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Research options for low-cost rehabilitation

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Introduction

There is a limit to the resources from the earth. If we want to survive we all have to use these resources as intelligently as possible. This is easier said than done. As we are confronted with a heritage of decisions from the past, for example, in the field of housing and infrastructure there was a policy to build for quantity (volume) and not so much for quality. This is one of the reasons why buildings are generally in a bad condition in developing countries.

For Kenya there are reports of cases where the maintenance component takes 50% of the annual revenues (1). Maintenance and rehabilitation should therefore be high on the list. Although some activities are undertaken in this field, it still has no priority. Partly because of the way of thinking, "Today and not tomorrow", but also because of a lack of knowledge into the mechanisms behind the behaviour of buildings.

The design stage is a major point where the measure of maintenance and renovation is already created. In view of the environmental problems maintenance and rehabilitation also need particular attention. Although many of us are aware of the problem, activities up until now, have been limited to particular cases. The goal of this paper is to motivate others to participate.

Theories

The research question for new housing and infrastructure is to find an optimum between new construction, maintenance and rehabilitation where it concerns total saving of resources in quantity of materials, labour and capital. For existing (infra)structures there is need for maintenance/rehabilitation instead of demolition. Where is the optimum? Sometimes the latter is cheaper.

More generally, the problem field can be described as: Can we design, build, maintain, rehabilitate housing and infrastructure in such a way that the use of (material) resources can be reduced?

Before we can develop such a system we have to know more about: the relationship between design, maintenance and rehabilitation. We also have to take into account 'external circumstances' which may differ by country, level of development, type of structure.

Research

Research at the Eindhoven University of Technology concerns the prediction of behaviour of buildings. A model will be developed in which the information of the behav-

our of building components in terms of durability and changeability can be collected, ordered and interpreted for design, maintenance and rehabilitation of other buildings.

The research covers three main topics:

- durability of building components
- influence of materials on durability behaviour of building components
- changeability of building components.

Research is also carried out into older buildings (20th Century monuments): what is their quality etc, how can they be maintained and restored?

Application of the model (which includes all influencing factors) will lead to better detailing, but also to development of new appropriate maintenance and renovation techniques.

Self-help

One of the solutions for Developing Countries may be found in self-help productivity. Figure 1 gives a review of them.

The view is that people who know/make their structures are also more capable of repairing and improving them.

A combination of all the above research topics will lead to a workable approach to the problem.

Action group/working party

I have concluded from, as well as other conferences and interviews that, although lack of knowledge on maintenance and rehabilitation is recognized as a problem, there are only a few people who are actually involved in the topics. In particular there is still a lack of people from developing countries. Therefore I began to stimulate interested people and researchers to start a working party. The response during the last CIB W70 (Oct 1992) conference was quite promising. Now I am trying to get more people interested. The idea is after an inventorisation of all activities in this field to share experiences/research and to develop a research programme with reports/output/meetings at more or less regular intervals.

References

1. UNCHS The rehabilitation of existing housing stock, 1982, p 15
2. Erkelens, PA, Self-help building productivity, University of Technology Eindhoven 1991, PhD Thesis, p 66.

	B. LABOUR	C. EQUIPMENT	D. MATERIALS	E. ORGANIZATION	F. INFORMATION	A. GENERAL
N	labour conditions		quality of materials	structure of building process	influence of national procedures	political stability
A	availability skilled labour		availability local materials		influence of regulations	availability infrastructure
T	availability artisans		availability import materials		influence of codes/bylaws	competition
I	avail. trained inspector/superv.		price of materials		speed of approvals/permits	variability of weather
O	organization of labour market		price changes of materials		availability of good bldg manuals	degree of technological progress
N	influence of unions		suitability of materials		available standard specifications	support for R & D
A			number of different materials offered		influence council procedures	interest rates
L			location materials shops		information new techniques	credit policies
				organizing ability of things	know how relation design execution	encouragement of savings
				identifying good subcontractors		degree of inflation
				organization of households		attractiveness of plot value
				cooperation between members	knowledge of procedure	stresses to regular income
H	commitments to regular job		knowledge of materials	relation with other SH builders	informal contracts	income level
O	responsibilities to family		knowledge of materials prices		availability support for approvals	financial resources
U	size of family		knowledge of quantities needed	familiarity with project coord.	decisiveness speed of households	
S	input of family members			available project time	documentation of past projects	
E	available time for building			building phases ready in time	knowledge of the project	
H	levels of skills			stability of production	knowledge building techniques	
O	available time for supervising			project preparation	knowledge survey techniques	
L	quality of supervision			project organization	knowl. criteria mats. loan	
D	health conditions			use of planning	knowledge on fits & tolerances	
	literacy rate			degree of work organization	form of contract	
	traditions of workers			participation in decisions		
	length of working hours			accidents		
				safety		
				degree of quality control	security of plot legalization	philosophy project organizer
P	relations between workers	maintenance of equipment	quantity of materials used	cooperation between crafts	complexity of design	
R	quality of hired labour	availability spare parts	use of 2nd hand materials	number of subcontractors	consistency of product specif.	
O		wear and tear of equipment/tools	quality of blocks made	ability for cost control	quality of drawings	
J		use of right tools	transportation on foot/cart	cost changes	availability of detailed drawings	
E			soil conditions	location of temporary unit	standards for mats. vs. skills	
C			soil survey carried out	plot topography	standards of construction vs. skills.	
T			materials quantity in designs	plot remoteness	allowed versus applied standards	
			correctness quality standards	size of project	training programmes skilled labour	
			degree of prefabrication	complexity of project	adequate labour instructions	
			standardization	degree of community participation	general project info.	
			degree of materials waste	degree of formalized house blog groups		
			storage methods	number of participants		
			reliability of supplies	type of construction		
			quantity discount	method of construction		

Figure 1. List of factors influencing self-help building productivity (2).