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Hogeschool van Arnhem en Nijmegen
HAN University of Applied Sciences

Project Sustainability Index in Logistics

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Project SIL Index

- **Goals of the project**
 - **Theoretical background**
 - **Management theories**
 - **Mathematical background**
 - **Organisation of the project**
 - **Execution**
 - **Evaluation**
-

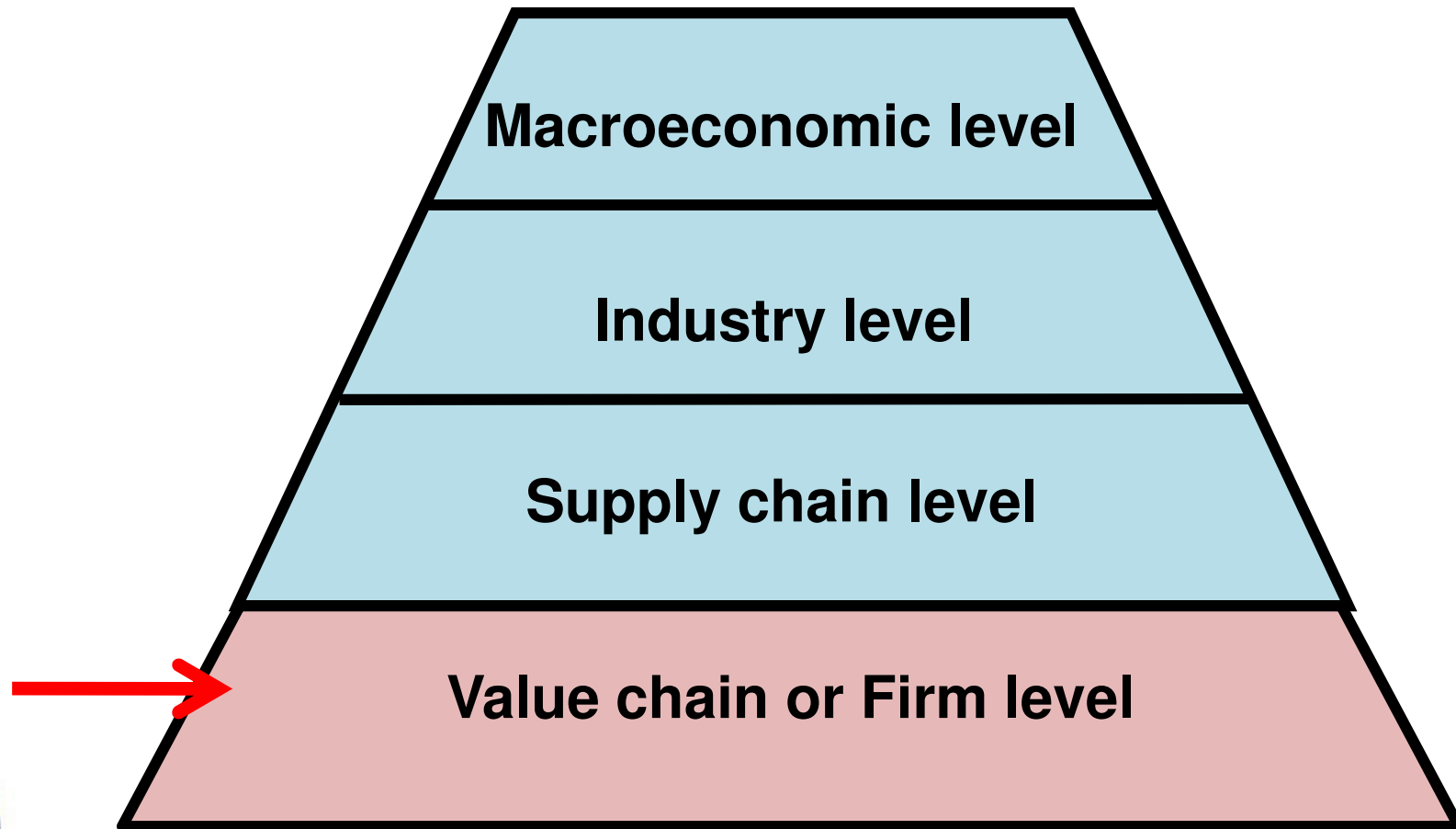


Goals of the project

- **To develop knowledge of Sustainability in Logistics on firm level**
 - **To develop a Quick Scan model**
 - **To test (in companies) the general model and make suggestions for improvement**
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SIL Performance Firm Model





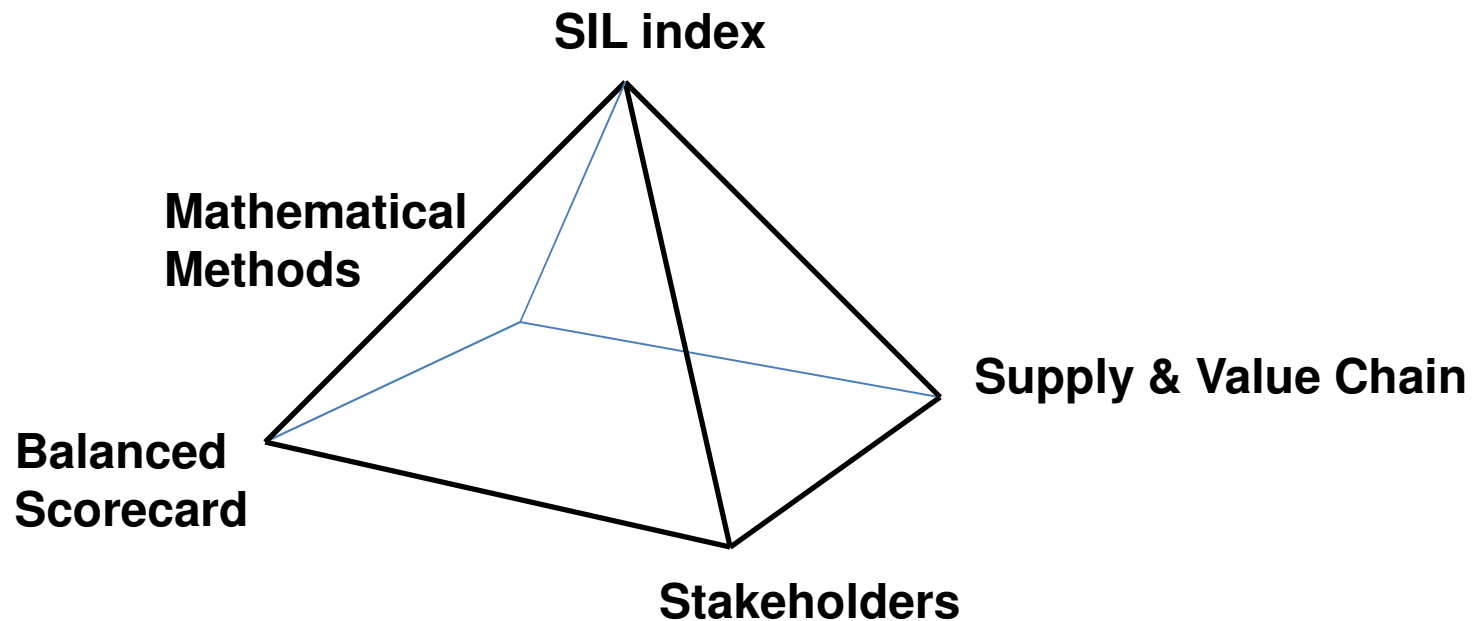
Theoretical background

- **Stakeholders theory (Rhineland Business model)**
 - **Balanced Scorecard (Kaplan & Norton)**
 - **Value Chain & Supply Chain (Porter)**
 - **Weighted Sum Approach**
 - **Analityc Hierarchy Process (Saaty)**
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Theoretical background

Measuring sustainability on firm level



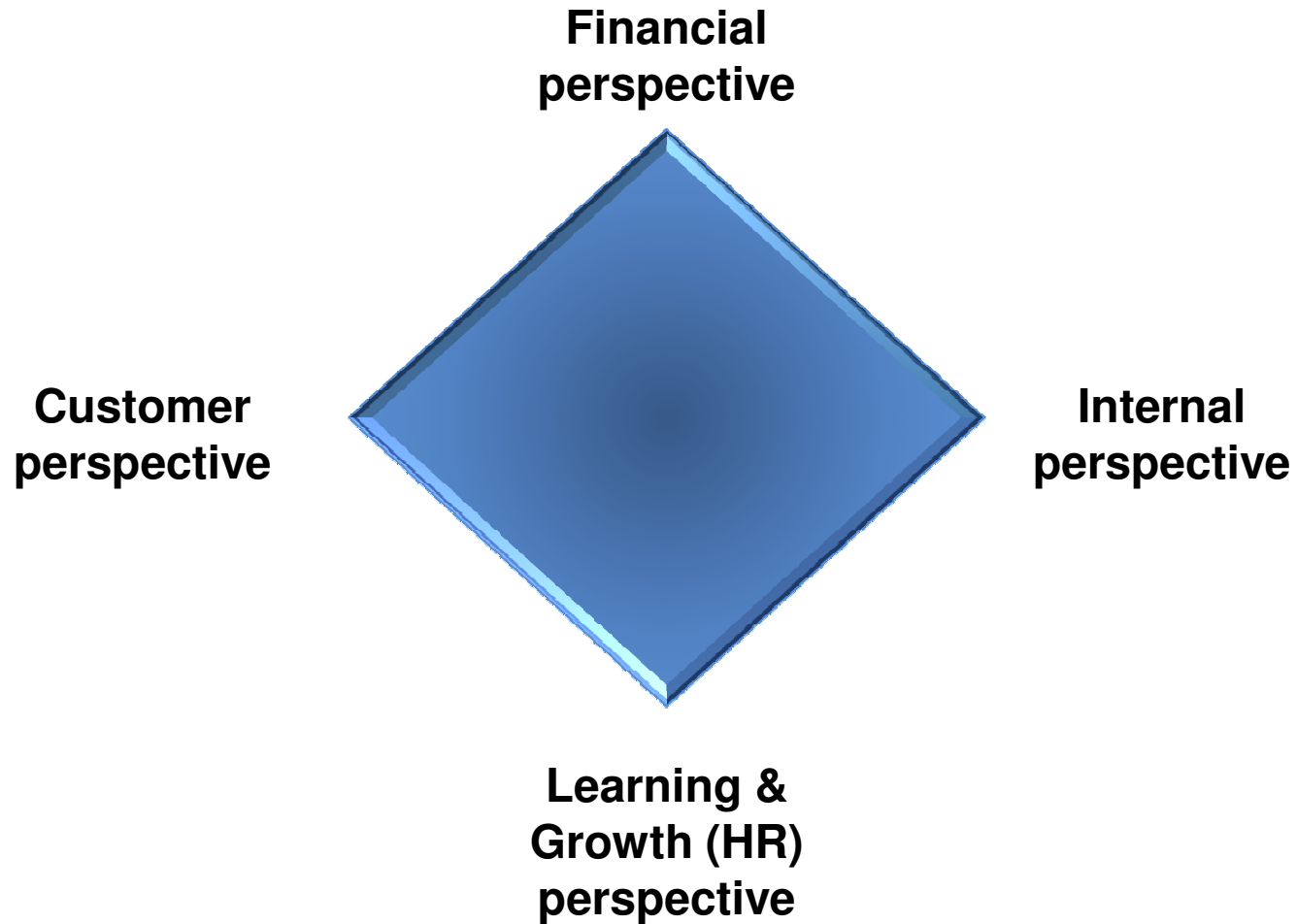


Stakeholders

- **Shareholders / Owners**

 - **Banks**
 - **Government**
 - Local
 - National
 - **Society (e.g. pressure groups etc.)**
 - **Clients**
 - **Suppliers**
 - **Labour (Workforce)**
-

Balanced Scorecard





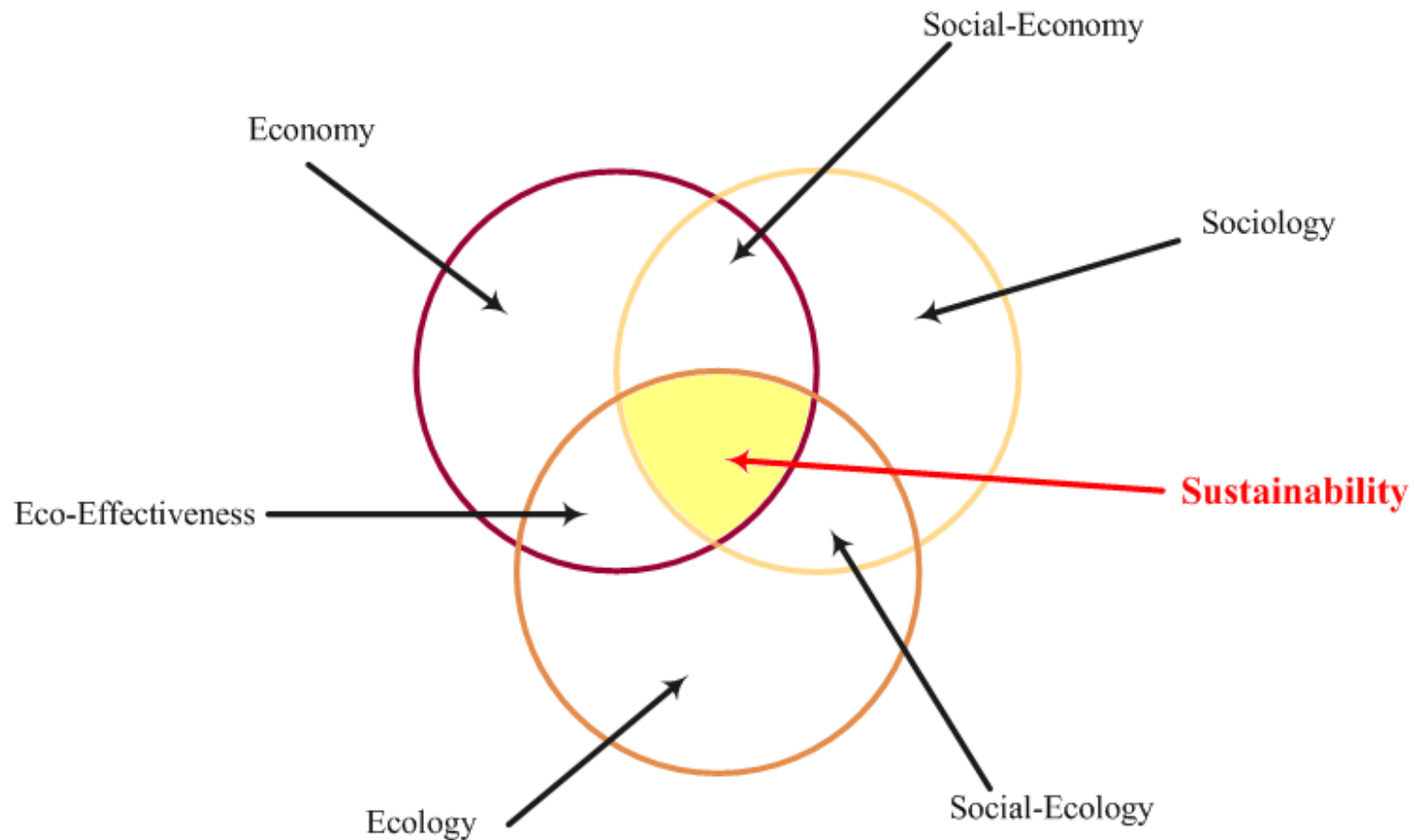
Examples of flows

Outcome of Porter's Value Chain

	Incoming	Outgoing
Tangible	Raw materials Labour Equipment & machinery Money	Products Pollution
Intangible	Information Goodwill	Services Pollution Information



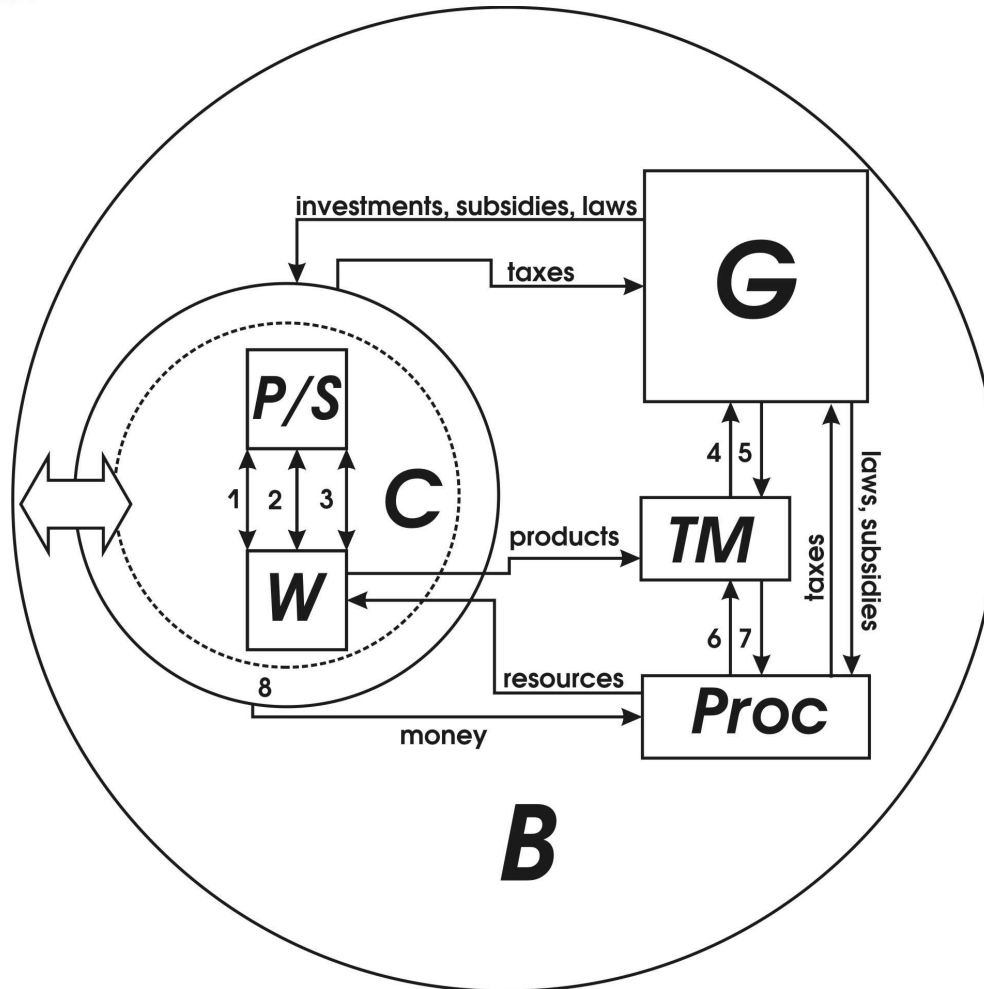
Definition of sustainability



Confrontation Matrix

	Financial Perspective	Client Perspective	Internal Perspective	HR Perspective
Shareholders / Owners	Return On Investment			
Banks	Financial leverage			
Government				
Society	R&D / Sales	Change in firm's environmental footprint Complaints by pressure groups		
Clients	Sales growth	Customer satisfaction Change in № of complaints		
Suppliers			Purchases/Sales	
Labour (Workforce)			Staff SHEQ training	Sickness rate staff

Framework of Factors



B – stands for biosphere
C – company
P/S – products/services
W – warehousing
G – government
Proc – procurement
TM – target market.

1 – Financial flows
2 – Informational flows
3 – Material flows
4 – Taxes
5 – Transfer payments
6 – Interests
7 – Investments
8 – Employees



Modeling procedure

**Study of the
science area**

Groups of Factors

Factors

Indicators

Weights of Indicators

SIL Model

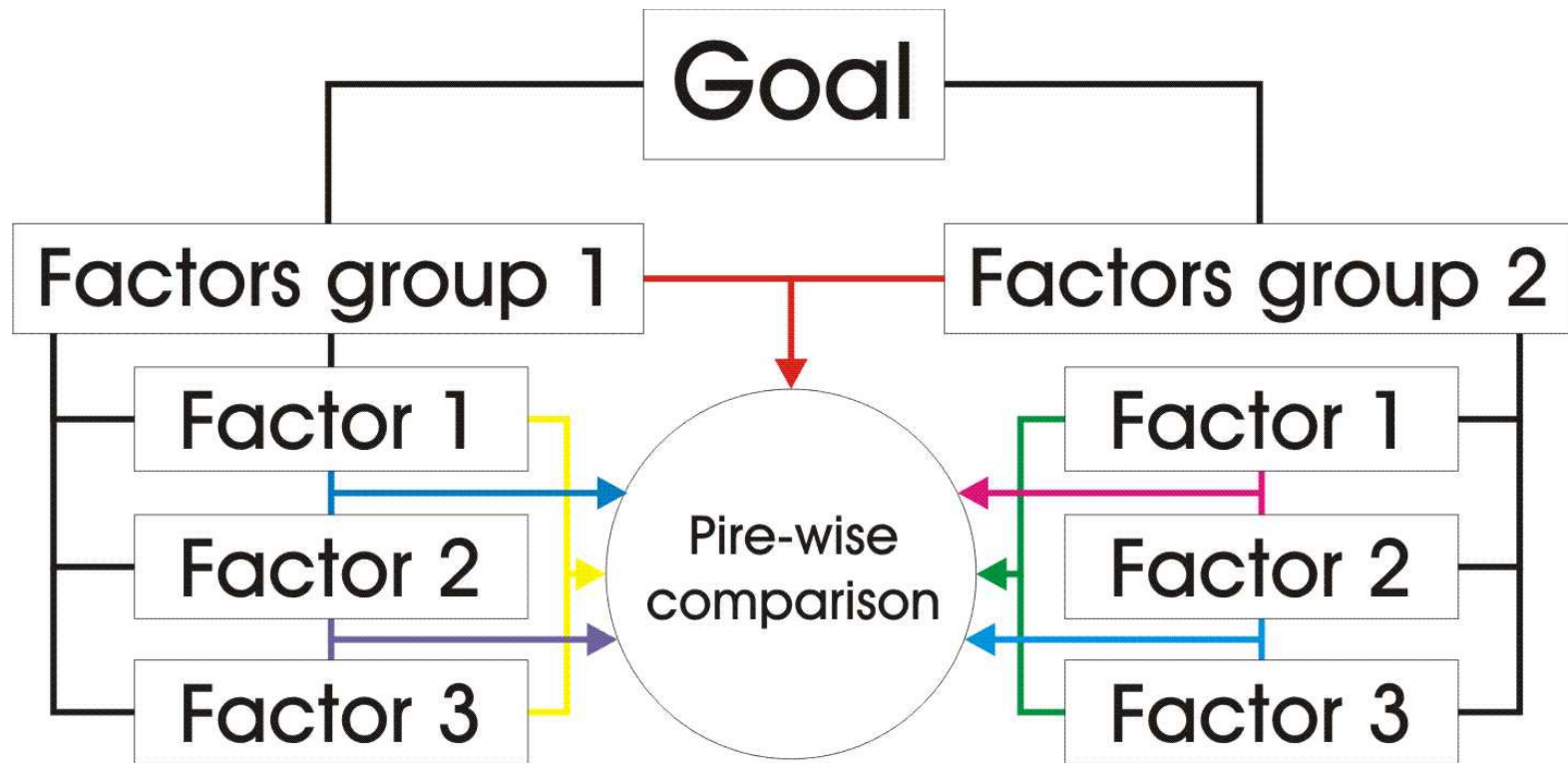
**Management
theories**

**Mathematical
methods**

Modeling

Implementation → Improvement

Analytical Hierarchy Procedure





Weighted Sum Approach

Group	Factor	Unit measure	Weight	Score	Weight * Score
Logistics					
<i>Storage</i>	The convenience of warehouses disposition	Balls (depending on the distance)	2.541		
	Warehouses filling	Percentage	1.778584		
	Automation of storing systems	Percentage	1.24704		
	Automation of loading/unloading.	Percentage	1.24704		
<i>Transport</i>	Optimization of navigation routs	Km or litres	5.1724		
	Filling of transportation units (TU)	Percentage	3.103		
	The collaboration with other companies	Yes/no Yes – 1, no –.0	0.77586		
	Number of trips	Product volumes divided one transportation unit load limit	1.03448		
	Automation of unloading systems	Percentage	1.2931		
	CO2 and other pollutants emission	Percentage: reducing in connection with production expansion.	6.4655		
	Average fuel consumption of vehicle fleet	L per 100 km in comparison with the standard	2.3276		
...					
	SUM		100	SI	



Data collection

Questionnaire filling

Interviewing the staff

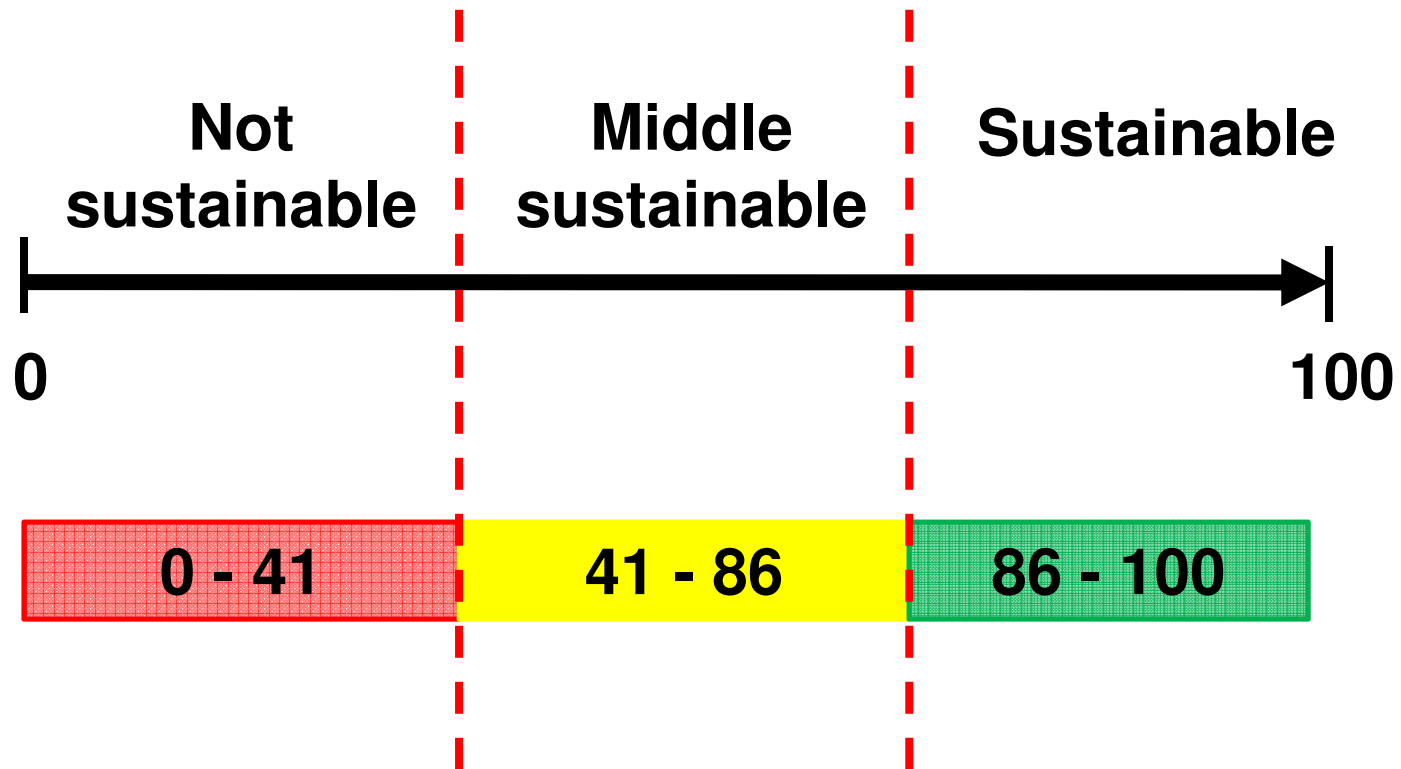
Internet survey
conducting

Expert appraisal

Annual reports



Classification of Sustainability





Organisation of the project

- **Distance learning:**

- www.kaledinovawebdesign.com/sil_blog

- Developed by Mrs Elena Kaledinova

- **Skype lecture (kick-off)**

- Jan Jansen

- **Skype conferences (weekly)**

- CSU students & Mrs Olga Lyamina

- HAN students & Mrs Elena Kaledinova

Execution

- **Simultaneously (winter semester)**
 - 3 groups of students at CSU (Faculty of Economics)
 - 2 students at HAN (Arnhem Business School)
- **Separately**
 - 1 group of students (HAN, College of Engineering)

Outcome

● Outcome on Theoretical level

- 2 teams of CSU developed an adjusted theoretical framework for the SIL-index

● Outcome on Research level

- 2 students from HAN (ABS) performed their field research at COSCO and TNT in the Netherlands
- 2 teams of CSU applied the developed framework at ChMK and Rastvorstory Co Ltd in Russia

● Outcome on Tool level

- 1 team of HAN (College of Engineering) developed a tool for the SIL-Index for Ri-Metaal (Using C++ programming language)



Evaluation (& Outcome)

- **The 3 main goals were realised (developing knowledge & testing)**
- **Experience was developed in:**
 - distance learning
 - empirical research / field research (firm level)
 - desk research (management models & mathematical models)
- **Outcome of this project is a good reason to continue for further research on:**
 - **Theoretical level**
 - further development of the SILI model on firm level
 - **Research level**
 - further research in companies (field research)
 - **Tool level**
 - further development of (C++) tool for the SILI-Index



What are our next steps?

- Develop the model into a unique one
 - Field research manual
 - Field research (Oct – Nov 2010)
 - Chelyabinsk
 - Arnhem
 - ? (not yet, but in 2011)
 - Further improvement of the model
 - Any questions / remarks ?
-



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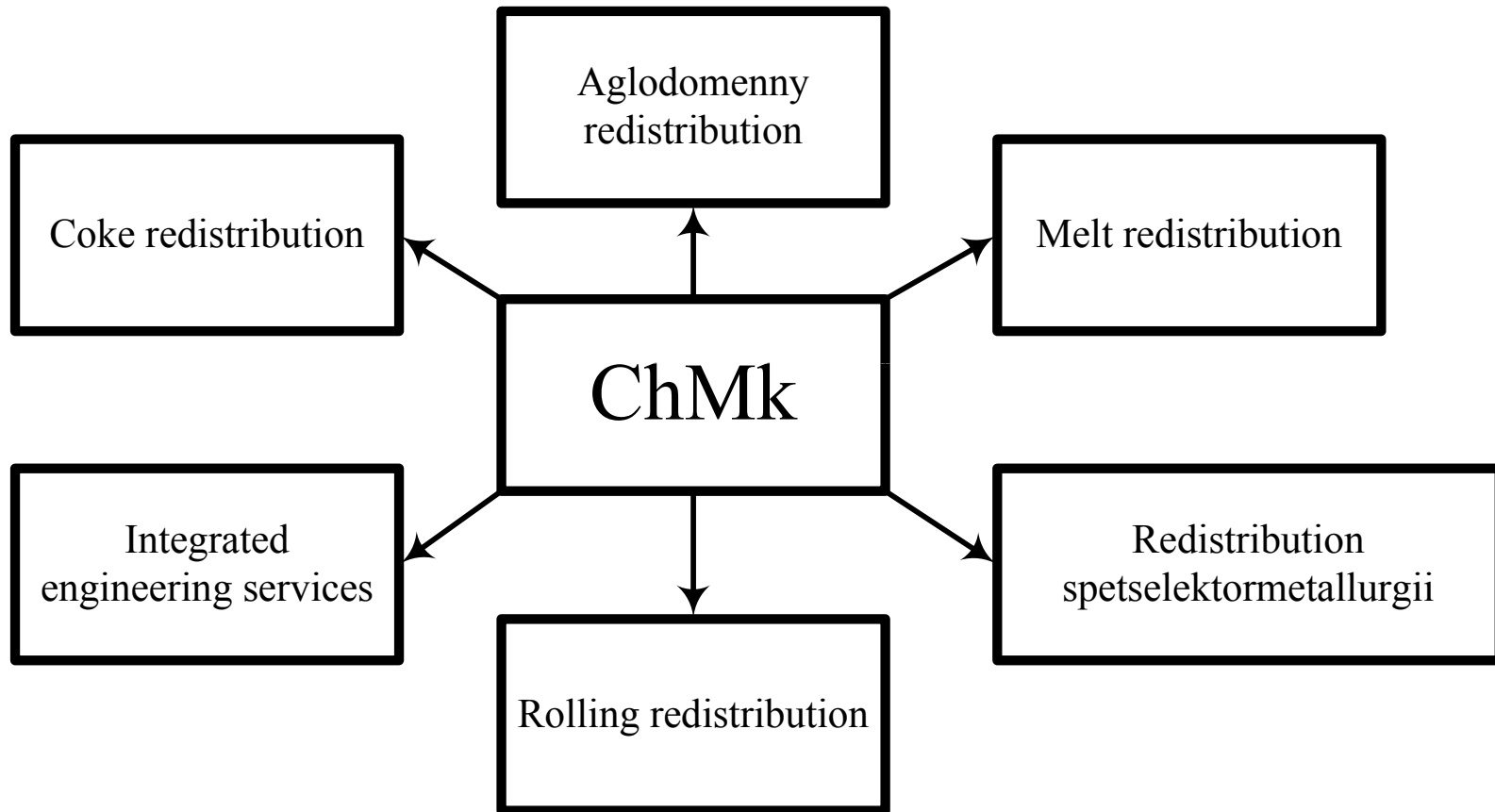
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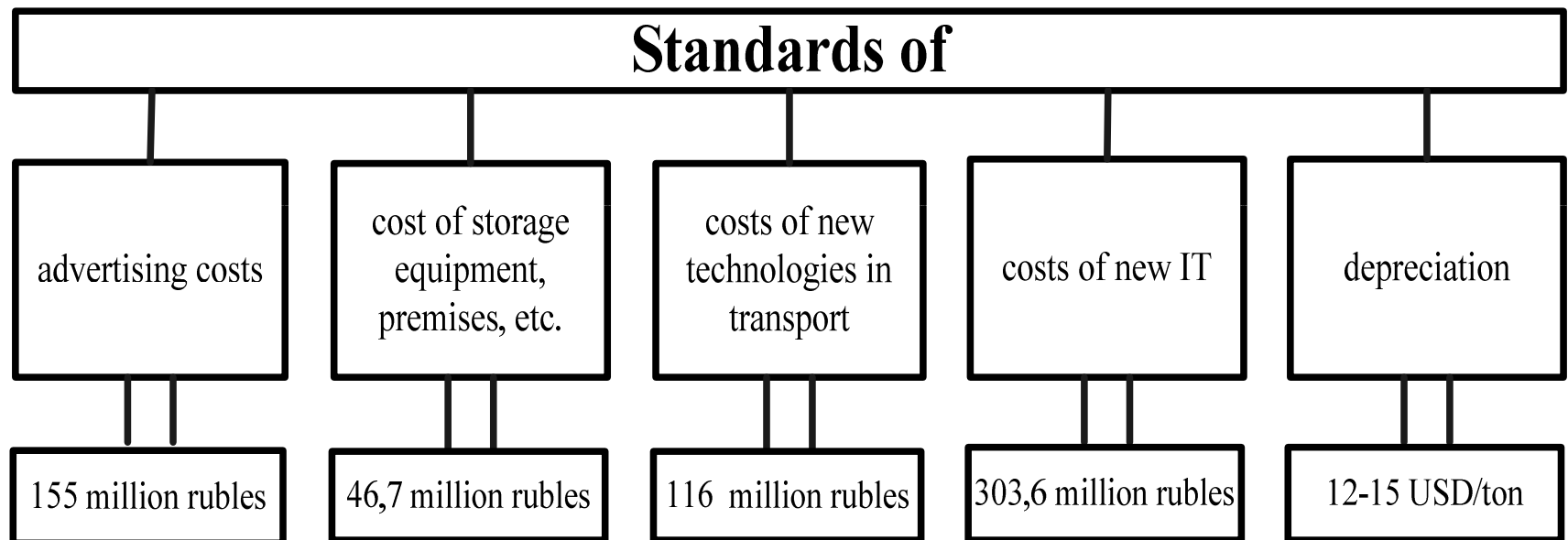


Chelyabinsk Metallurgical Plant





Cost standards of ChMK



[Data from The Federal service of state statistics] and [expert evaluation of the leading specialists in the field of accounting and economics]



ChMK SILI Index

The total score of environmental sustainability ChMK in logistics is	63,15
⇒ average level of sustainable development according to the Quick Scan Model model	



Examination of the results

"Weaknesses" ChMK

Isolation of insufficient funds for capital investment

Isolation of insufficient funds for advertising

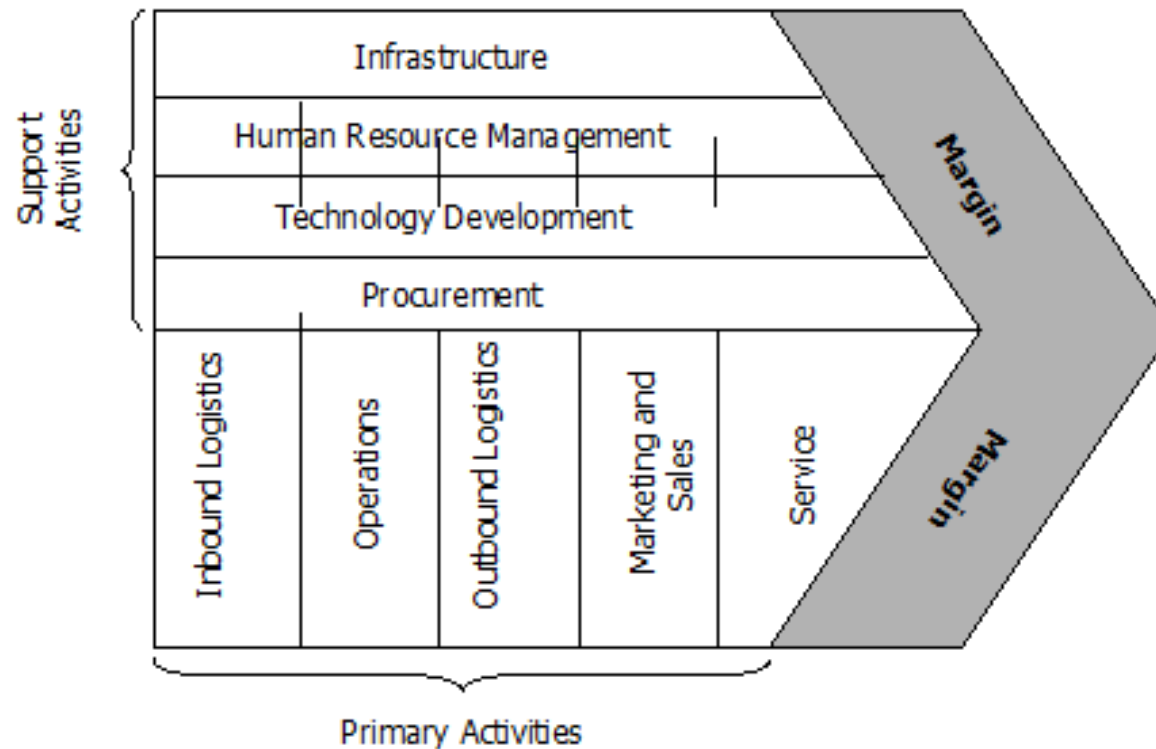
Isolation of insufficient funds for equipment and storage room

Lack of investment money into new technologies in the field of transportation

Inconsistency fuel to international standards



Porter's Value Chain



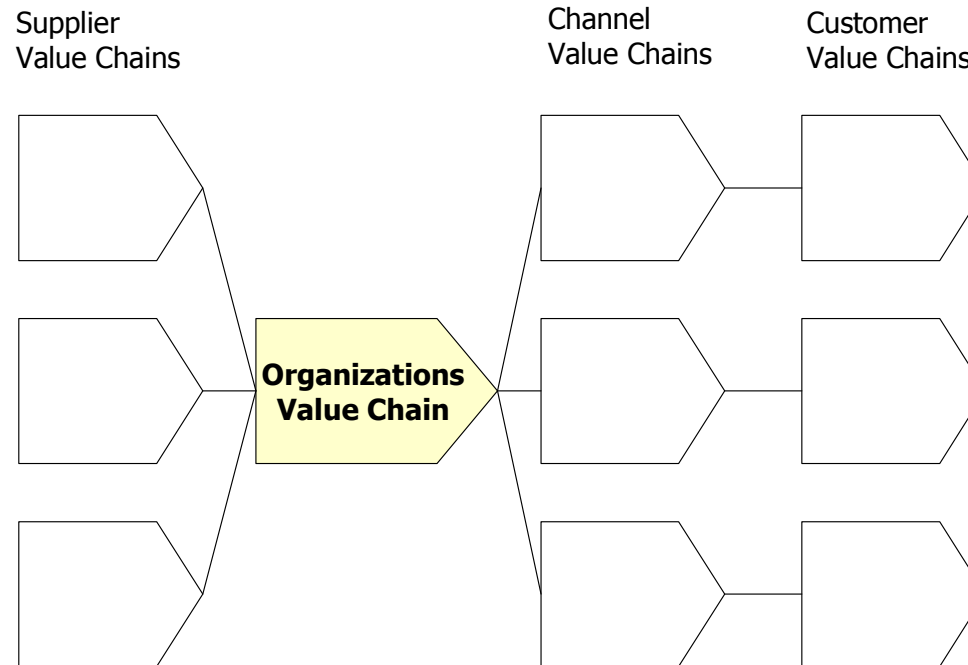
Porter 1985



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Porter's Supply Chain





Model

$$F(\bar{x}, \bar{y}, \bar{z}, \bar{u}) = X + Y + Z + U$$

$$X = 0,22 \cdot x_1 + 0,09 \cdot x_2 + 0,34 \cdot (x_3 + x_4) + 0,18 \cdot x_5 + 0,16 \cdot x_6 + 0,04 \cdot (x_7 + x_8)$$

$$Y = 0,66 \cdot (y_1 + y_2 + y_3) + 0,24 \cdot y_4 + 0,41 \cdot (y_5 + y_6) + 0,11 \cdot y_7 + 0,25 \cdot y_8$$

$$Z = 0,87 \cdot (z_1 + z_2 + z_3) + 0,37 \cdot z_4 + 0,6 \cdot z_5 + 0,33 \cdot (z_6 + z_7) + 0,27 \cdot z_8$$

$$U = 0,07 \cdot u_1 + 0,23 \cdot (u_2 + u_4) + 0,04 \cdot u_3 + 0,14 \cdot u_5$$



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Outcome on Theoretical level

Research team 1 of CSU (Rastvor-story Co Ltd) :

- Mangul A.V.,
- Piskunov S.A.,
- Sikorskaya T.I.,
- Filippov A.D

Research team 2 of CSU (ChMK company):

- Mikryukova A.S.,
- Pikuleva O.A.
- Todorov K.T.
- Fradkin, A.A.



Tasks of the research

- **Study the science area**
 - **Definition of the notion of sustainability**
 - **Definition the set of sustainability in logistics factors and their proper indicators**
 - **Developing Quick Scan model (SILI index calculation)**
 - **Weighted Sum Approach**
 - **Analytic Hierarchy Process (Saaty)**
 - **Analyzing a company with help of Quick Scan**
 - **Company data collection**
 - **Application of Quick Scan model**
 - **Examination of the results**
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