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RESEARCH PAPER

Integrating Sustainable Development Goals in Smart Cities: Lessons from Markaz Knowledge City, India

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ABSTRACT

PURPOSE: Sustainable cities are a key focus of the United Nations Sustainable Development Goals (SDGs), especially SDG 11, which aims for inclusive, safe, resilient, and sustainable cities. In this example, we illustrate Markaz Knowledge City's development from a concept to a thriving community.

METHODOLOGY: We conducted a detailed case study by looking into scientific research, regulatory documents, sustainability reports and the ancient wisdom for achieving sustainability. Our approach combines theoretical insights with practical applications, focusing on environmental conservation, socio-economic benefits and cutting-edge solutions.

FINDINGS: Key successes include advanced water recycling, waste management, clean transportation, energy-efficient technologies, high air quality, sustainable agriculture and the use of renewable energy. The city also acts as an economic driver, providing direct jobs for about 4,000 people and improving local living standards for 200,000 people through better healthcare, education and economic opportunities.

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ORIGINALITY/VALUE: This study offers fresh perspectives to build a self-sustaining urban environment by blending ancient wisdom and modern technology in rural settings. These insights are valuable for urban planners, environmental scientists, policy-makers and international organisations dedicated to sustainable development.

RESEARCH LIMITATIONS: Future research could explore similar projects in different regions to validate and expand these insights. The study shows how rural areas can achieve SDG 11, contributing to sustainable development on a larger scale.

PRACTICAL IMPLICATIONS: It emphasises the importance of community engagement and capacity building in fostering sustainable development. These lessons can guide urban planners and policy-makers in enhancing sustainability across various projects worldwide.

KEYWORDS: *UNSDG; Markaz Knowledge City; Rural Sustainable Development; Water Recycling; Clean Transport; Renewable Energy; Sustainable Urbanisation*

INTRODUCTION

This paper explores the process of the development of Markaz Knowledge City (MKC) in rural southern India. We will show how the city combines spatial planning with environmental awareness and supports the United Nations Sustainable Development Goals (UN SDGs) especially SDG 11, the creation of inclusive, safe, resilient and sustainable cities. Situated in the lush green landscapes in the valley of the Western Ghats, Markaz Knowledge City spans 500,000m^2 of land area with 300,000m^2 of built-up area. Total areas are demarcated into six zones, such as education, culture, residential, commercial, agriculture and healthcare zones. The city hosts around 20 various functional units, 10 of which provide various types of education (Markaz Knowledge City, 2024). It presents residence to approximately 5,000 humans across 1,400 residential flats, star-rated hospitality and wellness centres for global visitors. Figure 1 depicts the entire landscape of the city photographed in March 2023 using a drone.

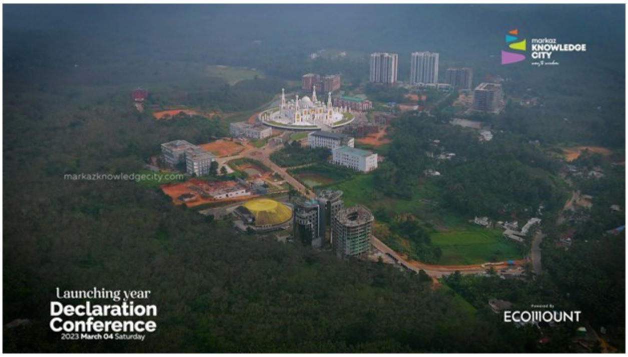

Figure 1 Panoramic view of the city photographed on March 2023 using drone

Source: Photograph captured from the Markaz Knowledge City Site

METHODOLOGY

To understand the journey of Markaz Knowledge City from concept to community, we undertook a detailed case study. We researched scientific papers, regulatory documents, sustainability reports and ancient city planning strategies. After thorough analysis, we identified all the environmental and social challenges of the project. We appointed environmental consultants to find and recommend solutions for the challenges posed by large-scale construction in rural areas, Environchem Laboratories Private Limited (2015).

The problems and solutions received from the environmental scientists were converted into simple PowerPoint presentations. These presentations were used to create awareness among people from all strata in the surrounding area that would benefit directly from the city. Together with these presentations, the benefits of such developments for the people in terms of education, health and livelihood were explained clearly; this mobilised support from the local community.

In addition, a study of ancient cities showed us sophisticated systems for managing natural resources, public health and harmonious living. Our approach is a blend of theory and practice, environmental conservation, innovative solutions and socio-economic benefits. We studied cities from different regions and eras, Indus Valley, Mesopotamian cities, Babylon (Hanging Gardens and Babel Tower), Petra and Fez in Morocco, Kingdom of Saudi Arabia (Al Madinah, Makkah) and Alhambra Palace. Key findings from the studies conducted from the records of the ancient cities are illustrated below:

- Water management by gravity
- Advanced drainage systems
- Water storage systems
- Irrigation and canal systems for agriculture, even in desert regions
- Food security and urban stability
- Sewage and waste disposal
- Passive cooling and lighting
- Use of local and natural materials
- Good transportation; ships and carts

Notable findings among the above-listed key findings are detailed in the subsequent sections.

Indus Valley Civilisation: The cities of Harappa and Mohenjo-Daro had advanced drainage systems, public baths and water storage facilities. These innovations ensured a steady supply of water and effective sewage disposal for public health and sanitation (Allchin, 2024).

Mesopotamia: Irrigation and canal systems helped agriculture in desert regions, ensured food security and urban stability (van der Crabben, 2023).

Babylonian Wind Towers: These towers used natural ventilation to cool buildings, and showed an early understanding of passive cooling techniques (Pinto, 2015).

Al Hambra Palace, Spain: The alignment of rays of sunlight with the building's architectural elements helped to receive natural lighting and temperature control. This helped them to minimise dependence on any external energy (al-Rhodesly *et al.*, 2018).

Petra: The city used local sandstone that was abundant and provided natural insulation (Rababeh, 2005).

Kingdom of Saudi Arabia: Courtyards promoted community living while ensuring privacy and space optimisation (Alnaim, 2024).

Implementation Strategies (Adopting Ancient Wisdom)

Despite many regulatory and environmental challenges, MKC has created a sustainable city taking best practices from ancient wisdom as illustrated in the previous section, while preserving the natural landscape. In addition to adopting best practices, modern technology is also integrated to make the city smarter and to minimise the carbon presence.

Water Management by Gravity

MKC uses a gravity-based plumbing network to minimise energy use, extensive rainwater harvesting, and tanks and natural pits for water storage. Water flow is maintained by gravity wherever possible, as seen in Figure 2, to ensure the flow of water to the dam.

Figure 2 Water flow is maintained by gravity to ensure flow of water to the dam

Source: Photograph captured from the Markaz Knowledge City Site

Water Storage Systems

Rainwater is harvested from each building and land area; this is allowed to pass through natural and manmade drainage systems and accordingly diverted into ponds, dams and pits that were primarily made to store water. The storage system holds more than 35 million litres of water for various uses in the city: on average, 400,000 litres of water per day is consumed in the city.

Natural filter pits are made in the drainage stream to purify the water along the way before it reaches its destination. Activated carbon is used for natural filtration. In addition to this, silica-based water purifiers are used wherever more purification is required. The filtered water is used for general purposes, such as cleaning and irrigation. For potable purposes, only natural well water is used and, accordingly, wells are dug in the premises of all the functional units of the city. This is being implemented in the city through strong policies. The main dam for water storage that holds 35m litres of water is shown in Figure 3.

Figure 3 Main water storage dam in the Markaz Knowledge City capable of storing 10 million litres of water

Source: Photograph captured from the Markaz Knowledge City Site

Since the area is tropical in nature and receives 4-5mm of rainfall on average, for 6 months of the year (Weather and Climate, 2023), storage of the water without overflow is a big challenge. There is, however, a big demand for stored non-toxic water for construction purposes and irrigation of farms around the city.

Drainage Systems

Wherever possible, natural gravity is used to flow rainwater and wastewater. A manmade drainage system is integrated into the landscape to ensure the flow of water into designated channels and prevent water logging in the city. Additional measures are taken to collect water, filter it using conventional methods and direct it into storage systems.

Irrigation System

Water used in the Cultural Centre for ablution is channelled separately and purified using silica-based purifiers and returned back to irrigate the lawns in the Centre. In this way, 70,000 sq.ft of lawn area is irrigated using 20,000 litres of water collected from the ablution area.

Harvested rainwater is used for drip irrigation in most of the green areas covering almost 200,000m^2. Treated wastewater is used for irrigating ornamental landscape features, as illustrated in Figure 4. This water is also diverted through canals for agricultural purposes.

Figure 4 Treated wastewater is used for irrigating ornamental landscape
Source: Photograph captured from the Markaz Knowledge City Site

Effective Sewage and Waste Disposal

Of the water used for domestic functions that include bathing or washing as well as kitchen and sewage water within the city, 75% is re-cycled and re-used. The treated water feeds into decorative fishponds, therefore integrating aesthetic and ecological functions.

The water is treated using natural enzymes as biological catalysts that accelerate the breakdown of organic matter present in wastewater, resulting in efficient and eco-friendly treatment processes (EPA), as illustrated in Figure 5. The schematic diagram of constructed wetland-based STP is shown in Figure 6.

Figure 5 Constructed wetland enzyme based STP
Source: US Environmental Protection Agency

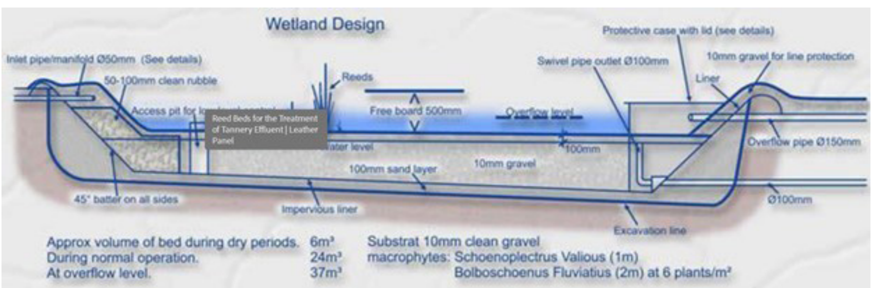

Figure 6 Schematic diagram of constructed wetland enzyme based STP
Source: Photograph captured from the Markaz Knowledge City Site

Compared to moving bed bio-film reactor (MBBR) based treatment plants, the enzymatic method has the following advantages (Stefanakis, 2016):

- **Environmentally Friendly:** Enzyme-based sewage treatment plant (STP) lessens reliance on dangerous chemical substances and decreases energy intake, making them extra sustainable and eco-friendly.
- **Operate at Lower Temperatures:** Enzymes-based treatment operates on minimal temperature, decreasing the need for electricity-extensive heating processes.
- **Reduced Sludge Production:** Enzyme-based strategies produce much less sludge, which decreases the complexity and costs of sludge management.

- **Handling Fluctuating Loads:** Enzyme-based STPs can adapt to various loads, ensuring efficiency in treating the sewage water at various loads.
- **Lower Operational Costs:** Enzymes may be produced locally from renewable assets, reducing the need for highly priced chemicals and conversion equipment.

Waste Disposal

The town wastes are segregated at the source and are converted into one-of-a-kind forms to attain a zero-waste method for the town. Bio-degradable wastes are transformed into bio-gas for cooking even as slurries are used as fertilisers.

Plastic wastes are outsourced to a company that collects, segregates, and packs them for recycling. We aid a start-up that reuses these wastes to supply bitumen, pavement blocks and other useful items, such as garden chairs, etc. This system is expected to create a circular economy whilst also assisting in zero-waste metropolis branding.

Passive Cooling and Lighting Techniques

While the contemporary era has made it viable to artificially alter temperature in a building, current environmental crises call for passive designs including those utilised in historical towns. Such designs align with bioclimatic architecture and use natural conditions to alter temperature and energy use, consequently efficiently lowering the carbon footprint. In MKC, we have followed the subsequent passive design techniques to obtain a premier capability of constructing structures (Arch 20).

- **Double Walls:** School buildings are designed with double-wall construction with air cushions inside to minimise the temperature inside. Double-wall construction reduces heat absorption, thus decreasing the need for artificial cooling and related energy consumption. Locally sourced clay is used for the interior design to offer natural cooling and aesthetic charm.
- **Insulation for Soundproofing:** The predominant hall inside the Convention Centre uses wooden panels for soundproofing and warmth insulation. The roof of the Centre is likewise filled with wool to prevent echo and to reduce heat, therefore minimising energy consumption.
- **Cross Ventilation:** The Mashrabiya (locally made tiles with patterns that allow natural light and air) panels embellishing the exteriors of the Cultural Centre, World Institute for Research in Advanced Sciences (WIRAS) and other college buildings permit the passage of wind, thus providing good ventilation for the building (see Figure 7). Some of these layout styles also save rain water from splashing into the construction while also ensuring natural cooling and air flow, as illustrated in Figure 8.

- **Facades Cladding:** The exteriors of most buildings within the metropolis employ façade cladding as shown in Figure 9. This allows light to penetrate inside and as a result minimises the usage of energy-powered lights and their related expenses.
- **Mud for Interiors:** Locally sourced mud is used to design diverse styles as an interior layout detail for the Tigris Valley health centre in the Knowledge City, as shown in Figure 10. This not only gives aesthetic attraction to the building interiors but also helps natural cooling.

Figure 7 The Mashrabiya – locally made tiles with patterns that allow natural light and - panels embellishing the exteriors of the building

Source: Photograph captured from the Markaz Knowledge City Site

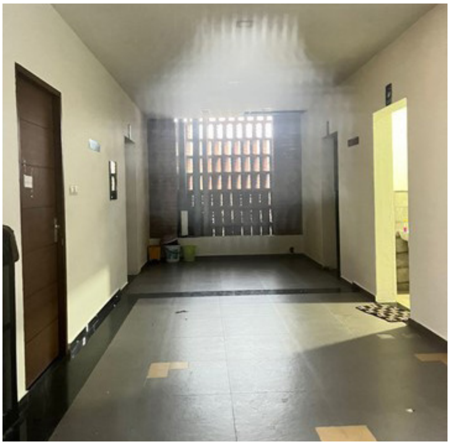

Figure 8 Layout styles also save rainwater from splashing into the building while also ensuring natural cooling and airflow

Source: Photograph captured from the Markaz Knowledge City Site

Figure 9 The exteriors of most building within the metropolis employ façade cladding
Source: Photograph captured from the Markaz Knowledge City Site

Figure 10 Locally sourced mud is used to design interior layout of the Tigris Valley health centre
Source: Photograph captured from the Markaz Knowledge City Site

Local and Natural Materials

The building and infrastructure construction sector is a prime contributor to greenhouse gas emissions. These emissions are produced throughout the manufacture of building materials, creation of homes, and whilst power is utilised in these systems all through their operations. According to the 2019 Global Status Report for Buildings and Construction, the buildings and creation sector accounts for over 40% of greenhouse gas emissions (UNEP, 2019).

In most buildings within the Knowledge City, great care is taken to use natural materials, such as timber, clay, granite, marble, laterite stone, etc. These substances are locally sourced and effectively available, making them sustainable and made available at very less cost, minimising transportation and related emissions (Kuriakose, 2020).

Green Spaces and Food Security:

We have planted bamboo and different oxygen-producing trees, enhancing oxygen availability and thus contributing to the city's ecological balance. This technique is in line with the United Nations' Urban Forestry practices, which suggest integrating green areas into urban landscapes to enhance air quality and public fitness (Salbitano, 2016).

Empowering people through education, training and distribution of seeds and fertilisers has been initiated by the agency called Markaz Alliance for Zero Waste Reforestation and Agriculture (MAZRA), for promoting value-added farming in the Markaz Knowledge City. The production of fruit, vegetables, diary, poultry and preparation of cooking oils from coconuts, spices, etc., are part of MAZRA's activities and are aimed at ensuring food security for the city.

Sustainable Agriculture: Our urban farms use a combination of traditional and contemporary techniques to ensure food safety. Automated, IoT-based farming structures developed by a start-up funded by Digital Bridge International, a research wing under the Knowledge City (as shown in Figure 11), decreases water use and maximises yield. The concept reflecting the Food and Agriculture Organization's (FAO) suggestions on sustainable agriculture practices (FAO).

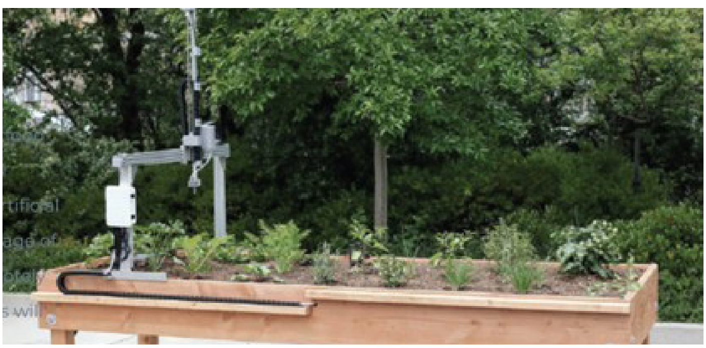

Figure 11 Automated, IoT-based farming structures decrease water use and maximise yield, DBI, Knowledge City

Source: Photograph captured from the Markaz Knowledge City Site

Community and Social Sustainability

Inspired by the Kingdom of Saudi Arabia's courtyard living, our urban design fosters interaction with the city dwellers while ensuring privacy, as shown in Figure 12. This social sustainability technique complements the better life and is aimed at strengthening social bonding of the people within the city (Alnaim, 2024). The floor plan of the M-Tower residential apartment of the Knowledge City is illustrated in Figure 13, depicting its courtyard structure. In addition to this, clubhouses and open spaces are created in the city for social gatherings promoting healthy community living.

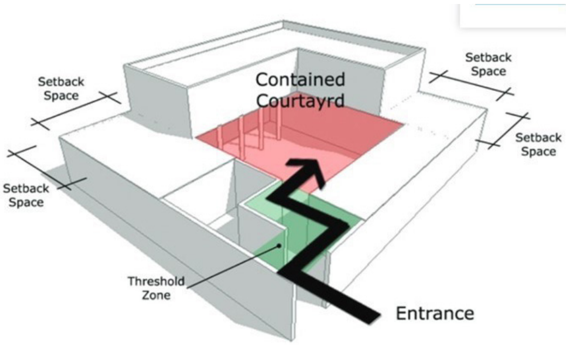

Figure 12 Courtyard living fosters interaction with the city dwellers while ensuring privacy

Source: Taylor & Francis online

Figure 13 Floor plan of the M-Tower residential apartment of the Knowledge City depicting it courtyard structure

Source: Ecomount Builders in the Markaz Knowledge City

Technological Integration for Sustainability

Renewable Energy: We use solar panels, wind turbines and revolutionary flywheel generators to generate energy to meet the energy demands of the city. Flywheel generators, as illustrated in Figure 14, were developed by a start-up company funded by the Knowledge City for standalone electricity generators; these work on wind as a source energy. The device has a current capacity of generating up to 250KVA power. Robust in construction, economic design and manufacturing and minimal carbon emissions are the primary features of the device. R&D is progressing to commercialise the product.

Energy efficient device: The use of locally assembled LED bulbs, BLDC fans, inverter ACs, and other energy-efficient devices, such as food mixers and grinders, are encouraged in the city to minimise power consumption. These measures align with international benchmarks, together with Leadership in Energy and Environmental Design (LEED) certification standards, therefore promoting the city as more green and environmentally friendly to ensure sustainability and to minimise carbon presence (US Green Building Council, n.d.).

Figure 14 Flywheel wind based electricity generator

Source: Photograph captured from the Markaz Knowledge City Site

IoT and Smart Systems: We make use of Internet of Things (IoT) and sensor-based technology to manage water, both treatment and consumption. In addition, sensors are used to power the lights based on occupancy and variations in natural light. Start-up companies promoted by the city research team assemble most of these devices in-house. The city uses following smart devices for managing the city in a most sustainable way:

- IoT-based STP
- IoT and drone-based weather forecasting, as shown in Figure 15
- Smart Flow Meters
- Smart Energy Meters
- Smart Street Lights

Figure 15 Very economically designed and implemented weather forecasting drone
Source: Photograph taken from the original model developed by HTI, Markaz Knowledge City

Transportation and Renewable Energy

Electric Vehicles (EVs): The promotion of electrical four-wheelers and two-wheelers, together with solar-based EV charging stations, reduces reliance on fossil fuels and lowers greenhouse emissions.

According to the International Council on Clean Transportation (ICCT), transitioning to EVs can reduce transportation emissions by up to 60% (Biekers, 2021).

Benchmarking with International Standards including UNSDG

Sustainability practices at Markaz Knowledge City are benchmarked with respect to international best practices to ensure environmental responsibility and community well-being:

Water Management: Compared to the global average, where only 30% of the world's water is treated, recycled and re-used, our 75% water recycling and re-use rate sets a new standard in sustainable water use (WHO, 2019).

Energy Efficiency: The adoption of electricity-efficient technologies aligns with the International Energy Agency's (IEA) recommendation that improving energy efficiency in buildings can reduce global energy consumption by 30% (IEA, 2023).

Air Quality: With an Air Quality Index (AQI) of 38, Markaz Knowledge City way exceeds the appropriate threshold of 50, set by the World Health Organization (WHO) (WHO, 2021). In contrast, many Indian cities record AQI levels above 200, posing extreme health risks.

Clean Transportation Electric Vehicles (EVs): The introduction of EVs in conjunction with solar powered EV charging stations, reduces reliance on fossil fuels and lowers greenhouse fuel emissions. According to the ICCT, transitioning to EVs can lessen transportation region emissions up to 60% (Biekers, 2021).

Affordable Healthcare – SDG 3

Healthcare tasks are centred on MIHRAS Multispecialty Hospital in the city, in which medical care is ensured with minimal fees so that it is affordable to wider strata of the community living in and around the city. A good percentage of our patients receive free medical services, irrespective of the state of their financial affairs. This aligns with SDG 3 (Good Health and Well-being), as we aim to reduce fitness inequalities and enhance overall community fitness.

Education and Training – Key to Sustainability - SDG 4

The Home Tech Industry (HTI) is a technology hub that assists people in becoming technicians capable of assembling various energy-efficient devices for the city and outside, operation and maintenance of various utility devices and home appliances, integration of solar panels and solar streetlights, fixing light fixtures, etc.

HTI is paving the way towards sustainability by lessening the downtime for all its operations, together with that of equipment working in the various functional units of the city. Annually, 300 technicians are trained to satisfy this demand within and around the city.

Furthermore, 11 other institutions in the city cater to various educational and training needs. These establishments play a crucial role in shaping responsible citizens through sustainable practices.

Sustainable Water Management- SDG 6

The system guarantees a dependable water supply assisting SDG 6 (Clean Water and Sanitation). By prioritising sustainable water management, we ensure a reliable water supply and protect this crucial resource for future generations.

Renewable Energy Initiatives – SDG 7

The city promotes renewable resources such as sun, wind and water for electricity generation to meet the load demand of the city. Supporting start-ups for developing alternative sources of energy to meet the 12MW demands of the city; it is expected that by 2030, the city can be fully powered from such sources. This commitment to renewable electricity aligns with SDG 7 (Affordable and Clean Energy), reflecting our dedication to sustainability and decreasing the carbon footprint. By harnessing the electricity of nature, we ensure a cleaner, greener and sustainable future for our society.

Sustainable Living – SDG 11

Markaz Knowledge City prioritises sustainability, with ample green spaces and eco-friendly infrastructure, reflecting our vision for sustainable cities and communities complying with SDG 11 of the SDG (Sustainable Cities and Communities).

Our dedication to sustainability is clear in our method of urban planning and development. By integrating sustainable practices into our operations, we create dwelling surroundings that harmonise with nature and reduce our environmental footprint, at the same time promoting a healthier and more sustainable way of life.

Climate Summit – SDG 13

Markaz Knowledge City actively engages in the international discourse on sustainability and environmental protection. We have hosted an international event inclusive of ‘Climate Action 2022’; this saw participation from 200 delegates from 40 countries, discussing strategies to mitigate the impact of climate change. During the summit, a declaration called ‘Malaibar Declaration for Climate Action’ as shown in Figure 16, that chartered out solid strategies and action required for mitigating the effects of climate change. The occasion underscores our dedication to SDG 13 (Climate Action) (Markaz Knowledge City, 2022).

Additionally, we are a member of the Inter-City Intangible Cultural Cooperation Network (ICCN), an NGO that focuses on safeguarding the world's Intangible Cultural Heritage. A copy of the membership certificate is shown in Figure 17.

Figure 16 Malaibar Declaration signed by the Markaz Knowledge City during 'Climate Action 2022' hosted by the city

Source: Markaz Knowledge City online web page

Figure 17 The copy of the membership certificate from ICCN

Source: ICCN - Valencian Museum of Festivals, St. Nou del Convent, Algemesi

The ICCN is a UNESCO-approved organisation of mayors and cultural leaders of 45 global cities that have cultural conservation as their declared agenda (UNESCO, 2008). The city hosted the 9th ICCN General Assembly, in November 2023. The ICCN 9th General Assembly awarded the city with Leadership in Sustainable Development. Figure 18 shows the award ceremony.

Figure 18 Leadership in Sustainable Development Award from ICCN
Source: ICCN - Valencian Museum of Festivals, St. Nou del Convent, Algemesi

Challenges and Mitigation

The primary challenge was the prevailing regulatory procedures and resultant litigation against construction by the judicial court in the context of spoiling environmental fragility that temporarily stopped construction activities. The challenge was mitigated by engaging an environmental scientist to produce scientific documents protecting the factors of sustainability (Environchem Laboratories Private Limited, 2015).

Detailed processes are defined in the scientific document for usage of water, recycling and reuse of water, protecting air quality, energy use and management. The report also addressed solutions to protect soil quality and preventing soil erosion. The report was submitted to the judiciary as a sworn statement and a promise to show that management is committed to sustainability and safeguarding the delicate environment.

Apart from financial challenges in building the city, tremendous political, institutional and legal challenges have wreaked havoc during the construction phase. Our analysis shows that these challenges were primarily due to ignorance of the potential benefits that such an initiative could bring to society. Such challenges are addressed by capacity building through awareness sessions among all strata of society.

The development of a city in a rural area poses a big challenge due to the general perception that such initiatives could potentially harm the rural ecosystem, wherein people already enjoy a certain standard of living within the comfort of a village environment. Major concerns were centred on pollution that would be caused due to traffic and overpopulation.

This was mitigated by introducing modern technologies to harness natural sources of energy and employing local people in developing and maintaining such technologies. We engaged women from rural areas to make energy-efficient devices by setting up mini workshops in the comfort of their homes. Through this process, we could ensure them a comfortable and decent life. In addition to this, we have provided them with better health and education.

Lessons Learned

The concept offers fresh perspectives on applying sustainable development principles in rural areas. It highlights the unique combination of ancient wisdom and modern technology used to create a self-sustaining urban environment. These insights are valuable for urban planners, environmental scientists, policy-makers and global organisations devoted to sustainable development.

While our focus is on Markaz Knowledge City, the findings can inspire similar projects in different regions. Future research could explore and validate these insights on a broader scale. A demonstration of how rural areas can achieve SDG 11 could contribute to sustainable development efforts worldwide. Future research could discover and validate those insights on a broader scale. A demonstration of how rural area can achieve SDG 11 can contribute to global sustainable development efforts.

We identify actionable measures such as advanced sewage treatment for recycle and reuse of water, rainwater harvesting, energy-efficient technologies, alternative energy sources, clean transportation and sustainable farming practices. We emphasise the importance of community involvement and capacity-building in promoting sustainable development. These lessons can guide urban planners and policy-makers towards enhancing sustainability across various projects globally.

CONCLUSIONS

The city is now beginning to function as a socio-economic development hub for the people living within the city and 40 villages across the city, benefitting around 200,000 people. This is in addition to better health facilities, quality education and a respectable livelihood for people in and across the town. Around 4,000 direct jobs have been created by the city for the rural area while indirect job generation is 10 times this capacity.

Therefore, Markaz Knowledge City serves as a remarkable model for sustainable urbanisation. Its uniqueness is a successful blending of local resources, traditional practices and blending with modern technologies that harness natural resources. It proves that meticulous planning, design and implementation can create sustainable cities and communities. The insights gained here provide valuable guidance for future worldwide urban development initiatives that align with the goals of international sustainable development practices.

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BIOGRAPHY

Dr Abdul Salam Mohammed is a sustainable development professional with a PhD in Geo-Information and Real Estate from the University of Technology Malaysia. He also holds an MTech from Aligarh Muslim University and a BTech from the National Institute of Technology, Calicut. Dr Mohammed is the CEO of Markaz Knowledge City in India, where he is pioneering the transformation of a rural area into a sustainable smart green city. His vision and leadership have been instrumental in integrating smart city standards and UN SDG principles into this project. Dr Mohammed is also the Chief Strategic Consultant for Naico Information Technology Services in Kochi Info Park and Director of Markaz Knowledge City Management Consultancy. He has received numerous awards for his contributions to sustainable development.

Dr Muhammed Abdul Hakim Al Kindi has a Hafiz degree from Jamia Markazu Ssaquafathi Ssunniyya, a degree in Islamic Theology from the same institution, an MA in Urdu Language & Literature from Bangalore University, special training for community leaders from Al-Azhar University in Cairo, and a PhD in Urdu from Dr B.R Ambedkar Bihar University. He is the Managing Director of Markaz Knowledge City, an integrated township focusing on living, spirituality, education, healthcare, and commerce. He is also the Rector of Jamia Markaz, a leading Islamic University in South India affiliated with Al-Azhar University, and serves as the Chief Imam of Jamiul Futuh - The Indian Grand Masjid. He has attended significant conferences worldwide, and has travelled to over 30 countries for his work