Developing technology: The quest for a new theoretical framework for understanding the role of technology in human development☆

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A B S T R A C T

In a development context, the term technology is often limited to its economic dimension while the meaning of technology for a human perspective of development (e.g. Capability Approach) has been widely neglected.

In order to fully investigate the social effects of energy technologies in developing countries, I argue that there is need for a new theoretical framework, which combines approaches within Science and Technology Studies (SCOT) and Development Studies (Capability Approach) to acknowledge the interconnection of technology and development and to strengthen both research fields. This new theoretical framework is illustrated by using the solar box cooker as a technological artifact.

1. Introduction

In a development context, the term technology is often limited to its economic dimension while the meaning of technology for a human perspective of development (e.g. Capability Approach) has been widely neglected. In particular, I claim that there should be a stronger focus on the human development effects of so-called energy technologies for developing countries. Even though energy has not been mentioned as one of the Millennium Development Goals, access to adequate energy supplies is a prerequisite for fulfilling and enhancing human development. In many developing countries biomass is the primary source of energy for households. According to the IEA [1] 2.5 billion people in developing countries depend on biomass in the form of firewood, charcoal, agricultural waste and animal dung for cooking. In most of these countries biomass accounts for more than 90% of household energy consumption.

The unsustainable use of firewood leads to deforestation in these areas and has multiple negative impacts particularly on women and young girls who are often in charge of the cooking process. First of all, the inefficient use of biomass in the form of a so-called open "three stone fire" can lead to indoor air pollution which causes respiratory diseases among women and young girls preparing the meals. In areas where firewood is collected the unsustainable use of biomass results in longer walking hours for women and young girls which prevents them from other activities, such as for example attending classes at school or generating additional income.

There is a wide range of improved cooking technologies found in developing countries which can overcome the problems related to the unsustainable use of firewood. These stove technologies claim to have several positive effects for their intended users. Besides fuelwood savings,

the use of these stoves can lead to improvements in of health, increased education and income generating activities among its users. While promoters have written much about the potential positive effects of these technologies, scholars have paid relatively little attention to the real human development effects of these technologies.

One reason for this limited focus might be that cooking does not seem to be as attractive as working with the social impacts of new modern information communication technologies including cell phones, computers and the internet. Improved cooking technologies, such as for example solar cookers and improved wood stoves are not new ideas, and they may have lost some of their glance over the years. However, I claim that it is important to investigate the social effects of these technologies on human development in order to identify the real benefits it has for people applying these technologies.

In addition, such an analysis would also help to evaluate these various technologies.[1] In order to fully investigate the social effects of energy technologies in developing countries, I argue for the need of a new theoretical framework which combines approaches within Science and Technology Studies (SCOT) and Development Studies (Capability Approach). This will allow us to acknowledge the interconnection of technology and development and to strengthen both research fields.

For a long time, the development discourse has viewed economic growth as a prerequisite for human development. Early scholarly writing after World War II focused mainly on the economic development of so called "underdeveloped countries". W. W. Rostow, probably the most known modernist theorist, emphasized a five stage concept of economic growth which every nation in the world passes through as it develops. However, reality has given evidence to the fact that economic growth does not necessarily lead to human development. For instance when looking at South America, Brazil is the country with the strongest economic growth but in the same time it is the country which is characterized by high levels of social inequality. According to Sen [2], Brazil's citizens are much richer than people in China (as measured in terms of the GDP) but Brazilians suffer from much lower life expectancy rates than do citizens of China. This example shows that economic growth (here in terms of the GDP) does not necessarily lead to human development.

With regard to technology, this means that it is not sufficient to emphasize only the economic benefits of new technologies for a given society. Furthermore, the implementation of new technologies in a given society will have social effects which are independent from its economic benefits and which have to find consideration in the development discourse. Compared to an economic

approach, the Capability Approach presents an alternative framework to conventional development theories. The focus of the Capability Approach is not exclusively on economic growth as a measurement tool for development. Rather, its focus is on people's real freedoms and the removal of the obstacles which limit people's freedoms to live the life they want to live.

I will start this paper by introducing the main concepts of the Capability Approach to the reader and discuss how it can provide an appropriate framework for studying the human development effects of energy technologies. In addition, I will introduce the major concepts of another theory called the theory of Social Construction of Technology (SCOT). I claim that these two approaches, combined in a new theoretical framework, can overcome their limitations and enhance one another. In the last part of the paper I will present a draft of a new combined theoretical framework of Capability Approach and SCOT. I will illustrate this new framework by using the solar box cooker as an example of a technological artifact.

2. The Capability Approach as alternative framework

In the 1980s the focus of Development Studies shifted from a strongly economic driven view to a human perspective view of development. In this view, development was no longer measured with reference to economic indicators such as for example growth of GDP, rise of personal incomes, industrialization or technological advance [2]. In this new understanding of development, the focus was shifted to people's agency to, or capacity for, their development.

Pioneered by Amartya Sen and his concept of capability, development is understood as a process which expands people's real freedoms. With freedom it is meant that people can engage in actions and activities they want to engage in; in broader terms, freedom is the choice to live the life that people want to live. In this way freedom is seen as "the principle ends of development" [ibid, p.5]. Capability is defined as the ability (opportunity) of a person to achieve certain beings and doings [3]. The aim of development within the Capability Approach is to remove the obstacles which stand in the way of people trying to reach these freedoms [2]. This means that the Capability Approach distances itself from an understanding of development in pure economic terms; it focuses on its wider social impacts on society.

Several scholars have applied the Capability Approach. One of the most famous contributors is Marta Nussbaum. In comparison to Sen, Nussbaum argues for a list of ten "central Human capabilities" including Life, Bodily Health, Bodily Integrity, Senses, Imagination and Thought, Emotion, Practical Reason, Affiliation, Other Species, Play and Control over one's Environment [4,5].

Sen's concept of capabilities also had an impact on the design of the Human Development Index (HDI) which is used in today's annually published Human Development Report (HDR). In addition to income (measured as the level of GDP), the HDI includes basic concepts for measuring social well-being, including life expectancy at birth and an

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[1] There can be found a wide range of different cooking technologies which can improve people's lives. On the one hand are those cooking technologies which still make use of biomass but in a more efficient way (so-called improved stoves); on the other are solar cookers which utilize the sun's power to cook. There are also huge variations of cooker types within these two groups and an analysis of the human development impacts of these technologies could help in evaluating the actual benefits of different types of cookers.