Human Well-Being and Ecological Sustainability: Some Issues Revisited

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Abstract: Ecological sustainability *essentially implies the existence of the ecological conditions necessary to support human life at a specified level of well being through future generations. However, apart from the ecological conditions there are certain* social or politico-economic conditions *that also influence the ecological sustainability of the people-nature interaction. The role of socio-economic structures and institutions is of crucial importance in such a state of affairs. Importantly, the notion of* social well – being *includes not only manmade, human and natural capital stocks, but also the institutional and cultural set-up of the society.*

In this backdrop, the paper makes an attempt to develop an operation sable criterion of sustainable development*. It also seeks to conceptualize and measure human well – being at the social level and focus on the role of natural environment, institutions and policies in determining social overtime. The paper highlights the importance of* resource allocation mechanism*, i.e., management of the portfolio of assets of all kinds of capital stock, in determining the quality of human life of a society. Finally, it highlights how* imperfections *of institutions and* inefficiencies *of economy often constrain the degree of freedom in resource allocation thereby affecting the measure of well – being and value of wealth of society.*

Introduction

The central concern of development is to improve the state of human well being of society overtime. Notably, improvement of human well -being is not the result of a single factor, but is favored by a combination of elements, including the improvement of physical and human capital, the reduction of inequality and establishment of efficient institutions managing the resource allocation mechanism. The notion of well -being also covers the civic and political life of people, apart from material well - being or utility derivable from the goods and services produced in the economy or directly harvested from nature, for consumption. Besides, the natural environment also plays an important role in such a state of affairs. Precisely, the source of human well being can be extended beyond human and manmade capital to include most importantly the natural capital or the natural resources, which include a wide array of natural assets of minerals, fossil fuels, water resources, forests, biodiversity, etc. These resources facilitate functioning of the ecosystem and thereby support human life. However, nature's ability to provide such support is no longer being considered abundant in quantitative or qualitative sense relative to the demand made on nature by human economies.

Therefore, over the past few years, "sustainable development" has emerged as the latest development catchphrase. A wide range of nongovernmental as well as governmental organizations has embraced it as the new paradigm of development. According to World Commission of Environment and Development, the concept of sustainable development requires the present generation to use the natural, manmade and human capital resources in such a way that they leave behind enough of these for the future generation to be able to attain at least the same level of social well – being as enjoyed by themselves. In other words, sustainability implies non-declining well – being

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over time. It is necessary to consider sources of human well – being and the implications of sustainability for evaluation of developmental policies. Besides, it is also important to conceptualize and measure human well – being at the social level and focus on the role of natural environment, institutions and policies in determining social overtime.

Ecological Sustainability

The concept of ecological sustainability is essentially a dynamic process. It means that nature should be able to indefinitely regenerate itself thereby ensuring certain stability or resilience of the ecosystem. In other words, ecological sustainability implies the existence of the ecological conditions necessary to support human life at a specified level of well being through future generations. Precisely, it emphasizes the constraints and opportunities that nature presents to human activities. However, apart from ecological sustainability, the sustainability of a social or politico-economic order is also of crucial importance. In other words, there are certain social conditions that also influence the ecological sustainability of the people-nature interaction. In the rush to derive ecological principles of (ecological) sustainability, we cannot afford to lose sight of the social conditions that determine which of these principles are socially acceptable, and to what extent. Sociologists, eco-Marxists and political ecologists are pointing out the crucial role of socio-economic structures and institutions in the pattern and extent of environmental degradation globally. The sustainable development movement will have to formulate a clear agenda for research in what is being called "ecological economics" (Ekins, 1986; Goodland and Ledec, 1987; Costanza, 1989) and press for its adoption by the mainstream of economics in order to ensure the possibility of real changes in policy making.

Social Well being and Sustainability

The notion of social well – being includes not only manmade, human and natural capital stocks, but also the institutional and cultural set-up of the society. The quality of human life of a society, in fact, depends on the resource allocation mechanism, i.e., management of the portfolio of assets of all kinds of capital stock. Importantly, the resource management mechanism is determined or characterized by the institutional set-up, motivation and culture of the people of the society. It is this resource allocation mechanism, which precisely determines the inter temporal flow of social well – being. However, imperfections of institutions and inefficiencies of economy often constrain the degree of freedom in resource allocation thereby affecting the measure of well – being and value of wealth of society.

It is quite obvious that the quality of human life of an economy is largely dependent on the natural environment, which includes an array of natural assets of minerals, fossil fuels, soil, atmosphere, water resources, biodiversity, etc. In other words, nature provides support to human life including functioning of the ecosystem. But, in the recent years nature's ability to provide such support is not being considered abundant in comparison to the demand made on nature by human economies. Hence, the need for sustainable development of natural environment has become crucial to ensure non-declining social well - being overtime.

Sustainability of an order of nature's system has been considered to be desirable because of the great uncertainty regarding life support, which might be faced if there is any radical shift in the structure and composition of an ecosystem causing extinction of some of the crucial plant and animal species, reducing biodiversity and thereby affecting the resilience of our ecosystem. In this paper an attempt has been made to suggest an operationsable criterion of sustainable development. In this context, it is important to mention that the wealth of a nation is of crucial importance for sustainability of the development process. Besides, if social being is to be conceived in the sense of intertemporal well – being, sustainable development essential implies maintenance of the aggregate value of society's wealth overtime. In other words, sustainability should also ensure that the aggregate value of net addition of all kinds of capital stocks, called genuine investment, is non-negative. Importantly, the estimate of genuine investment should take account of depletion or degradation of natural capital stocks as well as losses of human capital at the death of individuals.

Apart from the welfare derived from material sources, the concept of personal well – being also includes various other objects like health, happiness, freedom, etc. Thus, individual well – being should be determined by

aggregation through appropriate weightage of different constituents of well – being. The social well – being is then to be derived from individual well – being using further aggregation over individuals through interpersonal distributional weights. Further, a measure of current social well being in time is required as a prerequisite for obtaining a measure of social well being over time. Importantly, the concept of social well being includes not only the levels of private consumption, education and health but also the indices of political and civil liberties enjoyed by the people. For determining the intertemporal profile of well being for different generations, the role of natural environment as capital along with other types of capital stocks (human and manmade) also needs to be emphasized. In this context, it is crucial to mention that the value of wealth (comprising of all kinds of stocks) can be estimated in terms of "accounting prices", i.e., the present equivalent sum of current well being over generations or social well being overtime.

Precisely sustainable development means the maintenance of the aggregate value of wealth overtime so as to ensure non-declining social well-being over generations. In other words, sustainability essentially implies that the aggregate value of net addition of all kinds of capital stocks, called "genuine investment", is non-negative. In other words, the criterion of sustainable development is derived in terms of non-negativity of genuine investment, i.e., change in value of all kinds of capital stocks at their accounting prices. However, the implicit assumption is that substitution is possible among individual natural resources and also among natural resources, human capital and manmade capital. But substitution possibilities are allowed by the resource allocation mechanism of an economy, which in turn is determined or characterized by the structure of institutions and their rules. The equilibrium resource allocation is determined by the management of different types of assets governed by institutional rules. The imperfections of an economy are often found to affect the quality of efficiency of this resource allocation mechanism thereby lowering accounting prices and the measure of the wealth or equivalently that of social well being overtime. This can be understood clearly with the help of the following model.

The model

Suppose current well being of an individual depends on material consumption (C_t) and disutility of labor, i.e., utility derived from leisure (L_t).

Therefore, utility function of the individual in t th period can be written as; $U_t = U (C_t, L_t)$

The current well being in the t th period $= U (C_t, L_t)$

Let us assume that the aggregate production is dependent on the use of natural resources (R_t), manmade capital (K_t) and labour (L_t).

So, the production function can be written as, $Y_t = F (K_t, L_t, R_t)$

The production is assumed to be concave and input substitution is allowed. Also, the stock of natural resource is assumed to grow as per a concave function, $M (S_t)$

Now, $Y_t = C_t + I_t$

Or, $I_t = Y_t - C_t$

Therefore, $\dfrac{dK_t}{dt} = F (K_t, L_t, R_t) - C_t$

Hence, the dynamic changes of the assets of the economy are;

$$\frac{dK_t}{dt} = F (K_t, L_t, R_t) - C_t$$

$$\frac{dS_t}{dt} = M (S_t) - R_t$$

The *resource allocation mechanism*, represented by the parameter α, will lead to an equilibrium path of C_t, K_t, L_t, R_t, S_t for t from 0 to infinity. Suppose δ be the *time discount rate* and V_t be the intertemporal social well being.

$$\text{Then, } V_t = \int_t^\infty U\left(C_\tau\left(\alpha\right), L_\tau\left(\alpha\right)\right) e^{-\delta\left(\tau - t\right)} d\tau$$

i.e., *intertemporal social well being* is the present equivalent sum of current well being overtime.

Let us define,

$$p = \frac{\delta V_t\left(\alpha\right)}{\delta K_t} \quad \text{and} \quad \frac{q V_t\left(\alpha\right)}{\delta S_t}$$

Here, p_t and q_t are the *accounting prices* of manmade capital and natural capita respectively. Thus, accounting price for natural (or manmade) stocks would be the change in V_t per unit of marginal change in S_t (or K_t), as given by α. In other words, accounting price of a capital asset is the marginal value contribution to social well being for a small change in the concerned asset in the initial period t.

The genuine investment, which is the aggregate value of net addition to all kinds of capital stocks, can be represented in terms of accounting prices as

$$I_t = p_t \frac{dK_t}{dt} + q_t \frac{dS_t}{dt}$$

Thus, I_t is the accounting value of change in stock of assets (K_t and S_t) or wealth of the economy. As mentioned earlier, *sustainability implies non-declining well being.*

$$\text{Therefore, } \frac{dV_t}{dt} = \frac{\delta V_t}{\delta K_t} \cdot \frac{dK_t}{dt} + \frac{\delta V_t}{\delta S_t} \frac{dS_t}{dt}$$

$$= p_t \frac{dK_t}{dt} + q_t \frac{dS_t}{dt}$$

$$= I_t$$

Therefore, it follows that $I_t \geq 0$ *is necessary to ensure sustainability*. The *non-negativity of genuine investment (I_t) thus becomes an operation sable criterion of sustainable development.* The value of wealth would thus be an indicator of the absolute level of well being and its change would be a measure of change in social well being overtime.

However, the assumption of any idealized state of economic institutions quite unrealistic. Rather, there exist possibilities of imperfections and inefficiencies in an economy. These imperfections of economic institutions would influence the accounting prices through the parameter α, of the resource allocation mechanism. Imperfect institutions can in fact, lower accounting prices and therefore reduce the value of wealth. A resource rich economy

can also end up with negative genuine investment or decline in the value of wealth due to ecologically unsustainable practices of resource use. Study of sustainable development thus makes, valuation of goods and resources including natural environment and role of institutions quite important for obtaining insights into the working of an imperfect economy and thereby developing directions of required policy reforms. Nevertheless, there exist a few limitations with regard to the estimation of accounting prices.

Limitations

Natural environment has a user value and a non-user value that includes existence value and option value. Let us assume that an economy which reveals little concern for environmental conservation. In other words, less importance is given to the option or intrinsic value of natural resources. Under such circumstances, the question that arises is whether the accounting prices as estimated by the existing methods of Contingent Valuatio Method or others would realy measure the $q_t(\alpha)$ or not.

As discussed earlier, the accounting price of natural environment, as given by the resource allocation mechanism (α) is $\dfrac{Vt(\alpha)}{\delta S_t}$, i.e., the marginal value contribution to social well-being for a small change in the stock of natural resource (S_t). A decrease in the stock of natural resource (S_t) essentially implies a loss in the option value or intrinsic value of natural resources, which lowers the level of social well being (V_t). However, it may be pointed out that in an economy, which reveals little concern for environmental conservation and neglects the option or intrinsic value of natural resources, such fall in the level of social well being due to reduction in stock of natural resource (S_t) is comparatively less than otherwise. Thus, $q_t(\alpha)$ in such an imperfect economy is likely to be over estimated. Hence, the question then is to relate the option or intrinsic value of natural resources to $q_t(\alpha)$, where the behavior of the resource allocation mechanism, α, in an imperfect economy may reveal little concern for environmental conservation.

Furthermore, the measure of q_t corresponding to an imperfect economy may allow wasteful resource using projects to be passed for acceptance. As discussed earlier, sustainability requires non-negative genuine investment, i.e., $I_t \geq 0$.

We Know, $I_t = p_t \dfrac{dK_t}{dt} + q_t \dfrac{dS_t}{dt}$

Where, $p_t = \dfrac{\delta V_t(\alpha)}{\delta K_t}$ and $q_t = \dfrac{\delta V_t(\alpha)}{\delta S_t}$

It is important to point out that $q_t(\alpha)$, as given by α, is over estimated in an economy which reveals little concern for environmental conservation. This is because in such an imperfect economy, reduction in stock of natural resources is appeared to lower the social well being by a lesser proportion than otherwise. Thus, I_t corresponding to a particular project may be estimated to be non-negative when it may not be actually so. However, the sustainability criterion (I_t) being satisfied, the concerned project will be passed for acceptance, even though in reality it may be associated with wasteful resource use. The conceptual theory discussed earlier, may therefore be misleading under such circumstances. Any theory of second best can be used to get the shadow prices for project evaluation in such a state of affairs. The notion of estimating option value or intrinsic value of natural resources possibly presumes the implicit precedence of the right kind of institutional reforms over the use of accounting prices for project choice, i.e., the best configuration of α.

Summary

In the formal model that has been discussed in the paper, the resource allocation mechanism, α, which drives the social well being overtime, has actually its root in the working of a host of ecological, social and institutional factors. If the changes of these factors are to be endogenized, one would find α to be time dependent. This would make tracing of the optimal or equilibrium path to be more complicated. Therefore, attempts should be made to address the relation between changes in α and other ecological and economic variables through case studies. Precisely, the basic model is a theoretical one and t might be more important to put the model to empirical use so as to find out what kind of policy reform will improve the measure of social well being over time. It is worthwhile to find out the appropriate change or reform (i.e., change in α), which would raise V_t (intertemporal social well being) to its optimum value.

References

Barbier, E.B. (1987) "The concept of sustainable economic development", *Environmental Conservation*, Vol.14, No.2. pp. 101-110

Costanza, R. (1989), "What is Ecological Economics?" Ecological Economics, Vol.1, No.1,pp. 1-8.

Daly, H., (1991), "Sustainable development: From concept and theory towards operational principles", in H.E. Daly, *Steady-state Economics: 2nd Edition with New Essays*, Washington D.C, Island Press.

Ekins, P. (Ed.) (1986), *The Living Economy: A New Economics in the Making,* London: Routledge and Kegan Paul

Goodland, R., and G. Ledec (1987) "Neoclassical economics and principles of sustainable development", *Ecological Modelling*, Vol. 38, pp. 19-46.

Warford, J., (1986) "Natural resource mangement and economic development", Projects policy Department Working Paper, Washington DC: World Bank

World Bank (1987) "Environment Growth and Development", Development Committee Pamphlet No. 14, Washington DC: World Bank

World Commission on Environment and Development (1987), *Our Common Future,* Oxford University Press: New York