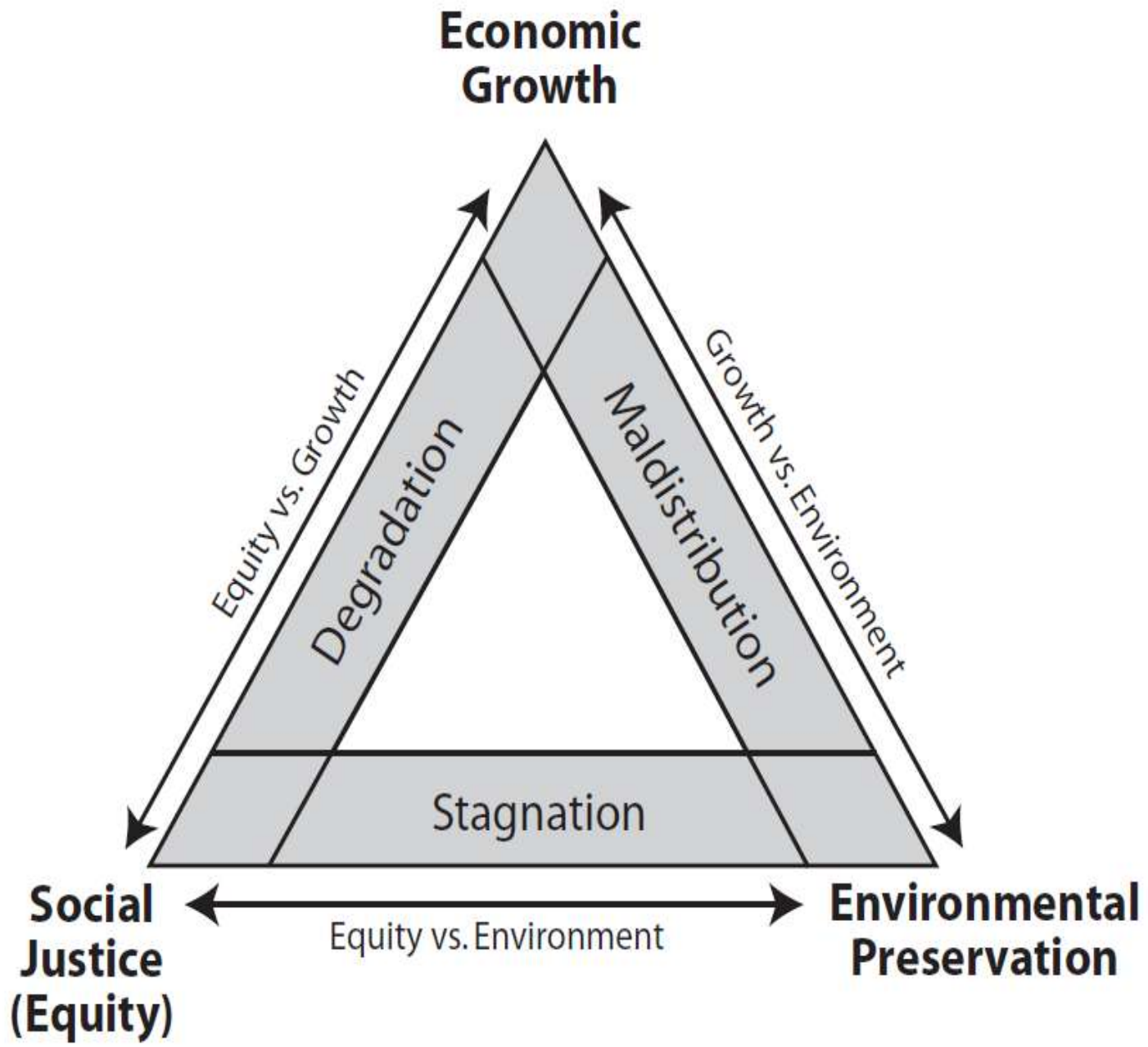
Incorporating Equity Considerations in Transport Projects Evaluation: Developing a New Measure

Bat-hen Nahmias–Biran

Supervisor:
Prof. Yoram Shiftan

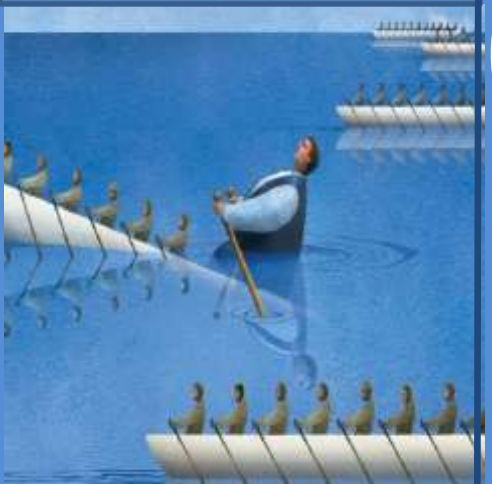
Contents

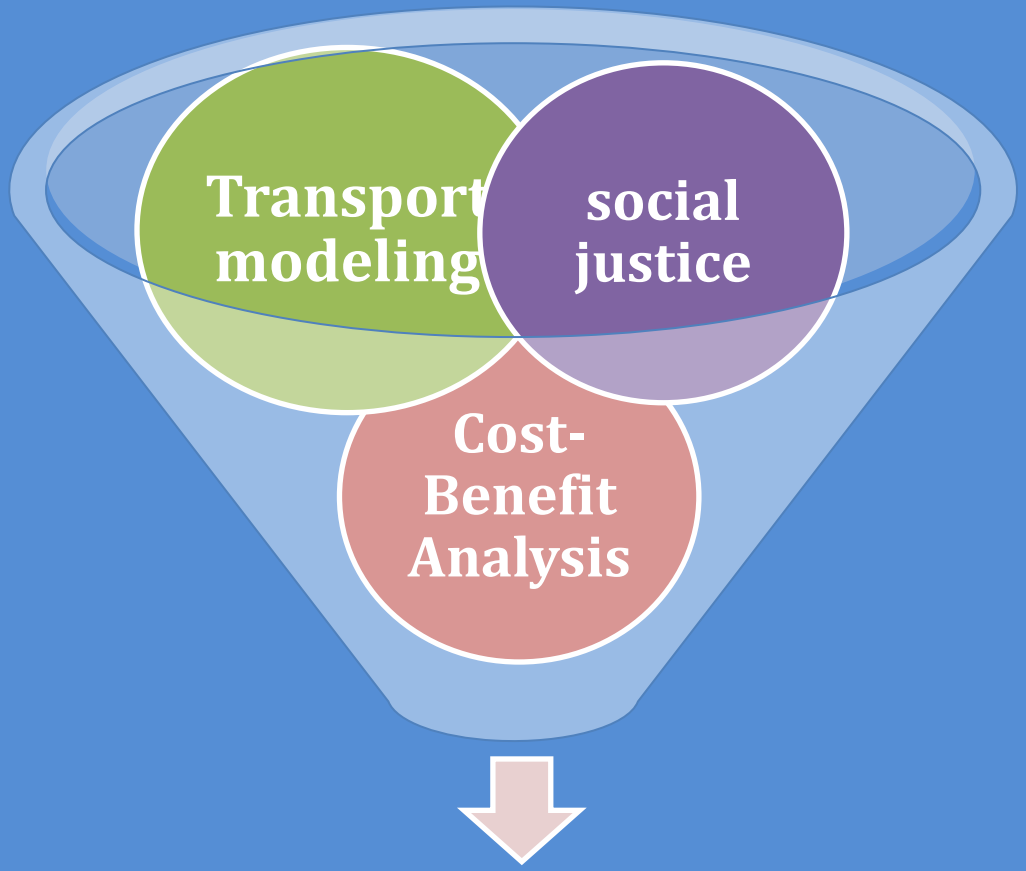
- **Introduction**
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



(Feitelson, 2002)

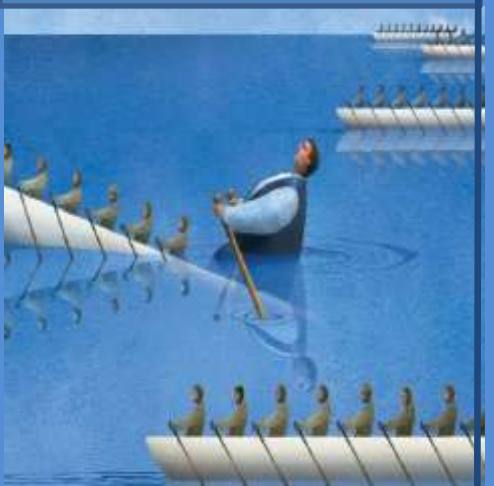
- **Introduction**
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan





(1)Improve equitable transportation planning.

- **Introduction**
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan

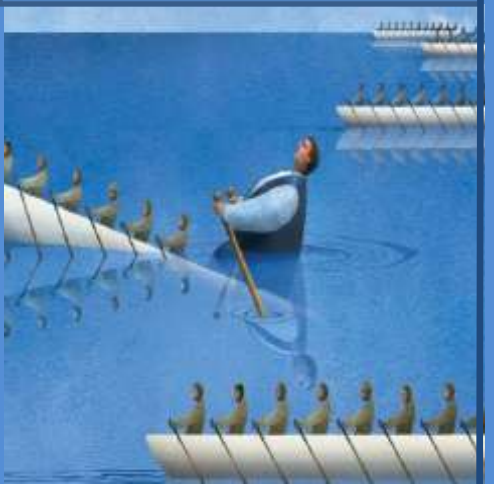


equity in economic evaluation involves great complexity:

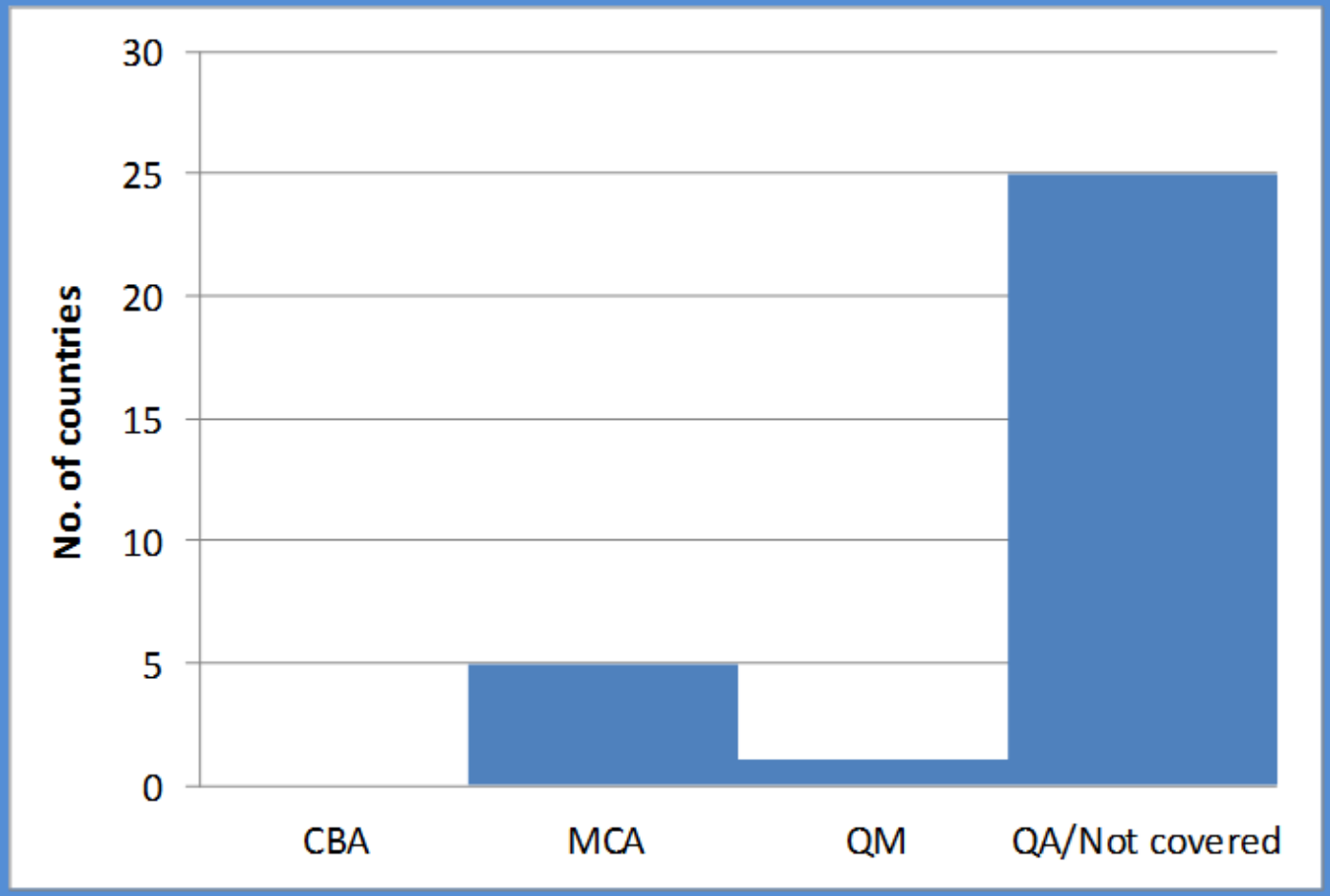
- several types of equity
- various ways to categorize people
- numerous impacts to consider
- various ways of measuring these impacts

- Large-scale effects
- Long-term impacts
- Land use changes
- The externalities component

- Introduction
- **Evaluation Methods**
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan

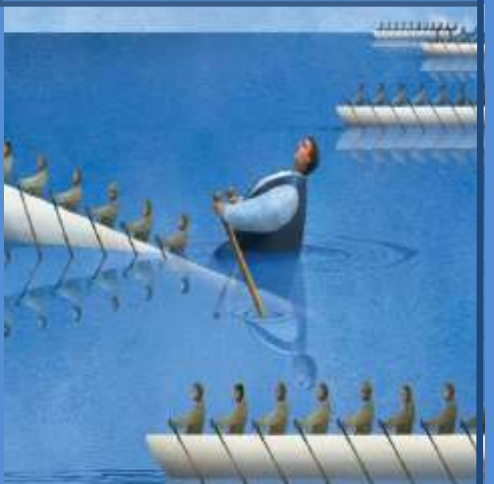


Equity analysis in EU-25, by evaluation method.



(HEATCO's database, 2006)

- Introduction
- **Evaluation Methods**
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



Cost-Benefit Analysis (CBA)

Advantage:

Ease and convenience of comparison and decision

Limitations:

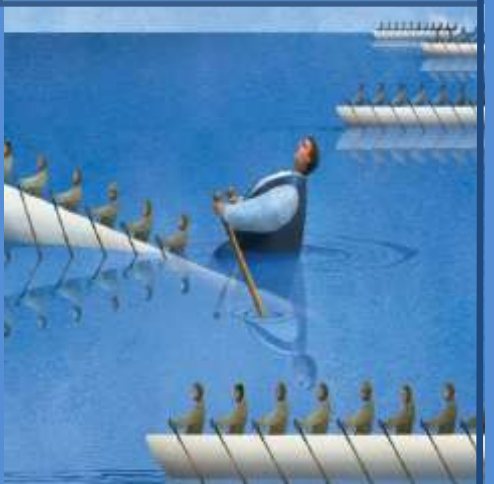
•It does not distinguish between certain groups or people.

•It include the potential for optimism bias.

•The link between the total number of trips and the total benefits

•The monetary value of travel time: WTP

- Introduction
- **Evaluation Methods**
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



Cost-Benefit Analysis (CBA)

"Equity value of travel time"

•It eliminates the complex set of considerations and preferences of each individual.

•Biased results in the overall assessment of the project.

EU Countries

•HEATCO Refers to Intra-generational equity issues and recommends, at minimum, that a "winners and losers" table will be developed, and presented alongside the results of the monetized CBA.

DG Regional Policy Guidelines, TINA, RAILPAG, HEATCO: a comparative overview

	DG Regional Policy 2003		HEATCO 2006
Equity (intra-generational)	Either included in CBA (through shadow prices) or in MCA (quantified e.g. through statistical measures such as Gini index). No disaggregation of impacts between stakeholder categories.	Disa… (per priva…	…s and losers tables at …m, distributional matri… a more sophisticated …h.

HEATCO 2006

Winners and losers tables at minimum, distributional matrices as a more sophisticated approach.

(Source: HEATCO, 2006).

EU Countries

•The distributional matrix involves separating the costs and benefits of different alternative projects by income percentiles of the population affected by the projects.

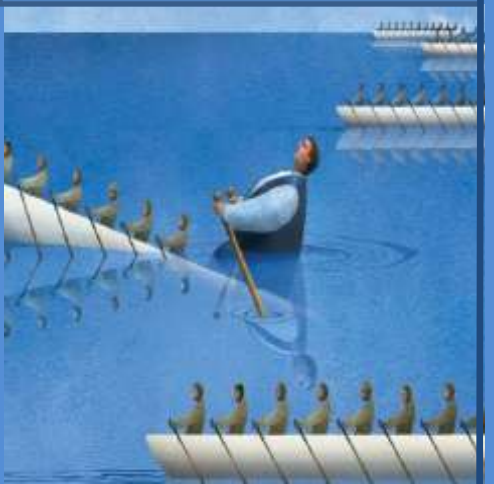
Example Distributional Matrix for a Transport Project Appraisal

	Transport Project Option					
	Option 1		Option 2		Option 3	
Income Quintile	(€'000)	(% of total)	(€'000)	(% of total)	(€'000)	(% of total)
> €50,000	12,000	19	6,000	10	10,000	9
€28,000 - €49,999	14,000	22	8,000	14	18,000	16
€16,000 - €27,999	15,000	23	12,000	21	25,000	22
€8,000 - €15,999	13,000	20	14,000	24	28,000	25
< €8,000	10,000	16	18,000	31	30,000	27
Total Net Benefit	**64,000**	**100**	**58,000**	**100**	**113,000**	**100**

UK transport appraisal guidelines is an example of such a matrix, geographical location, ownership (public or private) etc as can be used as recommended by the French manuals.

(Source: HEATCO, 2006; Quinet, 2000).

- Introduction
- Evaluation Methods
- **Evaluation Guidelines**
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



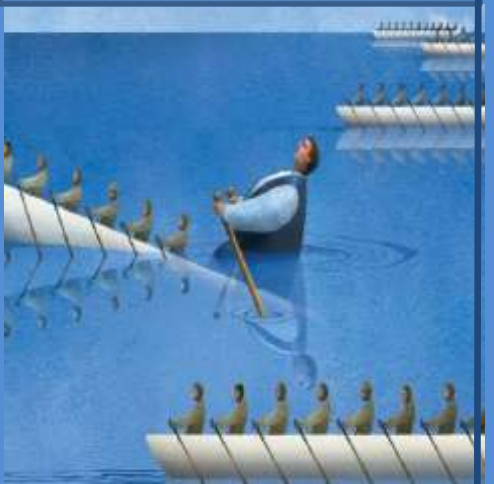
Israel

•a procedure aimed to determine how the accessibility improvements are distributed over weak and strong communities.

• Household Equity Indicator: a number that indicates whether the gaps in travel times between car-owning and car-less household have been reduced or increased .

•Community Equity Indicator: the ratio of the Average Aerial Speed (AAS) on the transport network improvements of the rich communities divided by the AAS improvements of the poor communities.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- **Ethical Theories**
- Value of Accessibility
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



•Utilitarian

•Egalitarian

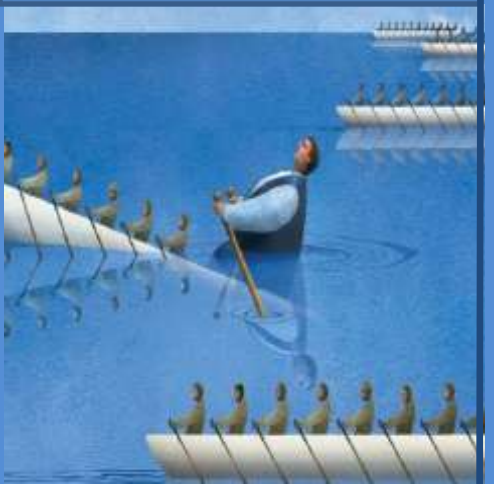
The theory of justice of Rawls (1971)

•considering the needs of individuals, we should not favor the majority at the expense of the least.

•“the greatest benefit of the least advantaged members of society”.

•examining the distribution of certain kinds of goods he labeled as ‘primary’ for all persons.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- **Value of Accessibility**
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



Accessibility:

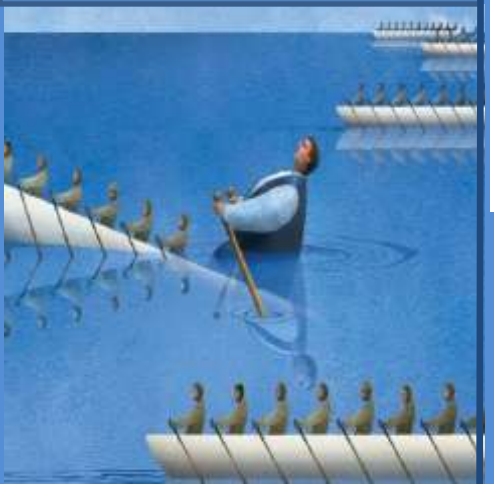
•Accessibility is the most important product of transportation projects.

•Accessibility is capable of providing the overview relationship of transportation, activities, and land uses.

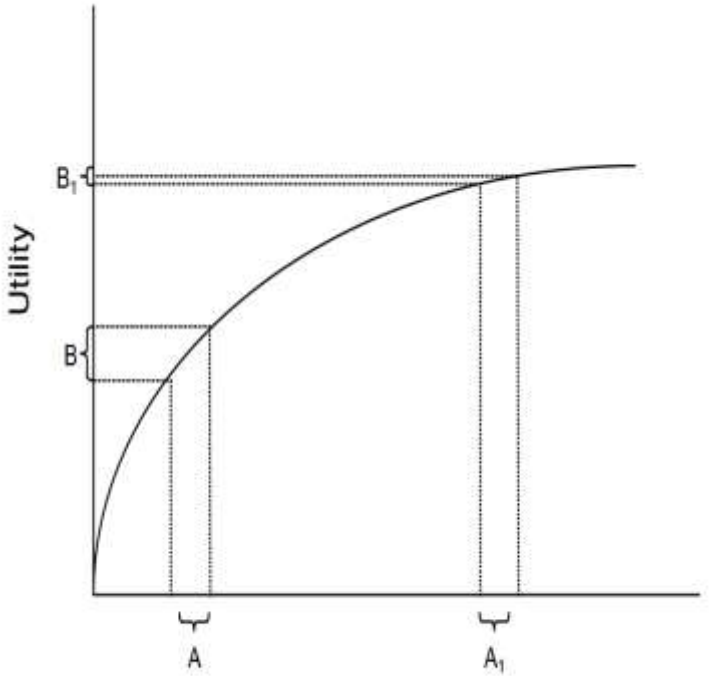
• Accessibility is critical to look at the long-term impacts.

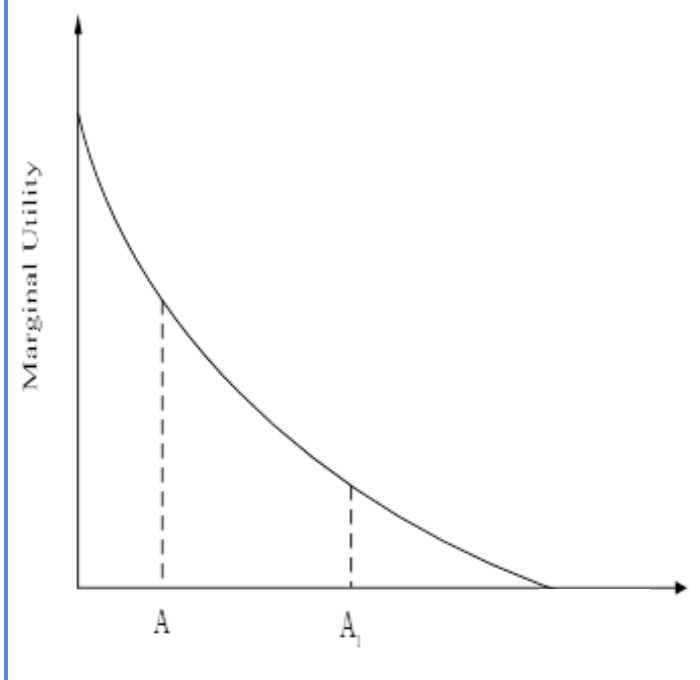
•Ignoring accessibility may lead to serious biases.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- **Value of Accessibility**
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



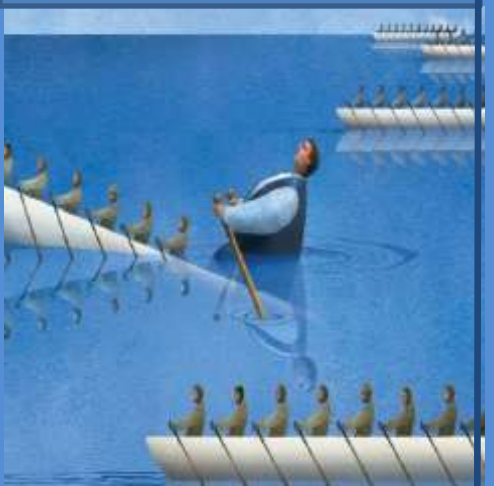
The principle of Diminishing Marginal Utility applied to accessibility gains

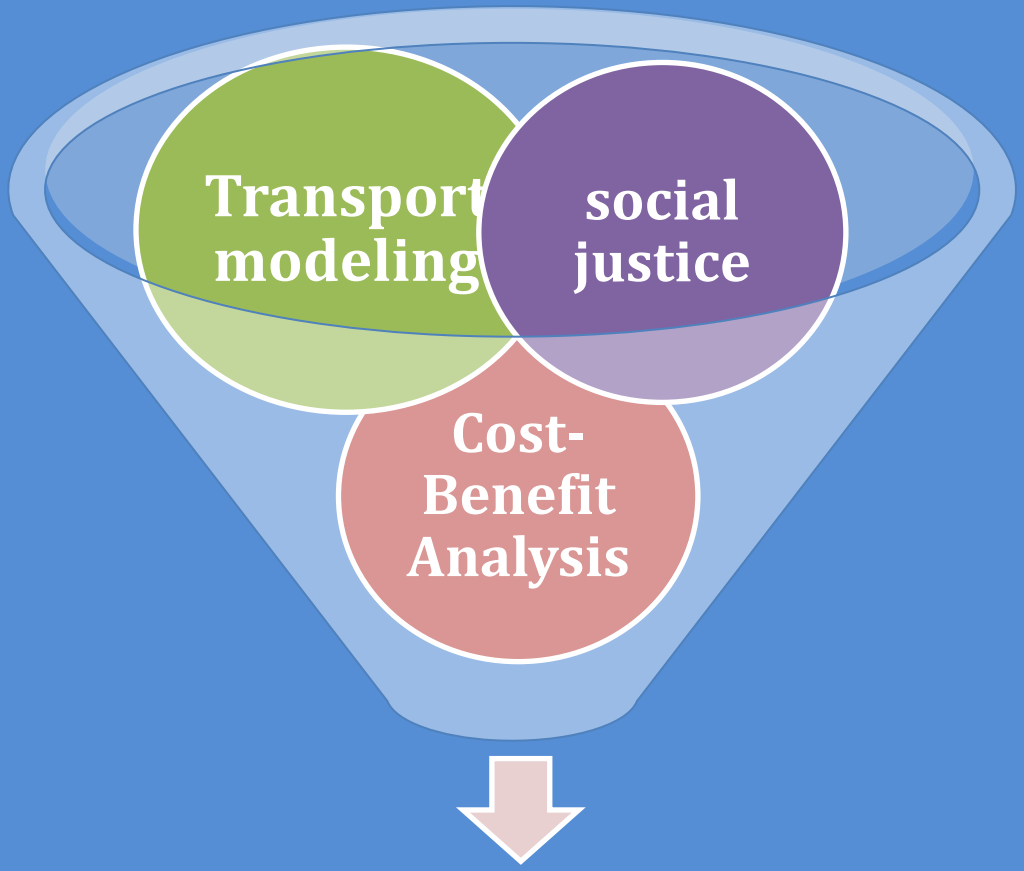




(Martens, 2006)

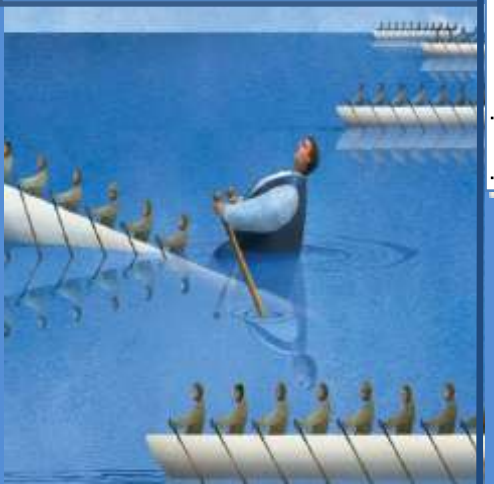
- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- **Value of Accessibility**
- Activity-Based Models
- Methodology
- Case Study
- Research Plan



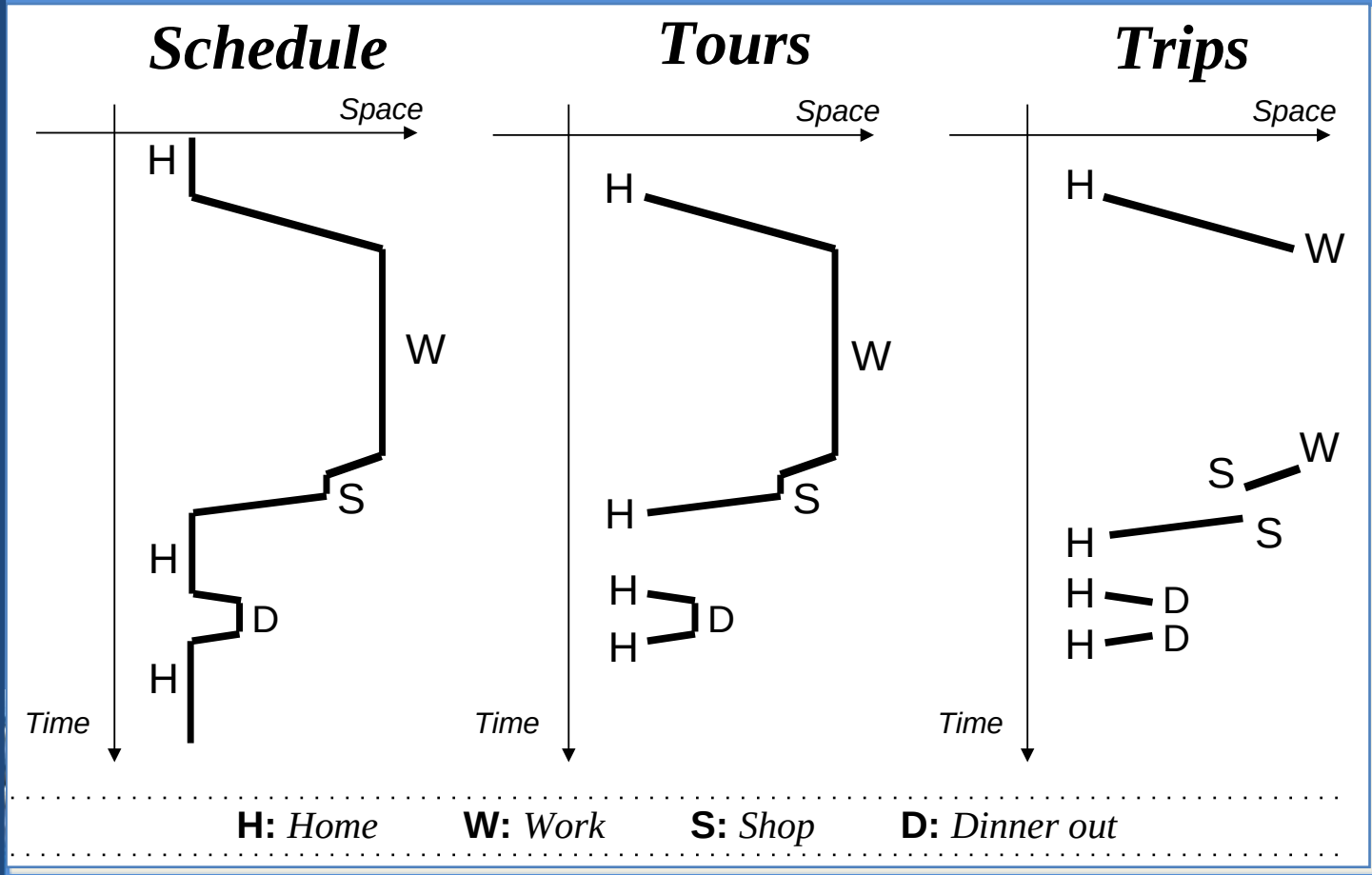


(2) Accessibility can better account for equity analysis.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- **Activity-Based Models**
- Methodology
- Case Study
- Research Plan

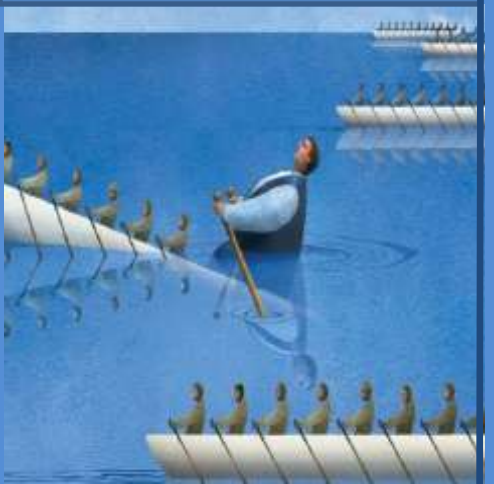


The Activity-Based Models



National: Scandinavia, the Netherlands and Italy.
Regional: France, the United Kingdom, Australia, United State and Israel.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- **Activity-Based Models**
- Methodology
- Case Study
- Research Plan



The Activity-Based Models

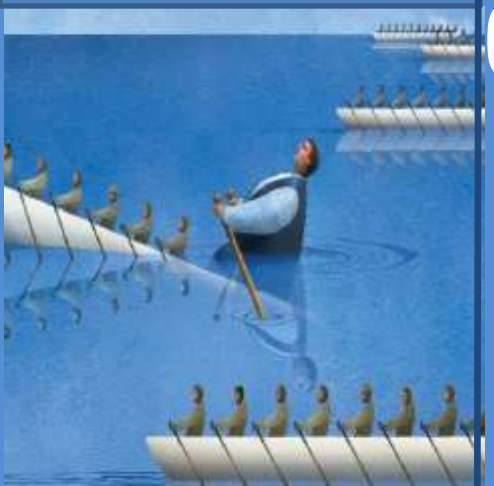
- Have the ability to analyze results by various groups of the population.

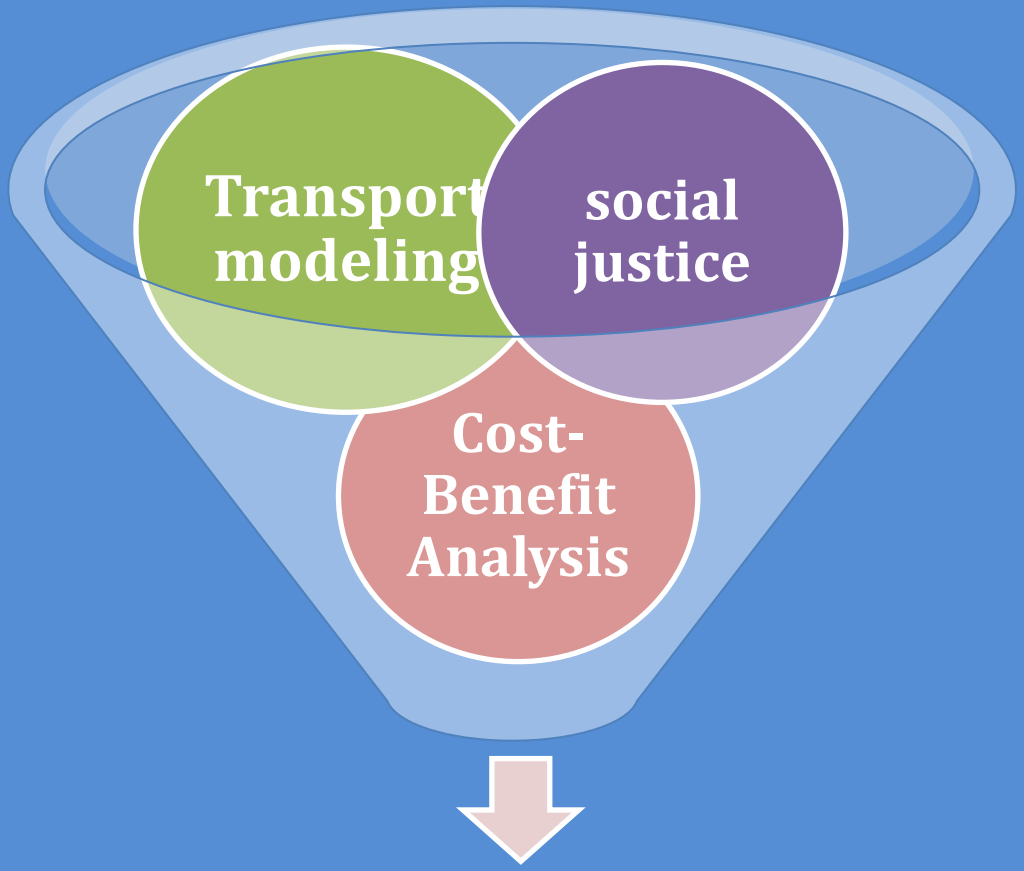
- Can track consumers' needs and abilities, which are expressed in the desire to participate in activities.

- Can reflect the socioeconomic characteristics of individuals.

- Can reflect the nature of land use and properties of the transportation system.

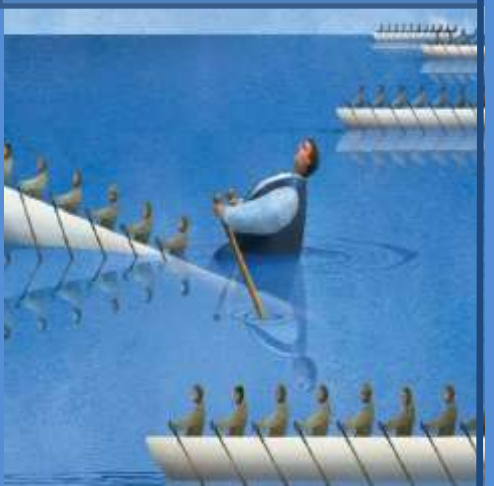
- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- **Activity-Based Models**
- Methodology
- Case Study
- Research Plan





(3) Activity based models can significantly contribute to equity analysis.

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan



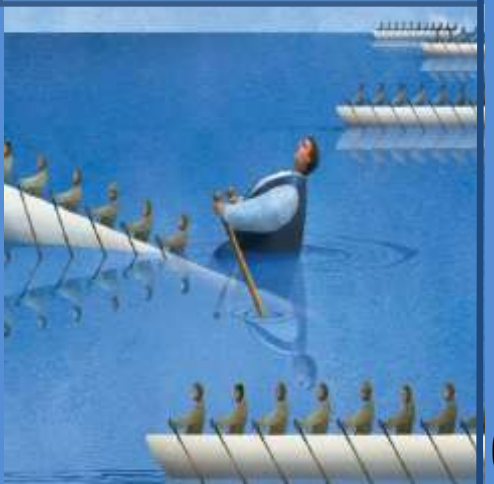
"the expected value of the individual's maximum utility "

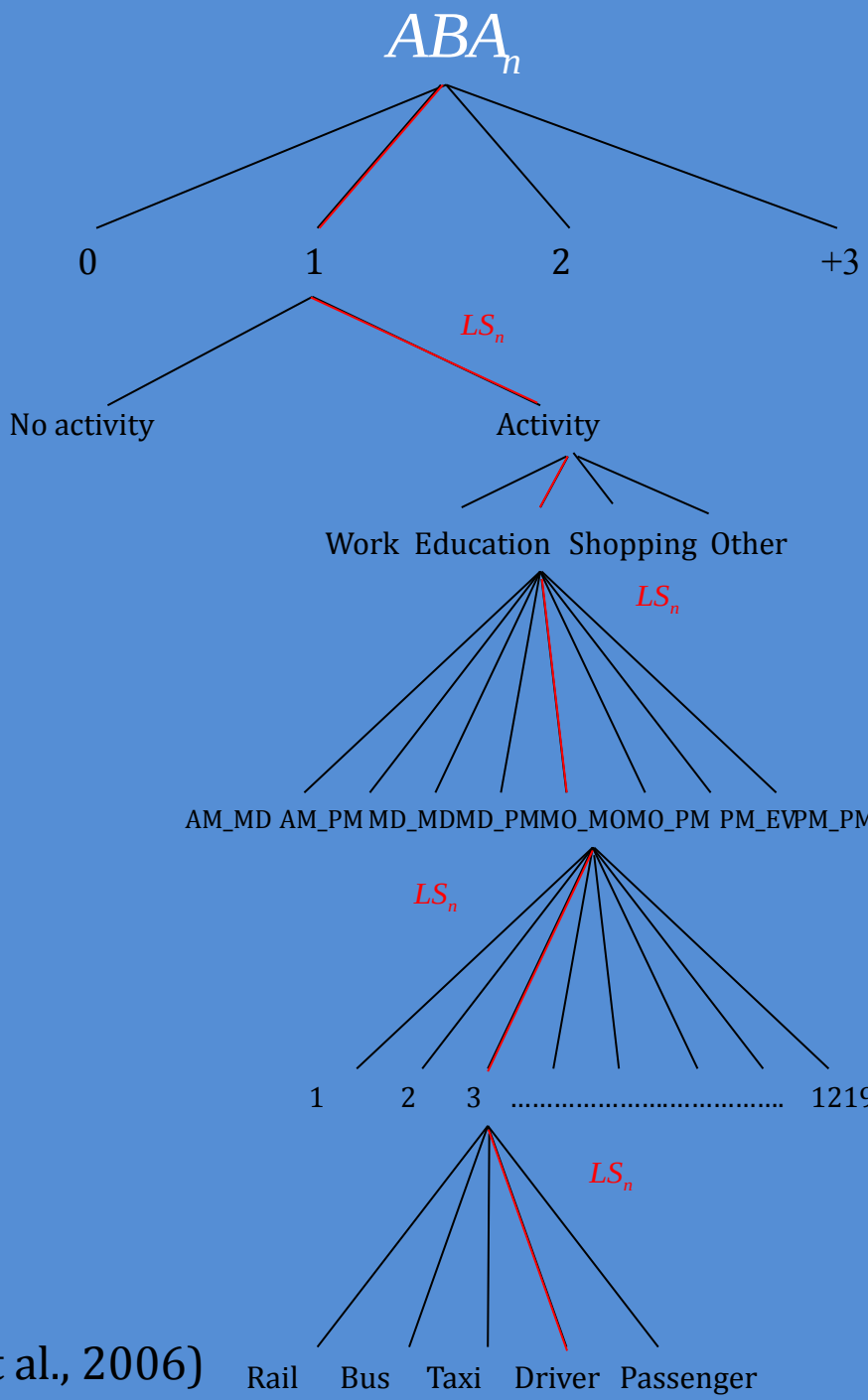
$$CS_n = \frac{1}{\alpha_n} \cdot \max_j (U_{nj} \forall j)$$

$$LS_n = \frac{1}{\mu} \ln\left(\sum_{j=1}^{J} e^{\mu V_{nj}}\right)$$

(Ben-Akiva and Bowman, 1998)

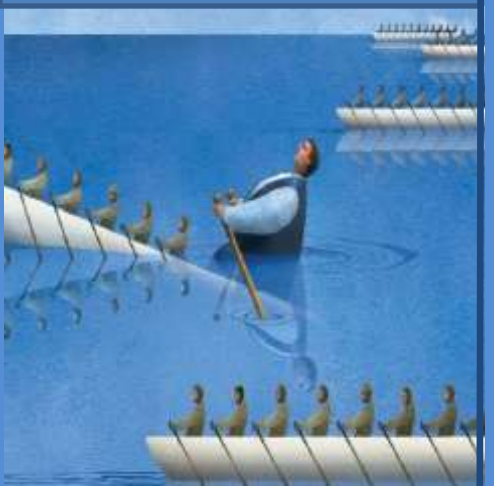
- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan





(Dong et al., 2006)

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan



Value of Accessibility calculation process

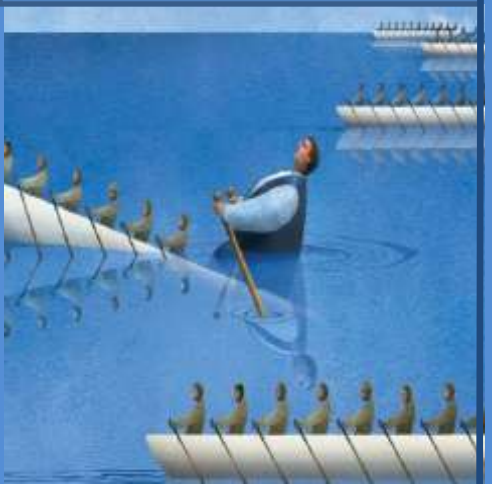
$$CS_n = \frac{1}{\alpha_n} \cdot \max_j (U_{nj} \forall j)$$

$$\alpha_n = \frac{dU_{nj}}{dY_n} = -\frac{dU_{nj}}{dC_n}$$

$$ABA_n = \frac{1}{\mu} \ln\left(\sum_{j=1}^{J} e^{\mu V_{nj}}\right)$$

$$E(CS_n) = \frac{1}{\alpha_n} \cdot \frac{1}{\mu} \ln\left(\sum_{j=1}^{J} e^{\mu V_{nj}}\right) + C$$

- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan



Value of Accessibility calculation process

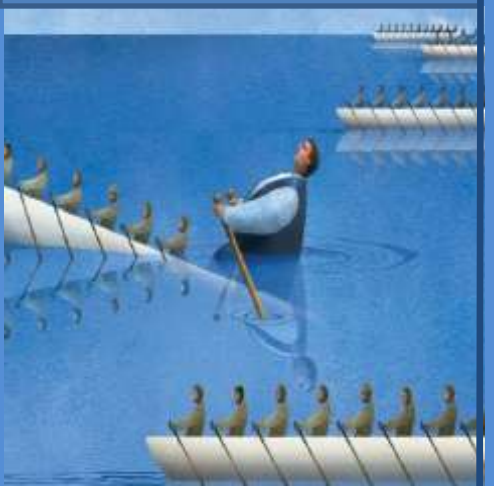
$$\Delta E(CS_n) = \frac{1}{\alpha_n} \cdot [\frac{1}{\mu} \ln(\sum_{j=1}^{J^1} e^{\mu V^1{}_{nj}}) - \frac{1}{\mu} \ln(\sum_{j=1}^{J^0} e^{\mu V^0{}_{nj}})] = \frac{1}{\alpha_n} \cdot \Delta ABA_n$$

$$V = c \cdot C + t \cdot T + ...$$

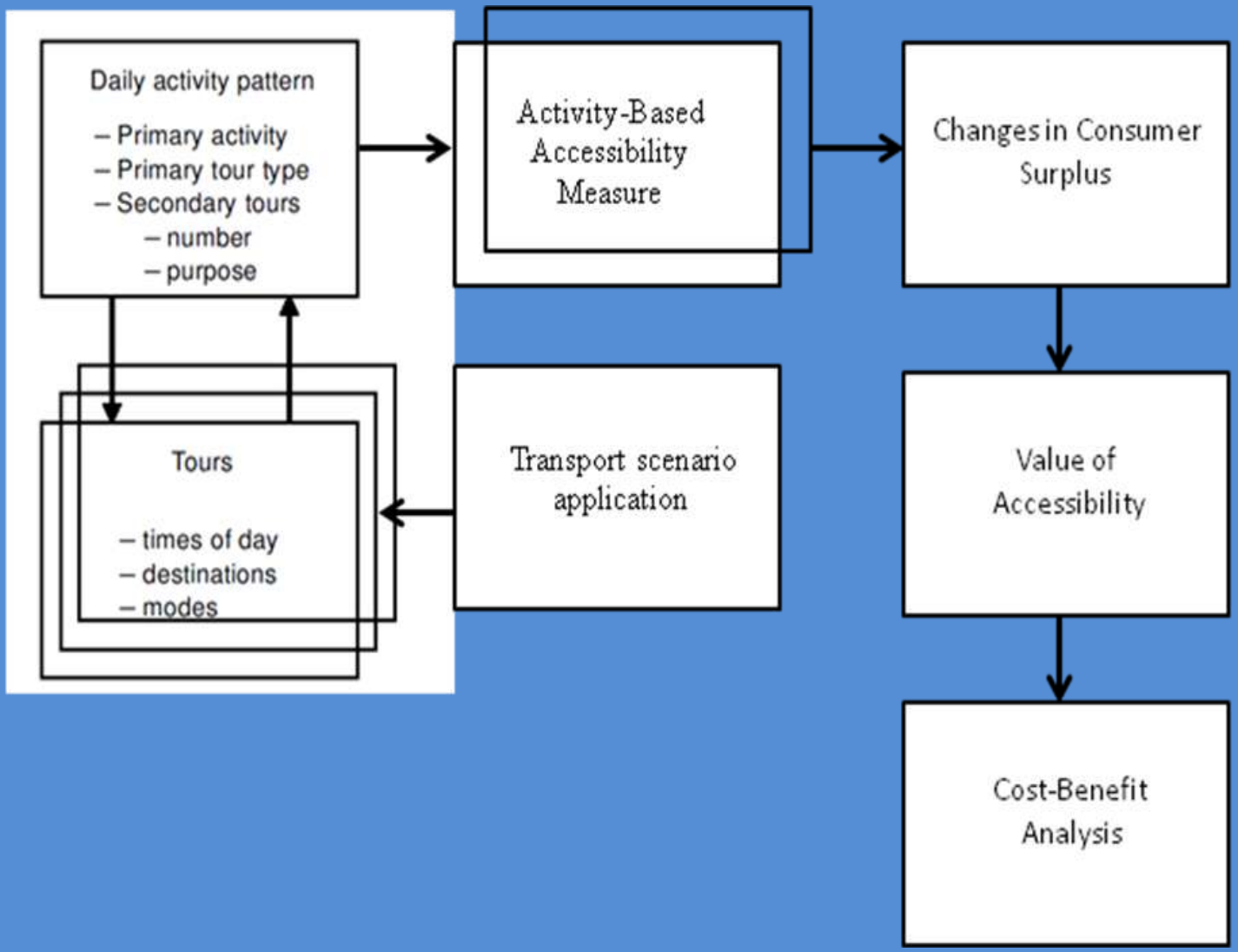
$$\text{ABA in NIS} = ABA_n / (\sum P_j c_j)$$

$$VOA = \sum_{n=1}^{N} (\Delta ABA_n / \sum P_j c_j)$$

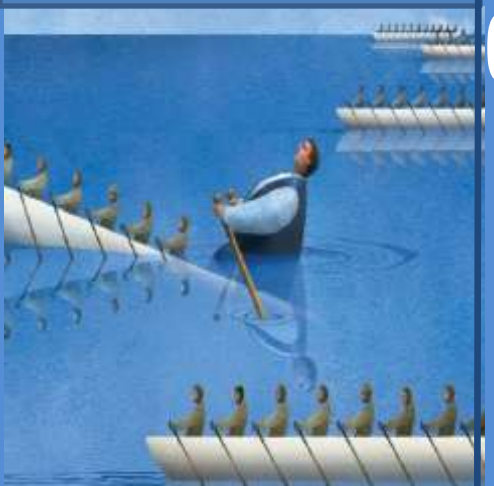
- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan

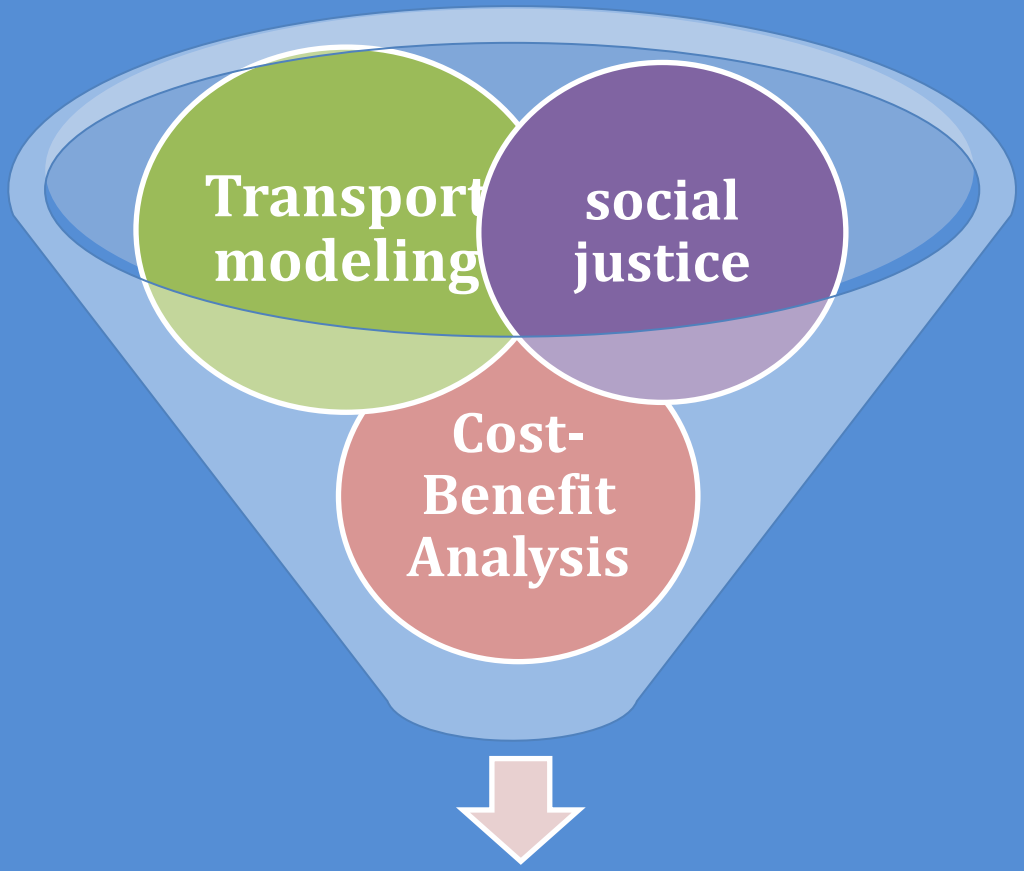


Value of Accessibility calculation process



- Introduction
- Evaluation Methods
- Evaluation Guidelines
- Ethical Theories
- Value of Accessibility
- Activity-Based Models
- **Methodology**
- Case Study
- Research Plan





(4) A monetized activity based accessibility measure (VOA) can replace the value of time in CBA.


Thank You!
Questions and Comments?
Contact Into
Email: bathen@tx.technion.ac.il