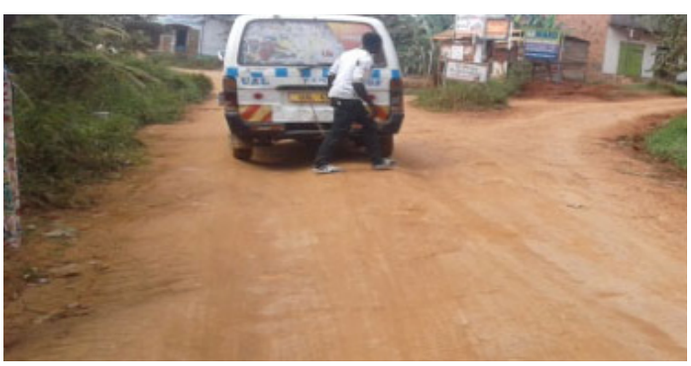
Shaping The World



PERI-URBAN INFRASTRUCTURE FOR EXPANDING AFRICAN CITIES

SUPERVISOR PACK

ICE Shaping the World Group Project Pack 2017

Shaping The World

Prepared by Dr Terry Thomas of Warwick University for use with groups of MEng civil engineering students in the academic year starting Oct 2017

Guide for Project Supervisors

Project Purpose

This project is designed to be undertaken by MEng Civil Engineering students as their group or team project, with their JBM accredited course. It has been developed in association with the Institution of Civil Engineers, the leading source of expert civil engineering knowledge for practitioners, industry and society.

In 2013 ICE launched its 'Shaping the World' campaign, to help society meet the most pressing global challenges. These include water poverty, mass city migration, energy deficiency, de-carbonization and the effects of climate on infrastructure as expressed in the United Nations' Sustainable Development Goals. The wish is to leverage the capacity of civil engineers to consider the way that successful solutions can be delivered and scaled for social good.

With innovation and technology driving productivity, and a growing population consuming resources faster than they can be maintained or replaced, there is a stark gap between meeting current need and providing appropriate infrastructure for generations to come.

The purpose of the project is to encourage students to think about the role of civil engineering infrastructure in achieving UN Sustainable Development Goals. The adjective 'sustainable' is currently in fashion but has several meanings – e.g. sparing in use of natural resources, maintainable, non-polluting, and affordable in the long term. For civil engineers sustainability as an objective has to be translated into built-environment technology choices and within any chosen technology into the sizing of components.

As this project covers several types of infrastructure, it is impractical to provide a comprehensive set of references. Searching out and assessing the suitability of both conventional and 'new' technologies is predominantly the responsibility of the student participants although as supervisor you may have particular resources to bring to their attention. Where possible an 'assessment' should contain some calculations of component sizes or of costs. A few references are included in the Topic-by-Topic notes to get the students started.

Project Administration

This Pack was prepared following a site visit by its designer Dr Terry Thomas in Summer 2017. It describes the Wamala Ward on the edge of Kampala, Uganda. It contains a description of its needs and social nature; it provides site data and lists some suitable recent references for the technologies involved. Dr Thomas may be contacted with queries concerning the project area at t.h.thomas@warwick.ac.uk) .

The project is suitable for teams of up to 8 students. For smaller teams –i.e. 3-7 students – the number of services investigated should be reduced. Projects will have to conform to your local academic arrangements (including allocation of credit and loading), so common (i.e. national) project rules are inappropriate.

It is assumed that a site visit by a team or one of its members is (financially) impractical and therefore has not been assumed in the project design.

Although a specific target area has been identified, and a copy of the final project report may (recommended), be forwarded to its municipal planner via Dr Thomas, this project will not be considered as a professional 'consultancy', but only an exploration of possibilities.

Design tasks

This project has been devised primarily to further a 'sustainable infrastructure' agenda – to sensitise students concerning technology choice and its impact on global sustainability. However, project supervisors may want to connect it to the more traditional design component (e.g. component sizing) of MEng group projects.

Listed below are some examples of more detailed design that students might choose to incorporate in their project work and reporting. However it is inherent in the main project objective that students 'find' these opportunities for themselves rather than be fed such design tasks ab initio by their project supervisor.

There are opportunities on the drainage side both re drain sizing and with how to achieve long term capacity despite lots of siltation from soil wash-off. A related issue is designing infiltration trenches

within a ‘SUDS’ strategy of reducing run-off flows.

On the ‘structures’ side four topics come immediately to mind – (i) design of ‘track’ for safe pedestrian movement (currently there is none!) that can resist being usurped by vehicles, parking etc, (ii) a low-cost design of (mini?) rapid transit track to cross linear swamps without interfering with their flow, (iii) optimising raintank design (of say 5000 litres, above or below ground) because current designs in HDPE or steel are too costly, (iv) identifying an affordable technology for span flooring (in 2-storey housing) which at present is normally avoided in rural Africa on cost grounds but is needed in cities.

On the process engineering side, there is (i) evaluating (and sizing) local small landfill sites, (ii) organising nitrates recovery from urban urine and costing related sanitation options, (iii) deployment of (hilltop?) buffer tanks within the piped-water network – maybe with pumping energy recovery - that might increase the mean throughput of existing mains.

