



Delivering a Sustainable Project

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Summary

- The basis for project sustainability
 - How will sustainability be achieved?
 - Why design and deliver a sustainable project?
- FIDIC: Project Sustainability Management (PSM)
 - Project Sustainability Management requirements
 - FIDIC Project Sustainability Management Guidelines
- Project Sustainability Management II
 - Proposed revisions to the Guidelines
 - Pathway towards sustainability: three initiatives
- Future work
- Project examples
- Questions
- Appendix: current approaches for project sustainability:
 - U.S. Green Building Council: LEED
 - U.S. Army Corps of Engineers: SPiRiT
 - Arup Group: SPeAR



The Basis for Project Sustainability



How Will Sustainable Development Be Achieved

- The problems posed by non-sustainable development are real and urgent
- The task to achieve sustainable development is enormous
 - More or less a **complete overhaul** of the world's existing infrastructure
 - Guide the design, construction and operation of new infrastructure
- Achieving sustainability will be a long journey, spanning many, many decades
 - Replace the legacy, non-sustainable infrastructure with more sustainable processes, systems and technologies
 - Most of which have yet to be invented



This Overhaul Will Be Done Incrementally, Project by Project

- The rate of advancement will be determined ad hoc
 - By individual project owners and their engineers
 - Based on local regulations, requirements, standards, goals, knowledge and priorities of the stakeholders
- Need for guidance
 - What makes a project sustainable?
 - How do you make progress toward sustainability?
 - How do you set sustainability goals?
 - How do you measure progress toward those goals?
 - How do you make continuous improvement?



“If you don’t know where you are going, then any road will get you there.”

Lewis Carroll



Why Design and Deliver a Sustainable Project?

- Demonstrate the organization's commitment to sustainability
- Save money
 - Project design and delivery
 - Operation
- Reduce project risk
 - Rejection by affected communities, other stakeholders
- Catalyst for innovation
 - New products and services
 - New ways to address engineering and societal problems



FIDIC: Project Sustainability Management (PSM)

- ❖ Requirements
- ❖ Setting project sustainability goals, indicators



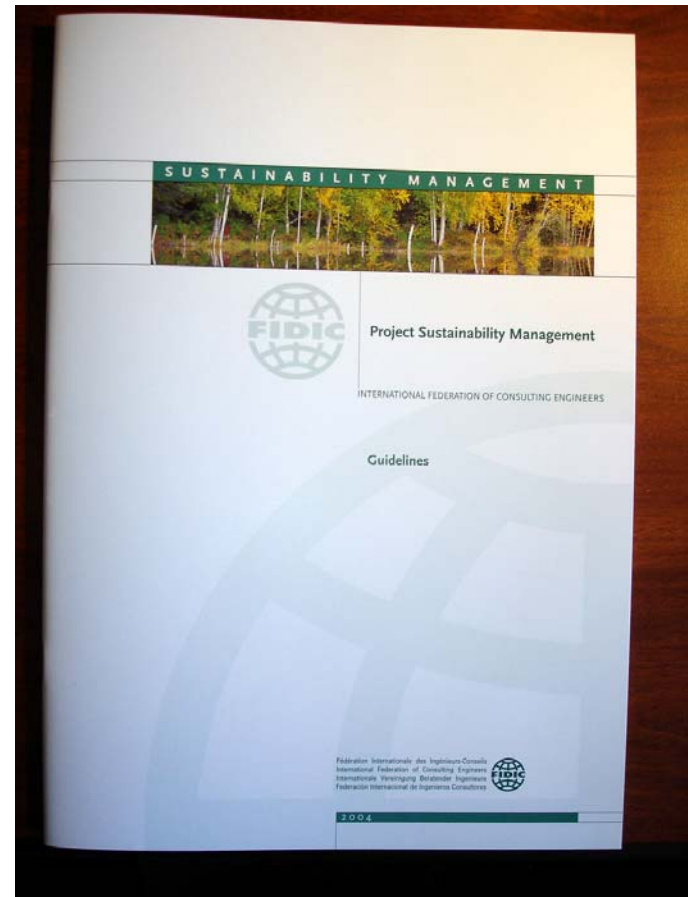
Project Sustainability Management Requirements

- Meets broadly accepted criteria for sustainability
 - Agenda 21
 - Locally based sustainability goals and indicators
 - “Safeguard” principles (for the developing world)
- Meets stakeholder needs
- Not static
 - Encourages the application of more sustainable technologies
 - Seeks to “raise the bar” over conventional
 - Share results, lessons learned



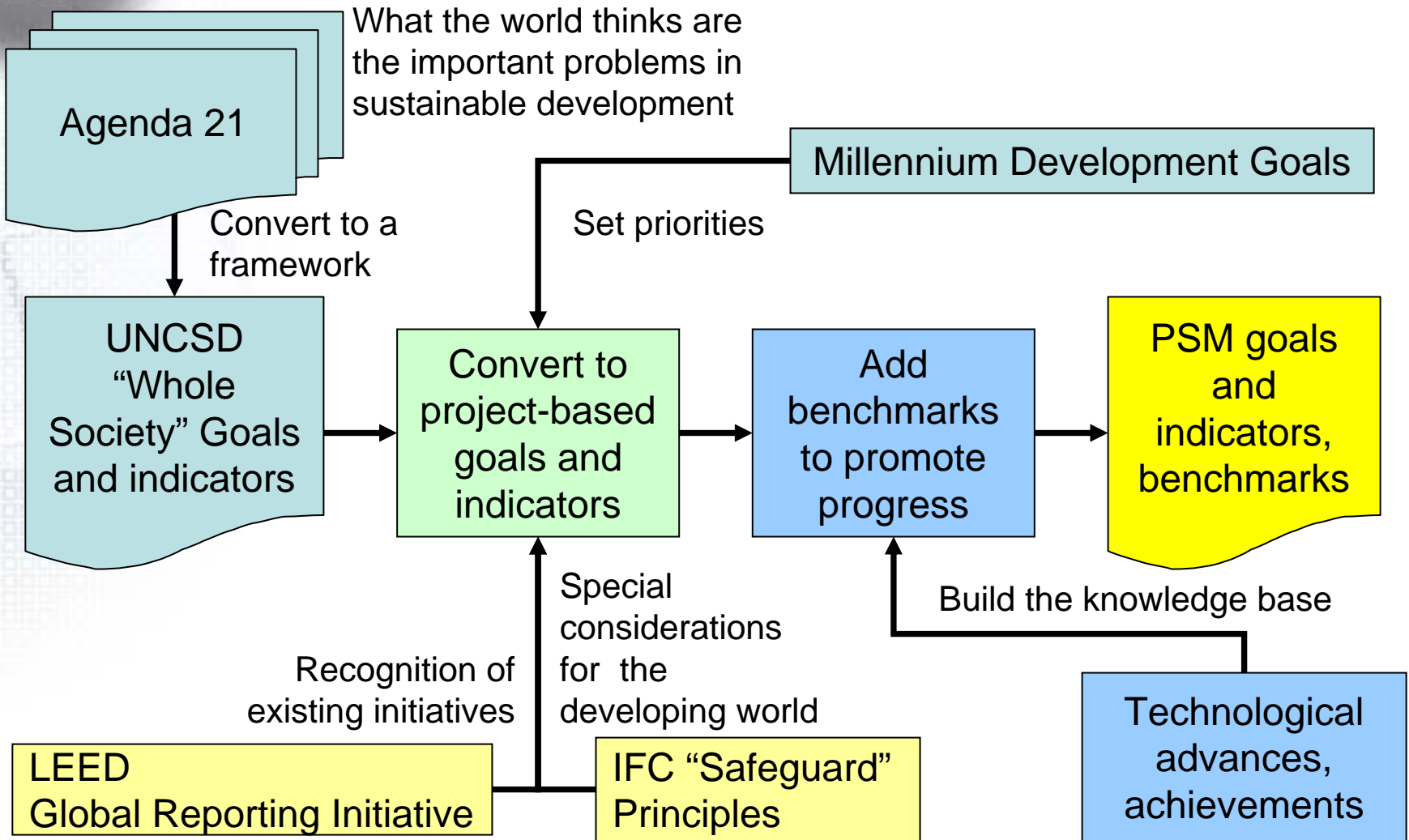
FIDIC Project Sustainability Management Guidelines

- Framework and process for setting project sustainability goals, measuring progress
- Core project sustainability indicators
- Case example



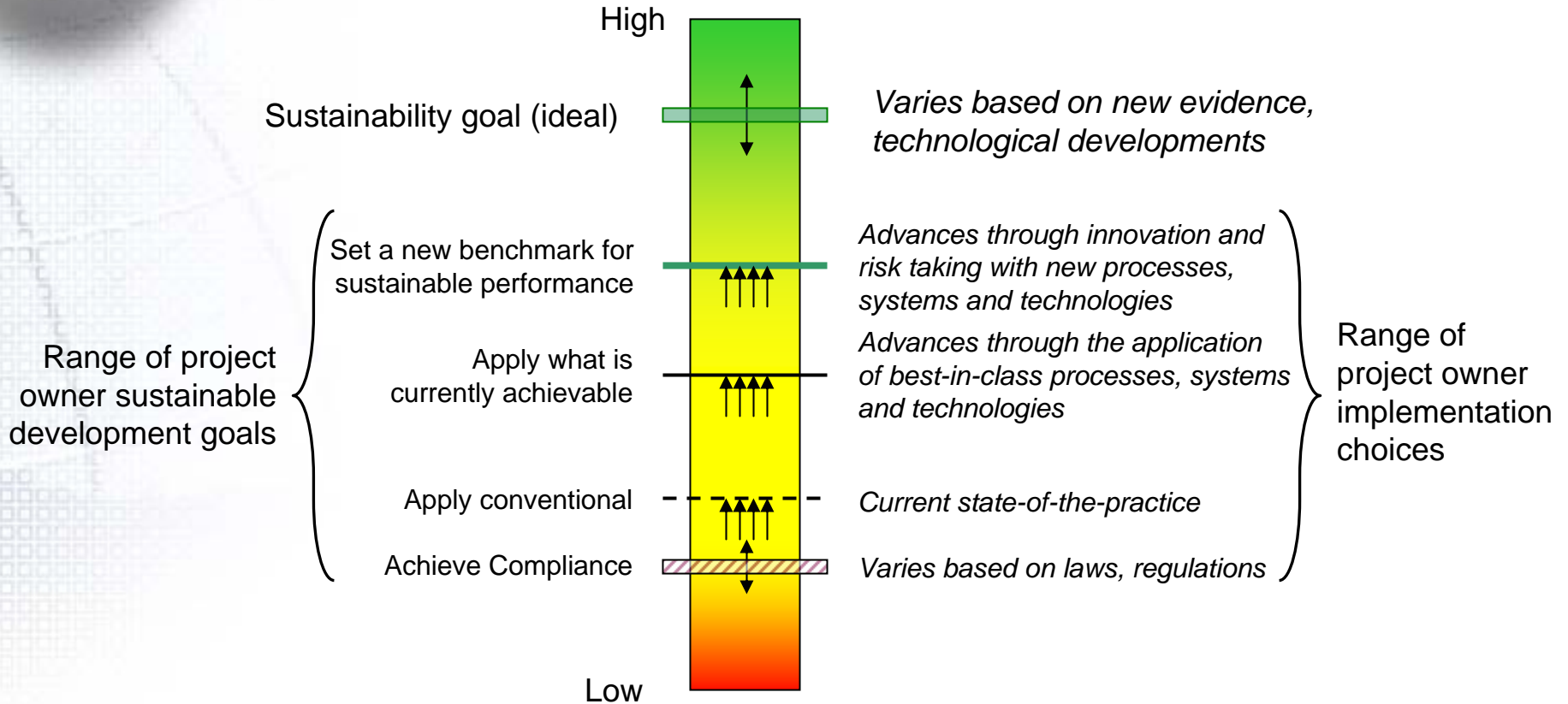


Project Sustainability Management Goals and Indicators





Sustainable Development Project Goals and Indicators

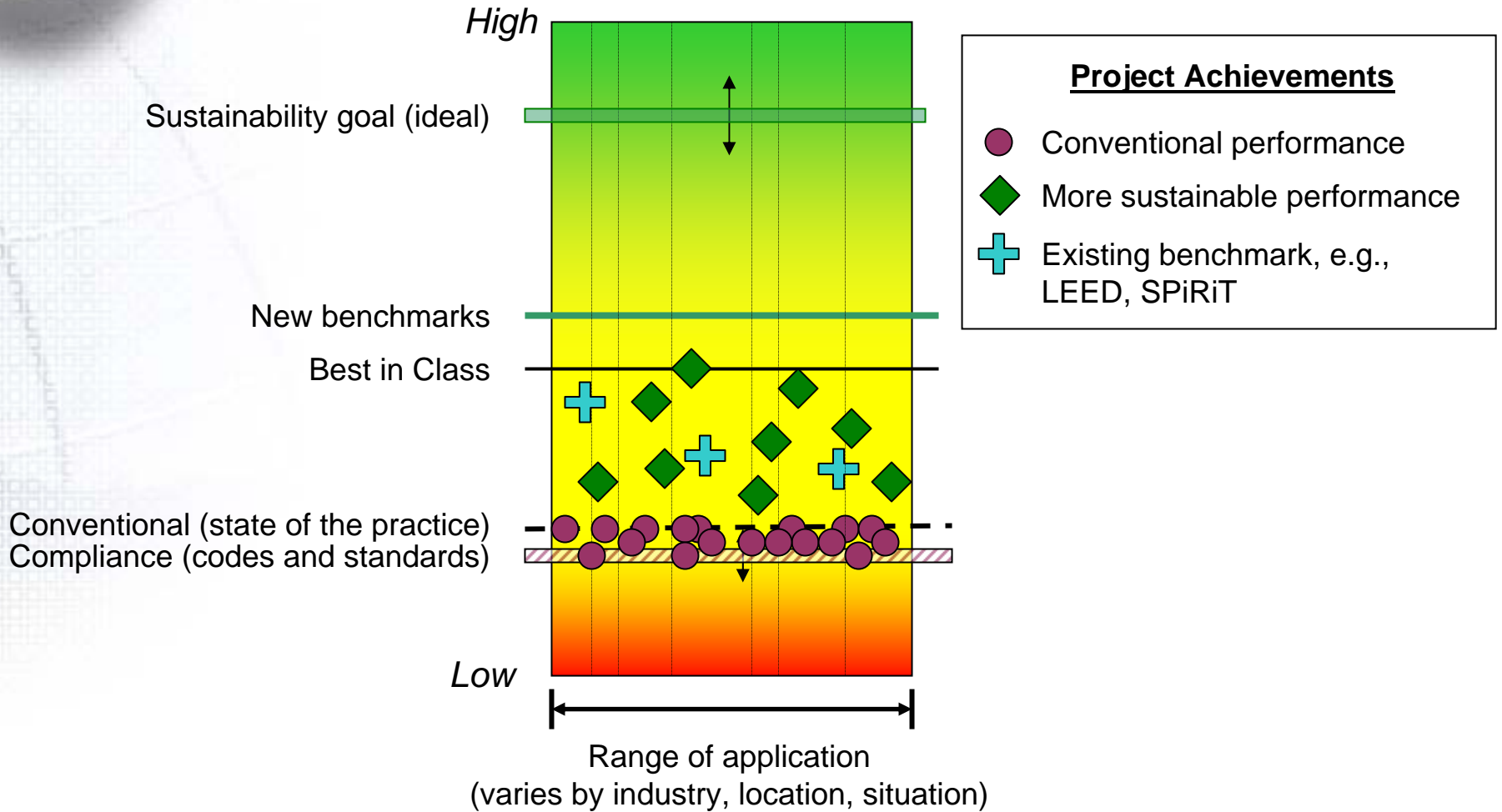


Sustainable development goals and indicators

Examples: water consumption per person, total GHG emissions, percent use of recycled materials.

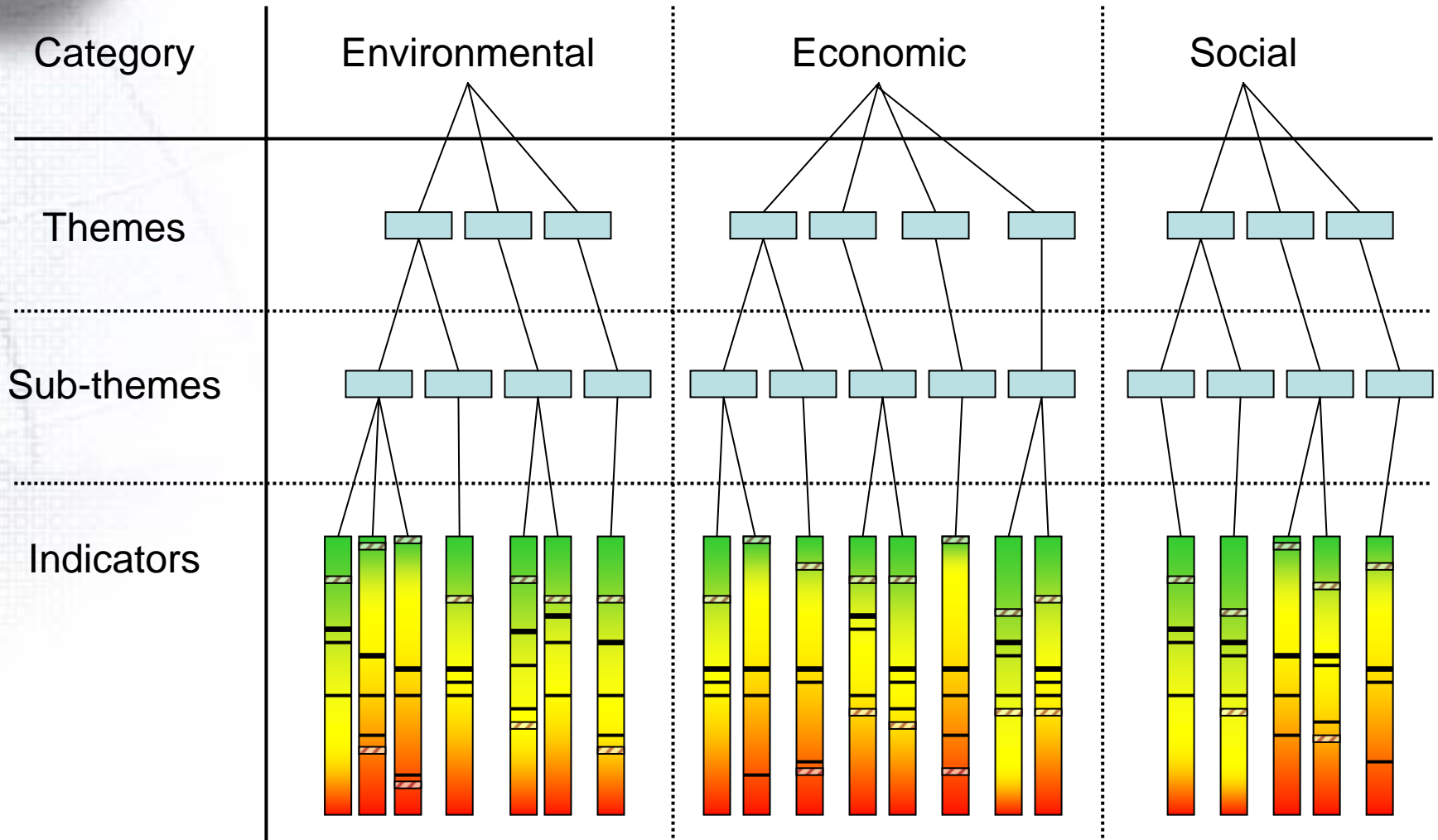


“Raising the Bar”





Sustainable Development Goals and Indicators Set



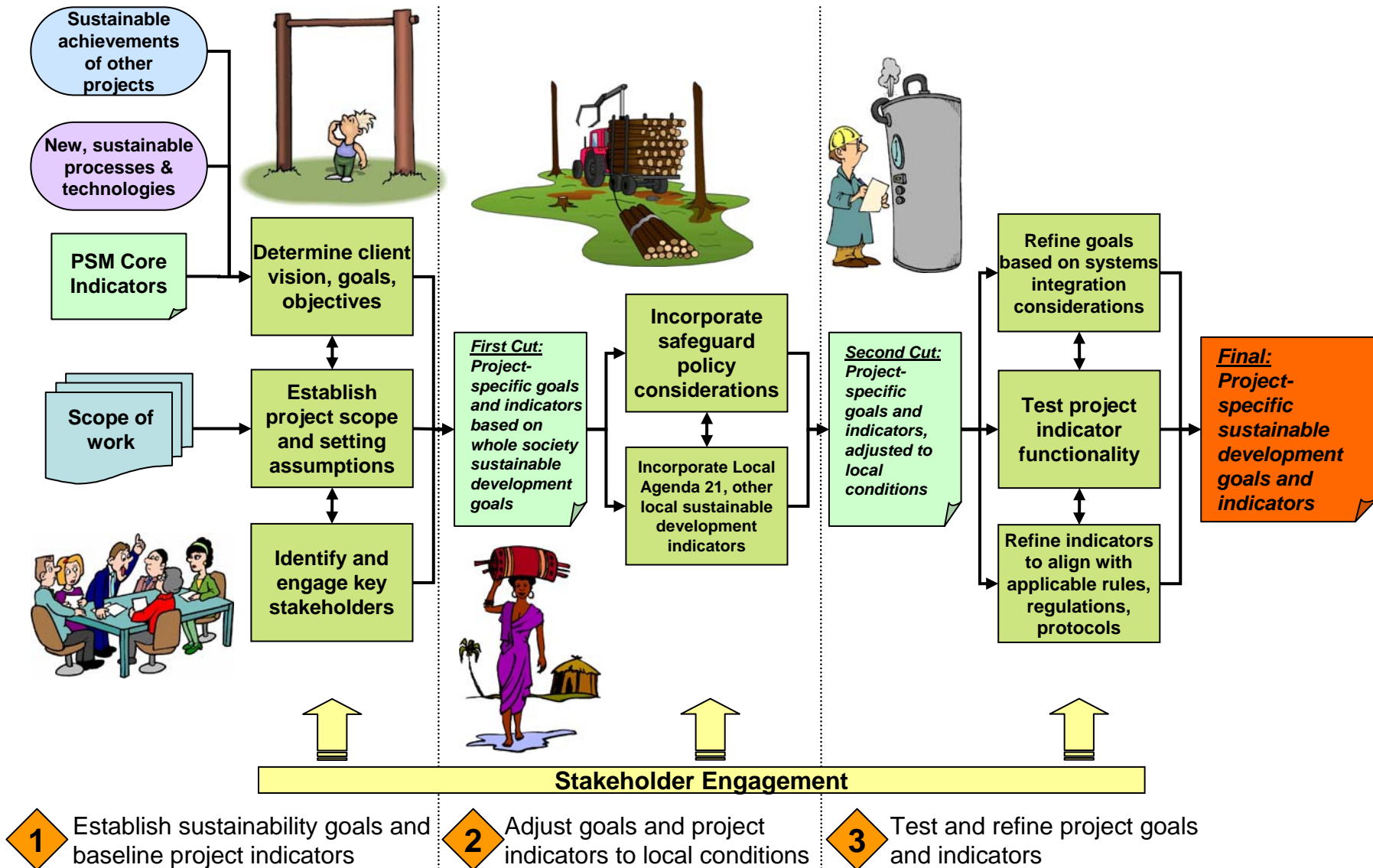


PSM Core Goals and Indicators: Examples

<i>Theme</i>	<i>Sub-theme</i>	<i>Goal</i>	<i>PSM Indicator</i>
Category: Environmental			
Fresh water (18)*	Water Quality	Maintain, enhance water quality	EN-14: BOD EN-15: fecal coliform
Category: Economic			
Consumption & production patterns (4)	Material consumption	Reduce the intensity of material use	EC-2: Degree of material usage
Category: Social			
Equity	Poverty (3)	Reduce the percent of people living below the poverty line.	SO-1: Proportion of local workers, companies employed

*refers to chapter in Agenda 21

PSM Process





Project Sustainability Management II

Proposed revisions to the Guidelines



Proposed Revisions to the Guidelines*

- Highlights relationship to the Millennium Development Goals
- Suggested revisions to the PSM indicators
 - Modified wording, additional indicators
- Lists practices which are more sustainable
 - Shows increasing levels of sustainability
- References minimum standards
 - Uses official publications of the UN and other internationally recognized groups
- Notes how each of the PSM goals and indicators can be addressed
 - Changes to policies and/or programs or through new designs and/or technologies

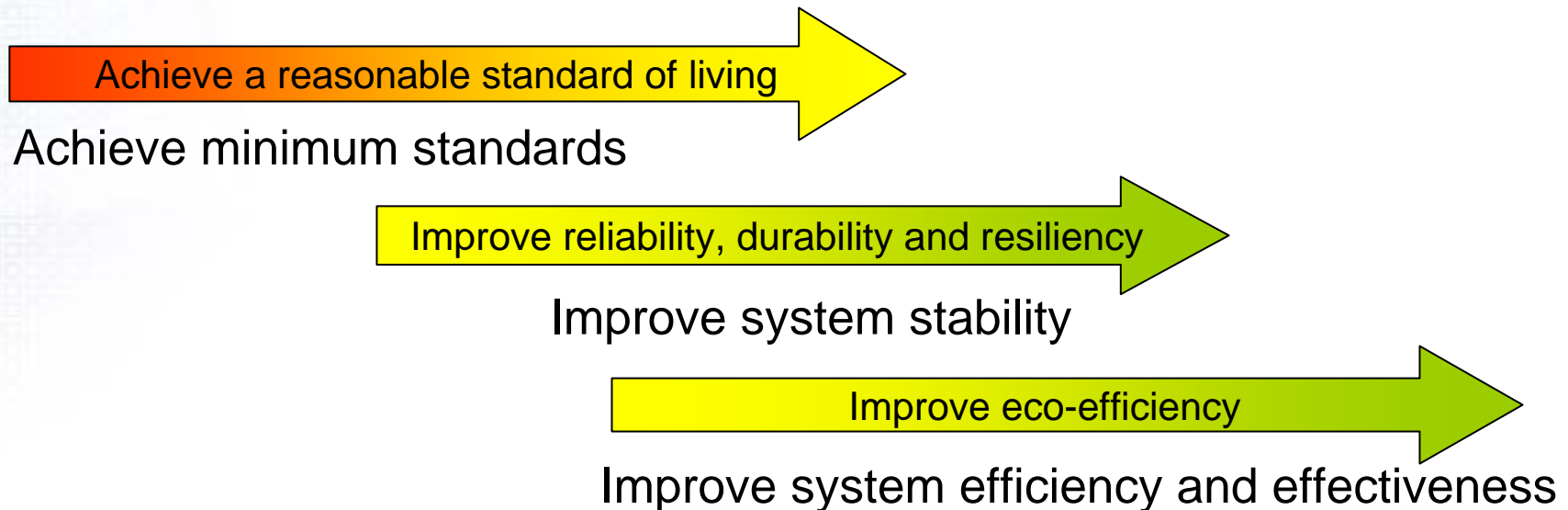
**See Table: Project Sustainability Management: Sustainability Roadmap*



Pathway Towards Sustainability: Three Initiatives

World Economies*

<i>Low income</i>	<i>Low-middle income</i>	<i>Upper middle income</i>	<i>High income</i>
<\$1**	<\$2	<\$9	>\$30
Malawi	Rwanda	India	China
			WORLD
			Poland
			Japan
			USA



*Source: World Bank list of economies, July 2005, <http://www.worldbank.org/data/countryclass/classgroups.htm>

** GDP in US\$ per person per day



Achieve a Reasonable Standard of Living

Millennium Development Goals:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development



Ending Rural Poverty

- 1.2 billion people earn <\$1/day (3 billion <\$2/day)
 - 70% live in rural areas, struggle with hunger and poverty
 - 45% (550 million) earn their living through agriculture
 - Some improvements, but more is needed
- Market-driven strategy
 - Increase income from \$1 to \$3/day
 - Improve profitability of small farms (1000m²)

“Ninety percent of the people who design things work on the problems of the world’s richest 5%. There is a huge need to design things that will create a market for the poorest 4 billion people.”

Paul Polak, Fortune, June 20, 2005

Source: Paul Polak, International Development Enterprises



“Four Revolutions”

1. Affordable small plot irrigation technology
 - \$25 Treadle pumps
 - \$360/hectare drip irrigation
 - \$40 water storage (10,000 l.)
 - \$7 arsenic filter
2. High value, labor intensive cash crops
3. Ruthless pursuit of affordability
 - “Factor five” design
 - Village-based chemical process technology
4. Access to markets



Source: Paul Polak, International Development Enterprises



Improve System Stability

- Improve the reliability of facilities and infrastructure
- Improve the durability and resiliency of facilities and infrastructure
 - Extreme weather conditions
 - Other disasters, natural and man-made





Improve Eco-efficiency

- Eco-efficiency
 - Reduce materials requirements
 - Reduce energy intensity
 - Reduce the use of toxic materials
 - Enhance recyclability
 - Use renewable resources
 - Extend product durability
 - Increase service intensity





Future Work

- **Revise the Project Sustainability Management Guidelines**
 - Revise and expand indicators
 - Add goals, current state of the practice, more sustainability practices
- **Apply and test on sustainable projects**
 - Identify problems and make necessary changes
- **Acquire endorsements**
 - Professional societies, trade associations, clients, governments
- **Acquire additional knowledge**
 - Examples of applications of more sustainable technologies, systems, programs
 - Best practices



Project Examples



Questions?



Useful References

Publications Specific to Project Sustainability

Project Sustainability Management Guidelines, International Federation of Consulting Engineers (FIDIC), ISBN 2-88432-034-5, Code: FI-EN-T-AA-10. Available through FIDIC at www.fidic.org.

Becoming Part of the Solution: The Engineer's Guide to Sustainable Development, Bill Wallace, American Consulting Engineers Council, Washington, DC, February 2005. Available through the ASCE bookstore.

Sustainable Development Project Indicator Web Sites

LEED: Leadership in Energy and Environmental Design, U.S. Green Building Council. <http://www.usgbc.org/>

SPiRiT: Sustainable Project Rating Tool. U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, Sustainable Design and Development. <http://www.cecer.army.mil/SustDesign/SPiRiT.cfm>

SPeAR: Sustainable Project Appraisal Routine, Arup Group. <http://www.arup.com/environment/feature.cfm?pageid=1685>

BREEAM: BRE's Environmental Assessment Method. <http://www.breeam.org/>

General References on Sustainable Development

Sustainable Engineering Practice: An Introduction, Jorge A. Vanegas (Editor), American Society of Civil Engineers, 2004.

Our Common Future, The World Commission on Environment and Development, Oxford, UK: Oxford University Press, 1987.

The Ecology of Commerce: A Declaration of Sustainability, Paul Hawken, Harper Business, New York, 1993.

In Earth's Company: Business, Environment and the Challenge of Sustainability, Carl Frankel, New Society Publishers, Gabriola Island, BC, Canada, 1998.

Natural Capitalism, Paul Hawken, Amory Lovins, and, L. Hunter Lovins, Little, Brown and Company, Boston, 1999.

Walking the Talk: The Business Case for Sustainable Development, Chad Holliday, Stephan Schmidheiny, and Philip Watts, Berrett-Koehler Pub., San Francisco, 2002.

The Natural Step for Business: Wealth, Ecology and The Evolutionary Corporation, Brian Nattrass and Mary Altomare. New Society Publishers. Gabriola Island, BC, Canada, 1999.

Dancing With the Tiger: Learning Sustainability Step by Natural Step, Brian Nattrass, Mary Altomare, New Society Publishers, Gabriola Island, BC, Canada, 2002.

Our Ecological Footprint: Reducing Human Impact on the Earth, Mathis Wackernagel and William Rees, New Society Publishers, Gabriola Island, BC, Canada, 1996.

Eco-Efficiency: The Business Link to Sustainable Development, Livio Desimone, Frank Popoff, and the World Business Council for Sustainable Development, MIT Press, 1997.

Cannibals with Forks: The Triple Bottom Line of 21st Century Business, John Elkington, New Society Publishers, Gabriola Island, BC, Canada, 1998.

Cradle to Cradle: Remaking the Way We Make Things, William McDonough and Michael Braungart, North Point Press, New York, 2002.



Appendix

Other approaches to project sustainability

- ❖ U.S. Green Building Council: LEED
- ❖ SPiRiT: Sustainable Project Rating Tool. U.S. Army Corps of Engineers
- ❖ Arup Group: SPeAR[®] : Sustainable Project Appraisal Routine



U.S. Green Building Council: LEED

**Leadership in Energy and Environmental
Design**



LEED

- Voluntary, consensus-based standard for high performance sustainable buildings
- LEED Certification process
 - Application for certification
 - Submission of information for each category of points (accredited professionals)
 - Certification with minimum points
 - Special levels (silver, gold, platinum) for designated range of points
- Website: www.usgbc.org





U.S. Army Corps of Engineers: SPiRiT

Sustainable Project Rating Tool



SPiRiT

- Adaptation of LEED for use for U.S. military installations
- Similar ratings: bronze, silver, gold, platinum
- Future military construction projects will require achieving a “gold” rating

Website:

<http://www.cecer.army.mil/SustDesign/SPiRiT.cfm>



Solar array panel testing site used to increase energy efficiency. At max load the solar panels can produce 30kw/hr



Conventional Method



Sustainable Method

Sustainable Design & Constructability methodology



Arup Group: SPeAR[®]

**Sustainable Project Appraisal
Routine**

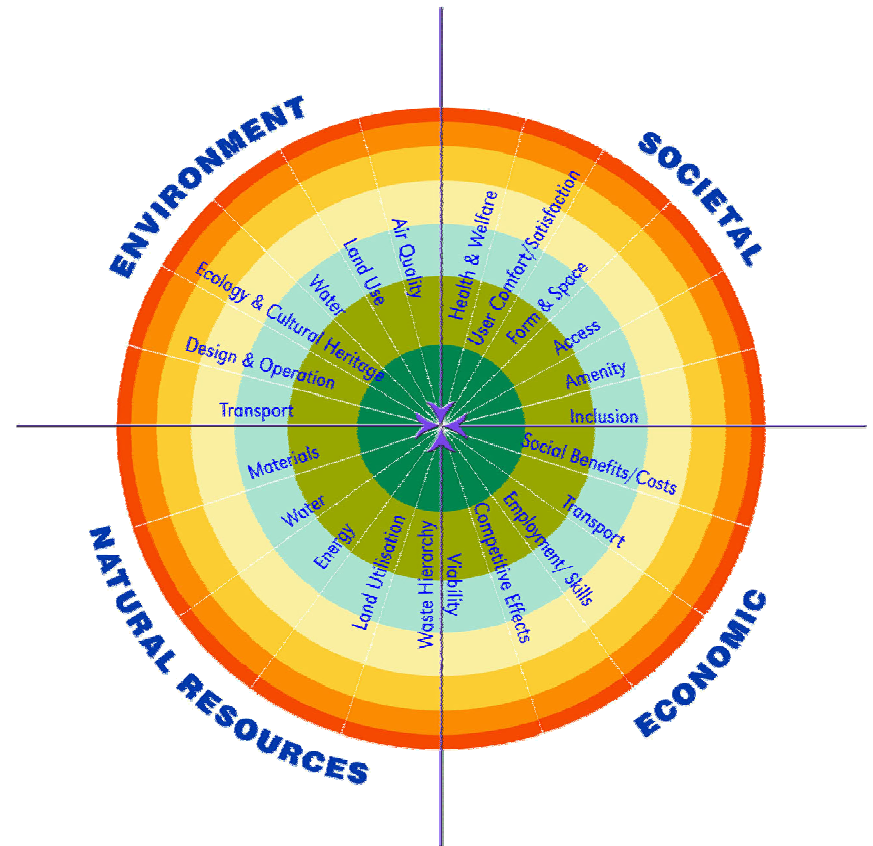


SPeAR[®] Framework

- A framework for sustainability issues
- Appraisal based on the performance of each indicator against a scale of best and worst cases
- Provides a profile of sustainability performance
 - Highlights both strengths and weaknesses
- Uses
 - Management information tool
 - Part of a design process

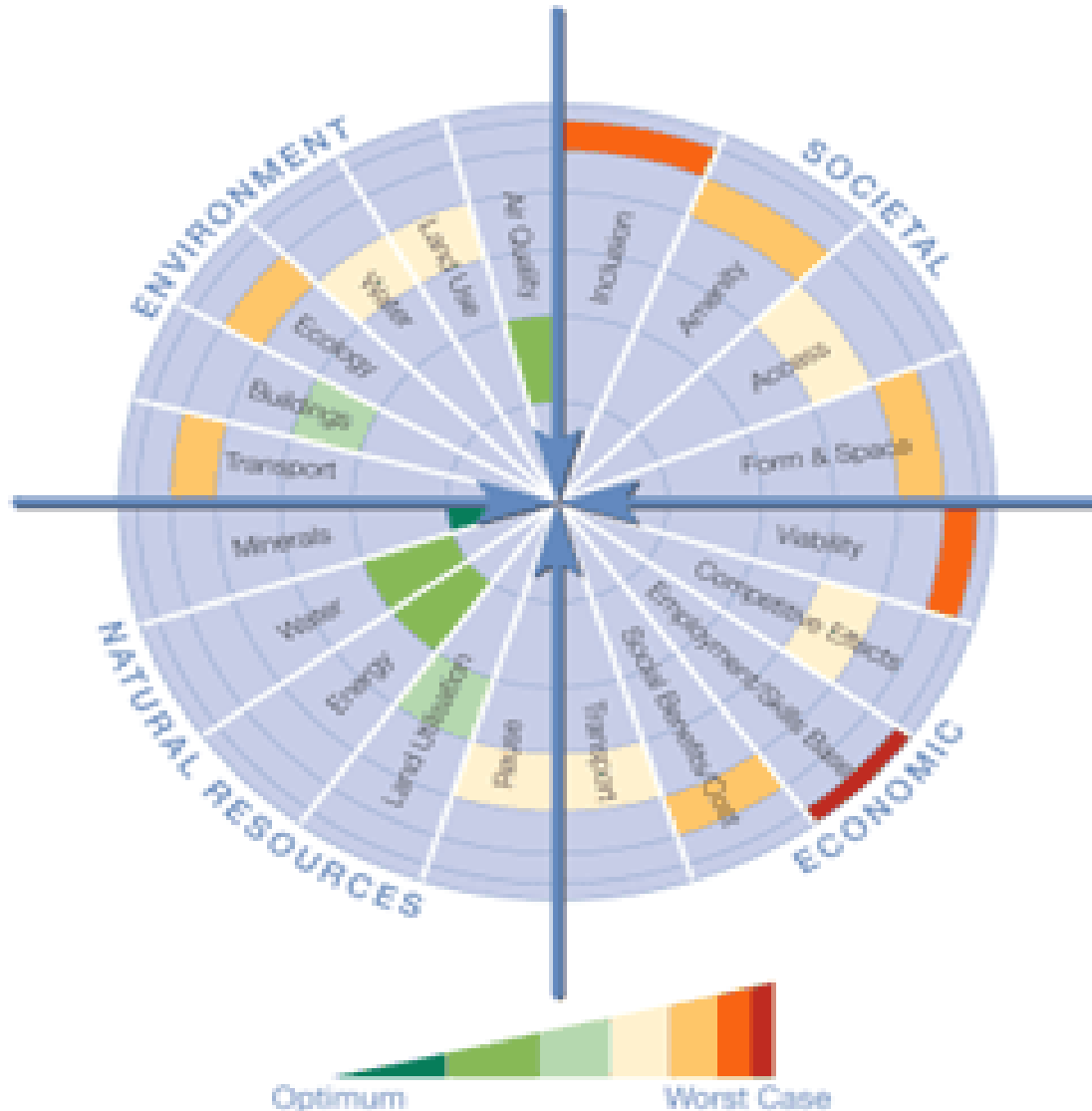
Web site:

<http://www.arup.com/environment/feature.cfm?pageid=1685>





SPeAR[®] Application Example





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