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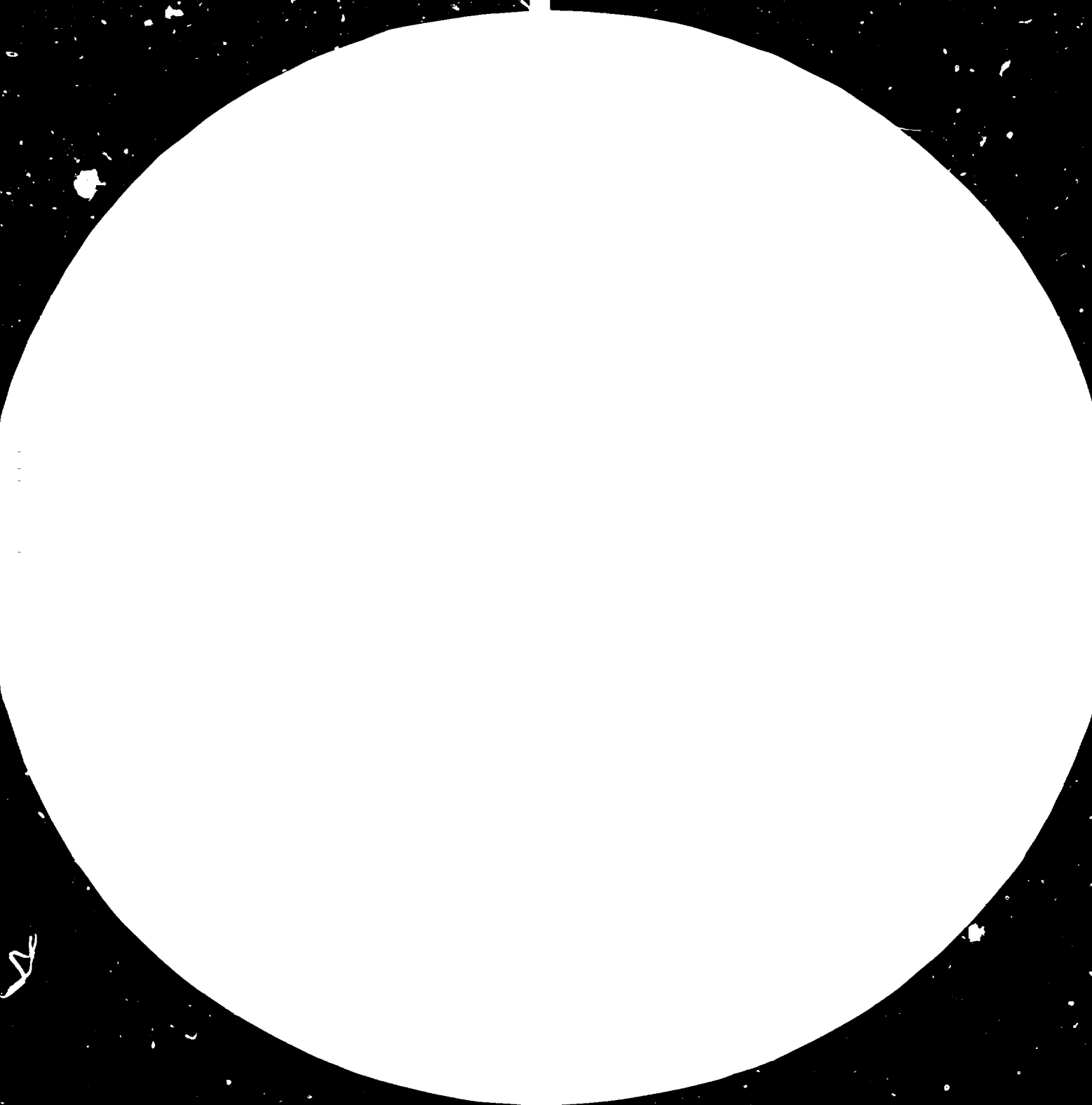
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THE DEVELOPMENT OF THE CEMENT INDUSTRY
IN THE DEVELOPING COUNTRIES*

prepared by
the secretariat of UNIDO

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Introduction:

Portland cement is the most versatile building material available at low costs. No wonder therefore that it is in increasing demand despite that it is not a cheap building material when compared to incomes in the developing countries.

The importance of Cement for development of Agriculture, Housing, Infrastructure and Industry is so, that without Cement there would be no development as we know it today.

Developing Countries should therefore develop their cement industry at least in ratio with other types of industry and maybe as a pace maker for the development itself.

The development of the Cement industry has in the past been fairly stable and continuous as long as no disturbing factors influenced the situation.

If we look at the development pattern for the total world consumption measured in kilo per capita per year (GRAPH I) page 14 we notice how smooth and regular the consumption increase has been, except at three occasions:

- A. In the late twenties an economical recession reduced the consumption to the 1920 level from where it starts to climb again.

- B. During the period of the Second World War the figures are not recorded, but it is apparent that the consumption level is unchanged over the period.
- C. In the Seventies the impact of the increasing oil prices can be seen. We are certainly still influenced by this factor because it takes time to change to another fuel and also other changes are in the making in order to reduce the specific energy consumption.

While we have this graph in focus I invite you to look at three different lines—continuing after the consumption curve of the past. These lines indicate very rough forecasts for the future development.

The low forecast is inspired by the three events of the past mentioned before (A, B and C) which all led to a stagnation if not a reduction of the activities.

It is a forecast anticipating that the development will be handicapped by one crisis after the other for the next 20 years we are actually looking into now.

The medium forecast anticipate that we successfully will change from more costly to less costly production methods and that we will have no major crisis disturbing the development.

The high estimate is our dream forecast and its realization would depend on an extremely balanced world development where resources reserved for social and economic development are given priority over military expenditures, where energy costs are kept moderate and new and old technologies for production of cement and substitutes are promoted.

The low estimate does not mean that there would be no need for initiative. Anticipating the world population to increase to 5.5 billion in 1990 and 6.5 billion in year 2000, production should increase from about 850 million ton in 1980 to 1100 million and 1300 million in respectively 1990 and year 2000 with the low forecast just to maintain the present average consumption per capita.

Table I gives the figures for all three forecasts.

Technology:

The product Portland Cement is relatively new and records of its production up to the beginning of this century is more sporadic than regular and more often related to technical developments than to indications of how much was produced.

Certainly in the beginning only small quantities were produced and for special applications. The technique used for burning lime in intermittently operated wood or coal fired shaft kilns was the starting point for the cement industry. Soon after continuously operated coal fired shaft kilns helped to satisfy the growing demand.

The quality was however seldomly very uniform because of raw material variations and insufficient experience and technique. The technological break through for the cement industry started with the introduction of the tube mill in 1895 for continuous open circuit grinding of raw materials and cement. Soon after the rotary kiln was taking over from the shaft kilns.

In the beginning of the century the wet process was introduced and helped to improve the uniformity and the quality of the cement, although fuel consumption in the beginning was very high.

The further development of the technology for cement production has gone in the direction of large, economic units with minimum personnel for operation and maintenance.

In the meantime also the dry process and new technique for blending, preheating and calzining has been introduced. The result is that we today have a very efficient technique for production of quality cement for many purposes at lowest possible costs.

The question is now how to make the development up to year 2000 ?

First we have to admit that the cement industry is both investment and energy intensive. The industry has developed to a scale of operation making it difficult to establish a new factory.

It is therefore important not to see the cement industry alone, but to see the available raw materials on the one side and the possible product variety together with the corresponding end-uses.

Before the universal binder Portland Cement became available, the World had for many years managed with lime which occasionally was mixed with pozzolanic materials when under-water structures were built.

In many industrialized countries lime is still produced in amounts up to one third of the cement produced, because Lime too is a very versatile material, used both in industry and for building purposes.

Considering Lime's final application in construction it may be less energy intensive than Portland Cement and it can be produced in smaller units. While Cement plants seldomly are built below a capacity of 120.000 metric ton per year, lime plants with a capacity as little as 5000 metric ton per year can be built at resonable costs.

This situation combined with the possible availability of pozzolanic materials give a number of approaches for starting new industry producing cement or lime or both.

- A. The simplest start is to establish a small lime kiln suitably near to good raw materials (Limestone) and an adequate market. The lime is sold as quick lime and slaked by the builders in slaking pits.

- B. The next step would be to increase the lime production with a new lime kiln if the market can absorb it, and to install a lime hydrator as well as a packing machine. Now the product sold is hydrated lime in bags ready for use by the consumers. The new product is also applicable in agriculture as soil conditioner.

- C. Should pozzolanic materials be available or is there a small well defined market for Portland Cement, it may be worth while to install a mill and additional storage and package facilities. This could open the following possibilities.
 - C1. If pozzolanic materials are available at reasonable costs and reasonable active, they may be ground into powder and mixed with hydrated lime to form "pozzolime" which can be used for production of building, blocks, mortar and appropriate concrete.

- C2. If pozzolanic materials are not available, Portland Clinker can be purchased at lowest possible costs at the world market and a cement production started parallel to the lime production aiming at a development of the market for cement so the rest of the cement factory can be built later.
- C3. If both Portland Clinker and active pozzolanic materials are available very interesting possibilities for diversification exist. Besides the mixing of pozzolane and Lime into "pozzolime" also the normal Portland Cement can be produced and extended with pozzolanic materials and maintain its quality.
- D. Finally one can if conditions are favourable, establish a complete cement factory from the beginning and diversify the production with the products mentioned before as soon as feasible. Whichever development strategy is selected, two things are needed in order to secure the investments on the longer term basis.
- One is the availability of trained personnel and the other is the necessary scientific back-up for the process control and the possible use of available pozzolanic materials.

The problem of scientific back-up for process control and the use of pozzolanic materials is a matter of applied science.

Active pozzolanic materials are either natural and created in volcanic processes or artificial and created as byproduct from an industrial process or through activation of materials responsive to such treatment. Well known pozzolanic materials are metallurgical slags and fly ashes.

The problem starts when a cement producer wants to go on the market with a uniform and reliable binder based partly on pozzolanic materials.

Several countries have demonstrated that it can be done and some countries have reached so far that up to one third of the cement sold originates from pozzolanic admixtures.

There are in other words many possibilities for starting and expanding the cement industry, because the technology is available. The real problem is to transfer all the technology and the know how, from those who has it to those who need it.

The Strategy:

The strategy generally promoted by UNIDO is very simple and direct and it can be expressed in one sentence: "we supplement and reinforce the national efforts".

It is indeed very simple and it is based on this idea that the Technical Assistance programme of UNIDO is promoted. We also play another role in the development of Industry by organizing Meetings to discuss how the development can be accelerated and consolidated.

The most important for us is to be ready to help when assistance is needed. The next is to establish and maintain a dialog with the officials and experts in the developing countries so they know what to do when support is needed and we know where the problem is.

For our work at the national level we are aiming at full utilization of established factories and expansion and diversification of the industry in ratio with the needs.

This aim immediately leads to a number of activities where UNIDO can support the national efforts, because many national teams involved in this development work, would benefit from having some kind of support in their work.

UNIDO has all the classical types of assistance to offer, ranging from analysing the situation and planning what to do, to on the spot assistance to solve technical problems or to survey a raw material deposit or to make a complete feasibility study.

UNIDO can as such be seen as a service center ready to act when called upon. Our resources are however not unlimited and we need very careful planning and administration to fulfill our obligations to the developing countries.

This work at the international level is just as important as our work at the national level. It is through meetings like this we can discuss strategy and learn something from each other.

Another activity is Technical Co-operation among Developing Countries which now plays an important role for the fulfillment of the mandate given to UNIDO.

CEMENTUREAU: TOTAL WD

kg/capita
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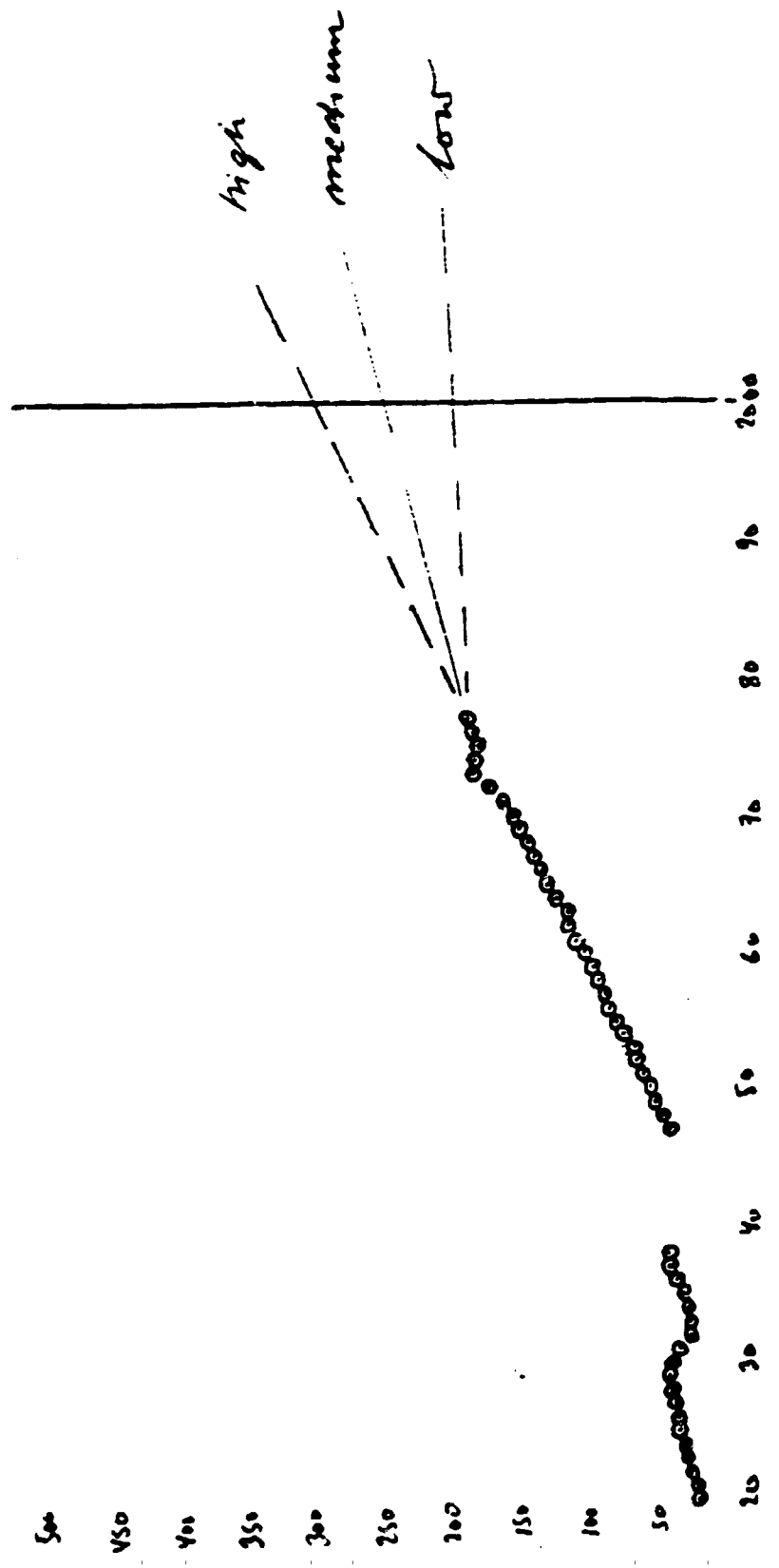


TABLE I

YEAR		1990	2000
WORLD POPULATION (Billions)		5.5	6.5
HIGH FORCAST	Kg per capita	250	300
	million ton	1375	1950
MEDIUM FORCAST	Kg per capita	225	250
	million ton	1237	1625
LOW FORCAST	Kg per capita	200	200
	million ton	1100	1300



