Sustainable Development of Water Resources

Project Level Thinking
Designers’ Perspective

- Over much of the world, our industry designs the physical water supply and treatment infrastructure
- As the world struggles towards a more sustainable form of this infrastructure, we will be called upon to design systems that work better and deliver projects based on objectives that lie well outside the realm of current practice
- We have been working to help our industry and our clients deliver projects to these future requirements – the subject of the presentation today
A brief history…

• 1992 the Earth Summit in Rio de Janeiro
  • Agenda 21 outcome
  • FIDIC perspective – dual paths
    – Run our companies sustainably
    – Run our client’s projects sustainably
• Local Agenda 21
  • 6000 cities and municipalities responded

- and then it staggered…….
Issues and problems...

- Global concept – how to translate into local and personal terms
- Confused with HS&E, CSR, ethics, conflicts of narrow perspective
- Governments, major companies, financial institutions, (our industry’s clients) started to act at a board level but at the working project level the subject was invisible
More history….

• 2002 Johannesburg Summit
  • We’re not getting there….
  • Millennium Development Goals
  • FIDIC report on the industry
    – Learn how to interact more with civil society
    – Develop indicators to project progress
And today.....

- Millennium Ecosystem Assessment reports
- “.....the ability of the planet’s ecosystems to sustain future generations can no longer be taken for granted”.
- “We can reverse the degradation..... but the changes in policy and practice required are substantial and not currently underway”
- Our conclusion:- Because of the scale of human population and the size of our planet, we are now designing and building the ecology of the human species
PSM – the FIDIC Approach

• Begin with a core set of sustainability goals and their corresponding indicators
  – Traceable to the whole society problems and issues documented in Agenda 21
• Modify/augment through a transparent and open process
  – Tailor the core indicators to fit project needs based on stakeholder input
• Recognize that conditions, state of the practice, stakeholder needs change over time
• Encourage the creation of an environment for innovation
UN Core Indicators – the basics

- Categories, themes, sub-themes, and indicators from UN Commission on Sustainable Development (CSD)
- 65 social, environmental, institutional, and financial indicators
- **Most** engineering projects relate to and may affect social, environmental, and financial indicators
- **Some few** may also impact on institutional indicators.
FIDIC Core indicators

- Example: Social//Equity//Poverty//converted from “Percent of population living below the poverty line” to “Proportion of workers or companies employed on the project from the local area”
- Some virtually unchanged – some look very different
- FIDIC core set reflects the primary impact of projects but in the case of projects with a wider footprint, the rest should also be reviewed
Sustainable Development Project
Goals and Indicators

Sustainability goal (ideal)

Set a new benchmark for sustainable performance

Apply what is currently achievable

Apply conventional

Achieve Compliance

High

Range of project owner sustainable development goals

Low

Varies based on new evidence, technological developments

Advances through innovation and risk taking with new processes, systems and technologies

Advances through the application of best-in-class processes, systems and technologies

Current state-of-the-practice

Range of project owner implementation choices

Varies based on laws, regulations
Sustainable Development Goals and Indicators: Conceptual Model

- **Category:**
  - Environmental
  - Economic
  - Social

- **Themes:**

- **Sub-themes:**

- **Indicators:**
  - Green (Environmental)
  - Yellow (Economic)
  - Red (Social)
PSM Process

1. Establish sustainability goals and baseline project indicators
2. Adjust goals and project indicators to local conditions
3. Test and refine project goals and indicators
Impacts on Built Facilities

• Sustainable development is creating new customer needs and wants
• Achieving conditions of sustainability is a long journey
  – Will be achieved project by project
  – Based on project owner’s goals, resources
  – Based on the designers’ ability to incorporate more sustainable technologies, processes, systems
    • Most have yet to be invented
• Requires guidelines
  – Setting direction
  – Benchmarking against the achievements of others,
  – “Raising the bar” on sustainable performance
Extent of Mining in Upper-Olifants Catchment
Economic Sustainability

The central idea of economic sustainability is to develop a scheme for which the aggregate revenue streams (from mines and water users) exceed the total cost (capital, operations and maintenance) of the scheme indefinitely.

Quality of life is improved because the local towns and communities have access to an affordable, long term water resource.
PROJECT GOALS

- Exploitation of the coal reserves
- Town access to supplemental water resource
- Contribution to local economy
- Alleviation of unemployment

PROJECT INDICATORS

- Extension of the life of mine
- Remining of old flooded sections, tons ROM produced
- Postponement of expensive interbasin water transfer scheme
- Lifting of moratorium on new housing and commercial projects
- Water tariffs in community increase in line with inflation rate (CPI)
- Fraction of project investment paid to local contractors and suppliers
- Fraction of project investment paid to emerging black contractors and suppliers (BEE component)
- Number of local labourers and staff employed during construction phase
- Number of local labourers and staff employed for operation and maintenance
Minimization of waste sludge and brine production

Water recovery achieved by the reclamation plant

Mass of waste sludge produced per m³ of reclaimed water

Volume of brine produced per m³ of reclaimed water

Reclamation of useful, saleable products from waste

Number of useful, saleable products separated and commercially sold

Mass of byproducts recovered as a fraction of total waste mass generated

Energy efficient water reclamation technology

Energy consumption per m³ of reclaimed water produced

Mines post-closure financial liability for water management

Drop in the audited post-closure financial allowance (Pollution Control Fund) for the mines

Obtaining a closure certificate on the one defunct mine participating in the project

Water recovery achieved by the reclamation plant

Mass of waste sludge produced per m³ of reclaimed water

Volume of brine produced per m³ of reclaimed water

Reclamation of useful, saleable products from waste

Number of useful, saleable products separated and commercially sold

Mass of byproducts recovered as a fraction of total waste mass generated

Energy efficient water reclamation technology

Energy consumption per m³ of reclaimed water produced

Mines post-closure financial liability for water management

Drop in the audited post-closure financial allowance (Pollution Control Fund) for the mines

Obtaining a closure certificate on the one defunct mine participating in the project
Social and Institutional Sustainability

The key goal of social and institutional sustainability is to set up an institution which can manage and operate the scheme over the long term. The role and influence of mines would progressively diminish, while that of the water users would grow in such an institution/company.

Quality of life improved because a water institution is set up, which strengthens local government in delivering services and builds social stability.
PROJECT GOALS

Social and institutional dimension

Building capacity in regulatory agencies to process such projects

Mining companies collectively manage regional water projects

PROJECT INDICATORS

Authorities Steering Committee remains operational for duration of the project

Regulatory authorities issue all required permits and licences

Similar projects are approved by regulatory authorities

Joint Venture between Anglo Coal and BHP Billiton remains in operation

Further phases or other similar projects are launched and executed

Other mining companies join the Joint Venture and participate in projects
Coalfields Water Company established after demonstration of project viability

Mining companies take lead and set up independent Water Company

Local authorities obtain a stake in and long-term commitment to Water Company

National Water Regulator uses this precedent to direct other similar water projects

Local authorities assisted in providing water services

Long-term water supply contract between local authority and mines is implemented

Consumer complaints about municipal water services decrease

Safety of mining improved by reducing risk of flooding

Number of health and safety incidents related to mining drops

Long-term water supply contract between local authority and mines is implemented
Environmental Sustainability

The overarching goal of environmental sustainability was to convert a source of water pollution into a usable water resource, both during mining and post-closure of the mines.

Quality of life is improved because the water environment is protected against pollution and diverse water users (domestic, industrial, recreation, aquatic ecosystems) have access to it.
PROJECT GOALS

- Environmental dimension
- Project develops a local water resource
- Clean-up of a polluted water body and reduction of risk to decant

PROJECT INDICATORS

- Municipal abstraction of local dam drops below safe yield of Witbank Dam
- Number of incidents of polluted water decants from the mines drop
- Level of water in mine workings drops
- Stored water inventory on mine complex (pits, pans and dams) drops
Support water ecosystem health and resilience

High quality water released to local streams and dams (m³/year)

- Improvement in local stream and dam water quality profile
- Improvement in local stream and dam biological health and diversity (bio-monitoring)
The bottom line....

• Issues of water resource and supply are integral to the broader issues of sustainability
• Progress on these broad issues depends on the translation of global perspectives into project level action
• The FIDIC Project Sustainability Management guidelines are a useful tool to advance the state of engineering practice and help deliver real progress on these issues – starting now, not later when we have worked out all of the complications and details