Design education for sustainability: a case study for an inclusive approach to design in India

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Abstract: People around the globe recognise that the current development trends are clearly unsustainable and that education can be seen as a critical tool for advancing our society towards sustainability. This paper showcases a case study for ‘Envisioning a sustainable Guwahati Railway Station Complex of the future’ undertaken by students of the Department of Design at the Indian Institute of Technology, Guwahati. The paper highlights the importance of participatory design, systems thinking and collective group learning when engaged in the design of complex public systems such as a railway station. It makes the case for design education for sustainability in the rapidly urbanising Indian context and concludes that design education should include approaches and methods that sensitise the students to the parameters of sustainability which are contextually relevant, inclusive and socially acceptable.

Keywords: collaborative group learning; design education for sustainability; DEfS; Guwahati railway station; India; inclusive growth; social acceptability; systems thinking.


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1 Introduction

The span of two decades brings the development story of India at cross roads for reflection and reassessment. On one hand, its effort to engage itself as a global player and open its doors to international practices of production and competition has resulted in opportunities for employment generation and economic growth of one of the largest middle class emerging markets. On the other hand, this growth has intrinsic dangers of a western model of consumption that has already proved unsustainable. There is also grave concern regarding a large population that continues to be poor and undernourished. It shows stressful signs of the danger of opening the economic gateway too fast resulting in a sudden widening of the gap between the rich and the poor. An inclusive growth is the only middle path.

With this realisation, the vision paper ‘India 2020’ undertaken by Technology Information, Forecasting and Assessment Council (TIFAC) in the year 1990, also sets out the following ten goals that aimed for an integrated growth of India by the year 2020 viz. reduce the rural-urban divide; equitable distribution and access to energy and water; working of industry, agriculture and the service sector in symphony; access to education for all; making India an attractive destination for talented scholars, scientist and investors; access to healthcare for all; eradication of poverty and illiteracy; prosperity, security and good health for all through a path of sustainable growth. In such a situation, the need to include community centric and locally relevant project initiatives in the educational curriculum amongst the 300 or more technical education institutions of higher learning set across the country becomes urgent. This can be seen as a step forward towards achieving our goals for sustainable future through the design of innovative solutions of products, services and systems that are contextually relevant, acceptable and sustainable.

This paper discusses the widely recognised sustainability issues and the importance of design education and system’s thinking in achieving the goals of sustainable development. It then showcases a case study undertaken as a design project with participation of the teaching faculty and students at the Department of Design, Indian Institute of Technology Guwahati through interaction with the local community and wider stakeholders. ‘Envisioning a sustainable Guwahati Railway Station Complex of the future’ examines the Guwahati railway station as a high density nodal point in the city that sees rail travellers passing through this gateway either to/or from the entire northeastern states of India. It showcases conceptual directions in the design proposal for
a modern architectural space that taps its vast economic potential through a socially inclusive and environmentally green initiative. It accesses the anticipated challenges in its implementation and makes a case for an urgent need to include community centric and locally pertinent project proposals.

The project developed among the students a fundamental understanding of sustainable principles in theory and application, capacity to work in multidisciplinary teams and stimulated systems thinking in order to deal with the complex sustainable development context that a design project addresses. It delves into the project description and later discusses the outcomes and way forward.

2 Design education for sustainability: an introduction to global and local scenarios

The 20th century has seen a new and more striking era of global urbanisation – about 3% of 900 million world population lived in cities in 1800; by 1900, 10% of 1.6 billion were urban; now over half of the world’s 6 billion live in cities. As cities become our primary habitat, achieving sustainability at the urban level becomes crucial as presently they concentrate major environmental problems (such as pollution, resource degradation and waste generation) as well as acute social issues (such as increasing poverty, inequity, crime and social disintegration). Yet, paradoxically, cities also hold our best chance for a sustainable future (UNPFA, 2007). Researches show that the potential benefits of urbanisation far outweigh the disadvantages. Sustainable ‘urban’ development has therefore, been adopted as a common political intent and formed the basis of development guidelines for dealing with the planet’s ecological and social crisis by many nations worldwide (McKenzie, 2004).

Sustainable urban development is generally accepted as a balance between its three dimensions – social, ecological and economic. However, the social dimension has so far remained the weakest and most explicit of all. Omann and Spangenberg (2002) argue that social dimension is essential for two reasons; firstly, it is a constitutive dimension of sustainable development and secondly, it is a necessary precondition for obtaining the environmental and economic sustainability objectives. Yet, in developing countries like India too, environmental concerns have come to dominate the realm of sustainable urban development initiatives. Such narrow approaches to development, where the social dimension has been highly under-represented, have not been able to provide equitable outcomes for all but increased disparities and urban divide. This is one of the fundamental challenges towards achieving sustainable future. Moreover, for a country like India which will become an urban majority by 2050 [with more than 875 million urban population (UNESCO, 2010)], rapid and intense urbanisation is likely to further stress the existing infrastructure and exacerbate the issues of urbanisation of poverty, localised social inequity, degradation of natural resource and increased carbon emissions that threaten the future of its cities. India therefore needs to act urgently towards achieving a sustainable urban future.

In such a situation, the shifting towards sustainability in education becomes essential for educational institutions in India. As Cortese (2003) mentions, “institutions of higher education bear a profound moral responsibility to increase society’s ability to create a just and sustainable future”. The aim of Industrial Design as laid out by The International
Council of Societies of Industrial Designers has also been redefined with sustainability as an important inclusive. India is the only country where environmental education has been mandated at all levels of formal education, which also includes a compulsory undergraduate course. Yet, as Chhokar (2010) argues that the challenges to effective implementation of this is held back due to the lack of inter-disciplinary competence among staff and students as well as the traditional methods of assessment in higher education institutions (HEI). Principles of sustainable development have been embedded in India’s education policy and education for sustainability (EfS) is, no doubt, becoming a part of higher education curriculums in India. Yet, a culture of sustainability entrenched within all areas of education (sustainability as not just a split subject) is still the need of the hour.

At present, as the global and local scenarios call for immediate and intensive actions towards achieving a just and sustainable future, education can be seen as an essential tool. It plays a significant role in increasing awareness, knowledge and understanding (Cortese, 2003) needed for our transition towards a sustainable future by not only making our “present and future generation responsive to and prepared for the current and emerging challenges”, but also empowering them to make “informed decision that can trigger market and political pressures to move the sustainable development agenda forward” (Hodge and Mochizuki, 2013). Combined education ‘for’ and ‘about’ sustainability and sustainable development provides learners with the necessary knowledge and understanding of complex issues faced by the world today. It also builds capacity to structure and manage global transition towards sustainable lifestyles and development trends (Tilbury, 2004). McFarlane and Ogazon (2011) argue that learning process can provide deeper information to the people about sustainability challenges by influencing people’s current thinking.

Since its first appearance in the World Congress ‘Challenges of a changing earth 2001’ in Amsterdam (Steffen et al., 2002), the term ‘Sustainability Science’ has been developed as a new academic discipline (Kajikawa et al., 2007). Having realised the importance of education in sustainability transition and the role of HEIs in supporting the development of innovative ideas and creation of new knowledge (Wals and Jickling, 2002), several declarations on sustainability in higher education (SHE) – from UNESCO (1972, 2009a, 2009b, 2009c) and AAU (2009) and ISCN/GULF (2010) (Grindsted and Holm, 2012) – that defines the universities role in ensuring sustainable development, have also grown in numbers in the past few decades. The Stockholm’s declaration on human environment and Agenda 21 (chapter 36, UNCED) highlighted education’s importance for sustainability and formed the basis for framing the education for sustainable development (ESD), a concept which involves objectives related to the respect of human life, the development of critical thinking and responsibility, as well as, the comprehension of ‘environmental values’ and ‘interdisciplinary relations’ [Petrovic et al., (2012), p.34]. ESD which means “including key sustainable development issues into teaching and learning” and “allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future” (UNESCO) has also been promoted through the UN Decade of Education for Sustainable Development (2005–2014) as an important step towards “the integration of the principles, values and practices of sustainable development into all aspects of education and learning”. These initiatives play a crucial role on sustainability awareness and problem solving of sustainability challenges through ‘education, research and outreach’ [Fadeeva and Mochizuki, (2010), p.250, p.254].
Lozano et al. (2010) however, argue that despite of a number of SD initiatives and an increasing number of universities becoming engaged with SD, most HEIs continue to be traditional due to which they still lag behind in helping societies become more sustainable. The current reductionist and mono-disciplinary education (Lozano et al., 2013) are inadequate for solving the complex global sustainability issues and hence, sustainability education, especially in HEIs requires not only sound theoretical foundation but also grounded understanding of practical problem solving through systems thinking and interdisciplinary approach to issues of sustainable development.

3  Stimulating systems thinking and encouraging collaborative learning

The pursuit for sustainable development requires a systems approach to understand and address complex global issues and the link between them. A ‘system’ is a perceived whole whose elements are ‘interconnected’ [Ison, (2008), p.140] and ‘systems thinking’ can therefore be defined as an ability to recognise inter-connections. A design action intervenes into an existing ‘real world system’ (seen as a ‘complex whole’ consisting of elements and the relationship between them) to make it a ‘preferred world system’ that is considered as an optimal fit for the system or product/services and its environment. It is generally accepted that design for sustainability today must not only focus on the form of a product and its utility but also consider a broad range of systems issues. Design thinking goes hand-in-hand with systems thinking in order to address the issues of sustainability and enable innovative solutions.

The systems thinking approach to design for sustainability therefore helps to identify and frame sustainability issues and appreciate complex relationships that exist within and between different systems associated with design and its implementation. As Cardenas et al. (2010) argue that such an approach is valuable for sustainability as it “enables the dealing with complex systems with the appropriate scope, depth, versatility and insight to generate qualitative changes that increase the sustainability of products and systems”. Moreover, taking into account the complexity of sustainability challenges, it also becomes clear that a single perspective or solo discipline is insufficient to deal with the current intricate global issues. There is also a close link between interdisciplinary [based on the explanation by Max-Neef (2005, p.6)] and sustainability as sustainability requires identifying the key interactions or conflicts that may arise between different stakeholders as well as cooperation and collaboration between different disciplines in order to provide design solutions that have a holistic perspective (Boutou, 2013). Therefore, as interdependent and transdisciplinary issues are increasingly shaping the context for design of major urban projects there is a greater need than ever for shared understanding and coordinated innovative action especially when designing for complex issues is involved.

‘Collaborative learning’ is a broad term with a wide variety of uses from different academic fields. It often refers to a range of approaches in education that involve joint (cognitive) effort or attempt by two or more individuals to learn something together (Dillenbour, 1999). It also refers to methodologies and environments in which learners work together or engage in a common task or goal where each is dependent on and accountable for the other. The concept is largely based on the work of Russian teacher and psychologist Vygotsky (1978) who emphasised that learning takes place through our
interactions and communication with others. Such a process of shared creation not only increases interest among the participants and promotes critical thinking (Totten et al., 1991) but working as a group or teamwork is a soft skill that is also highly valued in any profession. Collaborative learning and systems thinking thus allow students or learners to develop a mutual path and reflective understanding of the complexity of the system, combine knowledge from different disciplines and cooperate with a critical point of view thus, enabling students to make beneficial decisions (Gokhale, 1995). Such interdisciplinary and collaborative efforts can play an essential role in achieving sustainability. Researchers, Daniels and Walker (1996) explained that collaborative learning can also play a critical role in public participation theory and practice in order to address the complexity and controversy intrinsic to public land management by combining elements of systems methods and mediation.

4 A case example for an inclusive approach to design India – envisioning a sustainable Guwahati Railway Station Complex of the future

This case example was an elective studio design project ‘Envisioning a sustainable Guwahati Railway Station Complex of the future’ carried out in partial fulfilment of credits for the subject ‘System Design for Sustainability’ by MDes and PhD students of the Department of Design at the Indian Institute of Technology Guwahati, India during July–November 2011 semester. It showcases conceptual directions in the design proposal for a modern architectural space that taps its vast economic potential through socially and environmentally sustainable initiatives. It accesses the anticipated challenges in its implementation and makes a case for an urgent need to include community centric and locally pertinent project proposals. Emphasis was given to design for sustainability, systems thinking and collaborative group learning.

This section of the paper sets the context for the case study and describes the process and outcomes of the design studio project.

4.1 About Guwahati City

Guwahati, the capital city of Assam, is situated at 26°10’ North latitude and 92°49’East longitude on the banks of the Brahmaputra River. It is an ancient city with a long tradition of urbanisation dating back as far as the epic and puranic periods. However, the emergence of a new Guwahati City started in 1826 when Assam came under British occupation after the first Anglo-Burmese War (1824–1826) and the subsequent treaty of Yandabo. This ancient ‘City of Eastern Light’ is now one of the most rapidly-growing and important cities in North-East India in terms of its location, size, population, transport connectivity as well as being a major centre for industries, administration, education and health facilities. From a marshy settlement of mere 0.012 million people (in 1911) to a town of 0.12 million people Guwahati turned into a city in 1974. It has now expanded into a vast urban agglomeration of nearly 1 million population (in 2011) covering an area of more than 262 sq km under Guwahati Metropolitan Area. The city is geographically divided into two halves by the River Brahmaputra. The area to the north of the river has a vast open lands and a majority of the population still enjoys rural lifestyle while the area to the south of the river consists of dense, vibrant, fast developing urban quarters.
4.2 Scenario of Indian railways as a public transportation system

India’s public transport sector is large and diverse which caters to the needs of approximately 1.3 billion people. Since the early 1990s, the country’s growing economy has witnessed a rise in demand for transport infrastructure and services. Amongst various modes of transportation in India, Indian Railways (IR), owned and operated by the Government of India through the Ministry of Railways, has played a leading role in carrying passengers and cargo across India’s vast territory. Today, it is one of the world’s largest railway networks comprising 115,000 km of track over a route of 65,000 km and 7,500 stations. However, most of its major corridors have capacity constraint requiring capacity enhancement plans.

Guwahati Junction, the major station at Guwahati City, is the headquarters of the Northeast Frontier Railway zone of the IR. Kamakhya in Maligaon and New Guwahati (for freight services) at Narangi, located towards west and east from Guwahati Junction respectively are two other minor stations in the city. Proposals are to expand Kamakhya station as a passenger terminal, develop old Pandu yard for maintenance of passenger trains and build a coaching terminal at New Guwahati. Two other minor railway stations are Agthori and Azara which lack proper facilities and still to be made properly operational. Hence, Guwahati Junction continues to act as the significant rail station of the city for rail passenger movement.

Figure 2 Guwahati railway station context and location (see online version for colours)
4.3 Key challenges to the design

Guwahati Junction railway station is located on the Southern bank of river Brahmaputra in a dense and busy urban quarter of Guwahati. It adjoins Pan Bazar area in the north and Paltan Bazaar area in the south from where most of the private bus companies operate connecting Guwahati with the rest of the state and the Northeast. Guwahati Junction is among the 50 stations that are to be developed into world class stations with international level facilities according to the Railway Budget 2010–2011. As per the guidelines, the proposed World Class stations would broadly have state of art station building providing all modern passenger amenities including food plazas, currency exchange counter, hotels, retail outlets, departure and arrival arenas to streamline passenger movements with proper connectivity to other transport modes; well illuminated circulating areas, adequate signage, designs to suit people for special needs, etc.

The key design challenges for this were:

1. re-developing the existing railway station with minimum disruption to the present train and passenger movement
2. proposing world-class multi-modal station design which is also environmentally, socially and economically sustainable
3. exploiting the potential of a large-scale project such as this to be undertaken in order to create public spaces with the explicit aim of linking communities and encouraging local participation in urban development.

4.4 Design studio process

The students developed theoretical understanding of role of sustainability in system designs through various lectures after which the design project was introduced. The project involved students to conduct an initial collective site visit and general analysis as a joint effort in a common group. Later, due to a number of complex systems involved (Figure 1) at the railway station, they worked in three groups focusing on:

1. spaces and movement
2. information systems
3. waste management in order to conduct a more detailed analysis and outline design proposals.

Spatial organisations and stakeholder systems were further divided into three scales namely:

1. city level that looked at the city wide issue with respect to the station and movement
2. station level that looked at the design, organisation, layout and activities within the railway station building
3. personal level that looked at the interaction of the users with spaces at all scales.
Since the turn of 21st century, after the WCED (1987) report 'Our Common Future', sustainability has become the buzzword on everyone’s lips. For some it is an ideology, for some a social responsibility and for some just a mandatory requirement. No matter how it is perceived, viewed or expressed, its need and importance has been realised globally. However, the macro perspectives of internationally coordinated sustainable development initiatives can be held in stark contrast to grass-root initiatives working at local level as difficulties lie in applying the sustainability principles at the leg of design and execution. This project work allowed the students to apply their theoretical knowledge gained during the initial tutorials on 'System Design for Sustainability' to a real life project. Blending theory and practice, the students developed a link between system structure and patterns of stakeholder behaviour.

The key design challenges were identified:
1. re-developing the existing railway station with minimum disruption to the present train and passenger movement
2. proposing world-class multi-modal station design which is also environmentally, socially and economically sustainable
3. exploiting the potential of a large-scale project to create public spaces with the explicit aim of linking communities and encouraging local participation in urban development.

An inclusive and sustainable urban project

Based on initial site visit and an overall general analysis for the existing railway station key project criteria’s namely optimising SPACE utilisation, enabling effective MOVEMENT, reducing TIME taken were set up. Six areas of focus were then identified that could help achieve these project criteria’s. Various stakeholders associated to these six focus areas were also identified. Later a cognitive organisation chart was developed and spatial sub-system links were analysed. The outcomes of the initial site visit and analysis were presented as an overall group work. The results and next steps were laid out through interactive sessions.

Following a common site visit and collaborative site analysis, the students formed focus groups for more detailed investigation and design proposals on their chosen design subject. Focus groups were to work on three key areas:
1. spaces and movement
2. information systems
3. waste management

Three groups of 4–5 students worked as teams focusing on the detailed analysis and design development of the selected three areas of work mentioned above. After detailed SWOT analysis, systems-links study, questionnaires and interviews with the stakeholders including passengers, on and off-site railway staff, the railway planning and development officials broad and detailed design parameters were developed.

The group presentations were held every week for discussion and interaction among other group members and a final proposal was given as a collaborative design effort. Developing the ability to work in groups gave students from different educational backgrounds the potential to maximise the application of their diverse learning experiences and contribute better to understanding the interconnected complex global issues. Participatory and collaborative design process led to well-thought, well-reflected design proposals that were just and sustainable.
With a series of study questions, a number of issues were identified at all spatial scales at which the design proposals focused. Such a structured and collaborative approach to design for sustainability encouraged students to identify and frame issues in systemic terms also, creating shared constructs for inclusive design and problem solving.

Figure 3  Spatial sub-system link (see online version for colours)

Thus, following a common site visit and collaborative site analysis, the students formed focus groups for more detailed investigation and design proposals on their chosen design subject. The group presentations were held every week for discussion and interaction among other group members and a final proposal was given as a collaborative design effort. Developing the ability to work in groups gave students from different educational backgrounds undertaking this design programme, to maximise the application of their diverse learning experiences and contribute better to understanding the interconnected complex global issues.

4.5 Identification of conceptual framework for design insights

A conceptual framework forms a backbone of any design proposal. For this project, based on a thorough analysis of the issues, the students developed the following three key project criteria

1 optimising SPACE utilisation
2 enabling effective MOVEMENT
3 reducing TIME taken (Figure 4).

Design actions namely

a effective spatial organisation (zoning and distribution of services and uses)
b effective communication/information
c. safe and regulated spaces

d. clean and well kept environment

e. care, comfort and convenience of the passengers

f. sufficient and organised parking structure

g. regulated movement of vehicles and interconnected modal split were laid out in order to achieve these three key project criteria.

Associated stakeholders were also identified against each action.

**Figure 4** Spatial organisation chart and key project criteria (see online version for colours)

The students further developed design concepts that looked at station as:

- A multi-modal station: The design finds solutions to regulate and control the traffic around the station area and provide city wide multi-modal transport connection.

- An iconic station: Design for an iconic architecture, a gateway to North-East, a catalyst for urban change, one that will create ripple effect and bring about gradual regeneration of the entire area.

- A people centric, human scale station: Building and spaces no matter how large must be designed with individual users in mind. Arriving, enjoying and getting around – are all human activities.

- A world class station: Design for the future growth in traffic and population, provide state-of-the-art facilities as per the changing needs of passengers and services.

- A transformed station: Transformation is key. Change is needed from individual behaviour to collective thinking and visions for future.

To realise these design concepts the students developed broad and detailed design parameters as shown in Table 2.
Table 2  Broad and detailed architectural design parameters for the station complex

<table>
<thead>
<tr>
<th>Broad design parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arriving at the station complex</td>
<td>1 First impressions count! A city that demonstrates friendliness, an assurance to quality and ease of accessibility starts with a lead. 2 Cities are not just places where people live but are destinations that many people visit. They arrive and leave. 3 Guwahati railway station is not just a gateway to the city but the entire North East.</td>
</tr>
<tr>
<td>Enjoying the station complex</td>
<td>1 A large number of small amenities can make the waiting time pleasurable and enjoyable. 2 Well-maintained and well-kept utilities add to the comfort of the passengers. 3 Public facilities like a hotel, shopping area and food court at the station premises, plus mechanised parcel handling and additional facilities for the disabled provide convenience and effective use of time.</td>
</tr>
<tr>
<td>Moving in and around the station complex</td>
<td>1 Allow people to move in safety, comfort and speed. 2 Improving connectivity with the international airport and other transport interchanges.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detailed design parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key functional areas (developed from Kandee)</td>
<td>1 Core areas – focus on processing passengers. 2 Transit areas – connect transit facilities in the core areas to the transportation modes. 3 Peripheral areas – support circulation outside the main buildings. 4 Administrative areas – control both traffic and station management. In addition to these, the physical design of the railway station complex also sets out parameters for an integrated system, clear and convenient circulation for all, station complex design to take full advantage of the time passengers wait around by providing facilities and entertainment.</td>
</tr>
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4.6 Aspects of station design

The group focussing on spaces and movement worked out the following aspects of station design.

4.6.1 Phasing

Phasing forms an important element of design as it involves re-developing the existing railway station with minimum disruption to the present train and passenger movement. The present southern approach to the Guwahati railway station is neither legible nor efficient. It is a back-door entry from Paltan Bazar. Although the railway station site includes sufficient area for expansion and redevelopment, acquiring land around the southern back entrance to provide sufficient parking, ticketing and waiting facilities means relocating various landowners and small business that thrive due to the passenger movement. Hence, the design proposes to remove the last three rail tracks and platforms
Design education for sustainability

towards the south and retain the remaining four, which are to be refurbished to meet the new design standards. Further, ten new additional tracks will be added towards the north as part of expansion for future increased rail traffic. The station will be able to handle the traffic of approximately 350,000 passengers per day. Creating space towards the southern boundary edge will allow enough space for creating a proper legible approach from Paltan Bazar with onsite parking facilities and a new southern concourse. Once complete, this entrance can be used at the main entry while the massive construction takes place to the north (Figure 5).

**Figure 5**  Conceptual diagram showing proposed phasing and connections (see online version for colours)

4.6.2 Cross-links

At present the station area creates a barrier to the North-South movement between Pan Bazar and Paltan Bazar. As opposed to permeable street network, the huge urban block (approx. 1,037 m in width), obstructs the movement creating huge congestion around the area. The only pedestrian link across the station building is through a foot bridge. The design therefore extends the existing city lines so that the new transport node becomes an integral part of the city fabric. The two obvious extensions were:

1. Brahmaputra link (a pedestrian as well as vehicular link with a subway)
2. Judges field link (forms the main entrance to the station from both North and South entrances).

Various other possible links were also proposed to weave and complete the urban fabric (Figure 5). The proposal focuses on strengthening the pedestrian and cycle links to the city as well as creating a multi-modal station. These links will be lined with active uses like small retail outlets and convenience stores, health centre, dedicated space for hawkers, etc with its excitement and variety which forms a very important component of urban public life.
4.6.3 Architectural form

Figure 6 Conceptual diagram showing concepts for architectural form for the station complex (see online version for colours)

The vast metal canopy with its gentle curve is an abstract representation of the silhouette of the hills of Guwahati.

The horizontal planes in the internal spaces represent calm sheet of Brahmaputra River.

The form is designed to pick-up and reflect the proximity of amazing natural beauty that exists in the landscape of North-East.

The form, layout and the building materials used displays care and compassion for its city, countryside, cultures and ethnicity but in a contemporary manner.

This concept has been chosen because cities are becoming more and more busy and stressful places and people often escape to countryside for rejuvenation.

North-East has a spectacular and precious countryside at its doorstep. The design tries to bring this essence into the railway stations to make the passengers transit pleasurable.

The intention here is to reduce the feeling of a railway station as a place where passengers are forced to spend time, to an enjoyable aspect of transition.

The Station Building is planned to integrate with the urban environment yet at the same time make a confident statement.

4.6.4 Green architectural features

• Materials: The judges field link forms the main entrance and main link that connects the north and south of the city. The station greets the travellers with a huge bamboo and steel canopy, the structure of which is designed as per the Assamese weaving techniques. The station-building complex is a mix of traditional materials and contemporary building materials. It is envisioned to reflect an amazing blend of futuristic architecture and iconic construction created using indigenous sustainable methods.

• Energy: The proposed architectural form reflects energy efficiency and the use of alternative energy sources in its design from the very start. The roof is designed for maximum solar gains and water harvesting system. The building complex is partly air-conditioned and partly naturally cooled. Natural ventilation is achieved through an efficient design that implements two types of ventilation: wind driven ventilation and stack ventilation. The inverted roof over the atrium of the Linear Admin Block acts as wind shaft. The green walls and louvered vents of the building allow for natural cooling.

Figure 7 Conceptual diagram showing proposed functions (see online version for colours)
4.6.5 The edible landscape project

The Edible Landscape Project (Figure 8) is created with an aim to partly formalise the process of waste management that occurs at the railway station and provide more meaningful employment to the poor involved. Physically, it is a two level basement parking with a landscaped garden/farm at ground level. The project aims to utilise the strength of such large scale public project to create spaces that brings the communities together and proves benefits to the society. Maintained by an NGO these landscape gardens/farms to the north and south of the new station complex will support and train the poor and homeless at the station to grow organic food, develop a nursery and produce organic compost. Area for formalised plastic bottle segregation and compressing unit is also proposed on site. A vocational training institute housed in the station building complex can also be associated to the project that provides necessary training and skills to the unemployed currently involved in the waste segregation and recycling process at informal level. The activities involved under the edible landscape project involve

1. regularising onsite waste recycling
2. organic waste collection
3. training
4. producing
5. commercial viability
6. improving lives.

Figure 8 The edible landscape project (see online version for colours)

Regularising Onsite Waste Recycling
Organic Waste Collection
Training
Producing
Commercial Viability
Improving Lives

Source: The images used in the collage are from various unknown internet sources

4.6.6 Information management and communication systems

The railway station integrated information system, with the design of centralising distributed data processing, combines net communication, passenger transportation, integrated information, and intelligent building control subsystems etc aims to improve
the service to be safer, more efficient, and more orderly. The information management and communication system design was divided into two phases: top-level design and detailed design. Top-level design consisted of the identification of the major types of information systems and their functions. In order to specify the top-level design, a number of alternative system design concepts were synthesised and evaluated in terms of a variety of selection criteria, which included categorisation, global language of information, disability requirements, cultural influences, political acceptability, etc. The detailed design consisted of looking at the information design components such as cost (implementation, operation and maintenance), size and visibility, flexibility for expansion/upgrading, and use of mobile technology for ease of information and communication with respect to railway systems. Proposals were given for the three spatial areas as mentioned earlier in the paper. Proposals for general signage, platform ticket via mobile messages, map for station and platform, tourism centre, prepaid taxi centre, broad pedestrian with kiosk and PNR booths, informative kiosk, booth for people with special needs, mobile phone applications, global gate structure-grand welcome and book your parking space via mobile/internet were worked out. Consideration was given to colour coding, three languages (Asamese, Hindi, and English), global graphical icons, materials, dimension and shape, location while detailing the information and communication systems.

4.6.7 Cleaning and maintenance systems

The cleaning and maintenance systems hinged on three aspects: planning, installation and maintenance. It focussed on the following three waste categories:

1. Food, beverages and water involving
   a. packaging for railways
   b. recyclable and degradable considerations.

2. Waste management involving
   a. waste disposal unit
   b. waste segregation unit
   c. plasma gasification unit.

3. Water management involving
   a. rain water harvesting
   b. storm water harvesting
   c. fire fighting.

The detail design was given for onsite plasma gasification unit and a dedicated water harvesting system.

5 Summary and reflections

The significance of urban sustainability has been realised globally and the importance of its social dimension is also gradually building up in the development initiatives and design processes to make our future truly just and sustainable. There is also an equal
emphasis on the role of HEIs in fostering awareness, sensitivity and literacy regarding the planetary challenges and develop innovative ideas, new knowledge and explore pathways for sustainable growth. As a result, several declarations that emphasise a number of sustainability issues in HEIs including implementation of sustainability courses, sustainability research and development as well as academic collaborations have been signed in the last millennium.

The case study described in this paper is appropriate as part of the design education curriculum with the present consensus and commitments towards achieving a sustainable future. Academic projects such as this allow the students to apply their theoretical knowledge gained during the initial tutorials on ‘System Design for Sustainability’ to a real life project. The design exercises sensitise the students towards principles of sustainability and sustainable development, interdisciplinary approaches to design and decision making, systems thinking, collaborative design, stakeholder dialogue and empowerment. Systems thinking, collective learning and design collaboration resulted in a well thought, well reflected and thoroughly discussed design proposal.

In this design project ‘Envisioning a sustainable Guwahati Railway Station Complex of the future’ the students proposed a world-class multi-modal station which was also environmentally, socially and economically sustainable. The ecological sustainability as described earlier in the paper formed an essential part of the station complex design right from the conception. Various architectural features, design and layout of the railway station complex were conceived to aptly respond to the cultural and environmental sustainability aspects. Socio-economic considerations were also at the core of collaborative design efforts. The proposals made sure that amidst this thrill of developing a ‘World Class’ or ‘Global’ urban project such as this, the design remained inclusive, catering for the needs of the people at all levels and sensitive to the poor who are employed in the informal activities at the station premises as well as the small retailers or even hawkers around the station building. It promoted economic diversity by providing spaces for both formal and regularised informal employment. Having realised that the informal sector was the backbone of the railways station’s highly successful recycling system that unfortunately remained at a small scale without any access to finance or improved recycling technologies, the design proposed a ‘Edible Landscape Project’ that provided facilities for onsite waste segregation, recycling and organic waste compost activities proposed that generated more meaningful and regularised employment for the poor in the informal sector, also improving their quality of life. The project thus, aimed at utilising the strength of such large scale public project to create spaces that brings the communities together and proves beneficial to the society.

An inclusive approach such as this, involving the different stakeholders at an early stage of the project not only helps in enriching design insights, but also results in ownership of the proposed design solutions during implementation. On one hand, the ‘Designer(s)’ forms an important link in this team effort, and plays the critical role of translating wishful ideas and insights of stakeholders into tangible design solutions. Lack of critical design, technical or visual abilities as a specialist may lead to poor practical implementable design solutions. One the other, if left to only a team of well qualified designers to solve the problem, may sometimes overlook addressing real world experiences of stakeholders engaged with the problem. Design education must therefore, factor in these dimensions for consideration during a course on Design methods where dimensions of DfS would enrich the design process more holistically.
6 Way forward

Importance of design education for and about sustainability is recognised by most HEI in India however, they either address specific sustainability issues as an elective or offer full range of curriculum for sustainable design in general. However, we emphasise that sustainability should be well integrated as inherent aspect of design and in all facets of education, not just an elective. Gradually, building and nurturing a culture of sustainability entrenched within all areas of design education which enables collaborative systems thinking, working and implementing for sustainability is a way forward. Reorienting design education to sustainability requires recognising that traditional disciplinary approaches are no longer applicable as we live in a world of ever increasing connectivity where individual actions have global implications. Learning about sustainability involves breaking disciplinary barriers to focus on a single complex global issue from varied disciplinary perspectives. In India, we understand that these changes are not occurring as rapidly as desired nonetheless there are sparks of success within education at all echelons as seen through the project ‘Envisioning a sustainable Guwahati Railway Station Complex of the future’.

7 Limitations to the study and future work

The paper accepts that sustainability is a vast, complex concept and the contributions of this studio project can be seen as necessary first steps towards sensitising the students to the issue of sustainability in design. The three main limitations here are:

1. A project like this can only address limited issues and challenges associated with sustainability in design when dealing with large urban scale problems in a short time frame of study. Although many addressed, some real-world problems were simplified or ignored because their solutions were outside the scope of this project.

2. The project identified six areas of focus to achieve the design criteria’s for Sustainable Guwahati Railway Station Complex however, only one is discussed in detail in this paper.

3. The unpredictable and elusive nature of sustainability must be considered. Any sustainability claims made refer to predictions about the sustained future, which can only be validated after sufficient period of time. Further work may be conducted to develop the conceptual findings in this design proposal into real life project proposals.

References


UNESCO (1972) Stockholm Declaration.


UNESCO (2009c) Tokyo Declaration of Hope.


