

TRADE-OFFS BETWEEN COMMUNITY PREFERENCE; ENERGY AND ENVIRONMENTAL PERFORMANCE; AND PASSIVE AND ACTIVE SURVEILLANCE AS A DETERRENCE TO CRIME IN GOVERNMENT ASSISTED HUMAN SETTLEMENTS

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ABSTRACT

The paper analyses the trade-offs between big street-facing windows in the historical context of passive surveillance; and passive solar design in government assisted human settlements. It challenges the assertion that these are two mutually exclusive specifications. It introduces the concept of *cost optimisation* with regards to community stakeholder management and assertion of historical preferences in the face of new sustainable human settlement guidelines including health, safety and energy efficiency standards.

Keywords: energy efficient buildings, government housing, cost optimisation, passive solar, town planning, passive surveillance, crime prevention.

1. INTRODUCTION

The paper explores one of the challenges faced by the Witsand iEEECO Human Settlement project management team who are tasked with the development of the nation's first scaled sustainable government assisted Greenfield benchmark project near Atlantis in Cape Town. The topic addresses one of the challenges associated with meeting the aims of new sustainable development concepts driven by international, national and city green building guidelines in the face of historical perceptions related to street layout and housing designs.

It has come to our attention that historical South African human settlement and town planning design principles, regarding the desirability of *street facing houses*, are to a large extent driven by notions of *crime risk reduction* and *passive surveillance* [1]. These principles, reinforced by stakeholder perception, may, however, have unintended negative consequences for sustainable interventions linked to passive harvesting of solar energy, environmental and related long-term health and safety benefits. These challenges were uncovered while implementing Phase 2 of the Witsand iEEECO Human Settlement project in Atlantis, near Cape Town (Fig. 1), after a long delay in the approval process of the Phase 2 business plan.

The authors provide a number of considerations for town planners and implementing agents and offer a response to the following question, "Is the risk of crime and/or

personal preference for "*big windows facing the street*" adequate reason or justification to allow government funded housing to be exempted from proven energy, environmental, health and safety specifications and requirements linked to optimisation of passive solar benefits?" Orientation of the building is also linked to the layout of the rooms. Large windows facing the street can place the family room on the south side of the building away from natural lighting and optimal solar heating benefits.

Finally we suggest measures that can be taken to assist government, construction service providers, and family beneficiaries, to adapt to the healthier, energy efficient, and environmentally sound iEEECO™ Model and other sustainable human settlement planning and housing design innovations.

1.1 BACKGROUND

Integrated Energy Environment Empowerment – Cost Optimisation (iEEECO) is an inclusive, community driven sustainable human settlement development and implementation methodology introduced by PEER Africa and the Kutlwanong Integrated Housing Trust (KCIHT) in 1996 [2]. The aim of iEEECO is to empower communities to take ownership of the sustainable development process and to assess the trade-offs linked to the introduction of sustainable development policy in the government-assisted, affordable human Greenfield development sector. This consultative process is intended to yield a more sustainable and supported human settlement that can unblock or avoid community rejection of the entire sustainable development project.

1.2 LINE OF SIGHT

As a benchmark project, the Witsand iEEECO Human Settlement is a live research, development and demonstration project that seeks ways and means to help poor and informal settlement communities adapt to a new paradigm linked to a transition from the business-as-usual approach toward healthier, environmentally responsive human settlement development methodologies and technologies. In the course of this benchmarking effort, a number of barriers are being identified. One of the important aspects of this paper specifically deals with the challenge of stakeholder adaptation linked to historical

traditions and “personal preference” town plans that do not optimise building orientation to the sun. The second aspect looks at stakeholder preference for traditional township street layouts for “*big windows and verandas facing the street*”¹.

These issues are discussed at a practical level, which exposes the challenges of normal government delivery of basic services issues, while overcoming barriers associated with town planners, home owners and some community members in government subsidized human settlements, who desire to maintain traditional street layouts and historical house designs. The project facilitation and stakeholder management process is contextualised by understanding that there are community expectations of free, single, standalone houses “with big windows facing the street” on both sides of the road for every family in the settlement. It goes without saying that anything less than this expectation will cause resistance. The resistance can literally cause the entire project to be blocked by the community regardless of the long-term benefits of passive solar design, hence the need for a cost optimisation/trade-off assessment process.

1.3 HYPOTHESIS

It is our proposition that the iEEECO(tm) program, as implemented in the Witsand iEEECO Human Settlement project, enhances *passive and active surveillance*, while also providing optimal free passive solar renewable energy to warm, cool and provide free natural lighting in certified iEEECO houses. A unique feature of the Witsand settlement is that almost 100% of the dwellings have a north (sun) facing orientation (in Phase 1). This position is drawn in part because of the overall participative design and community engagement processes (for Greenfield development) that were completed at the time of the launch of the Phase 1 pilot project (400 homes) in 2004. It is also supported by the consultative approach taken by the City Northern Region Project Coordinator who is able to speak Xhosa and who is effective at relating to the community along social and cultural lines. Finally the development has the support of the majority of informal dwelling residents, many of whom have been waiting for houses for over ten years and have a pent up frustration for the delivery of a nice looking, free, standalone house, regardless of the technical details. In the eyes of these residents, speed of delivery is of greater importance than any other consideration.

The high density town plan and the active community engagement (Peoples Housing Process/self-help model) workshops for building houses in turn reduces the risk of crime, in comparison with existing sprawling informal

¹ The term “*street facing*” is ambiguous, but for the purpose of this report shall mean large windows and/or main entrances on the street side of the building. We also include the scenario that the lounge/living room is also situated on the street facing side of the building as an additional option under this scenario.

settlements, and the status quo township design principles, which do not include iEEECO features and are not based on active and intensive community participation from the design stage onwards.

Firstly, we must state that there is no published evidence that iEEECO as an implementation methodology, contributes to a decline in passive surveillance (leading to an increase in the risk of crime) - quite the contrary.

In the following sections we investigate some of the trade-offs and explore the proper context and repositioning of passive surveillance and street facing windows in the context of the modern South African sustainable integrated human settlement paradigm.

2. ADAPTATION CHALLENGES AND COST OPTIMISATION

What are the project management and implementation challenges observed and what are the trade-offs?

In many ways the issues raised in this paper can be considered as a technological methodology challenge or technology transfer barrier. The United Nations Intergovernmental Panel on Climate Change (IPCC) Working Group III offers a formal definition for the local issues uncovered in Witsands [3]. They define technology transfer as the following:

“...a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research /education institutions. Therefore, the treatment of technology transfer in this report is much broader than that in the UNFCCC or of any particular Article of that Convention. The broad and inclusive term ‘transfer’ encompasses diffusion of technologies and technology cooperation across and within countries. It covers technology transfer processes between developed countries, developing countries and countries with economies in transition, amongst developed countries, amongst developing countries, and amongst countries with economies in transition. It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies.”[4]

So, in fact, the challenges are technological methodology issues linked to the additional effort needed to improve the overall performance and level of service provided by the business-as-usual human settlement. It also includes the very important perceptions and “mindset” for individual householders, politicians and government officials to be able to adapt to the iEEECO human settlement approach. A list of the related discussion

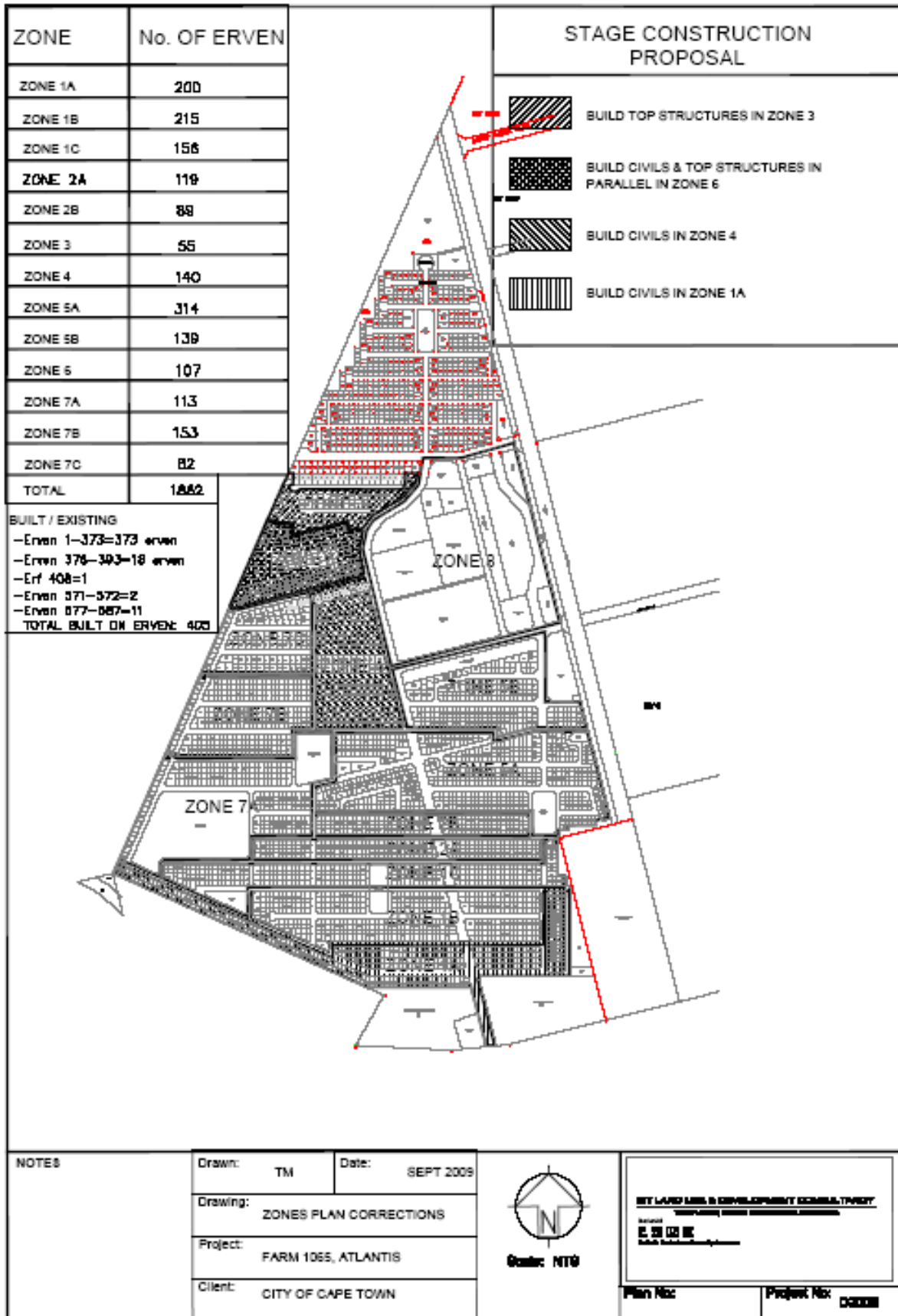


Figure 1. Witsand iEEOCO Human Settlement Town Plan

topics linked to *adaptation of sustainable development methodologies* are listed below:

a) *Policy*: There is incremental government funding made available via a “top up” subsidy for this specific climatic region known as the Southern Coastal Condensation Problem Area (SCCPA). The subsidy is incremental over and above the normal government housing subsidy available in the rest of the country. It is targeted at improving the thermal performance of the building in order to reduce mould formation in areas of high humidity. The iEEECO methodology requires town planners, City officials, energy/environmental design stakeholders and community leaders to work together at the design and implementation stages of the project in order to enable the community to take ownership of the certification of the SCCPA deliverables specified and to ensure optimal use of government funds. This commitment is especially important for energy and environmental grants that have a performance based mandate. In this case the certification or adaptation challenge is linked to this specific passive solar technical specification. The actual scientific mandate is based on the Agre’ment South Africa specification including orientation, ceilings, finishing and insulation in the SCCPA [5]

The aim of strict enforcement of the SCCPA specifications is more than a noble cause linked to the reduction of long term health and safety issues of avoiding indoor mould formation. North facing buildings are not enforced by the national or local authorities, so by enforcing the specific features of the SCCPA under iEEECO™, there will be a greater opportunity to improve the inside wall surface temperatures and avoid dew formulation. This is a Cape Town problem, so the goal is to reduce health and safety externalities linked to mould formation by improving the certification processes that ensure building thermal performance in Witsand. So this certification process exposed the barrier (lack of enforcement) which impacts traditional town plan design. On the other hand, in government subsidized housing projects, the town plan designer preferences can have either a positive or negative impact on building thermal efficiency. We also note that policy considerations do require town planners to take a look at passive surveillance as a specification or, at the minimum, as a consideration to reduce the risk of crime, as well as fire and SABS safety building distance standards. The later is often not enforced in low cost housing schemes and is a practice that is being challenged as a part of the iEEECO certification process.

b) *Consideration for individual homeowner/town planner preference for street facing units with big windows facing the street, under a fixed government subsidy budget when the street face is not optimal utilization of passive design features*: This is important for

example, because Peoples Housing Process families aspire to have standalone houses and their development partners responded by building **standalone** houses on stands earmarked for **semi-detached** higher density configurations. The higher density and closer spacing of the standalone house created another unintended consequence of violating the building line fire safety distance standards.

c) *Adaptation to Green Building Guidelines*: We looked at the trade-offs between standalone and higher density semidetached and double storey units as promoted by the City Green Building Guidelines. The community overwhelmingly rejected the idea of high density multi-storey housing configurations. So this aspect of the trade-offs process was delayed until a semidetached single storey and semidetached double storey compromise was reached at the time. The optimal solar orientation of the building in the iEEECO town planning redesign on the stands and optimal building room layout to harvest the sun’s energy for heat and utilization of longer daylight for indoor lighting was drafted after these sessions with the community hosted by the local ward councillor. This (along with the other SCCPA requirements for ceilings, insulation, and proper finishing) is the intervention which is required in order to offset space heating, hot water and lighting demand and to lower life-time energy related costs of operation for the families that will live in the units. The iEEECO™ process goes further and includes optimal roof design to enhance ease of installation of energy saving fixtures, the efficiency and utility of solar water heaters and other solar home power generation concepts. It should also be noted that the project was supported by the Eskom Demand Side Management Group in 2004 and the energy savings was certified by the University of Cape Town monitoring and verification unit for the National Energy Regulator of South Africa.

d) *Adaptation considerations*: focused on overcoming the barriers experienced and the need for know-how transfer related to the specifications for passive solar house design, layout and certification processes (re floor plan, openings and placement of services for toilet and kitchen to optimize the harvesting and use of free solar energy as a poverty alleviation tool) are also explored.

In the next section we look at line of sight and largest window in the home facing the street from an environmental town planning perspective.

3. ENVIRONMENTAL TOWN PLANNING DESIGN TO REDUCE CRIME

In the course of finding an optimal solution in the design of the settlement, and in an effort to satisfy the concerns raised by all parties, the subject of **environmental town planning and design to reduce crime** becomes part of

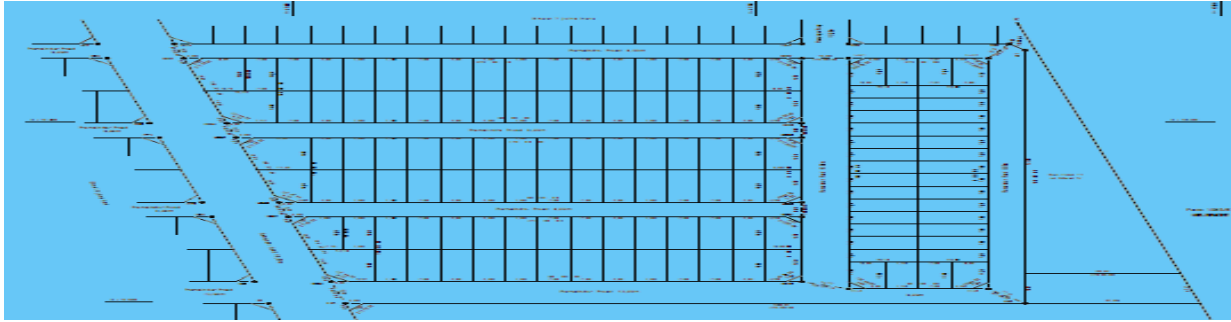


Figure 2. Typical NS-EW road and block layout in Witsand

the debate, as noted in the following quotation derived from a CSIR study on the subject [6]:

- a) *“The principles and recommendations dealing with crime prevention are, in most cases no different from basic design principles for well-performing urban environments.*
- b) *Unfortunately many of the planning practices of the past that led to the problems in our cities have not changed. Settlements for the poor are still being designed in ways that promote sprawl and leave tracts of open space that promote criminal activity. Schools, clinics, sporting and other community activities are not provided in a coordinated manner, although it may form part of the physical planning of new developments. This results in living environments that are unsafe and unsustainable.”*

Simply put, the study calls for more cooperative town planning and integrated design in a holistic context. This means looking at the development as an integrated human settlement with social and economic amenities in addition to housing. Window placement and line-of-sight for street facing windows are only one consideration in crime prevention, but there are many more. In the remaining sections we explore the role of personal preference and the future of green building policy in government assisted human settlement policy.

4. PERSONAL PREFERENCE ADAPTATION CHALLENGE

With respect to personal preference of the homeowner, that insists on big street facing and oriented buildings the municipality will have to make a decision regarding business-as-usual consumer demand while considering the life time value for money i.e. the funding and payments made to contractors for sustainable energy, water, health and safety standards when these specifications are not adhered to in practice. More funding is required to assist the municipal officials and community stakeholders in understanding the benefits and the drawbacks of business as usual vs. sustainable development practices. This is a know-how and knowledge transfer challenge that will take a formal capacity building and skills transfer intervention along

with on-site demonstration projects in order to enhance the adaptation process.²

In passive solar settlements designed under the iEEECO™ model, the *personal preference* challenge to strict enforcement of the SCCPA specifications is restricted to the north side of residential blocks of our east-west streets. This solves half the problem if one is blessed with a site that can be oriented in this north-south and east-west manner (Figure 2).

The units on the northern side of the east-west street will require an additional effort or incentive to reach an optimal state, one will not be able to achieve objectives of passive solar design principles and the homes will have to resort to more space heating in the winter and use of indoor lighting more frequently and for longer periods of time.

5. BUILDING/TOWNSHIP ENERGY AND ENVIRONMENTAL PERFORMANCE

Implementing agents, government town planners and project managers should challenge the business-as-usual town plan designs, Integrated Development Planning (IDP) processes and normal project management systems with creative approaches to win over community and political support, while simultaneously adhering to enforcement of the following South African policy directives:

- a. The new SANS 204 energy efficient buildings standards [7]; the CSIR Agreement thermal performance standards for the Southern Coastal Condensation Problem Areas (SCCPA) [5]; Climate change and other sustainable development goals linked to integrated development and reduction of energy related poverty.

The above policies and standards are supported by a number of real life accounts from beneficiaries that live in the Witsands iEEECO human settlement. There is also spot/on-site temperature monitoring certification testing

² The province of the Western Cape was encouraged by PEER Africa to contact the Stellenbosch Sustainability Institute at Lyndoch to conduct formal courses for community members. These courses were to begin in February 2011.

completed by PEER Africa and community beneficiaries from years 2005-2007. Live accounts drafted from personal interviews during Phase 1 pilot site walkthroughs [8] and workshops which include residents who live in the Phase 1 units are also a part of the data used in this report.

There is a need to look more closely at passive surveillance specifications and the practical application of this policy in today's climate change and energy conservation driven world. But there is certainly no reason to compromise health and safety benefits and policy for personal preference or political point scoring at the taxpayer's expense by limiting passive solar and other climate friendly interventions where their implementation is found to be otherwise feasible.

SANS 204 is a new energy efficiency standard for South African buildings that provides policy guidelines and standards which introduces building performance targets linked to the specific energy consumption profile of buildings - [energy consumption per m²]. The idea of introducing "*big street facing windows*" without consideration for other building/environmental and site measures that influence the long term impact will ultimately lower the value for money spent. This is especially true for dedicated top-up national housing subsidy funding for mould reduction and will impact the health and safety of the family as a whole.

6. CONCLUSION

Looking at town planning *without* passive solar design interventions and other iEEECO considerations in the name of passive surveillance to reduce crime, we draw the following conclusions:

Following the business-as-usual town planning processes for new government funded Greenfield developments, specifically failing to take passive solar design into account when laying out town plans and during implementation, is irresponsible given the overwhelming value of harnessing renewable free solar energy.

The above point is backed by tangible evidence, reported daily in the media, linking fire and health disasters to the use of inexpensive flame-based energy appliances in low income areas. There are reviewed research papers giving the predictable lifetime fire and energy related risk avoidance benefits (see for example Paraffin Safety Association- who suggests that the number of fire related injuries is far more than what is reported and seen on the local media [9]) compared to speculative crime reduction predictions linked to street facing line-of-site preferences. It is very difficult to assign quantitative benefits such as warmer inside temperature measurements during winter that support street facing line of site crime reduction. The need for change in national mindset linking energy and housing must also be highlighted by the onslaught of new sustainable human settlement and energy efficient human

settlement and housing policy. PASASA is also developing a more comprehensive incident tracking and surveillance system that will assist in developing more accurate emergency medical and emergency response costs that are the outcome/negative externality of the business-as-usual approach.

The authors could find no documented evidence that links an increase in crime with enforcement of passive solar orientation of site plans or building design under iEEECO™ protocols.

There is definitely a legacy of personal preference for big windows facing the street, which may not be optimal for integrated energy and climate change savings in poorly oriented town plans. This depends on a number of other conditions linked to local climate, building design and layout and technology. For example, properly shaded thermal pane windows can serve to provide line of site and thermal performance at the same time. But these windows come at a cost. In the case of Government assisted low cost housing, the "street facing large windows" typically used in government assisted human settlement projects are not thermally efficient.

Low cost thermally inefficient big windows facing the street can technically lead to non-compliance with the Southern Coastal Condensation Problem Area (SCCPA) mould reduction specifications. More specifically, the lower thermal performance of the building will lead to sub-optimal compliance with thermal performance specifications and policy, which aims to reduce mould formation in the Cape Town area and reduce sickness and illness associated with moulds and indoor pollution in the SCCPA.

It is our conclusion that the hypothesis is indeed correct and proven by the evidence found on the ground at the site and through the assessment of a number of sources linked to the topics. Passive solar design concepts as specified by the SCCPA and Energy Efficiency Demand Side Management research and guidelines are irrelevant when it comes to addressing historical town planning passive surveillance principles linked to the reduction of crime. However a more compelling argument can be made for the need for more research to understand core motivations behind beneficiary perceptions and preferences for street facing house design features, which can in some cases lead to suboptimal thermal performance and indoor air quality issues linked to mould formulation in the Southern Coastal Condensation Areas. This is not the intention of the additional funding provided by the National Government for this terrible building health issue, nor is a lifetime of higher building energy costs for the lower income families who can least afford it.

7. RECOMMENDATIONS

Personal preference for big street facing windows in government assisted human settlements is not a major

consideration for planners and project managers who work in the government assisted human settlement sector. It is business as usual from a town planning perspective.

The aim is to find a win/win approach which empowers all the key stakeholders with knowledge and information about passive surveillance and passive solar benefits in accordance within a fixed government funded budget per dwelling unit and the trend toward integrated sustainable human settlements.

It is recommended that officials be measured on the number of passive solar human settlements that take solar and other renewable energy and environmentally conscious designs and performance based delivery into account.

Targets should be set to increase the number of certified SCCPA north-facing units given the life cycle cost benefits for energy and water savings, health and safety. Line of sight should continue to be a consideration but not a basis for undermining thermal performance objectives.

Funding for greater community participation and awareness as well as additional funding to train officials on proper certification of compliance and enforcement is also critical to the long term success of the sustainable government assisted human settlement.

Other financial incentives are needed to help stimulate the migration of the mind and adaptation to optimal density safe and healthy integrated communities that will be looked after by the residents because they are part of the process from the beginning to the end.

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ACKNOWLEDGEMENTS

We wish to acknowledge the contributions made to this paper by Dr. Lilia A. Abron founder PEER Group, Project Manager City of Cape Town, Mr. Duke Gumede, and City of Cape Town PHP Inspector Mr. Dumisa Madolo.

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