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Roles of engineering in a changing world

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Roles of Engineers in a changing world.

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Abstract

We live in a changing world. The pace of changes and the scope of changes have created new challenges for professionals including Engineers. On one hand technology has made it possible to send information to any corner of the in few seconds on the other hand most people in the world lack basic services to live decent and quality life. The world has urbanised with implication for planning, design and implementation of development projects. Infrastructure engineering can contribute better by designing interventions both at policy and practice level. A conceptual challenge for Engineers is to see engineering in the existing and changing social and economic context for which conventionally they are not trained. Engineers are required to have a broad based understanding of basic principle of subjects which were historically not the reemit of Engineering Innovative approaches are required to not only address the existing problems but also to address the future problems. This requires professionals to be brave enough to challenge the existing paradigms.

Lack of capacity to create and manage capital is a key constraint in many developing countries. Poverty alleviation is the key policy objective in the context of which professional are required to perform. Frameworks are required to conceptualise the role and challenges of engineers in the changing world. One such framework is sustainable livelihood approach, which is very briefly described. The key challenges for engineers at policy and practice levels were identified with the conclusion that infrastructure engineering has to play proactive role to improve the quality of life in the society where they live.

Introduction

We live in a changing world. That is not new. The new dimension is the pace with which the change takes place. The scope of change is also very comprehensive; it covers all sphere of our life. Professional and academic institutes all over the world are conservative by nature. This approach is with good intentions to safeguard the traditions of the institutes. However, in many cases the traditions have “fossilised” the intelligentsia. Instead to doing what is fairly obvious and simple, complex procedures, even outdated, have been adopted in the name of good standards, specifications and practices. Innovation is not to discard whatever one had or has but to build on it as far as it is possible.

“Innovation is fostered by information gathered from new connections; from insights gained by journeys into other disciplines or places; from active, collegial networks and fluid, open boundaries. Innovation arises from ongoing circles of exchange, where information is not just accumulated or stored, but created. Knowledge is generated anew from connections that weren't there before. —**Leadership and the New Science**”

This article briefly describes a personal perspective on the role of Engineers in a changing world in the context of Infrastructure Engineering contributions to improve the livelihoods of our people using innovative approaches.

Context of the discussion

We live in the midst of globalisation, structural adjustments and “coke” culture. We have inherited also inherited a strong culture developed over centuries. On one hand we have access to the highest level of technology that man has ever seen in the recorded history. On the other hand most of our fellow “world being” not only lacks livelihoods opportunities but even lack the basic services such as safe water, sanitation (including waste disposal), transport, power, housing, health, education, and decent law and order. Another interesting fact is that most of us are or will shortly be living in an urban area, which will have different demands on the professional knowledge, skills and attitude of the professionals including Engineers.

One of the key constraints is access to capital on terms that are suitable for the long-term growth. The problem is compounded by lack of human resources to create and use such capital. We have so many prescriptions but in my humble opinion the professionals have not yet been able to propose innovative vision which can turn the conditions around with an environment where most of us live a quality life.

It is useful to classify the interventions at the levels of Principles or theory and Practices. It is acknowledged that those are interrelated and hence we need a framework to observe their interaction. We also have to be aware that Engineering is only a small subset of a large set of professional. It is in our benefit to understand and communicate with other professionals. One such framework, which will help in attaining such understanding, is termed as sustainable livelihood approach. This is not my intention to propose this framework as the best available framework but to propose this as a resource for discussion.

Practical sustainable livelihoods approach

'A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.' (DFID, 1999)

Sustainable livelihoods (SL) Approach has been taken as a flexible framework to identify the key issues and methodology to explore those issues. Following section provided a brief definition of livelihoods and some core principles of SL (Ashley, C & Carney, D. 1999).

Livelihoods

A livelihood comprises the capabilities, assets and activities required for means of living.

Core principles of SL

Following are some of the core principles of SL approach.

Poverty focussed

This research focuses on the low-income communities and issues related to transport which influences their livelihoods.

Responsive and participatory

The research was conducted adopting participatory approach and in response to the demand of the urban poor.

Multilevel-Micro-macro

The research explores macro-level factors, which have influenced the livelihoods of the urban poor. The issues were also explored at micro-level, which have the bearing on macro-level policy making and operations. The linkage between policy and practice was also explored. An historical perspective is also taken to see these linkages at work only currently but also how they were in action in the past.

Conducted in partnership

Perspectives from the urban poor, regulators and the operators were explored.

Sustainable

Special attention was given to learn from past and present policies and operations that worked or those which did not produce sustainable development in the context of the case city.

Dynamic

The socio-political dynamics in the past and in the present, linkages between changes at micro and macro levels, changing pattern of the city and changing political context were also explored to understand the mechanism to improve access and quality of urban transport to the poor through partnerships.

Key components of the framework for analysing the livelihoods of individuals and the community are:

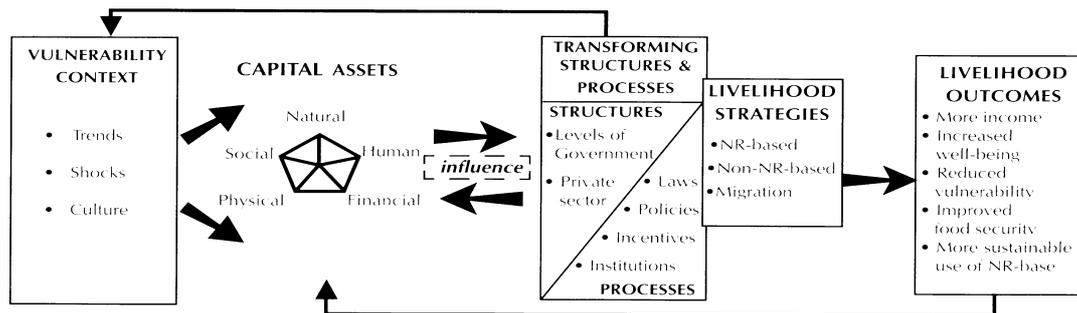
- capital assets
- vulnerability context
- transforming structures (layers of organisations both in the private and government sectors)
- processes (laws, policies, incentives)

The framework for their interaction is illustrated in Figure 1.

The capital assets are grouped as:

- **Natural Capital:** The natural resource stocks from which resource flows useful for livelihoods are derived (including land, water, wildlife, biodiversity, environmental resources).
- **Social Capital:** The social resources upon which people draw in pursuit of livelihoods (i.e. networks, membership of groups, relationships of trust, access to wider institutions of society).
- **Human Capital:** The skills, knowledge, ability to labour and good health important to the ability to pursue different livelihood strategies.
- **Physical Capital:** The basic infrastructure (transport, shelter, water, energy and communications) and the production equipment and means which enable people to pursue their livelihoods.

Figure 1: Sustainable rural livelihoods: Framework



- **Financial Capital:** The financial resources which are available to people (whether savings, supplies of credit or regular remittances or pensions) and which provide them with different livelihood options.

Infrastructure Engineering contributes directly or indirectly to all the categories of capital assets of the citizens as well as in the structures and processes. Engineering is apparently associated with improvements in physical capital. However, Infrastructure Engineering contributes in providing access to other services such as schools, health clinics and markets. Infrastructure Engineering is integral and contributory to the development of all the capital assets; hence Engineers and allied professionals have a significant role to play in understanding and supporting sustainable livelihoods as part of a multi-sectoral analysis of community life.

Sustainable livelihoods approach will help in developing integrated multi-sectoral interventions for improving the quality of life.

It is important to understand the structures and processes, which define people's

livelihood options. These structures and processes are critical in determining who gains access to the various assets, and in influencing the effective value of each asset. The vulnerability context is particularly important as it indicates the nature of trends, shocks and culture, and the ability of the poor to withstand their impact.

The combinations of activities, which make up a livelihood strategy, are known as a 'livelihood portfolio'. A portfolio will be diversified over time, and between households, communities and generations; hence the composition of livelihood strategies is a dynamic element of sustainable livelihoods, and as such requires a historical analytical approach [See for more details Diana Carney].

Key Challenge for Engineers in developing countries

National governments and International donors declare poverty alleviation as the key policy target. *How can Engineers help in meeting such targets?* In our changing and demanding world if Engineers take a comfortable but very dangerous position that "it has nothing to do with Engineering" then the profession will become more irrelevant to the society. The framework described above makes it very clear that we, as a professional, have to relate to the demands arising from our present and immediate society.

Issues of principles building

Following are some key issues for further exploration by Engineers and allied professionals.

- There is a need to explore multiple ways in which Infrastructure provision (or lack of it) impacts on the lives of the poor.
- Innovative vision and approaches is required in dealing with issues such as settlement planning, infrastructure planning and principles of pricing mechanisms.
- There is a need for integration of multiple services to better address the needs of the urban poor. There is a need to explore better mechanisms for organisational relationship between the private and public sectors.
- A better understanding of the actual and potential roles of different actors, and thus potentially policy improvements.

Issues for practical interventions

- Develop a better understanding of the existing capacities, perception and determinants of satisfaction of the people and move away from the typical need assessments.
- Need effective, efficient, affordable and durable infrastructure services in order to improve the quality of life for all.
- Need to understand differential impact of existing infrastructure services on women, children and the elderly and how to better serve them. Do we have any parallel to "Geriatrics" or "Paediatrics", if not why not?
- Softer issues in the context of engineering such as health and safety, management of projects, social dimension of infrastructure provisions, quality of processes and products, operation and maintenance of infrastructure need more attention.
- Management model to improve the role of Private sector in the provision and management of infrastructure needs professional interest. The debate about the role of the private sector should be based on empirical evidences and not solely on ideological opinions.
- There is a need for Engineers broaden the choice of methodologies to other than just

physical sciences, if appropriate. With the development in management sciences, and qualitative methods we now have a broad range to research methods and techniques available for our professional pursuits. This has an implication on the curriculum and professional training of our Engineers.

Concluding remarks

The professional involved in the planning, design, provision and maintenance of a wide variety of infrastructure provisions are facing challenges to new dimensions. If they do not keep themselves relevant to the need of the people they will soon become more irrelevant to the society. To earn a respect in the society the professionals have to service them. We cannot demand respect but only command respect by serving the people.

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