Ecomaterials create local jobs

The small-scale production of ecomaterials creates jobs and can stimulate local economies. It is especially suited to the informal sector, which is a key engine of economic development in most southern countries. 'Ecomaterials' is a word coined by Grupo Sofonias to define construction materials that are economically and ecologically viable. This article will focus upon microconcrete roofing tiles (MCR), the most widespread of these technologies used within the EcoSouth Network, and will touch on alternative cement, lime, and even clay to demonstrate the impact of local production of construction materials.

MCR plants worldwide

MCR tiles, developed in the 1980s, are now available worldwide. From Ecuador, to Ghana, the Philippines, and Tajikistan, small production units provide employment and serve local demands for roofing. This labour-intensive technology uses locally available raw materials (sand, cement, and water), and once the initial investment is made, raw materials and labour can be readily obtained in local currency, making it a business venture within the reach of ordinary people.

MCR is a technology particularly suited to small, informal, family businesses. Jobs are created for unskilled workers and tile production is particularly suited to women and to people with a good instinct for small business. Most tile businesses in Latin America are in the informal sector and create jobs not only in tile production but also in related areas, from roof-laying to delivery.

It all began in the early eighties, when development workers in different countries began to experiment with fibre-concrete roofing sheets, and SKAT decided to bring together some of these researchers for a series of seminars. One participant developed a prototype vibrating table and polyethylene moulds to produce tiles, and since then several equipment producers have developed acceptable equipment to serve the growing number of MCR tile workshops.

Jobs in roofing are among those created through the small workshops that produce MCR tiles.

Various dissemination projects have introduced the technology to Latin America, Africa, and Asia. Employment has been a key element of most of these programmes and monitoring reveals close to 8000 jobs created to date, more than half of which are in Latin America.

While MCR is certainly a worldwide phenomena, its impact varies according to the density of workshops in a country or region and the degree to which the technology has entered the mainstream housing market. In some countries MCR has become a viable product in the construction materials sector and in Honduras it occupies close to 10 per cent of the roofing material market.

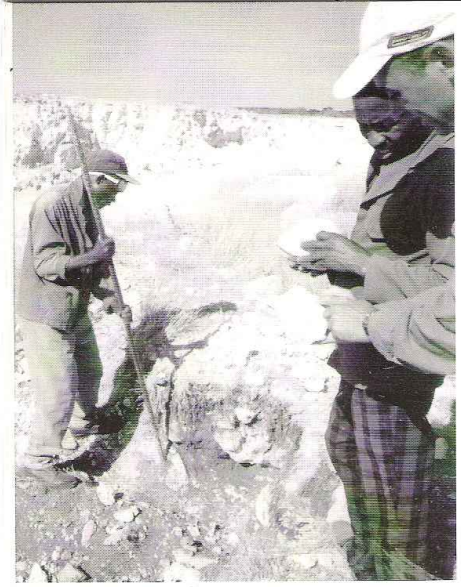
Local impact is most important, considering the great distances and difficult roads in most southern countries. Therefore simply reducing the distance that a product is transported brings both an ecological and economic benefit. A client survey in Honduras reveals that most workshops sell within a 20km radius. Where clusters of workshops emerge the technology obtains a visible share of the roofing materials market. The economy becomes more dynamic through the jobs created and the local purchase of raw materials. Money circulates in the region.

Of the 1211 workshops worldwide (according to 1999 MEPI figures) most have one or two operating units and many are family businesses. In Guatemala some of these businesses have flourished for more than a decade and cater to the needs of a local clientele for an elegant, duriable, and economic roofing material. These businesses rely greatly on the reputation of the producer to maintain a good level of quality and client service.

Total accumulated world production is more than 20,000,000m^2, which implies

La production à petite échelle 'd'éco-matériaux' crée de l'emploi et peut stimuler les économies locales. Cela convient tout spécialement au secteur informel qui est, dans la plupart des pays du Sud, la clef du moteur du développement économique.

La producción a pequeña escala de 'ecomateriales' crea empleo y puede estimular economías locales. Esto es especialmente apropiado para el sector informal, que es una clave para el desarrollo de la economía en la mayoria de los paises del sur.



Choosing the appropriate stones for burning lime in Namibia.

some 350,000 roofs. That in itself testifies to the great job-creation potential in the construction materials market.

The major weakness with the technology is guaranteeing quality when so many workshops exist in so many different environments. It is essential that ongoing follow-up be provided to producers, and in Latin America the EcoSouth Network is embarking upon this path through an EcoSouth Certificate of Quality.

Creating value from nothing

Very different from MCR technology is the use of sun-dried clay bricks (adobe). Adobe does not require special production equipment and can be made by unskilled labourers. While traditionally used for self-building, it has the potential to become a market product under the right conditions. It is the ideal ecomaterial, insofar as clay is there for the taking and the sun's energy is free. If the very poor had an opportunity to market this product, the clay under their feet could become a source of income.

A good example of this took place in Namibia where one project is having a local impact in a squatter area. Namibia is a desert country that imports virtually all life's necessities, so any contribution toward import substitution is crucial to the local economy. The Clay House Project promotes clay and through various pilot projects it has built more than twenty houses with self-builders, and a kindergarten in the Orwetoveni squatter area. When working poor people began to pay others to make their adobe bricks, however, the informal sector jumped at the opportunity and families who had learned to make the bricks began their own small seasonal brickmaking businesses. In addition, students from vocational training centres work in the project as apprentices and learn to build with clay and other locally produced materials, such as MCR tiles and lime.

The use of adobe instead of cement bricks lowers the total cost of a house considerably. A cement house with a zinc roof costs approximately double that of a similar clay brick house with MCR tiles if the owner is helping make the bricks. Sixty per cent of the budget of a clay house is spent in the neighbourhood, mainly on labour, whereas with a cement house only 30 per cent remains in the neighbourhood and almost 60 per cent goes toward imports.

Adobe is accepted by both the people and the local authorities. Clay homes now qualify – at least theoretically – for the national Build Together loan scheme that targets the poorest people. Thus, a market for clay has been created and with it the potential for a multitude of jobs for the poorest of the poor in squatter areas. The takeoff point has been reached.

The technology's weakness, however, is that further education is needed to help students to become entrepreneurs in the low-cost loan market on a sustainable basis. Once that happens, the jobs created and the materials produced will have helped stimulate the local economy.

Breaking into the housing and/or loan market is a crucial step for a technology or product. This step has been achieved, but the ultimate success still depends upon outside financial support that is non-existent at the moment. This lack of resources to put the technology into widespread use is typical of how much development funding goes down the drain through the lack of long-term investment.

Lime: Perfect plaster for clay walls

Where sources of lime exist, it can be burned on a small scale to create another important construction material. Interchange among EcoSouth scientists and practitioners has resulted in fieldtesting in Namibia using brush encroachment wood to burn the lime that abounds throughout that country. The first pre-commercial kiln is in operation and it is expected that this will create jobs and supply lime needed for plastering clay walls, as well as other construction uses. As with every pilot project, the trick is to make it commercially viable.

Lime is a binder with excellent qualities, but in many countries it is totally undervalued. In developing countries in particular, the general public and many professionals view lime as an inferior option to Portland cement. This is an oversimplification and there are in fact many applications where it would be much more appropriate to use lime.

Both lime and burnt clay bricks have been manufactured for centuries in many places in very simple ways. Recently many producers have been criticized for causing deforestation by using large quantities of firewood, and there is often much

A small family MCR workshop in Guatemala.

room for improvement in the burning process or in the procurement and selection of the biomass to be burned, as the 'Vertical Shaft Brick Kiln' research confirms.

Alternative cement

Masonry cement can be produced using very little energy and local raw materials, thereby reducing the amount of imported Portland cement used. Certain ashes together with lime will act as a low-grade cement. Historical buildings like the Coliseum and other monumental structures of ancient Rome were built with Pozzolana, using lime cement as a binder.

Several EcoSur partners are working together to develop this ancient technology. The goal is to produce cement products such as hollow blocks and paving slabs with a mix of alternative (CP40) and Portland cements. In Cuba, under the auspices of CIDEM researchers, several workshops are producing both cement and excellent hollow blocks while substituting up to 50 per cent of the Portland cement with CP40.

In Nicaragua Grupo Sofonias operates a pilot plant under commercial conditions, and after one year it is making a profit. We have been able to lower the market price of blocks while making a reasonable profit, and our blocks are a better quality than most competitors'! The blocks and paving slabs are checked periodically by the national laboratories and they continue to fulfill existing standards, while many of the commercially sold blocks in Nicaragua fail. Blocks made with CP40 have a smoother surface and a better appearance, which is important to the many clients who do not plaster the outside walls.

This first economically successful production unit uses volcanic ashes as its main raw material, together with locally produced lime. At the moment EcoSur is preparing the background information to be able to assess the economic feasibility of CP40 production in places with natural pozzolana deposits, such as volcanic ash. Many other ashes also have pozzolanic properties, and in Cuba sugar cane leaves and bagasse ash are used, although we do not yet have reliable economic data.

We are now ready to expand our knowledge to other places, institutions, and interested firms. It must be clear, however, that a technical and economic feasibility study must be done before embarking on production.

Unskilled jobs emerged because of a growing informal market for adobe (sun-dried clay bricks) in a squatter area.

For the production of 1.5 tonnes of cement daily, two ball mills are needed, which can be attended by an unskilled worker on-site, although thorough quality control procedures demand the attention of a technician for a few hours every week. Through the consumption of locally produced lime, another small business is able to survive and provide jobs.

With this production it is possible to substitute 30 bags of Portland cement and produce between 1500 and 2500 hollow blocks, depending on the quality of the blockmaking equipment, optimization of the sand-gravel-cement mix, and the desired quality.

While this ancient technology in a modern form will slowly spread from place to place, EcoSur is already researching the use of other forms of biomass as raw material for CP40, and will soon begin production of lime-silica bricks. This could be another great step in the direction of creating meaningful jobs in the productive sector, while at the same time saving energy and providing a better product.

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Beyond garbage...

A five-year programme to convert waste into construction materials supported by Werkhof Darmstadt and the European Union is now underway. Practical research at CIDEM is co-ordinated through a stellar group of scientists from the universities of Kassel, Oviedo, Calgary, and Santa Clara.

...new opportunities for waste products

A logical step in the ecomaterials movement has been to investigate the possibility of recycling agro, industrial, and municipal waste, and converting it into construction materials.

Currently underway is the commercial application of CP40 cement made from volcanic ash, as well as agro-waste. This cement is used to fabricate blocks that have a much smoother finish than normal cement blocks and, therefore, require no outside plastering, something akin to the lime-silica bricks currently fashionable in Europe. The next step is to actually fabricate lime-silica bricks from agro-waste and eventually from municipal waste.

Three experimental pilot plants are foreseen, in order to demonstrate the possibility commercializing the production of silica bricks made from agro-waste.

Another aspect includes the renovation of houses in Sagua and Caibarien, whereby the people purchase a variety of ecomaterials and receive technical assistance through a Building Advisory Service wherein an architect or engineer works together with the people to design a cost-effective renovation.

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