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Housing paradoxes in India: is there a solution?

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Abstract

If providing a decent shelter is an immediate concern for developing countries, the reduction of global emissions such as carbon dioxide is a cause of concern for industrialized countries. A short focused policy prescription for a country like India would be to provide a decent shelter for its more than 15% citizens, who do not have adequate housing. However, a sustainable path would be to develop a well strategized path to meet current needs of housing and also to reduce absolute contribution to global emissions through those construction techniques which are environment friendly. We develop an optimization framework to analyse a sustainable path to meet housing shortages in India, considering that the sustainable path should not be at the cost of engineering design criteria. The criteria to measure sustainability in this paper is cost effectiveness, efficient utilization of resources and environment friendliness. A computer model called 'MHOPE' has been developed to estimate resources and construction techniques required to achieve housing for all in India. The technologies incorporated in the model are suitable for India, however, the model can be upgraded to include the house construction technologies suitable for any other country of interest. The results indicate that it is not possible to provide housing for all in India with the present set of construction techniques which are predominantly cement and brick based. However, if low cost housing techniques, which use locally available materials, are used, we can achieve this target of 'Shelter for all'. It will not only reduce cost, but also reduce CO_2 emissions because locally available materials are less energy intensive. The paper quantifies the level of investment, resources and employment required to provide shelter for all.

Keywords: Multiobjective optimization; Shelter for all; Resources; Emissions; Strategies

1. Introduction

Shelter for all, is the philosophy and the most important social concern that governs the housing policy in India. Despite the state's commitment to provide a liveable house of reasonable standards to all its citizens, it has largely been a dream. Escalating land prices, soaring prices of key building materials, high house price to annual income ratio, government's inability to subsidize the cost of housing to affordable levels and rationed housing credit have all hindered the way of owning a house. Rising land prices to unreasonable levels is a result of perverse land policies which artificially makes land scarce. Regulations like rent control have kept rental houses out of the market resulting in a situation of too much competition for too few houses, and no rental housing supply. Housing affordability ratio (house price to annual income) is between 7–13 depending on cities when it should be not more than 2–3 as in most other cities around the world.

Enough has been documented on regulations which prevent land market from working efficiently, however, another key area of escalating building material prices has not been addressed adequately. As shown in Fig. 1, there has been a dramatic rise in prices of key inputs like cement, steel, bricks etc. One concern that arises

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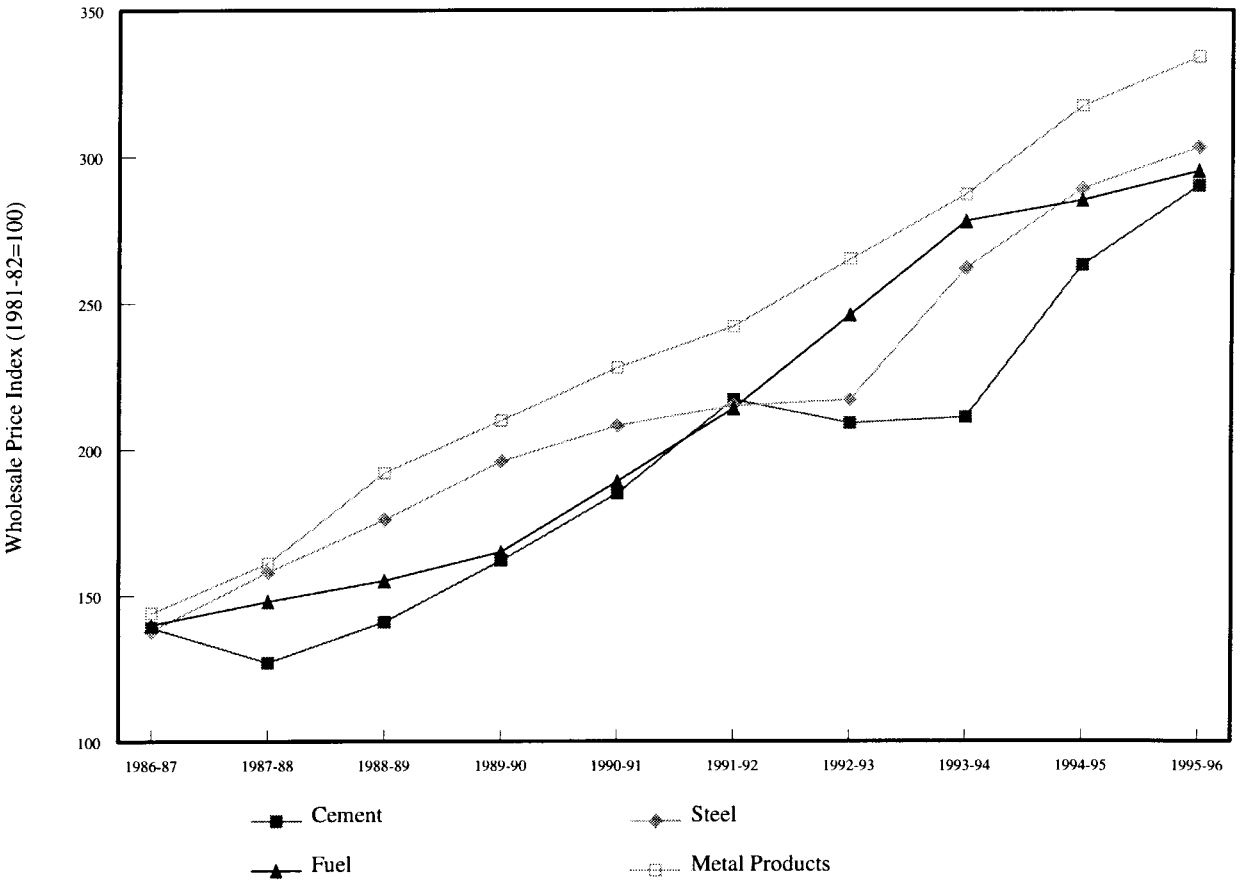

Fig. 1. Wholesale price index of major building materials.

is, can we reduce the construction cost without compromising engineering criteria?

The economy wide sectoral CO_2 emissions derived using an input–output approach for India and 1989–90 data, show that construction is the largest CO_2-emitting sector by final demand with its share of 17.0% when direct and indirect emissions are considered, see Fig. 2 [9]. Direct CO_2 emissions at the construction site are marginal because of minor applications of machineries that use fuels. This raises another concern, how can we minimize CO_2 emissions in house construction?

These two concerns are interlinked and should be addressed together. In this paper we present a multi-objective optimization model which compares construction technologies to meet housing shortage from cost and emissions point of view. The model assimilates structural engineering and economic theory of production function to the problem of house construction. The concept called 'Engineering Production Function' was pioneered by Chenery [4], but has not been used in construction so far. To obtain a solution to the production function which includes engineering variables empirically for house construction is our contribution. We further include the problem of choice of techniques and propose an optimization model to solve such a problem in a very simple and elegant way. This model is very important from a planning point of view to assess total resources (investment and materials) of the economy required to meet housing needs.

'Shelter for all' is a very normative term. One of the driving forces for housing demand is income besides other household characteristics like household size etc. However, for policy analysis and simplicity it is assumed that each household comprising one married couple demands a house. In this paper we assume that the demand for housing stock depends on (a) new household formation, (b) crude shortage, and (c) replacement demand.

The paper begins with an assessment of the housing situation in India. In the subsequent sections we present a modeling framework which is used to evaluate alternative construction techniques, results, and finally the conclusion with policy prescriptions to help in improving housing situation in India.