

Sustainability Cost Accounting (SCA):



University of Pretoria

Department of Engineering
& Technology Management

TU/e

A methodology for technology management in the process industry: A South African case study

Alan Brent, Ron van Erck & Carin Labuschagne

1. Technical University of Eindhoven, the Netherlands
2. University of Pretoria, South Africa

Chair: Life Cycle Engineering

Department of Engineering and Technology Management

University of Pretoria, 0002, South Africa

Tel: +27 12 420 3929

Fax: +27 12 362 5307

E-mail: alan.brent@up.ac.za

Outline of the presentation



University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **An introduction to the South African industry**
- **A framework to assess sustainability performances**
 - **Of operational initiatives**
 - For example, deployed technologies
- **Monetary indicators for a Sustainability Cost Accounting (SCA) procedure**
 - **Based on the framework to assess sustainability performances in industry**
- **Case study in the process industry of South Africa**
 - **To evaluate and understand the practical obstacles to apply such a methodology**
 - **Identify limitations of such an approach and make recommendations**
 - **Reveal how positive and negative impacts on sustainability relate to each other**
 - For a specific technology in the process industry of South Africa
 - Hypothetical Gas-to-Liquid (GTL) fuel-manufacturing facility

Sustainable businesses and industry in the South African context



University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **Legislation pertaining to sustainability in South Africa**
 - Mainly focuses on environmental issues
 - Enforcement and compliance to governmental legislation is weak
 - Environmental management is often of low importance to industry
 - Legislation dealing with social aspects has been tabled
 - Unlike environmental legislation it does not currently affect South African businesses in a direct manner
- **Market expansion towards multinational companies**
 - Stricter legislation and enforcement is faced
 - Global sustainability pressures, through international trade barriers and the promotion of parent companies
 - Consequent drive for South African companies to change management practices and production methods
 - Assessing potential liabilities and sustainability performances of newly developed technologies is therefore fundamental to companies

Available frameworks to assess sustainability performances



University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **A number of frameworks have been reviewed, primarily:**
 - **Global Reporting Initiative (GRI)**
 - **United Nation's Commission on Sustainable Development's Framework**
 - **Sustainability Metrics of the Institution of Chemical Engineers**
 - **Wuppertal Sustainability Indicators**
- **Certain limitations have been identified with these frameworks:**
 - **Strong focus on environmental sustainability**
 - **Macro perspective**
 - **Lack of concrete guidelines**
 - **Non-integrated approach**

Labuschagne C, Brent AC, van Erck RPG, 2005,
Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

An introduced framework to assess the sustainability performances of industry



Labuschagne C, Brent AC, van Erck RPG, 2005,
Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

Corporate Social Responsible (CSR) projects



Labuschagne C, Brent AC, van Erck RPG, 2005,
Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

Economic sustainability of operational initiatives as part of the overall corporate strategy



University of Pretoria

Department of Engineering & Technology Management

TU/e



Labuschagne C, Brent AC, van Erck RPG, 2005, Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

Environmental sustainability of operational initiatives as part of the overall corporate strategy



Labuschagne C, Brent AC, van Erck RPG, 2005,
Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

Social sustainability of operational initiatives as part of the overall corporate strategy



University of Pretoria

Department of Engineering & Technology Management

TU/e



Labuschagne C, Brent AC, van Erck RPG, 2005, Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

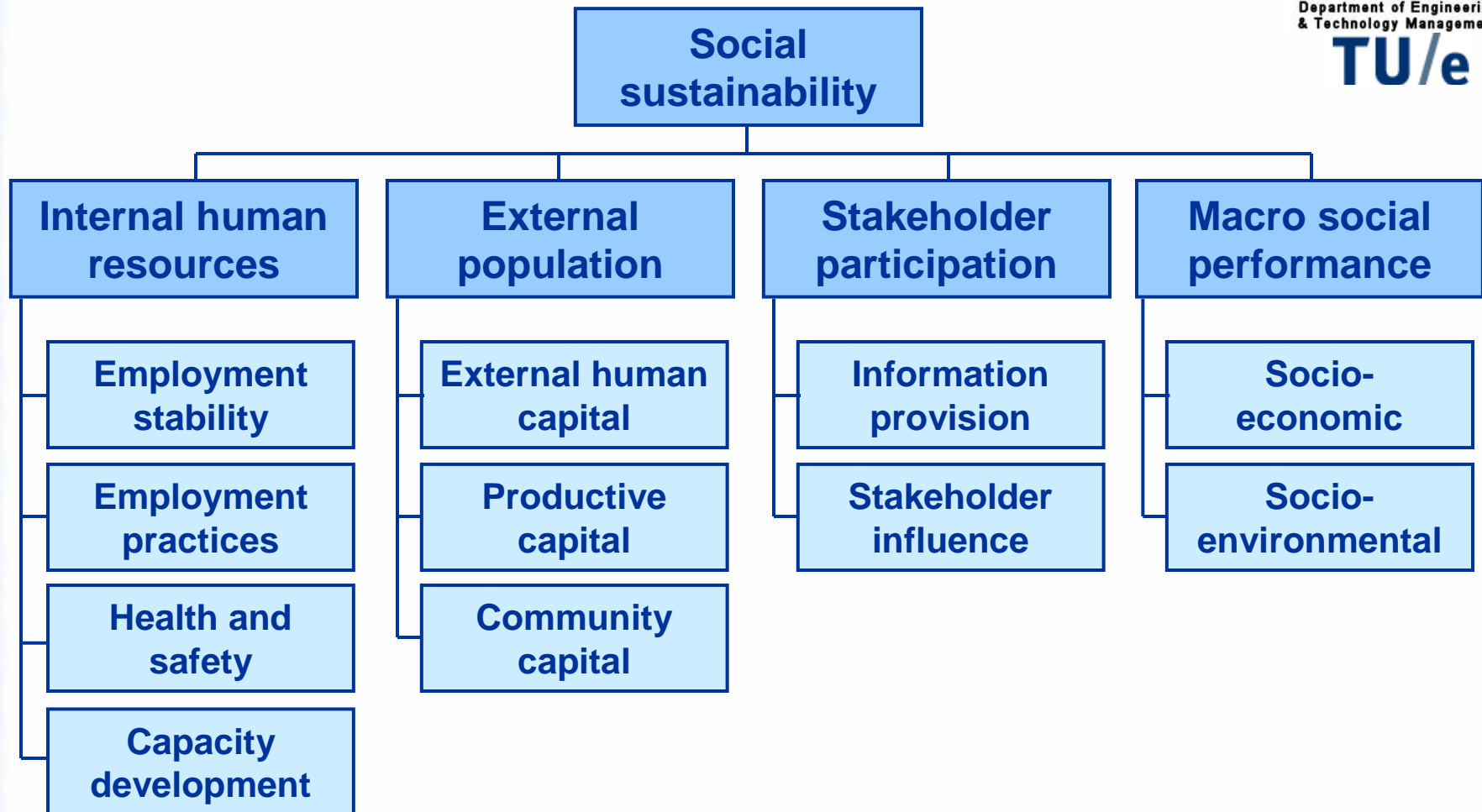
Sub-criteria of the social dimension



University of Pretoria

Department of Engineering
& Technology Management

TU/e



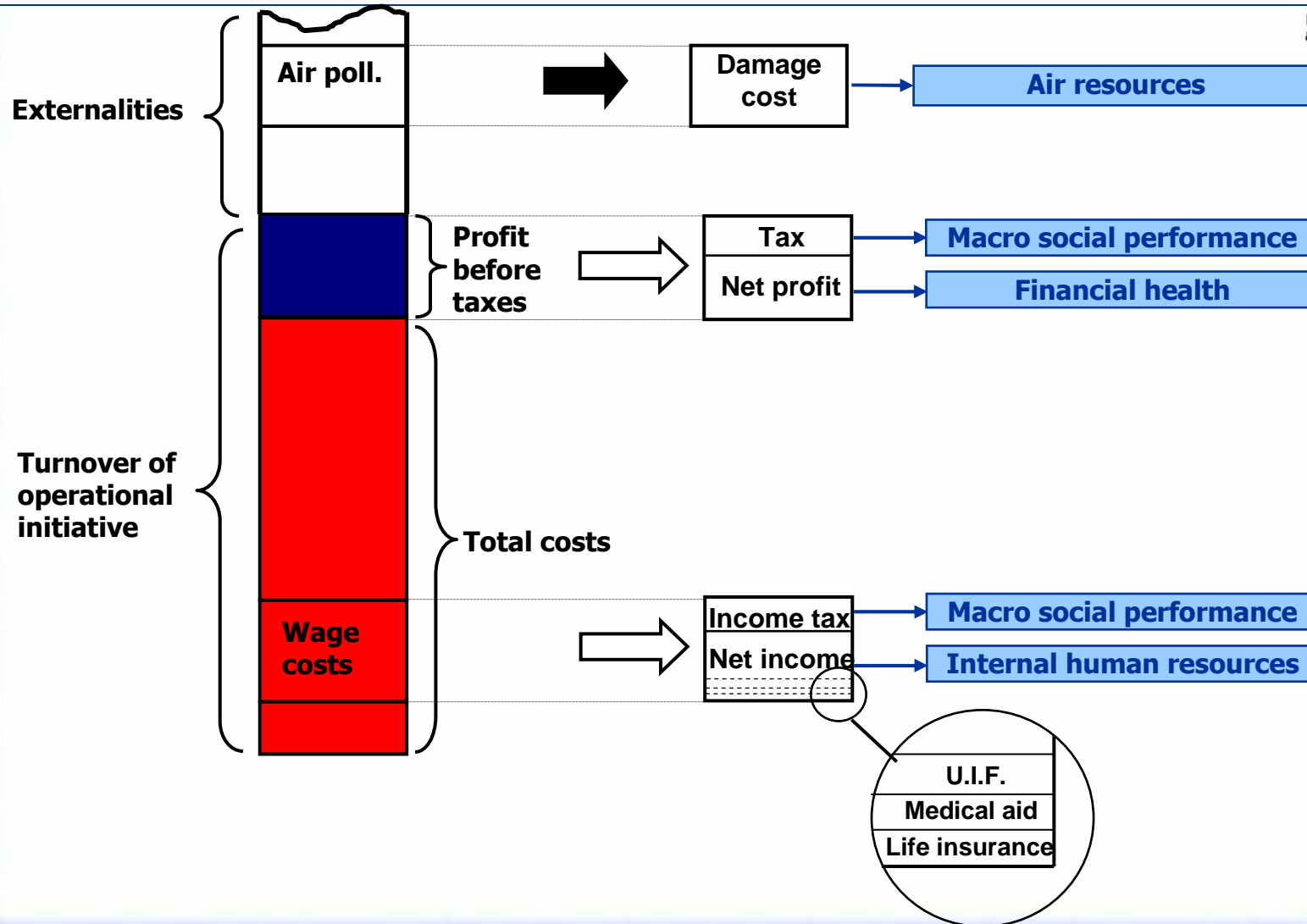
Labuschagne C, Brent AC, van Erck RPG, 2005,
Assessing the sustainability performances of industries. *Journal of Cleaner Production* 13(4) 373-385

Sustainability Cost Accounting (SCA) methodology



University of Pretoria
Department of Engineering & Technology Management

TU/e



Indicators of the economic criteria of the sustainability assessment framework



Criterion	Indicator	Reference
Internal financial health	Profit	Industry numbers
Economic performance	Not assessed – company wide	
Potential financial benefit	Financial benefits Subsidies	
Trading opportunities	Not assessed – company wide	Industry numbers

Indicators of the environmental criteria of the sustainability assessment framework



University of Pretoria
Department of Engineering
& Technology Management

TU/e

Criterion	Indicator	Reference
Natural air resources	Damage costs of regional/global air pollution on: human health, buildings and crops	European and U.S studies, converted to SA price levels
Natural water resources	Externalities of water consumption	
Natural land resources	Opportunity costs of used land	
Mined abiotic resources	Economic depreciation of resources	

Indicators of the social criteria of the sustainability assessment framework



University of Pretoria
Department of Engineering
& Technology Management

TU/e

Criterion	Indicator	Reference
Internal human capital	Expenditure on: wages, training & educating of employees and R&D	Industry numbers
External population	Investments in human capital Impact on real estate value	Country-specific studies
Stakeholder participation	Expenditures on communication with stakeholders	Industry numbers
Macro social performance	Taxes (profit, wages, other) and socio-environmental investments	Industry numbers

Case study in the South African process industry to evaluate the SCA procedure



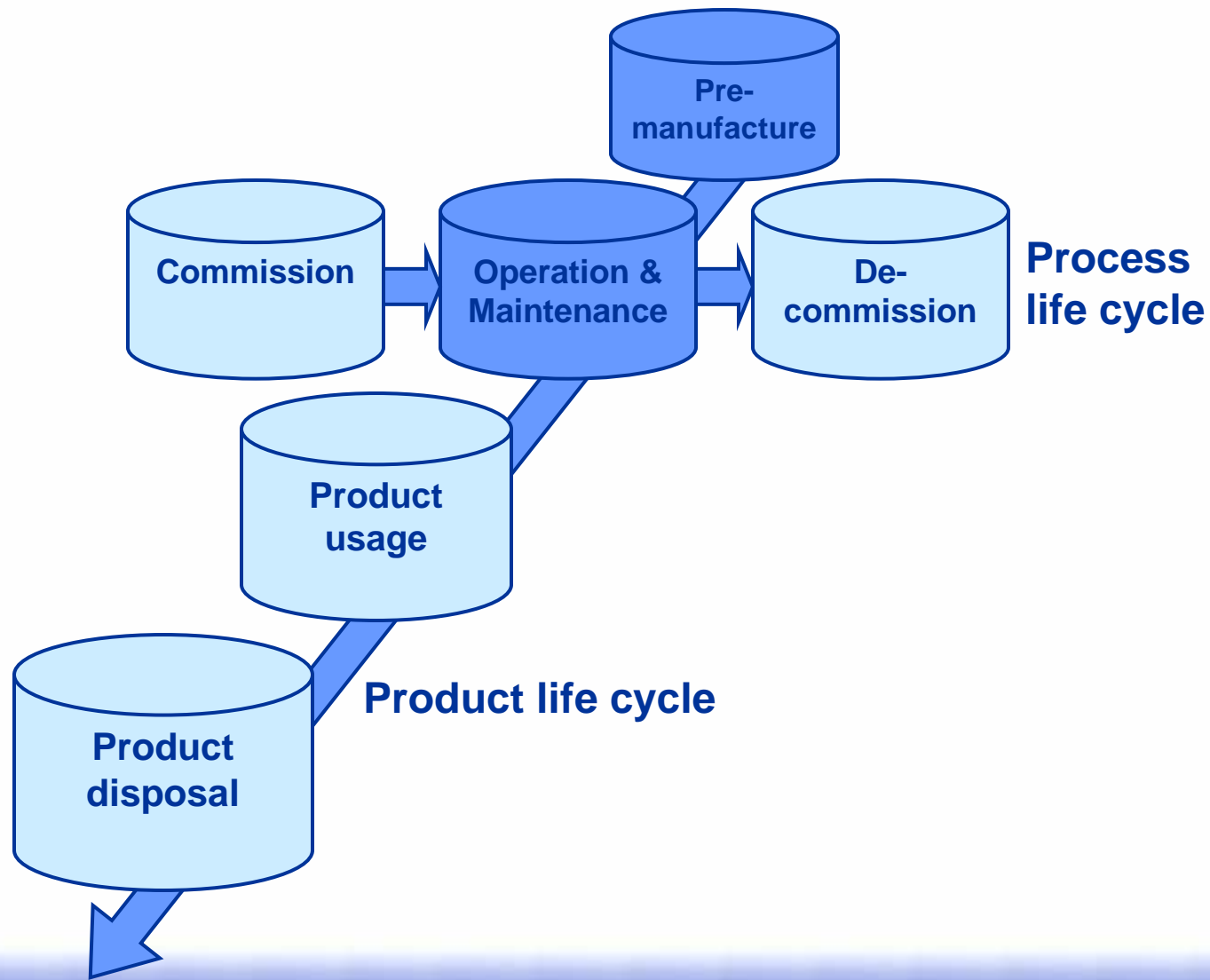
University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **GTL fuel manufacturing facility at a specific location**
 - The importance of the technology in South Africa
 - The Sasol company that has developed the technology
 - The importance of the Secunda location for the case study
- **Boundaries of the case study**
 - Process
 - Contingencies
- **Functional unit of the case study**
 - A barrel of diesel fuel produced

Demarcation of the operational activity



SCA results of the GTL conversion technology assessment: Economic dimension



University of Pretoria

Department of Engineering & Technology Management

TU/e

(Sub) criteria	Score (R ₂₀₀₂ /bbl)	Significance ^a	Comments
Economic dimension	115.10		
Financial health	115.10	High	The following has not been taken into account: contributions to corporate head office, auxiliaries and research and development activities that occur off-site

a A score value (for a criterion) that contributes less than 5 % to the overall score of a sustainable development dimension, is not considered significant

SCA results of the GTL conversion technology assessment: Environmental dimension



University of Pretoria

Department of Engineering & Technology Management

TU/e

(Sub) criteria	Score (R ₂₀₀₂ /bbl)	Significance ^a	Comments
Environmental dimension	- 142.17		
Air resources	- 81.60	High	Low estimate of the ExternE accounting framework (European Commission, 1997)
Regional impacts	- 38.30		
Global impacts	- 43.30		
Water resources	- 4.49	Low	Based on published estimates (Van Horen, 1996)
Water use	-4.49		
Land resources	- 0.08	Low	Only land use of the plant taken into account
Land use	-0.08		
Mined abiotic resources	-56.00	High	4 % discount rate, based on local proven reserves

a A score value (for a criterion) that contributes less than 5 % to the overall score of a sustainable development dimension, is not considered significant

SCA results of the GTL conversion technology assessment: Social dimension



University of Pretoria

Department of Engineering & Technology Management

TU/e

(Sub) criteria	Score (R ₂₀₀₂ /bbl)	Significance ^a	Comments
Social dimension	70.05		
Internal human resources	22.35	High	
Employment stability	18.50		
Capacity development	3.85		
External population	1.41	Low	
Human capital	0.13		
Community capital	1.28		
Stakeholder participation	0.77	Low	
Macro social performance	45.55	High	See the comments on 'financial health'
Socio-environmental	0.05		
Social-economic	45.50		

a A score value (for a criterion) that contributes less than 5 % to the overall score of a sustainable development dimension, is not considered significant

SCA results of the GTL conversion technology assessment: Comparison of the dimensions



University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **Economic dimension** : R 115.10
- **Environmental dimension** : - R 142.17
- **Social dimension** : R 70.05

Conclusions



University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **Practical SCA procedure has been developed**
 - **Based on FCA and TCA methodologies**
 - Incorporation of social aspects
 - **Demonstrated with a case study in the South African process industry**
- **The SCA procedure shows certain limitations**
 - **Concept of sustainability cannot be expressed in monetary terms**
 - In a comprehensive manner
 - Limitation on the assessment of all criteria in the framework
 - **Procedure may be generally applicable**
 - Indicator values must be assessed on a case-by-case basis
 - Uncertainty of the data that is used must be included in the interpretation of an assessment
- **The SCA procedure does improve the understanding of a technology's sustainability performance**
 - **Allowing trade-offs between the contributions and damages of a technology should be seriously considered before it is applied**

Recommendations

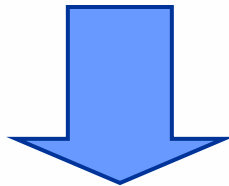


University of Pretoria

Department of Engineering
& Technology Management

TU/e

- **Uncertainty of data must be addressed**
 - **Damage costs is being refined**
 - **In the South African context**
- **Monetary route is limited**
 - **Combine the monetary assessment methodology together with qualitative indicators for an overall sustainability performance assessment**



- **PICMET conference 2005**



Closure and questions

