Pergamon Titles of Related Interest

BLOSS & PFISTERER
Advances in Solar Energy Technology, 4-volume set

BOWEN & YANNAS
Passive and Low Energy Ecotechniques

CARTER & DE VILLIERS
Principles of Passive Solar Building Design

FERNANDES & YANNAS
Energy and Buildings for Temperate Climates

HUTCHINS
Solar Optical Materials

McVEIGH
Sun Power, 2nd edition

SODHA *et al.*
Solar Passive Building

TWIDELL *et al.*
Energy for Rural and Island Communities IV

YANNAS
Passive and Low Energy Architecture

Pergamon Related Journals *(Free Specimen Copy Gladly Sent on Request)*

Building and Environment

Energy

Energy Conservation and Management

Heat Recovery Systems and CHP

International Journal of Hydrogen Energy

Progress in Energy and Combustion Science

Solar and Wind Technology

Solar Energy

INNOVATIVE HOUSING PRACTICES

Better Housing Through Innovative Technologies and Financing

Proceedings of the IAHS World Congress on Housing,
University of Porto, Portugal,
23–27 October 1989

Edited by

VITOR ABRANTES
University of Porto, Portugal

and

OKTAY URAL
Florida International University, Miami, USA

PERGAMON PRESS

OXFORD · NEW YORK · BEIJING · FRANKFURT
SÃO PAULO · SYDNEY · TOKYO · TORONTO

U.K.	Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, England
U.S.A.	Pergamon Press, Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, U.S.A.
PEOPLE'S REPUBLIC OF CHINA	Pergamon Press, Room 4037, Qianmen Hotel, Beijing, People's Republic of China
FEDERAL REPUBLIC OF GERMANY	Pergamon Press GmbH, Hammerweg 6, D-6242 Kronberg, Federal Republic of Germany
BRAZIL	Pergamon Editora Ltda, Rua Eça de Queiros, 346, CEP 04011, Paraiso, São Paulo, Brazil
AUSTRALIA	Pergamon Press Australia Pty Ltd., P.O. Box 544, Potts Point, N.S.W. 2011, Australia
JAPAN	Pergamon Press, 5th Floor, Matsuoka Central Building, 1-7-1 Nishishinjuku, Shinjuku-ku, Tokyo 160, Japan
CANADA	Pergamon Press Canada Ltd., Suite No. 271, 253 College Street, Toronto, Ontario, Canada M5T 1R5

First edition 1989

Library of Congress Cataloging in Publication Data

IAHS World Congress on Housing (1989: University of Porto)
Innovative housing practices: better housing through innovative technologies and financing; proceedings of the IAHS World Congress on Housing, University of Porto, Portugal, 23–27 October 1989/edited by Vitor Abrantes and Oktay Ural.—1st ed.
p. cm.
1. Housing—Costs—Congresses. 2. Housing—Finance —Congresses. 3. Housing policy—Congresses.
I. Abrantes, Vitor. II. Ural, Oktay. III. Title.
HD7286.I17 1989 363.5'82—dc20 89–22985

British Library Cataloguing in Publication Data

IAHS World Congress on Housing: 1989: University of Porto, Portugal
Innovative housing practices: better housing through innovative technologies and financing; proceedings of the IAHS World Congress on Housing, University of Porto, Portugal, 23–27 October 1989.
1. Housing
I. Abrantes, Vitor II. Ural, Oktay
363.5

ISBN 0-08-037884-6

Printed in Great Britain by BPCC Wheatons Ltd, Exeter

IAHS WORLD CONGRESS ON HOUSING

Porto, 23-27 October 1989

CHAIRMEN: Oktay Ural / Vitor Abrantes

SCIENTIFIC COMMITTEE

Oktay Ural - (Florida International University, USA)
Robert Krapfenbauer - (IAHS director Vienna, Austria)
Vitor Abrantes - (Porto University, Portugal)
Luis Prieto - (Florida International University, USA)
J.Salas - (Eduardo Torroja's Institute, Spain)
Caio Mota - (Techonological Research Institute, Brasil)
Rene Urien-(Centre Scientifique et Technique du Batiment, France)
Teixeira Trigo-(National Laboratory of Civil Engineering,Portugal)
H. R. Viswanath - (Bangalore University, India)

ORGANISING COMMITTEE

António Pedro
Hipólito de Sousa
João Porto
Leitão Borges
Maria Helena
Oliveira e Silva
Rangel das Neves
Rui Calejo
Daniel Quintã
Irene Chaves
Jorge Chaves
Manuel Sepúlveda
Moreira da Costa
Pedro Pinho
Ribeiro dos Santos
Vasco Freitas

SPONSORS

International Association for Housing Science
University of Porto
Florida International University
American Society of Civil Engineers
Ministério das Obras Públicas
Ministério do Plano e Administração do Território

and

Associação Industrial Portuense
Instituto de Gestão e Alienação do
Património Habitacional do Estado
Associação Portuguesa dos Comerciantes de Materiais de Construção
Instituto Nacional da Habitação
SITAL
IPOCORK
Caixa Geral de Depósitos
CINCLUS

Preface

IAHS 89 - World Congress on Housing - was held in Porto, Portugal, between October 23 and 27, 1989.

IAHS 89 was intended to continue IAHS Conference Series, which started with the First Symposium in Missouri, USA, 1970 and continued in Missouri (1972), Ohio (1973), Miami (1974), Quebec (1974), Atlanta (1976), Cairo (1976), Madras (1977), Bangkok (1977), Istambul (1977), Salvador (1978), Dhahran (1978), Miami (1979, 1980), Viena (1981), Miami (1983), Valparaíso (1985), Miami (1986), Berlim (1987), Singapore (1987), Bangalore (1988).

IAHS ' goals are: generate interest to improve every phase of housing technology and production; emphasize and foster interdisciplinary nature of housing problems; use integrated systems approach in the decision process associated with every phase of planning and construction; incorporate all possible scientific knowledge and methods in the housing industry; organize and sponsor meetings, courses and conferences concerned with housing problems; assemble, compile, publish and disseminate information of housing problems; cooperate with academic and research institutions, government and private organizations to sponsor and finance research related to housing; to search for and support innovations which have the potential to help solve the housing problems.

IAHS Oporto Congress main theme has been "Better Housing Through Innovative Technologies and Financing" particularly through new urban planning, new designs, new materials, new technological and management developments and innovative financing.

The organisers would like to thank for the help received from all their colleagues, sponsors, staff and, of course, from all the participants, who, in fact, are the ultimate reason for holding any conference.

Vitor Abrantes

Oktay Ural

IAHS 89, Chairmen

Quick Process for Evaluating the Cost of Infrastructures in Land-lot Divisions

L. M. ALVES DIAS

Department of Civil Engineering
Instituto Superior Técnico
Av. Rovisco Pais
1096 LISBOA CODEX

SUMMARY

An operation of land-lot division gives rise to costs. The expenditure involved includes not only the cost of the land, but also such costs as those for preparing the dossier (studies and projects, municipal licences and taxes or those paid to other public entities) and the cost of executing the necessary infrastructures (water supply, sewerage, roadways).

For estimating the cost of preparing the dossier, data are available that enable the cost to be evaluated approximately (fees for the project, municipal taxes).

For estimating the cost of the infrastructures there is not, in our technical milieu, compiled and systematized information that allows its evaluation.

The present text summarizes a recent study based on computer data base techniques, in which a methodology is developed for detailed determination of that cost and it essays the application of regression models that may lead to a quick estimate of such values, namely in the initial stages of preparing a land-lot dossier.

KEYWORDS

Infrastructures; Cost of infrastructures; Land-lot divisions; Information systems; Data bases.

INTRODUCTION

The aim of this work is to provide elements that can allow the evaluation of the cost of technical infrastructures, having in mind, among other applications, the preparation of economic feasibility studies on land-lot divisions and the planning of budget allocations for urban development purposes. It gives the methodology used in calculating the cost of infrastructures and presents a model for recording and processing information on land-lots. This model, based on the constitution of a data base of real land lot divisions, calculates economic indicators that are analysed in summarized form in statistical terms.

METHODOLOGY FOR CALCULATION OF COST OF INFRASTRUCTURES

The estimated cost of the infrastructures of the land-lot divisions are calculated by the **cost composition method** on the basis of the measurements of works to be executed in each specific job. This method is based on the identification, quantification and evaluation of the resources (labour, materials, equipment) that are involved in each job which has to be done. The sum of the quantities of each resource and application to them of the respective unit costs determines the total cost of each construction operation. For identification of the resources and their quantification, use is made of records of the performance obtained by direct in situ observations or to records prepared by specialists in this areas of intervention. The unit costs of the resources are obtained from various sources, namely suppliers, representatives, distributors or manufacturers, and processed according to their specific nature. In gathering this information, mean values were considered in order to enable them to be applied to cases in general.

Figure 1 shows an organization chart of the model for recording and processing the information of construction operations of infrastructures, giving the functional connections between information relating to operations, resources and unit costs.

The information relating to each resource and each construction operation as a rule presents one fixed part and another part that is variable. The fixed part contains all information that is required for complete definition of the resource or construction operation. The variable part contains the information dependent on time in the case of resources and information on each of the resources consumed in the case of a construction operation.

This model, based on the constitution of a construction operations data base (**Base A**), was implemented on a computer used in this work in the various stages of processing the information (recording, validation and operation).

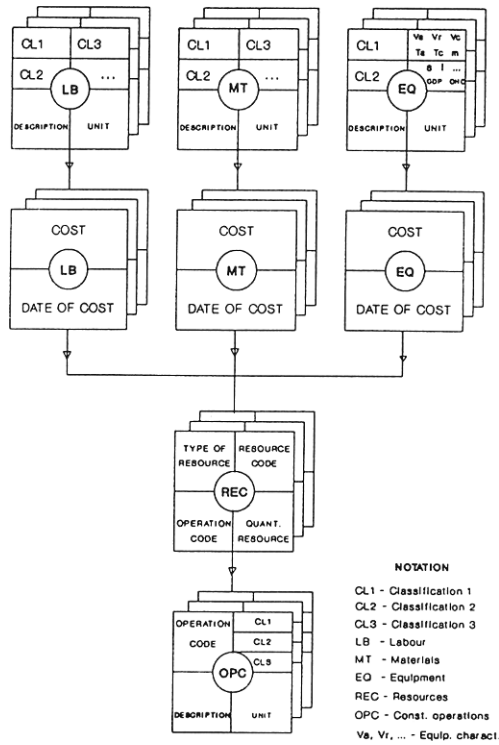

Fig. 1 - Construction operations. Information structure.

MODEL FOR RECORDING AND PROCESSING INFORMATION ON LAND LOT DIVISIONS

The model for recording and processing the information relating to land-lot divisions is shown in Figure 2 (Land-lot division infrastructures - Information structure).

The conception of this model was based on an analysis of various real land-lot divisions, and aims at showing the relationship of all the information recorded, in particular calculation of the economic indicators (relationship between costs and technical characteristics of the land-lot divisions.

The model integrates the data base of infrastructures construction operations (OPC), referred to in the previous chapter, and the following data files:

CRT - Technological characterization of the land-lot division;
CTOT - Total costs of the infrastructures of the land-lot divisions;
CMOV - Costs of earth shifting of the infrastructures;

QREF - Reference quantities of the infrastructures;
QMOV - Quantities of earth shifting of the infrastructure.

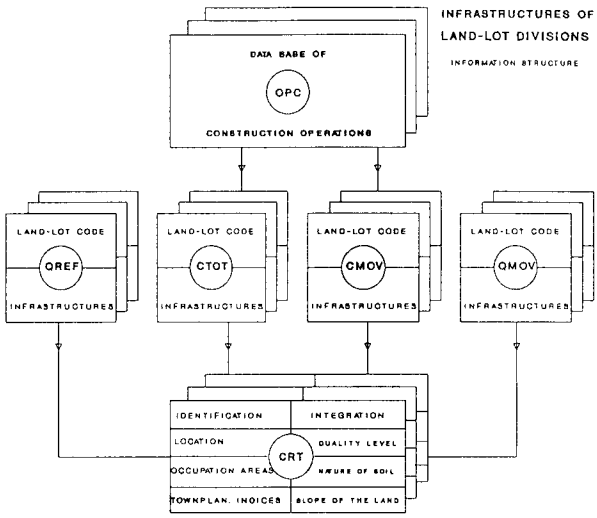

Fig. 2 - Land-lot division infrastructures. Information structure.

The technical parameters that characterize the land-lot divisions are recorded in the **CRT** data file, which holds information for each land-lot division on:

- Identification (code, designation, date of land-lot division, date of latest updating of the cost of the infrastructures);
- Location (municipality, administrative district);
- Areas of occupation (land area to be developed, area of lots, construction areas,...);
- Townplanning indices (indices of occupation, number of inhabitants, number of dwellings,...);
- Integration (area with infrastructures, periphery of a zone with infrastructures or away from an area with infrastructures);
- Quality level (low, medium or high);
- Type of soil (soft soil, hard soil, soft rock, hard rock);
- Slope of the land.

The other data files (CTOT, CMOV, QREF, QMOV) all have the same structure constituted by the identification code for each land-lot division and by the categories and sub-categories of the technical infrastructures.

This model, based on the constitution of a real land-lot divisions data base (**Base B**), was implemented on