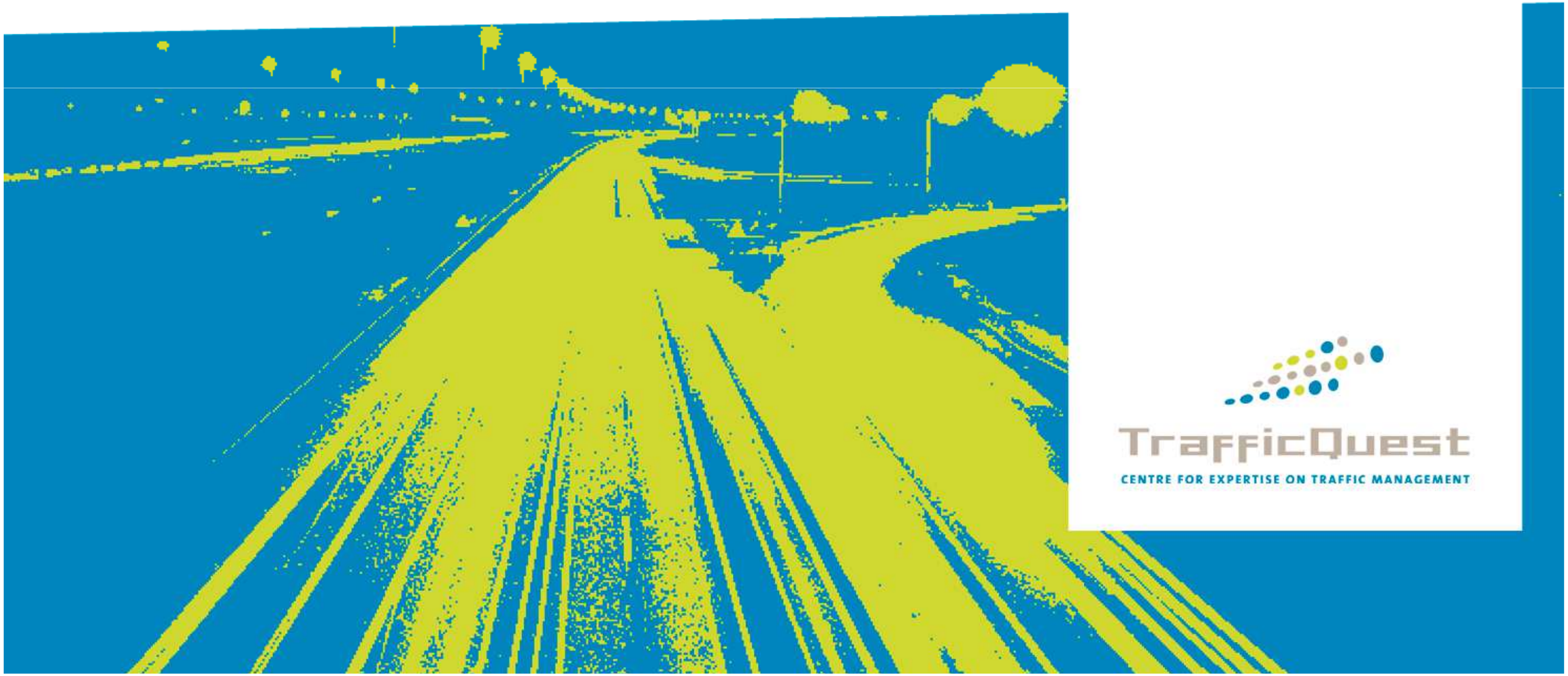
Traffic Management: State of the art, current trends and future perspectives

Ben Immers - TrafficQuest



Outline presentation

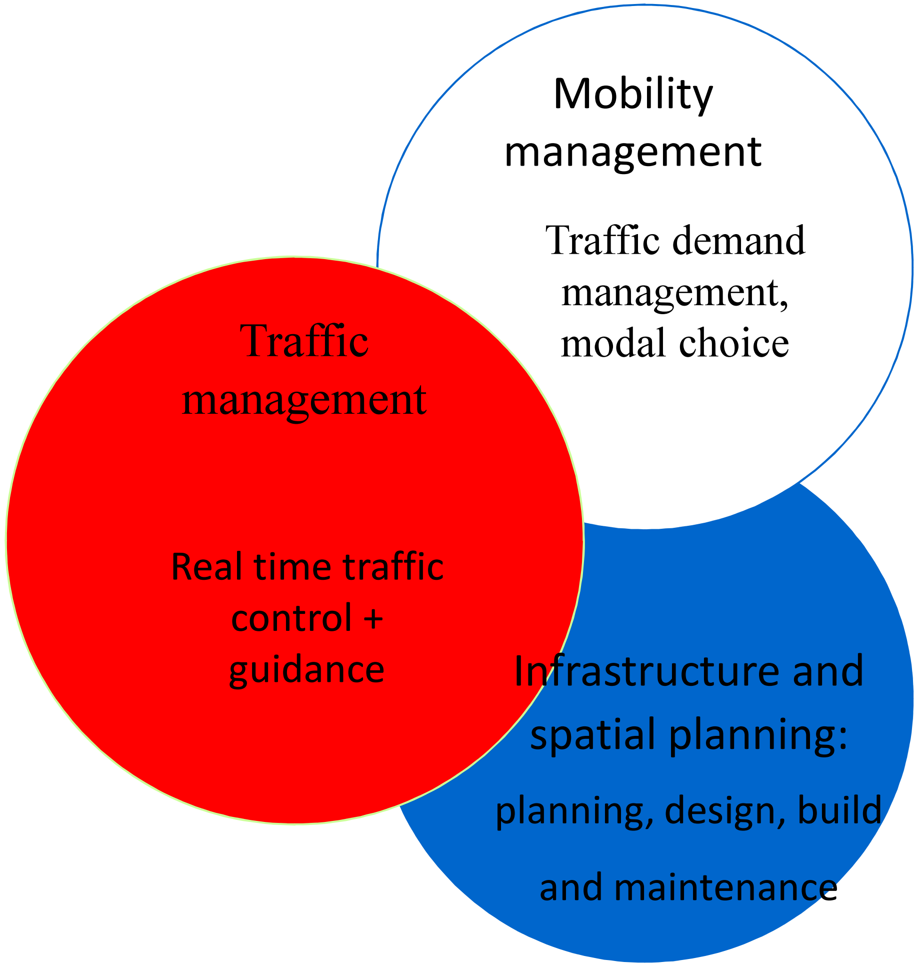
- Why traffic management?
- How does it work?
- Solutions - Measures
- State of the Art
- Current Trends
- Future Perspectives
- Research Agenda
- Analogies for TM

Why Traffic Management?

- Reducing delays;
- Improving throughput
- Improving travel time reliability
- Improving traffic safety
- Improving sustainability of transport system
- But….. Sometimes other solutions (other than TM) may be preferred!

3 level approach

- Traffic management
- Mobility management
- Infrastructure and activity management



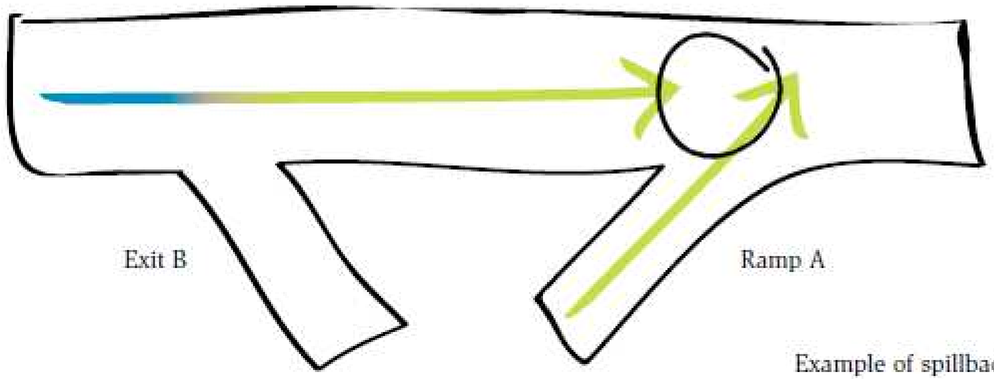
Benefits

SOURCE: *Intelligent transportation systems*, Capitol Research, Council of State Governments, April 2010; Transport for London, 2007; *Intelligent transportation systems benefits, costs, deployment, and lessons learned desk reference: 2011 update*, US Department of Transportation, September 2011; *Urban mobility plan*, Seattle Department of Transportation, January 2008; McKinsey Global Institute analysis

What can go wrong?

Underlying processes that cause congestion

- Capacity drop (14% – 30% reduction of capacity)
- Moving shockwaves
- Sub-optimal route choice
- Spillback



Example of spillback

How does TM work?

Basic types of intervention (solutions)

- Increase throughput
- Distribute traffic in an effective way across the network
- Regulate the inflow of traffic
- Prevent spillbacks

- Control the speed
- Enforcement
- Prioritise specific user groups

Measures in relation to types of intervention

MAIN SOLUTIONS	RAMP METER	TRAVELER INFORMATION	PEAK HOUR SHOULDER LANES	DYNAMIC SEPARATION OF THROUGH AND LOCAL TRAFFIC
INCREASE THROUGHPUT	Effective capacity increase by postponing queue formation	-	Increase capacity by opening an extra lane during peak periods (shoulder and/or re-striping)	Increase in capacity by decreasing weaving movements
EFFECTIVELY DISTRIBUTE TRAFFIC	Reduce cut-through traffic (rat running)	Inform drivers about routes with residual capacity	-	-
REGULATE INFLOW	Regulate entering traffic to main roadway	Inform drivers which on-ramp to use if options are available	-	-
PREVENT SPILLBACKS	Prevent queue spillback on the main roadway to an upstream exit	Inform drivers to choose exit if options are available	Prevent spillback by buffering traffic	Prevent spillback by channeling exiting traffic to dedicated lanes

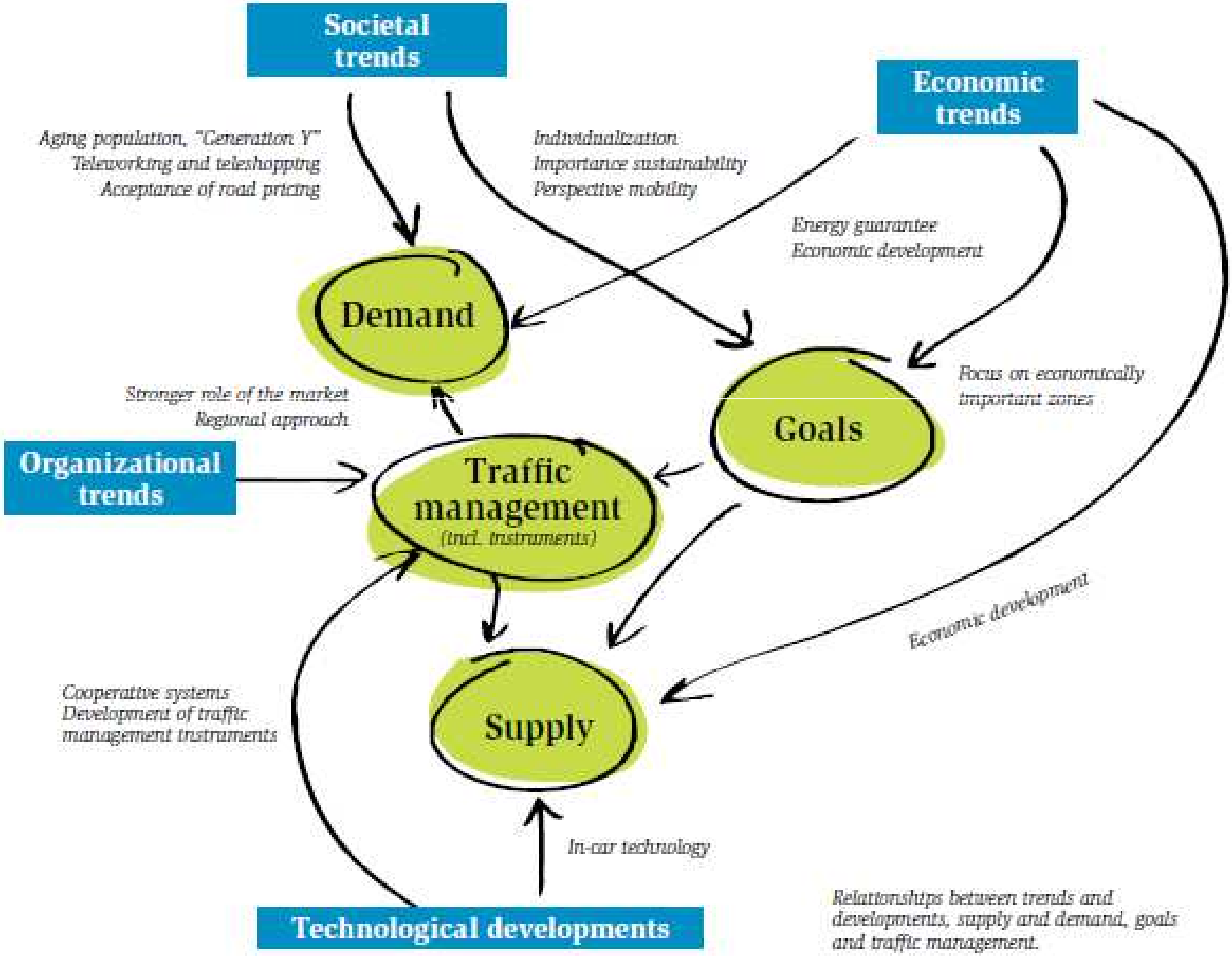
State of the Art

- Long history (London 1868 - Eindhoven 1968)
- Wide range of measures
  - Roadside
  - In-car
- Traffic data
  - Public - National Data Warehouse
  - Private - GPS, probe, etc.
- Stakeholders (public – private)
  - Societal interests
  - Individual or commercial interests
- Cooperation and coordination (network-wide)

Current trends

- Societal trends e.g. individualization, societal relevance, aging, generation Y , virtual society/mobility , flexibility of demand
- Organizational trends (PPP, DBFMO-contracts, DITCM), internationalization e.g. EC ITS-action plan, ITS Directive
- Economic trends e.g. economic crisis
- Technical developments e.g. traffic information systems, driver assistance systems, cooperative systems, incident and event management - penetration rate, standardization

Interrelationships



Relationships between trends and developments, supply and demand, goals and traffic management.

Possible effects

- Shifts in traffic demand (time and space)

- Changes in mobility objectives
  - More focus on sustainability

- Increasing effectiveness of traffic management (more advanced measures)

- But: Road user is also better informed - less easy to influence
  → Reconciliation individual and social (governmental) interests

- And: Better cooperation – public-private partnerships

→ Opportunities for effective deployment of traffic management will increase

Perspectives for the Future

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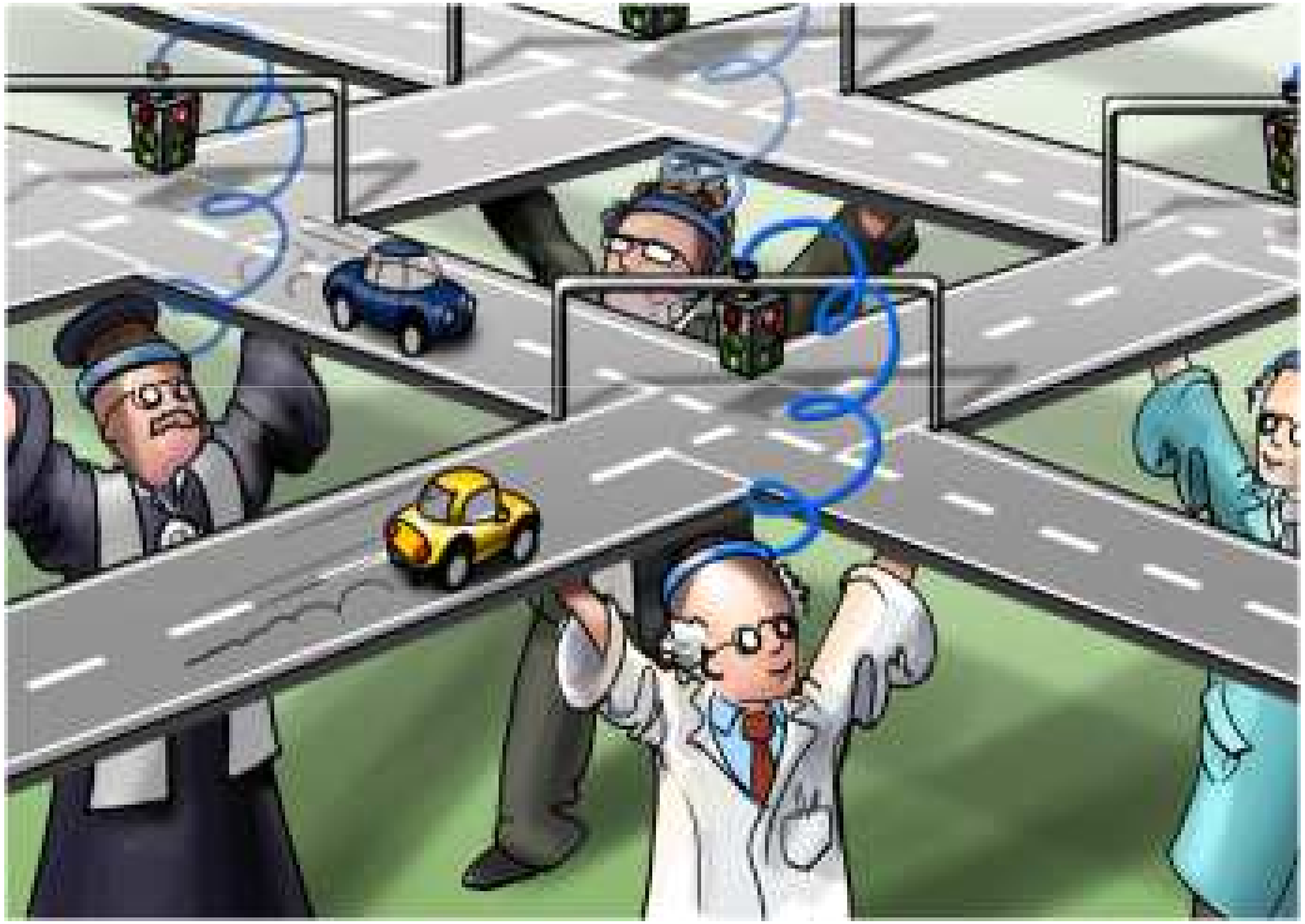
- Primary task: demand-supply alignment
  - Regular situations
  - **Non-recurrent and unexpected situations**
- Ability to respond to rapidly changing situations; rapidly deployable measures
- Pro-active approach
- High degree of instrumentation to guide traffic
- Well established coordination

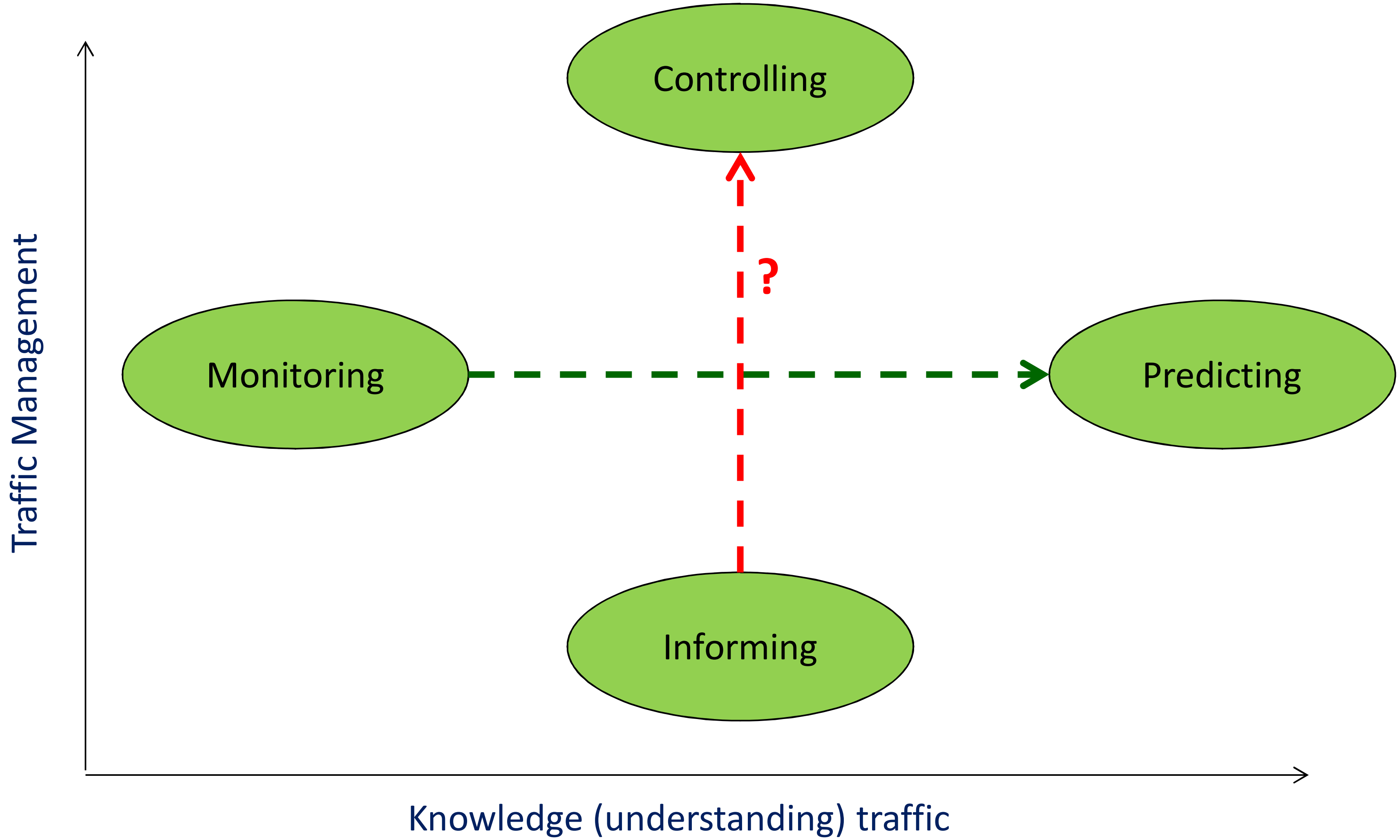
→ TM needs to be flexible, coordinated, cooperative, and pro-active

→ Requires close cooperation between
  - Road authorities
  - Private sector partners
  - Research/education institutes

Optimal network performance thanks to collaboration between stakeholders



Transition towards Pro-active TM



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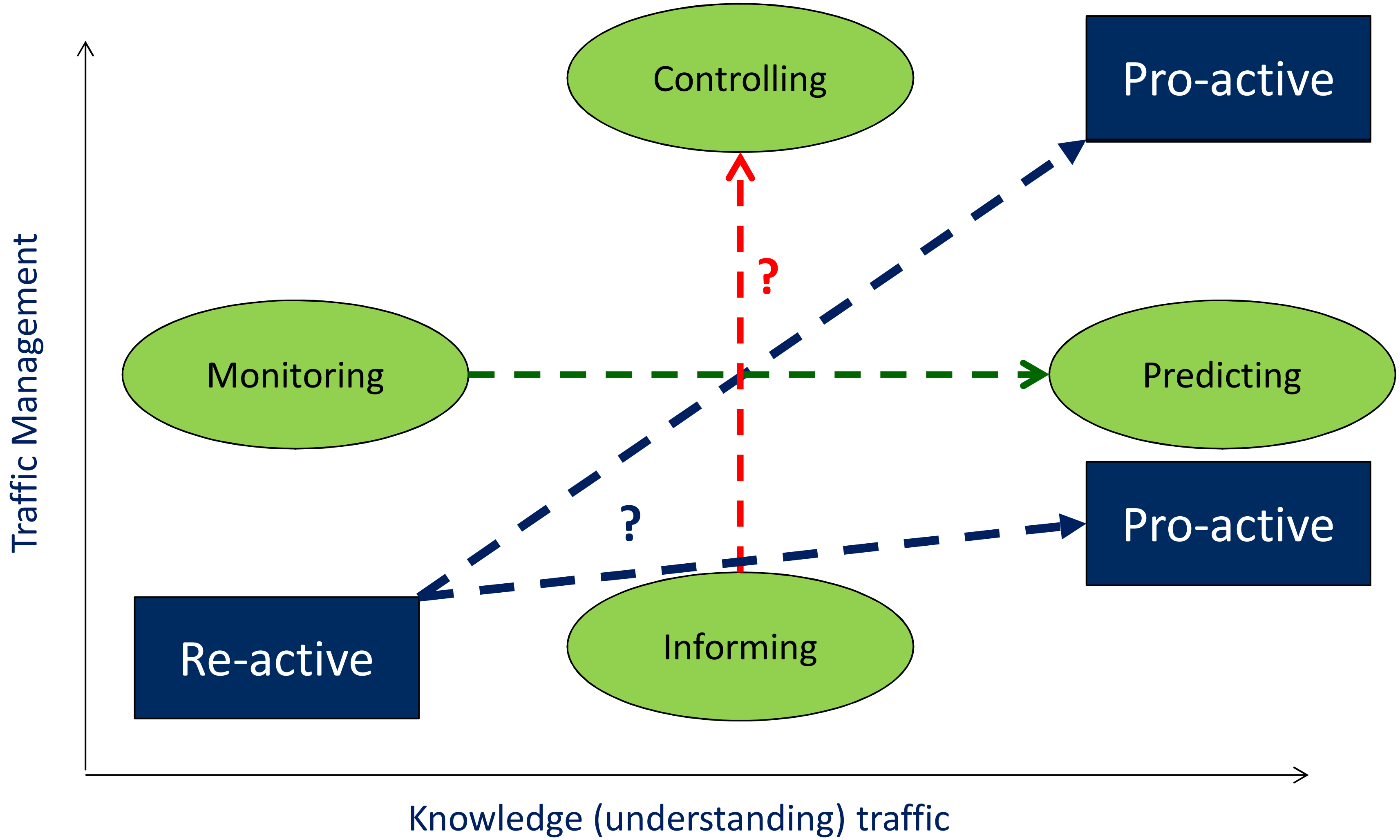

There is still work to do!

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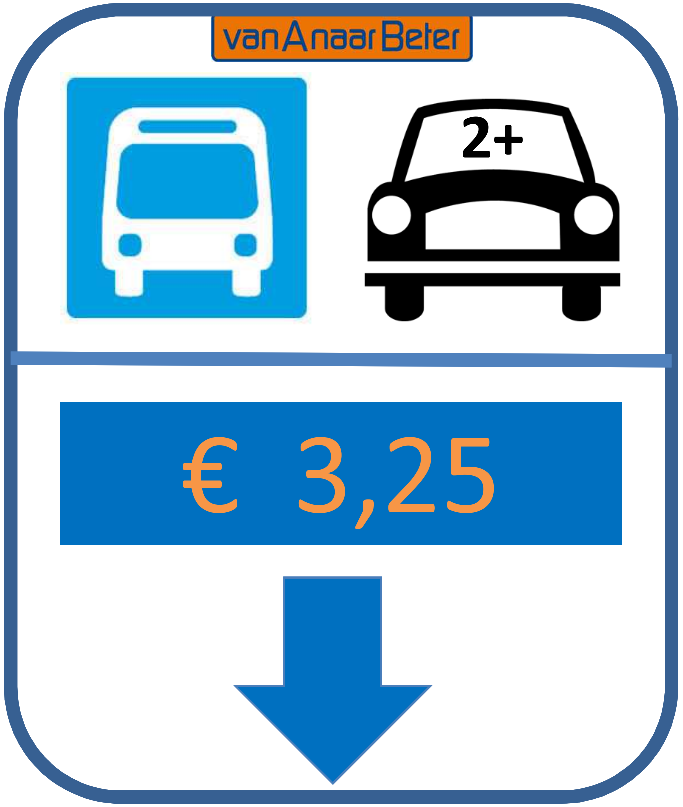
Topics that need to be addressed:

- Flexibility in supply and demand
- Road pricing
- More cooperation and coordination: network-wide Traffic Management
- Pro-active traffic management
- Optimization for multiple policy goals
- Integrated approach
- Organization (Public – Private)
- Training and education
- Basic facilities (architecture, monitoring)
- Evaluation

Dynamic Road Pricing

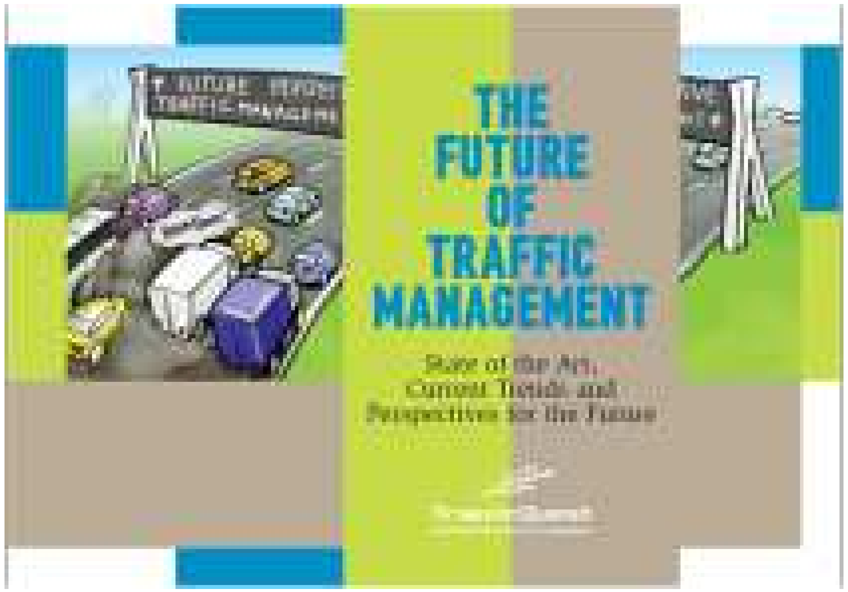
Road pricing is **HOT**



Future Research Agenda

Focus on:

Strategic – policy oriented research
Operational – problem oriented research
Knowledge development
Knowledge application



Selection of TQ research topics

- DITCM (cooperation and evaluation)
- Modelling human behaviour in traffic models
- PPA (Field trial Amsterdam)
- Analogies (controlling versus self organisation (informing))

Analogies

- What is happening elsewhere in the world – scanning tours

- How are flows managed in other systems - Analogies
  - Swarms of birds
  - Distribution logistics
  - Communication networks
  - Electronic payment systems
  - Water management
  - Electricity networks
  - The brain

Questions asked

- Self-organization versus dedicated (hierarchical) control?
- To what extent are we dealing with a stratified (layered) system ?
- How are robustness and reliability of the system ensured?

Preliminary results

Many similarities, but also clear differences, such as:

- Much more control in some systems
- Close attention to the robustness of the system (redundancy)
- Clear agreements between stakeholders
- Various forms of self-organization (with mutual alignment between a limited number of neighboring entities)

Next steps:

- Make a design a traffic management system based on the management and control principles deployed in the analogous systems
- What does that mean for the traffic system? Will or could it work? Are the goals still achievable? Is it acceptable for the traveler? etc.

Interesting concepts

- Highly controlled: Slot management
- Complete self-organisation (information driven)
- Hybrid forms

→ new ideas for future traffic management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€ 3,25
Thank you for your attention

Contact

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