What is a data model ?

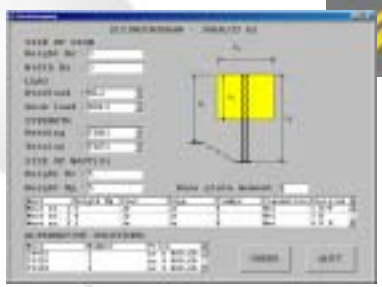
- Introduction
- Finn Zetterstrom – ViaNova

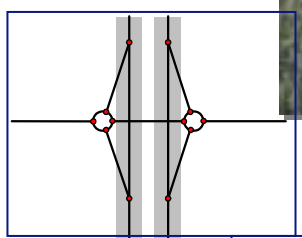
A computerised representation of the real world

3D model

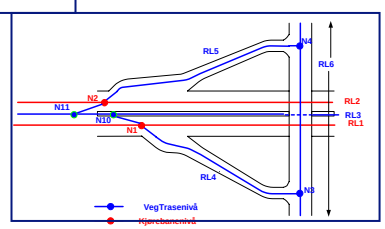
Real world

Object info & relations

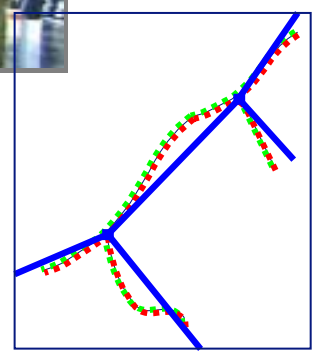




Route/path



Network



The optimal data model:

1. Let the data be shared instead of transformed, moved and dublicated
2. Insure dynamic update of the data
3. Handles data through the whole life-cycle and all disclipines
4. Handle huge amounts of data efficient
5. Manage data between all storage databases and all applications
6. Handles data independent of localisation, technologies and storage solutions
7. Handles all scales of data
8. Requires a standard feature catalogue, real world coordinate representation and a advanced and complete road network

Status and history Norway:

- 1980 NMA, NPRA, NSRA, NCA + municipalities agreed the first national geo code standard SOSI
- From 1980 New versions of SOSI was yearly reviewed and distributed by NMA
- 1980's The standard was adopted, integrated and distributed by leading software vendors
- 1980's The Quadri data-model framework was defined and integrated: CAD, GIS, DTM & Info in one model
- From 1992 Representative from NMA SOSI comitee joined EU ISO TC211 as chairman
- From 1996 Established Road Feature Catalogue DAKAT– detailed description and standardisation of road objects and object relations
- 2004 The Quadri vision still lives and continue to be implemented within small and huge projects. The following projects have been going on the last 7 years:

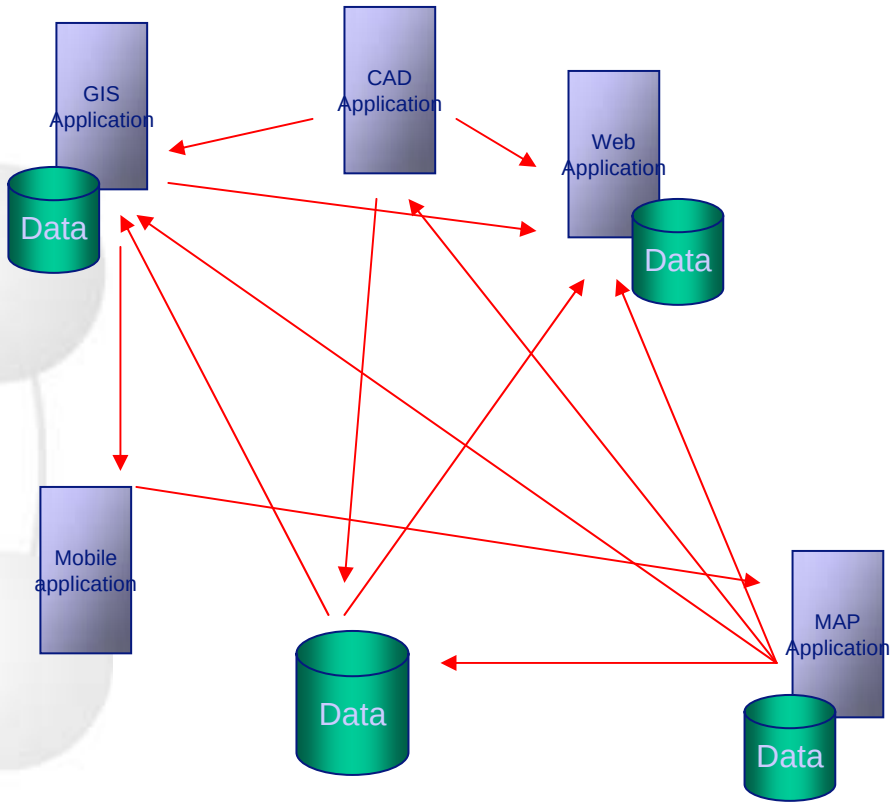
1) NGIS
- National Distributed Mapping Information System
- Norwegian Mapping Administration
- 1997-2002

2) NRDB
- New National Road Data Bank
- Norwegian Public Road Administration
- 1999-2004

3) SNB
- National Railway Data Bank
- Norwegian State Railway Administration
- 2001-2004

4) SYMPRO
- New System Model Project Road
- Further development of advanced road data model
- Norwegian Public Road Administration and ViaNova
- 2002 -

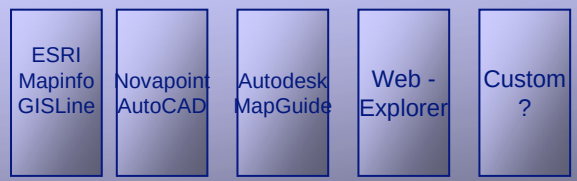
Data connected to user applications



- Dublicated data
- Translated data
- Inconsistent standards
- Multiple administration
- Parallel development
- Huge administration
- Difficult to keep data updated

Separate user applications and datastorage

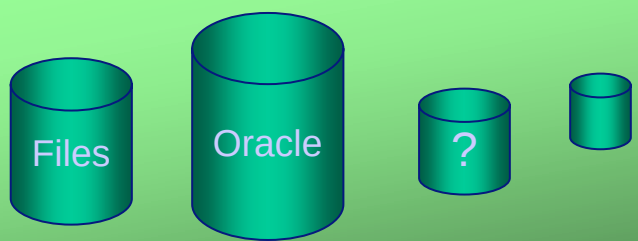
1. Applications



- CAD applications
- GIS applications
- Web applications
- Custom applications
- ?

All user applications could share all data!

3. Database

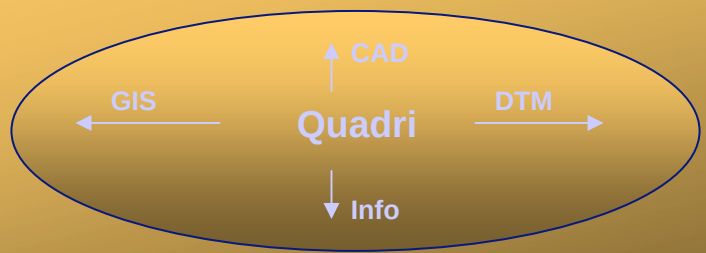


- Standard databases
- Files
- Distributed datastorage
- Local datastrorage

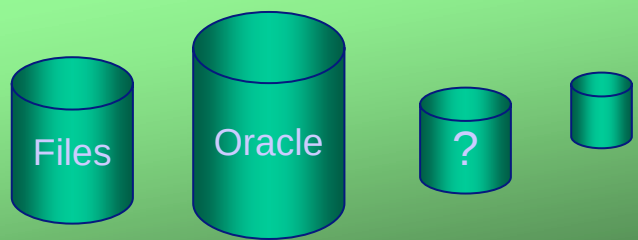
3 layer system design

1. Applications

2. Model



3. Database

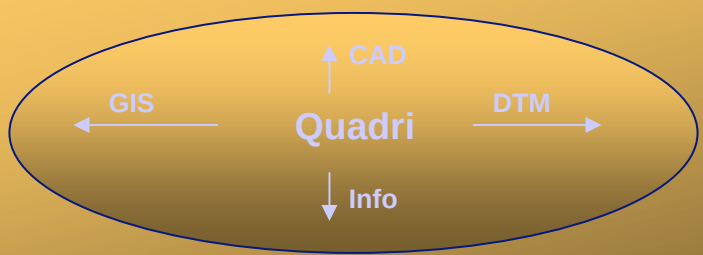


The Data Model and Data Model Framework

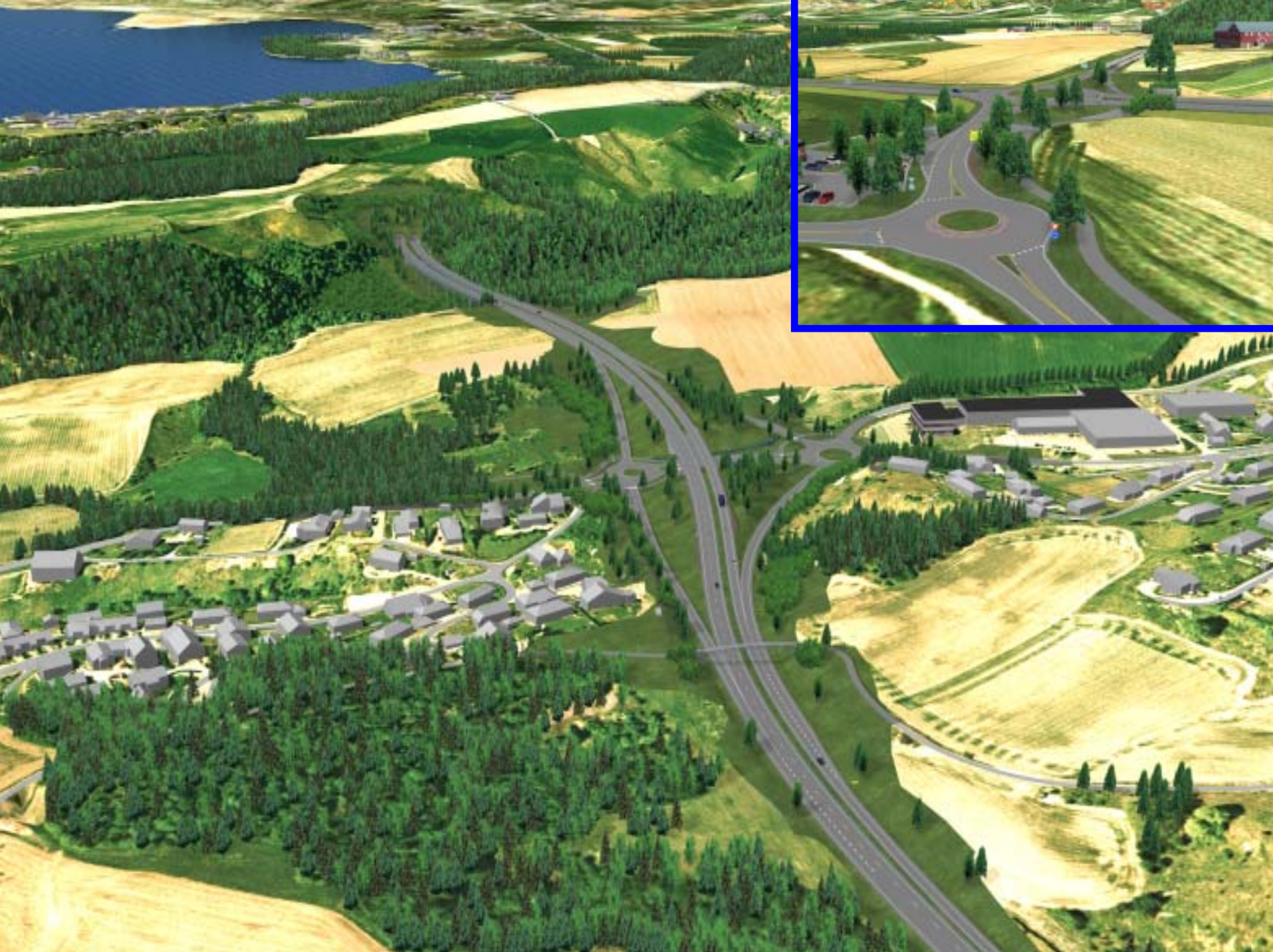
- Administrates the data between databases and user applications
- Interacting the data with the standard feature catalogue and road network

2. Model

Infra data-model framework

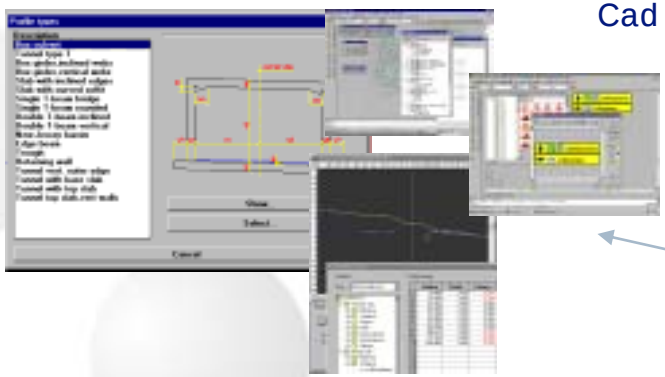


- **Feature type standard (Feature catalogue)**
  - **Data Relation Description**
  - **Object Description**
- **Infra Network model (topology)**
- **Calculations and management func. (3000)**
- **Distribution infrastructure (http)**
- **Application interface (SOAP, COM)**
- **Open database interface**

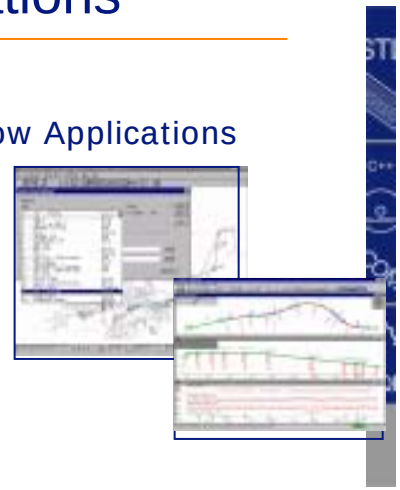


Share data between applications

Cad Applications



Window Applications

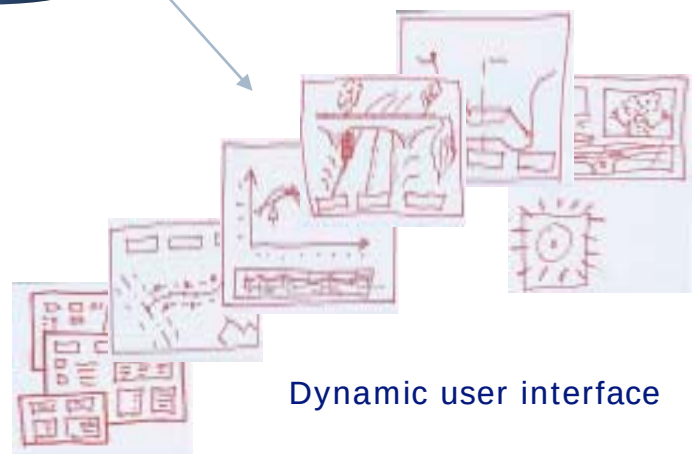


Model

Database

External: NRDB, NGIS, SNB…

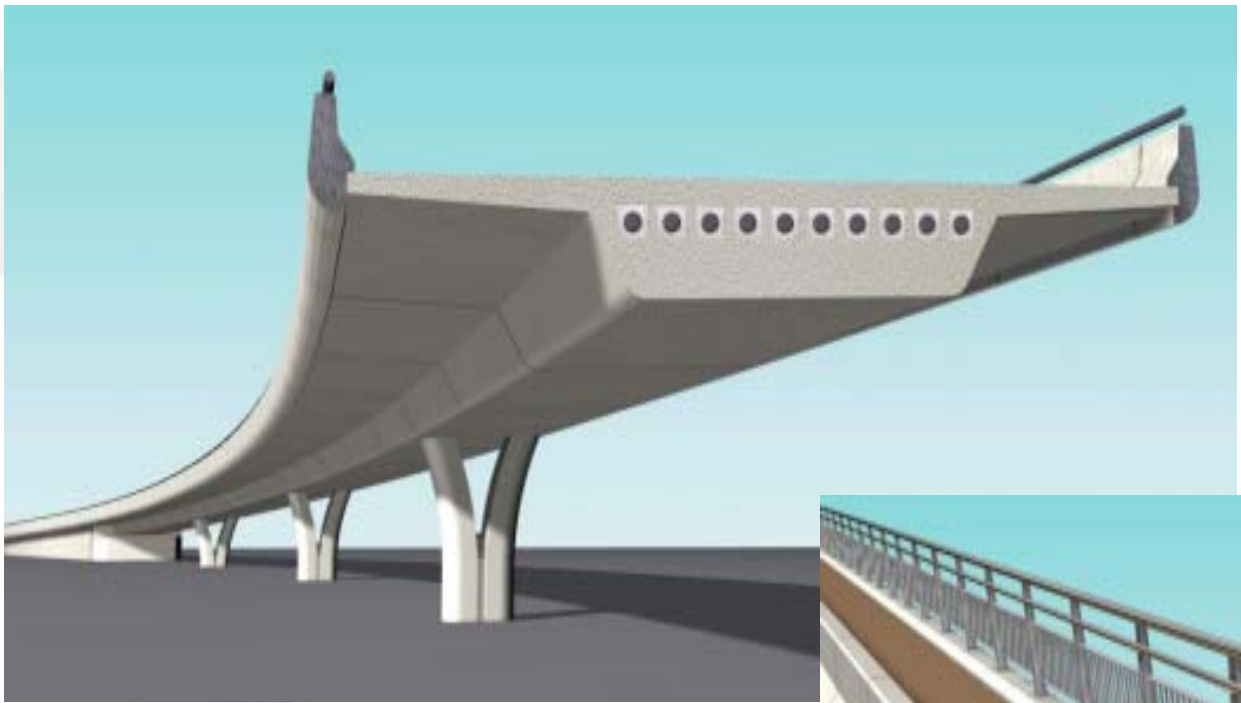
Presentations



Dynamic user interface

Integrated planning

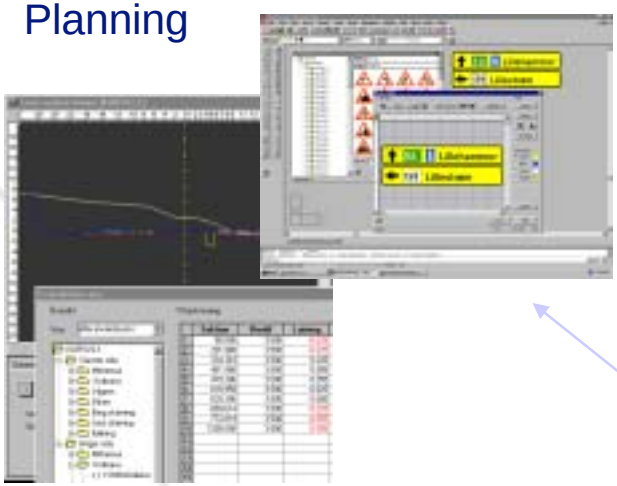
Infrastructure objects integrated



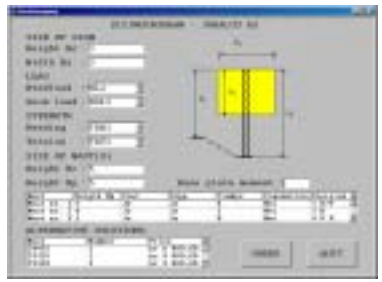
- Geometry connected to road model
- Parametric & interactive

Traffic sign object interact in many applications

Planning



Production

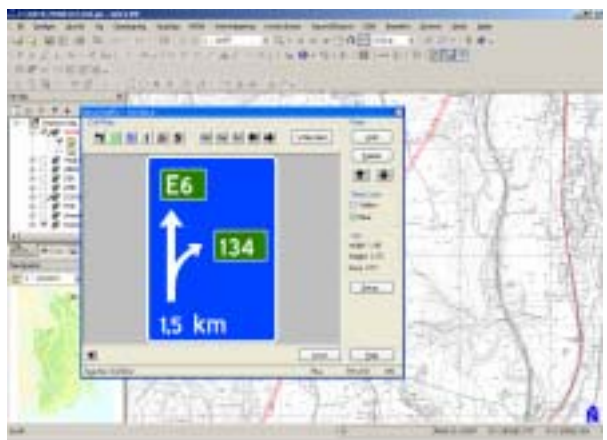


Mobile registration

Model

Database

Simulation



NRDB

Economic aspects:

The total road infrastructure investment/year:

Investments yearly (million USD)	Norway	Sweden	Denmark	Finland	Europe	Asia	USA	Rest.
New roads/highways	500	730	400	390	3 000	3 000	3 000	3 000
New Railways	130	230	120	120	600	600	600	600
New airports	80	120	70	70	400	400	400	400
New Harbours	60	80	50	50	200	200	200	200
New country roads	11	20	10	10	50	50	50	50
Maintenance country roads	11	20	10	10	50	50	50	50
Municipality roads. New + maint.	250	320	230	230	900	900	900	900
County Roads. New + maint.	160	220	130	150	700	700	700	700
FDV-Roads	400	560	340	330	1 600	1 600	1 600	1 600
FDV-Railways	300	400	220	220	1 200	1 200	1 200	1 200
FDV-Airports	280	320	200	200	900	900	900	900
Private roads ++	110	180	80	80	600	600	600	600
Alternative finance roads	150	200	140	140	600	600	600	600
Area constructions	110	200	100	100	600	600	600	600
Water and Sewer	110	200	100	100	600	600	600	600
New infrastructure	1 200	1 700	1 000	1 000	5 000	7 000	7 000	6 000
Existing infrastructure	1 462	2 100	1 200	1 200	7 000	5 000	5 000	6 000
Sum region	2 662	3 800	2 200	2 200	12 000	12 000	12 000	12 000
Sum all	58 862							

Return of investment:

	Area	Yearly basis (Billion USD)	Share (%)	Relevant Improvement (%)	Savings (M USD)
1	Administration	2,7	12	0	0
2	Planning	2,7	3 of 10	5%	4
3	Maintenance	1,3	100	5	65
4	Rehabilitation	Part of 3	-	-	0
5	Building of new roads	1,3	100	5	65
6	Driving/Use	0,25 euro/km	70km	5	20
7	Traffic Noise	0,05	Pr. person	5	2,3
8	Traffic pollution	0.025	Pr. person	2,5	1,1
9	Accidents	0,79	300 death	5	40
10	Aesthetics	0,05	Pr. person	1 euro	2,3
	Sum				200

- ✓ Totally: 200 Million Euro Yearly savings related to average 5% improvement on relevant parts of each of the elements
- ✓ We reduce with a factor of 0,5 to make the numbers more conservative
- ✓ Total estimated direct and indirect improvement related to extra investments in datamanagement and planning tool: 100 M euro/year
- ✓ If the extra needed investment to get the above improvement is 20 mill euro it gives the return of investment: 5 to 1

Finland + Norway = Good results!

Integration of detailed Infrastructure objects