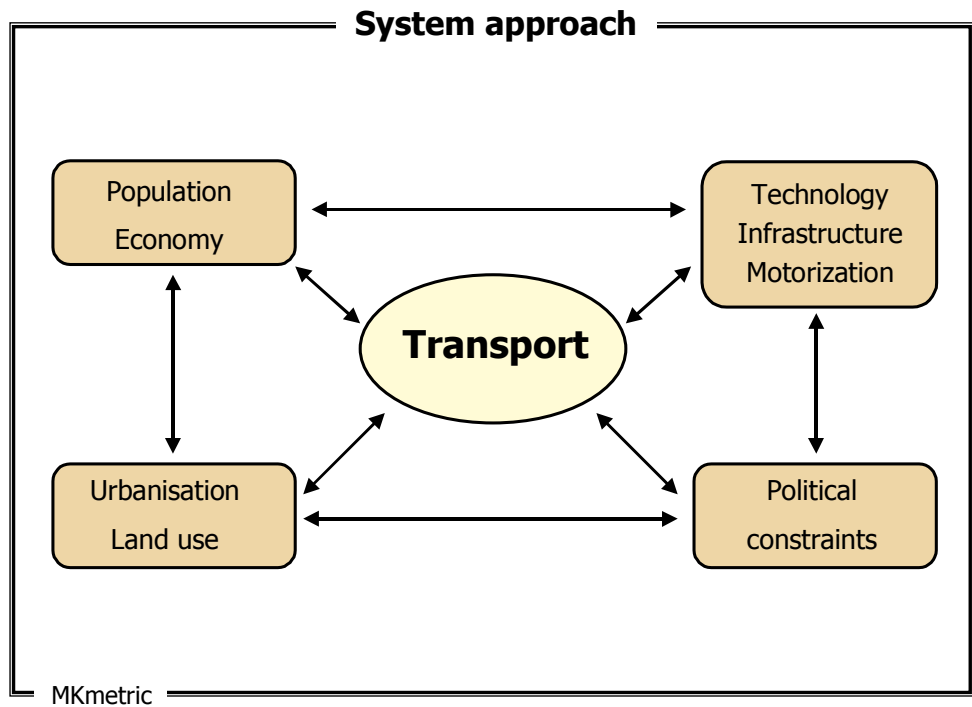


Modelling transport

The modelling process used by *MKmetric* is based on a systemic view on transport. This has a number of advantages compared to the unimodal approaches usually chosen.



MKmetric's system approach

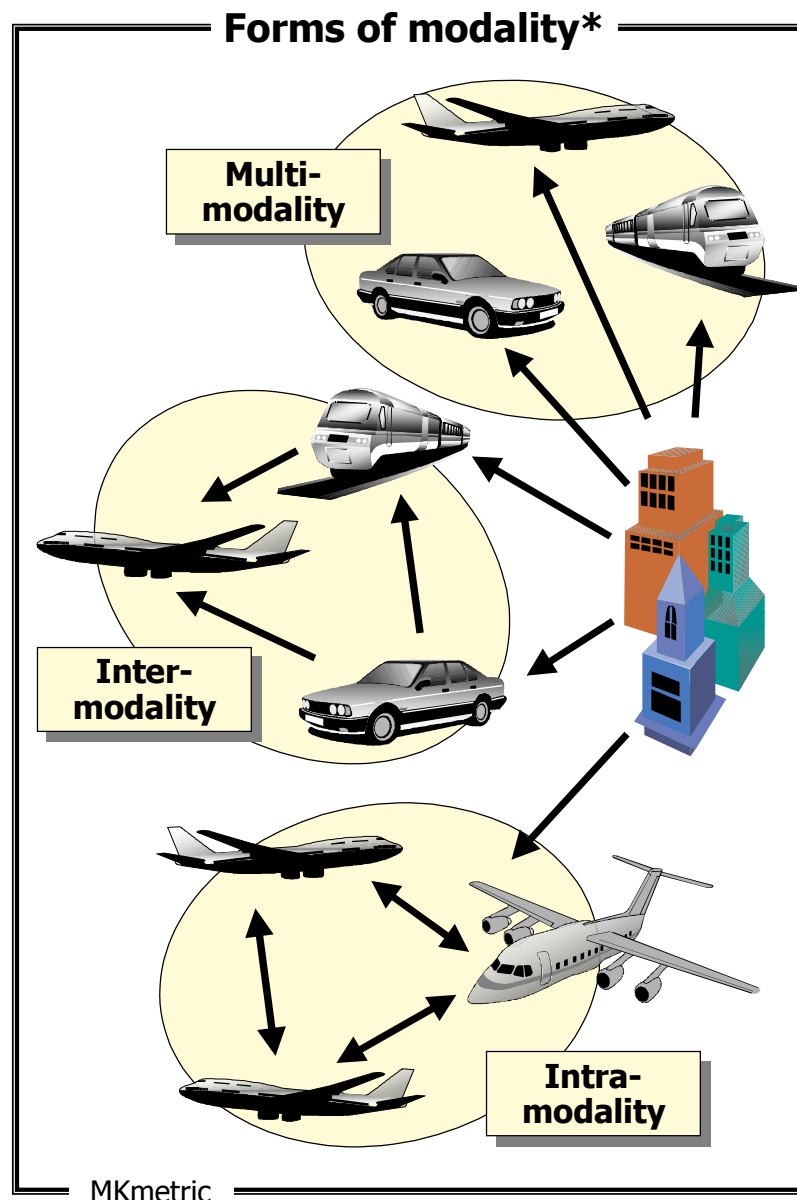
All transport related activities are explained by multimodal and multi-sectoral determinants. This form ensures the consistency of the whole model system in every step of the simulation process.

Considering detailed exogenous impact factors as population, economic and political circumstances, technical development and spatial structures the *MKmetric* models always process balanced figures of all endogenous measures. Hence, no transport activity appears or disappears unexplained within the system.

Changes in the system's state are substitutive or complementary and synergetic effects, as well as competition lead to new situations concerning diversion, accessibility or attractivity. These effects can be analysed with respect to modes (e.g. road, rail, sea, air) and/or trip purposes (e.g. business, vacation, private) / commodities.

Therefore MKmetric models cover different forms of modality and related fields of interest:

- Multimodality – consideration of competition between all modes (e.g. taking rail, road, sea and air transport into account)
- Intermodality – consideration of modal complementarity (e.g. the transport chain of modes, the accessibility of airports by private and public transport)
- Intramodality – consideration of competition within a single mode (e.g. between airports or certain levels of service (high speed vs. ordinary lines))



*e. g. passenger transport

Scenario technique and potential fields of interest

The *MKmetric* system approach allows the evaluation of various statements of problems. Additionally the separate questions could be combined for analysing potential interrelationships.

The following fields of interest should be regarded as possible kinds of items to be assessed:

- Socio-economic developments (optimistic vs. pessimistic demand corridors, household structure, employment, ...)
- Variations in the economic or political framework (to increase value added or kerosene tax, to internalise external costs, to subsidise certain modes, to apply capacity restrictions or motorway tolls, to establish speed limits on roads, ...)
- Monopolistic measures for traffic diversion (to differentiate landing fees by aircraft type, to introduce load specific motorway tolls, to subsidise certain rail ticket types or combined transport modes, ...)
- Infrastructural improvements (to upgrade existing links, to build new connections, to implement intermodal nodes (e.g. railway stations at ports or airports, goods distribution centres), ...)
- Intramodal or transmodal co-operation ('symbiotic' port or airport systems, rail&fly programme, ...)
- Deregulation and liberalisation of transport markets (e.g. Trans-European traffic)
- Operating figures (air transport markets - city pairs, hub & spoke vs. point-to-point - , railway alignment concepts, transport telematics, ...)

Degrees of freedom

Analysing the fields of interest can be done two-sidedly: corresponding to available measures or related to predefined targets. In both cases the simulation will give answers to questions similar to

? *"What will the demand figures be?"*

? *"Where do they originate?"*

? *"What will the underlying trip purpose / commodity be?"*

? *"What are the destinations?"*

? *"Which modes and which routes will be used?"*

Assessments of certain measures could be seen as asking questions to the system like

? *"What will happen when this measure is applied?"*

In comparison the target-related questions are looking for answers to

? *"What measure has to be implemented to achieve the considered aims?"*

To handle the above questions in a simulation system requires the modelling of various interdependencies. The *MKmetric* model specifications consider a wide range of determinants and their relationships to take into account all aspects of impacts within the process.

Examples of these impacts are competition, elasticities as well as non-linearity covering captivities, thresholds, remanence and hysteresis in human behaviour. Further on the system must consider values of time, levels of service and synergetic effects.

Steps in Transport Simulation

The current modelling process consists of the following components:

- Setting up a socio-economic and political framework
- Modelling the computer-based infrastructural networks
- Defining a set of scenarios covering certain measures or targets
- Generating and distributing the transport demand including modal split, access/egress choice, airport choice
- Assigning the obtained flow pattern to the modal networks with respect to considered trip purposes/commodities, vehicles/vessels or levels of service

Based on the required scope of study the obtained results can be computed for various sets of aggregation to fit best the clients needs.