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TNO

The TRANSTOOLS Consortium:
 Netherlands Organisation for Applied Scientific Research - TNO
 NEA Transport Research and Training - NEA
 TRT Trasporti e Territorio SRL - TRT
 Universitaet Karlsruhe (TH)UnikarL - IWW
 Christian-Albrechts-Universitaet zu Kiel - CAU
 Joint Research Centre - JRC
 Danmarks Teknishe Universitet - DTU / CTT
 Istituto di Studi per l'Integrazione dei Sistemi - ISIS




TRANS-TOOLS Goals

- TRANS-TOOLS aims to produce a European transport network model
- covering both passengers and freight, as well as intermodal transport, which overcomes the shortcomings of current European transport network models
- As on the European realm different models for different options and with different IPR settings are anticipated, it is useful to build an IPR free model on the basis of the best available knowledge
- Every model aims to be complete but is incomplete in reality (Werner Rothengatter)
- <http://www.inro.tno.nl/TRANSTOOLS/>

TNO 2




TRANS-TOOLS Goals

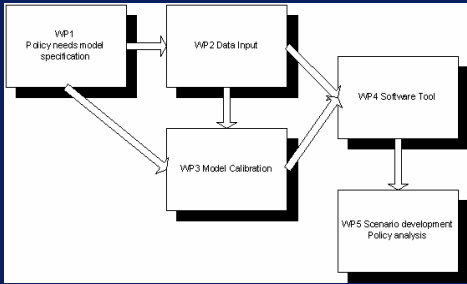
Clear innovations obtained from TRANS-TOOLS:

- Full coverage of Central and Eastern Europe (New Member States, Accession Countries and the countries at the borders of the enlarged European Union).
- Integration of the new Member States at a level similar to those of EU 15.
- Feedback infrastructure development-economy (as the question of indirect effects in the economy and on network level is important, especially where investment has a substantial influence - notably for the NMS and Accession Countries).
- Inclusion of intercontinental flows (mainly for freight), as some models do not cover this segment.
- Intermodality for passenger/freight (as National and European transport policies seek to promote intermodality through different measures).
- Logistics/freight chain explicitly included.
- Coupling method with local traffic in order to address the effect of congestion on long-distance traffic.
- A software approach is chosen which results in a software modelling tool on network level

TNO 3



TRANS-TOOLS Goals



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graph TD
  WP1[WP1 Policy needs model specification] --> WP2[WP2 Data Input]
  WP1 --> WP3[WP3 Model Calibration]
  WP2 --> WP4[WP4 Software Tool]
  WP3 --> WP4
  WP4 --> WP5[WP5 Scenario development Policy analysis]
  
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TNO 4




TRANS-TOOLS Goals

Identified shortcomings in modelling:

- No satisfactory representation of the mix of traffic on network (short/long distance and freight/passenger).
- Intermodality, as well as transport chains as standard load units (in case of freight), and logistics not well (or partly) covered in models.
- Differences in implementation of OD base year for freight traffic in some models, this leads to non-acceptance by member states
- Some models are not updated and use still outdated base year data and do not cover all new accession countries to a sufficient degree. Some models have limited network representation especially in new member states and the candidate countries.
- Forecasting procedures do not capture important features as acknowledged by policy makers (notably the reaction of the economy on transport initiatives, captured in indirect network effects);
- Fixed origin destination matrices are to some extent a problem, one expects in the long run an adaptation in economic behaviour due to changed accessibility.
- No sufficient linkage of network based transport models with socio economic effects (accessibility) and external effects exists at moment

TNO 5



TRANS-TOOLS Policy analysis

Shortcomings (continued)

- Full coverage of all EU countries. Existing models already cover the traditional EU-15 member states for the greater part, but data on the required transport performance in new Member States are in a few occasions included.
- Explicit link between economic and transport models. The existing models do not yet directly link transport developments nor incentives to economic effects. Vice versa, economic developments and incentives are commonly linked to transport effects in a rather general manner. Hence, the interrelationships between economic and transport models are not yet fully included in the contemporary models.
- Inclusion of LoS (Level of Service). How to come from yearly observed values to AADT and a measure of quality of service? In current models are constructed on the basis of yearly values (i.e. the yearly volume of tonnes, passengers, vehicles between origin and destination or on a link), however congestion does have a time component (per day/per season).

TNO 6

TRANS-TOOLS Policy analysis

- Appropriate zoning system. Some existing models work at too coarse spatial level and therefore traffic assignment results are not always accurate enough. Still keeping a different zoning systems for freight (NUTS 2) and passengers (NUTS 3) for trip distribution and modal split (essentially due to difficulties in the data availability and statistics gaps for goods movements), it is important at least to have an homogenous detailed assignment at NUTS 3 level which allows the inclusion of elements of local traffic.
- Freight intermodality and logistics is covered to some extent in current models. Logistics is previously implemented in SMILE and in SCENES, on European scale the implementation is necessary, since it is one of the drivers of transport growth. In passenger transport intermodality is covered to a better extent than freight in existing models.
- Use of recent data. European transport models should be based on most recent data. The best harmonised available data comes from ETIS-BASE, for the year 2000 data are available for passenger and for freight. An integrated model should use this information. For freight it is important that intercontinental freight flows are included since these are a determining factor in European freight flows.

TRANS-TOOLS Policy analysis

European Commission

- White book contains more than 70 specific measures
- TENs development analysis

Main lines in Community policy:

1. Liberalisation and Harmonisation;
2. Investment and Technologies;
3. Pricing, Taxation, and Financing;
4. Safety, Quality, and Environment

EU Member countries

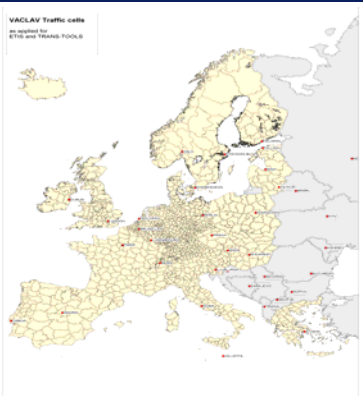
- Economic sustainability
- External effects and their pricing
- Modal split
- Local traffic and congestion
- Feedback processes economy-infrastructure investment

- Transport as a driver of the economy
- Transport efficiency
- Effect of international transport flows
- Compliance to Commission policies
- Safety and security

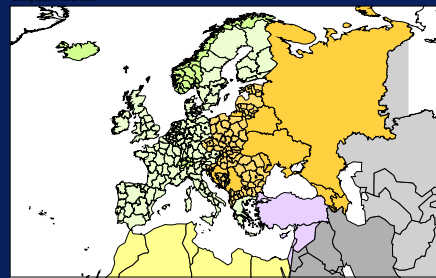
Notably in New Member States

- Feedback processes economy-infrastructure investment
- Infrastructure Investment

Passenger NUTS III regions



Freight NUTS II regions



Example SCENES Network



TRANS-TOOLS Direct/indirect effects

Indirect effects:
Additional benefits via transport using Sectors, which in itself creates transport?

Present practice = Direct effects; Changes in transport usage and price + environmental effects

Efficiency gains?
EU15 NMS
Redistribution of welfare?

Direct vs. indirect
Generative vs. distributive

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TRANS-TOOLS Direct/indirect effects

Scenario A1:
Implementation of TEN priority projects

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TRANS-TOOLS Direct/indirect effects

Scenario B2: SMCP applied to all modes of transport

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TRANS-TOOLS Policy analysis

Project type	Transport model	Wider economy model	How to measure benefits
Incremental infrastructure improvement – small to moderate Δ in GC	Good quality transport model	Qualitative market research	Transport Cost Benefit Analysis
Step-change in regional accessibility OR pricing policy reform = large Δ in GC	Good quality transport model	Spatial CGE/macro model	Equivalent variation at household level / aggregate GDP change

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Freight: ETIS-BASE freight demand matrix

Field	Description	Level of detail
Production	Origin region of the commodities	NUTS 2 for core countries
Ts_1	First transshipment region (when used)	Port regions at NUTS 2 level
Ts_2	Second transshipment region (when used)	Port regions at NUTS 2 level
Consumption	Destination region of the commodities	NUTS 2 for core countries
Flow-type	Domestic (0) / Intra-EU trade (1) / extra-EU trade (2)	
Mode_pr	Mode at origin	5 modes
Mode_ts	Mode between transshipments	Currently exclusively Sea
Mode_co	Mode at destination	5 modes
Commodity	Commodity classification	NSTR 1 digit with crude oil separate
Hazard	Hazardous goods (1) / other goods (0)	
Chilled	Conditioned goods (1) / other goods (0)	
Manifest	Manifestation of the goods	
Value	Value of the goods in thousands of Euro	
Tonnes	Volume of the goods in tonnes	
Unutilised tonnes	Volume of unutilised goods in tonnes	
TEU	Volume of unutilised goods in number of TEUs	

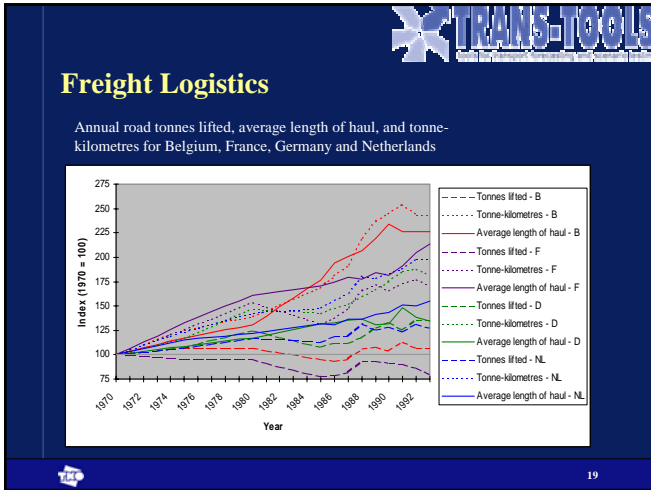
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Freight Logistics

- Analogy with business processes
- Difference with passenger transport
- Long term process

Base: SPITS

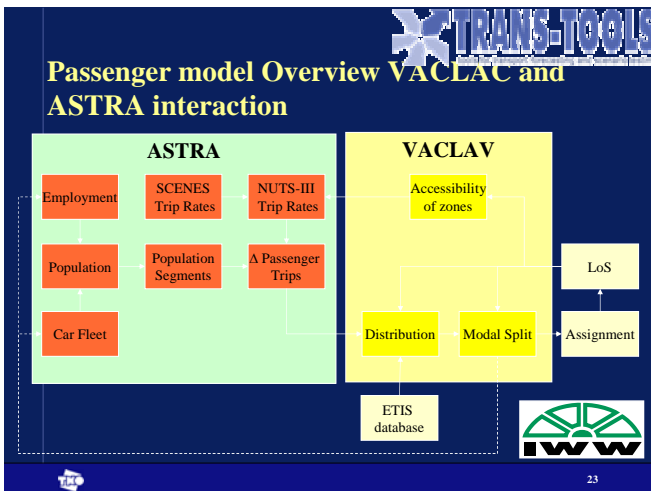
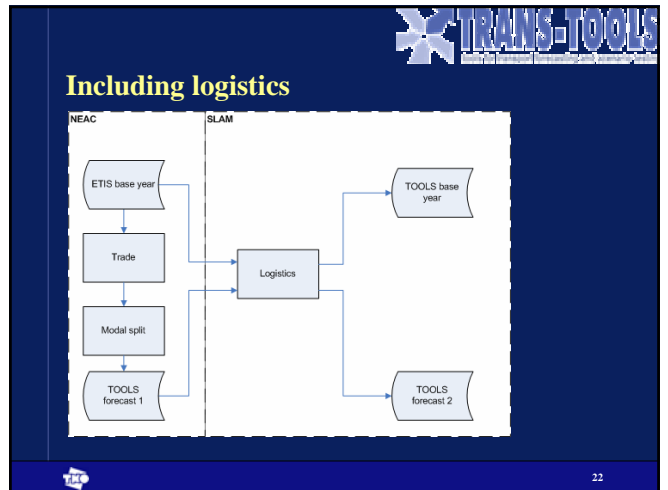
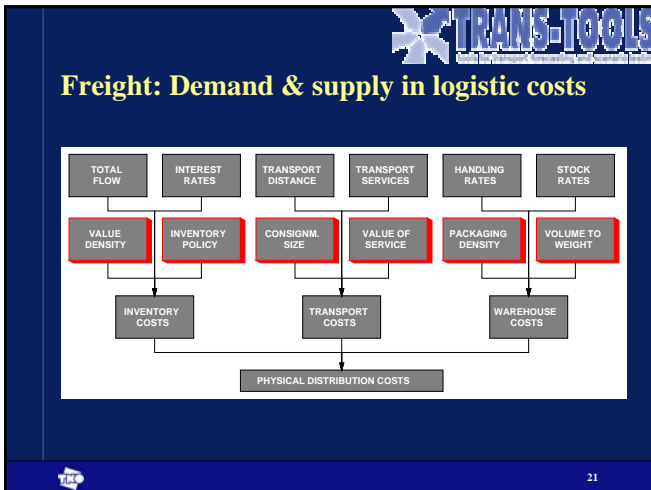
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Freight Logistics module

- O/D Trade \neq O/D transport !
- 40% products (high valued) goods in volume via a DC
- New in NL (SMILE), UK and S follow
- integral logistics costs
- Data difficult to obtain

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Passenger model: Modified trip generation in ASTRA

Feedback loop between VACLAV and ASTRA:

- ASTRA provides changed passenger trip matrix to VACLAV
- Endogenous calculated socio-economic data as input
- VACLAV provides accessibility indicator for modification and disaggregation of trip rates (NUTS-III)

➔ Closed feedback between infrastructure development and economy

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Assignment: Short distance traffic (Zonal internal traffic)

- Split of NUTSII freight matrices into NUTSIII
- Zonal internal traffic on the network – two methods
 - Preload of short distance traffic
 - Assignment onto lower level feeding points
- As preload require a priori traffic volumes (counts) at all links, this does not appear as an option
- IWW on methods for lower level feeding points

Assignment: Time distribution

Split into type of day

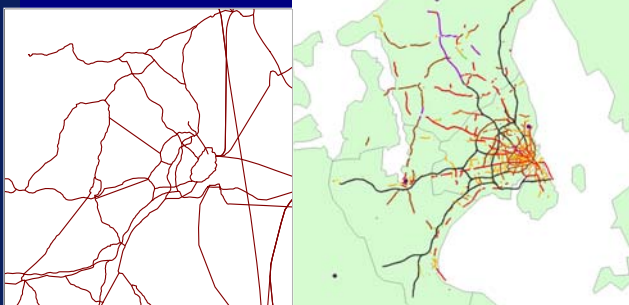
- Usual weekday, summer weekday, busy holidays, weekends and holidays

For usual weekdays split into AM peak, PM peak and of peak

1. Matrices are split into short distance (two hours) and link distance
2. Short trip matrices are split into the 3 time periods
3. During assignment
 - Short trip matrices are assigned using the cost function for the relevant time-period
 - Long trips are assigned using a weighted average cost function for the 3 time periods
 - Speed at each link is recalculated based on the volumes on the link

Road with more than 10,000 cars in ADT

- TRANSTOOL network versus Cph. Network



Assignment models

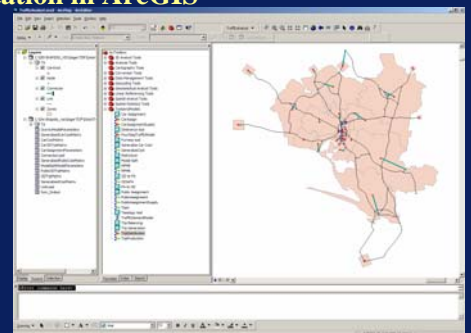
- IPR free – modification of various CTT models
- An equilibrium is obtained where no traveller's perceived utility can be increased solely by the traveller changing route at the desired time of travel
- Utility is determined by
 - the traveller class' utility function
 - the traveller's preferences
 - and the type of vehicle (service) and its reliability

Assignment: freight/passenger modelling

- Trucks are modelled simultaneous with passenger cars
- Freight (rail, inland waterway, maritime)
- Rail are assumed to be all or nothing (frequencies are coded exogenously)
 - Inland waterways are assumed to be all or nothing
 - Maritime not assigned (modelled at matrix level only)
- Passenger (rail, air)
- Multimodal trips are dealt with in the demand model
 - Individual VoT
 - All or Nothing (AoN) or Stochastic
 - Capacity at the service level is assumed to adapt to demand

Implementation in ArcGIS

- Example on passenger model



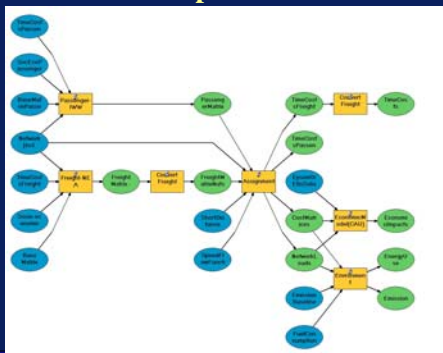
All geographical data in same environment

- Data
 - Networks
 - Zones
 - Zonal connectors
 - Matrices
- Possible metadata XML
 - Logical names short cut in the short run

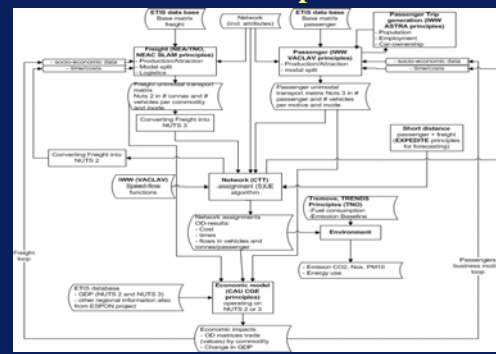
Model Builder

- New tool in ArcGIS 9
- Easy way to define relationships between sub-models of any type
- Aggregate model environment for scenarios, management of data and models
- Somewhat similar to TRIP's model interface – although not restricted to specific software for data end models

Implementation of Blueprint



TRANS-TOOLS "Blueprint"



TRANS-TOOLS "Blueprint"

"policy levers" of the TRANS-TOOLS model

- costs and travel times, i.e. for each measure you want to evaluate you would need an estimate of its impact on costs and time and then with that information you would get the impacts on traffic, environment and economic activity
- logistics parameters (besides transport, also inventory and warehouse costs)
- Socio-economic (GDP, population, employment, car ownership)
- parameter changes (structural model parameters, emissions)
- network changes