Technical Research Proceedings 2023, Cost of Construction

CONSTRUCTION COST COMPARISON WITH COLOMBO AND KUALA LAMPUR 2023

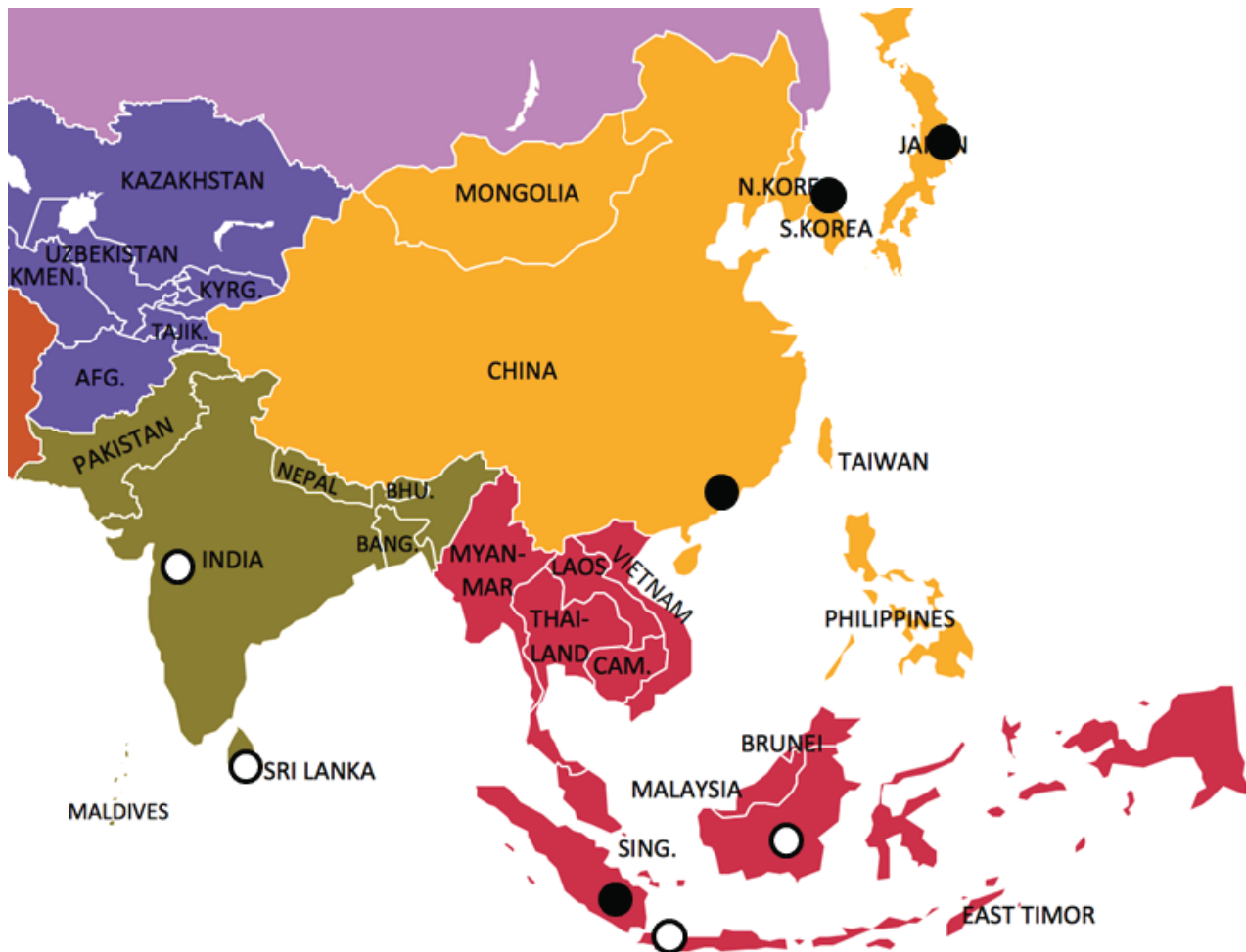
COST OF CONSTRUCTION IN US\$ PER M2

CITY/COUNTRY	APARTMENTS		HOTELS & RESORTS (Medium Rise)		WEAR HOUSES	HOUSINGS			OFFICE BUILDINGS (Grade A)	
	MEDIUM RISE	HIGH RISE	3 STAR	5 STAR		TWO STOREYED			MEDIUM RISE	HIGH RISE
						LUXURY	SEMI LUXURY	LOW INCOME		
Colombo - Sri Lanka	874	1,076	942	1,291	521	968	807	430	646	753
KL Malaysia	724	842	1,011	1,579	537	722	-	-	647	-
Reduction by 15% - 20%	175	215	N/A	N/A	N/A	194	121	65	N/A	N/A
Reduced Price	699	861	N/A	N/A	N/A	775	686	366	N/A	N/A
Benchmark for Sri Lanka	725	840	940	1,290	520	750	700	375	675	765
Benchmark in Rs. / m2	235,625	273,000	305,500	419,250	169,000	243,750	227,500	121,875	219,375	248,625
Benchmark in Rs. / ft 2	21,898	25,372	28,392	38,964	15,706	22,653	21,143	11,327	20,388	23,106

Note: Exchange rate 1USD = Rs.325.00- Excluding final taxes
References: International Cost Data Publications on websites, CIDA Cost Indices, IQSSL Publications, Expert Opinion Survey

THE CURRENT CLIMATE

Given that construction cost skyrocketed in the year 2022, Currently Sri Lankan construction cost has reduced to levels in par with its neighboring countries namely, Indonesia, Malaysia, Vietnam etc. Therefore we are now in the range of \$1000 per m², and less for other categories.



>\$2000
per m²

- Hong Kong
- Singapore
- S. Korea
- Tokyo

Around
\$1000
per m²

- Bangalore
- Sri Lanka
- Indonesia
- Malaysia

CIOB Unveils the Real Cost of Construction in Sri Lanka via industry research



From left: Dr Rohan Karunaratne (President CIOB), Mr. Dinesh Weerakkody (Chairman BOI), Prof. Chithra Weddikkara (Advisor CIOB), Eng. Saliya Kaluarachchi (Secretary CIOB)



From Left: Ms. Kumudini Irugalbanara, Asst. Director, EDB, Ch.Qs. Lalith Ratnayake, Dr. Kingsly Bernanrd, Chairman EDB, Dr. Rohan Kaunaratne and Eng. Saliya Kaluarachchi (CIOB)



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CHINA'S BRAND NEW 'FLYING KISS RIDE' IS WORLD'S TALLEST ATTRACTION WITH NO SEAT BELTS & SAFETY GEARS



The gradual resumption of flights to and from China has not only marked the beginning of recovery from the COVID-19 pandemic, but also put the tourism of China back on its foot. The reopening of China tourism, in a calibrated manner, has recently seen the unveiling of a unique tourist attraction – the 'Flying Kiss' ride. Southwestern China's 'Flying Kiss Ride' attraction in Chongqing municipality features two colossal statues with rotating observation desks at the stupendous height of 3000 feet. The most offbeat attraction is making headlines worldwide and urging travelers to book flights to China.

Standing on the Baima Mountain in Chongqing, each of the two massive statues – one male and one female – holds a rotating platform. Swinging from ground level to the sky high reach, the Flying Kiss Ride overwhelms you with a most enticing panorama of lofty mountains and lush green valleys. Reflecting/enlivening the Chinese mythical story of two lovers, the statues appear to blow kisses as they reach the peak.

China elevates cultural love through its Flying Kiss Ride in a contrasting theme park environment, and this cultural emblem is catching the attention of globetrotters.

In a short time, the Internet is overwhelmed with this not-to-miss ride story. The Flying Kiss Ride not just boosts your adventure streak, but takes you on a trip to a mythological love story. Its surrounding waist-high security gates simultaneously protect and allow you to move freely across the platform. Notably, the no-safety-harness feature makes it one of the most terrifying rides that you have ever come across in your lifetime. The climax of your adrenaline rush, as you reach the highest elevation, will efface the COVID backdrop in the blink of an eye.

Travel enthusiasts' elation can be clearly gauged by the stunning amalgamation of history and amusement in this thrilling ride. Get ready for an upbeat adventure on the Flying Kiss Ride in China.

The Flying Kiss Ride (Baima Mountain) is a 2.5-hr road trip from the Chongqing International Airport and is a 3-hr drive from Beijing. Both Chongqing and Beijing are just a short domestic flight away from Shanghai International Airport. You can also enjoy breathtaking sightseeing across tea plantations and mountain valleys en route before hopping on to the thrilling ride.

Don't let the pandemic beat your lust for adventure. Book your flights from USA to Beijing or Shanghai for cheap airfares and set the clock back to the pre-pandemic times. Log on to iEagle.com and get set – go!

Credit : ieagle fly high



CLIMATE CHANGE IMPACTS

Though we often think about human-induced climate change as something that will happen in the future, it is an ongoing process. Ecosystems and communities in the United States and around the world are being impacted today.



*A collage of typical climate and weather-related events: floods, heatwaves, drought, hurricanes, wildfires and loss of glacial ice.
(Image credit: NOAA)*

Global temperatures rose about 1.98° (1.1°C) from 1901 to 2020, but climate change refers to more than an increase in temperature. It also includes sea level rise, changes in weather patterns like drought and flooding, and much more. Things that we depend upon and value — water, energy, transportation, wildlife, agriculture, ecosystems, and human health — are experiencing the effects of a changing climate.

A COMPLEX ISSUE

The impacts of climate change on different sectors of society are interrelated. Drought can harm food production and human health. Flooding can lead to disease spread and damages to

ecosystems and infrastructure. Human health issues can increase mortality, impact food availability, and limit worker productivity. Climate change impacts are seen throughout every aspect of the world we live in. However, climate change impacts are uneven across the country and the world — even within a single community, climate change impacts can differ between neighborhoods or individuals. Long-standing socioeconomic inequities can make underserved groups, who often have the highest exposure to hazards and the fewest resources to respond, more vulnerable.

The projections of a climate change-impacted future are not inevitable. Many of the problems

and solutions are known to us now, and ongoing research continues to provide new ones. Experts believe there is still time to avoid the most negative of outcomes by limiting warming and reducing emissions to zero as quickly as possible. Reducing our emissions of greenhouse gases will require investment in new technology and infrastructure, which will spur job growth. Additionally, lowering emissions will lessen harmful impacts to human health, saving countless lives and billions of dollars in health-related expenses.

OUR CHANGING CLIMATE

We see climate change affecting our planet from pole to pole. NOAA monitors global climate data and here are some of the changes NOAA has recorded. You can explore more at the Global Climate Dashboard.

- Global temperatures rose about 1.8°F (1°C) from 1901 to 2020.
- Sea level rise has accelerated from 1.7 mm/-year throughout most of the twentieth century to 3.2 mm/year since 1993.
- Glaciers are shrinking: average thickness of 30 well-studied glaciers has decreased more than 60 feet since 1980.
- The area covered by sea ice in the Arctic at the end of summer has shrunk by about 40% since 1979.
- The amount of carbon dioxide in the atmosphere has risen by 25% since 1958, and by about 40% since the Industrial Revolution.
- Snow is melting earlier compared to long-term averages.

WATER

Changes to water resources can have a big impact on our world and our lives.

Flooding is an increasing issue as our climate is changing. Compared to the beginning of the 20th century, there are both stronger and more frequent abnormally heavy precipitation events across most of the United States.

Conversely, drought is also becoming more common, particularly in the Western United States. Humans are using more water, especially for agriculture. Much like we sweat more when it is hot out, higher air temperatures cause plants to

lose, or transpire, more water, meaning farmers must give them more water. Both highlight the need for more water in places where supplies are dwindling. Snowpack is an important source of fresh water for many people. As the snow melts, fresh water becomes available for use, especially in regions like the Western United States where there is not much precipitation in warmer months. But as temperatures warm, there is less snow overall and snow begins to melt earlier in the year, meaning snowpack may not be a reliable source of water for the entire warm and dry seasons.

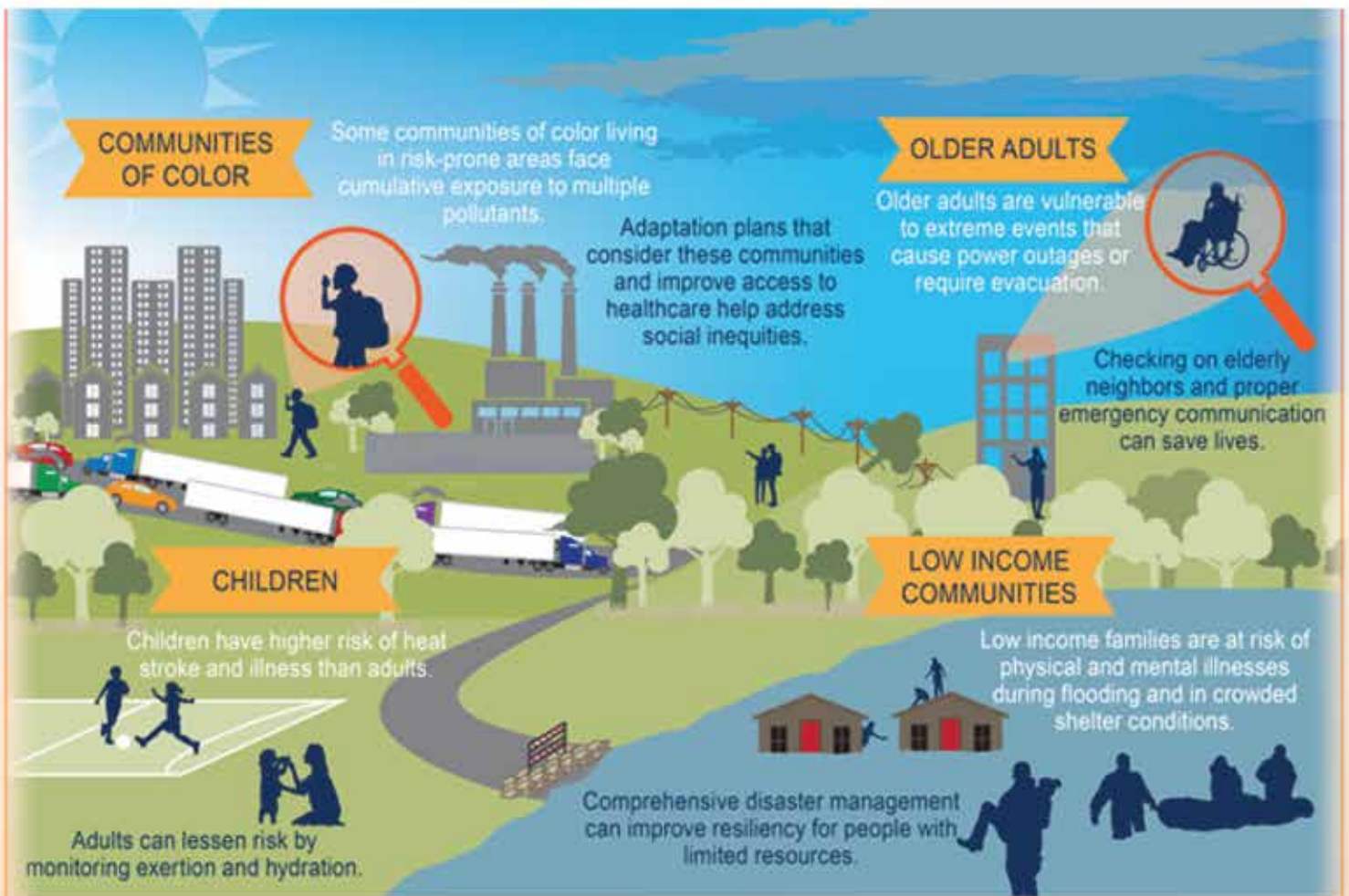
FOOD

Our food supply depends on climate and weather conditions. Although farmers and researchers may be able to adapt some agricultural techniques and technologies or develop new ones, some changes will be difficult to manage. Increased temperatures, drought and water stress, diseases, and weather extremes create challenges for the farmers and ranchers who put food on our tables.

Human farm workers can suffer from heat-related health issues, like exhaustion, heatstroke, and heart attacks. Rising temperatures and heat stress can also harm livestock.

HUMAN HEALTH

Climate change is already impacting human health. Changes in weather and climate patterns can put lives at risk. Heat is one of the most deadly weather phenomena. As ocean temperatures rise, hurricanes are getting stronger and wetter, which can cause direct and indirect deaths. Dry conditions lead to more wildfires, which bring many health risks. Higher incidences of flooding can lead to the spread of waterborne diseases, injuries, and chemical hazards. As geographic ranges of mosquitoes and ticks expand, they can carry diseases to new locations. The most vulnerable groups, including children, the elderly, people with preexisting health conditions, outdoor workers, people of color, and people with low income, are at an even higher risk because of the compounding factors from climate change. But public health groups can work with local communities to help people understand and build resilience to climate change health impacts.



Examples of populations at higher risk of exposure to adverse climate-related health threats are shown along with adaptation measures that can help address disproportionate impacts. When considering the full range of threats from climate change as well as other environmental exposures, these groups are among the most exposed, most sensitive, and have the least individual and community resources to prepare for and respond to health threats. White text indicates the risks faced by those communities, while dark text indicates actions that can be taken to reduce those risks. (EPA (National Climate Assessment))

THE ENVIRONMENT

Climate change will continue to have a significant impact on ecosystems and organisms, though they are not impacted equally. The Arctic is one of the ecosystems most vulnerable to the effects of climate change, as it is warming at least twice the rate of the global average and melting land ice sheets and glaciers contribute

dramatically to sea level rise around the globe. Some living things are able to respond to climate change; some plants are blooming earlier and some species may expand their geographic range. But these changes are happening too fast for many other plants and animals as increasing temperatures and changing precipitation patterns stress ecosystems. Some invasive or nuisance species, like lionfish and ticks, may thrive in even more places because of climate change.

Changes are also occurring in the ocean. The ocean absorbs about 30% of the carbon dioxide that is released into the atmosphere from the burning of fossil fuels. As a result, the water is becoming more acidic, affecting marine life. Sea levels are rising due to thermal expansion, in addition to melting ice sheets and glaciers, putting coastal areas at greater risk of erosion and storm surge.

The compounding effects of climate change are leading to many changes in ecosystems. Coral

reefs are vulnerable to many effects of climate change: warming waters can lead to coral bleaching, stronger hurricanes can destroy reefs, and sea level rise can cause corals to be smothered by sediment. Coral reef ecosystems are home to thousands of species, which rely on healthy coral reefs to survive.

INFRASTRUCTURE

Physical infrastructure includes bridges, roads, ports, electrical grids, broadband internet, and other parts of our transportation and communication systems. It is often designed to be in use for years or decades, and many communities have infrastructure that was designed without future climate in mind. But even newer infrastructures can be vulnerable to climate change.

Extreme weather events that bring heavy rains, floods, wind, snow, or temperature changes can stress existing structures and facilities. Increased temperatures require more indoor cooling, which can put stress on an energy grid. Sudden heavy rainfall can lead to flooding that shuts down highways and major business areas.

Nearly 40% of the United States population lives in coastal counties, meaning millions of people will be impacted by sea level rise. Coastal infrastructure, such as roads, bridges, water supplies, and much more, is at risk. Sea level rise can also lead to coastal erosion and high-tide flooding. Some communities are projected to possibly end up at or below sea level by 2100 and will face decisions around managed retreat and climate adaptation.

Many communities are not yet prepared to face climate-related threats. Even within a community, some groups are more vulnerable to these threats than others. Going forward, it is important for communities to invest in resilient infrastructure that will be able to withstand future climate risks. Researchers are studying current and future impacts of climate change on communities and can offer recommendations on best practices. Resilience education is vitally important for city planners, emergency managers, educators, communicators, and all other community members to prepare for climate change.

Credit : National Oceanic and Atmospheric Administration - U.S. Department of Commerce

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BUILDING THE FUTURE

A DEEP DIVE INTO PREFABRICATED & MODULAR CONSTRUCTION



During **construction** modular buildings **waste fewer materials** and **use less energy**.



On the **building site**, modular construction **eliminates hazards**, reducing the risk of injuries



Modular buildings have a **long life span** and can be **reused or reconfigured** for new projects

By - **Shanika Gamage**

"A great building must begin with the immeasurable, must go through measurable means when it is being designed, and in the end must be unmeasured." – Louis Kahn

Prefabricated and modular construction methods have emerged as transformative approaches to building, challenging traditional on-site construction practices. These methods offer efficiency, cost-effectiveness, and sustainability, revolutionizing the way structures are designed and assembled.

DEFINING PREFABRICATION & MODULAR CONSTRUCTION

Prefabrication involves manufacturing components or modules off-site and then transporting them to the construction site for assembly. Modular construction takes this a step further by creating entire sections or modules of a building off-site. These modules, complete with fixtures and finishes, are then transported and assembled to form the final structure.

HISTORICAL ROOTS

While the terms "prefabrication" and "modular construction" may sound modern, their roots can be traced back centuries. The Sears, Roebuck and Co. catalog homes in the early 20th century are a historical example of prefabrication. However, it's in recent decades that advancements in technology and construction methods have propelled these techniques into mainstream use.

BENEFITS OF PREFABRICATION & MODULAR CONSTRUCTION

- **Speed and Efficiency:** One of the primary advantages is the significant reduction in construction time. The simultaneous on-site preparation and off-site manufacturing allow for parallel processes, speeding up the overall project timeline.

- **Cost-Effectiveness:** Prefabrication often results in cost savings. The controlled environment of a factory reduces material waste, and the assembly line-like production streamlines labor and resources.

- **Quality Control:** Building components in a controlled factory environment enhances quality control. Precise engineering and standardized processes lead to fewer defects and inconsistencies in the final product.

- **Sustainability:** Modular construction is inherently more sustainable. With less waste generated during manufacturing and a reduced need for transportation to and from the construction site, the environmental impact is minimized. Additionally, materials can be recycled and reused in modular construction.

APPLICATIONS ACROSS SECTORS

- **Residential Construction:** Prefabricated homes, often referred to as prefab homes or modular homes, have gained popularity for their faster construction time and cost-effectiveness. These homes can range from simple structures to high-end, customizable designs.

- **Commercial and Office Spaces:** Modular construction has found its way into commercial projects, including office spaces. The ability to quickly assemble modular units makes it an attractive option for businesses looking to occupy their spaces promptly.

- **Education and Healthcare Facilities:** Schools and healthcare institutions are increasingly turning to modular construction to meet their growing space needs. The speed of construction is particularly beneficial for minimizing disruptions in these critical environments.

- **Hospitality Industry:** Hotels and other hospitality structures have also embraced prefabrication. The ability to create uniform, high-quality rooms off-site contribute to faster project completion and consistency across multiple locations.

CHALLENGES & CONSIDERATIONS

- **Design Limitations:** While prefabrication allows for a degree of customization, there can be design limitations. Modules need to adhere to transportation restrictions, which can influence the size and layout of components.

- **Transportation Logistics:** The transportation of large modules to the construction site is a logistical challenge. It requires careful planning and coordination to ensure the safe and timely delivery of components.

- **Perception and Skepticism:** Traditional construction methods have deep-rooted perceptions of reliability and longevity. Overcoming skepticism and gaining wider acceptance for prefabricated and modular construction methods may take time.



TECHNOLOGICAL ADVANCES DRIVING GROWTH

- **BIM (Building Information Modeling):** BIM technology plays a crucial role in the success of prefabrication and modular construction. It allows for detailed virtual representations of structures, enabling precise planning and coordination.
- **Advanced Materials:** Innovations in materials, including lightweight and durable options, contribute to the feasibility and efficiency of prefabrication. These materials often enhance energy efficiency and sustainability.
- **Automation and Robotics:** The integration of automation and robotics in the manufacturing process ensures precision and efficiency. From cutting and shaping materials to assembling components, technology plays a key role in optimizing the production line.



FUTURE TRENDS & OUTLOOK

- **Increased Customization:** As technology advances, there is a growing trend toward more customizable prefab and modular options. This includes not only the design of the structures but also the incorporation of smart technologies and sustainable features.
- **Rise of Hybrid Construction:** Many projects now adopt a hybrid approach, combining traditional on-site construction with prefabricated and modular elements. This allows for greater flexibility in design and construction.
- **Global Adoption:** While prefab and modular construction are gaining traction globally, there is still untapped potential. As awareness grows and technology becomes more accessible, these methods may become commonplace worldwide.

Prefabricated and modular construction methods are reshaping the construction industry, offering speed, cost savings, and sustainability. As technology continues to advance and perceptions evolve, these methods are likely to become even more prevalent, influencing how we build homes, offices, and various structures in the future.



RENEWABLE ENERGY

VS

SUSTAINABLE ENERGY

WHAT'S THE DIFFERENCE?

Solving the energy crisis is one of the most essential undertakings of the 21st century. Perfect solutions will be hard to come by, due not only to drastic differences in political and public support for sustainable energy throughout the world, but the extensive knowledge required to address the many challenges associated with the global energy landscape.

“Renewable energy” and “sustainable energy” are often used interchangeably, even among industry experts and veterans. There is some overlap between the two, as many sustainable energy sources are also renewable. However, these two terms are not exactly the same.

A clear understanding of renewable energy versus sustainable energy can help:

- Students make the right college and career choices based on their interests
- Energy industry leaders make the correct decisions based on their organizational objectives
- Policymakers craft appropriate, effective legislation
- Consumers advocate for and adopt the energy methods they find most suitable

Renewable Energy:

- Comes from sources that naturally renew themselves at a rate that allows us to meet our energy needs
- Includes biomass, geothermal, hydropower, solar and wind
- Not all renewable energy is also sustainable, but improving the sustainability of renewables and fossil fuels can have environmental benefits

Sustainable Energy:

- Comes from sources that can fulfill our current energy needs without compromising future generations

- Also involves collection and distribution; the energy must be efficiently acquired and distributed in order to be sustainable
- Includes geothermal, hydropower, solar and wind.

What Is Renewable Energy?

Produced from existing resources that naturally sustain or replenish themselves over time, renewable energy can be a much more abiding solution than our current top energy sources. Unlike fossil fuels, renewables are increasingly cost-efficient, and their impact on the environment is far less severe. By taking advantage of the earth's ability to grow and recycle organisms, renewable power sources will theoretically be able to supply our energy needs indefinitely.

Renewable energy is defined by the time it takes to replenish the primary energy resource, compared to the rate at which energy is used. This is why traditional resources like coal and oil, which take millions of years to form, are not considered renewable. On the other hand, solar power can always be replenished, even though conditions are not always optimal for maximizing production.



Under this definition, examples of renewable energy sources include:

- **Biomass:** Organic material that is burned or converted to liquid or gaseous form. Biomass from trees was the leading source of energy in the United States before the mass adoption of fossil fuels. Modern examples of biomass include ethanol and biodiesel, which are collectively referred to as biofuels.
- **Geothermal:** Heat produced by decaying radioactive particles found deep within the earth. Geothermal energy can be used as a direct heat source or to generate electricity.
- **Hydropower:** One of the oldest sources of electricity, requiring not only massive amounts of water but also a formidable amount of force. Hydropower was the largest source of renewable electricity until 2019.
- **Solar:** A favored green alternative, although production requires a large surface area and consistent sunlight. Solar farms should be combined with storage solutions in order to harness the sun's potential. Like geothermal energy, solar power is often used as a direct heat source and electricity generator.
- **Wind:** Utilizes turbines to convert the wind's kinetic energy into mechanical energy, which is then used to accomplish a task like grinding grain. Alternatively, the mechanical energy can be rotated at high speeds to produce electricity.

What Is Sustainable Energy?

Sustainable energy is derived from resources that can maintain current operations without jeopardizing the energy needs or climate of future generations. The most popular sources of sustainable energy, including wind, solar and hydropower, are also renewable.

Biofuel is a unique form of renewable energy, as its consumption emits climate-affecting greenhouse gasses, and growing the original plant product uses up other environmental resources.

However, biofuel remains a major part of the green revolution. The key challenge with biofuel is finding ways to maximize energy output while minimizing the impact of sourcing biomass and burning the fuel.

Even with resources that are both renewable and sustainable, like wind and solar power, an important question remains: Is sustainable energy the solution to our energy and climate needs?

It is a promising but nuanced option, and the answer isn't as simple as transitioning from so-called "dirty" resources to sustainable ones. In addition to the biomass conundrum, not all sustainable solutions can be used in every situation. Their efficiency and/or effectiveness depends on factors such as climate and location, and once the energy is generated, collected and stored, it must then be distributed. For instance, wind is produced by temperature changes in the air, which aren't consistent across the planet. In the U.S., this means that the best place to put wind farms is in the Midwest, the Texas region, or offshore. How do we ensure this energy fairly provides for other regions, like the Northeast?

Furthermore, disparities in regulations and target goals can create a problem where the best place to produce energy may not have the public interest or infrastructure necessary to support it. For example, a windy state may struggle to pass legislation for financing the construction of turbines, while its neighbor may be eager for a nearby source of clean energy. How do we navigate such situations in a way that allows consumers to get what they want, no matter where they live? Answering these and other questions requires the advanced critical thinking skills and social, political and economic awareness that a master's degree in sustainable energy can provide. It will take more to support widespread adoption of renewable and sustainable resources than technical knowledge alone.



The Renewable Energy vs. Sustainable Energy Debate

Energy leaders need to not only understand the nuances between these two terms, but be mindful of how they use them in legislation and organizational decision-making. Not only will the precise use of language benefit consumers, allowing them to understand the implications of their energy choices, but it will also help officials ensure their policies accurately reflect their objectives.

For example, a policymaker who drafts a green bill only using the term “renewable energy” may subvert the effect of their own legislation by failing to account for the potential environmental impact of energy sources like biofuels.

Additionally, by using these terms appropriately, energy leaders can be sure to craft initiatives that align with the ideals of the public, thereby increasing the chances of receiving public backing. Support for greener energy sources is high: As of 2017, 82% of people worldwide agree that the world should be fully powered by renewable energy. Researchers found this support consistent across people of different ages, education levels and political ideologies. Renewable energy has bipartisan support in the U.S., although reasoning differs among political lines. Generally, Republicans are interested in the economic benefits of renewables, while Democrats are more focused on climate change. Even with these two differences—or perhaps because of them, with the Democratic concern making the case for sustainable options—such overwhelming support suggests a positive future for sustainable energy, as well as a need for legislators, private sector decision-makers and non-profit leaders to develop comprehensive strategies for moving forward.

The question then becomes: How do we go from simply supporting sustainable energy to widespread adoption? The answer is multifaceted, but higher education plays a significant role. Energy professionals must understand how energy creation, distribution and consumption are affected by factors such as:

- **Geography:** Where and how can we obtain energy in ways that provide for efficient use, reduce environmental impact and remain cost-effective?
- **Economics:** How do we finance the transition to sustainable energy sources? How does the cost of creating and distributing sustainable energy affect the rate of adoption? What about areas with little money to invest in sustainable energy?
- **Availability:** How do we provide sustainable energy to areas less likely to produce it? How do we account for the earth’s natural shifts in resources when quantifying and meeting our energy needs?
- **Politics:** How do we navigate political interests and arguments for and against sustainable energy?

Even those currently in the industry may find themselves bewildered by the field’s rapid pace and myriad influences. They need the opportunity to build on their existing knowledge and skills in order to address the needs of now and the future.

A master’s degree can introduce energy sector professionals, both experienced and new, to the various issues surrounding the energy crisis. Successfully completing courses that cover multiple aspects of the energy industry, including but not limited to its organization, markets, end-use, policy, financing and global governance, prepares students to tackle some of the biggest energy and climate challenges of today and tomorrow.

Courtesy : energy sais.edu

CITIES OF TOMORROW- THE GLOBAL SURGE IN SMART CITIES & URBAN INNOVATION



By - Shanika Gamage

“The concept of a smart city is not just about being technologically advanced, but also about being sustainable, inclusive, and citizen centric.”

– Narendra Modi

The concept of smart cities is rapidly gaining momentum worldwide as urbanization continues to shape the global landscape. These cities leverage cutting-edge technologies to enhance efficiency, sustainability, and overall quality of life for their residents. From intelligent infrastructure to data-driven governance, the growth of smart cities is reshaping urban environments and setting the stage for a more connected and sustainable future.

Smart cities use information and communication technologies (ICT) to improve the efficiency of urban services and meet the needs of residents. These cities leverage data and connectivity to optimize various aspects, including transportation, energy, healthcare, and public safety. The goal is to create cities that are not only technologically advanced but also responsive to the evolving needs of their inhabitants.

KEY COMPONENTS OF SMART CITIES

- **Smart Infrastructure:** Smart cities invest in intelligent infrastructure, such as smart grids, to optimize the delivery and consumption of energy. Additionally, advanced transportation systems, including smart traffic management and autonomous vehicles, contribute to more efficient and sustainable urban mobility.
- **Data Analytics and IoT Integration:** The integration of the Internet of Things (IoT) allows for the collection and analysis of real-time data from various sources. From sensors monitoring air quality to smart waste management systems, data-driven insights enable informed decision-making for city planners and administrators.
- **Digital Governance:** Smart cities employ digital governance models to enhance civic engagement, streamline administrative processes, and improve public services. E-governance platforms and mobile apps empower residents to interact with local authorities, access information, and participate in the decision-making process.
- **Sustainable Urban Planning:** The growth of smart cities emphasizes sustainable urban planning and design. This includes energy-efficient buildings, green spaces, and eco-friendly transportation options. Sustainability is not just a goal but a fundamental principle driving the development of these cities.

GLOBAL TRENDS IN SMART CITY DEVELOPMENT

- **Asia-Pacific Leading the Way:** The Asia-Pacific region has emerged as a hotspot for smart city development. Cities like Singapore, Seoul, and Tokyo are at the forefront, implementing innovative technologies to address urban challenges and improve the quality of life for their citizens.

- **European Pioneers:** European cities have long been pioneers in the smart city movement. Barcelona, for example, has implemented a comprehensive smart city strategy that includes smart lighting, waste management, and digital governance. Other cities, such as Amsterdam and Copenhagen, are also leading in sustainable urban development.
- **North America's Tech Hubs:** Cities in North America, particularly tech hubs like San Francisco and Seattle, are leveraging their technological expertise to become smart cities. Initiatives range from smart transportation systems to the integration of renewable energy sources.
- **Rapid Growth in Emerging Economies:** Emerging economies are increasingly recognizing the importance of smart city development. Cities in India, including Delhi and Mumbai, are investing in digital infrastructure to address urban challenges and accommodate population growth.

CASE STUDIES FROM AROUND THE WORLD

1. **Singapore:** Often cited as a model smart city, Singapore has implemented a range of technologies, including smart traffic management, an extensive sensor network, and a comprehensive digital governance platform. The city-state's focus on sustainability and innovation has positioned it as a global leader in smart city development.
2. **Barcelona, Spain:** Barcelona has embraced smart city technologies to enhance urban living. The city's use of sensors for waste management, smart street lighting, and a city-wide Wi-Fi network showcases a holistic approach to digitalization. Barcelona's success lies in its integration of technology with a focus on social and environmental sustainability.
3. **Songdo, South Korea:** Built from the ground up as a smart city, Songdo integrates advanced technologies in every aspect of urban life. From smart buildings with energy-efficient features to an extensive network of sensors for monitoring air quality and traffic, Songdo exemplifies a futuristic and interconnected urban environment.

IMPACT ON URBAN LIVING

- **Improved Efficiency:** One of the primary benefits of smart cities is the optimization of urban services, leading to increased efficiency. From traffic management to waste disposal, digital solutions help cities operate more smoothly, reducing delays and enhancing overall productivity.
- **Enhanced Quality of Life:** Smart cities prioritize the well-being of their residents. Access to real-time information, efficient public services, and sustainable infrastructure contribute to an improved quality of life. Smart healthcare systems and education initiatives further enhance residents' overall well-being.





- **Environmental Sustainability:** Sustainable practices are integral to smart city development. The integration of renewable energy sources, smart waste management, and eco-friendly urban planning contribute to reduced environmental impact, promoting a greener and healthier urban environment.
- **Innovative Transportation Solutions:** Smart cities are revolutionizing transportation with intelligent solutions. From smart traffic lights that optimize flow to the implementation of electric and autonomous vehicles, these cities are reshaping the way people move within urban spaces.

CHALLENGES & CONSIDERATIONS

- **Privacy and Security Concerns:** The extensive use of data in smart cities raises concerns about privacy and security. Safeguarding sensitive information and ensuring robust cybersecurity measures are essential to maintaining public trust.
- **Digital Divide:** The benefits of smart city technologies should be accessible to all residents. Addressing the digital divide ensures that marginalized communities do not get left behind in the digital transformation of urban spaces.
- **Interoperability Issues:** Integration and interoperability between various smart city systems can be a challenge. Ensuring seamless communication between different technologies and platforms is crucial for the overall success of smart city initiatives.
- **Cost of Implementation:** The initial investment required for developing smart city infrastructure can be substantial. Funding models, public-private partnerships, and long-term cost-benefit analyses are essential considerations for city planners.

LOOKING INTO THE FUTURE

The growth of smart cities is poised to continue as technological advancements and urbanization trends shape the world. Future smart cities are likely to prioritize resilience, inclusivity, and adaptability to address evolving challenges such as climate change, population growth, and the need for sustainable development.

The evolution of smart cities represents a paradigm shift in urban living. From digital governance to sustainable infrastructure, these cities are leveraging technology to create more efficient, livable, and resilient urban environments. As the world continues to urbanize, the growth of smart cities offers a blueprint for the future of urban development, where innovation and connectivity converge to address the challenges of the modern world.

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SUSTAINABLE BUILDING MATERIALS FOR A GREENER FUTURE



As the world turns an eye toward sustainability, construction must follow suit. But what is sustainable construction and how does one transition into a more sustainable method of development?

WHAT IS SUSTAINABLE CONSTRUCTION ?

Sustainable construction is the practice of creating a healthy environment that's based on ecological principles. According to Professor Charles J. Kibert, sustainable construction focuses on six principles: "conserve, reuse, recycle/renew, protect nature, create nontoxic and high quality."

The goal is to reduce the industry's impact on the environment by utilizing sustainable development practices, employing energy efficiency and taking advantage of green technology.

Although most business sectors are making strides to become more sustainable, the construction sector is unique because it can significantly affect how sustainable practices are applied. This is because of the large amounts of materials and energy that the industry uses.

SUSTAINABLE BUILDING MATERIALS

One of the best ways to practice sustainability in construction is through the materials that are used. A new generation of stronger, lighter and revolutionary building materials can help solve many problems in the industry as well as push current practices to be more sustainable.

These materials have the added benefit of protecting the environment by reducing the carbon footprint of the buildings that use these materials. They promote a cleaner Earth and a future of sustainability while also being aesthetically appealing and much more efficient.



1. BAMBOO

Thanks to its renewable and versatile characteristics, bamboo is one of the most sustainable construction materials. Although bamboo is a type of grass, it has strength similar to wood while still being flexible. Construction projects can utilize bamboo in various applications like supporting concrete, scaffolding, roofing and building other structures.

Benefits:

- Fast-growing renewable material
- Cost-effective and eco-friendly to grow and harvest
- Absorbs more CO₂ than trees, so a growing demand for bamboo could lead to cleaner air in surrounding environments.

2. RECYCLED PLASTIC

In 2021, the total world population created 139 million tons of single-use plastic with the majority of it ending up in landfills or polluting waterways. With new advancements in construction and technology, we can now recycle plastic to create building materials, such as plastic sheets, bricks and lumber.

Benefits:

- Cuts down on waste that ends up in landfills, waterways and other polluted areas
- Recycled plastic does not require the same toxic preservative sealants that lumber needs.

3. LAMINATED TIMBER

Also known as mass timber, laminated timber is prefabricated timber that has a higher strength and water resistance than traditional timber. Its strength and water resistance are important factors, as it has the potential to replace steel and concrete. Both steel and concrete produce a much higher carbon footprint than mass timber during their production processes.

Laminated timber can support structures such as beams and columns. You might also see it used in roofing and flooring.

Benefits:

- Makes a smaller carbon footprint during production when compared to steel and other structural materials
- Faster to work with to cut down on CO₂ emissions associated with construction.

4. STONE

Stone occurs naturally in the earth and can be used both as a building material and as home furnishings, such as tiles and countertops. Stone is both durable and low maintenance and, thanks to its versatility, it produces little to no waste when used in construction projects.

Since it's a naturally occurring material, it often doesn't require factory production, which cuts down on CO₂ emissions.

Benefits:

- A lifelong investment that won't need replacing
- Is recyclable for use on other projects or in the making of roadbeds for little to no waste

5. COB

Cob is a mud mixture made from natural materials such as soil, straw, sand and lime. Cob most frequently appears in the construction of residential buildings or as a replacement for concrete structures.

The making of cob is inexpensive and produces less CO₂ than producing concrete. However, the material has a few disadvantages as it takes longer to build with and is more susceptible to mold if humidity levels are too high.

Benefits:

- All-natural and economically-friendly replacement to concrete in smaller structures
- Prevents heat transfer to keep heating and energy costs low and shrink the home's carbon footprint

6. CORK

Cork is currently common in European construction and is slowly making its way to the United States to insulate homes and other buildings. Cork comes from the cork oak tree. The material is harvested by hand from the tree's bark and, most importantly, doesn't require killing the tree.

As a renewable and recyclable resource, cork is an eco-friendly replacement for traditional insulation that requires manufacturing.

Benefits:

- Cork is a renewable resource that doesn't harm the environment to harvest
- Production creates a smaller carbon footprint than traditional human-made insulating materials
- Has mold-resistant properties

7. ADOBE BRICK

The use of adobe brick dates back centuries and is popular in the Middle East and in the Americas. Adobe is a mixture of clay and straw that people use to make bricks for the construction of homes and other structures. The main appeal of adobe is that it uses naturally occurring materials from the earth and takes less energy to produce.

Benefits:

- Contains natural insulating properties that keep indoor temperatures consistent for lower energy bills and a smaller carbon footprint
- Adobe is recyclable time and time again, leaving no waste behind.
- Consists of sustainable materials from the earth

8. RECLAIMED WOOD

Due to its ease of use and natural beauty, wood is the most popular building material out there. Unfortunately, it often goes to waste during a deconstruction project. Reclaimed wood technology can now deconstruct lumber from older structures while preserving its integrity. Contractors and carpenters can use reclaimed wood in new building projects or in home furnishing and decor.

Benefits:

- Reduces the need to cut down and harvest trees for new wood
- An effective step in reducing deforestation

9. PRECAST CONCRETE

While concrete tends to be a factor in CO2 emissions created at construction sites, it is still a much-needed material. That's where precast concrete comes to play. Precast concrete is factory-made in exact measurements and then shipped to the construction site.

While you may not notice the difference between regular and precast concrete, you may see precast concrete featured in structures like bridges, foundations, parking garages and, in some cases, entire buildings.

Benefits:

- Exact-batch technology during the production process leads to less waste
- Can adapt to various climates without cracking or sustaining other damages

10. MYCELIUM

Mycelium is the thin fibers from fungi that run underneath the ground as if they are roots. When harvested and dried, mycelium becomes an extremely durable, water, mold and fire-resistant building material.

Dried mycelium can combine with other materials, like sawdust and demolition waste, to create bricks for building structures. While not widely used today, mycelium is an organic and renewable resource capable of revolutionizing the construction industry as we know it.

Benefits:

- Renewable and earth-friendly resource
- Completely compostable and leaves behind no waste

11. SHEEP WOOL

Sheep's wool is a renewable and natural resource that can be harvested and used without hurting the animal. While we typically use wool in the making of clothing and other textiles, it's also useful to insulate buildings. Unlike human-made insulation, sheep's wool is natural, non-toxic and mold resistant.

Benefits:

- Lasts longer over time, leading to less waste
- More effective than its man-made counterparts
- Provides more energy savings to those who use it

12. POLLUTION-ABSORBING BRICK

With growing environmental concerns, air pollution is one of the main problems that has proved difficult to solve. While other sustainable building materials are effective ways to cut down on CO2 emissions, pollution-absorbing brick seeks to neutralize emissions.

These double-layered bricks have porous blocks that allow air to pass through as it filters out pollutant particles - coarse and fine. While pollution-absorbing bricks are rarely seen in construction today, this futuristic material can be a sustainable, air-filtering alternative to the use of earth brick.

Benefits:

- Self-sustaining ventilation system
- Innovative solution for greener construction materials and practices.
- Growing cities can use this technology to provide cleaner air to its residents

13. 3D-PRINTED CONCRETE

We know that concrete is a building material that's not going anywhere any time soon. While there are a few viable alternatives to concrete, there are also ways to make the production of concrete more sustainable. One of which is the use of 3D printing. 3D-printed concrete allows the contractors to digitally design any shape and use concrete to "print" it.

Benefits:

- Time, energy and money-saving
- The ability to print on demand leaves no waste behind
- Save energy and money on transporting materials

14. CORDWOOD

Cordwood is a building method that uses stacked short logs, similar in shape to firewood, to build a wall. Cob or mortar is used between the wooden logs to secure everything together. The cordwood technique is typically seen in homes and provides a rustic cottage look to the overall structure. Cordwood offers natural insulation and can use local materials to save energy and money on transportation.

Benefits:

- Inexpensive and easy to construct
- Saves time and energy on home construction
- The mixture of cob and wood prevents heat transfer for lower energy consumption

15. RECYCLED TIRES

Until recently, rubber tires weren't recycled and were left cluttering landfills. Thankfully, experts have found that the rubber found in tires provides durability, flexibility and insulation, all of which are important factors in building materials.

Some sustainability-focused homes, known as Earthship homes, use recycled tires filled with sandbags as insulation. Others are working on

ways to make rubber masonry blocks with recycled tires that builders can use for new structures.

Benefits:

- A sustainable way to keep tires out of a landfill
- A recycled material that can convert into home insulation

16. NEWSPAPER WOOD

Although paper is one of the easiest materials to recycle, paper waste is a growing concern. With new innovations and advances in technology, companies like Newspaper Wood seek to turn paper back into wood. While newspaper wood is not yet usable in construction projects, there are promising results in furniture and home decor.

Benefits:

- Keeps paper waste out of landfills
- Prevents the overconsumption of new lumber
- Slows deforestation

17. PLANT-BASED POLYURETHANE RIGID FOAM

Rigid foam has been around for a few decades as an effective insulator for homes and commercial buildings. However, a key compound in the original version of rigid foam was found to be harmful to the environment. That's where rigid foam's newer, eco-friendly counterpart is helpful.

Plant-based polyurethane rigid foam uses a mixture of bamboo, hemp and kelp that is great wall insulation. This improved rigid is also good for furniture and even surfboards.

Benefits:

- Protects against mold and pests
- Has a longer life span than other traditional insulation methods
- A high-quality thermal insulation that saves energy and money on cooling and heating

18. STRAW BALES

The use of straw in construction dates back centuries before our current day, but it still proves to be one of the most sustainable building materials readily available today. Like many of the other materials already mentioned in this article, straw is

another renewable resource that works well as insulation.

As long as it is properly protected from moisture, straw bale insulation can last for years on end.

Benefits:

- Improves air quality and absorbs carbon dioxide
- Produces low emissions, especially when compared to human-made insulation
- A fast-growing and all-natural reusable insulation material
- Biodegradable and leaves no waste behind

19. RECYCLED GLASS

Glass is one of the hardest materials to recycle, leaving it discarded in landfills and high-pollution areas. As a step in the right direction, recent studies are finding that construction projects can use waste glass to imitate natural aggregates, like sand, gravel and crushed stone.

Cement makers can also use recycled glass in their mixture. While using recycled glass is not a common practice in construction, this is an exciting new development that could benefit the environment and our landfills.

Benefits:

- Keeps discarded glass from cluttering landfills, waterways and polluted areas
- Provides a replacement for natural resources in construction

20. RECYCLED STEEL

As previously mentioned, producing steel can be harmful to the environment, yet it continues to be necessary for building frameworks and supporting entire structures. One of the best qualities of

steel is that it has an unlimited life cycle, which means it can be recycled repeatedly and never lose its quality or durability.

Seeking out recycled steel for new construction projects saves energy while effectively reducing a project's carbon footprint.

Benefits:

- Slows the production of new steel, which emits large amounts of CO₂
- Steel is the easiest material to recycle without losing its quality or value

SUSTAINABLE CONSTRUCTION METHODS

Sustainable construction goes beyond the materials contractors use in their projects. Certain construction practices and methods are proven to be more earth-friendly and enhance sustainable efforts. Sustainable construction methods include, but are not limited to:

- Using exact measurements to cut and produce materials and minimize waste
- Improving waste management by recycling materials
- Constructing green buildings
- Refurbishing old builds rather than building new ones
- Managing the CO₂ transmissions created by construction sites
- Encouraging workers to use eco-friendly practices onsite
- Examples of these practices include recycling food packaging or using reusable containers, not smoking, minimizing paper usage, etc.
- Conserving energy
- Using the sustainable materials above

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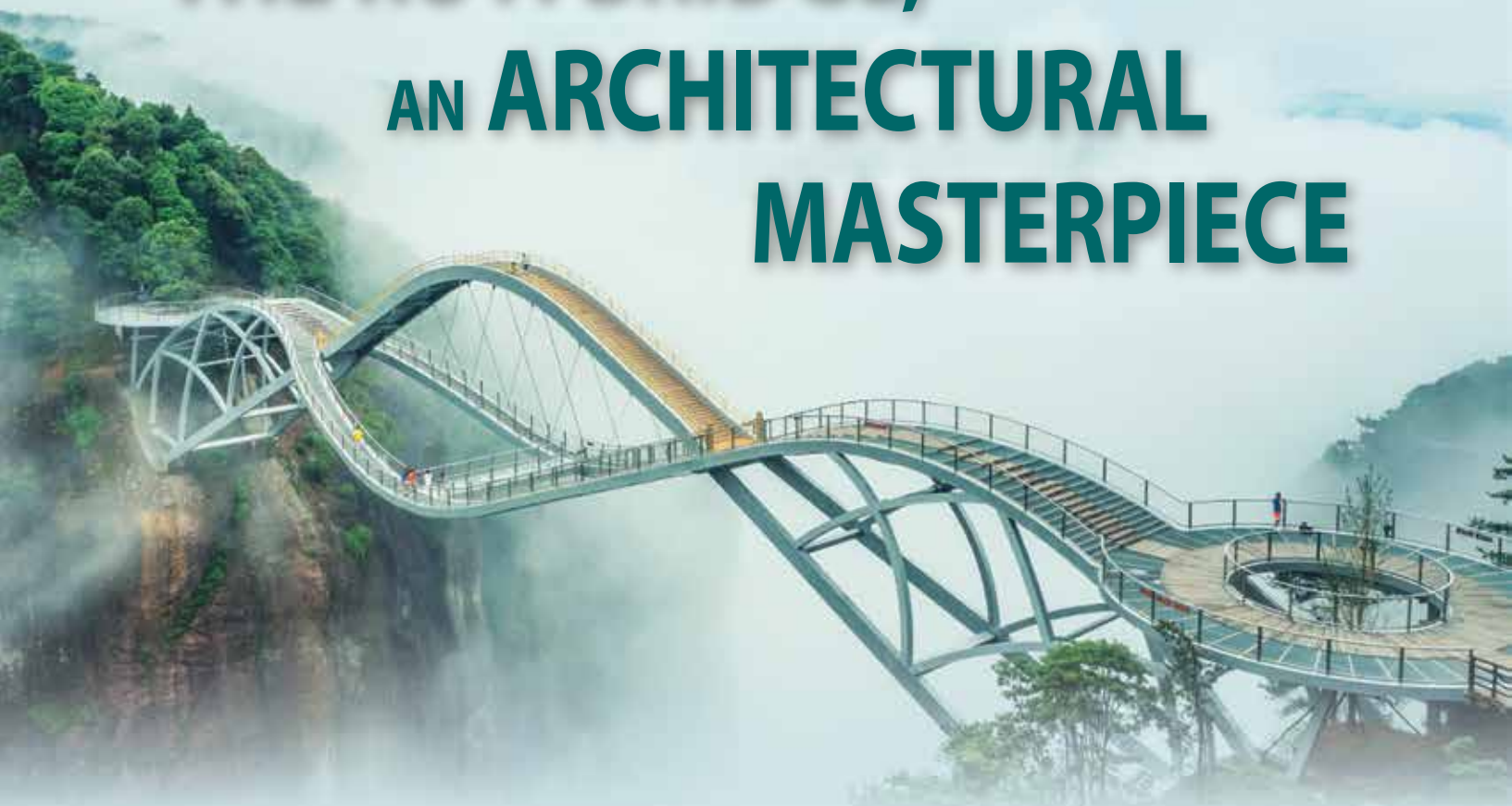
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THE RUYI BRIDGE, AN ARCHITECTURAL MASTERPIECE



Capt. John's search for Modern Bridges that will inspire quilters has brought him to China's Zhejiang province and the majestic **Ruyi Bridge**. Have you ever seen a quilt and wondered, "How'd they do that?" This bridge will have you asking the same question. As is very common with many of today's quilts, it combines the traditional with the modern.

Here is why the **Ruyi Bridge** in Taizhou, Zhejiang, China will inspire quilters:

"Here is a bridge whose design was inspired by a treasured item. Then movement was added as part of its strength.

The Ruyi Bridge, an architectural masterpiece nestled in the heart of China. The bridge is a bending glass-bottomed structure spanning across a canyon in the Shenxianju scenic zone in Xianju county in east China's. Constructed on May 1, 2019 and designed by the renowned architect Wang Jianguo, the Ruyi Bridge seamlessly blends traditional Chinese aesthetics with modern engineering principles.

Inspired by the shape of a ruyi, a traditional Chinese ceremonial scepter symbolizing good fortune and prosperity, the bridge's design embodies elegance and grace. The gentle curves of the bridge resemble the delicate petals of a lotus flower, creating a sense of harmony and tranquility for those who traverse it. The unique design of the Ruyi Bridge has captured the imagination of visitors from around the world.

The construction of the Ruyi Bridge was no small feat, with a total cost of ¥1.2 billion (\$170 million). Located in the picturesque city of Ruyi, the bridge spans over the serene Li River, offering breathtaking views of the surrounding landscape. The bridge serves as a vital transportation link, connecting the bustling city center with the residential areas on the other side of the river.

Beyond its practical function, the Ruyi Bridge has some fascinating facts that make it a true marvel. The bridge spans an impressive length of 500 meters, making it one of the longest cable-stayed bridges in China. It stands at a height of 120 meters, allowing ships to pass beneath it with ease. The bridge is also equipped with state-of-the-art LED lights, which illuminate the structure at night, transforming it into a dazzling display of colors."

Stay tuned and come back next week to find out the next Modern Bridge that will inspire quilters.

Here are some photos of the **Ruyi Bridge**, along with the inspiration for it's design, in Taizhou, Zhejiang, China that crosses the Shenxianju Valley.

*This is a "ruyi, a traditional Chinese ceremonial scepter symbolizing good fortune and prosperity" that inspired the shape of the bridge.
(Photo from the Beijing Museum)*



Courtesy : Cover photo: By Original work: He Yunchang Depiction: He Yunchang

THE TOP 3 TRENDS THAT WILL IMPACT THE CONSTRUCTION INDUSTRY IN 2024

Leaders at The Hartford share how technology, proper planning and strong recruitment efforts can help combat the ongoing construction labor shortage and supply chain delay



As more than 40% of the current U.S. construction workforce will retire in the next decade, industry leaders need to equip themselves with the necessary resources to combat the shifting work environment.¹

“Trends in the construction industry will fluctuate in the coming years, which can lead to additional risks for industry leaders. It will be important to think about how they can address any potential risk factors. A lot of leaders have been increasing

their planning efforts and looking into technology solutions to combat the ongoing labor shortage,” said David DeSilva, head of construction at The Hartford. Here, he outlines the top three top trends for business leaders to watch in 2024.

1. Ongoing Labor Shortages

Construction is an industry that traditionally has a high labor turnover rate, which means companies need to hire more frequently. This only increases

during labor shortages. The construction workforce is up against several factors, including an aging workforce and recruitment struggles.

Additionally, there has been an increase in large construction projects in concentrated pockets across the country.

“A lot of large-scale projects are happening across the country, many in close proximity to each other. These projects require a massive number of workers, which causes a major drain to surrounding area contractors and projects that need workers,” says Chris O’Hala, managing director of construction risk engineering at The Hartford. “They aren’t just pulling front line laborers and craft workers, but also superintendents, project managers, and safety management personnel. You combine that with the aging workforce, lack of early career entrants, and it is the perfect storm for creating a challenging recruitment environment.”

In 2024, the construction industry will need to attract an estimated 546,000 additional workers on top of the normal pace of hiring that happened in 2023 to meet the demand for labor.²

The industry is seeing a particular increased need for professionals to enter the construction field as field engineers, superintendents, project managers, safety and quality managers, architects and engineers.

“A lot of folks still believe a career in construction is about getting out there with a shovel in your hand and performing manual labor. There is certainly a labor component to the work, but there are so many other opportunities in the industry,” says O’Hala.

Recruiting younger generations will be vital to recruitment in 2024 and beyond. “Firms have to expand their talent pool, and it is important to think about how you can attract younger people from all different backgrounds and locations. There has never been a better time to be in the construction industry because there is a huge push in the industry to have good culture, with a focus on safety, technology and wellness,” says DeSilva.

2. Increased Supply Chain Management

The construction industry has been critically impacted by supply chain delays since early 2020. However, there is hope on the horizon as professionals have seen the supply chain delays begin to stabilize. “We believe some of the pressures are easing from the COVID-19 pandemic and related issues, like product delays, have slowly alleviated. Yet there are still some bottlenecks with things like electrical equipment, so it is still critical to plan well in advance,” said O’Hala.

The bottlenecks and supply availability caused by the pandemic exposed other areas of weakness in the supply chain as well. Climate change creates the question of how and when certain items will be available, while turmoil overseas requires companies to stay vigilant on inventory availability.

“For example, look at materials and products that comes from China and Taiwan. As political tension increases, companies need to factor in if they will have access to these materials and how costs are fluctuating,” says DeSilva.

Supply chain management, timely procurement for deliveries and efficient warehouse management will be the key factors to staying on schedule in the year ahead.

“Companies need to invest in staffing and tools to create supply chain plans at the project and company level. You cannot expect materials to be available when you need them. It is crucial to form new relationships and vet new suppliers,” says O’Hala.

Additionally, business leaders can explore purchasing programs that will help to lock in set pricing. “Businesses should consider escalation clauses when contract planning. From the time you sign a contract to putting the first shovel in the ground, pricing for materials will change. By putting in these clauses you are protecting yourself by securing an agreed cost range,” says DeSilva.

It's also important to have multiple options in the supply chain to serve as a back-up in case your primary supplier has capacity or logistical issues; or worst-case scenario, goes out of business. By diversifying relationships with vendors and contractors, businesses can decrease the possibility that they will be left without materials mid-project.

3. Emerging Technology

The evolution of construction technology has been slow, but transformation is happening to make the industry safer, more cost-effective and efficient.

“Construction has been a late adopter to technology. This creates new opportunity for leaders in the industry to find ways to include technology in their daily practice. As we’ve seen, the shortage of labor has created higher levels of workmanship issues due to lack of capacity. This is the perfect opportunity to implement effective technology to better protect job sites,” says DeSilva.

For example, companies are investing heavily in imagery technology to monitor job sites more effectively. “Site managers can’t be on the job at all times. This is a way to record what is happening and monitor various aspects of a project at one time, which .

helps encourage worker safety and site security. A safety manager can cover more ground with this imagery technology in place. Instead of overseeing a single project, they might have capacity for multiple projects,” says O’Hala.

Construction companies are also increasing the use of information tracking systems and dashboards. These systems provide a centralized hub for all project stakeholders to obtain real-time access to project information like contracts, design plans and specifications, safety plans and contracts.

Additional popular technology that’s being deployed on construction sites includes:

- **Drones:** Drones have been used to conduct site inspections in remote or hard to access areas. With drones you can make 3D and topographical models and obtain high-resolution images of job sites.
- **Wearables and site sensors:** Construction wearables can be placed on workers or in the personal protective equipment (PPE) or clothes of employees. They use GPS tracking and biometrics to mitigate accidents. Wearables can track slips and falls, while site sensors can warn workers about potential hazards and make the jobsite safer. They can track noise levels, dust saturation, temperature and the presence of hazardous substances.
- **Robotics:** Repetitive tasks can be executed by robots, such as bricklaying and tying rebar. Automation saves workers’ time and allows them to focus on more complex tasks. Robotics is also a promising way to prevent injuries and fatigue on a construction team.

Overall, there is a push to move the construction industry away from manual labor and towards technological methods. “Now is the perfect time to dip your toes in the water and figure out what this is like to work with technology. You need to start somewhere. Pick a problem you have and find a technology solution to help,” says DeSilva

Protecting Your Company Long Term

As new methods are integrated to mitigate on-going labor and material shortages, leaders should be aware of the added risks they can create – and the solutions that exist to support companies.

“The decreased number of workers, paired with increased work hours, fatigue and lack of process knowledge, creates a greater chance for loss. You must understand the technology, and its limitations, while also staying up-to-date on new offerings in the construction technology and equipment sectors. Additionally, it is important to explore resources that help train workers who might have a lesser skillset or simplify overly complex processes,” says O’Hala..

To best protect your company from loss, start with a strong, proactive leadership team. Prioritize hiring, effective onboarding and continuous training as a means of promoting safety and quality efforts.

“It starts with the leaders of a company. When you have less experienced workers coming in, what types of training are you putting them through to ensure ongoing success? Do you have mentorship or apprenticeship programs? These are all risk mitigation techniques to prevent product issues and decrease workers compensation injuries. It is about accountability and proactiveness as leaders,” says DeSilva.

1 “Replenishing The Construction Labor Shortfall,” Forbes, August 2022

2 “Construction Workforce Shortage Tops Half a Million in 2023, Says ABC,” ABC, February 2023

3 “10 Construction Technology Trends Impacting the Industry,” UK Connect, July 2023

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Credit: The Hartford Staff

11 EYE-CATCHING BUILDINGS OPENING AROUND THE WORLD IN 2023



Designed by REX with Davis Brody Bond Architects as the executive architect.
PHOTO: THE RONALD O. PERELMAN PERFORMING ARTS CENTER

1. The Ronald O. Perelman Performing Arts Center by REX | New York City



Toranomon-Azabudai by Heatherwick Studio in Tokyo.
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2. Toranomon-Azabudai by Heatherwick Studio | Tokyo



Grand Egyptian Museum in Cairo.
PHOTO: HENEGHAN PENG ARCHITECTS

3. Grand Egyptian Museum by Heneghan Peng Architects | Cairo



Zhuhai Jinwan Civic Art Centre by Zaha Hadid Architects in Jinwan, China.
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4. Zhuhai Jinwan Civic Art Centre by Zaha Hadid Architects | Jinwan, China



Abrahamic Family House in Abu Dhabi by Adjaye Associates.
PHOTO: ADJAYE ASSOCIATES

5. Abrahamic Family House by Adjaye Associates | Abu Dhabi



La Nube by Snøhetta in El Paso, Texas.
PHOTO: SNØHETTA

6. La Nube by Snøhetta | El Paso, Texas



The Pyramid of Tirana by MVRDV in Tirana, Albania.
PHOTO: MVRDV

7. The Pyramid of Tirana by MVRDV | Tirana, Albania



Merdeka 118 by Fender Katsalidis in Kuala Lumpur.
PHOTO: FENDER KATSALIDIS.

8. Merdeka 118 by Fender Katsalidis | Kuala Lumpur, Malaysia



The Arkansas Museum of Fine Arts by Studio Gang in Little Rock, Arkansas.
PHOTO: ARKANSAS MUSEUM OF FINE ARTS

9. Arkansas Museum of Fine Arts by Studio Gang | Little Rock, Arkansas



The Factory International by OMA in Manchester, England.
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10. Factory International by OMA | Manchester, England



Goethe Institut in Dakar, Senegal.
PHOTO: KÉRÉ ARCHITECTURE

11. Goethe Institute by Kéré Architecture | Dakar, Senegal

Courtesy : Galerie

WHAT IS THE FUTURE OF CONSTRUCTION?

The future of construction is expected to be influenced by several of the latest construction industry trends and technologies. Here are a few key areas that are quickly reshaping the industry:

1. Sustainability and green building

As environmental concerns increase, the need for sustainability and green building also increases. Sustainable construction practices are in demand for building high-performance homes that focus on energy efficiency.

2. Building apps

Construction apps improve efficiency and allow your team to better communicate. Besides reducing paperwork, a robust construction software will allow for real-time collaboration and document sharing and will perform project management tasks that'll save you long hours of administrative duties.

3. Prefabrication and modular construction

Prefabrication and modular construction methods, or “prefab,” are both efficient and cost-effective. Prefabricated construction materials are made off-site in a factory and assembled onsite at the project location. This method is growing in popularity because it gives greater quality control and reduces building time and material waste.

4. Robotics and automation

Robots are being used for labor-intensive tasks such as pouring concrete, bricklaying and loading bulky or heavy material onto trucks. Using a robot can improve accuracy and reduce risk for team members doing dangerous tasks.

5. Building information modeling (BIM)

Building information modeling is a software program used to model construction projects. It's essentially a digital representation of what the project will look like when it's complete and a helpful way to walk through details with clients and key project players.

6. Artificial intelligence (AI)

Artificial intelligence and machine learning are being used in the construction sector to automate tasks and analyze construction data. Many businesses use AI chatbots to help compose social media posts and to write customer messages or project proposals. AI has enormous potential. As it continues to expand, it'll become an even bigger player in the industry.

7. Internet of Things (IoT) and smart buildings

The Internet of Things and smart buildings include “things” such as AI voice assistants and other devices embedded with software to exchange and collect information. They're helpful for contractors who want to gather data from job sites. The ability to monitor energy usage, equipment operation, job completion and security takes a lot of work off your project manager's shoulders.

8. Augmented reality (AR) and virtual reality (VR)

The purpose of AR/VR is to enable a client or team members working remotely to view the job site as if they were standing in front of the project. AR allows designers to overlay digital images onto images of the actual construction site. VR gives lifelike images and video for design review or for construction walk-throughs and approvals.

9. 3D printing

Large-scale 3D printers have the ability to print custom construction projects for a fraction of the material and labor costs. Printing speeds up the process and allows for a lot of design flexibility. Construction companies are printing everything from sections of crown molding to entire buildings.

Why companies should consider the future of construction

For the future of your business, it's essential not to fall behind on construction trends. You don't need to embrace every trend out there, but to remain competitive and a leader in the market, you should be informed about where the industry is headed.

Competitive advantage

Understanding the latest construction technology, sustainability practices and efficient construction methods will secure your competitive advantage. Applying green building practices and offering smart home technology will help you stand out against your competitors and improve your marketing for future success.

Increased efficiency and productivity

Putting technology like BIM, AR/VR and digital printing to use will greatly increase your efficiency and productivity. Using AI to automate basic tasks and engage on social media will save you hours and leave you with more time to engage in those high-level decisions and projects.

Sustainability

You can make your building practice more sustainable by making simple changes: Use renewable materials, properly insulate to maximize energy efficiency, install LED lights and regulate thermostats and lighting with smart home technology. Sustainable construction processes like these are referred to as building science – these changes aren't drastic, but they're a step toward sustainability.

Enhanced project outcomes

Adopting new technology will help with project planning and client communication. AR/VR technology will allow your clients to visualize their new home and make informed design decisions before the construction begins. When the project is complete, no one will be surprised with the results.

Talent attraction and retention

Top talent is attracted to businesses that are willing to embrace change – and that includes new trends and technologies. By accepting trends, you're future-proofing your construction business by showing talent you're innovative and a leader in the industry.

How businesses can navigate the future of construction

Upcoming trends will impact your business even if you choose not to adopt them. Here are some key trends and suggestions on how to navigate them:

Adoption of new technologies

New technology in construction is available to make your life easier. Learn about each technology before

deciding if it's for you or not. Building information modeling and project management software were both created to ease communication and improve the quality of your work.

Skill requirements and workforce development

Creating a culture of continuous learning will attract young talent and keep you on top of your game. Offering training programs for your team to learn about new trends and technologies will bring everyone up to speed on what's happening in the industry.

Increased focus on sustainability

Sustainable construction practices are a priority. If you've been able to push this off, it's important to educate yourself. Many places are starting to mandate eco-friendly practices so stay ahead of the curve on everything from solar panels to rainwater harvesting systems.

Collaboration and communication

Technology simplifies communication. A construction management software provides a central platform to host project documents, track progress and streamline communication with your team and clients. Collaboration and communication are vital to the success of your construction project.

Shift in business models

A residential construction contractor may shift models to add extra revenue by providing maintenance or facility management. Evolving client demands could present opportunities to move into energy retrofits, renovations and smart home installations.

Enhanced project management

Adopting a smart project management software will change your entire workflow. You'll easily track project progress, update timelines and spot problems with subcontractors or mismanagement of the worksite. Clients enjoy the photo and progress updates, and future clients will expect a software that'll provide this for them.

Safety and risk mitigation

Construction can be a dangerous job if safety protocols are not strictly followed. As construction evolves, there's more of an emphasis on the well-being of construction workers, and that includes ensuring their safety. Ideas for navigating this include requiring safety checks to minimize accidents and establishing a safety committee to mitigate potential risks. Technologies that can help include drones to investigate site conditions and robots to perform riskier jobs like welding or cutting material.

Courtesy : Buildertrend

MODULAR CONSTRUCTION: A

CHALLENGE STATEMENT FOR SRI LANKA



Dr. Ashan Senel Asmone

Modular construction, also known as off-site construction, is a growing trend in the construction industry, with many companies investing in it to improve productivity and efficiency. In recent years, skyscrapers built with modular construction techniques have popped up around the world. Some notable examples include The Ark in London; The B2 Tower in New York; The Mini Sky City in Changsha, China; The T30 Hotel in Melbourne, Australia; The Rise in Vancouver, Canada; and The Clement Canopy in Singapore.

Modular construction has the potential to significantly reshape the way we build today, with many companies investing in it to improve productivity and efficiency¹. However, the current modular construction projects have also faced problems. For example, a recent project in Bristol, UK has run into problems, where it is building 185 modular homes, a mix of flats and houses, but has faced issues with the foundations, which has led to a 12-month delay. However, the trend is growing and is expected to continue to grow in the future.

Modular construction involves the production of individual components in a factory setting. Then these components are transported to the site and assembled, significantly reducing the construction time. Traditional construction, on the other hand, involves building on-site from the ground up, which can be time-consuming and can result in more waste. One of the most cited advantages of modular construction is time efficiency. This efficiency not only reduces the overall project timeline but also minimizes the disruption to the surrounding environment. The off-site building process results in less waste and energy usage. Furthermore, the potential for reusing modules can contribute to a circular economy, further enhancing sustainability. At the same time, the controlled factory environment of modular construction allows for reduced health and safety risks.

Setting up the factories for manufacturing components can no doubt be a large investment, making modular construction not necessarily cheaper upfront. Yet it offers long-term savings. The factory-based manufacturing process allows for greater quality control, reducing the likelihood of costly repairs down the line. Moreover, the potential for economies of scale can make modular construction more cost-effective in the long run.

Significant initial investment can be a deterrent to many in a developing economy like Sri Lanka. The challenges of setting up modular construction is more significant in developing countries like Sri Lanka where the construction industry is highly segmented and traditional construction methods are deeply ingrained, leaving little incentive or investment for change. Therefore, there is a strong resistance to change due to the perceived risks and uncertainties associated with such new construction methodsⁱⁱ. Additionally, a lack of expertise, experience, and technological support keeps hindering the widespread adoption of modular construction in the countryⁱⁱⁱ.

Despite these challenges, studies have shown that introducing a modular concept to the industry would benefit the Sri Lankan construction industry and that it would bring economic benefits that are significantly more important than environmental and social benefits when selecting modular construction^{iv}. Several key strategies could be considered to overcome the challenges of implementing modular construction in Sri Lanka and prepare the construction sector for 21st century global challenges. Starting off with Governmental support through financial incentives or subsidies to encourage the adoption of modular construction. This could help offset the high initial costs and make modular construction more affordable. Regulatory reforms can supplement these incentives with changes to current planning regulations and especially on procurement policies. Any such state buy-in would pave the way for collaboration, and partnerships between local companies and foreign contractors can help local companies gain access to new technologies and expertise. This will bring forth investments in technological advancements that can facilitate modular construction in a virtuous cycle.

By implementing these strategies, Sri Lanka could overcome the challenges associated with modular construction and use its potential for sustainable construction. This would not only contribute to the country's economic development but also help it meet its environmental goals and tackle the global challenges we are facing in the 21st century. Additionally, modular construction's alignment with sustainable practices has significant implications for green building rating systems such as LEED, BREEAM, and Green Mark; owing to their shared principles of efficient use of materials and reduction of on-site waste. Therefore, modular construction can be an attractive choice for developers looking to achieve both sustainability and recognition in the industry. Modular construction presents a promising alternative to traditional construction methods in the pursuit of sustainable construction. While it may have some limitations, its benefits in terms of time efficiency, quality control, and reduced environmental impact make it a viable solution for the future of construction.

ⁱ *Modular construction: From projects to products | McKinsey.* (2019, June). <https://www.mckinsey.com/capabilities/operations/our-insights/modular-construction-from-projects-to-products>

ⁱⁱ Jayawardana, J., Jayasinghe, J., Kulatunga, A. K., Sandanayake, M., & Zhang, G. (2022). Prefabricated Construction in Sri Lanka: From a Sustainability Perspective. *International Conference on Sustainable Built Environment*, 451–460.

ⁱⁱⁱ Munmulla, T., Hidallana-Gamage, H. D., Navaratnam, S., Ponnampalam, T., Zhang, G., & Jayasinghe, T. (2023). Suitability of Modular Technology for House Construction in Sri Lanka: A Survey and a Case Study. *Buildings*, 13(10), 2592.

^{iv} Sandeepani, T. A. S., Ekanayake, E., & Ilnaz Ashayeri, I. (2023). Modelling design stage risks in modular integrated construction projects in Sri Lanka. In *Proceedings of The 11th World Construction Symposium*.

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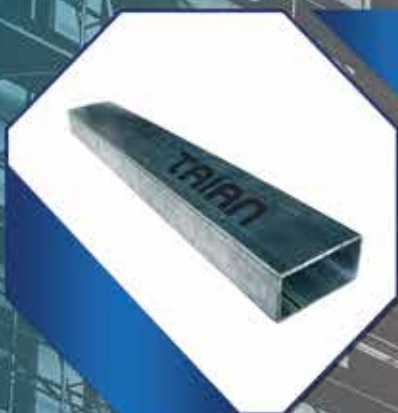
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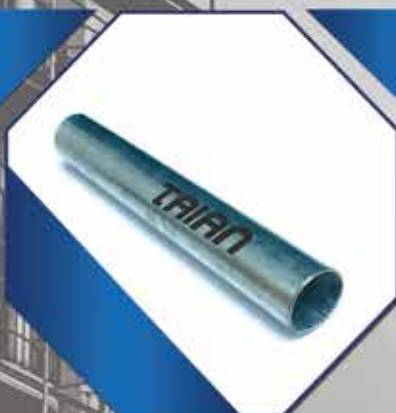
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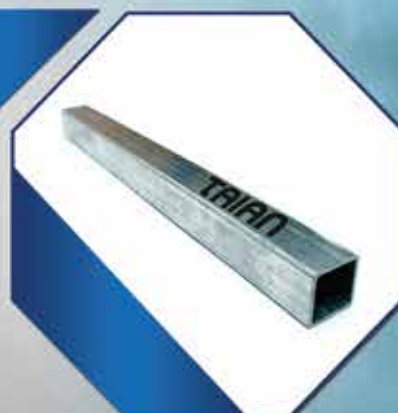
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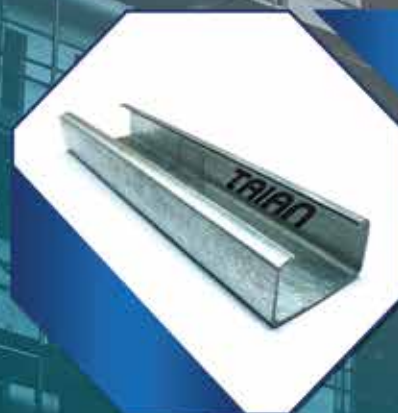
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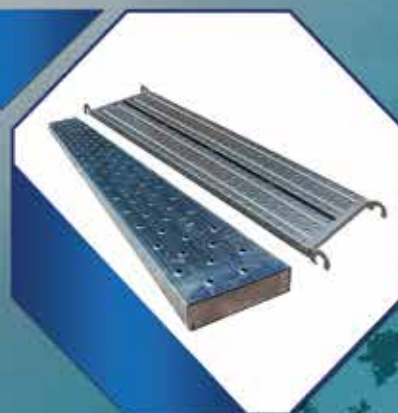
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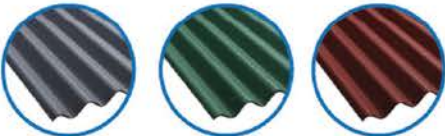
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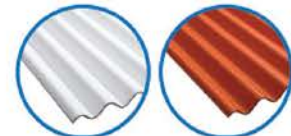
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