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Escape development strategy from the view of energy transition

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Абстракт

Сүүлийн үед судлаач, эдийн засагчдын анхаарлын төвд байгаа судалгааны ажлын нэг сэдэв бол "Тогтвортой хөгжил"(Sustainable development)-ийн асуудал юм. "Тогтвортой хөгжил"-ийн үндсэн томьёолол тодорхойлолт нь эрдэмтэд судлаачдын дунд "эдийн засаг(эдийн засгийн өсөлт), байгаль орчин(бохирдол), нийгмийн(ядуурал, тэгш бус байдал) үндсэн асуудлуудыг харилцан уялдаа холбоонд шийдсэн хөгжлийн түвшин" хэмээн хүлээн зөвшөөрөгдсөн боловч түүнд хүрэх арга зам, бодлого, стратеги нь онолын хувьд харилцан адилгүй маргаантай байдлаар хөгжин боловсрогдож ирсэн юм.

Энэхүү өгүүлэлд тогтвортой хөгжлийн түвшинд хүрэхэд баримтлах бодлого стратегийг **"эрчим хүчний шилжилт"**-ийн онолын үүднээс тайлбарлан тодорхойлж байна. Эрчим хүчний шилжилт(theory of energy transition)-ийн онол нь зөвхөн эрчим хүчний нэг эх үүсвэрийг нөгөөгөөр солих асуудал биш бөгөөд энэ нь эдийн засаг, нийгэм, экологийн асуудлуудыг цогц байдлаар шийдэхтэй холбоотой юм.

Сүүлийн 10 жилд даярчлалын үйл явц нэн хурдтай өрнөснөөр хөгжиж буй болон хөгжилтэй орнуудын хоорондох хөгжлийн түвшний ялгаа улам ихсэж, ерөнхийдөө дэлхийн эдийн засгийн систем ***олборлогч эдийн засаг*** (байгалийн баялаг, олборлох түүхий эдэд тулгуурлан хөгжиж буй орнууд), ***үйлдвэрлэгч эдийн засаг*** (олборлогч орнуудаас авсан түүхий эдээр эцсийн бүтээгдхүүн үйлдвэрлэгч орнууд), ***үйлчилгээний эдийн засаг*** (мэдээлэл, холбоо, аялал жуулчлал, үйлчилгээ, оюун санаа[техник технологийн шинэ дэвшил]-нд тулгуурлан хөгжиж буй орнууд) гэсэн үндсэн 3 системд хуваагдан төвлөрөх үйл явц ажиглагдаж байна.

Үйлчилгээний эдийн засгаас олборлогч эдийн засаг болон үйлдвэрлэгч эдийн засгийг, үйлдвэрлэгч эдийн засгаас олборлогч эдийн засгийг техник технологи - мэдээлэлийн давуу байдал, гадаад өр зээл, хууль эрх зүйн актуудаар дамжуулан өөрийн хараат хавсрага эдийн засаг болгох үйл явц (даярчлал нэрийн дор) хүчтэй явагдаж байгаа нь тодорхой юм.

Тэгэхээр дээр дурдсан "тогтвортой хөгжил"-ийн статусын үндсэн үзүүлэлтүүдийг энэхүү 3 эдийн засгийн системд харьцуулан үзэхэд хамгийн муу статус нь олборлогч эдийн засгийн системд ногдож байгаа юм. Тухайлбал, олборлогч эдийн засгийн хувьд бага нэмүү өртөг бүхий бүтээгдхүүн үйлдвэрлэдэг (үнэн хэрэгтээ олборлодог) учраас эдийн засгийн өсөлтийн түвшин бага буюу бусдаас хараат, байгаль экологийн эвдрэл сүйрэл бохирдол ихтэй, орлого хуваарилалт тэгш бус, ядуурлын түвшин өндөр байдаг нь судалгаа шинжилгээгээр нэгэнт батлагдсан зүйл юм. Харин энэ үзүүлэлтүүд нь эсрэгээрээ үйлчилгээний эдийн засгийн хувьд хамгийн сайн байдаг.

Олборлогч эдийн засгаас үйлдвэрлэгч эдийн засаг, улмаар үйлчилгээний эдийн засгийн тогтолцоо руу шилжих стратегийг "зугатаах" хөгжлийн стратеги (escape development strategy) гэж тодорхойлж байгаа ба үүний үндэсийн үндэс нь эрчим хүчний шилжилттэй салшгүй холбоотой юм. Нөгөө талаас, эрчим хүчний шилжилтийг шатах түлшний эрчим хүчинд тулгуурласан эдийн засгаас сэргээгдэх эрчим хүчинд тулгуурласан эдийн засгийн тогтолцоо руу шилжих шилжилт гэж тодорхойлж болно.

Экспортын орлогын 50 гаруй хувийг уул уурхай, эрдэс бүтээгдхүүнээр олдог манай орны хувьд олборлогч эдийн засгийн системд багтах бөгөөд бид энэхүү эдийн засгийн тогтолцооноос хэрхэн "зугатааж" гарах вэ? гэсэн асуудлыг онолын хувьд дэвшүүлэн тавьснаараа энэхүү өгүүлэлийн шинэлэг тал, ач холбогдол оршино хэмээн бодож байна.

Introduction

There are many factors which is determining and influencing economic development of the countries. Generally, those factors can be divided in to 2 categories.

- external factors (nature factors)
- internal factors (socio-economic factors)

The external factors are determined by nature, which is not dependent on social and human activity, and social and economic system can not influence to these factors. These factors contain such as geopolitical position, climate (average temperature, precipitation, season), territory size, natural resource and so on.

In contrast, internal factors are determined within the socio-economic systems. Generally, the internal factors contains such as economic and political structure, population number, capital stock, educational level and technology.

So economic development factors are must be determined by intersection of these two factors.

Economic development strategies of countries are very dependent on how they are identified rightly and value a intersection of factors.

Because development factors have a potential power to impact on economy either negatively or positively, it is difficult to correct again, if we define and value it wrongly.

Most of the Western (orthodox) economists such as Clark, G.Rostow, S.Kuznets and R.Solow who are studied relationship between economic development and growth, strongly focused on internal factors (socio-economic) of development, ignored the natural factors and did their theoritical works. They pointed out that potential power of economic growth and development will be base on internal factor in the future.

After the World war II, there were arising a lot of independent countries in the Asia, Africa and Latin America which is called third world countries. Most of the third world counties followed the "***hard industralization path***" of Western countries, but few of them made it successfully.

Whatever terminology is used (North-South, Centre-Peripheral, Underdeveloped countries- Industraliazed countries) the Third World does posses common features vis a vis the developed world. As will be seen later the impact of the crises has made these common features even more noticeable(Etienne Davingnon and etc:10).

These principal features found in most developing countries may be summarised as follows:

1. ***Dependence*** *is* the characteristic which most developing countries have in common. It cannot be measured by the percentage of imports in the gross national product. It is seen through the country's relationships with other countries in the economic, technological and cultural spheres as well as the legal and financial spheres. the opposite of dependence is not autarky but the gradual recovery by the countries themselves of the possibility to make autonomous decisions, decisions which all too often today are made outside these countries. In Latin America and some Asian countries this dependence is illustrated by the industrialization model chosen, where transnational companies play a dominating role as regards how the country relates to the world market and how it makes its technological choices. African countries south of the Sahara have for the most part remained on the fringe of the world economic system to which their only links are mining and agricultural exports. Generally, dependence limits and often prevents the accumulation process within domestic production sectors; in various ways (direct financial transfers, consumption of imported luxury goods...) it has meant the transfer of significant surpluses abroad.

2. Another fairly common characteristic of under-development is the ***internal disarticulation*** between the various production units having differing modes of production, differing technologies and consequently differing productivity levels. One could almost see the production system in certain developing countries not as an intergrated fabric but as succesion of juxtaposed enclaves whose links with the outside world are stronger than those with the other production units of the country itself. Although not enclaves in a legal sense, some national corporations and even state corporations are real enclaves in a social and economic sense. In both Africa, where the rural sector dominates, and Latin America where urbanization is expanding enormously, agriculture is the weak point in most countries, leading to an increasing food deficit. In both town and country the gulf between modern and traditional sectors are widening.

The absence of any economic and technological relationship between the various sections of the production system leads to a situation in which enterprises of varying

productivity levels exist alongside each other, and the growth of one does not induce the growth of the other. All too often as growth proceeds, rather than being reduced, disarticulation worsens.

3. ***Inequalities*** between social groups and geographic regions are a feature of many developing countries. They are often manifested by mass poverty, hunger, illiteracy, uncontrolled urban growth and badly adapted consumption patterns. Although in some regions dynamism can be observed in some elements of the urban informal sector, enabling the survival of marginal groups, as a whole the trend is towards an increase in inequality.

4. In many countries ***bad management of the ecosystems*** endangers natural resources(water, forest, soil) so that the population 's survival itself is threatened. But above all, underdevelopment goes hand in hand with imbalances between man and his natural environment.

After the socialist system is failed, there were arised also many independent countries which is called now transition countries from central planned economy to market economy.
So they are now searching their development path, and most of them are following the "hard industrialized path" directed by international institutions (IMF, WB).
So we can see from here that history is repeated again. If this development style is failed there will be appear common characteristics which is appeared in Third World.
When all these characteristics are taken into account it can be seen that economic growth, as measured by the increase in the per capita GDP, is not synonymous with development. The direction of growth is more important than its rate. It will have to be accompanied by structural changes deliberately aimed at, changes which will have to take place in a discontinuous way through discrete process entailing qualitative leaps and a break from past trends.
According to the L.Mumford, E.Altvater and G.Bunker from the view of resource-energy complex, world system is comprised by 2 economic regions.

- Extraction economy
- Production economy + service economy

Economic models of industrial production neglect the extractive origins of the materials which industrial process transform (Georgescu-reogen,1975). The internal dynamics of the extractive economies that have provided most of the exports from the least developed regions differ significantly from those of productive economies in their effects of the natural environment distribution of human populations, the growth of economic infrastucture, and therefore on the subsequent developmental potential of the affected regions. They argued that production models cannot explain the internal dynamics of extractive economies because the explotation of natural resources uses and destroys values in energy and material which cannot be calculated in terms of labor or capital. When natural resources are extracted from one regional ecosystem to be transformed and consumed in another, the resource-exporting region loses values that occur in its physical environment.

These losses eventually decelerate the extractive regions's economy, while the resource-consuming communities gain value and their economies accelerate (G.Bunker, 1985:22).
Matter and energy, the essential components of production, cannot be created, only transformed, and energy transformation increases entropy, that is, frees energy into humanly unusable form (Georgescu-Roegen, 1970). Productive economies are all, finally, only the molecular, structural, and spatial reorganization of matter and energy extracted from nature (G.Bunker, 1985:32).

So what it will be first strategy to escape from extraction economy to productive economy? The answer is, in my opinion, it related with energy transition strategy and policy.
Cultural and economic progress in the history of human civilization is largely defined by sudden advanced innovation in energy conversion technologies. This applied to the highly evolved classical Chinese culture as much as to the advanced worlds of Mesopotamia, Egypt, Greece and Rome, with regard to irrigation technologies and improved transportation facilities. This applied likewise to the early industrialization in the Middle Ages, powered by water and wind. It also applied to the Industrial Revolution in modern times, which was made possible by the steam engine, used in production processes, navigation, rail transport – and which continues until today in contemporary steam-powered plants, whether operated by fossil or nuclear energy. As a show in Table 1, the steam engine became the most important fossil energy converter of the 19th century based on coal, and later oil and gas, too: it created the fossil energy economy (Herman Scheer, 2002). In other word, energy transition means shift from fossil energy economy to renewable energy economy.
Transitions are social transformation processes in which society or a complex subsystem of society changes in a fundamental way over an extended period (more than one generation, that is 25 years or more). Transitions have the following characteristics:
• They concern a structural change to society or a complex subsystem.
• The change process is a gradual one.
• There are technological, economic, ecological, socio-cultural and institutional developments at different scale levels which all influence and reinforce each other.
• A transition is the result of slow changes (developments in *stocks*) and fast dynamics (*flows*).
• They cover at least one generation (25 years).

Transitions are interesting from a sustainability point of view because they constitute a possible route to sustainability, besides the route of system adaptation and optimisation.
Transitions offer the prospect of magnitude environmental benefits, through the development of new systems that are inherently more environmental benign or the transformation of existing ones, offering a range of sustainability benefits (in terms of natural capital, health and social wellbeing). This report offers a general discussion of transitions and a discussion of how transitions towards more sustainable development modes may be brought explored and stimulated through transition

management—a deliberate, collective attempt to explore and bring about a transformation in a functional domain (such as energy supply or food production) in a gradual, forward-looking and reflexive way, using a participatory approach.
Transition policy builds on a dynamic systems model of transitions and insights from technology dynamics and modern governance (Rene Kemp, 2001).

All the experts agree that a transition in the supply of energy will require one to two generations. It is a transition that is expected to be initiated from the technological domain, but one that requires wide support in order to be able to 'take-off'. Transition strategy will have to link up with other important developments related to energy, such as liberalization and internationalisation of the energy market. Transition strategy should also consider the preconditions other domains impose on energy developments—how such conditions slow down or reinforce the transition to a low-emission energy supply: profits and costs and reliability of supply (economy), health, safety and reliability of supply (socio-cultural) and ecological risks (nature and the environment). On the other hand, an energy transition will act as a force of its own which will bring about socio-cultural, institutional and economic changes.
Transition strategy is aimed at exploring, guiding and fostering a long-term social transformation process. In order to do this, it is necessary to develop a transition goal together with other actors. Transition strategy, therefore, implies *interactive policy development*.

The original "Agenda 21" document described the relevant dangers confronting the world civilization. However, the most important root of these dangers was omitted: the lack of energy availability in poor countries and the overwhelming dominance of the use of atomic and fossil energies all over the world.
The relation between the economic development of the third world and the energy-dependency became evident in the oil crises between 1973 and 1982: in this period the debts of developing countries increased from approximately 200 billion to 1.2 trillion US-dollar, of which they did not recover until today. The expected increase of prices, which will parallel the coming oil shortage in the next two decades, will confront developing countries with even more existential problems. Some of these countries already have to spend more on the import of fossil primary energy than they receive from export earnings. As energy investments of developing countries followed the example of developed industrialized countries, rural areas remained excluded from the access to electricity in most developing countries, because they could not afford the costly expenditures for the infrastructure of energy transportation. The established energy system of industrial societies was build up in a whole century of economic development, from an agro-cultural economy and rural settlements to an industrial and modern service economy in large urban areas. Simply imitating this and thus imposing an inadequate structure is the main reason for power failures and misleading developments in developing countries. This development accelerated the migration of rural population to such an extent that urban communities grew uncontrollably, increasing the poverty gap between cities and rural areas. Only Renewable Energy sources can allow developing countries to escape this energy trap.

The fossil energy system is developing – with a deadly logic – towards three limits that will increasingly confront the world civilization and each of which leads to existential problems of civilization:

1) Humankind approaches the exhaustion of conventional finite energy reserves: first oil, then natural gas and later coal.
2) Primarily due to the substantial increase of the fossil world energy consumption especially since 1950 the ecological system of the Earth has already been heavily damaged.
3) The fossil energy system created dependencies worldwide, because the energy sources for the world consumption are concentrated in just a few areas. This makes societies that are dependent on fossil energy imports extremely vulnerable. The dependence on relatively few energy producing regions did not only

advance a global process of concentration of the energy economy, but also led to constantly rising costs of the energy infrastructure and increasing trade imbalances. The economies of numerous energy producing countries is one-sided dependent on oil exports. In that way, they are economic, social and political unstable and are exposed to the danger of momentous destabilization.

These physical, ecological and economic limits demonstrate: time is overdue to globally substitute atomic and fossil energy by Renewable Energy. Only with this strategy, the basic needs of all humans for physical and economic power supply can be satisfied, the natural basis of life for all humans preserved, and energy conflicts and the increasing gap between poor and rich prevented.

The Figure 1 shows escape development strategy which is shifting from hard industrialization path based on fossil energy to soft industrialization path based on renewable energies.

The economic, social, ecological and cultural benefits of Renewable Energies must be realized and become the motivating force:

– avoided environmental damages;
– avoided energy imports for every national economy
– to the point of replacing the import of conventional energies by domestic Renewable Energies;
– avoided subsidies for atomic and fossil energies, which amount at present around 300 billion dollar annually world-wide;
– avoided health damage and fatalities in humans;
– avoided infrastructure costs – to the point of replacing conventional central energy supply system including their unavoidable distributional transport expenditures with Renewable Energies;
– avoided political, economic and military conflicts on limited fossil energy potentials;
– economic opportunities for new industries and new industrial and craft jobs through production, installation and maintenance of Renewable Energy systems;
– opportunities for revitalising the agricultural and forestry sectors by using biomass as energy carrier and raw material instead of fossil resources, and creating in that way jobs in rural areas that stops immigration;
– opportunities for education, information, health services and agricultural equipment.

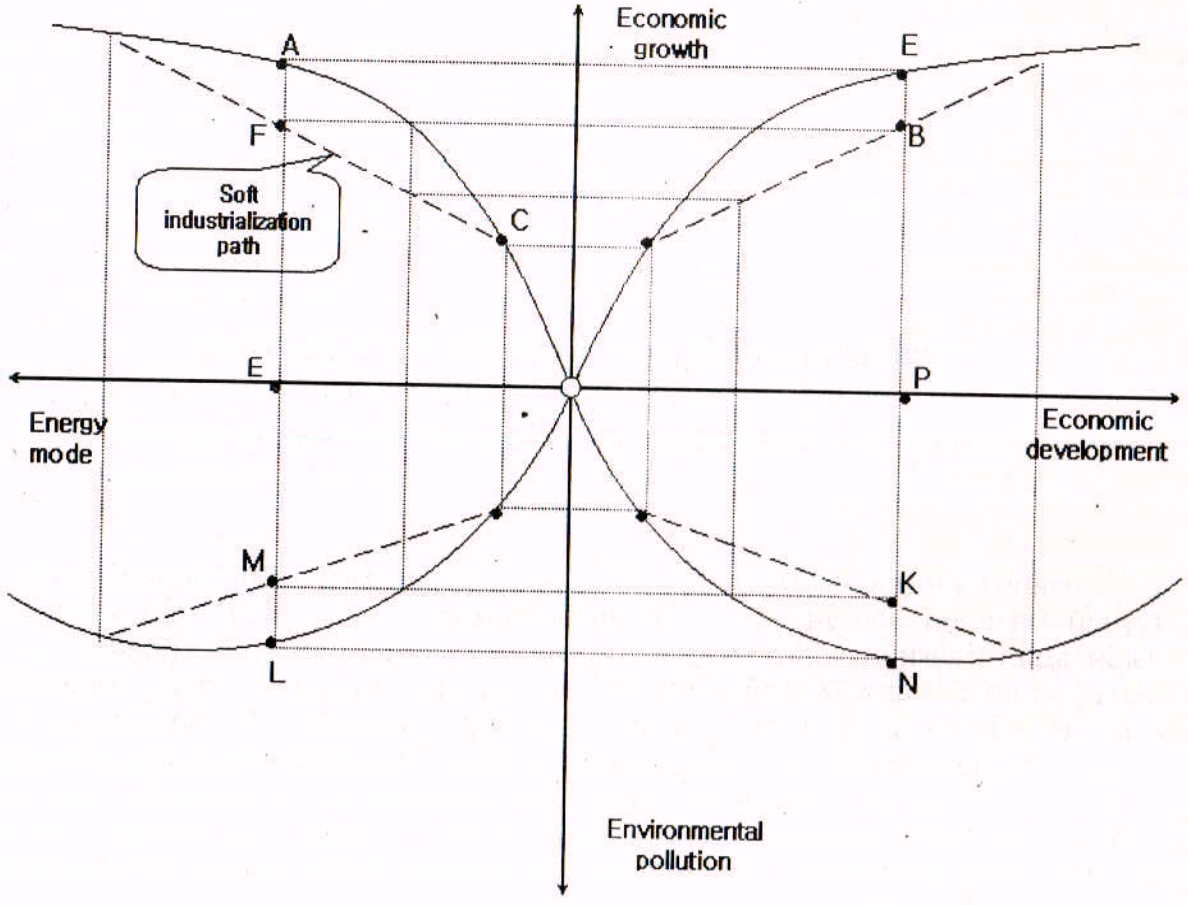
Table 1. The industries, infrastructures and paradigms of each technological revolution

Technological revolution (core country)	*New technologies and new or redefined industries*	*New or redefined infrastructures*	*TECHNO-ECONOMIC PARADIGM* 'Common sense' innovation principles
FIRST: From 1771 **The 'Industrial Revolution'** (Britain)	Mechanized cotton industry Wrought iron Machinery	Canals Waterways Turnpike roads Water power (highly improved water wheels)	Factory production Mechanization Productivity/ time keeping and time saving Fluidity of movement (as ideal for machines with water-power and for transport through canals and other waterways) Local networks
SECOND: From 1829 **Age of Steam and Railways** (In Britain and spreading to Continent and USA)	Steam engines and machinery (made in iron; fueled by coal) Iron and coal mining (now playing a central role in growth) (*) Railway construction Rolling stock production Steam power for many industries (including textiles)	Railways (Use of steam engine) Universal postal service Telegraph (mainly nationally along railway lines) Great ports, great depots and world wide sailing ships City gas	Economies of agglomeration/ industrial cities/ national markets Power centers with national networks Scale as progress Standard parts/ machine-made machines Energy where needed (steam) Interdependent movement (of machines and of means of transport)
THIRD: From 1875 **Age of Steel, Electricity and Heavy Engineering** (U.S.A. and Germany overtaking Britain)	Cheap steel (especially Bessemer) Full development of steam engine for steel ships Heavy chemistry and civil engineering Electrical equipment industry Copper and cables Canned and bottled food Paper and packaging	World-wide shipping in rapid steel steamships (use of Suez Canal) World wide railways (use of cheap steel rails and bolts in standard sizes). Great bridges and tunnels World-wide Telegraph Telephone (mainly nationally) Electrical networks (for illumination and industrial use)	Giant structures (steel) Economies of scale of plant/ vertical integration Distributed power for industry (electricity) Science as a productive force World-wide networks and empires (including cartels) Universal Standardization Cost accounting for control and efficiency Great scale for world market power/ 'small' is successful, if local
FOURTH: From 1908 **Age of Oil, the Automobile and Mass Production** (In USA and spreading to Europe)	Mass produced automobiles Cheap oil and oil fuels Petrochemicals (Synthetics) Internal combustion engine for automobiles, transport, tractors, airplanes, war tanks and electricity Home electrical appliances Refrigerated and frozen foods	Networks of roads, highways, ports and airports Networks of oil ducts Universal electricity (industry and homes) World-wide analog telecommunications (telephone, telex and cablegram) wire and wireless	Mass production/mass markets Economies of scale (product and market volume)/ horizontal integration Standardization of products Energy intensity (oil based) Synthetic materials Functional specialization/ hierarchical pyramids Centralization/ metropolitan centers-suburbanization National powers, world agreements and confrontations
FIFTH: From 1971 **Age of Information and Telecommunications** (In USA, spreading to Europe and Asia)	The information revolution Cheap microelectronics Computers, software Telecommunications Control instruments Computer aided biotechnology and new materials	World digital telecommunications (cable, fiber optics, radio and satellite) Internet/ Electronic mail and other eservices Multiple source, flexible use, electricity networks High speed physical transport links (by land, air and water)	Information - intensity (microelectronics based ICT) Decentralized integration/ network structures Knowledge as capital / intangible value added Heterogeneity, diversity, adaptability Segmentation of markets/ proliferation of niches Economies of scope and specialization combined with scale Globalization/ interaction between the global and the local Inward and outward cooperation/ clusters Instant contact and action / instant global communications

(*) These tradional industries acquire a new role and a new dynamism when serving as the material and the fuel of the world of railways and machinery

Source: Perez (2002), Tables 2.2 and 2.3, pp. 14 and 18.

Figure 1. Escape development strategy for sustainable development



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