FIDIC AFRICA 2021
Infrastructure Conference

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INFRASTRUCTURE & SOCIAL DEVELOPMENT - THE ROLE OF THE ENGINEER

Dr Ron Watermeyer

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27TH ANNUAL FIDIC AFRICA INFRASTRUCTURE CONFERENCE

Nature of infrastructure

- People are surrounded by infrastructure (the basic physical and organisational structures and facilities needed for the operation of a society or an enterprise)

- Investment in infrastructure has the following three impacts:

  1) an initial growth in demand for people, equipment, plant and materials on the project, which lasts as long as it takes to create the asset;

  2) a demand on resources over the lifespan of the project to maintain the asset; and

  3) a productivity impact

Infrastructure which provides improvements or efficiencies in services, production or export capabilities and which is delivered and maintained in a manner which minimises waste of materials, time, and effort to generate the maximum possible amount of value, is most likely **to contribute to economic growth**

Characteristics of the construction industry

Generates a high number of jobs per unit of expenditure while being able to absorb low skilled labour workers

Is delivered through a supply chain which involves a wide range of business of varying sizes

Has important linkage effects into related goods and services

Fundamentals of infrastructure project delivery ("buying" function)

The **client value proposition** is the promise of measurable benefits / impacts resulting from the project

Client value proposition

Client values (ethos, vision and core values for a project)

Client brief to satisfy the business case

- Budget
- Time for completion
- Scope

Project management (controlling practices)

Resources required to deliver projects

Activities
Plan
Design
Manufacture / fabricate
Construct / install
Commission

Project outcomes and impacts

Construction works (works with functionality, functional performance and quality in all its forms, delivered for a cost and ready for use or others to do their work)

Sustainability impacts (any change that may be beneficial or adverse):
- economic aspects
- social aspects
- environmental aspects

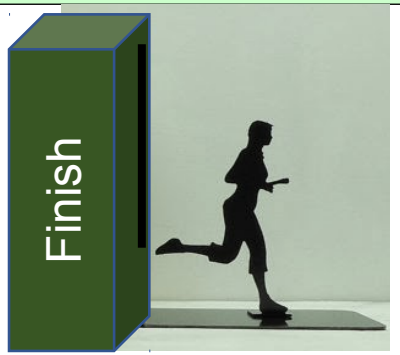
Client delivery management (influencing practices)
(client leadership, governance and procurement practices, strategy and tactics)

Plan - decide on what needs to be done, how it is to be resourced and achieved and in what time frames, and set a budget

Specify – define the client's functional and other requirements for the project clearly and precisely

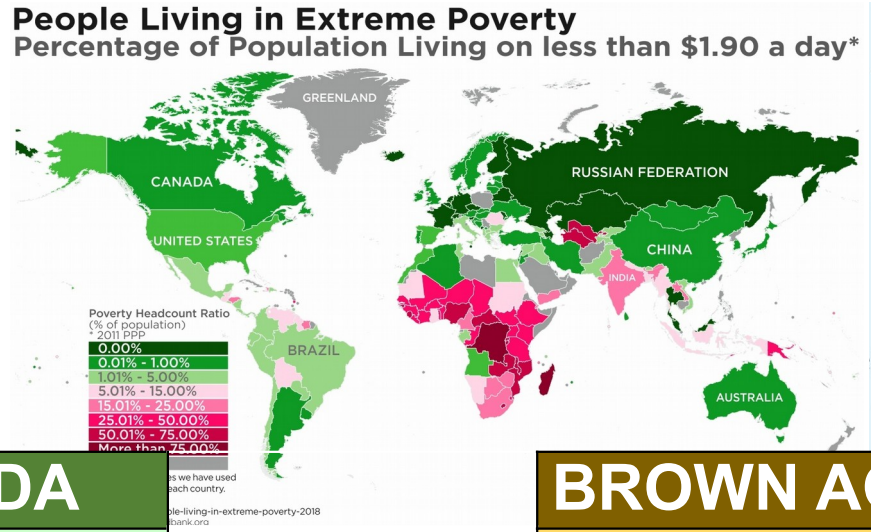
Procure – obtain project resources (internal and external) to execute project activities with care and effort

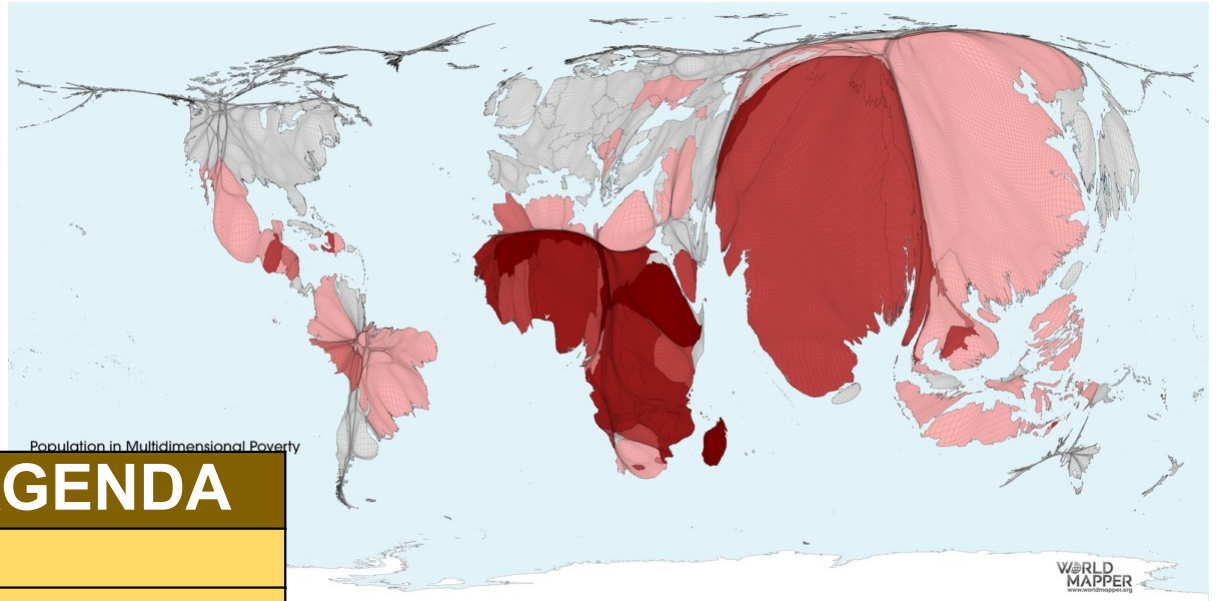
Oversee delivery – observe and define the execution of the project to realise the client's value proposition associated with a business case



Project value is the outcome of **client decision making** to achieve an optimal balance of the project benefits, risks and costs

Green and brown agenda





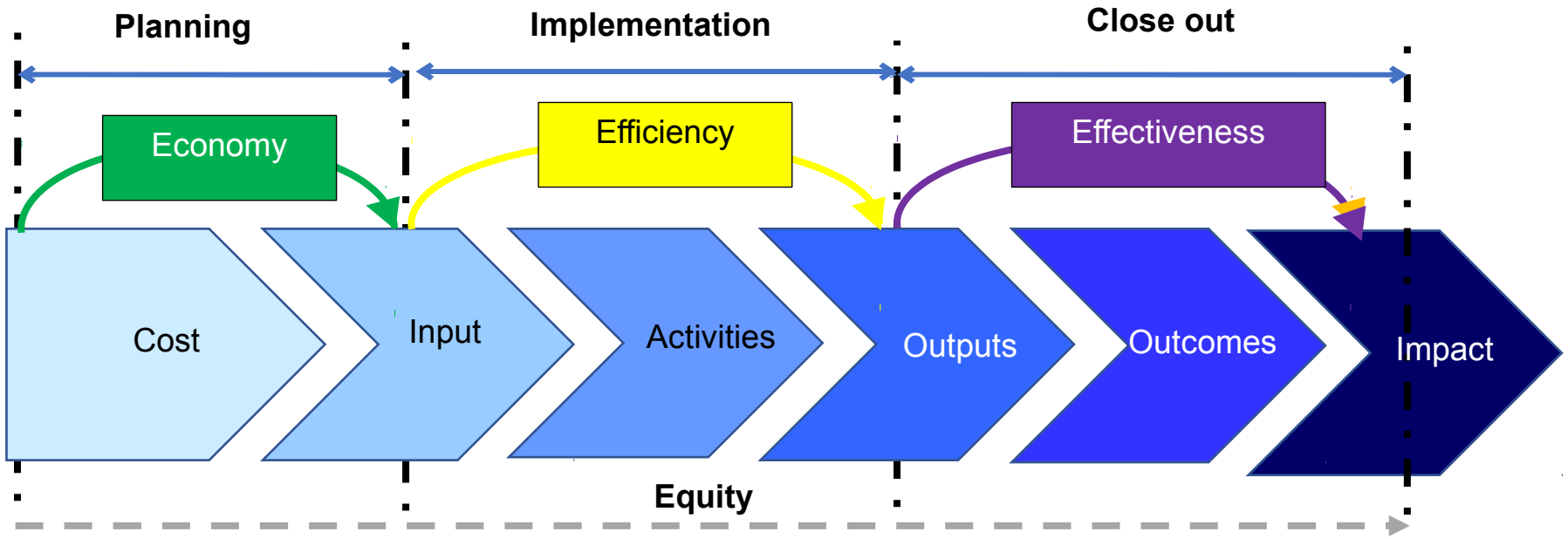
GREEN AGENDA	Key concern	BROWN AGENDA
Ecosystemic well-being		Human well being
Forever	Time frame	Immediate
Local to global	Scale	Local
Future generations	Concerned about	Low income groups
Protect and work with	Nature	Manipulate and use
Use less	Services	Provide more
Affluence and over consumption		**Poverty and underdevelopment**

The **2019 Global Multidimensional Poverty Index** (MPI) "looks **beyond income to understand how people experience poverty in multiple and simultaneous ways**. It identifies how people are being left behind across three key dimensions: health, education and standard of living, comprising 10 indicators. People who experience deprivation in at least one third of these weighted indicators fall into the category of multidimensionally poor." (UNDP/OPHI, 2019)

Developed nations

Developing nations

Value for money concept (4Es)



The effective, efficient, and economic use of resources

The optimal use of resources to achieve intended outcomes

	Economy (cost)	Efficiency (productivity)	Effectiveness (impact)	Equity
Objective	Obtain the right inputs at the right cost (obtain a good deal)	Obtain the most from the inputs (obtain a lot for the efforts).	Obtain the expected results from the outputs (do the right things)	Promote business, employment and skills opportunities for target groups
Focus	Reducing / minimising the cost of resources	Minimise waste and maximise value in the converting of resources (inputs) into results (outputs)	Achieving targets and ensuring the right work is being completed	Leverage business, employment and skills opportunities for target groups through the project
Key question	What is the cost of the resources consumed and the value of the output delivered?	How resourcefully are inputs converted into outputs and subsequent outcomes?	What is the gap between what has been achieved and what was intended?	**What legacy does the project leave behind?**

Role of engineers in infrastructure project delivery

A CONSULTING ENGINEER provides **expertise and leadership** in the planning, design, modification, or rehabilitation of public and private infrastructure

client value proposition

Client value proposition

Client values (ethos, vision and core values for a project)

Client brief to satisfy the business case

- Budget
- Time for completion
- Scope

Engineers play a critical role in translating the brief into the required infrastructure

Supply function

Project management (controlling practices)

Resources required to deliver projects	**Activities** Plan, Design, Manufacture / fabricate, Construct / install, Commission

Project outcomes and impacts

Infrastructure

Sustainability impacts (any change that may be beneficial or adverse):

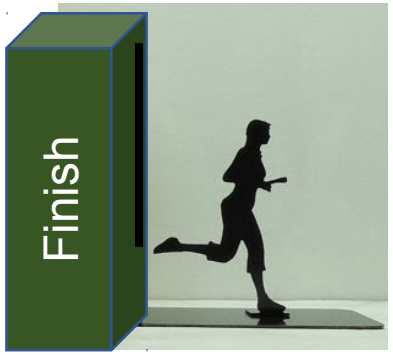
- economic aspects
- social aspects
- environmental aspects

Client delivery management (influencing practices)
(client leadership, governance and procurement practices, strategy and tactics)

Plan | **Specify** | **Procure** | **Oversee delivery**

Engineers support clients in the decision making process by providing strategic advice and practical support

Buying function



Project value

Sustainability objectives

Sustainability objectives include:

— the alleviation and reduction of poverty through the provision of work opportunities to the vulnerable;

— improving the sustainability of small or local businesses;

— local economic development;

— the establishment and strengthening of indigenous building materials and methods;

— the promotion of construction technologies that increase employment;

— the transfer or development of skills;

— the minimisation of the harmful effects of development on the local environment;

— the promotion of increased use of environmentally sound goods, building materials and construction technologies.

Common drivers for objectives associated with contributions to sustainability (ISO 19208)

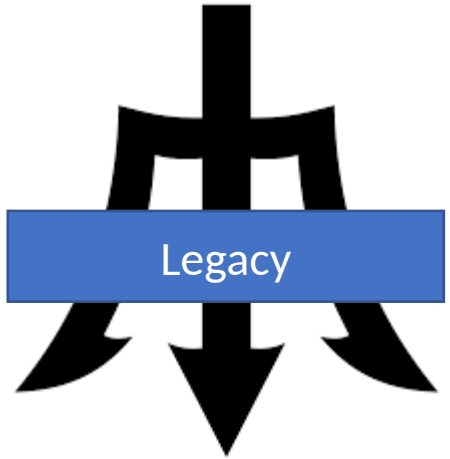
Subject matter of objective	Areas of concern
Usage of resources such as energy and water	Greenhouse gas emissions Use of renewable and non-renewable resources Consumption of fresh water Life cycle costs
Choice of building materials	Use of renewable and non-renewable resources and release of emissions because of materials and energy flows. Economics **Potential to generate business and employment opportunities for targeted groups** Formation of waste hazards
Choice of construction methods and resources	Health and safety during construction **Potential to generate business and employment opportunities for targeted groups**
Waste disposal	Recycling Hazardous waste
Resilience	"Bounce back" from disaster The capacity to restore not only buildings but also social systems following exposure to hazards

Choices

Challenge

Client brief

Money retained within the community from business and employment opportunities (income flows)



Skills to improve livelihoods

Infrastructure which supports social and economic development

The process of constructing infrastructure can be just as important as the provision of the infrastructure

Key question – who benefits from the construction?
- how do you maximise the flows of money into the community?

Engineers have opportunities to impact on the legacy of the project through innovation in:

- planning and design choices
- procurement arrangements e.g.
  - packaging strategies (framework / non-framework, value and duration of contract)
  - targeted procurement procedures (see ISO 10845) which secure the participation of targeted enterprises and targeted labour in the performance of a contract
  - setting contractually enforceable KPIs for skills development
  - finding ways to reduce barriers to entry for local contractor e.g. providing cash neutral interim payments, undertaking work incrementally to reduce performance bonds etc.

The role of the engineer

Herbert Hoover, the 31st president of the United States (1929-1933) described engineering in his memoirs as "*a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men.* ***Then it elevates the standards of living and adds to the comforts of life.*** *That is the engineer's high privilege*".

Politicians and law makers can capture the desires of the world's population. Engineers are required to transform **words into reality**. Engineers stand challenged to make the difference.