

POLICY BRIEF

AFRICAN CITIES IN THE URBAN ANTHROPOCENE

INFRASTRUCTURE AND SMART TRANSITIONS

CITIES
ALLIANCE
AFRICA
THINK
TANK

BY CAMAREN PETER, BLAKE ROBINSON & MARK SWILLING

BACKGROUND AND INTRODUCTION

Accommodating a tripling of the population of African cities between 2010 and 2050 will require a roll-out of infrastructural services at a pace and scale the likes of which the world has not yet seen. If African cities are to prosper, urban growth will need to be achieved in a manner that eradicates urban poverty, reduces inequality, enables local government, stimulates economic growth and accommodates sustainability criteria at the same time. Hence there is a strong global, regional and national consensus that Africa's development challenges will necessitate an industrial structural transformation that embraces urbanisation and sustainable development priorities as central principles for transition.

African cities will no doubt play a key role in the roll-out of infrastructures as they serve as priority sites for the agglomeration of activities. These activities in turn drive growth and structural transformation

through increases in innovation, productivity and incomes¹. However, piecemeal development patterns and persistent sprawl hampers the accrual of full benefits and works against sustainability². The persistence of exclusive strip malls, office blocks and gated residential complexes, greenfield satellite cities, privatised precincts, tolled freeways and mega-urban projects³ that target the middle classes and higher income groups⁴, negates the emergence of a coherent and sustainable urban form, as infrastructure roll-outs and government subsidies follow suit without public consultation⁵.

When the urban spatial and infrastructural layout impairs agglomeration dynamics, it can negate their advantages; leading to lower productivity, taxes, investment and underemployment, as well as congestion, infrastructure backlogs and increased vulnerability of communities who are not connected to infrastructures and service

provisions. Where state delivery is inadequate, informal and private service providers fill the gap. These hybrid service delivery systems can be inefficient, more costly and resource-intensive ways in comparison to well-planned services⁶, but fill a crucial gap. In addition, they are not all and always inefficient, but may be limited in relation to economies of scale. This is typical of African cities, where a “low-income, low investment equilibrium” prevails. Poor internal mobility, coupled with poor external connectivity⁷ exacerbates this condition.

Moreover, African cities have relatively low *resource productivities*⁸ when compared with global averages. This is fuelled by low *resource efficiencies*. Even though resource productivity improved by 33 per cent between 1980 and 2008, in 2008, Africa was the lowest by a factor of 4 when compared to European averages, and a factor of 0.5 lower compared to Latin America and Asia⁹. This highlights the

importance of infrastructures as opportunities to improve resource productivity and thus influence the macro-level structural transformation agenda. African cities have an opportunity to avoid the “lock-in” to high environmental, carbon, resource and cost footprints associated with the conventional infrastructures and urban planning regimes of the 20th Century.

The opportunity lies in innovative people-centred urban design and planning, and embracing more resource efficient technologies that can help stimulate more sustainable transitions and behavioural modes within cities. While there may not be sufficient local capacity to produce some of the more sophisticated technologies at first, much of this transition can be achieved through sustainable design (e.g. passive building design), by embracing low cost technologies, and innovations in service delivery that draw on new technology, methods and indigenous knowledge systems. Moving from the unjust and

dysfunctional status quo to a just transition requires a 'smart' approach; one that works with the existing, local mechanisms and systems (whether formal, informal or hybrid), and the patterns and flows of materials, that are administered through African cities.

Instead of importing "plug-and-play" high tech solutions from the cities of the developed world, African cities will require investments in innovative approaches to service delivery that optimise resource use so that the poor can access services for less cost, and with less environmental impacts. The infrastructure deficit in

African cities and towns does not have to be thought of as merely a financing and governance failure. The massive infrastructure deficits need to be addressed creatively, drawing on the diverse conditions, behaviours and dynamics of African cities in order to enable new paradigms for infrastructure provision and service delivery, spatial development, and social inclusion, as households and communities get enrolled in new or adapted forms of service delivery.

Urban Metabolism, Resource Efficiency and Urban Productivity

In this brief, we argue that “bioregional economic diversification”¹⁰ is the paradigm that can facilitate the desired transition. This vision for a sustainable African urban transition essentially revolves around achieving resource efficiency at the city level, as well as improving access to opportunities for the poor, and boosting resilience and adaptive capacity. It is important to consider the following key features of African cities when considering their growth from a spatial perspective: (1) slum urbanisation and a dire lack of decent affordable services, (2) that the rapid growth of small and intermediate, secondary and tertiary towns presents a unique opportunity to leapfrog to new, more sustainable forms of development¹¹, (3) that in order to attain optimal return on infrastructure investments densities need to be raised strategically around public transport nodes (i.e. strategic densification¹²), and (4) that commensurate land-based financing mechanisms

are required to maximise local government returns on infrastructure investments. Understanding how resources flow through a city is critical to identifying intervention points that help to improve city-level resource efficiency and productivity, and avoid unnecessary wastage of local government budgets. The volume and direction of the various flows within a city constitute an ‘urban metabolism’, which can be shaped by strategic investments in infrastructure (e.g. waste-to-energy power plants, public transport, or energy efficient street lights). Urban productivity (and conversely, resource efficiency) can be radically improved by a factor of at least ten, and up to 20¹³ through interventions in the design of cities that promote decoupling from resource exploitation and environmental degradation¹⁴. Three key technology areas of intervention are required for the spatial restructuring of cities that promote resource productivity and sustainability, enhances social inclusion, and negates

splintered urbanism: (1) public transportation and Transit Oriented Development (TOD)¹⁵, (2) energy efficiency and renewable energy, and (3) the transformational role of ICTs with respect to sector and regional integration¹⁶.

Key Infrastructures for Transition

Public transportation and TOD:

Many African cities suffer from chronic traffic congestion which inhibits economic productivity, mobility and accessibility¹⁷. This could be substantially reduced with the implementation of good public transport systems that facilitate access to opportunities and reduce greenhouse gas emissions per commuter. These systems need to be affordable to all citizens, and to interface successfully and efficiently with existing informal and private transport providers (e.g. by accommodating feeder routes), through inclusive, participatory-based development processes. Soft mobility provisions¹⁸ such as sidewalks and bicycle lanes, as well as designated motorcycle lanes can also help to reduce the need for private cars. Integration of different modes is key to successful implementation (e.g. Bogota and Curitiba)¹⁹.

Public transport investments are costly, so it is important that they are designed in a manner that allows for as much public value to be captured from

the investment as possible. Public-sector led TOD leverages private sector partnerships and investment in order to capture value from public transport investments, making them more financially viable.

Energy efficiency and renewable energy:

A key aspect of African structural transition relates to the demand for electrification. Yet, if this demand were to be met using fossil fuel technologies, global climate targets would be exceeded. African cities can play a key role in the necessary renewable energies transition that African countries and regions are required to undergo. The large-scale opportunities in wind, solar and hydro-electric energy have been evaluated by the International Renewable Energies Agency, and are significantly higher in Africa compared to other parts of the world. However, many services can be accessed safely using energy sources other than electricity. While connection to the electricity grid provides

a high level of service access and the most abundant range of choice to users, it is often a costly option, and may not be appropriate if the user costs and environmental impacts exceed those of a mix of decentralised technologies like improved cookstoves, solar water heaters and solar photovoltaic panels for lighting and appliances²⁰.

Cities can play a key role as early adopters of small-scale decentralised and semi-decentralised renewable energies technologies and systems, building their expertise in new technologies, maintenance, local financing mechanisms and other factors that need to be customised to adapt to local scales and contexts. It is important to note that cities can further improve energy efficiencies by re-using waste heat from industry and power generation plants to provide piped heating and cooling services instead of defaulting to electricity-based space heating and cooling.

Information and Communications Technologies:

The lack of fixed line telecommunications presents a significant opportunity for ICTs in Africa and its cities. Despite the high cost of mobile technologies, their penetration is very high in Africa as they are essential for accessing telecommunication and other mobile services. Opportunities for catalysing and supporting urban transitions to sustainability through ICT include: the provision of banking services (e.g. e-wallets, payments, transfers, etc.), microfinance and prepaid options to individuals, as well as small and informal businesses; the facilitation of people-driven urban management for real-time information on urban conditions (i.e. people as sensors), especially in slums and informal settlements; smart logistics to reduce freight transportation; rideshare and other smart transit systems that have yet to emerge; as well as data for reducing traffic and parking congestion and optimising transport times.

Innovative and Inclusive Transition

Yet technical solutions (whether policy oriented or technological) alone are unlikely to resolve challenges and bring about desired outcomes.

Cultivating niche innovations – i.e. in technologies, systems, policy discourse, finance and so forth – is also critical to transition. Successful transition will depend on how well niche innovations are generated in order to meet changing local specificities and extra-local contextual factors that impact local dynamics, especially where hybrid formal and informal systems are concerned. In this respect, the technological nexus that is enabled through overlap between different sectors (e.g. waste-to-energy, transport-ICT, ICT-energy, ICT-banking/microcredit/financing) is where the potential for innovating solutions to meet context-specific local demands is highest. Corresponding with this overlap, is the need for policy and regulatory instruments to ensure efficient, transparent and accountable service delivery. Moreover, participatory-

based policy is essential to successful implementation, and the role of urban coalitions in infrastructure roll-out is also likely to prove key. Participation is necessary, not only to draw on leadership that is distributed throughout society for implementation, but also to ensure that the imperative of universal, affordable access to basic services is prioritised. The capacity for employment creation and spatial benefits, and potential adverse impacts also need to be assessed through broad participation. Participatory-based groups, such as coalitions, can prove to be key innovators and drivers of a new urbanism (e.g. where TOD around dense nodes with heterogeneous functions is driven by them)²¹.

Financing Transition

In 2009, the scale of investment needed to address the infrastructure deficit in Africa was USD 93 Billion per year. This amounts to 15 per cent of annual GDP, which is double the current level of spending²². Despite a relatively substantial increase in infrastructure spending since then, from National Governments, the private sector, and international donor finance (Gutman, 2015), there is little data that explicates how these growing allocations are being distributed. Moreover, persistent underinvestment in affordable and accessible urban infrastructure²³, due to an blatant refusal of many national governments to accept the reality of rapid urbanisation exacerbates backlogs and bottlenecks and compounds haphazard, piecemeal progress²⁴.

Turok (2016) makes reference to the importance of considering the urban “land-infrastructure-finance nexus” when considering the infrastructure challenges that African cities face in the context of local property

taxation and borrowing mechanisms that can be accessed²⁵. Administrative control over land-use planning at local levels makes sense because land constitutes an immovable asset and can be easily traced and taxed, and public investment yields benefits – through increased land values – that are not attributable to landowner decisions or actions. Hence, local government revenue generation through increased property taxation, development charges or betterment levies on land values is justifiable. It also helps prevent land speculation, hoarding and necessitates the formulation of policy and regulatory systems (i.e. land valuation, taxation structures, judicial frameworks, and local government structures) that aid coherent governance throughout the city²⁶. Increased local control over infrastructure and property development also improves the ability of local authorities to plan for sustainability criteria, and to ensure that resource efficiencies are optimised.

While leveraging land values at local levels through planning and land-use change management to finance infrastructure development has proven successful around the world to yield more liveable and better quality urban settlements²⁷, and helped finance massive physical infrastructure and housing programmes²⁸, full repayment of debt is unlikely to be obtained. This is especially the case in African cities, where the revenues from land-based financing is very low²⁹, due to poor formal systems of land management and traditional, informal and slum settlements do not pay taxes.

Financing for small-scale infrastructure and technology options is at present unlikely to emerge through conventional funding channels such as the World Bank. However, there are a number of new funds emerging, such as the Sustainable Development Investment Partnership which is geared towards mobilising USD 100 billion to finance projects in developing countries over five years. It targets

potential private investments with improved instruments that reduce potential risks. At local scales, however, there exists the potential to leverage off emerging micro-financing and credit options that are paired with online mobile banking services, and to establish local cooperative banks and common pool savings that introduce financing schemes that fit the particular needs of low-income and slum-dwellers. Prepaid options that allow for varied upgrade and downgrade options, for example, can help poor households cope with fluctuations in household budgets, while maintaining service delivery.

REFERENCES

1. Turok, I. (2015). Turning the Tide? The emergence of national urban policies in Africa. *Journal of Contemporary African Studies*, 33(3), 348–369; (2) UN-Habitat. (2015). *Towards an Africa urban agenda*, United Nations Human Settlements Programme (UN-HABITAT), United Nations.
 2. UN-HABITAT (2014) *State of the African Cities Report: Re-Imagining Sustainable Urban Transitions*, United Nations Human Settlements Programme (UN-HABITAT), United Nations.
 3. Turok, I. (2015). Turning the Tide? The Emergence of National Urban Policies in Africa. *Journal of Contemporary African Studies*, 33(3), 348–369.
 4. *State of the World's Cities 2010/11: Bridging the Urban Divide*, United Nations Human Settlements Programme, UN-Habitat, London, Sterling, VA.
 5. (1) Cain, A. (2014). *African Urban Fantasies: Past Lessons and Emerging Realities*. *Environment and Urbanization*, 26(2), 561–567; (2) Herbert, C., & Murray, M. (2015). *Building from Scratch: New Cities, Privatized Urbanism and the Spatial Restructuring of Johannesburg after Apartheid*. *International Journal of Urban and Regional Research*, 39
 6. (1) Andreasen, M. H., & Møller-Jensen, L. (2016). Beyond the networks: Self-help services and post-settlement network extensions in the periphery of Dar es Salaam. *Habitat International*, 53, 39–47; (2) Glaeser, E., & Sims, H. (2015). *Contagion, Crime and Congestion: Overcoming the Downsides of Density*. IGC Growth Brief Series 001. London: International Growth Centre.
 7. World Bank. (2009). *Reshaping Economic Geography*. Washington, DC.
 8. Peter, C. (2013). *A Review of Resource Efficiency in Sub-Saharan African Cities*, Discussion document for Global Initiative for Resource Efficient Cities, United Nations Environment Programme (UNEP).
 9. Swilling, M. (2016) *Greening African Cities: Urbanization, Structural Transformation and Sustainable Resource Use*, Draft 1 for Discussion, United Nations Economic Commission for Africa (UNECA).
 10. Swilling, M. & Anneck, E. 2012. *Just Transitions: Explorations of Sustainability in an Unfair World*. Cape Town and Tokyo: UCT Press & United Nations University Press.
 11. UN-HABITAT (2014) *State of the African Cities Report: Re-Imagining Sustainable Urban Transitions*, United Nations Human Settlements Programme (UN-HABITAT), United Nations.
 12. (1) Salat, S. 2011. *Cities and Forms: On Sustainable Urbanism*. Paris: Hermann; (2) Salat, S. & Bourdic, L. n.d. *Factor 10: Multiplying by 10 Resource Productivity in the Urban World*. Paris: Urban Morphology Laboratory, Centre Scientifique et Technique du Bâtiment.
-

13. Salat, S. 2011. *Cities and Forms: On Sustainable Urbanism*. Paris: Hermann

14. Fischer-Kowalski, M. & Swilling, M. 2011. *Decoupling Natural Resource use and Environmental Impacts from Economic Growth*. Report for the International Resource Panel. Paris: United Nations Environment Programme; (2) UNEP (2013) *City-Level Decoupling: Urban Resource Flows and the Governance of Infrastructure Transitions*. A Report of the Working Group on Cities of the International Resource Panel. Swilling, M., Robinson, B., Marvin, S. and Hodson, M., p. 68.

15. 1) Salat, S. 2011. *Cities and Forms: On Sustainable Urbanism*. Paris: Hermann
(2) Salat, S. & Bourdic, L. n.d. *Factor 10: Multiplying by 10 Resource Productivity in the Urban World*. Paris: Urban Morphology Laboratory, Centre Scientifique et Technique du Bâtiment.

16. (1) World Bank/AfDb (undated) *The Transformational Role of Information and Communications Technologies in Africa*, Eds Enock Yonazi, Tim Kelly, Naomi Halewood and Colin Blackman, World Bank and African Development Bank (AfDB), with the support of the African Union.
(2) AU (2014). *Agenda 2063: The Africa We Want*, African Union (AU), 2nd Edition, August 2014.

17. UN-HABITAT (2014) *State of the African Cities Report: Re-Imagining*

Sustainable Urban Transitions, United Nations Human Settlements Programme (UN-HABITAT), United Nations.

18. CAATT (2016) *Sustainable Urbanisation – The Key to Africa’s Future*, Cities Alliance Think Tank (CAATT) Narrative, Draft, 1 August 2016.

19. For examples of transit-oriented-development in developing countries see:

(1) UN Habitat (2014) *State of the African Cities Report 2014: Reimagining Sustainable Urban Transitions*, UN-HABITAT: see Box 3.3. for case study on Lagos’ BRT Lite implementation, and
(2) Peter, C. (2012) *Sustainable Resource Efficient Cities: Making it Happen!* United Nations Environment Programme (UNEP), Position Paper for Rio+20: see case study on P35 on implementation of BRT and Light Rail in Bogota Columbia.

20. UN-HABITAT (2014) *State of the African Cities Report: Re-Imagining Sustainable Urban Transitions*, United Nations Human Settlements Programme (UN-HABITAT), United Nations.

21. CATT (2016) *Sustainable Urbanisation – The Key to Africa’s Future*, Cities Alliance Think Tank (CATT) Narrative, Draft, 1 August 2016.

22. Foster, V. and C. Briceño-Garmendia (2010) *Africa’s Infrastructure: A Time for Transformation*. Africa Infrastructure

Country Diagnostic. Washington DC: Agence Française de Développement and World Bank.

23. (1) AfDB (2013). An Integrated Approach to Infrastructure Provision in Africa. African Development Bank (AfDB).

(2) Leipziger, D., Freire, M. E., & Lall, S. (2015). Africa's Urbanisation: Challenges and opportunities. In C. Monga & J. Y. Lin (Eds.), *The Oxford Handbook of Africa and Economics*, Volume 1: Context and concepts. Chapter 31. Oxford: Oxford University Press.

24. Gutman, J., Sy, A. and Chattopadhyay, S. 2015. *Financing African Infrastructure: Can we deliver?* Report produced by the Global Economy Development Centre at Brookings.

25. (1) AfDB (2013). An Integrated Approach to Infrastructure Provision in Africa. African Development Bank (AfDB).

(2) World Bank. (2013). *Planning, Connecting and Financing Cities – Now*. Washington, DC.

26. Turok, I. (2016) *Getting Urbanization to Work in Africa: The Role of the Urban Land-Infrastructure-Finance Nexus*, Area Development and Policy, Routledge, Vol 1, No. 1.

27. (1) Palmer, I., & Berrisford, S. (2015). *Urban infrastructure in Sub-Saharan Africa – Harnessing land values, Housing and Transport*. Cape Town: African Centre for Cities.

Retrieved February 10, 2016 from, www.urbanafrika.net

(2) UN-HABITAT & ECA (2015) *Towards an African Urban Agenda*, United Nations Human Settlements Programme (UN-HABITAT) and Economic Commission for Africa (ECA), United Nations.

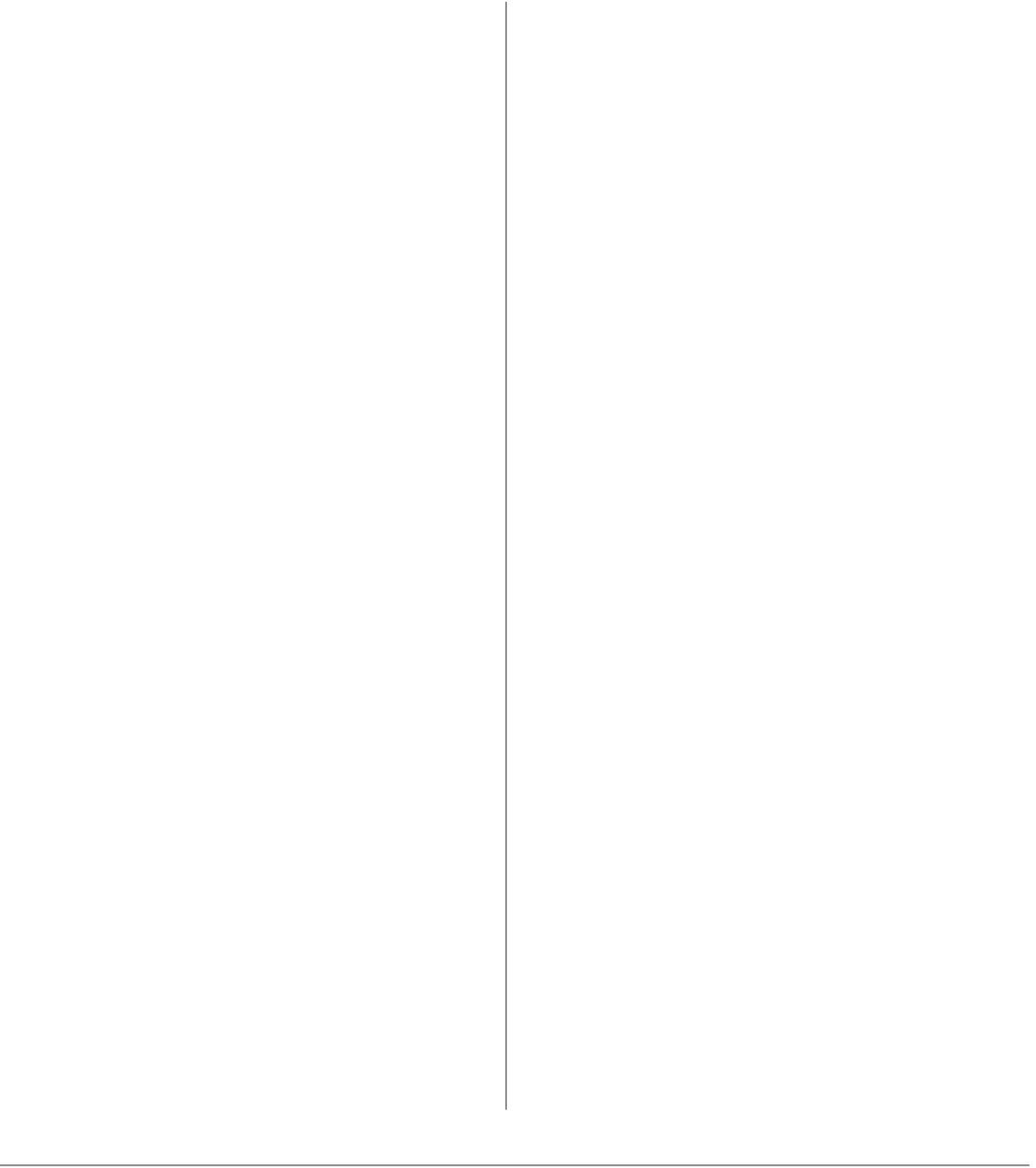
28. Liu, W., Dunford, M., Song, Z., & Chen, M. (2016). *Urban-Rural Integration Drives Regional Economic Growth in Chongqing, Western China*. Area Development and Policy.

29. UN-Habitat. (2015). *Towards an Africa urban agenda*, United Nations Human Settlements Programme (UN-HABITAT), United Nations.

30. See website: <http://www.sdiponline.org/>.

31. Turok, I. (2015). *Turning the Tide? The Emergence of National Urban Policies in Africa*. *Journal of Contemporary African Studies*, 33(3), 348–369.

32. Hodson, M., Marvin, S., Robinson, B. Swilling, M. (2012). *Reshaping Urban Infrastructure Material Flow Analysis and Transitions analysis in an Urban Context*, *Journal of Industrial Ecology*, In Press, website: www.wileyonlinelibrary.com/journal/jie.



CONTACT

Rike Sitas
African Centre for Cities
Environmental & Geographical Science Building,
Upper Campus, University of Cape Town
Pvt Bag X3, Rondebosch 7701,
Cape Town, South Africa

Tel: +27 (0)21 650 2881
Email: caatt@uct.ac.za