Education for Sustainable Future: Design of a Sustainable University

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Preamble

The concept of sustainability is not very new, yet the researchers continue to add new dimensions towards the perfect understanding of sustainability. The concept of sustainable university is a new addition in the portfolio of sustainability issues. A university is a complete and complex system with numerous interacting subsystems. As such for a truly sustainable university, its sustainability must be a cumulative sum of the sustainability of its hard as well as soft sub systems. Universities are autonomous systems which are engaged in the human resource development business. These are probably the only places where largest concentration of people per square kilometer function and interact. The students, the faculty, the administration and the support services suppliers co-exist and interact with each other, supposedly to the full of their abilities. Universities are thus autonomous and self-contained service delivery systems where the education is provided, training is delivered, and research is conducted in seamlessly interactive manners. The students, teachers, researchers and administrators are the visible players yet enormous support systems for the provision of learning environment is essential and also exists.

There are countless definitions of sustainability cited in the literature but for the sake of clarity and to act as foundation for the subsequent discussions in this paper, we would define sustainability as follows:

Our world which includes individuals, organizations, communities, societies, and countries must plan, organize, coordinate and use the available resources (natural or man-made) in such a way that the difference between haves and have nots continuously reduces and ultimately disappears and the world population at large have very equitable access to these resources, in doing so the drawing the resources must be replenished with the least disruption and harm to the echo system, biosphere and without compromising the quality of life for this generation and the coming generations.

The literature also extensively cites the concern for the environment, concern for the economy and concern for the society and sustainability as a balancing act for these concerns. Exhibit 1 summarizes fundamental environmental concerns, fundamental economic concerns and resulting target society. Within the premise of this balancing act, a sustainable university thus is a self contained system which has policies, plans, procedures, and practices towards the theme of sustainability in all of its subsystems, functional areas and operations. At the very outset, it must be clearly understood that the concept of sustainability in the economically developing parts of the world is relatively different than economically developed parts of the world. In developing countries the use of scarce resources in desperate situations would certainly get priority to save the family from economic or weathering severities while in the economically developed west environment stands as prime concern. This paper covers both the perspectives of developing as well as developed parts of the world.
The fuel that drives knowledge-based approach to sustainable development comprises elements derived from government and industry, as well as education. I myself held positions as corporate manager, a university professor, a government official, and now, the university Vice Chancellor. My perspective, therefore, incorporates the roles of all three sectors - industry, government, and the academia formally known as the university; each one of them is vital to a vibrant, dynamic, technology-driven sustainable economy. There can not be two opinions on the significance of education and higher education is not an exception. The governments have realized it, publics have realized it and the corporate sector have realized it. In today’s world, it is actively sought that universities must function as self supporting corporate entities and co-exist in its environment without or with least help from the government.

**Figure 1: Sustainability Defined**

![Image of a figure illustrating sustainability defined with a pie chart showing vibrant community and equitable economy]

This paper adopts and embeds the sustainability theme in university’s core competencies. The universities must efficiently and effectively deliver its core competencies to leave healthy impact in and around its echo system.
Exhibit 1: Environment, Society and Economics – A Balancing Act

Environment Concerns
- Use of nonrenewable resources should be paid for through increased renewable resource replacement.
- Rates of use of renewable resources should not exceed the rates of their regeneration.
- Rates of use of nonrenewable resources should not exceed the rate at which sustainable renewable substitutes are developed.
- Rates of pollution emission should not exceed the environment’s capacity to counteract it.
- Substitutes (e.g., Styrofoam, food waste) produced by society must not be produced at a rate faster than nature can break them down again.

Societal Concerns
- Cities should grow only within predetermined community boundaries (e.g., current city limits).
- Adequate food, housing, and medical care should be available to every family.
- Every girl and boy should receive education that teaches the knowledge, perspectives, values, issues and skills for sustainable living in the community.
- The present generation should ensure that the next generation inherits a community at least as healthy, diverse, and productive as it is today.
- Communities should insist upon planned longevity and less conspicuous consumption of material goods.

Economic Concerns
- Resource distribution must be fair and efficient while meeting human needs. Money should be circulated as long as possible within the community.
- A living wage should be paid to all employees.
- Businesses should give back to the community in proportion to its footprint on the community.
- Markets should maximize efficiency, discourage the use of disposables and greatly reduce waste.
University’s Core Competencies & Sustainability

A well-educated population is the sine qua non of economic development and there are four postulates, as shown in figure 2, upon which a university helps contribute to a successful and sustainable technology-driven knowledge economy within its internal and external environment:

- First, universities function to educate scientists, engineers, technologists, and technical leaders for industry, government, and education.
- Second, the basic scientific research conducted in the university is critical for innovation, emergence of new technologies, and sustained economic development.
- Third, universities can and must foster entrepreneurship, the process not only of translating new knowledge to application, but commercializing those new applications as new business ventures.
- The universities must also act as catalyst in the sustainable development of communities and around campuses.

![Diagram of University's Core Competencies within its Environment]

Figure 2: A University’s Core Competencies within its Environment

University’s Core Competency 1: To Educate

The universities function to educate and the education phenomenon itself, further has four core elements; the student, the academic environment, the curriculum and the faculty. The sustainability ought to be built in and around this system.

We believe that “higher education is fundamentally a public good” and whoever is capable to acquire higher education must not be denied the access to education. Education for a fee is generally
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![Diagram](Image)

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philosophy and practice of the commercial educational institutions in developing as well as developed parts of the world, however, there may be some exceptions.

**Sustainability in Academic Environment**

The academic environment is a very inclusive term comprising the classrooms, the laboratories, the library, students and faculty interaction places, playgrounds, auditoriums, cafeterias, hostels, and other places of mental, physical and emotional development. The world accepted standards for the student space requirements in classroom, library, laboratory, workshops, hallways, books, journals and laboratory equipment, ratios of administrative staff to teaching staff, staff rooms, and workshops, cubical, dormitories, parking spaces, toilets, scholarships and free ships, university rating systems for the institutions of higher learning are present. Similarly standards for allocations for research, systems of inspections, and academic rating also exists. I can very responsibly say that most of our credible public as well as private sector universities have those environmental elements. The only missing link is putting them to effective use and embedding the sustainability element in it.

The issue of embedding sustainability in academic program and curriculum has at least two dimensions. First, the program should be sustainable in economic perspective by way of strong linkages with the market environment and second the program must embed the sustainability concepts from the environmental perspective. Course/Programs must offer a good blend of theory and market orientation. It is generally argued that the education should be market oriented. It is perceived that the students should be taught state of the art tools and techniques which they are readily able to use when they enter the practical life and this position has very serious limitation i.e., teaching of tools instead of principles and foundations that underlie these applications and tools.

It is therefore essential that the academic programs are a good blend of theory, and practice. In addition, the concept of environmental sustainability must be embedded in the academic programs also popularly known as greening. Be it art, biology, computer science, development studies, economics, engineering, environmental sciences, finance, geology, human resource, information technology, kinematics, language, mathematics, national heritage, organizational behavior, political economy, Quoran, religious studies, sociology, theater, visual arts or zoology – sustainability must make an integral part of it. Apart from the specialized curriculum in the subject matter that university offers to its students, the university must also inculcate in its students the concept and value of conservation, recycling, sharing, responsibilities for the current and future generations, written and verbal communication skills, time management, marketing and presentations skills, project management and creativity.

**Core Competency 2: Research – A Vehicle for Sustainability**

Dr. Vannevar Bush, the founder of National Science Foundation in USA, half a century ago noted in his report "Science — the Endless Frontier", "Scientific progress is one essential key to our security as a nation, to our better health, to more jobs, to a higher standard of living, and to our cultural progress." Further he said, "Basic scientific research is scientific capital."

An important ingredient and outcome of Dr. Bush's work was the notion of the research university, which would partner with government and industry. He asserts, "the publicly and privately supported colleges, universities, and research institutes are the centers of basic research. They are the
wellsprings of knowledge and understanding. As long as they are vigorous and healthy and their scientists are free to pursue the truth wherever it may lead, there will be a flow of new scientific knowledge to those who can apply it to practical problems in government, in industry, or elsewhere."

It is the "innovative ability, in addition to the technical ability that plays an ever-increasing role in sustained economic success. An industry depends upon specialized expertise to design innovative products and processes. The capacity to translate knowledge into high-value, sometimes unique, products and services is imperative for a nation to become competitive in global economy. This capacity arises in numerous domains, including design, manufacturing, marketing, and management of products and services. The ability of a nation to develop individuals with such innovative abilities depends upon an educational system which provides a high quality cognitive skill base from which all enterprises can draw."

The universities will have to act as long-term visionary research and development resource places. This is equally true for all academic disciplines, sciences and subject areas. When we look around the machine which can run with a fraction of power supply that originally was required is amazing. Today once fully charged, the power supply of a mobile cell phone can sustain as long as 12 days. If we look around the marvels research has contributed to the sustainability in almost all areas of human engagement, the engineering, waste management, manufacturing, medicine, agriculture, new and innovative materials – there is a continuous improvement in the contribution to sustainability and friendliness to environment. Certainly, not sufficient and one can not say, that this is enough. There are still long list of issues which require research to further improve the environment friendliness of our technologies and universities need to continuously address these issues in sustained manners.

Core Competency 3: Fostering Entrepreneurship

Fostering entrepreneurship is yet another important vehicle of inducting and enhancing sustainability in the educational system. Technological entrepreneurship is the ability to translate discoveries made in the course of scientific research into practical application i.e. the process by which innovation is transformed into business ventures. For us entrepreneurship also means putting to use the unique resources bestowed to the mankind us in the shape of minerals, vast stretches of lands, oceans, marine life, forests but in sustainable fashion. Understanding the principles, practices, and importance of entrepreneurship coupled with sustainability, therefore, is vital to the sustainable, economic health and well being of ours. We believe that the spirit of entrepreneurship is absolutely critical for the university education in today's knowledge-driven economy. Education delivered, research conducted and entrepreneurship developed at the universities in a sustained culture, and green environment provide serious foundations in the life of university graduates.

University and Sustainable Societal Development

Universities are prime places that can serve as breeding grounds for inoculating sustainability concepts. This is generally true that universities produce leaders in all areas of practical life; business leaders, politicians, actors, and ambassadors, doctors, economists, farmers, generals, hakims, kings, lawyers, professors, secretaries; traders, technocrats; the people in the leadership role in the society. If the universities are rightly able to communicate the concept of sustainability in its graduates then the sustainability will be embedded in their message, feelings, passions, opinions, arguments, values, businesses and understandings. They will be the careers of sustainability genes wherever they go.
Sustainability will show-off in all their transactions and this will help the universities sustain and the community sustain and the world sustain. Sustainable university therefore would mean fostering understanding that shall breed cohesiveness and integration for building, pampering and promoting the better world for today and tomorrow.

**Sustainability through Communal Diversity**

Another very critical area in promoting sustainability is promoting diversity in the university population including but not limited to students, faculty, research and administrative support staff. People from various regions, local and international is likely to breed more intercultural understanding, inter-regional and inter-racial harmony. The collaboration in education and research, exchange of faculty and students, joint organization of research and social events is likely to promote peace and prosperity in this world.

The universities enjoy special status in societies as such they have special obligations as well. The universities are microcosms of much larger and bigger systems and must act as roll model for the communities where they exist. On theoretical, conceptual, and practical fronts the universities can act as eyes, ears, and brains of the community. The promotions of healthy production and consumption patterns, use of recycling, cause for environment friendly activities can be very safely and very easily promoted by the universities.

Involvement of communities and community leaders in university affairs and vice versa would promote the cohesiveness in the communities. The university population can become deeply involved in community activities like tree plantation campaigns, promoting a healthy life style by awareness campaigns and in countless other ways.

**Physical Plant of a Sustainability University**

Whenever I travel and stay in a hotel, I frequently see a clipboard or a sticker in the bathroom saying unnecessary use of towels leads to unnecessary use of detergent that is injurious to our environment. It is very valid point that in 24 hours of stay, one towel ought to be sufficient rather than three, four or five. This makes me think the provisioning and use of physical plant facilities at our campuses. The use of paper, plastic and glass which is recyclable, the water that can be saved, the electricity and gas that can be economized and use of telecom that can be optimized are just few examples. Instead of disposable plate, we may wash the plate. Much has to do with our individual and collective attitudes. Attitudes start with the state of mind while we are thinking some solution to our problem. The sustainability in physical plant starts with the design of the provisioning systems be it a classroom, selection of paper or selection of a trash basket, building a new building, selecting an HVAC system. The exhibit 2 provides a list of just few things that involve sustainable mindset in a university’s physical plant system. If we think of a university’s sustainability concept map, something similar would emerge:

- Communities have universities
- Universities have people who use buildings must be energy efficient
- Buildings use energy create environmental issues are addressed by research at universities
- Universities have people are students come from communities go to the communities make communities
- Universities teach students start new businesses generate employment support sustainable economy enhances community image and attractiveness promotes tourism and so on.
Exhibit – 2: List of some activities at a University to Promote Sustainability

1. Designing energy efficient building
2. Use of non-depleting, non-polluting sources of energy like solar, wind, and hydro systems for energy purposes
3. Planting trees in every plantation season by involving students, faculty, administration and community and avoiding cutting down the trees
4. Self stopping water conserving water taps
5. Better design of toilet for flushing – using air pressure instead of water
6. Water treatment, and helping groundwater recharge
7. Managing bio-diversity
8. The conservation of water from various forms of precipitation i.e., rain, snow etc., using dams, dikes, lakes, fountains
9. The design of policies, plans, processes, and procedures that promote sustainability
10. Designing energy efficient heating, ventilating and cooling systems
11. Selection of reusable, recyclable utility items instead of disposables
12. Disposal of effluents from residential areas, academic areas, and labs only after appropriate treatment to avoid hazards impacts
13. Locale of expansions, new campuses
14. Design of traffic circulation on the campus
15. Design of facilities that promote walking or use of public transport facilities rather than use of low capacity motor vehicles
16. Energy efficient and environment friendly vehicles i.e., busses, trucks, cars
17. Use of organic substances instead of insecticides and pesticides
18. University town – efficient land use planning
19. Quality of life on campus—ensuring the availability of healthy food, clean water, fresh air, green surroundings
20. Life in the dorms for academic wellbeing, mental, social wellbeing, and physical wellbeing
21. Clean water, clean air, noise free surroundings
22. Education for employee’s children’s and less privileged population
23. Adopting non-smoking policy on campus
24. Promoting health clubs and healthy activity associations
25. Organizing walks, and nature weeks, conservation weeks, environment weeks, walking week and so on.
26. Student events and activities debates, drams, declamations, essay competition that foster the concept of sustainability
27. Preparing and adopting University’s “Sustainable Planet” Policy to include environment, energy, transport policies, cycling, waste management policy

This in no way is an exhaustive list of things that can be done at our university campuses but the point is that the concept of sustainability must be adopted and advanced.

Financial Sustainability
Sustainability in a university’s financial systems is a must. The sustainable functioning of a university’s other sub systems are very closely related with the sustainability of its financial system. Student’s sustainable inflows requires sustainable academic program structure, liaison with industry, would increase sustainable flow of donations; continuous quality proposals for grants would energize the research mechanisms, as well as the university’s research stature, production of PhDs and so on. The university industry liaison would have multifactor impacts e.g., on student internship and later employment and absorption of students, faculty research funds would promote research on industry’s problems, new projects, innovative products, more businesses and additional resources for the university, venture capital would provide new business opportunities for graduates. Critical areas for university’s financial sustainability involve identifying the sustainable cash flow streams, enhancing the cash flows streams, managing the cash flows, leveraging the receivables and innovative fund management to name the few.
University & Its Environment

The universities have a key responsibility to play in the development of a general technological awareness and literacy in all citizens of a given nation, in order to create understanding and acceptance of technology, and to create a favorable climate for technological developments. Universities cannot do it alone. Academic institutions, corporate sector and government offices and labs play a vital role in this process. There are countless examples of successful collaborations. I strongly urge the governments, the industry and businesses to come forward for technological alliance for the development of sustainable communities. A typical collaboration example of cooperation of our university with our environment is presented in figure 3.

The university’s corporate relations should not put all its eggs in one basket. Corporate relations must be diversified in multiple but manageable directions. The universities must bank on its strong areas of academics and research. The industry, financial institutions, sector specific companies and associations need to be approached in planned fashion. The confidence building campaigns, publicity and public relations campaigns should be ongoing features in a university’s corporate relations. The alumni are very dear to its Alma meter and conversely is also true. The strength of university alumni relation adds another dimension to the sustainability of a university.

![Diagram of BUITMS Collaborative Model]

Figure 3: BUITMS Collaborative Model to be operated on Pakistan Educational and Research Network (PERN) sponsored by Higher Education Commission

However, the power of this relationship is not effectively realized. Generally the university’s clout in the industry, community and society helps its graduates to get started in their practical life. The university initiates help from internship, career counseling, business incubation centers, venture capital, research support and in many other ways. While the alumni settle in their careers they bring goodwill of organizations they work in, help in research funds, donations, employment offers for graduating classes, sponsorship of events, scholarships for students and numerous other ways. These relations and goodwill works even at the international levels in inter country and inter-university relations, used appropriately can avoid destruction, wars, and tensions and promote peace. I am sure
that role of international students in international collaboration and international peace efforts have only partially been realized by the nations.

There are numerous examples of corporations in competition collaborate with each other, universities can do it in much better way; student exchange, faculty exchange, course acceptance, credit transfer, collaborative research, service provision agreements, split programs, faculty development, sharing of laboratories, libraries, and other research resources, joint organization of seminars, conferences and other technical, social and cultural events would certainly promote network effects.

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