Session 5 - Contribution to sustainable development

Paper :
Road Asset Management : Example of the city of Zurich, Switzerland

Authors :
Martin BURGI - Switzerland
Claude MORZIER - Switzerland

Road Asset Management: Example of the City of Zurich, Switzerland

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Summary by Claude Morzier, Chief Engineer, Bridges and Road Office, Fribourg, Switzerland, TC4.1 Chair

1. Basis Model

The road network of the city of Zurich contains about 740 km of streets and 588 bridges, representing a replacement value of about CHF 2.9 billion.

The basis model for maintaining asset value (*Illustration 1*) postulates that maintenance of the urban network is guaranteed when both the annual loss of value resulting from aging, and the realized maintenance measures, are balanced in the long term (sustainable maintenance).

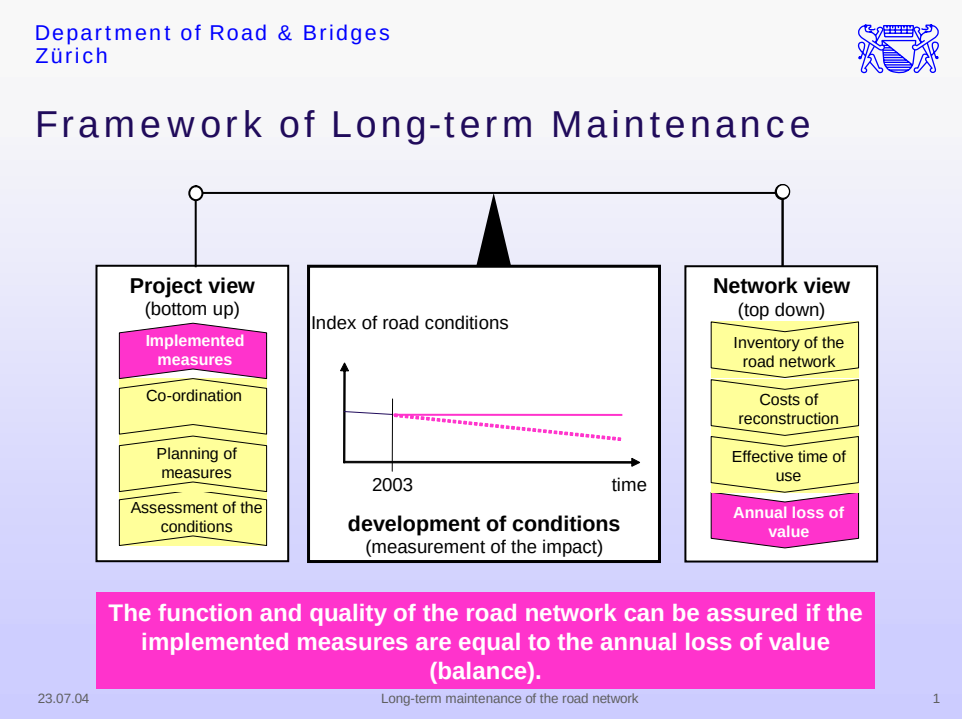


Illustration 1: Basis Model

Project view:

Analysis of maintenance objects (bottom up) is based on condition evaluation of street sections and structures. From this analysis, planning of maintenance measures is made.

Project costs are computed based on unitary costs for each element. Those measures then have to be co-ordinated with the measures for other infrastructures in the streets for final realization of co-ordinated projects.

Network view:

Analysis of the network (top down) begins with an inventory of the road network, which contains streets, squares, walkways as well as bike lanes. Reconstruction costs and effective time of use determine the annual loss of value.

Development of conditions:

Average condition index for the entire network indicates the change of conditions in the long run. This indicates also the effects of maintenance measures on the network.

2. Selection of Maintenance Objects

Selection of maintenance objects is given with a Pavement Management System (PMS). Condition statement, based on surface degradation, is made only for the streets. The network is divided into sections, according to street conditions. Four types of maintenance measures, including their respective cost, are used for the planning phase (*Illustration 2*). A more detailed analysis is made, once the objects are selected , during the detailed project phase.

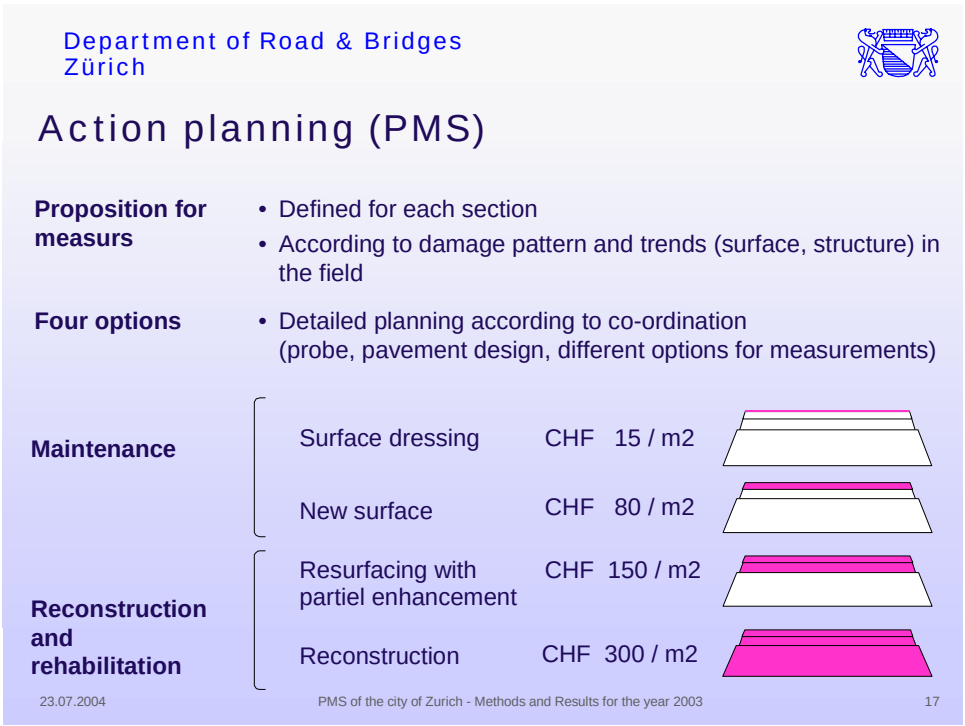


Illustration 2 Measure Types

3. Co-ordination

Urban road networks include many other networks like water and power supply, telecommunication, and so on. In order to limit the impact on road users, it is necessary to co-ordinate all maintenance work between the respective managers.

Timing for maintenance results then from the conflicting needs of the various networks (*Illustration 3+4*). The repair moment cannot be later than the time when one of the networks is no longer able to provide its expected services. Naturally Maintenance can take place earlier if the required funding exists.

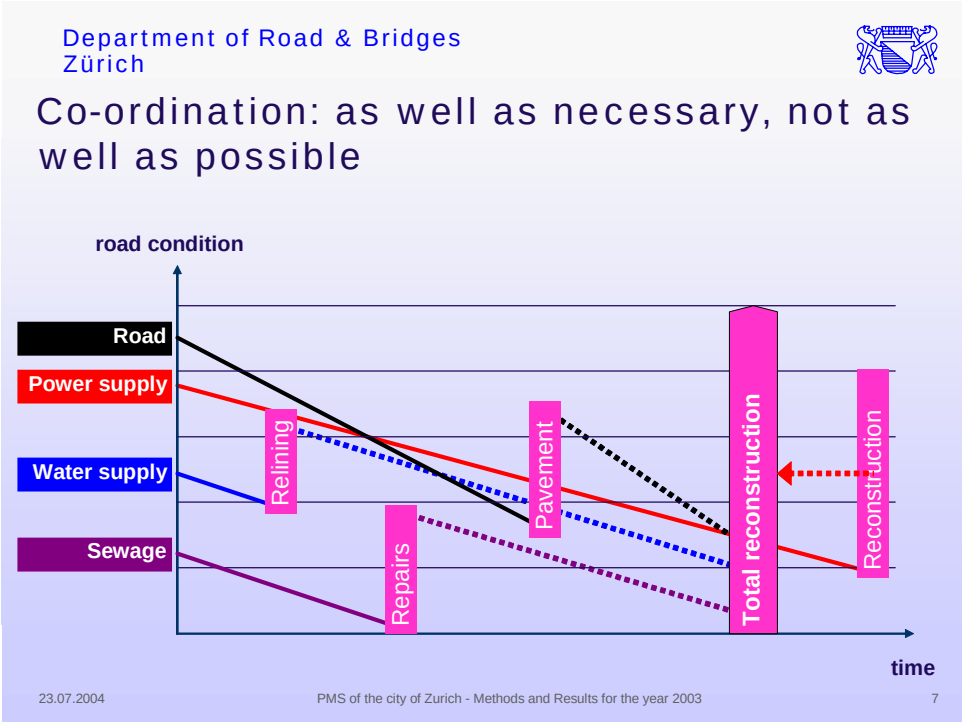


Illustration 3: Coordination Principle

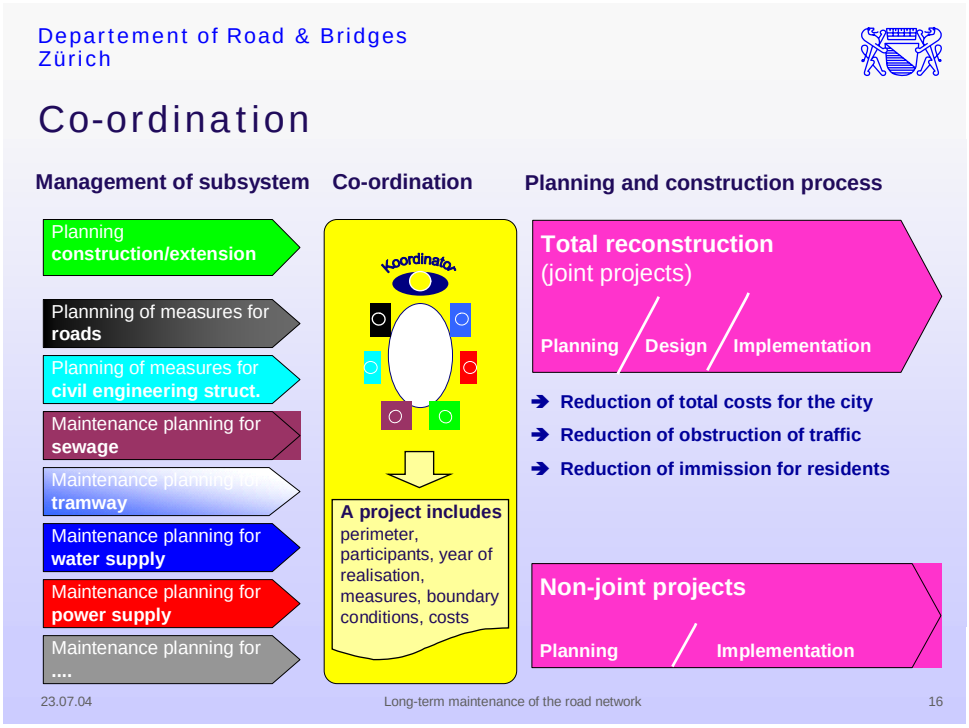


Illustration 4: Coordination

4. Network Level Analysis

The road network of the city of Zurich represents a surface of about 5.3 million square metre, plus 2.5 million square metre of pedestrian walkways and bikelanes. The basis model for maintaining asset value begins with the replacement value of the actual network. This corresponds to the actual repair costs of the elements to be maintained. It is then linked to replacement on actual conditions (works under traffic, environmental legislation, and so on). It also contains the equipment adaptations of existing road traffic to higher needs, like reinforcement, corrections of geometry or rain water pipe adaptations. The construction costs like excavations, land purchases, pipe moving, and so on are not included..

Value loss rate depends mainly on traffic road (*Illustration 5*).

Department of Road & Bridges
Zürich

Effective time of use

Traffic volume	Average time of use (years)				annual value loss in %
	foundation layer	base layer	pavement	average	
lane > T4	60	35	25	38	2,6%
lane T2, T3	75	45	30	48	2,1%
lane T1	85	50	35	54	1,9%
pedestrian/bike lane				55	1,8%

- Data by interviews conducted by Wüest&Partner
- Structure according to traffic volume and system parts
- Accurate operational maintenance and repairs as required

23.07.04 Long-term maintenance of the road network 4

Illustration 5: Value Loss Rate

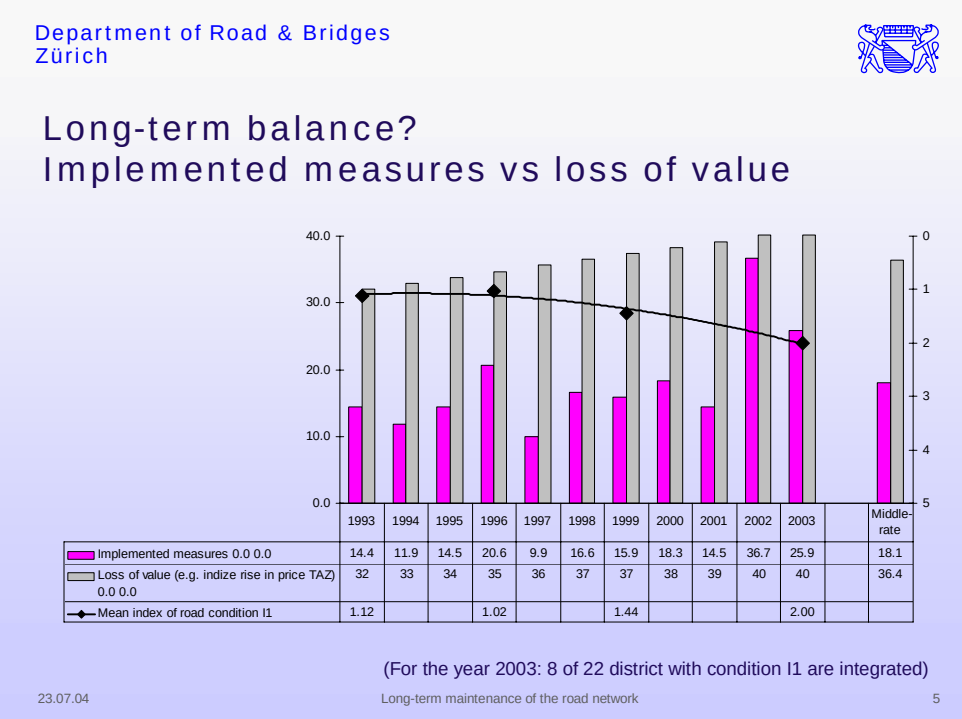
Those values are based on several decades of experiencemade by road office engineers.

Applying the values of *Illustration 5*, the annual value loss is evaluated at about CHF 36 million for the streets and at CHF 4 million for pedestrian walkways and bikelanes.In summary, the annual urban network value loss for Zurich is approximately CHF 40 million, corresponding to an annual value loss rate of about 2.2%.

5. Balance

The average condition index of the surface layer is used to analyze the change in road conditions. If a constant value of the average condition index is observed, value loss and realized maintenance measures are balanced. Today, a downward trend of the average condition index is noted.

The balance is made comparing the average value loss of road asset with the amounts invested for maintenance (*Illustration 6*).



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		Middle-rate
Implemented measures 0.0 0.0	14.4	11.9	14.5	20.6	9.9	16.6	15.9	18.3	14.5	36.7	25.9		18.1
Loss of value (e.g. indize rise in price TAZ) 0.0 0.0	32	33	34	35	36	37	37	38	39	40	40		36.4
Mean index of road condition I1	1.12			1.02			1.44				2.00		

Illustration 6: Balance

The basis model for maintaining asset value doesn't determine at what level the average condition index has to be set. But it does allow discussions between decision-makers, users and specialists to determine the fundings necessary for road maintenance.