

UNIVERSITY OF MOUNT ALLISON, CANADA

STUDIES AT VIVEKANANDA INSTITUTE OF INDIAN STUDIES, MYSURU

SCIENCE, TECHNOLOGY AND SUSTAINABLE DEVELOPMENT

ST&SD Course segment: 18 May to 07 June 2018

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COURSE DESCRIPTION

The course introduces students to "development" in India in its historical, economic, sociological and ideological aspects. India, which historically had a strong science and technology tradition, is a vibrant democracy which has embraced modern science and technology, in which it has made great strides. India has come to terms with the developmental realities of on-going globalization. While the negative social and ecological impacts of conventional development makes it an imperative to seek sustainable alternatives, the roots of such alternatives and practices still draw upon India's vast corpus of indigenous knowledge in innovative as well as modern ways. The lectures are presented by academicians and activists from Mysore and Bangalore. The course includes panel discussions and video documentaries that highlight themes covered in the lectures, and are intended to broaden perspectives.

The course consists of the following eight units:

1. Science & Technology
2. Development
3. Environment & Technology
4. Food, Water and Corporate Farming
5. Energy
6. Society & Economics
7. Governance
8. India In a Global Context

COURSE REQUIREMENTS

Students should carefully read the details of the units and the lectures given in the Course Content below. The schedule of classes will be issued separately.

Classes will be for one-hour duration, with time during the 45-minutes lecture and also after the lecture for questions or brief discussion.

Students are expected to engage actively in classroom discussions.

Students are required to submit one soft copy (to <sg9kere@live.com>) in .DOC format, and one hard copy of a 3,000 to 5,000 word-length term paper on a subject of their choice but within the scope of the course content, **both not later than 04 July 2018**, for evaluation.

Students may interact with the speakers or the Course Coordinator for choice of subject for the term paper, or other guidance.

COURSE CONTENT

UNIT 1 – SCIENCE & TECHNOLOGY

In the contemporary world, S & T is the reason for rapid changes in lifestyles the world over. The most significant changes have been accelerating industrial growth (based first on coal and later on petroleum) and urbanization of populations.

For many, this has meant improvement in the standard of living (SoL), but for very many more the ill effects have lowered their quality of life (QoL). By all accounts this difference is widening and deepening, leading to conflicts of interest and social tensions.

This situation raises ethical and civilizational issues regarding the sharing of finite resources, particularly since most of the benefits of industrialization accrue to those sections that are in power.

But knowledge, it is said, is power. Hence knowledge, which is primarily based upon information, can empower the millions who live near the bottom-most rungs of the socio-economic ladder. Today, information technology provides the starting point for a knowledge revolution, but only if primary and secondary education at the lowest socio-economic levels is appropriate to human needs (as opposed to corporate needs) and is imparted universally.

LECTURE ST&SD-1: Relevance of S & T to people's well being, and the importance of information in society.

LECTURE ST&SD-2: Ethics in S & T in the context of finite resources.

UNIT 2 – DEVELOPMENT

The main component of the development paradigm the world over is industrial growth regardless of political ideology or type of government. Research and development (R&D) in the areas of S&T are governed by the economics of the products of R&D in terms of their marketability and the financial profits that they generate.

No doubt a portion of this goes towards the welfare of people (e.g., so-called infrastructure projects), but an increasing share is going towards corporate profit. At national level, economic indicators have been devised to assess sectoral and overall growth, while corporate progress is reflected in the stock market figures.

The welfare and economic progress of most people however do not appear to relate adequately to these economic growth indicators, bringing the validity of the economic indicators into question.

Industrial growth has historically gone hand in hand with urbanization, and concentration of economic power in urban centres has resulted in a rural-urban divide as urban centres expand into the surrounding rural areas. Urban expansion with increasing concentration of human and vehicle population is making urban governance problematic especially in metros and large cities where a significant proportion of the population is poor, and lives in slums. The collapse of governance and urban infrastructure has been typified in New Orleans (Katrina, July 2005), Mumbai (Floods, July 2005) and elsewhere.

LECTURE ST&SD-3: The Third World – people & progress, education & health, beneficiaries & victims of development (urban & rural).

LECTURE ST&SD-4: Economic parameters – measuring progress in a globalizing world.

LECTURE ST&SD-5: Poverty and economic growth.

LECTURE ST&SD-6: Urbanization – the rural-urban divide, urban chaos & collapse, its causes, effects and future.

UNIT 3 - ENVIRONMENT & TECHNOLOGY

In times before modern science defined matter in the universe as being composed of elements made up of atoms, collective wisdom held that the universe comprised five elements, namely water, air, earth, energy and space (Jal, Vayu, Pruthvi, Tejas, Aakash, according to Hindus). In present times nobody denies that matter is composed of elements, but in practical terms, it is clear that the environment that sustains life on Earth consists of the first four of the elements defined by the ancients - Pruthvi (Soil), Jal (Water), Vayu (Air), and Tejas (Energy) - whatever be their form or composition in modern physical and chemical terms.

Modern technology uses enormous quantities of energy (coal and oil) and apart from the products and services available as a result, produces solid, liquid and gaseous waste products that enter soil, water and air, which we now call the physical environment. Even the "durable" consumer products eventually end their useful life as junk that pollutes the environment. Thus it is obvious that there are many kinds of pollution. Every environment is capable of "carrying" a finite "load" of each type of pollution - beyond this load, the environment "degrades", as viewed from a biological stand point, and the survival of one or other life-forms get seriously threatened. This has today, exceeded the background extinction rate.

For the past few decades, keen observers and some scientists have noted that Earth as a whole has begun to display changes in soil, water and air that have the potential to adversely affect all life-forms in a major, even revolutionary, way. Further, the causes for these changes have been traced to human industrial activity. The finger thus points at modern technology-driven industrial civilization.

We need to think about whether technologies that are more appropriate to people's basic needs should be introduced and encouraged with wide public participation rather than business-as-usual with heavily energy consumptive, technology-driven, consumerist lifestyles.

LECTURE ST&SD-7: Appropriate Technology, NGOs and people's participation.

LECTURE ST&SD-8: Pollution - causes, effects, solutions.

UNIT 4 - FOOD, WATER & CORPORATE FARMING

In the industrially developed countries and in large portions of industrially developing countries, food and cash crop agriculture is heavily dependent on the use of chemical fertilizers and pesticides. Since these are prepared from oil, oil is a major agricultural input apart from water, thus adding substantially to input costs. Use of oil-based agricultural inputs also causes increased demand for water by the crops, further raising input costs and making farmers dependent upon intensive irrigation. Thus the profit-orientation of the corporate sector plays an important role in formulating agricultural policy.

Especially in the Third World, the cost of agricultural inputs are rising, and marginal and small farmers in India are getting increasingly driven to destitution for many reasons, among which the use of unsustainable methods and faulty agriculture policy are important. Under these circumstances, WTO has facilitated entry of multinational seed corporations that are forcing introduction of genetically modified (GM) seeds, while other multi-national corporations are introducing GM agricultural products at lower costs than local produce, seriously threatening biodiversity and traditional farming practices, and adding to the woes of farmers.

However, time-tested and proven indigenous knowledge systems in agriculture are seeing a renaissance, and organic farming with use of indigenous seed varieties and water-harvesting conservation systems are gaining recognition albeit slowly.

With new technologies and improved engineering design, heavy engineering has been employed to construct over 45,000 major dams on rivers in the period from the

1930s to date with construction peaking in the 1970s when 2 to 3 dams were being constructed daily, worldwide. Construction of dams and canals along with “river training” and “flood control” works became easily possible, and since Independence (1947), India has invested heavily in such works. Concomitant with that, about 30-40 million rural and tribal people have suffered involuntary displacement, mostly without adequate or just compensation and many with none at all.

Notwithstanding the human misery inflicted on the weakest and most vulnerable sections of society, the dam-canal projects have rarely if ever, performed according to design parameters, besides suffering time and cost overruns and quality shortfalls. Indeed, to date, there has been no comprehensive, transparent review or study of any dam project from the economic standpoint.

With S&T advances, food technologies have been developed to improve agricultural products and make storage, preservation and other properties of various food products more economic. Food technologies have brought in their wake regular markets for processing of agricultural products and, at the input end, entry of corporations into agriculture by way of contract farming.

With heavy dependence of agriculture on oil for inputs and for transportation of agricultural products, a scenario of lowered availability or affordability of oil can have serious effects on the volumes and costs of food production and distribution, and the downstream effects on law and order in society. In some quarters, this scenario is not being seen so much as a question of whether as of when it might occur and how precisely.

LECTURE ST&SD-9: Surface and ground water – rivers and engineering.

LECTURE ST&SD-10: Formal & informal knowledge systems, plant biodiversity, transgenic modification.

LECTURE ST&SD-11: WTO, corporate farming & food technology.

UNIT 5 - ENERGY

From the earliest human settlements to modern times, societies have been dependent upon sources of energy. With time, societies have discovered new sources of energy, developed them and found new uses for them.

The use of steam (produced by boiling water, using coal as fuel) for mechanical propulsion and other machines was a revolution in the use of energy that triggered what is today called the industrial revolution. It caused change from a handicraft economy to one dominated by machine-based industry, triggering technological, socio-economic and cultural changes as mathematics and the physical, biological and earth sciences developed. From coal, industrially advanced countries began to use oil, also a fossil fuel, also finite and irreplaceable like coal, but far superior.

In present times, as the finiteness of oil (indeed, fossil fuels in general) is being understood more widely, there is serious S&T focus on alternative or so-called “non-conventional” sources of energy like solar, wind, ocean-wave, tide and ocean thermal energies, and fuels like hydrogen.

But regardless of the source of energy or the fuel, a vital link in the economic chain of any country is electric power – generated from flowing water or by use of coal, gas or steam from nuclear heat. Economists hold generation of electric power as a sure sign of development, and per capita rate of electric power consumption is the parametric indicator. Hence there is a tendency to resort to supply-side economics in power generation regardless of the productive or unproductive use, misuse, wastage or loss of electric power or the environmental damage caused.

Nuclear-based electric power generation is claimed to be safe, reliable, clean and cheap, and at first sight appears to be the ideal solution to the negative effects of most other methods of generation. However, the nuclear accident at Fukushima (2011) has led to serious doubts concerning the basic claims of the nuclear industry,

especially in view of the extreme secrecy of nuclear operations. Several industrially advanced countries are phasing out nuclear power, while some others are even expanding nuclear power generation under draconian laws of secrecy, in spite of demonstrated risks and lifetime audit costs. In the meanwhile, the politics of nuclear power has only increased the risks of nuclear proliferation, and forms an existential threat to life-forms on earth.

A brief study of the links between the energy scenario, economics and climate change, demonstrates the essential unviability of the present global trend of energy use, and the need for macro energy-audit.

LECTURE ST&SD-12: Energy, climate change and economics.

LECTURE ST&SD-13: Alternative energy sources.

LECTURE ST&SD-14: Nuclear energy – policy, costs, benefits, risks, transparency, accountability.

UNIT 6 – SOCIETY & ECONOMICS

Indian society, from 300 million in 1947 (20% urban, 80% rural) crossed 1,000 million in 2001 (40% urban, 60% rural) i.e., 60 million urbanites in 1947 have grown to 400 million in half a century. In many metros, slum dwellers are more than 50% of the population e.g., in Mumbai 60% of its population is in slums. The population now stands at 1.3 billion.

With urban pollution and heavily overloaded civic infrastructure, the quality of life (QoL) of the poor is abysmal, while that of the lower and middle income groups is poor. This, combined with a reasonable standard of living (SoL) for the middle classes and a high consumption lifestyle for the narrow band of the wealthy, has created simmering social tensions that erupt sporadically as sectarian or communal violence. Fall in QoL has resulted in health problems across the social spectrum, with endemic and chronic diseases and lifestyle diseases increasing in incidence, and huge loss of human productivity.

The model of development adopted since Independence has favored the urban-industrial over the rural-agricultural, and since 1991 when India's New Economic Policy was formulated, this differential has been accentuated. Further, India joined WTO in 1995 and the difference has become stark ever since. In the rural areas and in tribal areas, a lively debate has commenced regarding community ownership of natural resources. The link between community control over and ownership of water-forest-land (jal-jangal-zameen) with the constitutional right to livelihood has been understood at rural level, and forms the basis for grass-roots people's movements.

The economy runs on the basis of agricultural and industrial products of all kinds being transported to markets for consumers besides providing input materials for both sectors. Urban centers, big and small, receive supplies of food and fuel from distant places due to the transport sector, while physical movement of people is also dependent upon it. In short, transportation is not merely necessary for economic growth, but in the contemporary context is a vital need for survival, a lifeline for the nation.

The cost of living rises with the cost of fuel, but beyond a certain point the volume of transportation (and goods transported) is bound to decline, leading to shutting down of sectors of the economy. Any interruption in oil supplies due to any reason can precipitate an economic crisis primarily due to collapse of the transportation system. This would hold true for any country. The search for alternative fuels is on, but there are no moves to re-design the economy itself, which is so highly and dangerously dependent on fossil fuels.

LECTURE ST&SD-15: Indian society, its economics & multilateral financial institutions.

LECTURE ST&SD-16: Transportation – the lifeline of the economy in the context of fuel availability & alternative fuels.

LECTURE ST&SD-17: Re-thinking Sustainable Development.

UNIT 7 - GOVERNANCE

The function of government is to deliver basic civic services and security to people. In a democracy, since government is meant for people, it is also elected by the people. However, the election system and its process sends elected representatives who are in fact not truly representative of the people's needs, wishes and aspirations because they represent a minority of the population. (The "first-past-the-post" system has this disadvantage). To make matters worse, corruption in government, need for huge finance to stand for elections, the sources of finance having their own agenda, and the need to "recover the investment" while in office, together go to make governance ineffective because mostly only the wealthy and influential benefit from governments' development plans while the poor and unempowered receive little or no benefits, and even become the victims of the projects of development in various ways.

Government is increasingly being influenced by corporate power in elections as well as in governance by setting agendas and proposing programs and projects that primarily benefit themselves. Governments often offer benefits of projects as promises to gain political mileage, when the benefits can materialize years (even decades) in the future, when there is no guarantee that the same government will be in power at that time. Hence there is little or no accountability, and performance of projects is not reviewed transparently to learn from past mistakes. In-house performance reports are only for the purpose of justifying further investment in similar projects. Naturally, since politicians usually do not remain in power beyond a maximum of 5 years, the central role of the bureaucracy in this is obvious.

This is not to say that large or mega-projects have not brought benefits, but only to emphasize that the benefits are routinely exaggerated so as to obtain sanction. As for the costs of projects, it is not possible to quantify the social costs of rehabilitation of populations displaced due to the project. (Since 1947, it is estimated that 30-40 million people, mostly rural or tribal people have suffered displacement). The Benefit:Cost ratio calculated for sanctioning the project is thus inherently inaccurate, even if it is not manipulated by engineers.

Planning is a central activity of government, but input data is often out-dated and in any case the prior, informed consent of people who will be adversely affected (and have to pay in terms of displacement and/or loss of livelihood) is never sought. This results in protests, representations and unnecessary litigation. (This is one of the reasons why, of the million plus pending cases in the courts of law in India, government is one of the parties in a large majority of the cases).

Protest in a democracy is only to be expected when people who are adversely affected by government decisions get no relief when they state their problems through the "proper" official channels. Protesters are people who suffer from real or perceived injustice. Protests are usually peaceful at the outset, but if government ignores them or refuses to engage in discussion, public frustrations can build up to the point of militancy, which may still not be physically violent, though this is not often the case. These are political problems that need solution by political means. However, much too often, governments use police or military force to quell protest.

Frequently, a project proposed can be executed only when adequate external funding is available. When prior, informed consent of the affected public is not obtained, but financial agreements and work contracts have been finalized, government, under pressure from corporations, is unable to tolerate dissent or protest. Finance is obtained from international financial institutions (IFIs) like WB, ADB or JBIC, and the imperatives of debt-servicing force governments to push ahead with the work by brushing aside protest and agitations using the means at their disposal, namely, propaganda that highlights the benefits to get the support of the (usually better-off) beneficiaries to ridicule, denigrate or browbeat the protestors, and

the police to break up demonstrations and meetings held by project-affected people. To be fair, this situation is not peculiar to India, and exists where corporate power equals or exceeds real political power.

LECTURE ST&SD-18: Planning - "prior informed consent", transparency & accountability, ethics & practice.

LECTURE ST&SD-19: Concept of the corporation.

LECTURE ST&SD-20: Protest, militancy & terrorism - causes and solutions : Role of the police and military in a democracy.

UNIT 8 - INDIA IN A GLOBAL CONTEXT

India is an emerging economic and military force in the world and particularly in Asia, next to its powerful neighbor China. India's is a modernizing military, even as it has the questionable reputation of being the world's largest military hardware importer. India's world-class missile and space technology has been indigenously developed. But as the character of warfare changes with artificial intelligence, cyber warfare capability, unmanned drones for military uses from launching missiles to intelligence and battlefield surveillance, etc., challenges abound, not least of which is in training of military personnel.

In present times, cyber security encompasses all spheres of national endeavour, and is an integral part of national defence capability. In spite of India's strides in several high-technology areas, the cyber field appears to be an area of great challenges, as indeed it is for almost every other country.

It is no secret that the military-industrial complex (MIC) in USA is among the most powerful lobbies that influence government. Tie-ups between India and USA in the defense sector has given a boost to MIC in USA and also in India, where outsourcing to industry for production of items of military hardware is increasing. There is a school of thought which holds that India is already a part of the "US Camp", especially following several civil-military cooperation agreements.

China's economic-political power has grown substantially in recent times. It has flexed its military and economic muscle globally, challenging USA's geo-political pre-eminence. Its growing influence in the international financial system is cause for disquiet.

India has made its informal entry into the club of nuclear states by dedicated work over decades without external help, by its own pool of scientists and technologists. With the India-U.S strategic agreement with focus on nuclear power in place, India is expanding its nuclear power program even without signing the NPT.

India as a regional power with Pakistan as a legacy problem, may become prone to being used in the power-play as China rises with a vision of being the global hegemon even as USA struggles to retain its military-based geo-political standing.

The Middle East remains the center of gravity of global oil reserves. All the growing economies of the world are making strategic moves necessary to secure their oil sources and the security of the sea-routes and overland routes to maintain their economies. Thus the Middle East remains an area of intense geo-political conflict and rivalry. India's peninsular landmass is located strategically with respect to the sea-lanes which carry over 25% of globally traded oil.

Until world-leaders begin to understand the futility of military conflict and of total economic dependence upon fossil fuels, the world powers will continue to jockey for position and power, and India will continue at the focus of the conflict area.

LECTURE ST&SD-21: The military-industrial complex - corporatizing conflict.

LECTURE ST&SD-22: Nuclear states and neo-nuclear states - proliferation.

LECTURE ST&SD-23: Regional reactions & repercussions to Indo-US ties.