

Mamre Ceiling Insulation Evaluation

Energy retrofitting in low income communities



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Overhead image of Mamre RDP housing area - © 2011 Google

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Introduction

This report has been produced by ICLEI (Africa Secretariat) and the Environmental Resource Management Department of the City of Cape Town. The project is a 'sustainable livelihoods' project that has been undertaken during 2010 with around 240 insulated ceilings installed in Reconstruction and Development Programme (RDP) homes in the community of Mamre. ICLEI has partnered with the City of Cape Town to assess the impact of the newly installed ceilings at a household and wider community level.

This report draws together the research undertaken with community members through a programme of engagement that has worked alongside households to understand the impact of this retrofit intervention. This work has included a range of participatory methods including workshops, interviews, surveys, photography sessions and stakeholder consultation.

The research undertaken in Mamre forms part of a larger initiative by ICLEI Africa 'Sub Saharan African Cities: A Five City Network to Pioneer Climate Adaption through Participatory Research and Local Action' funded by IDRC and DFID. As such the objective of this work is to understand how projects of this type can help to assist with developing capacity and understanding towards identifying, analysing and acting upon localised climate change impacts. The City of Cape Town and specifically this project provide an excellent opportunity to begin to consider how South African cities are approaching the need to retrofit urban infrastructure as part of the wider climate change and energy challenge.

This report begins by contextualising the project into the wider retrofitting challenge for the City of Cape Town, exploring the circumstances in which the project was delivered and thinking about its role as a pilot project or experiment in new forms of urban infrastructure. The report then provides a project summary outlining the key characteristics of the project before explaining the methodology used to evaluate the intervention and the role of the community in the research process. The next section provides an analysis of the ceilings in Mamre by exploring some key areas of interest including energy issues, livelihoods, health, climate resilience and project implementation. Finally the report explores lessons learnt and improvements to be made from the project before reflecting on the research, the project and the wider retrofit challenge.

The authors would like to extend their gratitude to the Mamre community for their role in supporting the research process over the last year. The evaluation of this intervention will continue to provide important information for the City of Cape Town as it further its retrofitting agenda.

This report compliments and builds upon previous reports undertaken during and after the intervention. These are available from ICLEI Africa or City of Cape Town.

Retrofitting Cape Town

Retrofitting is the upgrading of the existing urban infrastructure and is one of the most critical challenges for cities in the 21st century seeking to provide responses to complex and rapidly changing dynamics such as increasing populations, energy security, poverty alleviation and climate change. These interventions will require substantial investments across the complex networks that provide the support systems for cities. But how do cities set about these challenges? How do they create the policy and technology interventions that transform infrastructures within the current institutional and financial contexts in which cities exist?

This project evaluation attempts to analyse the impact of one particular retrofit intervention. This is the insulated ceiling installations in RDP housing in Mamre as part of a retrofitting project led by the City of Cape Town and will provide a chance to reflect on the challenges, opportunities and issues associated with this type of intervention. As such it is important to understand the context in which this particular retrofitting emerged.

The South African Government, alongside municipalities such as City of Cape Town and a range of other partners, have embarked on a programme of formal housing construction for low income and vulnerable households. In Cape Town whilst thousands of homes have been built during the last 17 years over 450,000 people remain on the housing waiting list across the municipality with an annual migration rate of 17 percent compounding the pressure on housing delivery across the city¹.

Over the last ten years in recognition of the Southern Cape Condensation Problem Area the National Government have provided a National Housing Subsidy, for insulated ceilings in new RDP housing in the Western Cape, in recognition of the need for increased thermal efficiency in the region and the low energy efficiencies of this type of housing. However no funding has been made available for the houses already built that lack ceilings and are now privately owned. This private ownership makes it difficult to fund any retrofitting work owing to the Municipal Funding Act which means that new models of retrofit financing are required.

Although insulated ceilings are primarily considered as an energy efficiency intervention a wider understanding of their benefit to households is required in order to understand and analyse the investment in pilot projects such as Mamre and the wider challenge of the 30,000 to 40,000 RDP houses in the City of Cape Town lacking such thermal protection..

Health and wider livelihood impacts from households without adequate thermal efficiency will have financial consequences for families, communities, local and national government. Thus the need to better comprehend how retrofitting interventions such as Mamre can provide a financial investment for cities that support both local communities and wider urban areas.

Other retrofitting pilots are also taking place across Cape Town based out of a number of different departments at the City of Cape Town. The evaluation work on these projects compliments the findings of this report in seeking to widen a knowledge base for the City of Cape Town to consider, plan and fund retrofitting work on a larger scale.

¹ <http://www.eyewitnessnews.co.za/articleprog.aspx?id=24035>

Project Summary

Overall

The project incorporates a R1.9 million investment in the installation of insulated ceilings in the Mamre community. The retrofit project was funded by the Danish International Development Assistance (DANIDA) Urban Fund through the program 'Promoting Resilience of at Risk Communities in Climate Change'.

Contractor Quote: R1.277 million

The remaining amount of the DANIDA Funds was approved by the City to install more ceilings within the community. The selected contractor had to guarantee with bank approval that their company can provide all the necessary materials beforehand. The wages of the 18 to 20 employed workers were paid from the DANIDA Funds.

The project was in line with a number of objectives set out in the City of Cape Town Climate Action Plan that also contribute toward the goals of the Sustainable Livelihoods and Greening unit which led the project²

Objective 1 - City Wide 10% reduction in electricity consumption

Objective 6 - Adapting to and building resilience to climate change impacts

Objective 7 - More resilient low income/vulnerable communities

Objective 9: Local economic development in the energy sector

Partnerships for delivery and evaluation

Housing Department- The City of Cape Town's Housing Department identified the Mamre community as the smallest RPD housing community to implement the ceilings project. The community consists of 400 RDP houses, where only 230 houses were selected. With the assistance from this department, the necessary criteria and drafting thereof became relevant.

Spatial Planning and Urban Design: The City of Cape Town's Spatial Planning and Urban Design (SPUD) Department were responsible for being focused on all the tenders and contractors that will make this project successful. The department monitor and guide the physical and spatial evolving transformation of the City.

Danish International Development Assistance: The Danish International Development Assistance (DANIDA) forms part of Denmark Foreign Affairs which made the initial funds available to the City of Cape Town. These funds were only approved to make use of the specific requirements and themes from DANIDA that provides aid to developing countries.

Expanded Public Works Programme: The Expanded Public Works Programme (EPWP) is part of the government selections of programmes that purposes to provide temporary employment for the unemployed citizens. The Mamre Ceilings Project is a registered EPWP project that successfully reported 18-20 temporary jobs. These workers came from the Mamre community.

Ward Councillors- The roles of the Ward Councillors were to assist with the beneficiary criteria. They are the appointed representatives for the community and their insight and influence contributed great to the selection process.

² [http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Documents/Energy+CC Action Plan project info 2010-08.pdf](http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Documents/Energy+CC+Action+Plan+project+info+2010-08.pdf)

Mamre Community: This project could not become manifested if the community did not participate. Their level of interaction with the rest of the project partners, contributed to the success of the project.

Supply Chain Management: The City's Supply Chain Management Department assisted with the contracts and tenders that were submitted. Part of this department's responsibility is to ensure a sustainable and supply chain in partnerships, hence their involvement in all the tendering procedure.

ICLEI Africa: The partnership between the City of Cape Town and ICLEI could monitor and evaluate the outcome effect of installation of the insulated ceilings, on the Mamre community. Together, this partnership undertook the needed action to increase the community's climate resilience whilst building upon poverty mitigation.

The community

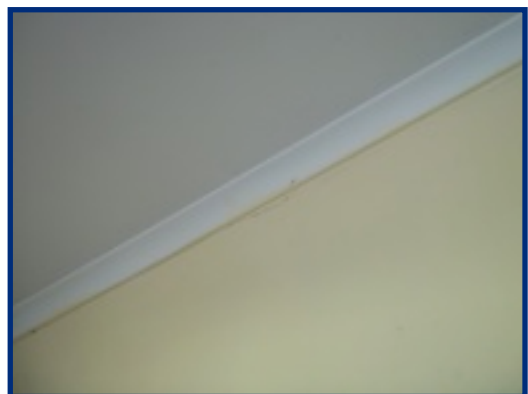
Mamre is a small community on the northern boundary of the City of Cape Town. In its recent history many of the residents of Mamre have suffered from conditions of poverty including a lack of basic housing and access to services. By 1997 the waiting list for the housing of over 500 families began to be addressed and over the proceeding years many RDP homes were built.

Mamre was identified by the City's Housing Department as the smallest RDP community to implement the Ceilings Project in order to ensure a high proportion of the areas was installed with ceilings. The criteria for the selection was included:

- only original owners that resides in their RDP house;
- households that are refurbished;
- households that received free geysers from the Provincial Government of the Western Cape; and
- certain vulnerable groups, such as disabled members, child-head families and elderly members received special preference.

Specification of ceiling:

- Install 50mm glass wool or polyester insulation @ 10kg/m²
- Nailed to 38x50 bracker @ 450 c/c
- Standard electrical fitting for light bulbs
- 38x38mm SA pine battens @ 300mm
- 75mm wire nails
- 5.4mm rhino board
- 32mm Galvanized Nails @150mm
- Fibre adhesive tape
- ± 3mm crestone plaster
- 75mm coved cornice



Methodology

The evaluation research has been undertaken by the City of Cape Town and is supported by ICLEI Africa under the 'Five-City Network to Pioneer Climate Adaption through Participatory Research and Local Action'. Evaluation and monitoring has taken place from before the installation of the ceilings and continues to engage with the community in order to explore the issues and impacts surrounding the intervention. This report is therefore an update in the ongoing research process monitoring the impact of the insulated ceilings in Mamre.

The research has included quantitative research³ that has sought to provide a statistical base for the evaluation. This has meant that the evaluation can measure a number of key issues as the project has progressed (e.g. energy costs/health impacts). It will be important to continue this quantitative monitoring to provide a long term picture of the intervention. The research has also included an element of qualitative research⁴ that has allowed for the research team to move beyond statistics and explore issues with residents in greater depth. This aspect of the research is important as it provides a wider picture of the interventions and allows for a better understanding of people's views and impressions of the project. It has been used to try to understand some of the statistical findings being generated.

The evaluation research can be characterised as a two part process which is outlined below;

Stage one

- Establishment of a community volunteer committee (June 2010)
- Training workshops for community volunteers (July 2010)
- Baseline climate change analysis work by ICLEI Africa (July 2010)
- Survey involving 50 households to develop a 'climate risk assessment' (August 2010)
- Follow up survey of 50 households after retrofitting (January 2011)

Stage two

- Community interviewing with 25 residents (May 2011)
- Survey involving 140 households (August 2011)
- School photography workshops (June 2011)

The evaluation has included an element of participatory research involving the community with training being undertaken by a number of residents to become involved in the evaluation and help shape the course of the work. These positions provided a chance for community members to develop new skills which have been utilised to support a research process that has been orientated around the particular context of the Mamre community. Stakeholder consultation has also taken place bringing the views and in some cases data from a variety of different

³ http://en.wikipedia.org/wiki/Quantitative_research

⁴ http://en.wikipedia.org/wiki/Qualitative_research

professionals (e.g. the district nurse). This has helped to create a more robust picture of the intervention and illustrate the myriad impacts of the intervention.

The evaluation study also draws on other research of retrofitting projects in Cape Town for a range of data particularly around energy efficiency calculations developed during the SouthSouthNorth CDM verification process for Kuyasa and work by Sustainable Energy Africa. The report would like to acknowledge the contribution of groups and organisations based in Cape Town and working around the same agenda in creating a wider knowledge base around these interventions.

Energy

Energy poverty is experienced by households across communities in Cape Town, including in Mamre. For low income households in Mamre this energy poverty means often lacking the financial resources to ensure that there is enough energy to meet their basic needs;

“In my house, we cannot live without energy. The paying rates for the electricity are too high. Every time it increases. We can barely afford our lifestyle. Life is not easy here in Mamre” (interview b)

“The electricity rate is increasing too quickly in this country. The rich will always be in a position to afford buying electricity at the new tariff rates. We as a community really struggle with looking after our own immediate family (Interview d)

Energy poverty is multi-dimensional process that both reflects and reinforces the socio-economic position of the household. Energy poverty thus has a direct influence on the ability of low income households to create a livelihood for themselves. Many households in Cape Town are struggling with alternative, cheaper fuel supplies, dangerous connections and rising electricity prices in order to construct responses to these processes. Communities, households, NGO's and City of Cape Town amongst others have approached energy poverty through a number of different pathways such as the supply of subsidized energy to poor households, a range of retrofitting projects and energy efficiency measures. The following section seeks to understand the impact of the insulated ceiling retrofit in Mamre in terms of how it has addressed issues of energy poverty in the community and the changes in energy practices that this intervention has brought about.

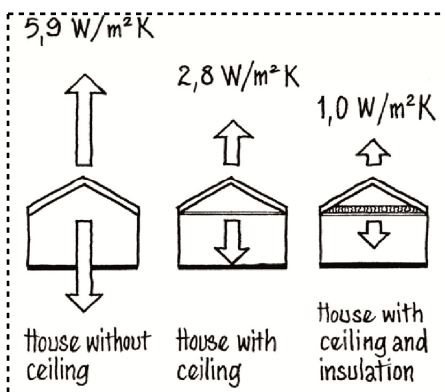
Thermal efficiencies

It has not been within the scope of this social research evaluation to directly measure thermal efficiency savings resulting from the retrofit of insulated ceilings in the Mamre community. However extensive work done by Sustainable Energy Africa (SEA) has explored these issues in detail⁵ and illustrated the thermal efficiency savings that this intervention provides in RDP housing.

Figure 1 shows that a low income house with ceiling and insulation is more thermal efficient than a similar house without a ceiling. The modeled benefits of this intervention suggest that a 70 percent improvement in thermal efficiency is experienced by households. This evidence suggests that households that have received insulated ceilings in Mamre will require less energy to heat their households.

Fig 1: Analysis of thermal efficiencies in low income housing

(Source: Sustainable Energy Africa 'Ceilings Retrofits in Low Income Homes' www.sustainable.org.za)



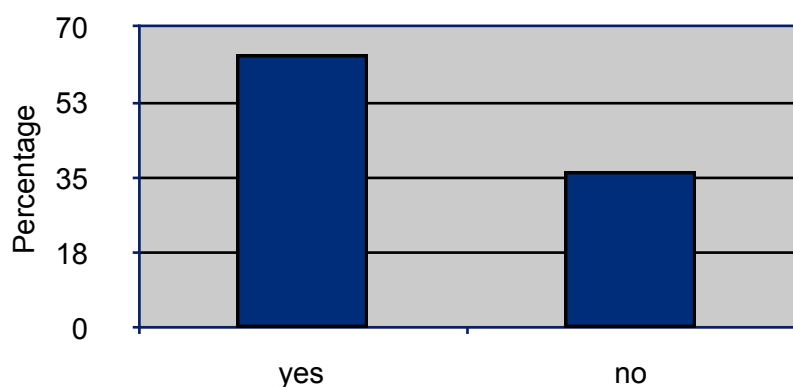
⁵ Available at http://www.sustainable.org.za/index.php?option=com_docman&task=cat_view&gid=28&Itemid=41

Changing energy practices in Mamre

The research undertaken with households in Mamre explored how energy usage in the retrofitted RDP houses has been reshaped by the ceiling intervention and the relationship these changing practices have on household energy poverty. The emerging evidence from Mamre suggests that the ceiling intervention has had a range of positive impacts for low income households.

An important emerging pattern from the research process suggests that the insulated ceiling intervention has reduced the amount of electrical energy required to heat the house in 64 percent of households (see fig 2) and supports the research undertaken by SEA that ceilings increase thermal efficiency in low income housing;

Fig 2: Since the ceiling installation do you need less electricity to make the house warm?



For a number of households (44 percent) this reduction in the amount of electricity required to heat the house has also meant a reduction in overall fuel costs for energy to heat the house (see fig 3). It should be noted that this is not a uniform response with some households using the same amount of energy as before the intervention and a minority actually increasing how much they spend in heating homes.

Fig 3: Would you say this is more, less or the same than you used to spend in fuel for heating before you got the ceiling?

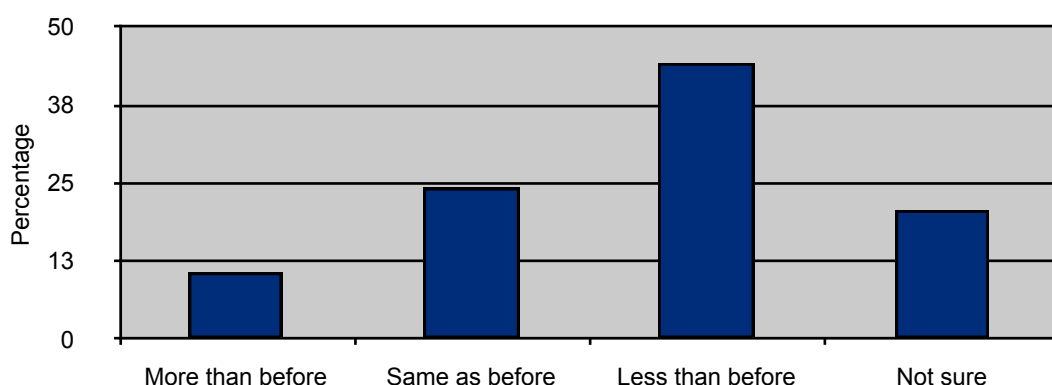
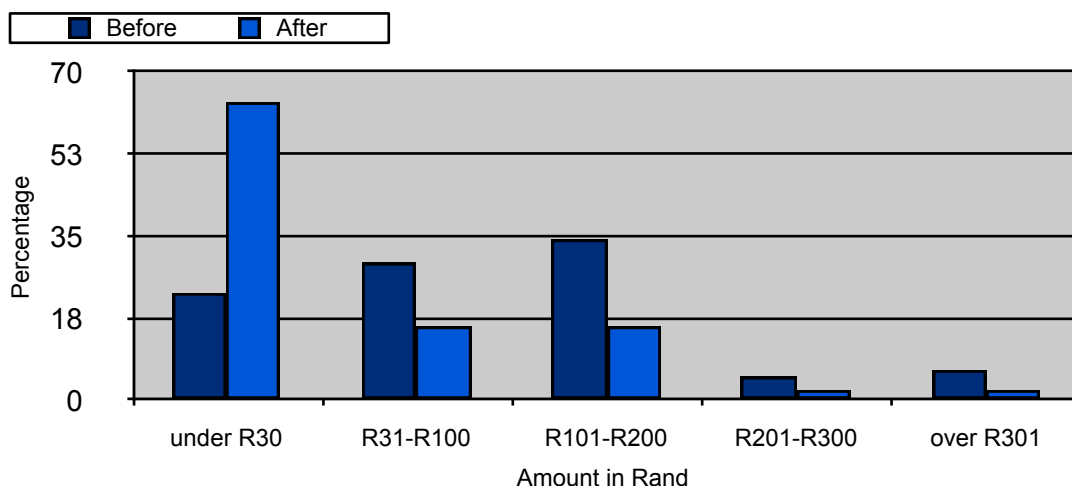


Figure 4 shows the financial impact of these changing practices brought about through the ceiling intervention on the overall amount of money spent during a (winter) month by households in Mamre on energy. The rise in households spending under R30 a month on energy has increased significantly whilst those spending higher amounts (R31-R100, R101-R200 and R201) has decreased. Although other factors may have influenced these patterns (such as climate, worsening household finances etc) this supports the position that the intervention has helped households reduce both their heating and wider energy costs.

Fig 4: What is the overall amount of money spending on energy during a month?

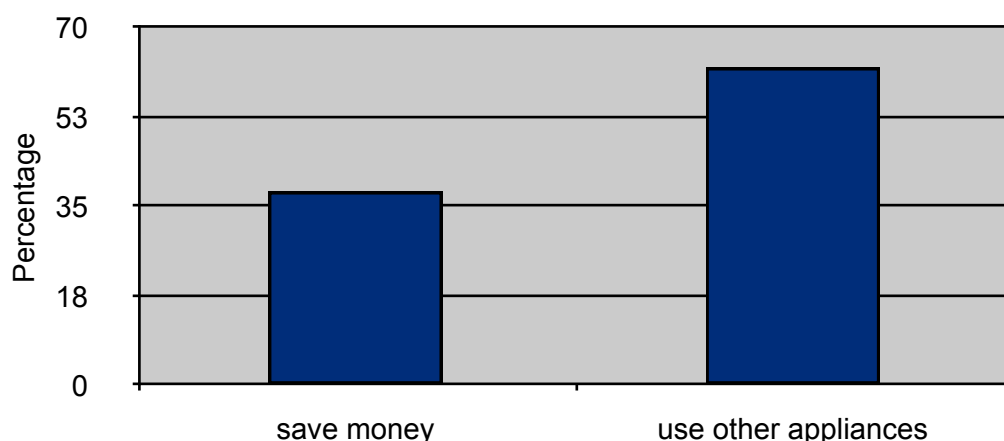


For a significant number of households, that have received the insulated ceiling intervention, overall energy usage, energy used for heating the household or the amount of money spent on energy has not been reduced. This suggests that the Mamre households are also changing their energy practices beyond simply reducing energy usage/costs. One explanation is that energy usage for heating whilst remaining stable is allowing homes to keep warm for longer due to in the increased thermal efficiency provided by the insulated ceilings;

“Using the same amount of electricity as before but lasts longer so can help the house stay warm for longer”(interview n)

For those households that are using less energy for heating the research (see fig 5) shows that for many (around 65%) the energy is simply used for other appliances requiring electricity. Thus households are choosing the ‘take back’ effect in which the financial saving is reallocated within the energy budget to meet the repressed (energy) demand of the household.

Fig 5: if you use less electricity to make the house warm, do you...



For those households that responded to increased thermal efficiency of the house by saving money, representing around 35% the energy savings generated by the intervention are used to support other areas of the household budget thus strengthening the livelihoods of its members;

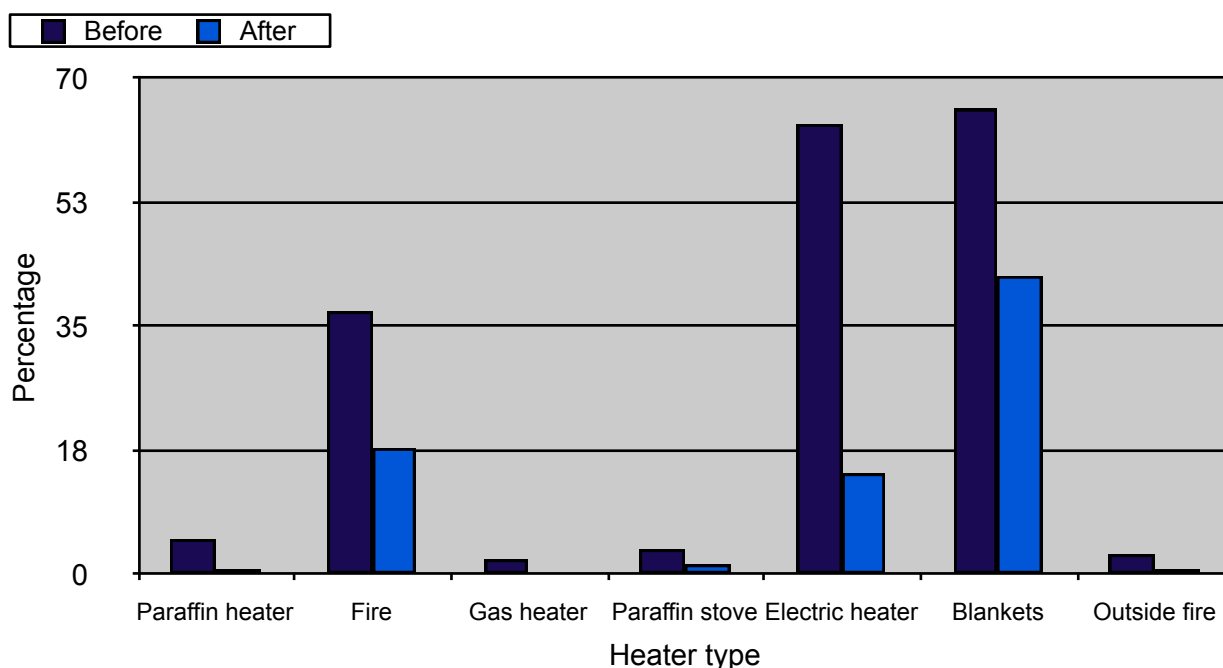
“Don’t use as much electric now after ceiling has been installed so save money - maybe R10-R15 a month which is now spent on food for the children” (interview q)

Many low income households in Mamre have been reliant on heating sources that offer a cheaper alternative to electricity;

“The house is not warm enough. We make a fire outside if it is too cold, we use a fire a lot. The firewood is a cheaper way to keep warm than the electricity”. (interview m)

Households are at risk from a range of impacts caused by these alternative heating sources such as paraffin or outdoor fires. These risks include ingestion by children, burns and fires that can destroy homes. The research process has thus been interested in understanding how the insulated ceiling intervention has changed practices around the type of energy used to heat households. The results (see fig 6) show a significant reduction in all types of non-electrical heating sources being used by Mamre households since the intervention. Firstly, this shows that households are generally staying warmer as alternatives are being used less often. Secondly the data shows an important reduction in energy practices that pose significant health risks for households, illustrated by the reduction in fire to heat houses from 52 respondent households before the intervention to 25 afterward.

Fig 6: How do you heat your household?



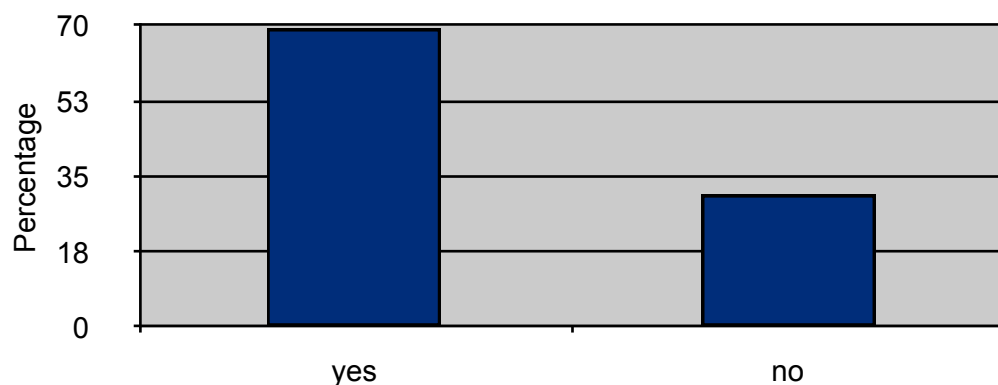
Reflecting on the changing energy practices

Whilst the research has shown the positive impacts the insulated ceilings have had on household energy practices this should not hide the complex and interconnected issues of energy poverty that continue to affect households in Mamre.

Fig 7 shows that nearly a third of households (31%) involved in the ceiling intervention continue to struggle with the costs of energy in relation to current energy needs. Whilst the intervention has supported households in fulfilling some of their energy demands this has not necessarily been enough for vulnerable households to move beyond issues of energy poverty. Energy poverty, despite the intervention, remains a central issue in mediating the economic status and livelihood pathways of low income households in Mamre;

“I get my money once a month and it must last but sometimes don’t have and therefore no electricity so must borrow money. Can’t get through with this money. There are things we must have every time. Other members of the community will feel the same.... Energy is biggest problem in Mamre.”.
(interview p)

Fig 7: Is this enough for your current energy needs?



A note on carbon financing

According to work by SouthSouthNorth⁶ the ceiling insulation intervention in RDP housing saves 1.3 tonnes of carbon per year opening up the possibility of trading this carbon as part of the CDM process with each house generating around 20 Euro’s per annum. This suggests the community could potentially generate R50,000 per annum from its carbon savings by trading on international carbon markets. However the complicated and costly process of verification makes this a difficult task at present and further work is needed in the wider policy community around involvement in CDM processes.

⁶ See presentation by Stephen Thorne www.cdm.unfccc.int/stakeholder/workshops/build_fccc/thorne.ppt

Climate resilience

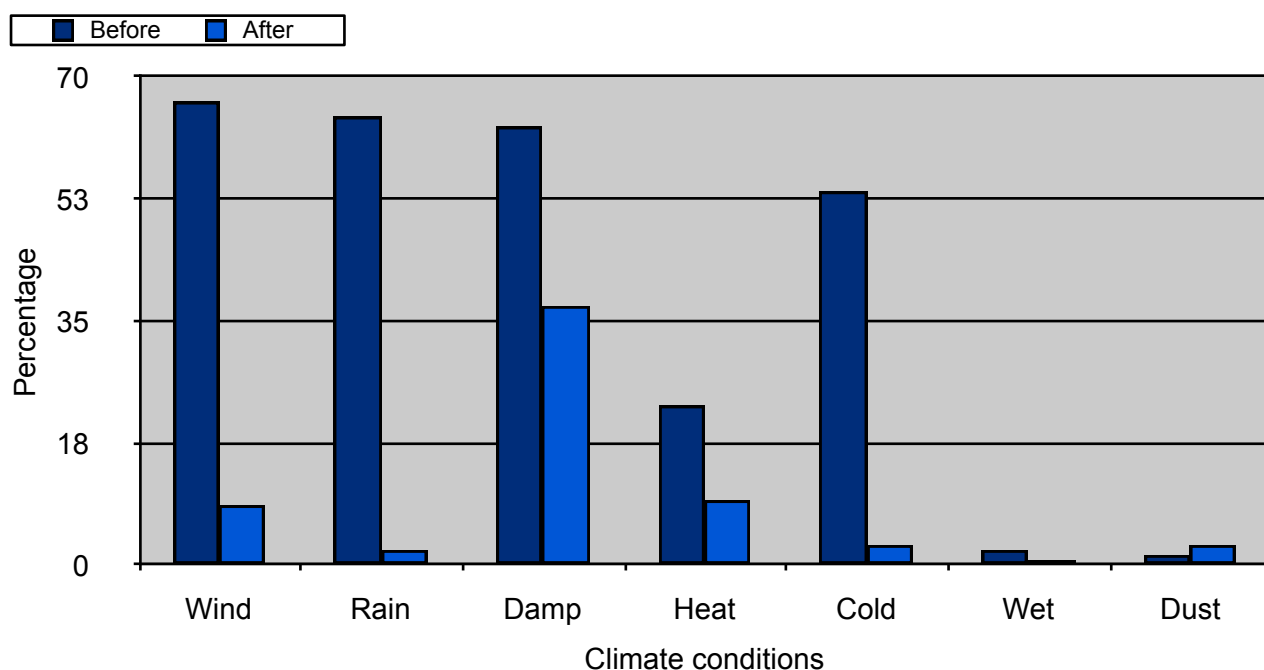
With the community situated within the Southern Cape Condensation Problem Area low income households without adequate climate resilience are vulnerable to conditions of damp and cold, wind and rain. Climate change is expected to have a number of impacts on weather patterns affecting Mamre that could exacerbate the problems associated with the climate of the Western Cape.

These climate processes will increase the vulnerability of the Mamre community..Vulnerability to climate change in Mamre is wide ranging and provides a number of challenges for the community and City of Cape Town that if ignored will compound household poverty and have a negative impact on the livelihoods of the community. As part of this research ICLEI have developed a contextual study⁷ to explore how these climate processes are likely to change, the potential impact on the city and particularly Mamre. Thus it is important to consider how the insulated ceiling intervention has supported a developing community climate resilience at a household level.

Retrofitting resilience?

The research (see fig 8) shows that the ceiling insulation has provided improved climate resilience across a range of climate processes with households experiencing a reduction in impacts across most t

Fig 8; Do climate conditions adversely affect your household?



Households experiencing adverse impacts from wind and rain have dropped from 66 percent to 9 percent and from 64 percent to 2 percent respectively showing the improvements in the overall climate resilience of RDP houses when insulated ceilings are installed;

“We would have had a more difficult time if the ceilings were not installed” (interview a)

⁷ ICLEI ‘Sub-Saharan African Cities: A Five City Network to Pioneer Climate Adaption through Participatory Research and Local Action Baseline Study for City of Cape Town

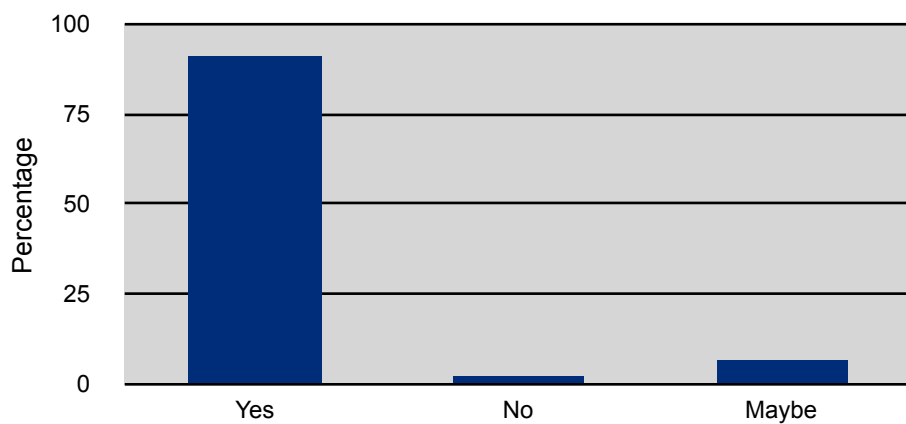
This is particularly pertinent when considering the potential climatic changes that will take place over the next few decades and the potential actions of communities and City of Cape Town in responding to these adaptation challenges.

As already explored in the energy section a significant number of retrofitted households are now able to keep their houses warm during the cold winters for longer periods of time, this is reflected in the reduction, of households impacted by cold weather events, from 54 percent to 3 percent;

“Since we have received the ceilings, our home became warmer” (interview e)

The ceilings also operate to keep the houses cool during summer and many households are now less affected by heatwave’s during the summer with heat described as a problem by respondent households being reduced by 50 percent. Furthermore, fig 9 shows that over 80 percent of respondents feel that the ceilings have helped to control rising temperatures during the summer.

Fig 9: Has ceiling made any difference to the high temperatures in the summer?



Whilst there has also been a significant reduction (around 45%) in households experiencing damp due to the insulated ceiling retrofit this problem, which has a range of serious health implications, still affects a significant number (36%) of households in the area;

“Unfortunately, the rain still came through the walls of our home. I know we are not experiencing the full benefit of the ceilings. The rain water still seeps through the walls which still floods the inside floor” (interview e)

One explanation for this is the failure to plaster all the walls of the RDP housing meaning that although damp is stopped from entering the house via the roof it is still getting in through the walls and providing a serious problem to Mamre households.

Health

Health, climate and energy

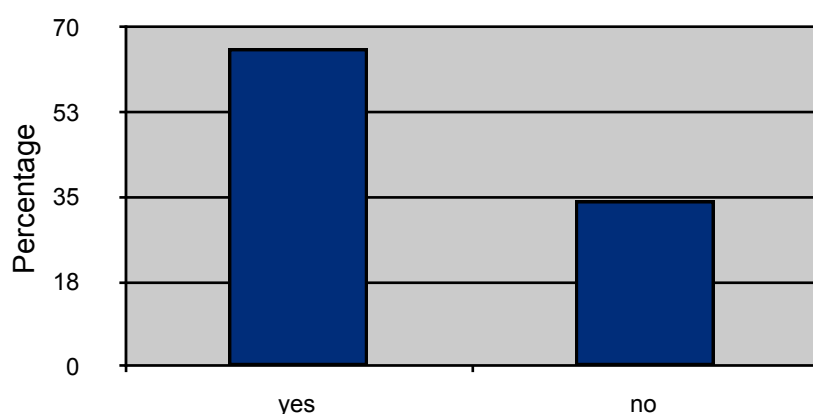
Poor households in Mamre suffer a range of health burdens that create complex and inter-related impacts on the household and wider community. Premature mortality due to chronic disease/illness such as TB, asthma and HIV is one of the biggest problems affecting households in Mamre and the ability of health providers to provide adequate treatment resources due to the high numbers of people seeking health service support. The climate of the Western Cape exacerbates the spread of these different diseases/illnesses with the lack of thermal protection meaning that households are more likely to suffer from many of these health indicators whilst also interacting with conditions of energy poverty and the need to use paraffin or open fires to keep households warm. The retrofit intervention should therefore be considered in terms of its health impacts on the local community as the City of Cape Town and partner agencies consider how to improve health care for low income communities who are exposed to the highest risk in terms of health burdens⁸.

Impact on household health

Overall households have felt that the ceiling has brought improvements in the family health since installation;

“We as a family are healthier than before. There are fewer incidents of chest infections. The ceiling has brought change amongst the community. Before we had the ceilings the Clinic used to be full of patient. Now when I pass the Clinic on a daily basis, I have noticed how the numbers of patients decreased.(interview h)

Fig 10: Have you noticed any difference in the family health since the ceiling installation?



The research has shown (see fig 10) that 67 percent of households have noticed a difference in the family health since the ceiling installation. This is an encouraging result when considering the cost of the intervention and how it has had a significant impact on the health of the community. The interviewing process provided an opportunity to explore health issues in more detail and a number of interesting testimonies were recorded that supported the idea that the ceilings have had resulted in improved health.

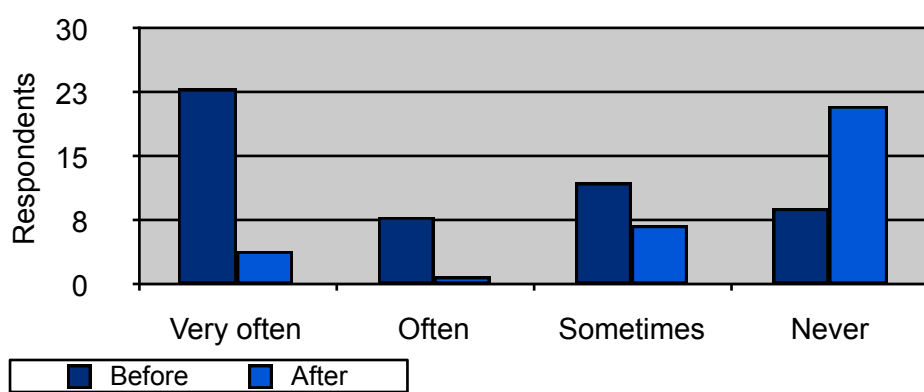
⁸ Kaplan, G.A., Haan, N.H., Syme, L.S., Minkler, M. & Winkleby, M. 1987. Socioeconomic Status and Health. In: Amler RW, Dull HB, eds. Closing the Gap. The Burden of Unnecessary Illness., New York: Oxford University Press

South Africa has one of the most significant tuberculosis (TB) burdens in the world with around 419 cases per 100,000 population⁹. In Mamre this is also a significant problem which is reinforced by the poor housing quality of the RDP houses, before the ceiling installation, with overcrowding, poor air quality and the presence of damp, smoke and mold all factors influencing the spread and outcomes of TB¹⁰. The survey and interviewing both show that TB has been reduced over the period in which the ceilings have been installed (see fig 11);

“Before the ceiling insulation one of my sons had TB but now he is fine. Also we have less colds and flu in the household” (interview r)

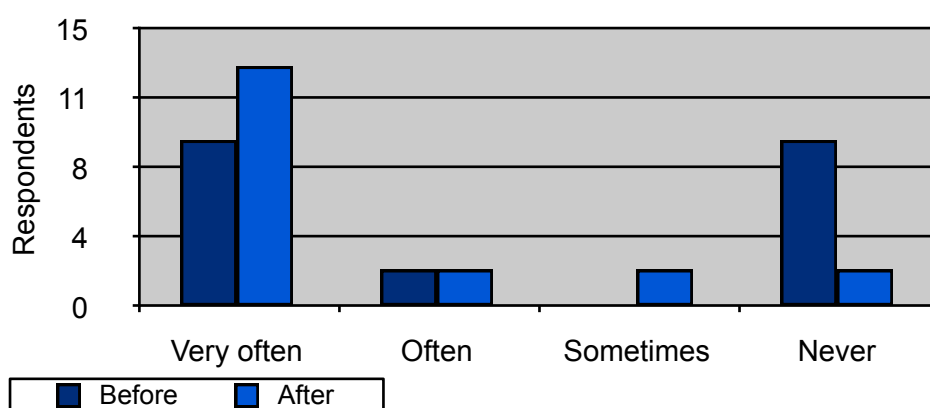
Responding households have recorded a reduction in the frequency of TB, with the data showing households suffering TB very often or often reducing from 31 cases to 5 cases showing the potentially significant impact of the intervention.

Fig 11: Frequency of illnesses in household (per annum): Tuberculosis



Pneumonia is another problematic health burden for the Mamre community. The research (see fig 12) has shown a rise in the cases of pneumonia since the ceiling installation which suggests that households are still exposed to cold conditions (whether inside the house or outside).

Fig12: Frequency of illnesses in household (per annum): Pneumonia



Colds and flu are a common illness particularly in households without adequate thermal protection. Although not often fatal these illnesses have an impact on the livelihoods of households by increasing sick days at work or limiting other economic activities. The research (see fig 13) has

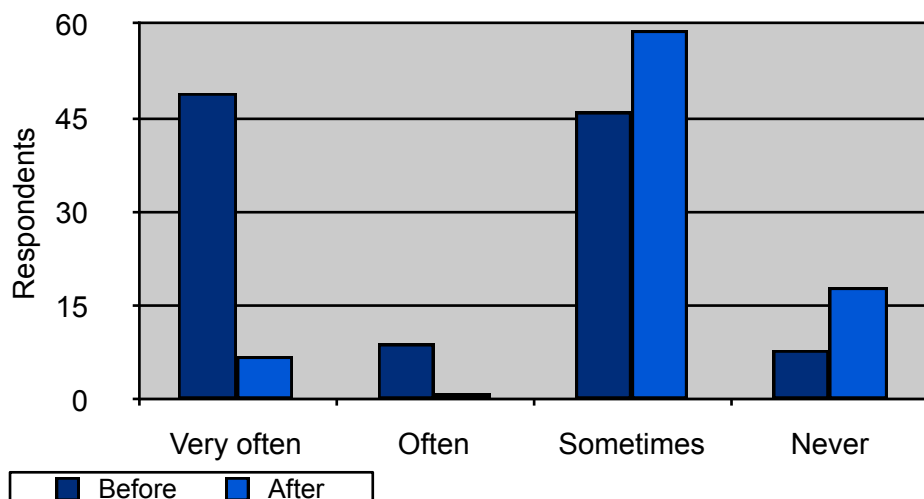
⁹ <http://www.sahealthinfo.org/tb/tburden.htm>

¹⁰ <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/07pdf/acs33-09.pdf>

shown a dramatic reduction in the frequency of colds and flu in households receiving insulated ceilings. This reduction can be seen with households recording a reduction of the illnesses occurring very often from 49 households to 7 households and resulting rises in the sometimes and never frequency categories;

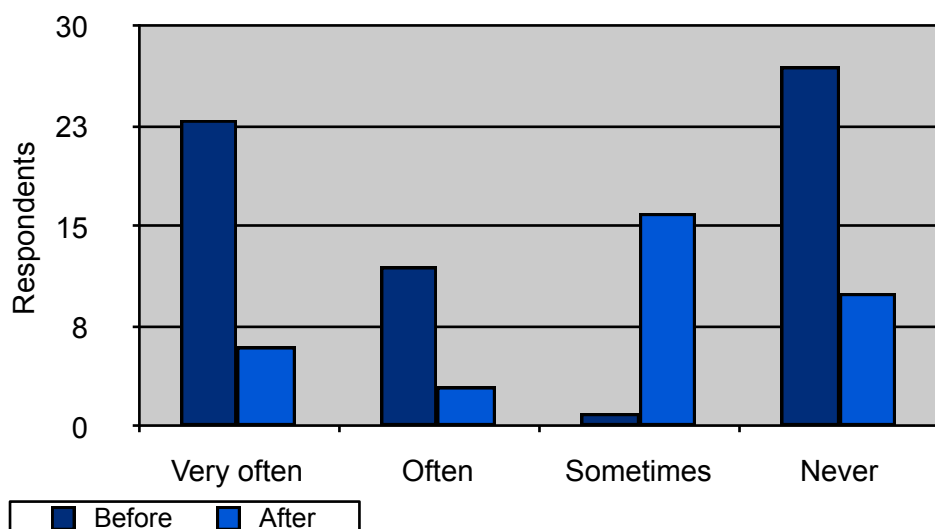
“The children are much better now they used to have colds but not as much anymore”
(interview p)

Fig 13: Frequency of illnesses in household (per annum): Cold and flu



Asthma and wider breathing difficulties are common in low income communities such as Mamre due to the range of factors that impact on the respiratory system such as heating sources (fires, paraffin), bad ventilation in homes, dust and others. Asthma is estimated to effect around 10 to 15 percent of Cape Town’s population, particularly low income communities¹¹. The emerging evaluation data (see fig 14) suggests that the ceilings have contributed to a significant reduction in the frequency of asthma and other breathing difficulties with households recording a frequency of very often reducing from 24 households to 6. This reduction can be accounted for the reduction in alternative heating sources and the increased thermal efficiency provided by the ceilings due the the accelerating effect of cold on the illness.

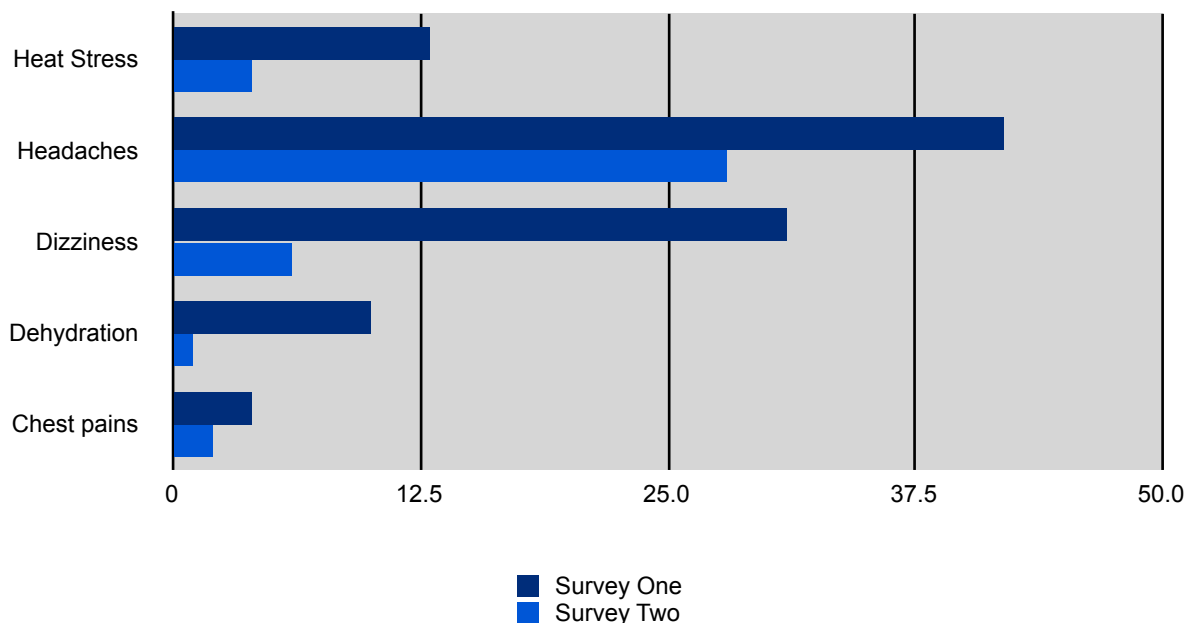
Fig 14: Frequency of illnesses in household (per annum): Asthma and/or breathing difficulties



¹¹ <http://www.mrc.ac.za/chronic/cdlchapter11.pdf>

The research has also explored how the cooling effects of the insulated ceiling impacted on health associated with hot weather and heatwaves (see fig 15). Households suggested that across all areas of bad health associated with hot weather; heat stress, headaches, dizziness and dehydration there have been improved health conditions within households. This illustrates that the ceiling insulation should not simply be considered in terms keeping households warm in the winter but also play a significant role in cooling the houses during the summer.

Fig 15: Respondents with bad (or very bad) health: What are these health issues?



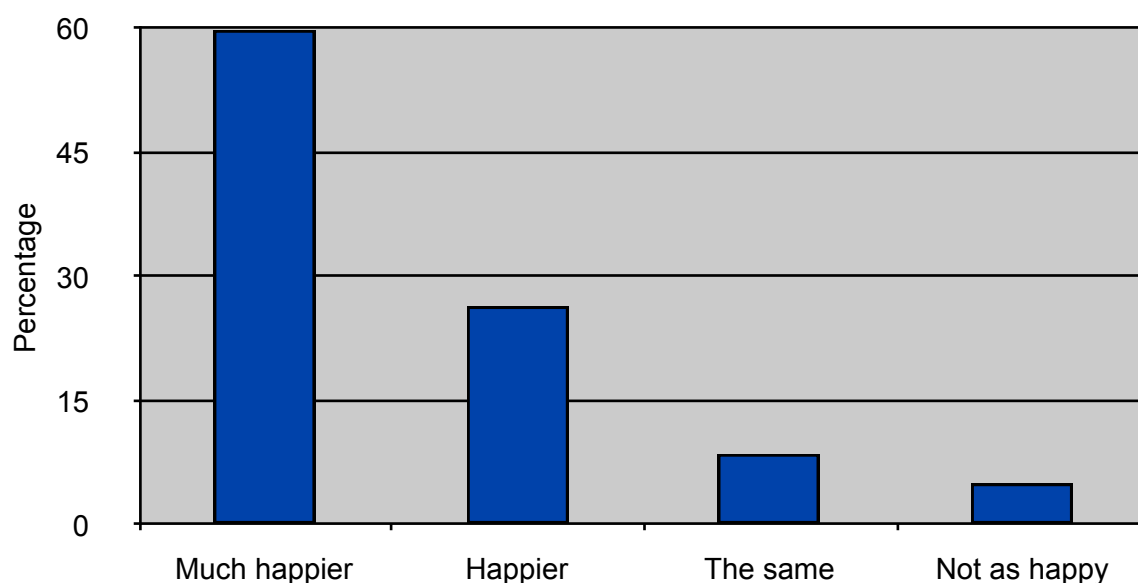
It should be noted that although improvements have been made in the health conditions of a significant number of households involved in the ceiling insulation around 33 percent experienced no improvement. Interviewing has suggested that some of this figure can be accounted for by already existing good household health. Furthermore although the community has witnessed health improvement not all households have been able to experience these health improvements due to the limited financing of the project in being able to retrofit all the RDP houses in Mamre:

“I have three children, one is suffering with a bad chest, its bronchitis with the other one and they suffer with breathing. When his chest is tight I go to chemist. The medicine costs money, it comes from our income, its not for free. I can’t say how much it always costs but the medicine can cost around R300. During the winter this happens mostly. If they are sick they must stay at home which has impact on their schooling. In the winter it is cold, we can feel it coming inside, I worry my boy has TB or something wrong with his lungs. We use blankets to keep warm as the electricity costs a lot of money and we cannot afford it (interview I - no ceiling)

Psychological health

Low income communities do not just suffer increased physical health burdens by also suffer from a range of psychological health impacts due to a range of factors such as ongoing poor health, stress and crowded living conditions. The research (see fig 16) has explored whether the ceiling has had any impact on the pschylogical health of households in Mamre.

Fig 16: Do you think the ceilings have made your household...



The results show that 86 percent of households are not happier or much happier showing the importance of improving housing conditions of low income communities. Other factors which could explain this improved happiness were suggested by residents beyond the thermal efficiency/ improved health experienced by the household and included aesthetic reasons and working alongside a pro-active municipality;

“The installing of the ceilings are a good starting point for upgrading RDP homes. We have not asked for this but we are so grateful. The City of Cape Town did a splendid work in rebuilding the confidence within the community. I can safely say, to a certain extend they have restored a level of pride back to the community” (interview g)

Valuing better health

The financial savings of better health in the community through the retrofit intervention can be measured in a number of ways including looking at the impact on the livelihoods of the households, which is explored in the next section, as well as the direct medical costs of treatment. For example the cost of TB treatment costs R400 for the drugs used (rising to R24,000 for multi-drug resistant strands) ¹² as well as running of medical facilities, staff costs etc. Further work is need with local health workers to better assess how the ceilings have reduced the costs of health services in the Mamre community.

¹² Department of Health <http://www.doh.gov.za>

Livelihoods

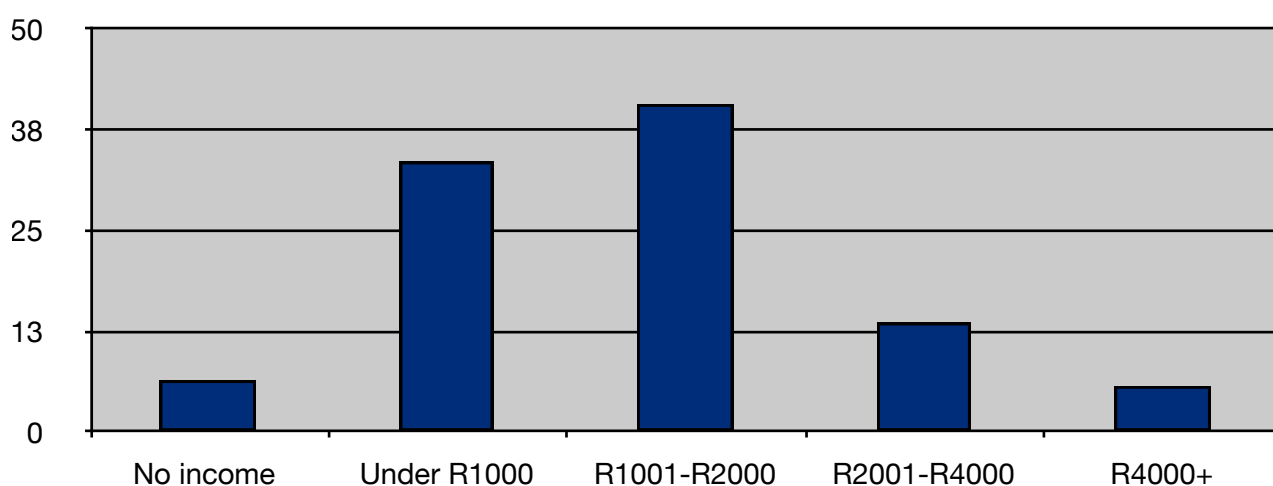
“The community as a whole are poor. We have to stand together and help one another to sustain ourselves. It is not easy to live within this community, but we have no other choice. There is no other place for us to go. I feel that we are stuck in this area and nobody cares about what we are going through.(interview g)

Livelihoods, that is the means in which people secure the necessities in life such as energy, water or economic opportunities will be affected in many ways by this inter-related set of vulnerability processes around energy, health and climate. For many of Cape Town's residents their livelihoods are often precarious and prone to disruption meaning conditions of poverty are reinforced and making life more difficult for poor households to create sustainable livelihoods that provide basic needs.

The first survey undertaken with the community before the insulated ceilings retrofit explored the livelihood context of households undergoing the intervention. The households involved in this retrofitting intervention can be classified as low income although it should be noted that with permanent homes Mamre residents have asset bases and basic services not available to citizens living in informal housing conditions. The employment rate is low with statistics showing 50% unemployment within homes and from the remainder 50%; only 40% of these households have one member bringing in an income. The survey illustrated that houses receiving an income receive monetary resources from either a disability fund (31%), contract income (20%), permanent work (17%), seasonal work (9%) amongst others.

Research (see fig 17) has shown that the around 85 percent of households survive on under R2000 per month putting severe strain on extended families residing in these homes and reinforcing the findings from the first stage of research that show the households in RDP housing in Mamre struggle with conditions of poverty.

Fig 17: Total monthly income of household



The intervention

The first consideration when considering the livelihoods impact on the project is to analyse how the project had direct economic benefits for community members involved in the implementation of the work. The inclusion of local labor was a key specification for the public tender and a local team was assembled and trained to carry out the works bringing substantial temporary benefits to twenty households in terms of generating income:

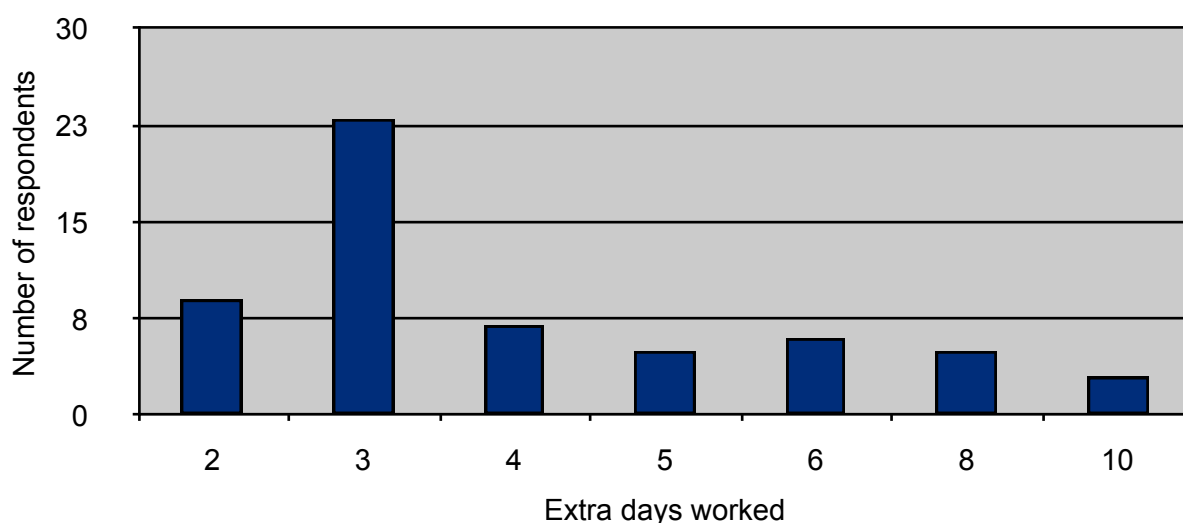
“We made sure they use local labor with four teams of five people that were employed. Some of these people are now employed in other work whereas before they knew nothing now they work in private installations in other areas so good long term benefit. Currently there are eight guys who are now competent to do the job and can go out on their own and do the job. They could help the CCT in other places, also they are learning thatching skills so expanding their skills. This is regular work, now earning R750 a week”.

A legacy of this project implementation has been the long term employment of eight of these workers who are continuing retrofitting in the wider Atlantis area whilst also learning new skills. These jobs mean that over R250,000 per annum is now being earned by members of the Mamre community as a direct result of the training offered during the intervention.

Supporting livelihoods

The intervention has also supported livelihoods in Mamre through the improved health in the community. As explored in the health section households have experienced significant improvements in their overall health levels. This means that households are spending less time with ill health and this has an impact on their ability to sustain livelihoods. The research explored how these health impacts have supported livelihoods by seeking to understand what benefits have been derived from this improved health status. Fig 18 shows that households are experiencing less sick days from work compared to before the intervention. The cumulative figure of 246 sick days (over the course of the year but particularly winter) from work has been saved due to the improved health of households, with 82 households (out of 140) experiencing some improvement in extra days in work.

Fig 18: What difference has this (improved health) made to the household in terms of reducing sick days off work

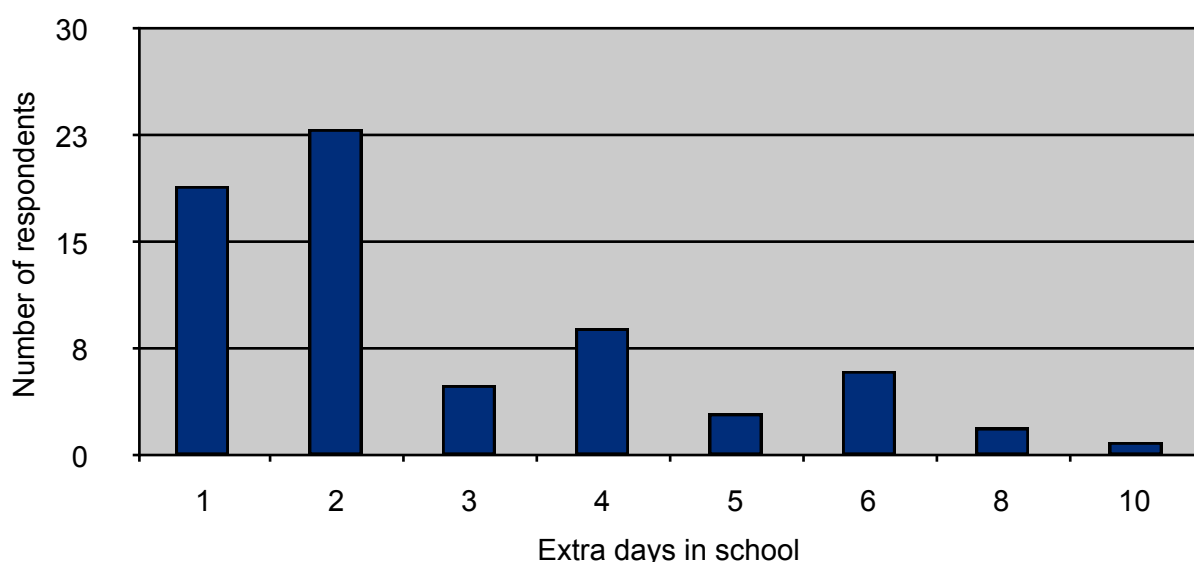


The research has attempted to construct a financial estimate of the economic impact of the extra days worked by the community. For an employed person the research assumes a figure of R150 per day based on the wage of a day laborer in Mamre whilst acknowledging this to be a minimum

amount, potential health protection from employers and high unemployment in the study households. Therefore according to these calculations an extra R36,900 has been generated by households being able to work extra days due to health improvements over the last year.

The improvement in the health of households and its impact on the extra days worked, that have been saved, are also reflected in the extra days at school that children and young people are able to participate in. The research (see fig 19) shows that 193 extra days of school have been attended by children and young people in Mamre over the last year due to the improvements in community health that the ceilings have offered. Over 70 households responded to this part of the research showing the important impact on education that the intervention has had. A number of study's¹³ have attempted to consider the economic costs of lost school days due to bad health but this is problematic within the South African context and requires further detailed research. However it is worth noting that Days off school due to bad health can result in parents having to take time off from employment or other economic activities.

Fig 19: What difference has this (improved health) made to the household in terms of reducing sick days off school



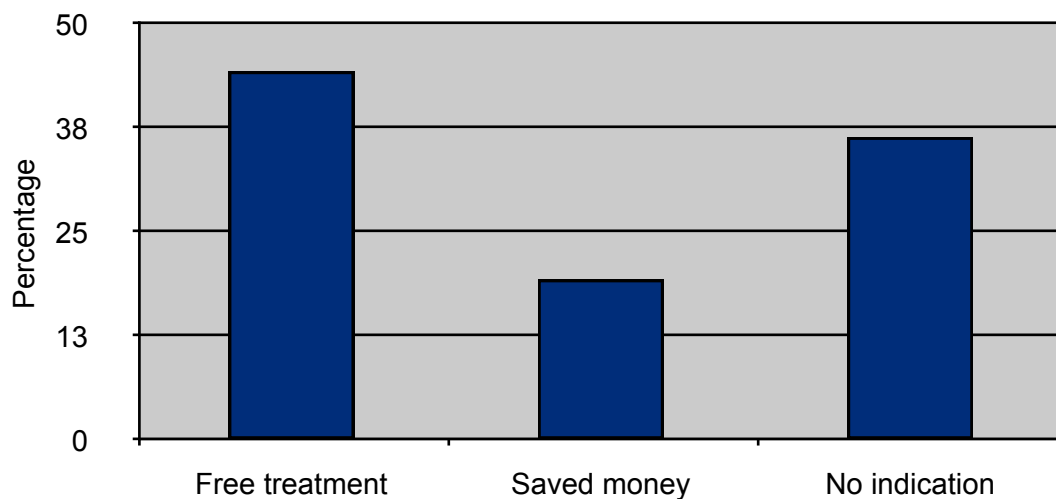
Livelihoods, through the ability to go out and earn income or through improving life chances by attending education, can thus be considered to have improved as a direct result of better health in the community.

The research was also interested to see if there were any direct financial savings on medical costs which can often act as a stresses on the sustainability of a households livelihood. Around 20 percent of respondent households (see fig 20) reported a saving of medical costs resulting from improved household health with the highest proportion of respondents saving around R250 an annum. The research has recorded a total of R6,070 saved by households in Mamre on medical costs over the last year which can therefore be directed to supporting other livelihood issues within the household.

¹³ Wylie C, Hipkins R. On the edge of adulthood: young people's school and out-of-school experiences at 16. Wellington: New Zealand Council for Educational Research, 2007.

Moonie S, Sterling A, Figgs L, et al. The relationship between school absence, academic performance, and asthma status. J. of School Health 2008;78(3):140–8.

Fig 20: What difference has this (improved health) made to the household in terms of reducing sick days off school/work reducing medical costs



For many residents in Mamre free treatment provided by the medical clinic means that the costs are not directly attributable to the households. However it should also be considered how the improved health of the households has meant less financial and resource pressure for the local clinic. As discussed in the health section ongoing discussions with health practitioners in the community should be continued in order to build a detailed picture of health savings.

Reflecting on livelihoods

Reflecting on the direct impact on livelihoods of the retrofitting works it is therefore possible to suggest that the ceilings have provided a range of livelihood improvements for households by improving the human (health), social (training, increased educational attendance), physical (improved housing) and financial (jobs) capital assets of households and the wider community.

Additionally, the project implementation itself has provided 20 short term employment and training opportunities for the community, many of whom experience short and long term periods of unemployment. The foresight and vision of the community management team has built on this opportunity to develop eight full time jobs from this training which has generated further income for households in the area with this income then being spent in local shops further amplifying the impact of the financial investment by the City of Cape Town.

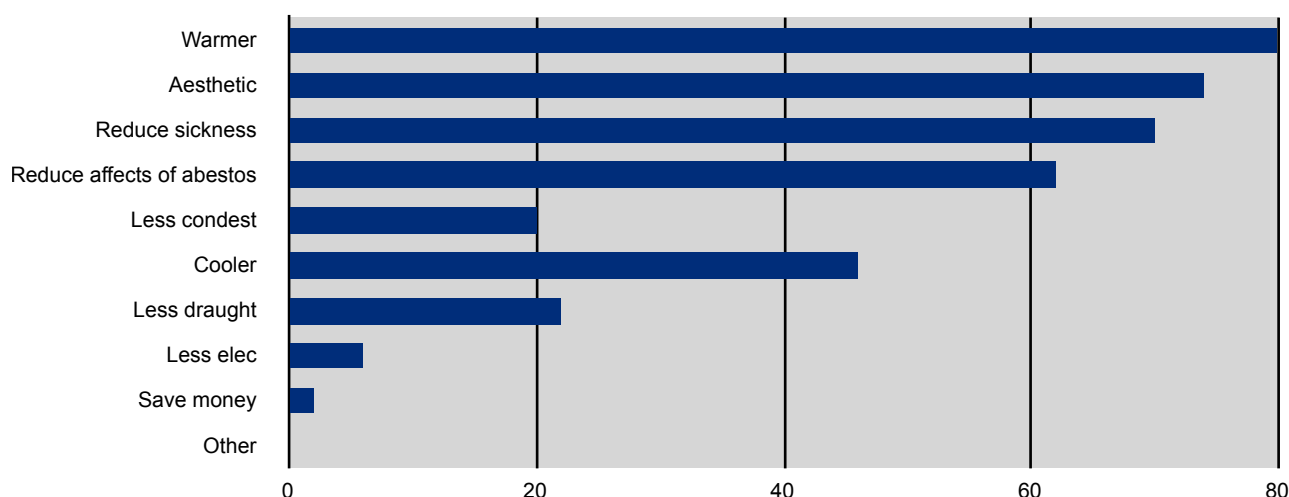
Project delivery

It is important to evaluate the delivery of the project in the community for a number of reasons. Firstly, the Mamre ceiling insulation is acting as a pilot or experiment in retrofitting for the City of Cape Town and is intended to provide a case study to reflect on the lessons learnt during the delivery and implementation of the project. Secondly, the project will act as a model for upscaling this retrofitting work and thus provides an important tool for attracting further financing, developing delivery models etc and the need to show a successful implementation of the project is important in taking forward this work. This next section seeks to reflect on how the project was implemented and how improvements can be made in future.

Community expectations

Due to the engagement and participation of the community during the earlier phases of the ceiling retrofit residents were aware of the role of the ceiling in the house and developed a number of expectations around the impact of the intervention in their household.

Fig 21: before you received your ceiling, how did you think it would benefit your home?

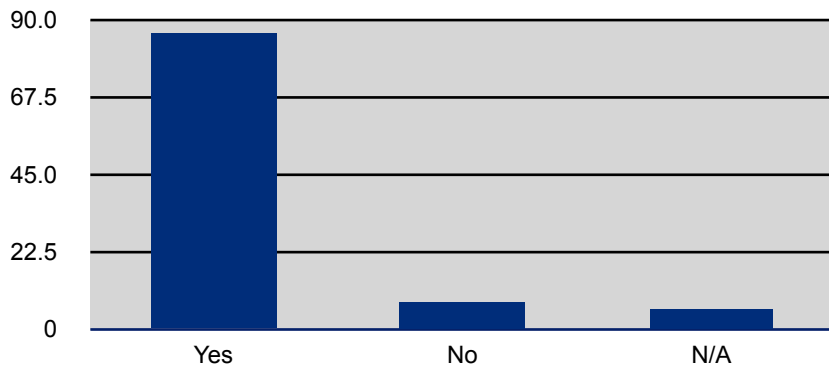


Around 80 percent were expecting their house to be warmer and the research has show that the project has achieved these and other expectations;

“The instillation of the ceilings was worth every cent. We are healthier than before. The level of asbestos dust does not affect us anymore. We are so glad that we do not have to look up to the roof during the winter season. The rain does not affect us that mush. I will recommend that whoever considers to expand on the ceilings project, will build on a great reputation”. (Interview d)

Overall nearly 90 percent of respondent households felt their expectations were met by the project

Fig 22: Were you expectations met?



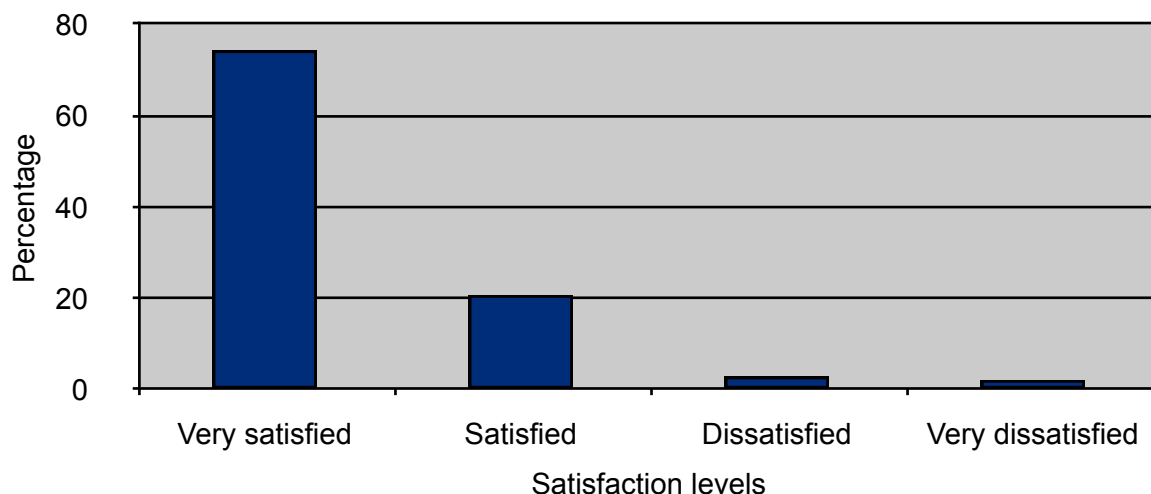
Households that had received the ceilings were grateful whilst calling for a roll out of the project to those households that had not received the

“The installing of the ceilings are a good starting point for upgrading RDP homes. We have not asked for this but we are so grateful. The City of Cape Town did a splendid work in rebuilding the confidence within the community. I can safely say, to a certain extend they have restored a level of pride back to the community” (interview g)

Delivery

Only a couple of households were not very satisfied or satisfied according to the research (see fig 23). Overall the retrofitting of insulated ceilings in low income homes in Mamre has been well received by residents who have been able to express the myriad of ways in which the ceiling has helped support the household.

Fig 23: Are you satisfied with ceiling?



Furthermore those without ceilings have witnessed the transforming impact of the intervention on their neighbors and have made calls for further retrofitting work in the community. This illustrates that the ceilings can make a real difference to households and the need to ensure that other Mamre households are also able to retrofit insulated ceilings;

“I have three children, one is suffering with a bad chest, its bronchitis with the other one and they suffer with breathing. When his chest is tight I go to chemist. The medicine costs money, it comes from our income, its not for free. I can’t say how much it always costs but the medicine can cost around R300. During the winter this happens mostly. If they are sick they must stay at home which has impact on their schooling. In the winter it is cold, we can feel it coming inside, I worry my boy has

TB or something wrong with his lungs. We use blankets to keep warm as the electricity costs a lot of money and we cannot afford it (interview I - no ceiling)

Areas for improvement

During the interviewing process a number of households who were not selected were invited to express their views on the selection process and their wider thoughts on the ceiling installations. There was a certain level of anger amongst those residents who came to speak particularly from those who had already invested in their houses and were thus ineligible for the retrofitting work;

“I was very upset, other people who were working but due to my husband working they said we couldn’t get it as he is bringing in too much money to qualify - is it right? Could have been a fairer process by handling us the same, people don’t know my household circumstances, how could they? (interview i)

“My house wasn’t for free, I had to pay R12,000. Anything that happens is with the people that get it for free. Wouldn’t invest in a ceiling now as other people have it for free. The process was unfair especially to those who paid money for the house. I feel that they will never come here again and there are still a lot of people who didn’t have ceilings.”.(interview I)

For other non selected residents seeing certain households that had already received a retrofit of a Solar Water Heater from the Provisional Government and then receiving an insulated ceiling was viewed as being unfair. Further work is needed to ensure that the selection process is as fair as possible;

“I am fortunate to have the solar geyser in my house. Obviously I was not on the list, but I knew those in authority to give me a geyser. My neighbors complained” (interview e)

Although overall households felt that the installation was implemented in a sensitive and professional way there were a number of complaints about various aspects of the work including the workmanship of the plastering and the mess left by the work teams.

“I only have one concern. Those who installed the ceilings made a huge mess in my house. At the end we had to do all the cleaning ourselves”. (interview e)

Conclusion

This report has provided an update in the ongoing evaluation process resulting from the retrofitting of insulated ceilings in Mamre. The emerging results suggest that improvements in a number of key themes: energy, climate resilience, health and livelihoods have all been recorded.

For energy:

The household surveys and community interviews have shown the impact on energy usage and poverty in retrofitted RDP houses in Mamre has been significant in many cases. Thermal efficiency appears to have increased significantly with households requiring less energy to heat the space thus creating a range of new energy practices. These include households needing less energy to heat their home resulting in overall energy savings that are either used for heating the home for longer, redirected toward repressed demand from other energy appliances or converted into financial savings. Furthermore, the intervention has had a significant impact on the use on non-electrical heating sources with significant reductions in hazardous practices such as fires.

For climate resilience:

Overall the insulated ceiling intervention can be considered to have significantly improved the climate resilience of the RDP houses in Mamre by providing warmth and protection from the rain in the winter and acting to cool the households during the summer. This does not mean that the houses can now be considered 'climate resilient' as the high numbers of households still experiencing damp as a problem can testify.

For health:

Significant health improvements have been recorded by households since the installation of the ceilings in both the summer and winter since they were retrofitted. The improvement in health can be seen as encouraging and support the wider findings around improvements in energy, climate resilience and livelihoods which are all directly connected to the health status of the households. Thus the relatively low cost of the intervention can be shown to have had value in terms of reducing overall health burdens and the attendant financial burdens that come with bad health.

For livelihoods:

The ability of low income households to support sustainable livelihoods is affected by complex and multiple conditions of poverty and the services provided by the City of Cape Town. The research has shown that the insulated ceiling intervention in Mamre has created a range of impacts around the ability of households to go to work and generate income, to attend school and receive an education and in some cases save money on medical costs. Together these findings show that the intervention has provided an extra level of protection for low income households as they seek to improve their livelihoods.

Reflections:

The challenge for communities and the City of Cape Town to respond to myriad and connected issues such as climate change, energy poverty and sustainable livelihoods means that pilots such as the Mamre ceiling insulation project are important when considering the retrofit pathways which the city travels upon. These landscape pressures thus create and shape the wider socio-technical pathways from which retrofitting is emerging in a myriad of different ways. For the City of Cape Town further experimentation and pilot projects are important to help inform policy makers about how to support low income communities within a framework of limited financial resources. Poverty remains one of the city's biggest challenges and interventions such as insulated ceilings may provide a way to approach the multifaceted nature of economic disadvantage experienced by communities such as Mamre.

What the Mamre project has shown is that for a relatively low investment the City of Cape Town have been able to respond to a variety of wider pressures facing communities. Furthermore, the Mamre project has provided valuable lessons in how to implement such a project (such as local labor stipulations, community evaluation etc) with the research providing a robust evidence base in which to consider how to upscale this retrofitting project to more low income communities in the city. This brings its own challenges such as how to finance such upscaling, (with the CDM process a potential pathway for financing these projects), where this work lies in relation to other priorities (such as the need to provide housing for thousands of citizens) and how to deliver such works on a wider scale.

Next steps:

The evaluation process is ongoing and further research is needed to support the emerging findings. Partnerships with a number of key agencies should be developed. These include the health practitioners in Mamre to correlate and analyse health data to provide a more robust picture of health improvements in the community. Also work with an organisation such as Sustainable Energy Africa or SouthSouthNorth would help provide a more robust analysis of the thermal efficiencies of the insulated ceilings and provide technical data on energy performances etc.

The community have helped the research considerably by actively participating in the planning and implementation of the data and further engagement and communication is required in order to support their continued involvement in the project.