

Building Materials and Construction Technologies

Annotated UN-HABITAT bibliography



UN-HABITAT






Acknowledgements

The original draft which forms the basis for this report was written in 2001 by Abhirami S. Raghavan. The draft was later revised, expanded and updated by Moses Gathua Kimani between January and April 2003. Their considerable efforts in retrieving, reviewing and summarising the publications, reports and documents referenced in this report are very much appreciated.

Inge Jensen and Selman Ergüden, both of **UN-HABITAT**, supervised the activities and finalised the substantive content of the report. The input of Rainer Nordberg, also of **UN-HABITAT**, is also appreciated. The electronic version of the report was finalised by Moses Gathua Kimani and Inge Jensen.

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Title	Published year	Printed copies available for dissemination?	Electron version available
UN-HABITAT publications			
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The construction industry in developing countries. Vol. II	1984	No	No
Energy conservation in the construction and maintenance of buildings. Vol. 1: Use of solar energy in the design of buildings in developing countries	1984	No	
Small-scale building materials production in the context of the informal economy	1984	No	
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The use of selected indigenous building materials with potential for wide application in developing countries	1985	No	
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Earth construction technology. Volume I: Manual on basic principles of earth application	1986	No	No
Earth construction technology. Volume II: Manual on production of rammed earth, adobe and compressed soil blocks	1986	No	No
Earth construction technology. Volume III: Manual on design and construction techniques	1986	No	No
Earth construction technology. Volume IV: Manual on surface protection	1986	No	No
Case study of women block makers in Kenya	1988	No	No
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Development of the construction industry for low-income shelter and infrastructure	1988	No	No
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Bibliography on small-scale building-materials production	1989	No	No
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Development of national technological capacity for production of indigenous building	1991	No	No
Energy for building: improving energy efficiency in construction and in the production of building materials in developing countries	1991	No	No
Energy efficiency in housing construction and domestic use in developing countries	1991	No	No
Technology in human settlements: role of construction	1991	No	No
Earth construction technology	1992	No	No
Development of national technological capacity for environmentally sound construction	1993	No	No
Endogenous capacity-building for the production of binding materials in the construction industry – Selected case studies	1993	Yes	No
Small-scale production of Portland cement	1993	Yes	No
Vertical-shaft limekiln technology	1993	Yes	
Report on the Workshop on the Network of African Countries on Local Building Materials and Technologies	1994	Yes	No
Policies and measures for small contractor development in the			

construction industry	1996	Yes	No
Global overview of construction technology trends: Energy efficiency in construction	1997	Yes	No
Building materials and health	1997	Yes	No
Women constructing their lives: Women construction workers: four evaluative case studies	1997	Yes	No
Housing and Environment: Report of the Vienna Workshop	2000	Yes	
Posters on low-cost building techniques	2001	No	
Journal of the Network of African Countries on Local Building Materials and Technologies			
Vol.1, No.1	1989	No	No
Vol.1, No.2	1990	No	No
Vol.1, No.3	1991	No	No
Vol.1, No.4	1991	No	No
Vol.2, No.1	1992	No	No
Vol.2, No.2	1992	No	No
Vol.2, No.3	1993	Yes	No
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Vol.3, No.2	1994	Yes	No
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Vol.3, No.4	1995	Yes	No
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Technical Notes			
No. 1: Construction with sisal cement	1981	No	No
No. 10: Fibre-concrete roofing	1987	No	No
No. 11: Earth construction technology. Part 1: The basic parameters of soil as a construction material	1987	No	No
No. 12: Energy efficiency in building materials production	1987	No	No
No. 13: Earth construction technology. Part 2: low-cost technology for production of adobe, rammed earth and compressed blocks	1987	No	No
Other UN-HABITAT reports			
Building materials production for shelter development Paper presented at the Women and Shelter Seminar in Vienna	1985	No	No
Bibliographic Notes, No. 22 (December 1992): Building materials and construction technology	1992	No	No
Building materials for housing. Report of the Executive Director to the fourteenth session of the Commission on Human Settlements	1993	No	
Building materials and health. Background paper for the fifteenth session of the Commission on Human Settlements	1995	No	
Building materials and health. Report of the Executive Director to the fifteenth session of the Commission on Human Settlements	1995	No	



ABOUT
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ANNOTATED UN-HABITAT BIBLIOGRAPHY
HS/688/03 E
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Preface

"Within its mandate ... the United Nations Centre for Human Settlements (Habitat) shall have, inter alia, the following responsibilities: ... (d) To facilitate the global exchange of information on adequate shelter for all and sustainable human settlements development by, inter alia, exchanging information on best practices and encouraging research activities on sustainable approaches and methods concerning building materials and construction technology"

(Habitat Agenda, paragraph 228).

The Habitat Agenda -- adopted by the second United Nations Conference on Human Settlements (Habitat II) (convened in Istanbul, Turkey, in 1996) -- identifies exchange of information on, and support to research on, building materials and construction technologies as core mandates of UN-HABITAT. This focus is in line with the recommendations of the first United Nations Conference on Human Settlements (Habitat) (convened in Vancouver, Canada, in 1976). The Vancouver Declaration and Action Plan emphasized that high priority should be given to the exchange and dissemination of information on human settlements, and called for collaboration of existing research institutes, professional institutions and non-governmental organizations in these fields.

As a result of this, UN-HABITAT activities during the 1980s and 1990s made an effort to contribute to the growth of the building materials and construction industries, particularly in Africa, both in terms of development of new technologies and in terms of applied research. UN-HABITAT supported and facilitated information flows, regional cooperation and the transfer of appropriate technologies in low-cost and innovative building materials sector in African countries, particularly through the activities of the Network of African Countries on Local Building Materials and Technologies.

Population growth and urbanisation led to an increasing need for shelter developments, and focused attention on the importance of local building materials and techniques. In many parts of the world, such materials and techniques are widely used and help meet the growing demand for low-cost housing. Methods of improving such materials and technologies and for combining them in new ways are constantly being developed. However, the production of indigenous building materials requires that technologies are tested, tried, and above all, widely known at the local level. In some cases, it is dissemination of technological innovations is limited by the inability of local institutions to translate research findings to commercial scale operations and to self-help builders.

Generally, the quality of output will depend on the choice of technology, given that the raw materials vary in their characteristics from one location to the next. The lack of requisite skill or techniques in the appropriate use of indigenous building materials in construction could be the single most important factor limiting the wide-scale adoption of such materials. Construction skills are important to the extent that they are linked to the objective of achieving minimum cost of indigenous building materials.

The supply of low-cost but durable building materials is almost universally recognized as a major obstacle to improved housing conditions in developing countries, whether in urban or rural areas. There is a growing interest in the use of building materials that can be produced entirely from local resources, using simple small-scale production technologies to provide durable building materials at a cost that is affordable by the majority of potential builders.

Despite the potential contributions of indigenous materials to the construction sector and national economies, and despite the opportunities that exist to promote these materials in several countries, the successful development of these materials has been restricted to a few countries only. The transfer of technologies between countries and establishment of a framework to identify and receive requisite technologies can overcome this limitation. This was highlighted by the Habitat Agenda, which stated that "International organizations have an important role to play in disseminating and facilitating access to information on technologies available for transfer" (paragraph 205).

Despite of the considerable efforts of UN-HABITAT within the fields of building materials and construction technologies during the last two decades, public access to technical material produced by UN-HABITAT has been relatively limited. Information about availability of technical material has been limited and many reports are currently out of print. The effect of UN-HABITAT publications on building materials and construction technology development and application has thus been less than what it could have been.

In the current situation where very limited resources are available within UN-HABITAT to address its mandate within this field, this bibliography is an effort to summarize and make more readily available existing UN-HABITAT publications and reports on building materials and construction technologies. The objective of this report is to provide our partners with an overview of work undertaken by UN-HABITAT in these fields during the last two decades. The report thus indicates the availability in printed and electronic formats of the various reports reviewed herein.

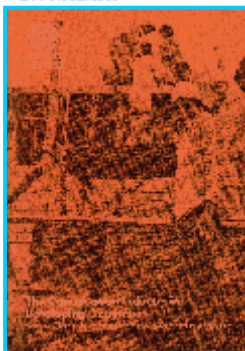
The bibliography is organized in two main parts. The first part lists the reports and documents chronologically by type, e.g., UN-HABITAT reports; bibliographies; Commission on Human Settlements documents; UN-HABITAT papers; the Journals of the Network of African Countries on Local Building Materials and Technologies; and the Technical Notes. The second part lists the same reports (except the Journals)

alphabetically by theme, e.g., building materials or construction technologies. Separate sub-sections have been added for energy and gender related issues. Each of the summaries is organized according to the following format:

- A copy of the cover (if available);
- Bibliographic details;
- A general introduction and summary, including the aims and objectives of the report; and
- An annotated table of content of the report.

As a follow-up to the preparation of this report, **UN-HABITAT** will attempt to make available in electronic format some of the most important reports on building materials and construction technologies published in the past. Furthermore, an effort will be made to expand the current report and include reviews of additional reports and documents as and when they become available. The current report will thus be regularly updated to reflect these developments.

Comments, corrections, and additional information are very much welcome (please contact: Housing.Policy@unhabitat.org).



**The construction industry in developing countries
Vol. I: Contributions to socio-economic growth**

This report describes the role played in economic development by the construction industry in developing countries; the various facets and characteristics of the demand placed upon the construction industry, and the nature of construction technology. Examples of issues, problems and promotion programmes are drawn from selected countries.

The report discusses proposals where all the components of the construction industry are viewed in an integrated manner. One proposal for the development of the sector is considered in a more comprehensive manner in another complementary report. In that report, the various elements of the sector are considered separately and policies are formulated for each specific element.

UNCHS (Habitat)

Nairobi, 1984

HS/32/84 E

ISBN N/A

No. of pages: 57+iv

Printed copies: No

Electronic copies: No

The report is organized in two parts dealing with characteristics of the industry and strategy options. It includes a total of five sub-sections:

- Part one:** Details the construction industry in developing countries.
- Chapter I.** Views the construction sector in terms of its contributions to the overall national economy of a developing country. In addition, it describes the backward and forward linkages of the construction sector.
- Chapter II.** Discusses construction in terms of the nature, structure, sources of construction demand, and outlines some of the ways in which that demand is influenced by various owners, users and funding agencies. Recent trends in the structure of demand and their impact on the construction sector are also discussed.
- Chapter III.** Discusses construction in terms of various characteristics and aspects of supply. Several examples of approaches that have been used to promote the indigenous construction industry are provided.
- Chapter IV.** Discusses the construction technology, productivity, costs and innovations. Particular emphasis is placed on establishing a framework for assessing the suitability and appropriateness of various levels of technology in construction activities of developing countries.
- Part two:** Focuses on strategies, policy options and issues for the promotion of indigenous construction industries. Provides a synthesis of findings and insights that have significant implications for the future of the industry.



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The construction industry in developing countries, Vol. II

Profile of the construction industry in various countries. It provides basic data on the structure of the construction industry in a number of countries: Bolivia, Greece, Honduras, Kenya, Mexico, Pakistan, Syrian Arab Republic, Tunisia and Yemen.

UNCHS (Habitat)

Nairobi, 1984

HS/35/84 E

ISBN N/A

No. of pages: N/A

Printed copies: No

Electronic copies: No



Energy conservation in the construction and maintenance of buildings. Vol. 1: Use of solar energy in the design of buildings in developing countries

UNCHS (Habitat)

Nairobi, 1984

HS/49/84 E

ISBN N/A

No. of pages: 58+ii

Printed copies: No

Electronic copies:

Yes



This report is written within the framework of restricted availability of petroleum products and depletion of forest resources in oil importing developing countries. The constraints imposed on these countries have led them to encourage the adoption of energy-conserving human settlements patterns, especially since expanding industrialization results in increasing energy demands.

Governments in developing countries must take into account the relationship between human settlements and energy planning with a view to conserving energy in the built environment. Energy-conserving measures in the operation of buildings which consume approximately 40 per cent of the total energy supply in many oil-importing developing countries would result in substantial savings.

In order to overcome these problems, developing countries must conserve non-renewable energy sources and make increased use of renewable energy alternatives such as solar energy. Through proper design, construction and maintenance of buildings, solar energy and other renewable energy sources find its applications to heat buildings in the cold seasons and to cool them in the hot season, thus reducing the dependency on conventional non-renewable fuels.

As an initial step in defining the scope of energy conservation in buildings, UN-HABITAT convened an expert group meeting on the use of solar energy and natural cooling in developing countries. The meeting concentrated on the needs of future research and development activities needed to alleviate some of the technical and economic constraints identified.

The report is organized in eight chapters:

- I. Assesses the state of the art of energy conservation in relation to broad climatic analysis.
- II. Discusses the design methodology, which includes bio-climatic analysis, thermal analysis and the role of solar energy in the management of large buildings.
- III. Explains the materials, their availability and their properties.
- IV. Assesses technical constraints and institutional barriers
- V. Focuses on demonstration projects and performance monitoring of buildings.
- VI. Analyses the need for research and development in this field.
- VII. Focuses on training, technology transfer and international cooperation.
- VIII. Provides conclusions and recommendations.



Small-scale building materials production in the context of the informal economy

This report argues that building materials are the main input to the construction industry, which in turn is an important contributor to national capital formation. Despite some encouraging trends, the building materials industry is still unable to meet the demands made on it, and it is yet to maximize its contributions to development. The main reason is that indigenous building materials, which can lead to self-sufficiency and import substitution, have not yet been adopted on a wide scale.

UNCHS (Habitat)

Nairobi, 1984

HS/45/84 E

ISBN N/A

No. of pages: 40+v

Printed copies: No

Electronic copies:

Yes



This report focuses on small-scale production of building materials in the context of the informal economy. The main purpose of the report is to examine ways to increase the contributions of the indigenous building materials industry.

The report is organized in five sections:

- Chapter I. A comprehensive overview of small-scale building-materials units in the informal sector, including definition and scope, examples and characteristics.
- Chapter II. Reviews the contributions made by the small-scale building materials production units to the national economy: the construction sector; the lessening of import-dependence; employment generation and income redistribution; and economic development, as well as the contribution through economic multiplier effects.
- Chapter III. Outlines the constraints to the production of indigenous building materials in the informal sector. In this respect, the report focuses on the quality of products, lack of basic inputs, markets and technologies.
- Chapter IV. Outlines measures aimed at increasing the capacity of building materials production in the informal sector.
- Appendix. Outlines characteristics of various processes of production of building materials.



UNCHS (Habitat)

Nairobi, 1985

HS/82/85 E

ISBN 92-1-131006-7

No. of pages: 32+ii

Printed copies: No

Electronic copies: No

Planning of the construction industry with emphasis on the use of indigenous production factors

In developing countries, the construction sector generally operates with severe limitations, and is unable to meet local demand. Several complex activities, agencies and inputs have to interact before deriving any products or outputs of this sector. Typically, contractors, equipment, machinery, building materials and a multitude of construction skills have to be assembled to produce an output.

Any gap or deficiency in this complex network of interacting activities could lead to excessive cost or undue delay in the final product or, worse still, the abandoning of a construction project. The fundamental reason for this is that there is hardly any effective mechanism for dealing with all the varied activities and the components of the construction sector in a coordinated and rational manner.

This report deals with this problem by examining constraints posed by the lack of planning and broad principles for tackling this limitation. It emphasizes one of the goals of the International Year of Shelter for the Homeless -- that is, to provide guidelines to governments in their efforts to improve the capacity of the construction industry, particularly in relation to the shelter needs of the low-income population.

The report is organized in five chapters:

- I. Profiles the construction industry and the implications for planning the sector.
- II. Outlines the main constraints that developing countries face in planning construction activities.
- III. Discusses the basic targets to be achieved in planning the construction industry.
- IV. Presents a framework to guide the planning of the construction industry.
- V. Focuses on the main issues that decision-makers will have to resolve in planning the construction industry.



UNCHS (Habitat)

Nairobi, 1985

HS/83/85 E

ISBN 92-1-131007-5

No. of pages: 70+iii

Printed copies: No

Electronic copies:

Yes



The use of selected indigenous building materials with potential for wide application in developing countries

The promotion of the building materials sector in developing countries has been a subject of importance to the United Nations, as they are the main input in the construction of houses, schools, factories, airports, roads, water supply facilities, dams, etc. However, the building materials sector has been a cause of inadequate construction output, high construction cost and thus abandonment of construction projects and, sometimes, inadequate building maintenance in developing countries.

Largely, the trend of rising costs and falling supplies of materials can be reversed, if the system of production is based on locally available resources. In most countries, indigenous building materials exist, but they are often either unpopular or insufficient in supply.

The report examines the factors which act as constraints to the production and use of indigenous building materials and identifies measures which can be undertaken to overcome the constraints. It assesses the importance of the indigenous building materials sector in developing countries and outlines the constraints that limit the wide-scale adoption of indigenous building materials.

What constitutes an indigenous material will vary from one country to the next, but the basic criteria are the same. For this reason, the report deals with the production and use of indigenous building materials based on commonly accepted principles and concepts, rather than by relevance to a comprehensive range of building materials. However, a few building materials have been selected to illustrate the broad issues related to the promotion of indigenous building materials.

The bibliography is organized in nine sections:

- Chapter I. Presents an overview of the building materials situation in developing countries, reviewing the importance to national development of the construction sector and the main obstacles to improving its efficiency.
- Chapter II. Reviews the concept of indigenous building materials, with a view to determining criteria that are applicable to most developing economies.
- Chapter III. Discusses constraints that limit the adoption of indigenous building materials.
- Chapter IV. Suggests measures to promote the wide-scale adoption of indigenous building materials.
- Chapter V. Describes pertinent aspects of production and use of indigenous building materials using selected materials as an illustration.
- Annex I. Includes a total of ten case studies on production of selected indigenous cementitious materials.
- Annex II. Provides information on limestone deposits in African countries.
- Annex III. Provides information on natural pozzolana deposits in African countries.
- Annex IV. Provides information on rice-husk availability in African countries.



Case studies on measures for energy efficient shelter and infrastructure

UNCHS (Habitat)
Nairobi, 1986
HS/105/86 E
ISBN 92-1-131023-7
No. of pages: 78+vi
Printed copies: **No**
Electronic copies:
Yes



Rising energy prices have led to a re-evaluation of all facets of energy use aimed at identifying energy conservation measures. There is growing awareness of the harmful ecological impacts of current energy technologies and the cost implications of ecologically improved systems. Conservation measures, technological improvements and the use of new and renewable sources of energy are obvious solutions to the problem.

Domestic energy requirements consist of cooking, water heating, lighting and space heating and cooling. Passive solar heating and natural cooling systems use natural renewable energy sources, such as solar radiation, nocturnal radiation, air convection, and water evaporation.

There are passive design techniques that are reliable in energy saving and the provision of comfort. The use of these technologies should be promoted in developing countries because the technologies result in energy savings with a very slight increase in initial building costs.

This report is a compilation of three case studies on solar heating and natural cooling techniques. The three case studies are from different climatic zones from developing countries. The different climatic zones are: Hot-Humid, Patambo (Mexico); Hot Dry, New Delhi (India); and Temperate, Istanbul (Turkey).

The case studies are analyzed in terms of thermal performance and the techniques used for solar heating or natural cooling.

The report is organized in six sections:

- Chapter I. Provides a comparison of the three case studies based on climate, building operation and thermal performance.
- Chapter II. Reviews passive solar heating in a residential building in Istanbul.
- Chapter III. Reviews natural cooling in New Delhi.
- Chapter IV. Reviews natural cooling in rural houses in Patambo.
- Chapter V. Summarizes the results of the three case studies. All three are assessed based on climate, building operation, and thermal performance.
- Annex. Definitions for terms used in the report.



UNCHS (Habitat)

Nairobi, 1986

HS/55/84 E

ISBN 92-1-131031-8

No. of pages: 50+v

Printed copies: No

Electronic copies: No

Earth construction technology

Volume I: Manual on basic principles of earth application

Aims at professionals dealing with projects on earth construction and serves as useful reference material and aids actual field practice. It is a set of four technical manuals, complementary to each other (see also Volumes [II](#), [III](#) and [IV](#)).

The report is organized in four parts:

Introduction.

- I. Fundamentals of soil science.
- II. Principles of soil stabilization.
- III. Characteristics of soil stabilizers in some detail, by types of materials, such as fibre, cement, lime, bitumen and natural products.



Earth construction technology
Volume II: Manual on production of rammed earth, adobe and compressed soil blocks

Aims at professionals dealing with projects on earth construction and serves as useful reference material and aids actual field practice. It is a set of four technical manuals, complementary to each other (see also Volumes [I](#), [III](#) and [IV](#)).

The report is organized in four parts:

Introduction.

- I. Production of rammed earth.
- II. Production of adobe blocks.
- III. Production of compressed blocks.

UNCHS (Habitat)

Nairobi, 1986

HS/86/85 E

ISBN 92-1-131034-2

No. of pages: 37+v

Printed copies: No

Electronic copies: No



UNCHS (Habitat)

Nairobi, 1986

HS/84/85 E

ISBN 92-1-131032-6

No. of pages: 66+v

Printed copies: No

Electronic copies: No

Earth construction technology Volume III: Manual on design and construction techniques

Aims at professionals dealing with projects on earth construction and serves as useful reference material and aids actual field practice. It is a set of four technical manuals, complementary to each other (see also Volumes [I](#), [II](#) and [IV](#)).

The report is organized in seven parts:

- I. Basic considerations.
- II. Substructure.
- III. Walls.
- IV. Openings.
- V. Floors.
- VI. Roofs, vaults and domes.
- VII. Fireplaces and services.



Earth construction technology
Volume IV: Manual on surface protection

Aims at professionals dealing with projects on earth construction and serves as useful reference material and aids actual field practice. It is a set of four technical manuals, complementary to each other (see also Volumes [I](#), [II](#) and [III](#)).

The report is organized in four parts:

- I. Basic considerations.
- II. Surface protection.
- III. Detailed aspects of surface protection.
- IV. Tests on rendering.

UNCHS (Habitat)

Nairobi, 1986

HS/85/85 E

ISBN 92-1-131033-4

No. of pages: 57+v

Printed copies: No

Electronic copies: No



UNCHS (Habitat)

Nairobi, 1990

HS/183/89 E

ISBN 92-1-131106-3

No. of pages: 78+vi

Printed copies: [Yes](#)

Electronic copies: [No](#)

Use of new and renewable energy sources with emphasis on shelter requirements

Inadequacy in supply of energy is a major constraint to improving the quality of life in human settlements in developing countries. Energy is required not only for production of food and goods but also for domestic needs such as cooking, lighting and transport. It has been demonstrated that energy requirements are often much higher in the domestic sector than in the agricultural or transport sectors.

In the context of rapidly decreasing supplies and escalating prices of fossil fuels, many developing countries have initiated programmes to reduce dependence on petroleum-based fuels and increase the use of new and renewable sources, in particular biomass fuels. However, the energy demands in human settlements cannot be met exclusively by renewable sources owing to the level and characteristics of demand and high cost involved in using new sources of energy. Therefore, it is necessary to focus on specific technological options, available or to be explored, which permit the use of the new and renewable sources of energy.

This report gives an overview of energy use patterns and energy requirements in human settlements in developing countries and their various commercial energy sources and of their use limitations in developing countries. It also discusses the technical options for energy applications in the domestic and transport sectors. Although some of these technologies might not affect the developing countries in the short term, they nevertheless represent important options for these countries in long-term development.

The report is organized in five chapters:

- I. Analyses energy-use patterns in human settlements, urban and rural.
- II. Details the energy requirements in human settlements. This includes activities such as agriculture, non-agricultural activities, cooking, heating, and lighting.
- III. Explains the different energy options for human settlements -- both commercial energy sources and new and renewable energy technologies.
- IV. Details energy-use for transportation in human settlements.
- V. Outlines strategies for implementation of renewable energy technologies.



Case study of women block makers in Kenya

Partly due to the rapid rural-urban migration in most developing countries, the demand for urban housing outstrips the supply, presenting government authorities with a major challenge. Apart from direct commercial activities, the vehicles for developing low-cost housing include co-operatives and self-help schemes. In self-help schemes, there are opportunities for groups to establish themselves at a very informal level and, subsequently, to develop into informal production or industrial operations. As the interest in promoting women's integration in non-traditional sectors of the economy gains momentum, techniques to make women's activities more effective and efficient arises. This case study sets out to identify gender-specific constraints to small-scale building materials production and to generate sets of policies for eliminating such constraints.

UNCHS (Habitat)

Nairobi, 1988

HS/08/86-20 E

ISBN 92-1-131046-6

No. of pages: 19

Printed copies: No

Electronic copies: No

The report is organized in three chapters:

- I. Identifies and describes different operating groups and activities, such as:
 - The Kabiro women's group, which had received support from the different development authorities;
 - The Dandora local women's self-help group;
 - Small-scale industrial production of concrete blocks;
 - Concrete roofing tiles;
 - Prices and production of related factors.
- II. & III. Provides summary, conclusions and recommendations. Includes a comparison of two groups, the Kabiro women's group and the Dandora local women's self-help group. They have similar backgrounds and identical technologies, but their progress has been different. The technical aspects of building materials production are of considerable importance, especially where women are competing in an open market situation, but also because of safety factors. It is noted that women's traditional skills may be of advantage in building materials production.



A compendium of information on selected low-cost building materials

There is a growing interest in the use of building materials that can be produced entirely from local resources, using simple small-scale production technologies to provide durable building materials at a cost which is affordable to the majority of potential builders. However, the spread of small-scale production technologies has not been as rapid or as extensive as the urgent housing situation requires.

The main objective of this compendium is to bridge this gap by assembling information on a range of building material technologies, which have the potential to improve the low-income housing situation in developing countries. It concentrates on five different categories of building materials, namely:

- Burnt clay brick and tiles;
- Soil construction;
- Low-cost binders;
- Fibre concrete roofing; and
- Timber.

The choice of materials is by no means comprehensive. Stone and thatch for instance are important materials that have not been included. The materials chosen are all derived from very widely available raw materials, they can use relatively simple low-cost processing technologies and they have been subjects of recent research and development work in many different developing countries.

This report is intended to be of use to organizations or individuals wishing to acquire and make use of the technologies for the production of building materials rather than for designers or users of the materials.

UNCHS (Habitat)

Nairobi, 1988

HS/137/88 E

ISBN 92-1-131065-2

No. of pages: 106+v


Printed copies: [Yes](#)

Electronic copies:
[Yes](#)



The report is organized in seven chapters:

- I. Provides a general introduction to the topics discussed in the report.
- II-VI. Concentrate on each of the five different categories of materials with each of the five chapters divided in eight sections:
 - A brief introduction;
 - Raw materials used;
 - Production technologies;
 - Performance standards;
 - Uses in construction;
 - Innovations in manufacture and its use;
 - Further reading; and
 - Equipment manufacturers and suppliers.
- VII. Provides details (including addresses) of organizations involved in technology transfer and adaptation, including research and training organizations; development and application organizations; and international organizations.

	<h3>Development of the construction industry for low-income shelter and infrastructure</h3>
<p>UNCHS (Habitat) Nairobi, 1988 HS/120/87 E ISBN N/A No. of pages: 43 Printed copies: No Electronic copies: No</p>	<p>Provides guidelines on tackling specific issues that limit the capacity of the construction industry to meet the requirements of the low-income populations.</p> <p>The report is organized in four chapters:</p> <ol style="list-style-type: none">I. Examines the limitation of existing mechanisms for construction of low-income shelter and infrastructure. Observes that the limitations include scarce supply or low quality of building materials, low-skilled labour, inadequate systems of financing, and lack of maintenance and upgrading.II. Deals with economic benefits of low-income shelter and infrastructure construction, with reference to economic benefits of small-scale building materials production, income or employment generation on construction sites skill generation, and the significance of economic activities generated in low-income settlements.III. Highlights innovations, in selected countries, to overcome specific constraints in low-income shelter and infrastructure construction. The innovations include low-cost building materials, technology transfer, formulation and promotion of standards for a vast range of indigenous building materials, construction programmes for delivery of low-cost infrastructure, credit assistance, and social welfare approach for marginalized groups such as women, the destitute, and the aged.IV. Explores the way to promote a construction industry for delivery of low-income shelter and infrastructure, including, inter alia, promotion of small-scale indigenous building-materials production units, improvement of access to basic skills and innovative construction techniques, and exploration of investment by the private real estate market.



The economic and technical viability of various scales of building materials production

UNCHS (Habitat)

Nairobi, 1989

HS/180/89 E

ISBN 92-1-131103-9

No. of pages: 49+iii

Printed copies: [Yes](#)

Electronic copies: [No](#)


In most developing countries, the basic building materials are fired-clay bricks, concrete products, timber products, alternative cementitious materials and Portland cement. Given this array of materials, this report should prove useful to several countries especially in respect to the needs of the low-income population.

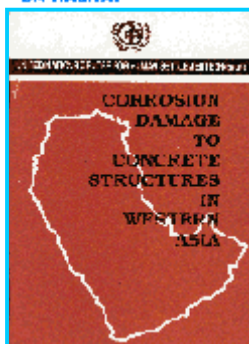
The report is based on empirical evidence from selected developing countries, which by virtue of their geographic spread gives the report an almost global perspective. In technical scope, the report also covers all the basic building materials, which are of significance to attainment of the targets of the global strategy for shelter.

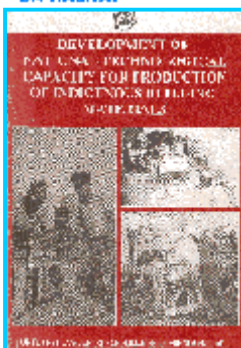
This report outlines a methodology on how to investigate existing production plants in terms of the viability of scales of operation and thus provide a basis for better decision-making in subsequent ventures. It intends to provide technical guidance, rather than be the basis for policymaking. It is targeted at professionals in both public and private sector institutions in developing countries as well as professionals in international organizations dealing with projects on local building materials.

The paper is organized in six sections:

- Chapter I. Provides a comprehensive background to the general principles of technology scale by dwelling on the significance of scale technology in the entire process of promoting local building materials.
- Chapter II. Reviews the technical viability of various scales of building materials production in the United Republic of Tanzania.
- Chapter III. Discusses the economic viability of alternative scales of building materials production, using the same case studies as in Chapter II.
- Chapter IV. Focuses on cementitious materials, providing an analytical basis for decision-making on alternative scales of producing a variety of such materials. Includes examples from Botswana, China, India, and the United Republic of Tanzania
- Chapter V. Conclusions.
- Annex. Provides summaries of the country case studies which formed the basis of the analysis presented, viz. Egypt, Ghana, India, Mauritius and the United Republic of Tanzania.

	<h3 style="text-align: center;">Co-operation in the African region on technologies and standards for local building materials</h3>
<p>UNCHS (Habitat) Nairobi, 1990 HS/181/89 E ISBN 92-1-131104-7 No. of pages: 35+ii Printed copies: Yes Electronic copies: No</p>	<p>In response to deteriorating economic conditions, most governments in Africa are currently undertaking, or are planning to undertake, economic-recovery programmes. These programmes aims at expanding agricultural-commodity production, improving and rehabilitating infrastructure, developing industrial units, providing public facilities and promoting the shelter output. All these activities include a high component of construction, so any inadequacies in the supply of building materials could jeopardize national efforts at achieving economic recovery.</p> <p>UN-HABITAT has provided a basis for governments to reverse the negative trends in the building materials sector. It has shown that, by promoting indigenous production capacity the building materials sector offers opportunities for reducing import-dependency and for attaining self-sufficiency.</p> <p>The report highlights the findings of a workshop on <i>"Co-operation in the African region on technologies and standards for local building materials"</i> which had the following objectives:</p> <ul style="list-style-type: none"> • To review the innovations of the Ghana, Malawi and Kenya workshops on standards promotion in other African countries. • To establish modalities for strengthening the network of African countries on local building materials and technologies.
	<p>The report is organized in four sections:</p> <p>Introduction. Introduces issues related to the development of technologies and standards for local building materials.</p> <p>Annex I. Report of workshop on Ghana standards and specifications for the production and use of soil blocks and lime masonry, Accra, Ghana, 18-22 July 1988.</p> <p>Annex II. Report of workshop on Malawi standards and specifications for fibre-concrete roofing, Blantyre, Malawi, 12-16 September 1988.</p> <p>Annex III. Report of workshop on Kenya standards and specifications for soil blocks, Nairobi, Kenya, 26-30 May 1989.</p>

	<p align="center">Corrosion damage to concrete structures in Western Asia</p>
<p>UNCHS (Habitat) Nairobi, 1990 HS/204/90 E ISBN 92-1-131122-5 No. of pages: 33+ii Printed copies: Yes Electronic copies: No</p>	<p>Designers and builders of concrete structures should be aware of the problem of corrosion of reinforced steel, which -- if unchecked -- will lead progressively to cracking and spalling of concrete, unserviceability, and eventual collapse. Chemicals such as chlorides and sulphides present in the materials used for making concrete, the ingress of moisture through air and water into the vicinity of reinforcement in the finished structure cause corrosion of steel.</p> <p>The problem of corrosion is particularly acute in the Gulf region of Western Asia where high summer temperatures and saline atmosphere, coupled with high humidity activate the chlorides present in the sand used for making concrete. Several buildings have started showing the effects of corrosion-cracking and crumbling calling for highly expensive repair and reconstruction programmes, including demolition of such buildings. Such maintenance and reconstruction programmes are unending and very expensive. It is far better and more economical to prevent corrosion than to rectify it.</p> <p>This report explains the phenomenon of corrosion with particular reference to conditions in the Gulf region. It also deals with repair of structures damaged by corrosion, corrosion management techniques, and the steps taken to prevent corrosion.</p>
	<p>The report is organized in nine chapters:</p> <ol style="list-style-type: none"> I. Introduces the problem of corrosion of reinforcing steel bars in concrete structures II. Details the phenomenon of corrosion III. Elaborates on factors inducing corrosion IV. Outlines the effects of corrosion on structures V. Details the repair of structures damaged by corrosion VI. Describes corrosion monitoring techniques VII. Details how to prevent corrosion VIII. Highlights areas in need of further research and development IX. Conclusions.



UNCHS (Habitat)

Nairobi, 1991

HS/247/91 E

ISBN 92-1-131170-5

No. of pages: 383+iii

Printed copies: No

Electronic copies: No

Development of national technological capacity for production of indigenous building materials

As populations grow and become urbanized, and as aspirations for higher living standards rise, the demand for building materials grows rapidly. In most developing countries the building materials industries have not only failed to cope with the rising demand but the gap between the demand for building materials and the domestic capacity for production has widened. The poor technological capacity of the local building materials sector relates to issues like its inability to expand and its inability to keep up with rising demand.

Past attempts to break this technological barrier mainly relied on imports of large-scale technologies that were in most part mere imports of production capacities aimed at bridging the immediate gap between demand and supply. However, these attempts had few long-term effects, and added little to the local building materials industry. Recently small-scale building materials industries have gained recognition due to their inherent flexibility to cope with volatile and shifting demands, and their ability to take best advantage of available factors of production in developing countries.

This report, a result of in-house research at UN-HABITAT, is an effort to improve the production of indigenous building materials in developing countries. It is aimed at assisting both national decision makers and international communities in gaining an insight into the problems of capacity building in the building materials sector and stimulate coordinated action that is vital for the implementation of national shelter strategies. Its conclusions are based on projects undertaken in the 1980s. It also refers to the rich literature on technology transfer produced by different agencies within the United Nations system and relevant works of other authors. It analyses the causes of current technological shortcomings of the building-materials industry and outlines the framework of a possible strategy for endogenous capacity-building in the building-materials sector.

The report is organized in five sections:

- Chapter I. Discusses the significance of technology in the production of indigenous building materials in developing countries in economic, financial, social, energy and environmental terms.
- Chapter II. Analyses the problems faced by developing countries in their efforts at domestic capacity building, and the key underlying issues. The report focuses on only one small-scale industry and issues related to the same
- Chapter III. Identifies the principal actors who must work together to enhance the technological capacity of the building materials industry, including entrepreneurs in both private and public sectors; national institutions; and international agents for technology transfer.
- Chapter IV. Outlines the elements of an operational strategy for technological capacity building of the building materials industry. Refers to the possibilities of South-South and North-South cooperation.
- Annex. Presents some selected case studies on technology transfer and diffusion in the building materials industry.



Energy efficiency in housing construction and domestic use in developing countries

Addresses the use of energy-efficient building-construction processes; the production of low-energy-intensive materials; the conservation of materials, through use and recycling of recovered items; the lowering of transport costs of such materials; the promotion of efficient construction practices; and increased efficiency in domestic energy use.

The report is organized in two parts:

- I. Elaborates on energy efficiency in building construction.
- II. Discusses household energy efficiency.

UNCHS (Habitat)

Nairobi, 1991

HS/218/91 E

ISBN 92-1-131138-1

No. of pages: 47

Printed copies: No

Electronic copies: No

Energy for building: Improving energy efficiency in construction and in the production of building materials in developing countries



Examines the question of energy efficiency in building materials from the point of view of producers of building materials, building designers and builders. It is intended to be of use to policy-makers in the field of housing and construction. It examines the energy use in the production of a range of separate materials, which together comprise more than 90 per cent of materials used in building.

UNCHS (Habitat)

Nairobi, 1991

HS/250/91 E

ISBN 92-1-131174-8

No. of pages: 104

Printed copies: No

Electronic copies: No

The report identifies the opportunities for improved energy efficiency through the choice of appropriate technology for building-materials production, processes and plant management. Considers how the optimum strategy for plant location could be developed. Also looks at the possible contribution of recycling to reducing the energy cost of building materials.

The report deals with the energy content of building components and looks at the energy content of complete building systems, and considers the particular case of insulating materials where increased energy costs in manufacture can be offset by improved energy efficiency in the life time use of the building. It discusses the opportunities for energy saving by designers in making use of recycled materials or buildings. Finally, it sets out a range of strategies for producers, builders and designers to optimize energy use.



Technology in human settlements: Role of construction

Examines the problems and constraints that get in the way of increased exploitation of technology in human settlements development. Analyses developed country experiences to identify possible approaches relevant to developing countries, and provides a framework of action to speed technology application in such countries.

UNCHS (Habitat)

Nairobi, 1991


HS/262/91 E

ISBN 92-1-131182-9

No. of pages: N/A

Printed copies: No

Electronic copies: No

	<p style="text-align: center;">Development of national technological capacity for environmentally sound construction</p>
<p>UNCHS (Habitat) Nairobi, 1993 HS/293/93 E ISBN 92-1-131214-0 No. of pages: 91+v Printed copies: Yes Electronic copies: No</p>	<p>The construction industry produces physical assets such as buildings and infrastructure, which are the basis of virtually every aspect of development and for the creation of much of the world's human made capital. Yet, the construction industry is one of the largest exploiters of natural resources, both biological and mineral. Its activities cause irreversible transformations of the natural environment and contributes to the accumulation of pollutants in the atmosphere.</p> <p>In this respect UN-HABITAT and UNIDO jointly organized the first global consultation on the construction industry (see also "Policies and measures for small contractor development in the construction industry"). The main objective of the consultation was to address issues related to sustainable construction-industry activities -- an area of expressed concern in Agenda 21.</p> <p>The consultation focused on three areas of sustainability:</p> <ul style="list-style-type: none"> ● The management of non-renewable resources; ● The control of physical disruption; and ● The minimization of air pollution caused by construction-related activities.
	<p>The report consolidates lessons from the technical papers prepared for the consultation. Its purpose is twofold. First, it attempts to identify, in detail, the ways in which construction activities contribute to different areas of environmental stress and examples thereof. Secondly, it considers the means available for reducing adverse environmental impacts through improved technologies and through design or modified practises.</p> <p>The report is organized in four chapters:</p> <ol style="list-style-type: none"> I. Considers the contribution of construction to the deterioration of the physical environment, the conflicts with agriculture, forests and the other natural resources, how to reduce the deterioration, and some policy issues to support the industry. II. Discusses the use of non-renewable resources in construction, the means to reduce the embodied energy in buildings, and how to improve the energy efficiency of buildings. It also outlines future policy requirements at both industry and government levels. III. Analyses the contribution of construction to atmospheric pollution and then outlines the ways and means, which could reduce atmospheric pollution caused by construction activities. IV. Outlines the elements of a strategy for the promotion of sustainable construction activities. Also highlighted in this chapter are the roles of governments as well as the international community in facilitating and being instrumental in the process of promoting sustainable and environment-friendly construction processes.



Endogenous capacity-building for the production of binding materials in the construction industry: Selected case studies

UNCHS (Habitat)

Nairobi, 1993

HS/292/93 E

ISBN 92-1-131215-9

No. of pages: 124+vi

Printed copies: [Yes](#)

Electronic copies: [No](#)

The consumption of Portland cement in most developing countries increased rapidly during the 1970s and 1980s. Among all binding materials, Portland cement remains the most popular with builders because of its versatility. The production of Portland cement is, however, not sufficient. The result has been that construction projects have stalled, due to scarcity of Portland cement and/or sudden increases in its price.

Thus, demand for alternative binders (like lime) has risen in areas where they are available. Similarly, a mixture of artificial or natural pozzolanas with cement or lime finds its use in many rural and sub-urban areas. The lack of information on alternative technologies for production is associated with the constraints and challenges facing the development of the local building material industry.

By compiling a number of case studies on achievements and constraints of alternative binders, this report focuses on the development of such binders. The report is not limited to technical aspects of production, but includes a discussion of non-technical aspects of development. This includes the methods applied for the acquisition and development of technologies, problems encountered and how they were solved.

Case studies from several African countries (Ghana, Kenya Malawi, Rwanda, and the United Republic of Tanzania) and India elucidate the different production technologies, with special emphasis on their advantages, disadvantages and problem solving.

The report is of particular interest to researchers and professionals in the construction industry and encourages small-scale entrepreneurs to produce and market alternative binding materials.

The report is organized in eight sections:

- Overview:** Introduces the relevant binding materials and technologies.
- Chapter I.** Details the Chenkumbi Hills lime projects in Malawi, including the Balaka forced air-kiln.
- Chapter II.** Details the development of a pilot up-draught and vertical-shaft lime-kiln in Ghana.
- Chapter III.** Details the development of pozzolanic cement in Rwanda.
- Chapter IV.** Details the development of pozzolanic cement using rice-husk ash in Kenya.
- Chapter V.** Details a SIDO assisted lime production technology in the United Republic of Tanzania.
- Chapter VI.** Provides a critical analysis of scale economy in lime production from India.
- Appendix.** Provides details about the Khadi and Village Industries Commission (KVIC) and the Central Building Research Institute (CBRI) in India.



UNCHS (Habitat)

Nairobi, 1992

HS/265/92 E

ISBN 92-1-131192-5

No. of pages: 200+v

Printed copies: No

Electronic copies: No


Earth construction technology

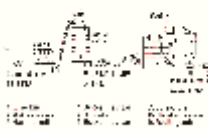

In most rural areas of developing countries and in some urban low-income settlements, earth is the main material used for shelter construction. Earth construction is often linked to dilapidated, temporary and unsafe structures. Due to this, modern materials are often preferred. However, soil is not restricted to low-cost construction. Instead, it forms the basis of a technically sound engineering practice, which is comparable to concrete technology or any of the more popularly adopted building materials. In fact, earth technology should be promoted as an effective alternative to other conventional building materials.


The fact that there is currently very limited knowledge on earth technology -- as compared to conventional materials -- is a major reason for publishing this report. The report is targeted at professionals dealing with projects on earth construction, and is produced to serve as a useful reference material and to provide assistance in actual field application.

The report is organized in five parts:

- I. Basic principles on earth application: Deals with the fundamentals of soil science, principles of soil stabilization and the characteristics of soil stabilizers.
- II. Design and construction techniques: Focuses on the different parts of any structure: the substructure, walls, openings, floors, roofs, vaults, domes, fireplaces and services.
- III. Surface protection: Discusses the different types of surface protections, the detailed aspects of surface protection and outlines different tests on renderings.
- IV. Production of components: Discusses the different types of construction, such as rammed earth, adobe blocks and compressed blocks.
- V. A comprehensive bibliography on earth construction technologies.

	<p align="center">Small-scale production of Portland cement</p>
 <p>UNCHS (Habitat) Nairobi, 1993 HS/281/93 E ISBN 92-1-131204-3 No. of pages: 81+vi Printed copies: Yes Electronic copies: No</p>	<p>Cement, with its superior binding properties, early strength development and easy availability in ready-to-use condition is the most popular binding material for construction. In developing countries the per capita production and consumption of cement is an indicator of development. Yet, the growth of cement production in developing countries is not sufficient.</p> <p>One of the main reasons for the limited expansion of the production capacity of cement industries is the choice of technology in favour of large-scale production facilities. Most developing countries have opted for the large-scale production of cement. Due to factors like supply constraints, energy costs, the size of the markets, and the rising distribution costs, developing countries have not been able to address the gap between demand and supply. The advantages of small-scale decentralized cement productions are thus being increasingly recognized.</p> <p>The report is aimed at assisting a prospective entrepreneur make investment decision. In addition to technological information, the publication provides the methodology for carrying out feasibility studies to ascertain project costs and profitability. It focuses on the different types of production of Portland cement, and discusses their advantages and disadvantages. The report provides examples of a wide range of dimensions and gives suitable suggestions concerning the area, the resources available and the demand of the community that the plant has to support.</p> <p>The report is organized in 14 chapters:</p> <ol style="list-style-type: none"> I. Explains the advantages and disadvantages of small-scale production vis-à-vis large-scale production. II. Discusses the different technologies of small cement plants and how they fare in comparison with others. III. Discusses small cement plants and their operation in India, China and other countries. IV. Explains in detail appropriate geological investigations, selection of materials and fuels. V. Describes the raw-mix design and quality control in vertical-shaft kiln-cement plants. VI. Outlines the system design and selection of plant and machinery. VII. Discusses plant descriptions, e.g., plant flow sheet and instrumentation and process control. VIII. Details operation of vertical-shaft kiln. IX. Focuses on environmental controls in small-cement plants based on the vertical-shaft kiln technology. X. Outlines a methodology for the preparation of pre-feasibility study. XI. Details the economics of small-scale production of Portland cement. XII. Details how to monitor performance of an operating plant. Annex. Includes a format for recording performance data of a vertical-shaft kiln cement plant. Appendix. Includes additional technical details, on the vertical-shaft kiln technology, as well as a glossary of technical terms.

	Vertical-shaft limekiln technology
	<p>Lime has traditionally been a major building material. However, its use has been restricted since the advent of Portland cement which though much more expensive is preferred for its strength and stability. The variable and often unreliable nature of lime, especially when it is produced in small clamp-type kilns with little process control, has made it unpopular, in comparison to Portland cement.</p> <p>In many developing countries, lime production is mostly undertaken by small-scale and village industries that offer good employment opportunities. The different traditional methods of lime production though, have not gained popularity due to their inefficiency in fuel requirements, inefficiency in production, wastage of heat, pollution and lack of uniformity of product in terms of physical and chemical properties.</p>
<p>UNCHS (Habitat) Nairobi, 1993 HS/303/93 E ISBN 92-1-131225-6 No. of pages: 82+v Printed copies: Yes Electronic copies: Yes</p> 	<p>This report focuses on a wide range of issues related to lime production, illustrating different technological features of small-scale lime-production processes. Due to its inherent advantages and successful experiences, vertical shaft limekiln technology for plant capacities in the 3-10 tons per day range has been given special attention.</p> <p>The report seeks to provide technical information and guidelines to professionals and entrepreneurs who intend to set up small-scale lime plants or wish to improve and modify their existing plants. The report also includes a methodology for conducting feasibility studies and cost-benefit analysis.</p>
	<p>The report is organized in 11 sections:</p> <ul style="list-style-type: none"> Chapter I. Details the various types of lime available Chapter II. Outlines the lime manufacturing process Chapter III. Discusses various recent design developments Chapter IV. Considers the scale and methods of lime -burning in developing countries Chapter V. Provides technical information on vertical -shaft limekiln Chapter VI. Provides production details Chapter VII. Outlines technical details of kiln operation Chapter VIII. Discusses lime hydration Chapter IX. Discusses a methodology for preparation of pre-feasibility studies Annex I. Includes an overview of profitability analysis Annex II. Provides a glossary of terms relating to building lime.

	<h3>Report on the Workshop on the Network of African Countries on Local Building Materials and Technologies</h3>
<p>UNCHS (Habitat) Nairobi, 1994 HS/306/93 E ISBN 92-1-131228-0 No. of pages: 123+iii Printed copies: Yes Electronic copies: No</p>	<p>Despite some modest gains in production capacities during the 1970s and 1980s, the gap between construction needs and the indigenous production capacity of basic building materials remains wide in many African countries. Sub-Saharan Africa's share of the world production of building materials actually declined between 1975 and 1985. Sub-Saharan Africa's dependence on imports consequently increased. This increase imposed additional strain on an already acute balance of payments situation and fuelled inflation in the building materials sector, resulting in cost overrun in public projects and inhibiting private initiatives in shelter production.</p> <p>UN-HABITAT and the Commonwealth Science Council established the Network of African Countries on Local Building Materials and Technologies in 1985. The main objective of this network was to promote regional cooperation through information exchange and to assist the participating countries in the formulation of standards and specifications for local building materials and technologies. The twelve countries participating are: Cyprus, Ethiopia, Ghana, Kenya, Malawi, Malta, Mauritius, Nigeria, Sierra Leone, Uganda, the United Republic of Tanzania and Zimbabwe.</p> <p>The workshop, which is the subject of this report, was convened on 6-8 September 1993 in Nairobi, Kenya.</p>
	<p>The report is organized in 12 sections:</p> <ul style="list-style-type: none"> Chapter I. Details the background, objective and outputs of the workshop. Chapter II. Presents the conclusions and recommendations suggested for the Network of Sub-Saharan countries. Chapter III. Details the organization of the workshop. Chapter IV. A UN-HABITAT technical presentation on new and innovative technology transfer mechanisms. Chapter V. Summarizes the technical papers submitted by the various countries in the network. Chapter VI. A UN-HABITAT presentation on domestic capacity-building in the building materials sector in the Sub-Saharan region. Chapter VII. Summarizes the closing session of the workshop. Annex I. Contains a UN-HABITAT report on the building materials sector in the African region. Annex II. Presents a programme proposal for domestic capacity-building in the building-materials sector in Sub-Saharan Africa. Annex III-V. Contain the programme of the workshop, a list of documents and the list of participants.



UNCHS (Habitat)

Nairobi, 1996

HS/375/95 E

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No. of pages:
118+xviiPrinted copies: [Yes](#)Electronic copies: [No](#)

Policies and measures for small contractor development in the construction industry


The construction industry contributes significantly to the development, expansion and improvement of human settlements and because of its strong links with other sectors of the economy, the industry generates increases in employment, income and savings and thus promotes economic growth. An efficient, well-functioning construction industry is, therefore, vital to the achievement of national socio-economic development goals, including human settlement development goals in every country.


A major feature of the construction industry in developing countries is its heavy reliance on small-scale and informal sector operations, which often account for about two-thirds of the industrial output. It is, therefore, imperative that any strategy to improve the performance of the industry should give due consideration to enhancing the abilities of small contractors and those operating in the informal sector and establishing a supportive environment for them. This requires reforms in the current legislation and in contract procedures and controls that affect small-scale contractors. It is also essential to address their entrepreneurial needs, in particular in terms of training on the management of risks faced by small-scale contractors.

The objectives of this report is to present (in a comprehensive manner) development and management issues related to small-scale contractors, with a view to promote small-contractor development programmes in developing countries. The report documents a number of small-scale contractor development programmes that are already implemented in developing countries, with support from international development agencies. The report emphasizes the recommendations of the first global consultation on the construction industry, which was jointly organized by the United Nations Industrial Development Organization and UN-HABITAT in 1993 (see "*Development of national technological capacity for environmentally sound construction*").

The report is organized in three parts:

- I. Elaborates on the conceptual background, which includes importance of contractor development and management development.
- II. Focuses on small contractors in developing countries, including specific features of the contractors and of their operating environment.
- III. Focuses on benefits and approaches of contractor-development. It elaborates on the needs and potential benefits of contractor-development, different contractor development programmes. It concludes with proposals for action.

Building materials and health	
 <p>UNCHS (Habitat) Nairobi, 1997 HS/459/97 E ISBN 92-1-131338-4 No. of pages: 64+vi Printed copies: Yes Electronic copies: No</p>	<p>In the past decade, there has been increasing concern among scientists and professionals about the suitability of certain building materials to the environment and human health. The health hazards associated with building materials have been the subject in many forums. Given the importance of health as one of the most pressing areas of social concern, and in view of the variety of health hazards which need to be addressed, a range of studies have already been conducted by leading experts and agencies. These discuss mainly the health hazards related to select building materials.</p> <p>The United Nations Commission on Human Settlements requested UN-HABITAT to explore the possibility of drafting an informative document on building materials in the housing sector that are harmful or potentially harmful to people's health and the environment and, alternative building materials that could substitute for such materials. In this respect, UN-HABITAT had earlier published a report entitled "<i>Development of national technological capacity for environmentally-sound construction</i>".</p> <p>This report builds on that work and is based on comprehensive research conducted by UN-HABITAT (see also HC/C/15/INF.8 and HS/C/15/2/Add.5). It focuses exclusively on ways in which a variety of building materials contribute to different aspects of health hazards, and the means available for prevention or mitigation of their adverse health impacts. The study also outlines an implementation strategy, which could serve as a basis for controlling the health hazards associated with building materials.</p> <p>The report is organized in three chapters:</p> <ol style="list-style-type: none"> I. Discusses the nature of health hazards associated with the production of building materials and their use and the demolition and disposal effects of some of the harmful materials and wastes. II. Addresses the problems and constraints to the control of the harmful effects of the building materials. III. Outlines a strategy for the control of health hazards focusing on the possible actions by principal actors involved with the production and use of building materials.

	<p>Global overview of construction technology trends: Energy efficiency in construction</p>
<p>UNCHS (Habitat) Nairobi, 1997 HS/376/95 E ISBN 92-1-131290-6 No. of pages: 196+x Printed copies: Yes Electronic copies: No</p>	<p>The provision of shelter for the hundreds of millions of homeless and inadequately housed urban dwellers is a big challenge for the construction industry. The construction sectors do not meet the demands for shelter and infrastructure and especially the demands of the low-income population. There are several reasons for this anomaly, but the most fundamental ones are lack of sound planning and policies, lack of finance, and use of inappropriate and outdated technologies, which are not suitable for local problems and are wasteful in terms of energy inputs.</p> <p>The purpose of this report is to address some of the prevailing and critical setbacks of the construction sector in developing countries. It demonstrates how environmentally sound construction practices can be developed and how -- and through which measures -- the sector can meet local demands in a suitable manner. Bearing in mind that energy is one of the most costly and vital inputs to the construction and the building materials industry -- and the fact that excessive use of energy increases the cost of production and causes environmental degradation -- special emphasis has been given to energy-related aspects of production. Attempts have been made to demonstrate and analyze different approaches and modalities on how energy use in the construction sector can be optimized and how high-energy content materials can easily be replaced with low-energy content materials for the purpose of low-cost housing construction.</p>
	<p>The report is organized in eight sections:</p> <p>Chapter I. Introduces the issues raised in the report.</p> <p>Chapter II. Provides an analysis of the energy efficiency in the production of high-energy content materials such as cement, lime, and bricks.</p> <p>Chapter III. Presents innovative technologies related to the increased use of low-energy building materials, such as soil construction, use of timber and bamboo, and alternative cementitious materials.</p> <p>Chapter IV. Discusses innovative technologies related to the use of organic and inorganic wastes in construction.</p> <p>Chapter V. Elaborates on energy conservation in construction.</p> <p>Chapter VI. Discusses energy efficient building design options, namely: passive solar heating and natural cooling of buildings.</p> <p>Chapter VII. Discusses strategies for optimizing the use of energy in construction.</p> <p>Annex. Details solar timber seasoning in Sri Lanka.</p>



UNCHS (Habitat)

Nairobi, 1997

HS/442/97 E

ISBN 92-1-131323-6

No. of pages: 144

Printed copies: [Yes](#)Electronic copies: [No](#)

Women constructing their lives: Women construction workers: four evaluative case studies

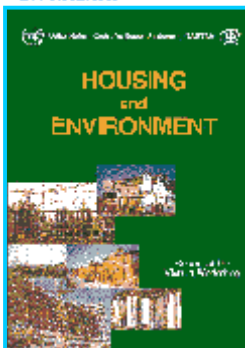
Women have specific roles in traditional construction practices that require particular skills. Where modern construction techniques and patterns of employment are introduced, women are, however, nowhere near the well-paid skilled jobs. The differentiation in work between men and women on building sites seems to be based on cultural appropriateness (with regard to gender), rather than on individual capabilities.

This report is a compilation of four case studies. These four case studies portray the bleak situation of women in the industry. All four case studies focus on skilled construction work, mainly masonry but also carpentry, painting and others. The case studies from Ghana, India, Jamaica and Mexico describe how women, both trained and untrained, have participated in the construction sector with varying degrees of success and personal fulfillment. They describe the obstacles: from lack of access to training, to unequal pay, to harassment on construction sites.

This volume is aimed at those planning construction projects and/or are involved in increasing and improving women's skills in human settlements related fields.

The report is organized in four case studies:

1. Brick by brick: Training women to build -- The case of India. Women in the construction sector both skilled and unskilled in India.
2. Women construction workers: A case study on the impact of women's participation in the construction sector in Ghana.
3. Women construction workers: A case study evaluation in Mexico -- The impact of women's participation in the construction sector.
4. Women in construction: the Jamaican experience.



UNCHS (Habitat)

Vienna, 2000

HS/596/00 E

ISBN 92-1-131456-9

No. of pages: 392

Printed copies: [Yes](#)

Electronic copies:

[Yes](#)



Housing and environment: Report of the Vienna Workshop

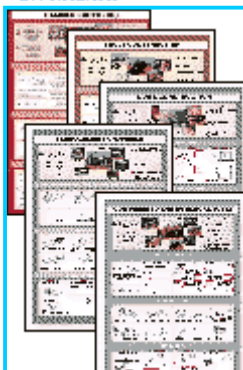
The promotion of housing development and sustainable construction practices has been central to the work of **UN-HABITAT** during the 1980s and 1990s. This report notes that it is increasingly being acknowledged that the prevailing limitations of the housing sector and the environmental implications of the construction industry cannot be tackled universally, even though there are quite a number of common problems everywhere. Besides this, the solution to the housing issues in most Central and Eastern European countries must be taken from different perspectives than elsewhere in the world.

This is one of the main reasons for convening the *Regional Workshop on Housing and Environment* in Vienna on 22-23 November 1999. The workshop focused on the conditions and concerns in Central and Eastern European countries with economies in transition and the newly independent States of the former USSR. The year 1999 marked the tenth anniversary of the start of political and economic reforms in these countries. The Workshop thus offered an opportunity to make an assessment of the housing conditions and, by taking stock of successes and failures during the ten years of change, it provided an insight into policies and courses of future actions required to tackle the current problems.

The deliberations of the workshop were organized around two main themes, namely: the role of the private sector in housing supply; and environment-friendly construction practices.

The report is organized in five sections:

- Introduction. Contains an executive summary of the proceedings of the workshop.
- Part I. Presents a total of 12 papers submitted under the theme "The role of the private sector in housing supply."
- Part II. Presents a total of 20 papers submitted under the theme "Environment-friendly construction practices."
- Part IV. Presents a total of 15 papers of a more general nature related to the themes of the workshop.
- Annex. Contains a list of participants at the workshop.



UNCHS (Habitat)

Nairobi, 2001

HS/610/01 E

ISBN N/A

No. of pages: 5

Printed copies: No

Electronic copies:

Yes



Posters on low-cost building techniques

While conventional building materials such as concrete is well known to builders, in many developing countries there exists a general lack of technical knowledge among builders on the production and use of low-cost building materials and techniques. Many so-called low-cost housing projects have failed to reach the poor due to expensive building materials and techniques.

Over the years, UN-HABITAT has published a number of reports on low-cost building materials and construction technologies. However, publications and books do not always reach those who need them most the low-income communities. To popularize low-cost building materials and technologies, and to improve building skills in low-income communities, UN-HABITAT published a series of posters illustrating innovative low-cost building techniques. It is envisaged that these posters will be used as training materials at technical colleges and schools.

The series consists of five posters prepared to illustrate five different building techniques:

Compressed earth blocks.

The poster illustrates the main stages of production including sieving the soil, measuring and mixing of components, moulding, quality control, curing and stacking. It also includes guidelines on the proper building practices when using compressed earth blocks.

Ferro-cement channels.

Ferro-cement, a layer of steel mesh (chicken mesh) embedded in mortar, is a durable, waterproof, versatile and economical solution that can be used for roofs. Despite its obvious advantages, ferro-cement is not used extensively in developing countries due to lack of know-how. The poster illustrates all stages of its production, channels that can be used for floors and roofs including manufacturing of the mould, casting the channel, transport of channels with detailed drawings and specifications.

Dome construction.

In many countries, people are depending on wood for roof construction. Yet, deforestation has raised the price of timber to a level that is unaffordable for the poor. Dome construction is an ancient woodless building technique that needs to be revived. The poster illustrates the basic dome types and gives guidelines in the construction of a circular dome and a square dome.

Rammed earth construction.

Rammed earth is a building technique where humid relatively sandy soil is rammed in layers between shutters made of metal or timber. It is often stabilized with cement or lime. It is a non-polluting energy-saving building material that lends itself for commercial production because it is a simple and rapid building technique. The poster stresses the need for proper soil identification and illustrates the various phases in rammed earth construction, and includes also typical details, specifications for the construction of the form and a typical wall section.

Vault construction.

Vault construction is an ancient building technique that can be revived especially in countries with scarcity of timber. However, as the shape of the vault is crucial for stability, construction of vault requires often stability studies and well-trained masons. The poster shows how to make a stability study, and how to build a vault without a form, as well as with a form.



BIBLIOGRAPHY ON LOCAL BUILDING MATERIALS, PLANTS AND EQUIPMENT
BIBLIOGRAPHIE SUR LES MATÉRIAUX DE CONSTRUCTION, LES PLANTES ET LES ÉQUIPEMENTS
BIBLIOGRAFIA SULLI MATERIALI EDIFICI, LE PIANTE E LE STRUMENTI

UNCHS (Habitat)
Nairobi, 1982
HS/23/82 E/F/S
ISBN: N/A
No. of pages: 253+xx
Printed copies: No
Electronic copies: No

Bibliography on local building materials, plants and equipment

The increasing need for shelter has focused attention on the importance of using local building materials and technologies. Such materials and technologies are widely used and help to meet the growing demand for low-cost housing. Methods of improving them and combining them in new ways are constantly being developed.

This bibliography on local building materials, plants and equipment was designed to help users become aware of the existence of relevant literature, and to provide users with the information necessary to gain access to original documents.

Literature on building materials that are commonly used and already well documented in developing countries has been omitted. In some cases, items dealing with traditional or historical aspects of the use of certain materials have been included as they may be relevant to present conditions.

The descriptors are drawn from the UN-HABITAT draft thesaurus in the field of human settlements. Additional descriptors have been added for specialized local building materials.

The bibliography is organized in eight sections:

- I. Introduction;
- II. List of participating agencies;
- III. Bibliography;
- IV. Subject index;
- V. Geographic index;
- VI. Author index;
- VII. Corporate authors index;
- VIII. Conference list.

Bibliography on small-scale building-materials production



UNCHS (Habitat)

Nairobi, 1989

HS/154/89 E

ISBN N/A



No. of pages: 122

Printed copies: No

Electronic copies: No

The bibliography is organized in three sections:

- I. Provides a general reading list on various building materials and is classified by authors.
- II. References on selected building materials. It is subdivided into six sections corresponding to one specific material, including cement and concrete products; low-cost binders; timber, fired-clay products; earth construction; and fibre reinforcement.
- III. Provides an annotation for a selection of a few materials in the bibliography considered to be of key importance to the subject.

Bibliography on soil construction	
	<p>The bibliography is organized in four parts:</p> <ol style="list-style-type: none">I. Lists general reading on the subject by type of publication, including books, seminars, papers, periodicals, articles, reports and theses.II. Provides classification by specific subject areas such as: properties of soil and soil stabilization; techniques and equipment for production; design and construction techniques; standards and specifications; and strategies for project implementation.III. Comprises selected annotated bibliography, also categorized by type of publication.IV. Contains an index by title.
BIBLIOGRAPHY	
ON SOIL	
CONSTRUCTION	
	
UNCHS (Habitat)	
Nairobi, 1989	
HS/169/90 E	
ISBN 92-1-131089-8	
No. of pages: 173+ix	
Printed copies: No	
Electronic copies: No	



UNCHS (Habitat)

Nairobi, 1989

HS/173/89 E

ISBN 92-1-131094-8

No. of pages: 68+vi

Printed copies: No

Electronic copies: No

Bibliography on passive solar systems in buildings

Nearly half of the world's commercial energy is consumed in buildings in order to provide indoor comfort. However, the natural environment can be used to reduce energy requirements by making use of passive energy systems.

In order to promote standards and technologies for the provision of economically efficient infrastructure, UN-HABITAT prepared this bibliography to provide information to professionals, such as designers, architects and engineers concerned with construction and retrofitting of buildings, particularly in developing countries with information on passive solar systems and allied subjects from the available literature. It is aimed at encouraging them to make maximum use of energy-conserving devices and systems.

The report represents a summary of a database of some 360 selected references on passive solar systems in buildings.

The report is organized in five sections:

- Part I. A general list of documents that provide an overview of passive solar design.
- Part II. A list of references to specific aspects of passive solar systems. These include passive solar technology; passive heating; passive cooling; building materials and construction techniques; solar radiation and climate.
- Part III. A more detailed annotated reference on 30 selected references that are of particular importance.
- Part IV. A cross-reference to the descriptors of publications in Part II.
- Annex. A list of specialist publishers in this field.



**Bibliographic Notes, No. 22:
Building materials and construction technology**

Includes details on about 60 books, periodicals and reports on the subject of building materials and construction technology.

UNCHS (Habitat)



Nairobi, December
1992

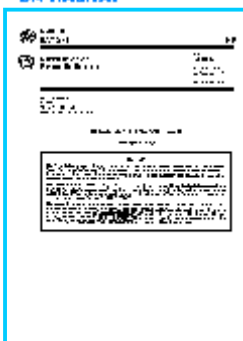
ISSN 0257-7216

No. of pages: 16

Printed copies: No

Electronic copies: No

Building materials for housing. <i>Report of the Executive Director to the fourteenth session of the Commission on Human Settlements</i>	
	<p>The Commission on Human Settlements, in its decision 13/24 of 7 May 1991, decided to include in the agenda of the fourteenth session the theme "appropriate, intermediate, cost-effective building materials, technologies and transfer mechanisms for housing delivery." The purpose of the report is to provide the Commission with an objective review and appraisal of the performance of the building materials industry in developing countries, focusing on key issues and problems, especially the technological and other constraints that currently hinder the availability of basic building materials that are affordable to the common house-builder.</p>
<p>UNCHS (Habitat) Nairobi, 1993 HS/C/14/7</p>	<p>The operational strategy presented in the report is based on the enabling concept of the Global Strategy for Shelter to the Year 2000 and attempts to bring a practical framework for coordinated action at national and subnational levels, with the required international support.</p>
<p>No. of pages: 28 Printed copies: No Electronic copies: Yes</p>	<p>The report is organized in five sections:</p> <ol style="list-style-type: none">I. Presents the current scenario and recent trends in production, imports and prices of building materials, to give an indication of the size and scope of the problem of building materials supply in developing countries.II. Analyses the factors contributing to the poor growth in production and the continuing high prices of building materials.III. Identifies some of the future challenges that have to be faced in formulating an effective strategy for increasing the supply of building materials in a sustainable manner. It also identifies some new opportunities that can assist this process.IV. Outlines an operational strategy for the development of the building-materials sector.V. Contains points for consideration by the Commission on Human Settlements, e.g., possible action by national governments and the international community.
	



Building materials and health.
Background paper for the fifteenth session of the Commission on Human Settlements

This report is the result of a request made by the United Nations Commission on Human Settlements, in its resolution 14/16 of 5 May 1993, for UN-HABITAT to prepare an informative document on building materials which are harmful to people's health and the environment, and the alternatives available for the substitution of such materials.

A summary of this document, "[Building materials and health. Report of the Executive Director](#)" (HS/C/15/2/Add.5) was submitted to the Commission in direct response to that request.

UNCHS (Habitat)

Nairobi, 1995

HS/C/15/INF.8

No. of pages: 28

Printed copies: No

Electronic copies:

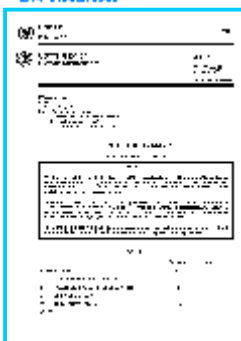
Yes



Adverse environmental aspects of construction activities, including building materials, have already been presented in detail in a publication entitled "[Development of national technological capacity for environmentally-sound construction](#)" (HS/293/93 E). UN-HABITAT has since also published a publication with the same title as the current document ([HS/459/97 E](#)).

The report is organized in three sections:

- I. Discusses the nature of health hazards associated with the production, use and demolition of building materials, and the disposal effects of some of the harmful materials and wastes.
- II. Addresses the problems and constraints to the control of the harmful effects of the building materials.
- III. Outlines a strategy for the control of health hazards focusing on the possible actions by principal actors involved with the production and use of building materials.



Building materials and health.
**Report of the Executive Director to the fifteenth session of
the Commission on Human Settlements**

This report is the result of a request made by the United Nations Commission on Human Settlements, in its resolution 14/16 of 5 May 1993, for UN-HABITAT to prepare an informative document on building materials which are harmful to people's health and the environment, and the alternatives available for the substitution of such materials.

This report is a summary of the document, *"Building materials and health. A background paper"* (HS/C/15/INF.8), which focuses on health hazards of building materials and their control.

UNCHS (Habitat)

Nairobi, 1995

HS/C/15/2/Add.5

No. of pages: 6

Printed copies: No

Electronic copies:


Yes



Adverse environmental aspects of construction activities, including building materials, have already been presented in detail in a publication entitled *"Development of national technological capacity for environmentally-sound construction"* (HS/293/93 E). UN-HABITAT has since also published a publication with the same title as the current document (HS/459/97 E).

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- II. Addresses the problems and constraints to the control of the harmful effects of the building materials.
- III. Outlines a strategy for the control of health hazards focusing on the possible actions by principal actors involved with the production and use of building materials.

	<p>Building materials production for shelter development Paper presented at the "Women and Shelter" seminar in Vienna in 1985</p>
	<p>Focuses on the contribution of small-scale building-materials production to national development as a component of the informal economy, as well as its limitations. The paper takes a look at women and their entrepreneurial potential in small-scale production of building materials. It concludes that the views and needs of women should be given consideration in the choice of building materials and women should participate in various aspects of planning, policy and decision-making for human settlements development.</p>
<p>UNCHS (Habitat) Vienna, 1985 Mimeo. No. of pages: 15 Printed copies: No Electronic copies: No</p>	<p>The paper is organized in four chapters:</p> <ol style="list-style-type: none"> I. Emphasizes the importance of research and development activity on building materials in developing countries. States that considerable research efforts are required to develop "new" building materials, to encourage the use of agricultural waste materials and to improve standardization and quality control. II. Focuses on the contribution of small-scale building-materials production to national development as a component of the informal economy, as well as its limitations. III. Reveals the advantages of small-scale building-materials production for women. Also points out the shortcomings of production processes and the products. IV. Comprises examples of small-scale building materials production drawn from China, Colombia, Indonesia and the Philippines. Mentions that there is great potential for women to play an entrepreneurial role in such small-scale production owing to the low investment required to establish a business. Concludes that the views and needs of women should be given consideration in the choice of building materials and women should participate in various aspects of planning, policy and decision-making for human settlements development.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 1, No. 1

Portland cement is increasingly becoming a high cost building material and at the same time becoming a scarce resource in most African countries. As a result most countries, and agencies involved in building and construction, are in search of cheaper and more abundant binders to be used in place or with Portland cement.

This issue highlights the search for applicable pozzolanas, e.g., rice husk ash, volcanic ash, baggase, etc., in different countries to ease the pressure on limestone deposits, the raw material for manufacture of Portland cement. Some of the achievements made are briefly described and some vital statistics on their application and use given.

UNCHS (Habitat)

April 1989

ISSN 1012-9812

No. of pages: 22

Printed copies: No

Electronic copies: No

This issue of the journal has seven main substantive sections:

- Ghana.
 - Blended cements from bauxite waste;
 - Low cost binder using lateritic soils and limestones.
- Kenya.
 - Standards and specifications for fibre concrete roofing tiles;
 - Promotion of wide-scale adoption of fibre-concrete roofing tiles;
 - Cost comparison between fibre-concrete roofing tiles and other roofing materials.
- Malawi.
 - Fired clay bricks;
 - Sand cement tiles;
 - Performance standard specifications for sand-cement roofing tiles;
 - Cementitious materials from rice husk ash;
 - Performance test on rice-husk ash/lime binder.
- Mauritius.
 - Lime production;
 - Pozzolanas from bagasse ash.
- Nigeria.
 - Use of agricultural residues for production of building materials.
- Uganda.
 - Lime production;
 - Limestone deposits;
 - Fired clay bricks.
- Tanzania.
 - Low-cost binder from natural pozzolanas.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 1, No. 2

This issue of the Journal opens with a brief overview of the Global Strategy for Shelter for the Year 2000. It then looks at technology transfer between developing countries for the promotion of low cost building materials. This is reviewed in the context of impacting on the needs of low-income populations.

The journal observes that the problem of technology transfer can be tackled if a collaborative approach is adopted and international funding is made available for developing countries.

UNCHS (Habitat)

December 1990

ISSN 1012-9813

No. of pages: 22

Printed copies: No

Electronic copies: No

This issue of the journal has six main substantive sections:

- a. The conceptual and policy framework of transfer of technology;
- b. Co-operation in the African region on technologies and standards for local building materials;
- c. Standards and specifications for local building materials in Ghana and Malawi;
- d. Workshop on co-operation in the African region on technologies and standards for local building materials;
- e. International co-operation for technology transfer in the production of indigenous building materials and components;
- f. International co-operation for technology transfer in the production of indigenous building materials and components in developing countries.



UNCHS (Habitat)

August 1991

ISSN 1012-9814

No. of pages: 38

Printed copies: No

Electronic copies: No

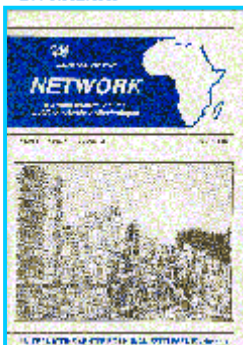
Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 1, No. 3

This issue focuses, among other issues, on technical aspects of building materials, including several examples on research carried out on roofing techniques in some African countries. Moreover, as an effort to disseminate technological information among countries in Africa, a low-cost technology developed in India, on corrugated roofing sheets from coir waste or wood wool and Portland cement is also included.

Roofing technologies are emphasized in this issue, considering that, among all elements of shelter, the roof is the most important component in providing protection from harsh environmental conditions.

This issue of the journal has five main substantive sections.

- Malawi. Production process, application and acceptance of fibre concrete roofing products.
- Nigeria. Natural fibre Shwishcrete technology for low cost housing.
- Nigeria. Appraisal of coir-fibre/cement-mortar composite for low cost roofing purposes.
- Malawi. Improved concrete roofing tiles and roof tile machines. East African roof thatching techniques being tested in India.
- India. Corrugated roofing sheets from coir waste or wood-wool and Portland cement.



UNCHS (Habitat)

September 1991

ISSN 1012-9815

No. of pages: 40

Printed copies: No

Electronic copies: No

Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 1, No. 4

This issue is a follow-up to a previous issue on roofing materials (see Vol. 1, No. 3). It tackles walling materials as another basic material in the construction of low cost houses. Considering that low-cost shelter does not necessarily require special fittings and costly mechanical and electrical equipment, walling and roofing will easily cost up to 75 per cent of the total cost of a dwelling. Therefore, efforts to improve the quality of walling and roofing material and reduction in the cost of production go a long way to improving low-cost houses and making them more affordable.

This issue dwells on the aspect of improving low-cost walling material, research and experimental results thereof and how these compare in different developing countries.

This issue of the journal has seven main substantive sections:

- Kenya. Towards the development of a national code of practice for structural masonry -- The Kenyan approach.
- Nigeria. Research and development in the promotion of standards and specifications for stabilized soil blocks.
- Ethiopia. Lightweight concrete made with Ethiopian pumice.
- Mauritius. Use of calcarenite blocks in housing construction, Rodrigues, Mauritius.
- Ghana. Optimum-firing temperature for some clay bricks in Ghana.
- Ethiopia. Construction of mud houses -- an alternative to the traditional methods of house construction in Ethiopia.
- India. Technology profiles:
 - Production of bricks by hand moulding table.
 - Manufacture of bricks from black cotton soil.
 - Stabilized bricks/blocks.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 2, No. 1

The theme for this issue is binding materials. Neither walling (see [Vol. 1, No. 4](#)) nor roofing (see [Vol. 1, No. 3](#)) materials would be produced without the use of appropriate binding material. Binders are essential components in the production of mortars for masonry, in plastering walls, in stabilizing soil and in making concrete.

Portland cement, the preferred binder for most construction work is largely inaccessible in low-cost construction due to its scarcity and high cost. However, research has shown that there is immense potential in alternative binders such as lime and natural Pozzolanas, and binders produced from agricultural and industrial wastes, and other materials.

This issue has combined a number of technical articles on research findings and innovations for the production and use of low-cost binders.

UNCHS (Habitat)

June 1992

ISSN 1012-9816

No. of pages: 42

Printed copies: No

Electronic copies: No

This issue of the journal has six main substantive sections:

- | | |
|-----------------------|--|
| Nigeria. | Pozzolana -- the cheap alternative to Portland cement. |
| Mauritius. | A study of the potential use of Mauritian baggase ash in concrete. |
| Malawi. | The use of rice husk and baggase ash as building materials. |
| Technology profile 1. | Mini cement production. |
| Technology profile 2. | Production of lime. |
| Technology profile 3. | Hydrated lime. |



**Journal of the Network of African Countries on Local
Building Materials and Technologies. Vol. 2, No. 2**

This issue of the Journal has three main substantive sections:

- a. Manufacture of bricks by a semi-mechanized process including high draught kiln;
- b. Manufacture of bricks from alumina red mud; and
- c. Manufacture of bricks from red murrum soil.

UNCHS (Habitat)

August 1993

ISSN N/A

No. of pages: ??

Printed copies: No

Electronic copies: No



UN-HABITAT

UNCHS (Habitat)
August 1993
ISSN 1012-9817
No. of pages: 34
Printed copies: **Yes**
Electronic copies: **No**

Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 2, No. 3

This issue of the journal includes an article, "sustainable development and the construction industry", which provides an overview of the ongoing construction-environment debated. It also deals with a specific technical theme: roofing materials, by highlighting the experience of Kenya in fibre-concrete roofing technology.

This issue of the journal has four main substantive sections:

- a. Sustainable development and the construction industry.
- Kenya. Fibre-concrete roofing technology: adaptation and progress. Paper produced on the basis of information and data given in an unpublished draft study prepared for UN-HABITAT by Martin Fisher and Mary McVay.
- Zimbabwe. Low-income housing pilot projects.
- India. Technology profile: Solar timber-seasoning kiln. Paper submitted by Central Building Institute (CBRI), Roorkee, India.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 2, No. 4

In the framework of the Network of African Countries on Local Building Materials and Technologies, and in an effort to expand its cooperation with African countries, UN-HABITAT organized a workshop in September 1993 to develop a strategy for strengthening the activities of the Network and also to establish a basis for launching a programme for domestic capacity building in the building materials sector in Sub-Saharan countries.

UNCHS (Habitat)

December 1993

ISSN 1012-9818

No. of pages: 58

Printed copies: Yes

Electronic copies: No

The main feature of this issue of the Journal is the report of the workshop, which includes its findings and recommendations. It also summarizes the manufacture of bricks using alumina red mud and red murrum soil.

This issue of the journal has four main substantive sections:

- a. Proceedings of a workshop of the Network of African Countries on Local building Materials and Technologies.
- Technology profile 1. Manufacture of bricks by a semi-mechanized process including high draught kiln. Paper submitted by Central Building Institute (CBRI), Roorkee, India.
- Technology profile 2. Manufacture of bricks from alumina red mud. Paper submitted by Central Building Institute (CBRI), Roorkee, India.
- Technology profile 3. Manufacture of brick from red murrum soil. Paper submitted by Central Building Institute (CBRI), Roorkee, India.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 3, No. 1

This issue is devoted to the second United Nations Conference on Human Settlements (HABITAT II) held in Istanbul in 1996. Also included is an article highlighting the key constraints affecting the development of the construction sector in the region and proposals for a number of measures and policy options on how these constraints could be overcome.

Selected articles on research findings and technologies related to building materials are also included. More specifically, it focuses on the use of industrial wastes in the production of low-cost building materials.

UNCHS (Habitat)

June 1994

ISSN 1012-9819

No. of pages: 35

Printed copies: **Yes**

Electronic copies: **No**

This issue of the journal has five main substantive sections:

- Uganda. Follow-up actions with regard to the recommendations of the Workshop of the Network of African Countries on Local Building Materials and Technologies.
- Habitat II Conference. General information about the preparatory process for a strategy for effective participation of the African region. Also includes a section on the relevance of the Habitat II preparatory process for the construction sector.
- Technology profile 1. Blended cements. Paper submitted by Central Building Institute (CBRI), Roorkee, India.
- Technology profile 2. Phosphogypsum as building material. Paper submitted by Central Building Institute (CBRI), Roorkee, India.
- Technology profile 3. Utilization of fly ash in the production of building materials. Paper submitted by Central Building Institute (CBRI), Roorkee, India.



THE KOMA ROCK HOUSING PROJECT IN NAIROBI, KENYA

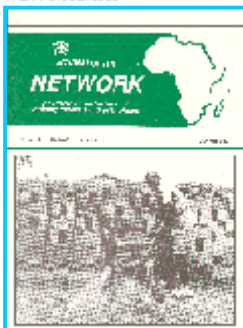
UNCHS (Habitat)
December 1994
ISSN 1012-9820
No. of pages: 34
Printed copies: **Yes**
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Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 3, No. 2

This issue of the Journal is devoted to fibre concrete roofing technology, by way of a case study of Kenya. An article which describes a large-scale public sector housing project that has used fibre concrete roofing tiles is included to demonstrate the advantages and disadvantages of such alternative roofing materials, especially for mass-housing schemes.

This issue of the journal has three main substantive sections:

- a. KomaRock Housing Project in Nairobi, Kenya. Prepared by Dr. Jill Wells, Reader and Director of Research, School of Construction Economics and Management, South Bank University, London.
- Technology profile 1. Fibre-concrete roofing. Paper prepared by Baris Der-Petrossian, UN-HABITAT.
- Technology profile 2. Utilization of agricultural wastes. Paper submitted by Central Building Institute (CBRI), Roorkee, India.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 3, No. 3

The importance of appropriate building codes and regulations in improving the delivery of low-income housing in the African region is the main feature of this issue of the Journal. It should prove useful to policy makers as well as professionals in the efforts at reviewing and reformulating their building codes and regulations.

It is in this context that the Journal seeks to press the fact that the ultimate purpose of any reformulation exercise should, obviously, be to facilitate the use of appropriate and low-cost materials in the construction sector for low-income housing delivery.

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June 1995

ISSN 1012-9820

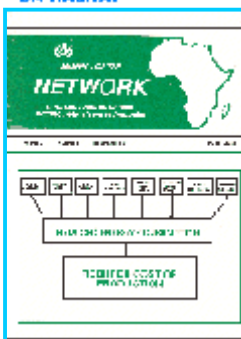
No. of pages: 34

Printed copies: Yes

Electronic copies: No

This issue of the journal has three main substantive sections:

- a. Importance of appropriate building codes and regulations in improving low-income settlements conditions in the African region. Paper prepared by Baris Der-Petrossian, UN-HABITAT.
- b. Kenya: Building standards and planning regulations: The Kenyan experience. Paper submitted by Elijah Agevi, Coordinator, Shelter Forum, Nairobi, Kenya.
- c. United Republic of Tanzania: Sustainability of building materials supply in Dar es Salaam. Paper submitted by J. Mamiro, National Construction Council, Dar es Salaam.



Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 3, No. 4

This issue of the Journal is devoted to energy efficiency in the production of building materials. Various studies have revealed that many building materials industries, especially in developing countries, use outdated technologies which are inefficient in terms of energy. It is in the light of this situation that the Habitat agenda adopted by the second United Nations Conference on Human Settlements (Habitat II) has emphasized the need for Governments and stakeholders to encourage and promote the application of low energy, environmentally-sound and safe manufacturing technologies in the building materials and construction sector.

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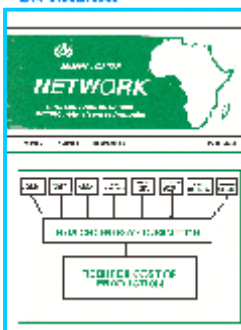
Printed copies: Yes

Electronic copies: No

This issue of the Journal looks into measures that could be taken to monitor and optimize the use of energy in production processes, efforts to increase the use of low energy-content materials and apply energy-efficient and low-polluting technologies in construction.

This issue of the journal has four main substantive sections:

- a. Energy efficiency in the production of building materials. Paper prepared by Baris Der-Petrossian, UN-HABITAT.
- b. Energy conservation for cost reduction in Indian cement industry -- NCB's initiatives. Paper submitted by J.P. Saxena, Ashwani Pahuja, Pradeep Kumar, National Council for Cement and Building Materials, New Delhi.
- c. Energy efficient method of portland slag cement grinding. Paper submitted by N.P. Verma, Holtec Engineers Private Limited, New Delhi, India.
- d. Plant audit and energy management. Paper submitted by S.K. Gupta, H.K. Dutt, Holtec Engineers Private Limited, New Delhi, India.



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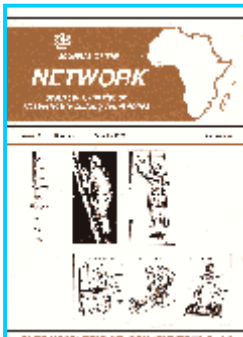
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Journal of the Network of African Countries on Local Building Materials and Technologies. Vol. 4, No. 2

Very few developing countries have made any significant progress in increasing awareness and knowledge of health hazards caused by construction and building materials industries. The situation is worsened by the fact that many of them do not possess adequate regulations, experience or facilities for environmentally-sound construction practices let alone the mitigation of health hazards of the sector.

This issue of the journal is devoted to "*Construction, Building Materials and Health*". It covers selected articles on the subject which outline, among others, some strategy options and recommendations on how to mitigate the health hazards of the construction activities.

It also contains a comprehensive research study entitled "*Construction, building materials and health*" produced by **UN-HABITAT**.

UNCHS (Habitat)

December 1996

ISSN 1012-9820

No. of pages: 43

Printed copies: **Yes**

Electronic copies: **No**

This issue of the journal has three main substantive sections:

- a. Building materials and health. Paper submitted by Mr. K. Msita, formerly **UN-HABITAT**, and Mr. B. Der-Petrossian, **UN-HABITAT**.
- b. Environmental aspects of manufacturing and use of asbestos products. Paper submitted by Dr. Brian Commins, Environmental and Pollution Consultant, United Kingdom.
- c. Health and safety in construction.



Construction with sisal cement
Technical Notes, No.1

This is the first in a series of technical notes. It focuses on sisal cement as a building material and relevant technologies utilising sisal cement.

Section titles include:

- a. Some drawbacks of mud building materials;
- b. Problems with modern materials;
- c. A low-cost innovation in building materials, tried and tested;
- d. Cheap, permanent mud-brick walls;
- e. Specifications; and
- f. How to make corrugated roofing sheets.


UNCHS (Habitat)

Nairobi, 1981

No. of pages: 4

Printed copies: No

Electronic copies: No

	Fibre-concrete roofing <i>Technical Notes, No. 10</i>
<p>UNCHS (Habitat) Nairobi, 1987 No. of pages: 6 Printed copies: No Electronic copies: No</p>	<p>Concludes that fibre-concrete roofing production can take place at the point of use, so that transport cost of the finished item can be almost eliminated. States that there are still gaps to be filled in the development cycle -- notably, formulation of standards, effective processes for technology transfer and, most of all, mechanisms for technology adaptation or improvement within the context of low-cost application of the material.</p> <p>Section titles include:</p> <ol style="list-style-type: none">a. Inputs required for fibre-concrete roofing;b. The production process;c. Strength and durability test;d. A comparison between fibre-concrete roofing sheets and tiles;e. Use of fibre-concrete roofing products in construction; andf. Scales of production for fibre-concrete roofing tiles.

**Earth construction technology. Part 1:
The basic parameters of soil as a construction material**
Technical Notes, No. 11



Reviews the basic parameters of soil as a construction material, i.e. basic soil science, properties of soils, soil tests, and principles of soil stabilization.

States that these issues are the key to successful soil-construction practice. Fundamental properties of soil mentioned include texture, plasticity, compactibility and cohesion.

UNCHS (Habitat)

Nairobi, 1987

No. of pages: 4

Printed copies: No

Electronic copies: No

The technical notes also give an insight into some soil tests, vis-à-vis visual examination, smell test, nibble test, touch test, washing test, lustre test, adhesion test, sedimentation, and shrinkage. It presents two methods of stabilization: densification by grading and densification by compaction. Finally, it describes types of stabilizers used in soil construction such as fibres, cement, lime and bitumen.



Energy efficiency in building materials production
Technical Notes, No. 12

Takes account of the useful innovations towards improvement of the energy situation and, in particular, to stimulate research and development activities in the overall effort to ensure the wide-scale production of local building materials for the low-income population.

Section titles include:

- a. Energy consumption in the building-materials sector;
- b. Prevailing energy-inefficient production systems; and
- c. Innovations for energy-efficient building-materials production technologies.

UNCHS (Habitat)

Nairobi, 1987

No. of pages: 6

Printed copies: No

Electronic copies: No



**Earth construction technology. Part 2:
Low-cost technology for production of adobe, rammed earth
and compressed blocks
*Technical Notes, No. 13***

Reviews technological developments in rammed earth, adobe and compressed soil block construction technologies, by focusing on selected machinery and equipment that are consistent with principles of low-cost housing.

UNCHS (Habitat)

Nairobi, 1987

No. of pages: 4

Printed copies: No

Electronic copies: No