Notice:
For reasons of confidentiality, Moladi was unable to disclose a certain amount of commercially sensitive information, including quantitative information on sales and profits. The exploration in this case of the substance of its business model, and its capacity to create value and economic opportunity remain unaffected.

Executive Summary

“How do you eat an elephant? Bite by bite”
Hennie Botes, interview, October 1, 2009

Driven by urbanization and demographic growth, the estimated need for affordable housing, at a global level, is 96,150 units per day. This represents a huge challenge but also constitutes an economic opportunity, and a potential tool for economic development. Any strategy to address this challenge will need to take into account the particular constraints linked to developing societies, including the lack of resources, insufficient funds, skills shortages, and environmental challenges. Moladi of South Africa is innovating to address these challenges and build sustainable housing for the poor throughout the world.

Given the magnitude of the task, it is legitimate to ask if traditional building techniques can possibly provide the only answers. Is laying bricks or concrete blocks on top of each other the most efficient and environmentally sound solution to build walls, for example? There is a strong case for innovative thinking in an industry that, at least in terms of basic building principles, has not changed fundamentally in centuries; and also for introducing completely different costing models. Additional challenges, when it comes to providing low-cost housing, include scarcity of suitable land, urban density, overcrowding, environmentally unfriendly building materials and the complications of servicing housing areas with ancillary infrastructure such as water, sanitation and electricity.

Adequate housing, therefore, is not just about houses, it is an important condition, (while not sufficient), to ensure the well being of communities. Combined with proper sanitation, access to energy and basic infrastructure, such as schools, sports facilities, shops, clinics and similar services, adequate housing plays a crucial role in expanding choice and opportunity at the lower end of the economic pyramid, and helps to build socially cohesive communities. South Africa, in this regard, presents its own specific set of issues. Centuries of racial discrimination, which culminated in the apartheid regime of 1948-1994, have entrenched deep inequalities between rich and poor, and between black and white. Almost every urban settlement in South Africa combines predominantly white, low-density ‘suburban’ residential areas characterized by urban sprawl similar to that of North America or Australia, with adjacent high-density shantytowns, consisting of small brick units and shacks mostly made of corrugated iron sheets, plastic and wood, inhabited almost exclusively by blacks. Housing is, therefore, one of the most crucial focus areas for the country when it comes to addressing the social, economic and political challenge of reducing the gap in living standards and healing the wounds of the past. It is a deeply emotive issue, given the extent to which the promise of adequate housing is an essential part of South Africa’s post-apartheid social contract, together

Case Study • Moladi – an affordable housing solution for the poor?
with the presumed spill-over effects that decent housing could have on other aspects of human development. If South Africa can achieve a measure of success in this area, it could have a meaningful impact in many other parts of the developing world grappling with similar issues.

Moladi, a small family-run business based in South Africa’s Eastern Cape Province, has the ambition to do precisely that. It challenges conventional building techniques and claims that its building technology has the potential to successfully address many of the constraints currently holding back the provision of adequate shelter at the base of the socio-economic pyramid. The analysis of its model and results suggest that Moladi does indeed have huge potential when it comes to providing decent and affordable housing, particularly in its home country.

Much of Moladi’s destiny is linked to that of its founder, Mr. Hennie Botes, a visionary man who sees himself as an African social entrepreneur with the ambition to bring affordable housing to as many poor people as possible. This dream may be within reach for Moladi, possibly by way of entering into partnerships with, among others governments, by opening itself up to outside investors, and by devising a goal-orientated strategy to reach scale.

This case study is above all, the story of a business that could hold one of the answers to the challenge of bringing affordable housing to the poor.

Introduction

Based in the South African coastal city of Port Elizabeth, Moladi is a stand-alone family business active in construction technology, seeking to provide solutions to some of the challenges of affordable housing for the poor: lack of resources, lack of skilled labour, time constraints, work flow control and waste management. The original idea was developed over 20 years ago by Moladi founder Hennie Botes, when his frustrated attempts to build a brick wall for his house spurred him to design more efficient construction techniques for walls, and houses by extension.

Using an innovative system of moulds assembled with 30cmx30cm plastic panels, the technology allows for buildings such as schools, houses, clinics and community centres to be ‘cast’ with remarkable speed and ease by pouring a specially conceived aerated mortar (stone-less concrete) into the cavities formed by the mould. The model does not have any application restrictions but is particularly appropriate for low-cost housing, as the casting structures can each be used up to 50 times, allowing for cost savings through economies of scale. The firm’s basic model is to combine its construction technology with a simplified assembly method that helps to reduce both the costs and complexity of the building process, while concurrently reducing the use of traditional building materials such as steel and timber.

This case study is organized around three main sections, which essentially cover the how, who and what of Moladi’s model, its people, and the results it has achieved so far:
The ‘how’ is a description of Moladi’s business model, its origins and evolution. It also describes the technology it uses, and how this technology can be applied to build low-cost housing.

The ‘who’ looks at the main actors shaping Moladi’s model, the direct as well as indirect stakeholders, how they interact with each other if at all, and how these interactions affect Moladi’s fortunes.

The ‘what’ looks at some of the results that Moladi has achieved so far, as an illustration of its potential and possible applications, not just in South Africa, but also elsewhere in the developing world.

Moladi’s model cannot, of course, be understood properly without first covering some background and contextual information with regards to affordable housing in South Africa, and the very first part of the case study is a brief and synthetic overview of that overall background.

Moladi’s story is one of resilience, caution, patience and small, step-by-step advances: “You eat an elephant bite by bite” as Botes is fond of saying. In its home country, Moladi has been struggling to make major inroads into the large existing low-cost housing market and convince the building industry that its technology offers real opportunities in that segment. Meanwhile, however, the company has been thriving on business coming from beyond South Africa’s borders, in Sierra Leone, Mexico, Panama, Ghana, and India, among others. Moladi’s biggest challenge, perhaps, is to break into what should be its natural market, South Africa, with its ambitious, government-driven programme to bring housing to the poor. This case study also aims to look at the reasons behind this, and attempt to understand what needs to change for Moladi to reach its full potential. If it can be achieved, Moladi could make a major contribution to improving the lives of millions of poor people in South Africa and elsewhere in the developing world, expanding economic opportunities and choice at the base of the economic pyramid.

BACKGROUND: THE CONTEXT OF AFFORDABLE HOUSING IN SOUTH AFRICA

In a country with deep socio-economic divides such as South Africa, housing is one the most sensitive and immediate issues affecting the lower income segments. According to current estimates, close to 14% of South Africa’s 13.4 million households consist of informal dwellings, the generic term employed in South Africa to designate shacks, corrugated-iron structures and other makeshift shelters. This represents around 1.8 million households and anything between 7.2 and 10.8 million people
out of a total population of 49 million, based on an estimate of 4 to 6 members per household.\(^1\) There are, of course, serious issues linked to informal settlements. The structures often are made of highly combustible materials such as wood and cardboard. Hardly solid, the shacks are easily damaged, and exposed to the elements, meaning that people often live in damp, very hot or very cold conditions. Combined with the lack or total absence of sanitation and running water, these issues also constitute a serious health hazard for the population.

Similar conditions are present in many parts of the developing world, but in South Africa they are one of the most visual and striking results of three and a half centuries of unequal economic development, based on racial discrimination, which culminated in the policy of apartheid, through which the white minority kept full control of political power, and much of the economic wealth until 1994. There are few other places in the world where the rich, essentially western world, rubs shoulders so closely with the poor, mainly black world.

In such a context, it is hardly surprising that the dream of accessing decent housing has deeply taken root in the collective imagination of millions of impoverished South Africans. A house is often seen as the main visible symbol of economic and even political liberation, as a vital first step on the ladder to ‘a better life for all’. Housing is contained in the promise and implicit new social contract that liberation from apartheid and racial discrimination was supposed to achieve. Even more deeply rooted is the firm belief that it is the responsibility of government to provide such housing, free of charge, at least for the most indigent. So deeply entrenched is this idea, and so firmly part of the public policy narrative, that South Africa is one of only a handful of countries in the world in which the right to ‘adequate housing’ of all citizens is enshrined in the constitution. According to the constitution, the state has an obligation to take “reasonable legislative and other measures, within its available resources, to achieve the progressive realization of this right [to housing].”\(^2\)

In order to translate this commitment into results, the first fully democratic South African government, immediately upon taking office in 1994, embarked on a far-reaching economic policy framework called the ‘Reconstruction and Development Programme’, widely known as the RDP.\(^3\) Even though the RDP itself has long since

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been shelved in favour of updated and modified economic policies, its name lives on in the collective imagination of South Africans, and government-subsidized housing units are still commonly referred to as ‘RDP houses’ – usually small, simple 40m² brick units with a basic corrugated iron roof. Perhaps the main remaining policy instrument of the initial RDP programme today is the National Housing Subsidy Scheme, through which the poorest sections of the population can, via a number of different funding options be assisted towards housing ownership. The achievements of this programme over the past 15 years have been real and tangible: according to government figures, a total of 2.3 million houses had been built by December 2008, providing housing free of charge to no less than 13 million people.

Despite these serious efforts to address the lack of housing, the Department of Human Settlements (the government department in charge of housing) estimates the current backlog to still be of at least 2.1 million units. As a result of demographic pressure and rapid urbanization, this backlog keeps growing and seems unlikely to recede any time soon. Paradoxically, the national effort to provide low-cost housing can actually be said to contribute to the growth of informal settlements: given just how wide the gap is between demand for low-cost housing and supply, areas earmarked for low-cost housing are typically overwhelmed by the sheer number of people hoping to gain better access to services and facilities provided in formal housing projects, such as sanitation and electricity. Recent and sometimes violent ‘service delivery protests’ across South Africa have, once again, highlighted the plight of the poorest and the urgency of addressing their challenges.

The question of housing in South Africa goes far beyond the mere provision of houses. Given the legacy of the past, it is a deeply political issue, and it is no exaggeration to say that an important element of success or failure of South Africa’s post-apartheid social contract will depend on whether or not this highly symbolic issue can be addressed in a significant manner. And while government has a major role to play, so does South Africa’s developed and diverse private sector, which can seize many of the opportunities offered by the market, while contributing significantly to economic and community development. This is exactly what Moladi aims to do.

**Market and Location Context**

**LOCATION CONTEXT**

Moladi is based in Port Elizabeth, the largest city in South Africa’s Eastern Cape Province.

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4 Please refer to a more detailed section on the subsidy scheme in Annex 1.
8 Please refer to further details on the political and historical dimensions of housing in Annex 1.
The province itself, with an estimated population of 6.65 million in 2009, is in many ways a microcosm of South Africa, characterized by sharp disparities of economic development and income. It is the second poorest of South Africa’s nine provinces, with an average annual income of R 48,000 (US$6,400) per household, a third lower than the national average household income of R 74,500 (US$9,930). There is also, as everywhere else in South Africa, a strong correlation of race and income levels: a total of 69% of blacks in the province live below the poverty line, compared to 4% of whites.

Despite such high overall levels of poverty and income inequality, the province boasts a large manufacturing industry in the areas around Port Elizabeth, Despatch and East London, where most of South Africa’s large automotive sector is located. These industries make a significant contribution to employment in the province and to South Africa’s overall industrial output and exports. Nevertheless, much of the rest of the province is rural and impoverished. Moladi’s immediate hinterland, just like the rest of South Africa, is therefore very much in need of rural and urban development.

THE MARKET – SOUTH AFRICA AND THE WORLD
In South Africa itself the market for affordable housing is very large: As mentioned above, the national housing backlog is estimated to be at least 2.1 million units.

Moladi’s real market, however, is not just South Africa but the entire developing world. With an estimated 200,000 people moving from the countryside to cities around the world every single day, cities in the developing world are under immense pressure to provide adequate shelter, sanitation and basic facilities, before even considering further needs such as schools and clinics. Habitat for Humanity, in a report published in 2005, estimates that in order to avert a global crisis; governments around the world would have to build 96,150 units per day. The growth of informal settlements, in South Africa and elsewhere, comes with great risk of social, economic and political strife. It cannot be hoped that any of the Millennium Development Goals (MDGs) can be given their full meaning if hundreds of millions of people around the world continue to live in slums.

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11 Ibid, pp 253 & 256. “Poverty” is not defined as a precise income figure but varies depending on household size; it ranges from R 1,023 per month for one individual to R 3,752 for a household of eight or more in 2007.
15 Improving this situation is directly linked to MDG Goal 7 to ensure environmental sustainability, and especially its sub targets 10 and 11, i.e. improving the lives of at least 100 million slum dwellers by 2015, and reducing by half the number of people without proper sanitation or drinking water.
Indeed, at this point the bulk share of Moladi’s business comes from outside South Africa. In its 23 years of existence, Moladi technology has been used in projects in 16 countries around the world, all of them developing countries. The most recent large project is about to kick off in Ghana for 100 units\textsuperscript{16}, with an additional order from India signed in November 2009.\textsuperscript{17} An important point to note is that while Moladi technology is particularly suitable for low-cost housing projects, there is no particular restriction to the technology in terms of building size or type. In fact, the process is also suitable for the construction of larger residential buildings, and public buildings such as schools, offices or clinics. It can also be applied for multi-story buildings, a particularly important point given the question marks surrounding the viability of endless rows of single story structures of stand-alone units on individual plots: In fact, “One of Moladi’s key objectives” says Hennie Botes, is precisely to “help create integrated suburbs, towns and cities in order to reduce the urban sprawl.” He sees Moladi’s approach as “holistic and focused on improving the lives of communities on a bigger scale, in which housing is only one of the constitutive elements of an integrated and sustainable neighbourhood.”

**Description of the Business Model**

**EVOLUTION OF THE MODEL**

**The Founder: Hennie Botes**

Moladi’s story and the evolution of the model are closely linked to its founder, Hennie Botes. With a background as a tool and die maker, Botes started early on in his career to look for simple solutions to day-to-day problems. His first breakthrough had nothing to do with construction but was inspired by his wife, who complained about how unpractical it was to wash their young baby girls in a bathtub designed for adults. Like millions of mothers elsewhere, she took to using small washbasins meant for laundry, until Botes designed a plastic baby bath that could neatly fit across the bathtub. This design was patented and sold all over the world, giving Botes the necessary financial security and capital to found Moladi.\textsuperscript{18}

Botes describes himself as a bulldog, relishing a challenge and never ready to give up in the face of obstacles. He comes across as determined and obstinate, and is clearly a deeply devoted family man, particularly close to his two daughters, to whom he has now passed on the ownership of his businesses.

\begin{itemize}
\item \textsuperscript{16} Business Fights Poverty, \url{http://businessfightspoverty.ning.com/profiles/blogs/new-housing-technology}
\item \textsuperscript{17} De Jager, Shanaaz, “Award-winning House system snubbed locally”, Weekend Post, Port Elizabeth, November 28\textsuperscript{th}, 2009. \url{http://www.weekendpost.co.za/business/article.aspx?id=503649}
\item \textsuperscript{18} KRAHE Dialika, “Ein Haus für die Welt”, Der Spiegel, Hamburg, 11\textsuperscript{th} of May 2009, p. 128
\end{itemize}
Botes also sees himself as an African social entrepreneur, with an almost missionary enthusiasm to change people’s lives. As a South African, he is confronted on a daily basis with his country’s inequalities; a key driver for his motivation to change the face of the country’s housing landscape. He is also very open about his Christian faith and his belief that “as you climb up the ladder, you reach out to the person behind you to help him up.”

**Moladi - The early days**

Trying to build a conventional brick wall around his first house in the early 1980s, Botes realized, in his own words, “how difficult it was to put bricks on top of each other in a straight line, and, once the wall is built, to plaster it.” The wall was eventually erected, but the frustration inspired him to search for new ways of building walls. In November 1985, Botes started experimenting with a mould system which would enable him to cast entire walls at a time, rather than single bricks. “My initial attempt failed, and the concrete I tried to pour ended up serving to build a duck pond in my garden. But now I stood before a challenge, and I decided to refine the concept,” he said. Botes also quickly realized that if he could cast one wall, he could actually cast all walls simultaneously for an entire house or a building, by pouring a concrete-based mortar into the casting and removing the casting once the mixture had dried inside the cavities. Botes looked at different types of materials that would be appropriate for the formwork (or casting), and initially looked at steel and wood, before settling for injection-moulded plastic components, since assembling plastic panels required no skilled labour in the form of carpenters and welders, which are in short supply in South Africa.

The plastic mouldings enabled him to successfully cast a wall. The basic concept was born, but Botes had many more milestones to reach: both on the technology side, and with regards to bringing the product to the market. Moladi has come a long way on both fronts since these early days in the mid-1980s.

**The technological milestones**

“Concrete is not a liveable product,” Botes was told upon first attempting to get the process certified by the Engineering Council of South Africa in 1987. With the help of a chemical engineer, he then formulated a chemical which, mixed with the concrete, aerates the wall, ensures it is waterproof and gives the wall better thermal properties compared to block structures. This mix is now patented as ‘MoladiCHEM’ and is used as an essential ingredient of the mortar mix.

The next milestones were reached during the 1990s. Moladi first had to obtain quality accreditation and conform to all the regulatory requirements needed to comply with essential building standards. In 1994, the company obtained certification from the ‘Agrément Board’ of the South African Council for Scientific and Industrial Research (CSIR).

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19 Hennie Botes, Interview, October 1st, 2009.
20 Hennie Botes, Interview, October 1st, 2009
22 www.moladi.net, The “Agrément Board” is South Africa’s technical assessment agency for the
Basic robustness tests were then conducted and certified by the South African Bureau of Standards (SABS): these included a water penetration test, a soft body impact test and a chisel impact test. In all three standard tests, walls built through the Moladi test surpass the minimum standards required. Monolithic structures such as Moladi walls also contain the key advantage of being able to withstand earthquakes. The horrific death toll of the Haiti earthquake of January 2010 compared with the relatively low number of casualties in the Chilean earthquake a few weeks later, has come to vividly illustrate just how much of a difference building standards can make.

Additional milestones were reached as Moladi earned awards for its technology. In 1997, Moladi received the SABS Design for Development Award, and in 2006, it won the Housing Innovation Award jointly awarded by the National Homebuilders Registration Council NHBRC and ABSA Bank (one of South Africa’s main banking institutions).

One major step in the technological evolution was the building of multi-storey units in Mexico in 2006. As part of a 1,000-unit project, 100 multi-story units were built with Moladi formwork panels, proving that the technology could also be used for higher-density projects.

**Commercial milestones**

The first Moladi house was completed and sold in 1987 in Springs, an industrial city east of Johannesburg. But most of the firm’s commercial successes so far were reached outside South Africa.

During the 1990s, Hennie Botes established partnerships with property developers and construction companies based mainly in Central and South America. Through these partnerships, Moladi’s technology was rolled out and used by developers in Mexico and Panama. Its biggest project to date is in Mexico, where a 1,000-unit project was completed in 2006. This initial expansion in emerging markets was consolidated in the late 1990s and 2000s, during which time Moladi expanded its network of partners on the African continent, and in India.

Today, Moladi has appointed agents in charge of promoting and distributing its technology in Ghana, Botswana, Mozambique, Namibia, Sudan, Kenya, Zambia, Angola and Nigeria. Moladi also gets a stream of visitors from other parts of the developing world, including from Nepal, the Philippines and Iraq.27

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23 See further information in [www.disastermgmt.org/type/earthquake.html](http://www.disastermgmt.org/type/earthquake.html): “The entire construction should be a single monolithic structure, so that the structure can move as a whole”.

24 As presented on [www.moladi.net](http://www.moladi.net)

25 Hennie Botes, Interview, December 4th, 2009

26 Hennie Botes, Interview, December 4th, 2009.

27 [www.moladi.net](http://www.moladi.net) and interview with Hennie Botes
Some of the projects for which Moladi technology will be used in 2010 include:

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Size of project in houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2010</td>
<td>Sierra Leone</td>
<td>25,000</td>
</tr>
<tr>
<td>January 2010</td>
<td>Ghana</td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>Angola</td>
<td>25,000</td>
</tr>
<tr>
<td>February 2010</td>
<td>South Africa</td>
<td>1,000</td>
</tr>
<tr>
<td>2010</td>
<td>Nigeria</td>
<td>450</td>
</tr>
<tr>
<td>2010</td>
<td>Tanzania</td>
<td>1,200</td>
</tr>
<tr>
<td>2010</td>
<td>Haiti</td>
<td>10,000</td>
</tr>
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</table>

**The integrated model and the building process**

Central to Moladi’s model is the ‘lean production’ paradigm (further expanded on page 16), which consists of deconstructing the building process into a series of steps, and simplifying these steps in order to eliminate wastage of resources and time.

The building process offered by Moladi’s technology can best be unpacked in four basic steps:

1. Erecting the formwork (i.e. the basic casting)
2. The reinforcing
3. Pouring the mortar mix into the casting
4. Removing the formwork panels

**Erecting the formwork**

The essential component of the formwork is 30x30cm plastic injected moulded modular plastic panels. These panels are clipped together and then joined by link rods to form wall configurations of any desired length and height with a wall cavity of 100mm for internal walls and 150mm for external walls.

Once the assembly of the panels are complete, the process does not need to be repeated – the formwork panels can be re-used up to 50 times, making the technology cost-effective thanks to its repetitive application. This factor is one of the key elements of Moladi’s cost-effectiveness and speed, with savings on transportation costs as well. The moulds are also entirely boltless, freestanding and do not require struts or bracing.
The reinforcing and window block-outs
(Photo credit: Moladi)

The reinforcing: Once the formwork casing is erected, the wall cavities are fitted with steel reinforcements, as well as water pipes and electrical conduits, and blocks-outs for doors windows. The steel reinforcements ensure that Moladi walls are particularly resistant (as attested by the SABS tests).

Pouring the mortar mix: An engineered mortar mix consisting of a specified ratio of cement, river sand, water and MoladiCHEM is then poured into the entire mould in one single step. This can be done either manually (requiring local, unskilled labour), or with pumps.

Removing the formwork panels: After 12 hours of drying, the formwork panels can be removed and re-erected on an adjacent site. The result is smooth off-shutter walls that do not require any plastering. The structure can now have a roof fitted, as well as the basic sanitation equipment (washbasin, toilet, shower or bath), doors and windows.

The final product, once fitted with a roof, looks rather like a smaller suburban unit.

A DISTRIBUTION STRATEGY FOCUSED ON TRANSPORT, ON-SITE TRAINING AND PARTNERSHIPS WITH CUSTOMERS

Another essential feature of Moladi’s business model is its distribution strategy, based on partnerships with its customers, who often become Moladi agents in the countries in which they operate.

Transport

Moladi’s basic materials are typically shipped to location (for instance by maritime container transport) in kit form. At a very minimum, these kits would contain the essential components that are manufactured at the plant in Port Elizabeth: this includes the plastic formwork panels and other essential components of the moulds. Where possible, Moladi would encourage local...
sourcing near the project site of the tools and additional items such as windows, doors, taps or bathtubs. However, in some markets such materials may not be locally available, so Moladi also offers the option to ship everything, right down to the drills and tools needed to kick-off the project, to a building site. In these cases, the only locally sourced material would be the actual mortar, aggregate, steel and manual labour.

**On-site training**

The ownership of the material is transferred upon delivery at the building site. Moladi employees, sent from Port Elizabeth, would then supervise the erecting of the initial moulds and train local labourers employed by the customer or developer, in order to ensure that the customer (or developer) is able to replicate the technology as soon as possible. On average, a Moladi team would spend around 15 days with the client on site to accompany the initial phase of a project.

**Customers as agents / licensees**

Moladi customers, once they have been trained, and the partnership has been established, they may in some cases have the option of becoming agents or distributors of Moladi technology for a given territory. In this regard, Moladi’s model could be described as licensee or even a micro-franchise model, in which local agents, once they have been appointed as such by Moladi following a partnership agreement, hold a right to use, market, and distribute the building technology. Moladi thus does not carry the costs (and risks) linked to running an in-house network around the world, but it still benefits from any contracts that its agents / licensees are able to obtain, as it produces the essential kit components needed in any building project.

**Constraints and Strategies**

Moladi’s evolution and progress has been held back by a number of constraints, many of which it is still in the process of overcoming. While several aspects of these challenges are very general, some of the dimensions are specific to South Africa, and closely linked to the country’s history and its current socio-economic and political context.

**MARKET-RELATED CONSTRAINTS**

The low-cost housing market in South Africa is dominated by the government as the main source of funding, as it is driven almost exclusively by subsidies and public tenders. One of the implications this has for Moladi is that if it genuinely wants to become a serious player in the affordable housing market rather than just the provider of an alternative construction technology, it may need to consider establishing, consolidating and expanding a strong partnership with government, as well as reputed local construction firms, or it may also consider setting up such a construction entity itself and compete head-on with other players in the market.

Moladi says it has repeatedly approached government authorities at local, provincial and national levels in order to promote its technology and emphasize Moladi’s potential. Clearly, some levels of government are showing interest, as is evidenced in existing discussion
documents, for instance in the Western Cape Province. The implementation process, however, seems to be moving slowly: the decision-making process within government is very decentralized, and many low-cost housing projects are administered locally, meaning that approaching government does not just imply going to the national level but establishing a network across the country, something for which Moladi has limited resources at this point.

A second important consideration is the context of Broad-Based Black Economic Empowerment or BBBEE (commonly referred to as ‘black economic empowerment’), a government-driven programme designed to accelerate the process of economic transformation and redress the inequalities inherited from the apartheid era through a series of incentives and preferential procurement policies (see box below). In the long term, overcoming this challenge may turn out to be the key element needed to help Moladi reach significant scale in its home country, and leverage on its natural advantage and local expertise. In order to respond to this challenge, Hennie Botes has created Moladi South Africa; a local subsidiary of Moladi which he says is “fully geared towards BBBEE.” However, he says, finding the right partner to ensure Moladi South Africa’s success is no easy task, and it will be one of the company’s strategic goals for the coming period.28

So far, Moladi’s main response to this relative market constraint has been to find customers for its technology outside its home country. Indeed, over 95% of its sales are exports, mainly to other developing countries including Ghana, Sierra Leone, Nigeria, Mexico, Tanzania and Panama.29

<table>
<thead>
<tr>
<th>Broad-Based BEE: A government and private sector-driven attempt to redress inequalities in South Africa</th>
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</thead>
<tbody>
<tr>
<td>Based on the Broad-Based Black Economic Empowerment Act of 200330, South Africa’s Black Economic Empowerment programme is a government-driven scheme designed to accelerate transformation in the South African economy and partner with the private sector to redress three centuries of unequal economic development. The scheme is mainly a response to entrenched inequality in the South African economy and an attempt to increase &quot;broad-based and effective&quot; black participation in the economy. The law is mandatory for state companies and any business wanting to apply for government contracts. It applies to all South African businesses with a turnover higher than 5 million Rand per year (ca. US$ 670,000 at December 2009 exchange rates). A generic scorecard measures progress of businesses in 7 key areas:</td>
</tr>
<tr>
<td>Chapter 1: Ownership</td>
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<tr>
<td>Chapter 2: Management control</td>
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<td>Chapter 3: Employment Equity</td>
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<td>Chapter 4: Skills Development</td>
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<tr>
<td>Chapter 5: Preferential procurement</td>
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<tr>
<td>Chapter 6: Enterprise development</td>
</tr>
<tr>
<td>Chapter 7: Socio-economic development</td>
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</tbody>
</table>

Moladi’s current white ownership does not constitute an obstacle to its development per se, as it has clear potential contribute to black economic empowerment through other aspects such as skills development, preferential procurement, and socio-economic development.

28 Interview with Hennie Botes, 11 December 2009
29 Source: Moladi, Interview with Shevaughn Botes
KNOWLEDGE AND SKILLS

As Hennie Botes pointed out during his interviews, the South African construction industry is “confronted with an extreme shortage of qualified builders and artisans.” This points to a much larger general issue in South Africa, which is the poor state of much of the educational system and its inability to provide young people with the skills the economy needs. As a result, like so many other businesses in the country, Moladi has to bear the cost of training and transferring skills to people.

The fact that Moladi’s technology is new, or at least non-traditional, is not necessarily an obstacle. Actually, one of the advantages of the cast housing system, according to Moladi, is that fewer skills are needed. Indeed, as the formwork panels are designed to clip together, almost anyone can assist in assembling the formwork, with minimal supervision of a trained Moladi foreman. This creates an opportunity in fact for members of the community, unemployed people and the future homeowners themselves to be involved in the construction of their own homes. This potential for community involvement is one of Moladi’s major advantages from a social development point of view, especially in view of the importance for the communities to have “ownership” of development programmes. As pointed out in a recent article on Moladi, “communities that are building their own homes; [...] do so in a state of excitement and eagerness. It gives them a sense of fulfilment, bringing peace and stability to the community.”

In order to really leverage the potential skills transfer and mitigate the shortage of skilled labour, Moladi is also in the process of creating a ‘Moladi College’ which will seek to provide basic training to people. The goal of Moladi College, says Hennie Botes, “is to train future entrepreneurs and provide them with a package of skills: not just general construction skills that are transferable to any part of the construction industry, such as measurement or mortar and cement ratios, but also general enterprise management skills including basic bookkeeping, people management skills and management.”

RESISTANCE TO CHANGE IN THE BUILDING INDUSTRY

Perhaps not surprisingly, Moladi claims that the mainstream building industry has a vested interest in sticking to traditional building technology and uses its dominating position to ensure that new building techniques that threaten their position do not take off. Botes affirms that the building industry is “one of the industries most antiquated, conservative, and resistant to change industries in the world.” Moladi’s innovative approach, according to Botes, is therefore a threat to the established industry. But Moladi also has to break conventional patterns of thinking elsewhere, says Botes. Even government officials, he says, have told him that Moladi is at least “a few years ahead of its time.” The main consequence of this resistance to change is that Moladi prefers to partner with property developers rather than construction firms, as the latter typically first need to be “converted” to the Moladi

32 Interview with Hennie Botes, 4th of December 2009
33 Interview with Hennie Botes, 1st of October 2009
34 Interview with Hennie Botes, 1st of October 2009
CORRUPTION

As has been mentioned already, Moladi asserts that corruption and flawed tender processes constitute a major obstacle to its development in South Africa. Such a claim can be at least partly substantiated by several critical reports of the Auditor-General of South Africa (the country’s national oversight body), which have found irregularities in tender processes and serious institutional failures in the management of flagship housing projects for the poor.\(^\text{35}\) Over the years, there has also been serious criticism and allegations of corruption in the South African media.\(^\text{36}\) The South African government is fully aware of the seriousness of the problem and has recently announced measures to address the issue. The Minister of Human Settlements (in charge of housing), Mr. Tokyo Sexwale, has publicly announced in November 2009 that thousands of low-cost houses were so badly constructed that they would have to be rebuilt, at a total estimated cost of 1.3 billion Rand to the exchequer – the equivalent of US$173 million at December 2009 exchange rates. He also announced the creation of a National Audit Task Team, appointed by the National Prosecuting Authority (NPA), to probe cases of corruption and prosecute the perpetrators.\(^\text{37}\) Reports in the South African media also make mention of suspected crime syndicates operating from within government departments and involving collusion with estate agents and lawyers “moving from province to province, cashing in on housing tenders.”\(^\text{38}\) Corrupt practices such as these are not, by any means, unique to South Africa or developing countries, but they can serve to illustrate why having a potentially interesting technology is not sufficient to win contracts.

Value Created

The essential element of Moladi’s value proposal lies in how its model purports to address what it considers to be the six key challenges faced by developing countries when it comes to housing:

- Lack of resources
- Insufficient funds
- Lack of skilled labour
- Time constraints
- Work flow control
- Waste management

We have already seen how Moladi has innovated by departing from a traditional brick-building process. This innovation, aside from its inherent contribution to building technology,
also allows Moladi to create value by eliminating what it considers to be inefficiencies in the traditional brick-based process.

Moladi’s methodology to create value and make a profit is based on the following elements:

- Cost savings
- The lean production paradigm
- Boosting sales through a network of international agents/licensees

**COST SAVINGS**

Moladi claims to be able to control costs better than traditional construction firms by consolidating the supply chain. Its kit concept ensures that it controls costs by sourcing almost all components needed for a building site in one go, ensuring better control over prices and costs. Furthermore, says Hennie Botes, “the streamlined building process is designed in such a way that we can avoid expensive stoppages which are common on traditional building sites, where the builders have to wait for the electrician, then for the plumber, and new holes need to be drilled every time, wasting building material and time.”

Furthermore, “during the design process, precise weight and volume calculations can be made for all materials and components thanks to standardization, which simplifies project management and drastically reduces the wastage factor on site.” Finally, the speed of construction effectively reduces other costs related to the hiring of equipment, labour requirements and transport.

The cost savings achieved through this model, Moladi claims, can reach up to 35% compared to conventional building techniques. **Direct cost comparison example:** Based on a 50-unit project such as the Diepsloot project rolled out in February 2010, (see section III) a standard, 40m² unit would have a base unit price of 45,280 Rand (US$6,037 at December 2009 rates).

This figure is an estimate, and would be a factor of local labour costs, soil conditions and the overall size of the project, but it demonstrates that Moladi’s process and technology is very competitive on large scale, low-cost housing projects compared to similar units build with traditional techniques.

<table>
<thead>
<tr>
<th>Unit cost of Moladi 40m² TJ 40 unit</th>
<th>Average unit cost of conventional 40m² unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 45,280.00</td>
<td>R 55,000</td>
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</tbody>
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From the above table, it clearly appears that Moladi can be price-competitive in the South African market. Here the projected unit cost of a Moladi-house on a 1,000-unit project is 17% lower than a standard 40m² (note that the amount of an average conventional standard unit, provided by the Western Cape Department of Housing, is almost identical to the basic housing subsidy – please refer to the section on subsidies in Annex 1). The above-quoted

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39 Interview with Hennie Botes, 4th of December 2009
40 Interview with Hennie Botes, 4th of December 2009
41 Figure supplied by Moladi based on 1,000-unit Diepsloot project
42 Figures supplied by the Western Cape Department of Housing
figure for a Moladi unit is based on the average unit cost for a 40m² unit and a maximum of 50 uses per Moladi formwork.

THE LEAN PRODUCTION PARADIGM

Underlying the lean production paradigm is lean assembly, characterized by the industrialization, modularization, standardization and continuous flow processes. The idea is to simplify the building process in order to reduce errors, maximize productivity and keep costs low, both as a result of the simplification and the minimization of wastage. The technology itself, Moladi claims, involves a well-coordinated and controlled system whereby the prospect of waste and leftover materials is minimized.

The lean production paradigm further allows to avoid bottlenecks and interruptions associated with conventional “one step at a time” techniques, in which walls typically need to be cut or chased to ensure the installation of electricity and plumbing, before needing plastering, involving further waiting periods and costs. With Moladi technology, cavities for plumbing and electricity are already in place when the formwork panels are removed, and there is no need to plaster the walls.

This lean production principle is a fundamental aspect of Moladi’s capacity to innovate and disrupt traditional building techniques, and it has been directly inspired by the ‘assembly line’ technique used in the automobile industry, among others. The ability of the technology to eliminate inefficiencies is also a further factor of significant cost control.

BOOSTING SALES THROUGH A NETWORK OF INTERNATIONAL AGENTS / LICENSEES

As mentioned in the distribution strategy section of the business model, one fundamental feature of Moladi’s model is to build a network of local agents and licensees in the markets in which it operates. Moladi’s competitive advantage is quality at low cost on projects of at least 50 units or more. Its preferred partners therefore, are often property developers, who can share both the risk and profits of selling the housing units (either directly to end-customers, or to governments in the case of government-subsidized housing schemes, as would be the case of state-sponsored low-income housing projects).

Moladi will also provide logistical and technical support once a project is underway, including the following items:

- On-site training
- Technical manuals and skills transfer
- Professional engineering support
- Quality procedures
- Specifications and guidance
- Suppliers and purchasing database
- Project planning advice

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43 www.moladi.net
44 See: www.moladi.net - Distribution section
The Business and its Relationships

A number of direct and indirect stakeholders shape Moladi’s evolution and its model. The main direct actors influencing Moladi are its owners, its suppliers, and its customers. Several indirect stakeholders also play a major role: they include governments, oversight bodies and representatives of the construction industry, NGOs, and, of course, the ultimate beneficiaries in the form of the end-users of Moladi houses. All of these stakeholders play a major role in the company’s current state of progress and affect the company’s actual impact as opposed to its potential.

DIRECT STAKEHOLDERS

The family
Moladi is clearly a family business. In the past few years, Hennie Botes has transferred the ownership of the company to his two daughters. While Botes and his family are not explicitly excluding the idea, they say they have no wish, nor do they have any immediate plans, to change the ownership structure in such a way that it would either open the business to an outside capital investment, or design a model that would involve any relinquishing of ownership control of the business. This does not mean, however, that there is no room for outside investors or partners to participate in the Moladi model. Indeed, Moladi’s distribution model, in which partners inside and outside South Africa can set up agencies through which the technology can be marketed and sold to entrepreneurs, makes provision for partners and stakeholders outside the immediate family.

The staff and internal departments
One of the most striking characteristics upon visiting Moladi’s unit in Port Elizabeth is how few people are directly employed by the business at the production facility itself. One of the reasons for this, according to Botes, is the need to keep the firm as ‘lean as possible’ in order to be cost-effective.

There are 18 direct employees at the formwork production facility in Port Elizabeth. These employees mainly handle the machinery and the manual processes attached to the production line, including visual quality control. Three of the employees are employed as in situ trainers and project managers. They are dispatched to the actual project sites as and when required: One of them was recently in Ghana and Mozambique to act as the Moladi representative, supervisor and trainer on specific building projects.

Moladi also has a Research and Development Lab division, located in Johannesburg, which carries out soil tests in order to adapt mortar mix to local soil conditions for a specific construction project.

Suppliers
Moladi’s suppliers include the manufacturers of tools and equipment included in the building
kits, as well as the injected plastic needed to manufacture the formwork panels. “In all aspects of transfer and materials, Moladi’s overriding concern is to ensure quality,” says Hennie Botes.45

As a guiding principle, Moladi has, in the South African market, a policy of favouring local suppliers over non-South African ones and of only sourcing supplies from foreign sources when no local source is available. “This policy,” says Botes “is mainly motivated by our desire to support local businesses and jobs, even when cheaper alternatives could be found elsewhere.”46

The contents of Moladi kits, for example, are, according to Botes, entirely made up of locally manufactured items, which would include all tools, sanitary equipment (sinks, bath, shower tub, taps…), and pipes. The builder supplies their own steel, cement, sand and other materials. There is an option for the builder to supply their own finishing material (such as sanitary equipment, windows, doors, etc.) or for Moladi to supply these items. In general, Moladi would supply the finishing material for the first housing unit in order to establish a quality standard visible to the community, which the builder then needs to maintain.

The plastic raw material, however, is sourced from a German manufacturer, as according to Botes no local supplier of this particular type of plastic exists. Some of the specialized industrial machinery, including the mould presses, is also sourced from outside South Africa, for example from Taiwan.

Customers / Agents
Moladi refers to its customers as ‘partners’. This, Hennie Botes explains, is also part of its ‘holistic’ approach to construction. Its typical clients are private construction firms and property developers. Governments can often play indirect roles, as they would usually contract any state-funded housing programmes to the building industry through tender processes.

As would be the case for any building project, projects are carried out and executed in a step-by-step process involving a complete feasibility study and cost analysis of the project. Once this preliminary cost analysis has been completed, and when the project is given the go-ahead, materials can be shipped and the project commenced. This process, and its implementation, is conducted jointly by Moladi and its partner, with Moladi also providing guidance in the form of training, skills transfer, engineering support and logistics.

A crucial aspect of the ‘partnership’ approach is that once a project is completed successfully, the client / partner is fully trained to use Moladi technology and receives certification from Moladi, enabling it to carry out new projects elsewhere without necessarily having to rely on renewed supervision from the Moladi head office. In several countries in which Moladi operates, the partner is now set up as a Moladi agent with the Moladi trademark and name.

45 Interview with Hennie Botes, 1st of October 2009
46 Interview with Hennie Botes, 1st of October 2009
This is the case in Panama, where Moladi, in partnership with local investors, is planning to establish plastic formwork production facilities modelled on the factory in Port Elizabeth.47

Moladi claims to be extremely careful in the choice of its agents in order to uphold its own reputation and avoid any damage to its brand – as would be the case in any license or quasi-franchise model. The screening or vetting process includes referral by trusted intermediaries, and a full application process through which the business intending to use, distribute and sell Moladi provides evidence of its experience in the building or property development industry, details its motivations and proposes a marketing and distribution strategy.

This practice of turning original customers into local Moladi agents seems to have significantly contributed to the success of the business outside South Africa. Moladi’s Ghana agent, for example, has won an order from a contractor on behalf of the government of Sierra Leone to build 25,000 low-cost housing units as part of the country’s post-war reconstruction effort. In Ghana itself, Moladi Ghana is currently rolling out a project to build 100 low-cost units.48

**INDIRECT STAKEHOLDERS**

Indirect stakeholders influencing Moladi’s model include the end-users of Moladi houses, the South African government at local and national level, oversight bodies and representative organizations of the building industry, community-based organizations such as NGOs, financial institutions and finally, competing firms in the low-cost housing market.

**Civil society and NGOs**

According to Botes, there is a very informal relationship between Moladi and civil society, sometimes through NGOs, “when these stakeholders have convergent interests – housing the poor.” As an example of such an organization, he mentions Abahlali BaseMjondolo (isiZulu for ‘shack-dwellers’), a militant Durban-based shack-dwellers movement campaigning for better housing and better living conditions for poor people in South Africa.49 There is no active formalized link between Moladi and civil society organizations, but these movements are increasing their influence in South Africa and form an integral part of the universe of stakeholders on housing issues, especially as grass-roots movements such as Abahlali are typical actors of the South African political landscape and exercise real influence on the ground, especially at local level.

**The South African Government and related agencies**

In as far as government is the main driver, at least in South Africa, of the low-cost housing market; it has a strong influence on Moladi’s current and future prospects in its home market. While the overall strategy and housing policy is set by the national government for the whole country, and coordinated by the Department of Human Settlements, actual implementation of low-cost housing projects, as well as the management of the subsidy programme, is

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47 Interview with Hennie Botes, 1st of October 2009
48 Ibid.
49 More information on Abahlali BaseMjondolo is available on www.abahlali.org
channelled through the provincial housing departments and local authorities, the second and third spheres of government in South Africa. The national government does not instruct local authorities to work with a particular construction firm, and all housing projects are submitted to an open tender.  

To address the challenge of what Moladi describes as the lack of response of government to its overtures, Moladi is planning a national strategy (see section on Growth Strategy and future outlook below) through which it will establish a national subsidiary with a series of provincial branches, all of which may be possible BBBEE vehicles. Such a strategy might prove effective especially if Moladi considered establishing its own construction entity (rather than selling its technology to developers as is currently the case). Such an entity could freely compete in tenders and win contracts.

**Oversight bodies and representative organizations of the building industry**

The main oversight body in the residential construction industry in South Africa is the National Home Builders Registration Council (NHBRC). As part of an effort to ensure proper construction standards, it is a legal requirement for homebuilders in South Africa to be registered with the NHBRC. Moladi has obtained a ‘Rational Design’ approval from the NHRBC, as mentioned earlier in this study, and is in regular contact with officials at the NHBRC.

**Construction firms as partners and competitors**

Construction firms, especially those active in the low-cost segments, are Moladi’s potential partners, perhaps as franchisees, for example or as competitors. While there is no head-on competition against Moladi by actors using the same technology, it comes, rather, in the form of ‘traditional’ building techniques widely used in South Africa and elsewhere in the world.

**Financial institutions**

Moladi does not get involved in any funding per se, however local Moladi agents and licensees may in some countries be able to arrange funding with banks and other financial institutions specialized in housing finance. These channels would normally be used by the end-users, unless, as is the case in South Africa, these end-users are eligible for free or partially free housing under subsidy rules, which implies that funding, is sourced out of the national budget. Moladi is also establishing formal partnerships with commercial financial institutions offering loans to low-income individuals, as well as with specialized financial institutions catering for the ‘gap market’ - people who earn above the income threshold to be eligible for state subsidies, but too little to be able to obtain loans from commercial banks.

**End-users of Moladi houses**

The end-users of Moladi houses are, ultimately, the people whose lives Moladi says it wants to change: people at the base of the economic pyramid who are in need of affordable housing and shelter. A typical example of such a person would be Mrs. Charmaine Ruiters and her family. Charmaine, who used to live in informal accommodation, now shares a Moladi house.
with 14 other family members in the town of Despatch outside Port Elizabeth. For her, becoming the owner of her own house was a dream come true. Her spontaneous comment upon being asked what benefits the house brought her was that she and her family “could now live in a dry environment.”⁵¹ While the overcrowding in her house (14 family members living in a 40m² unit and its backyard) is a clear indication that access to affordable housing, on its own, will not solve other socio-economic issues such as the lack of skills and employment opportunities, adequate housing is a first step towards dignity and pride.

ANALYSIS OF THE RELATIONSHIPS AND INTERACTION OF THE STAKEHOLDERS

The current state of relationships between the relevant stakeholders in Moladi’s universe may provide key indications as to why the business has, so far, failed to reach significant scale and not attained its stated vision.

A visual representation of Moladi’s relationships would possibly best be made as concentric circles: The direct actors form the inner circle, while the indirect actors play a marginal role as satellite figures in the actual fortunes of the business, at least at this stage of its evolution.

Actors in the inner circle interact through a set of personal, contractual and transactional links. There is also a certain level of mutual dependence between the actors, as the fortunes of each actor affect the whole. This ‘inner circle’ also seems to function almost autonomously, with little significant interaction with the indirect actors who form part of the outer circle. The result is a closed circuit that seems to enable Moladi to be sustainable and financially viable, but which fails to do what Moladi says it wants: achieving scale and be “the solution” for affordable housing.

Actors in the outer circle or indirect actors in Moladi’s universe are the ones on which, arguably, the business will have to focus much more on in any future approach if it truly wants to achieve the vision that it claims to pursue.

Considering the role that government plays, especially in South Africa, in allocating the resources towards housing the poor, it would seem that Moladi needs to develop a focused strategy to market itself with government authorities, at national level but also at local level, which is where most low-cost housing projects are budgeted and approved.

Furthermore, given the particularities of the South African socio-economic context, Moladi could clearly benefit from a black economic empowerment partner: such a partner could hopefully add significant value to the company and provide the business with the necessary support network, which it arguably lacks at this stage.

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⁵¹ Interview with Charmaine Ruiters, Despatch, October 2nd, 2009
Results Created by the Business

GENERAL IMPACT
In order to illustrate an example of the socio-economic impact and its potential, Moladi agreed to provide us with specific information on its largest project to date in South Africa, a 1,000-unit low cost housing project in the township of Diepsloot, located between Johannesburg and Pretoria in Gauteng province, South Africa’s industrial heartland and the country’s most densely inhabited region.

A CONCRETE EXAMPLE OF MOLADI’S IMPACT: THE DIEPSLOOT PROJECT

Context
Diepsloot is a large settlement located about 25 km northwest of Johannesburg’s city centre, adjacent to one of the main highways linking Johannesburg with South Africa’s capital Pretoria (Tshwane). Its origins go back to the mid-1990s, as people were encouraged by government to relocate to a new RDP housing settlement, partially in order to relieve older and more established townships around Johannesburg, such as Alexandra, from over-crowding. But the availability of a few thousand formal housing units attracted many more people than the original Diepsloot settlement was supposed to accommodate, and today more than two thirds of the households live in informal dwellings: According to one source, 15,900 families live in informal dwellings versus 7,100 in formal housing.52 In this regard, Diepsloot is representative of many other South African townships, where formal housing developments destined for the poor are often overwhelmed by demand, and informal dwellings tend to appear very fast, as people hope to have easier access to transport and facilities such as sewage, running water and electricity.

Today, barely 15 years after the first families relocated to the area, Diepsloot is home to an estimated 150,000 people. Overall socio-economic conditions are very difficult: unemployment rates are estimated to hover around the 50% mark, and the area is plagued by social tension, high crime levels, and lack of proper amenities.53

So typical is Diepsloot of living conditions in South African townships that the Minister of Human Settlements, Mr. Tokyo Sexwale, recently spent a highly publicized overnight visit among the residents as part of an attempt to demonstrate the government’s commitment to improving people’s lives.54

In some areas of Diepsloot, the provincial government is rolling out new affordable housing projects. The Gauteng Department of Housing recently awarded a 1,000-unit development tender to a local construction company, Ngabolo Projects, which will be using Moladi

53 General and background information about Diepsloot is available on www.diepsloot.com.
technology and materials for the entire development. Ngabolo, a black-owned construction firm employing a permanent staff of 10, established a partnership with Moladi in mid-2008.\(^{55}\)

In the words of Mr. Mongezi Qupe, Managing Director of Ngabolo Projects, “Ngabolo and Moladi share the same vision, which is to revolutionize the way housing production is approached in general in South Africa – we also aim to provide a solution to the dire housing backlog in South Africa.”\(^{56}\)

The project has kicked off in February 2010. Each housing unit will have a floor area of 40m\(^2\) and consist of two bedrooms, one living room, one bathroom with bathtub and wash-basin, and kitchen with wash-basin (see layout in annexes).\(^{57}\) The timeframe for construction is 16 weeks, and the overall project is supervised by a core team of 15 Moladi employees.

**Economic Impact**

In order to maximize its local economic impact, the project leaders have opted for the labour-intensive manual casting methods. The construction of each unit will mobilize 40 labourers for two hours on the building site allocated to filling the mould. The mortar is mixed, discharged into wheelbarrows and then into buckets, which are manually lifted to the filling point, and discharged into the Moladi wall cavity.\(^{58}\) These labourers will consist of local, unemployed and unskilled men and women from the community, thus giving Moladi strong social and economic empowerment content. As explained by Mongezi Qupe, “[Our partnership with Moladi] empowers the general community in the form of employment opportunities, and [provides] new sets of skills even to the most seasoned contractors.”\(^{59}\)

Workers of course also directly benefit economically in the form of a regular income for the duration of the project. On average, such labourers can expect to be paid around 10 Rand per hour (the equivalent of US$1.15 based on current exchange rates). While this is not much by any standard, it makes a significant difference in the daily lives of people who, on average, have a disposable income of less than 20 Rand or US$3 per day measured in purchasing power parity or PPP (as is the case of an estimated 40% of the population in South Africa).\(^{60}\)

From a much more general perspective, the single most crucial and lasting economic impact of low-cost housing is that it provides, mostly for the first time, asset ownership for the poor. Owning real estate means much easier potential access to financial services such as loans or micro-loans, and can also provide a steady source of income in the form of rent for part or the entire house. House ownership constitutes a crucial first step for many families out of extreme

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55 Information kindly provided by Mr. Mongezi Qupe, Managing Director of Ngabolo Projects.
56 E-mail from Mr. Mongezi Qupe, 17 February 2010.
57 See outline of a typical unit in Annex 2
58 Interview with Shevaughn Botes, 2nd of October 2009
59 E-mail from Mr. Mongezi Qupe, 17 February 2010
60 SOUTH AFRICA SURVEY 2007/2008, op. cit., p256, & HAMMOND A., et al., “The next four billion - Market size and business strategy at the base of the pyramid”. WRI & IFC, Washington DC, 2007. PPP is now a widely accepted measure taking into account the relative purchasing power of one dollar rather than its nominal value, and is considered to be a more accurate measure of real income levels (a dollar in South Africa, for instance, buys more goods and services than the same dollar in the US, implying that for the same level of nominal income in US$ a South African is wealthier than an American).
poverty and deprivation. However, this does not come without its own set of unintended consequences. Although there are no statistics available, and government is trying to outlaw the practice, some beneficiaries of low-cost housing have been known to move out of their newly acquired homes and back into informal housing, finding it financially more beneficial to rent out their newly acquired asset. A less extreme variant of this phenomenon is the presence of ‘backyarders’: people who, with the consent of the homeowners, build a shack on the few available square meters in the backyard of a government-subsidized house. While this may not be what the planners intend to see happen, it does make rational economic sense for many of the people concerned to maximize the income they can get from their asset. In addition, another issue is that many people who move into subsidized houses soon find that they are unable to pay for municipal services and taxes that come along with house ownership, a striking illustration of how issues surrounding poverty are structural and interconnected, and cannot be broken down into a ten-point checklist of individual challenges to be tackled one by one.

Social Impact
The delivery of subsidized housing in areas such as Diepsloot can have a very significant social impact on the beneficiaries and the communities they serve, even though this impact is not necessarily uniformly positive. The overall positive social impact is qualitative rather than quantitative: it is about providing poor people with a sense of self-worth, dignity and hope for a better future for themselves and their children.

The key to a truly lasting, sustainable positive impact starts with houses. Owning their own shelter provides people with a sense of pride and belonging which in turn has positive effects on their sense of self-esteem and a sense of opportunity. In the words of Charmaine Ruiters, who has been living in a Moladi house for three years in the town of Despatch, Eastern Cape, “Our lives are much more comfortable now that we have a house of our own. It used to rain upon us where we lived before, now our place is dry. It makes a very big difference in our lives and our health, especially for my father whose health was not so good.”

For her brother Mr. Thomas Ruiters, one of the main benefits was being able to work on building their own house: “We are very proud of our house. We’ve been living in the house for 3 years now and I helped build it. If more such homes were built, people would have jobs and a better life.”

Environmental Impact

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62 Informal interview with Charmaine and Thomas Ruiters, owners of Moladi house in Despatch, Eastern Cape, October 2nd, 2009.
As measured by energy consumption, Moladi claims to use low-energy materials such as sand, gravel and cement (mortar). The plastic formwork is also recycled after its initial use into consumables. These include items such as reinforced spacers, drip line formers, toilet seats, water cisterns, and other types of house fittings such as reusable window block-outs and door handles.\(^63\) In addition, as neatly outlined by Mongezi Qupe, “Moladi houses are designed such that they conserve energy or rather preserve heat and have an automatic air conditioning system (i.e. in winter they store all the heat during the day meaning that it remains warm, thus reducing the need for using heaters, for example; and in the summers they are cooler too.) Given all the energy supply problems this country is currently facing this innovation is exactly what the country needs.\(^64\)

## Growth Strategy and Future Outlook

As evidenced by the Diepsloot project, Moladi is finally making some breakthroughs in South Africa, and the partnership it is building with Ngabolo Projects could be a model for the future. It intends to build on that success over the next few years while continuing to expand overseas as well, and wants to translate its vision and ambitions into reality on the ground.

At the heart of this strategy are Moladi’s plans to give substance to its Moladi South Africa branch, the vehicle that Hennie Botes says has been created specifically with an empowerment component. The challenge is now to find the right partner who shares his vision and ambition: “In order to ensure the success of the technology, we need to partner with individuals, organizations and professionals who have a solid and reputable track record in the industry,” says daughter Camalynne.

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\(^63\) See “Moladi – sustainability” document attached in Annex 3 for further information.

\(^64\) Email from Mr. Mongezi Qupe, 17 February 2010.
At the core of this national strategy, Moladi South Africa would act as an umbrella entity, in charge of initiating and sourcing projects in conjunction with the national government. Moladi South Africa would maintain overall control of core business departments such as marketing, financing and quality control, as well as the supply chain and support service. Moladi branches would be established at provincial level and liaise with local and provincial governments, while a user of the Moladi technology would benefit from training and technology transfer, and be in charge of the actual implementation of a construction project (as outlined, not just low-cost housing projects but also many other types of construction projects for which Moladi technology can be applied, such as the construction of schools, clinics, and commercial buildings for example.

Outside the country, Moladi intends to continue on its current drive to focus on emerging markets all over the world. A promising new partnership was launched at the end of 2009 with Indian property developer Karle Group. Mr. Sudarshan Karle, one of the Indian company’s partners, said there was “demand for more than 100-million houses in India,” and on the back of this development Moladi has tentative plans to open a plant in Mumbai, on a model similar to the existing facility in Panama. Moladi has also been very active over the last few months in other emerging markets, launching recent partnerships in several African countries such as Botswana and Nigeria. Moladi Nigeria opened in the first week of March 2010, with the construction of a show house in the commercial capital Lagos; Sub-Saharan Africa’s largest city.

Following the catastrophic earthquake in Haiti in January 2010, Moladi is now also looking at teaming up with local and international partners to help rebuild the devastated country, and Hennie Botes confirms Moladi is now working with international development agencies such as the Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation) or GTZ for a 10,000-unit housing project in Haiti. As posted on the company’s website, “Moladi reinforced walls and stub wall configuration is designed to withstand earthquakes and minimize the damage [caused by them]”. Furthermore, it adds, “we are able to utilize the rubble from the collapsed buildings to create new structures.” Given the fact that so much of the death and destruction in Haiti seems has been linked to sub-standard building, there is a real opportunity for Moladi technology to contribute to a major improvement in building standards so that destruction and fatalities can be minimized in the event of similar natural disasters, not just in Haiti but in any other locations vulnerable to major natural disasters.

Moladi has some clear ideas on how it wants to structure itself in order to reach greater scale in the future, most crucially, redoubling its efforts in the local market. The main challenge it will face is to implement this structure and to find the partners who will translate this strategy into reality.

66 Moladi, www.moladi.net
67 Telephone call with Hennie Botes on February 9th, 2010, and www.moladi.net
Conclusion

The Moladi model clearly presents quite a radical departure from conventional building technology. Perhaps its main advantage is that it seems able to combine a high level of quality with cost-effectiveness, a crucial asset for any type of building, but particularly in the context of affordable housing. Moladi has enormous potential in this regard, and there is little doubt that if scaled up, it could make a very significant contribution to improving lives at the base of the socio-economic pyramid. The challenges are important but they are not insurmountable. So why, one might ask, has Moladi not made more headway so far, after over two decades in operation?

One of the possible answers is that there seems to be a fundamental contradiction between its stated ambition to “house the whole world” and the channels Moladi has chosen so far to expand its model. It is true that it may be hindered by resistance to change, vested interests and the entrenched scepticism of policy-makers, but a truly cost-effective and efficient model is always likely to attract investors and catch on if the right partners are recruited. Understandably, like many other family firms, Moladi seeks to strike the right balance between keeping control of the firm within the family while allowing outside investors and managers to take the business to the next level.

Another dimension of the Moladi model, which has been a source of strength but also perhaps a hidden weakness, and could help explain the relative lack of scale so far, is the firm’s reliance on agents and licensees in its key markets. In the current model, the business is a construction technology firm rather than a construction firm, and it depends to a large degree on the quality of its partners / licensees to obtain contracts. There are, arguably, a number of steps Moladi could take without too much difficulty or disruption to its model in order to reach more scale. To start, it could be much more aggressive in marketing its technology to countries in need of affordable housing for the poor. It could also follow up on the proposal to establish its own in-house construction subsidiary, a step that would not only create welcome jobs, but could significantly reduce the need to rely on outsiders who first need to be ‘converted’ to its technology and model. Such an entity could also be the perfect empowerment vehicle for Moladi, a crucial factor in South Africa’s current socio-economic context. All of this is conceivable without involving a significant loss of family control over the business, and would help to overcome some of the challenges it faces.

In the words of Hennie Botes, “We’re still in the initial phase of our evolution. Perhaps the advances in communications and transportation during the past two centuries are the most evident technological improvements enjoyed by humankind today. Yet strangely, when it comes to housing, we still tend to resort to the brick and mortar method of construction; a technique that is at least 3,500 years old. Given its magnitude, we can hardly expect to resolve the housing crisis in our age with a technology that was originally designed for the requirements of society three millennia ago. The time for a paradigm shift to take place is long overdue.”

68 Interview with Hennie Botes, 9 December 2009.
Moladi is quietly confident that it will succeed and prove the sceptics wrong. Ultimately, the firm already has all of the basic ingredients needed to have a profound effect on the affordable housing market, especially in South Africa.
References

INTERVIEWS
- Smith, Rob. Director, Housing Grant Management, Western Cape Department of Housing. Cape Town. Nov. 2009.

PUBLICATIONS
- Business Day. 1.3 billion Rand needed to rebuild badly constructed houses. Johannesburg. Nov. 16, 2009

WEBSITES
- Moladi Website. [www.moladi.net](http://www.moladi.net): 

Discussion document.
Annexes

Annex 1: The national housing subsidy scheme and the allocation of national resources for housing the poor

The origins and main characteristics of the subsidy scheme

The subsidy scheme and delivery of affordable housing to the millions of poor South Africans was originally one of the main items contained in the ‘Reconstruction and Development Programme’ (RDP) – the very first economic policy framework of the post-apartheid era, which was meant to address the most severe socio-economic problems of the country in a holistic manner. Even though the RDP policy framework has long been shelved and succeeded by updated policies, government-subsidized houses are still commonly referred to as ‘RDP houses’ around South Africa and in popular parlance.

The main types of subsidies include:

- **Individual subsidies**: mainly to facilitate the sale of existing houses;
- **Project-linked subsidies and Institutional subsidies**: for assisting in the acquisition of new serviced sites;
- **Consolidation subsidies**: for the consolidation of older low-cost housing sites built through earlier low-cost housing schemes;
- **Rural subsidies**: for rural populations settled on state land governed by traditional authorities.

In all cases, qualifying applicants need to fulfil a set of basic criteria, the most important of which is a monthly income not exceeding R 3,500 per household (around US$470 based on December 2009 exchange rates).

The final amounts vary depending on a number of factors (including local weather and soil conditions), but for a basic stand-alone house of 40m², the government’s subsidy amounts to R 55,706 or about US$7,427 at December 2009 exchange rates. Applicants earning a monthly income of less than R 1,500 (ca. US$200) are not expected to contribute anything towards that amount, while those applicants earning between R 1,501 and the upper limit of R 3,500 (ca. US$200-470) are expected to make an own contribution of R 2,479 (or about US$330).

The South African Housing Subsidy Scheme subsidy quantum amounts for the period 2009/2010 in respect of a 40m² house

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69 Adapted from: Department of Human Settlements of South Africa, [www.housing.gov.za](http://www.housing.gov.za). Updated information obtained from the Department of Housing of the Western Cape.
The National Housing Subsidy Scheme represents a very significant allocation of national financial resources: At this stage, the total national budget for housing alone and related community amenities such as sanitation, electricity, road pavement and the like, is 65 billion Rand (around US$8.7 billion and EUR 6 billion). This represented 9% of the government’s entire budget for 2009, more than twice the amount allocated to defence and only slightly less than the national health budget.\(^{70}\) Even such significant means are considered insufficient by the Department of Human Settlements, which has called for an additional 102 billion Rand (around US$13.6 billion) over the next three years if the government “was to address the housing backlogs and live up to the Millennium Development Goals it had committed to.”\(^{71}\)

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\(^{71}\) “R 102 billion need for SA’s housing needs”, BuaNews, July 2\(^{nd}\), 2009. http://www.marketspi.com/Property24/Hub/AffordableHousing_Full.aspx?ArticleId=10006
The financial strain of providing affordable housing for the poor is compelled by the fact that a significant proportion of the housing budget is now being spent on fixing derelict houses, at the expense of new projects. The Department of Human Settlements disclosed in November 2009 that R 1.3 billion (US$173m) would have to be spent on repairs and sometimes even complete rebuilding of substandard low-cost housing.\footnote{See, for one example: VAN DER MERWE, Christy, “Millions wasted on shoddy housing construction, Minister avers”, Engineering news, 2nd of November 2009. http://www.engineeringnews.co.za/article/human-settlements-minister-says-millions-wasted-on-shoddy-housing-construction-2009-11-02.} For Hennie Botes, this fact constitutes clear evidence of the hidden cost of relying on inferior workmanship and substandard construction techniques, one of several major obstacles he says Moladi can address.

A deeply political issue
Providing affordable housing to low-income South Africans is much more than just a question of financial resources. It is, ultimately, about trying to overcome centuries of racially based divisions, whereby whites reside in the core urban centres and blacks are confined to the peripheries. Black townships in South Africa, as they developed in the early phases of the country’s industrialization, were never planned as permanent settlements. Rather, they were meant to be reservoirs of cheap labour designed to service the white urban areas, and township residents were considered to be ‘migrant’ workers ultimately supposed to ‘go home’ at some point; ‘home’ in this instance being the rural areas across Southern Africa from which many blacks originally migrated to the cities out of economic necessity. For decades, the apartheid regime planned and administered townships in this mindset, entertaining the fantasy that blacks would return to so-called ‘traditional’ tribal homelands. The resulting spatial organization of towns and cities across South Africa is one of apartheid’s main legacies, and one of the most difficult to overcome.

Partly in an attempt to break this legacy and as a response to initial criticism that low-cost housing in South Africa was entrenching existing spatial divisions inherited from the past, government has, since the early 2000s, launched its ‘breaking new ground’ (BNG) policy of building mixed residential areas, containing a variety of low- and medium cost housing in an attempt to develop new patterns of urban and social evolution\footnote{A full description of the BNG policy is available from the Western Cape provincial government website under http://www.capegateway.gov.za/Text/2007/10/bng.pdf}. It has also created a new ‘Housing Development Agency’ or HDA in March 2009. The main purpose of the Housing Development Agency is to acquire and hold well-located land where housing projects can be developed. The HDA will ‘work with municipalities, private sector developers and provinces to ensure that government reaches its target of doubling the current delivery rate from 250,000 to 500,000 houses per year.’\footnote{As reported by http://architectafrica.com/node/1078}
Annex 2: The Diepsloot Project

1. Layout of T 40 units

![Diagram of T 40 units layout](image-url)
Case Study • Moladi – an affordable housing solution for the poor?
2. Cost Estimate

**Gauteng - Diepsloot**

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Case Study • Moladi – an affordable housing solution for the poor? 39
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### PRELIMINARY AND GENERAL EXPENSES

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Case Study • Moladi – an affordable housing solution for the poor?

SUMMARY

16 Mar 09

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SUGGESTED CONTRACTORS PROFIT
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BUS TOTAL 1,151.46 RAND RAND 45,260.91

PLEASE NOTE: These ABOVE items are based on South African Suppliers and prices are to be replaced by local material costs.

moladi

EX WORKS PORT ELIZABETH, SOUTH AFRICA 164,389.78 RAND
TOTAL CALCULATED FORMWORK AREA 360 SQUARE METRES
TOTAL CALCULATED SHIPMENT VOLUME 15.7 CUBIC METRES
TOTAL CALCULATED SHIPMENT MASS 2167 KILOGRAM
SHIPPING VOLUME (APPROXIMATE) 8.3 OFF A 40 FT CONTAINER
HARMONIZED CODE: 382290
SHIPPING COSTS 3

SUPERSTRUCTURE

150 EXTERNAL + 150 INTERNAL WALLS
COST OF A SQUARE METRE OF WALL AREA
100mm - EXTERNAL 122.31 RAND
100mm - INTERNAL 145.30 RAND
COST OF A SQUARE METRE OF FLOOR AREA 1,131.46 RAND
MANOUR TO ERECT, FILL AND STRIP moladi: (1 DAY CYCLE) 83 HOURS
AMORTIZED COST PER SUPERSTRUCTURE 3,287.88 RAND
moladi CHEM REQUIRED PER SUPERSTRUCTURE 70.84 LT
SPACERS REQUIRED PER SUPERSTRUCTURE 173 EACH

VARIABLE MATERIAL INPUT

FOUNDATION REINFORCING STEEL (Y16) 9.66 KG
SUPERSTRUCTURE REINFORCING STEEL (Y16) 9.05 KG
19mm CRUSHED STONE FOR FLOATING RAFT FOUNDATION 260.35 M³
RIVER SAND 260.35 M³
ORDINARY PORTLAND CEMENT 0.065 KG
UNSKILLED LABOUR 90.00 PER DAY

MATERIALS BASED ON SOUTH AFRICAN COST CAN BE REPLACED BY LOCAL COSTING

ROOFING MATERIALS 4154.48 MATERIAL + LABOUR
CEILING 0.00 MATERIAL + LABOUR
STEEL WINDOW FRAMES INCLUDING GLAZING 2616.55 MATERIAL + LABOUR
STEEL DOOR FRAMES, HOLLOW CORE DOOR LEAF, LOCKS 3554.32 MATERIAL + LABOUR
ELECTRICAL HARDWARE 253.19 MATERIAL + LABOUR
PLUMBING HARDWARE 4886.15 MATERIAL + LABOUR
PAINT 1344.09 MATERIAL + LABOUR
PRELIMINARY AND GENERAL 2833.33 12 UNITS PER MONTH

PLEASE NOTE THAT THIS DOCUMENT IS AN ESTIMATE AND NOT A QUOTATION AND ACCORDINGLY, COST OF MATERIALS AND LABOUR CAN VARY DEPENDING ON QUANTITIES AND SITE LOCATION.
Annex 3: From the Moladi Website

1. Technology

The FORMWORK is an award winning and unique, lightweight, reusable, patented injection moulded formwork system that has been developed to streamline the cumbersome qualities, and the much inefficiency, associated with traditional timber and steel formwork as well as other alternative building methods. With the emphasis of the technology being on quality and efficiency, the formwork has been specifically designed to benefit the end user with its unique simplicity.

Key Points:
- Emphasis on quality and efficiency
- Unique, lightweight and reusable
- Simplicity
- Lightweight and robust, weighing 8kg/m²
- Easy transportation
- Speedy assembly
- Modular Components
- Versatile design
- Easily adaptable
- Wall cavities of 100mm and 150mm
- Formwork re-used 50 times
- Smooth off-shutter finish
- No plastering
- No beam filling
- No chasing
- No skilled labour

Facilitates the training of local contractors and entrepreneurs to use our technology. The formwork components are produced to the highest quality standards, with an unlimited production capacity. The formwork is a comprehensive system that is entirely boltless, freestanding, and does not require the need for struts or bracing. It is unique in that it represents the most advanced alternative building solution with a proven track record and years of experience in the construction industry. We provide a body of knowledge that has inspired and led the way for the development of numerous subsequent ulterior solutions.

The injection moulded formwork is lightweight and robust, weighing 8kg/m, that allows for easy transportation and the speedy assembly of components. The precision components are fully interlocking and any dimensional adjustments to the desired structure can be made with little effort. The modular components are assembled into easy to handle panels which are configured into a mould of the desired structure. These panels are joined to form wall configurations of any desired length and height with a wall cavity of either 100mm or 150mm. Once the assembly of the panels is complete, it does not need to be repeated. The formwork panels can be re-used 50 times; making the technology cost effective due to its repetitive application scheme, reducing the cost of construction and transportation significantly. The steel reinforcing, window and door block-outs, conduits and other fittings are positioned prior to the wall cavity being filled with the mortar mix. The result is a wall with a smooth off-shutter finish that does not require any plastering, beam filling or chasing. Once the pre-assembled formwork panels have been removed they can be immediately re-erected on an adjoining site to be used on a repetitive basis; again saving valuable time in the construction process.

With its streamlined and simplistic approach to construction, the application of the technology is not dependent on skilled labour to assemble, erect, fill or strip and enables community involvement in the construction of their own homes. It brings to the field of construction all the benefits of a factory assembly line; quality assured work by unskilled labourers at a maximum rate of production with a
high production output capacity. The technology is versatile in that it is easily adaptable to the specified design requirements and is suitable for all types of buildings, yet highly suited for use in repetitive housing schemes. This alleviates many of the logistical problems facing the construction of affordable repetitive housing projects. By utilizing indigenous materials the benefits of the technology are spread to local communities.

MORTAR MIX: The mortar that is used to fill the wall cavity is essentially concrete without stone. The mix design of the mortar is specifically determined by laboratory tests that are carried out on local sand or aggregate, to ensure that quality standards are adhered to. The density of the mortar will vary depending on the sieve grading of the sand used, but will range between 1600 to 1800 kg per cubic meter. The mortar mixture produces a fast curing aerated mortar which flows easily, is waterproof and possesses good thermal and sound insulating properties.

What is filled with?
One generic cubic meter of mortar consists of: *

- 1800kg or 0.720m³ of local decomposed granite / river sand
- 250kg of ordinary Portland cement: (OPC)
- 5 litres of moladiCHEM, a non-toxic, water based chemical cocktail
- 200 litres of water

* Please note that the above is a generic site mix ratio and will be varied with trial mixes at the site mix plant.

Fly ash can be used as an extender to substitute the use of cement in order to reduce the volume of cement, but will still achieve the same ultimate compressive strength - mPa. A compressive strength of between 10 and 30 mPa can be achieved in a 28-day period, depending on the cement: water ratio. Under normal conditions the mortar usually sets during the night (12 to 15 hours) and the formwork is removed the following morning. There is no need to vibrate the mortar in order to achieve a smooth finish.

The application of is 1litre per 50kg of cement. At the start of each project, cube tests are to be carried out, which would determine the compressive strength of the mix design specific to each project.

Key Points;
- Custom Mix design
- Fast Curing Aerated Mortar
- Flows Easily
- Waterproof
- Good thermal properties
- Mortar sets during the night
- No need to vibrate

Advantages
The formwork components are modular with makes the adjustments in dimensions simple, adapting to endless design layouts

- reduces the cost of construction without compromising quality
- construction process is not dependent on skilled labour
- panels are lightweight and robust
- represents the most advanced patented technology and innovation in the industrial construction of low-cost and affordable houses, schools, clinics and other structures and is a leader in this field
- is a reusable, interlocking modular plastic formwork system for moulding complex structures
- formwork components are modular with makes the adjustments in dimensions simple, adapting to endless design layouts
- structures are stronger and more durable than masonry structures
- structures are socially acceptable amongst a wide range of cultures
Case Study • Moladi – an affordable housing solution for the poor?

• is an affordable technique to effectively build durable, earthquake, cyclone resistant shelter
• can be used to build one house in one day with one mould, or many houses in one day with more moulds
• is a realistic modern alternative to overcoming the widespread misuse of scarce materials
• is a building technology which encourages self participation by means of technology transfer
• reduces pollution and environmental destruction of our natural ecology by addressing the poor living conditions of billions of poverty stricken communities who are one of the major sectors of society that contribute to global warming
• creates jobs within unskilled communities

Building process
Moladi follows an optimized and sequential process. This allows for the number of unskilled labourers, which are utilised effectively, to be predetermined according to the size of the house, area of formwork for the intended unit and volume of the mortar. The speed of construction is also taken into consideration to calculate the number of unskilled labourers on site, with larger units having additional unskilled labour to optimize construction time.

Local unskilled labourers are trained by a foreman on the client's first unit. The duration of the training process usually takes 1 – 2 weeks, depending on the size of the unit, and all the procedures and phases of the construction process are followed through and explained thoroughly. The client will be supplied with a working document and assembly instructions, which are compiled specifically for the client's project. After training has been completed, the team of unskilled labourers is awarded certificates for the completion of the training programme and will be graded accordingly by our foreman.

A certified structural engineer is involved in the design of the reinforcing according to your local sites soil conditions. A reinforcing schedule would be supplied to the client, or alternatively, a local independent structural engineer would be employed by the client. The engineer would also be involved in signing off the units and verifying that the correct measures were taken in following the supplied reinforcing schedule.

Key Points;
• Unskilled labour
• Comprehensive training programme
• Engineer design
• Optimized and sequential process

Production rates
A few disadvantages of brick or block construction are:
• Labour intensive
• Compressive capacity only
• Skilled labour
• Mortar shrinkage
• Thermal expansion and contraction
• Levelling
• Erratic supplies = erratic delivery
• Waste
• Rework
• Slow delivery
• Inconsistent quality
• Unpredictable cash flow
• Increased cost

The technology is cost effective due to its repetitive application. It is affordable due to the fact that the formwork is used on a repetitive basis for up to 50 reuses per kit; this results in the cost of the formwork being amortized over the construction of 50 units.

By combing the re-usable, patented, recyclable lightweight plastic injection moulded formwork system,
with a South African Bureau of Standards approved lightweight aerated mortar, Agrément Certificate 94/231, a full scale mould of the designed house is configured with all the services, both plumbing and electrical, are cast in situ as a monolithic reinforced walling system. Chasing, beam filling, plastering and wastage are eliminated, producing a fast track, cost effective, transferable construction technology.

In simple terms, has:
- A constant supply of materials
- Known costs
- Unskilled operators
- Next to no waste
- Increased productivity
- Reduced cost
- Consistent quality
- Predictable cash flow

2. Ideology

COMMUNITY UPLIFTMEN T: Combining shelter and economic development, is set to challenge the tradition bound construction industry in order to allow for the participation of contractors and entrepreneurs to empower and develop communities on a global basis.

Due to the neglect of the poor and very poor over many decades, the real source of market promise is not the wealthy few in the developing world, or even the emerging middle-income consumers: It is the billions of aspiring poor who are joining the market economy for the first time.

Countries that lack the infrastructure to meet basic humanitarian needs provide the ideal situation for the development of environmentally sustainable technologies and products. Housing is a primary sector of industry that can contribute towards the upliftment and empowerment of communities. The building industry’s emphasis has traditionally been on commercially viable projects sideling low-cost housing and the implicated low profit margins. As a rule, small contractors build low-cost affordable houses in a traditionally ineffective way, with low quality materials, inferior workmanship, little or no professional support, and most importantly, no benefit of economy of scale.

By focusing on aspects of the construction industry, it is possible to generate wealth and opportunities for emerging communities by introducing and facilitating mutually beneficial projects between these communities and the established formal sector. Mobilise joint ventures and partnerships involving business, community based and non-governmental organisations, facilitating the establishment of Co-operatives are but some of the options that can bring forth “Sustainable Development”.

The opportunity for creating “sweat equity” is also a great incentive for building one’s own home. To more and more people this is very important, because their sweat equity is the only equity they can muster. Communities who are building their own homes do it in a state of excitement and eagerness.

For companies with the resources and persistence to compete at the bottom of the economic pyramid, the prospective rewards include the incalculable contribution to social and economic development, growth and substantial profits. This would ultimately result in the multiplication of secondary economic activities and the development of small and medium scale enterprises, which would result in an increase in job opportunities.

Empowering individuals through community development

Working together to generate wealth and opportunities within emerging communities
3. Sustainability

The majority of home owners have not been made aware of the embodied energy in building materials. The embodied energy of a building material, such as brick, refers to the energy that is used or expended during the life cycle of a material. This would include the cost to produce, transport, build and maintain the material during its life cycle.

Building materials should be not be evaluated by their function, cost and aesthetic value alone. The environmental consequences associated with the selection and use of building materials should be considered a crucial aspect in ascertaining the viability of a project.

The calculation of the embodied energy in building materials, or their life-cycle assessment, takes into account the following aspects;

1. The extraction and processing of raw materials
2. The manufacturing, packaging and transportation of the product
3. The maintenance of such a product after installation or positioning
4. The possibility of the recycling and reuse of the product
5. The final disposal of the product

The results for the embodied energy in common building materials, published by the American Institute of Architects, are as follows;

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>ENERGY CONTENT KJ/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand &amp; Gravel</td>
<td>41.878</td>
</tr>
<tr>
<td>Wood</td>
<td>430.31</td>
</tr>
<tr>
<td>Lightweight concrete</td>
<td>2 186.44</td>
</tr>
<tr>
<td>Gypsum board</td>
<td>4 256.58</td>
</tr>
<tr>
<td>Brickwork</td>
<td>5 117.20</td>
</tr>
<tr>
<td>Cement</td>
<td>9 536.60</td>
</tr>
<tr>
<td>Glass</td>
<td>25 818.60</td>
</tr>
<tr>
<td>Plastic</td>
<td>43 031.00</td>
</tr>
<tr>
<td>Steel</td>
<td>44 659.20</td>
</tr>
<tr>
<td>Lead</td>
<td>60 243.40</td>
</tr>
<tr>
<td>Copper</td>
<td>68 849.60</td>
</tr>
<tr>
<td>Aluminium</td>
<td>240 741.00</td>
</tr>
</tbody>
</table>

Moladi utilizes lower energy materials, such as sand, gravel and lightweight concrete within the local community. Plastic, the material used for the moladi formwork, has a higher energy content, but conserves energy and resources due to the fact that it is reused, recycled, is lightweight and long lasting, and requires very little maintenance.

The following points are key points to consider in achieving the most sustainable outcome with regards to building projects;

- Reduce building materials through more efficient layout and use of spaces.
- Reduce construction waste
- Specify products that use raw materials more efficiently
- Substitute plentiful resources for scarce resources
- Reuse building materials from demolished buildings
- Rehabilitate existing buildings for new uses
- Recycle new products from old"
January 2010

The information presented in this case study has been reviewed and signed-off by the company to ensure its accuracy. The views expressed in the case study are the ones of the author and do not necessarily reflect those of the UN, UNDP or their Member States.

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