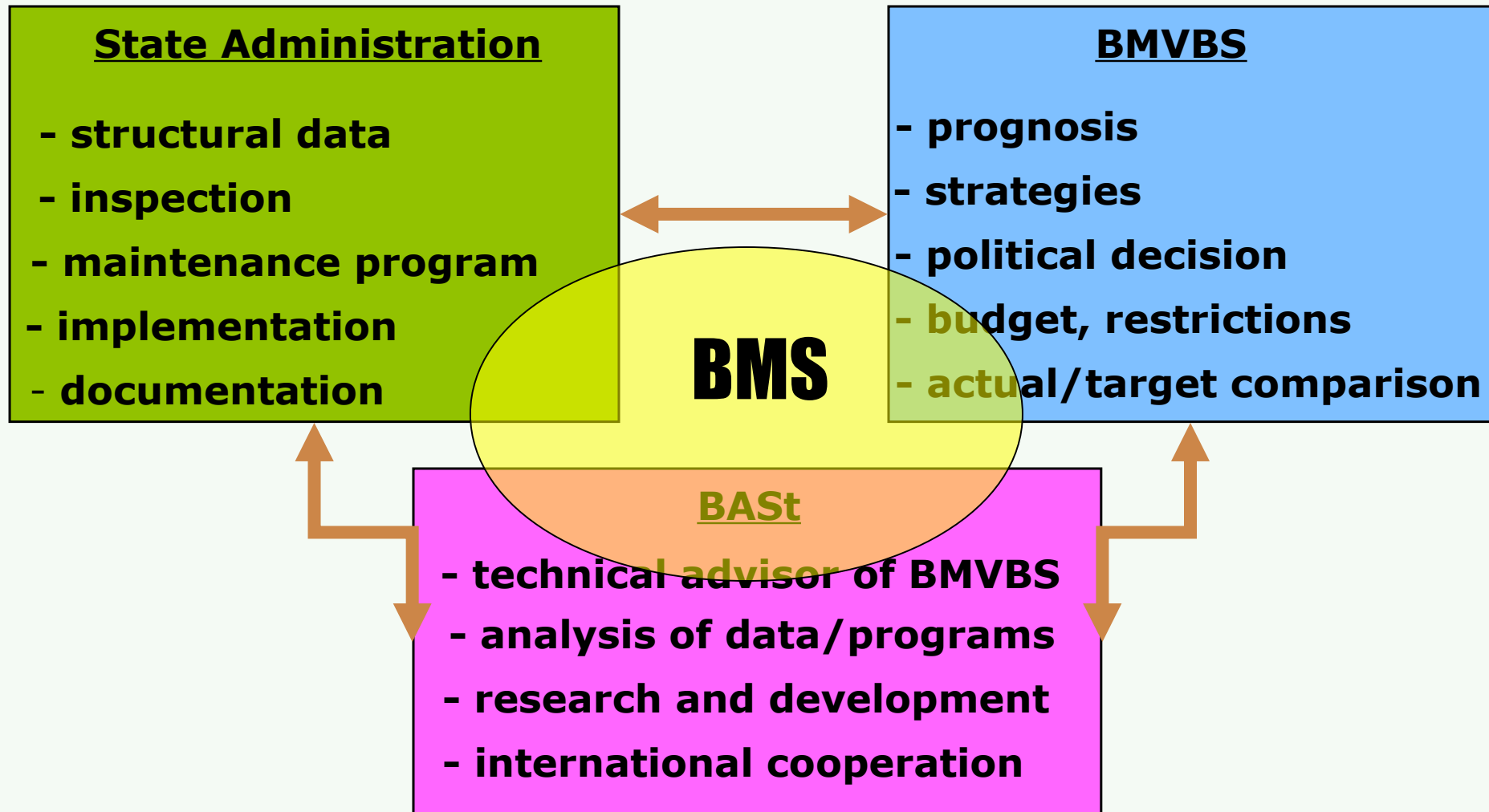


Bridge Management in Germany

Dipl.-Ing. Ralph Holst

- 1 Organisation of Maintenance**
- 2 Statistics**
- 3 Data-(base)**
- 4 Inspection**
- 5 Management**
- 6 Closure and Outlook**

- 1 Organisation of Maintenance**
- 2 Statistics
- 3 Data-(base)
- 4 Inspection
- 5 Management
- 6 Closure and Outlook

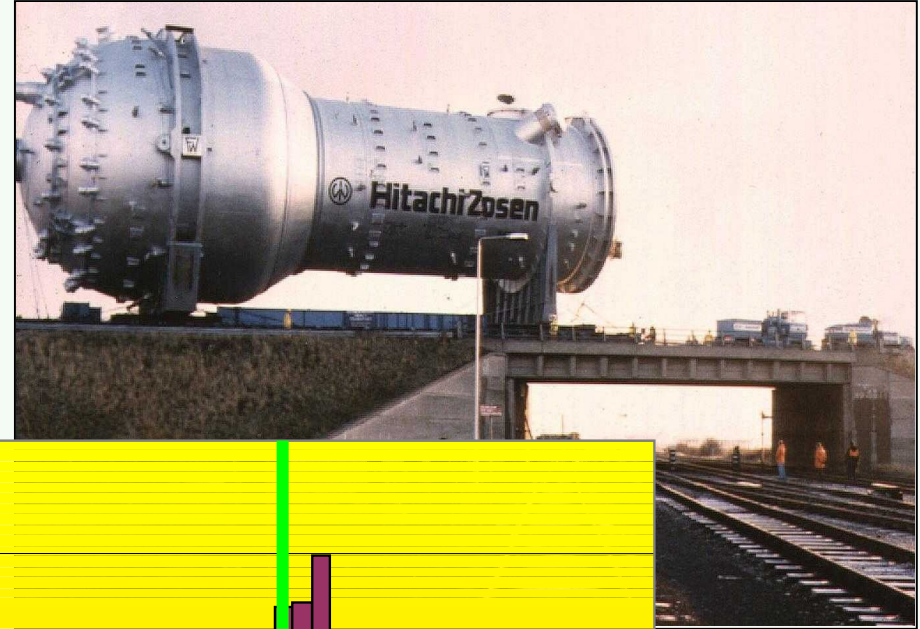
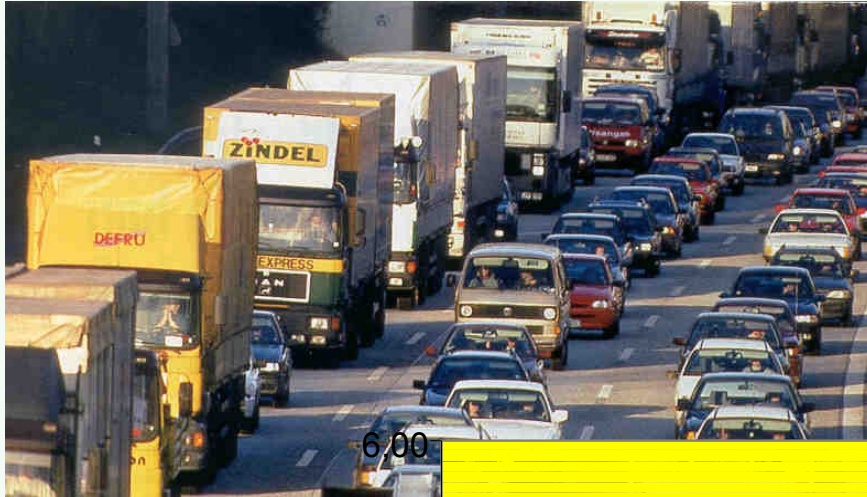


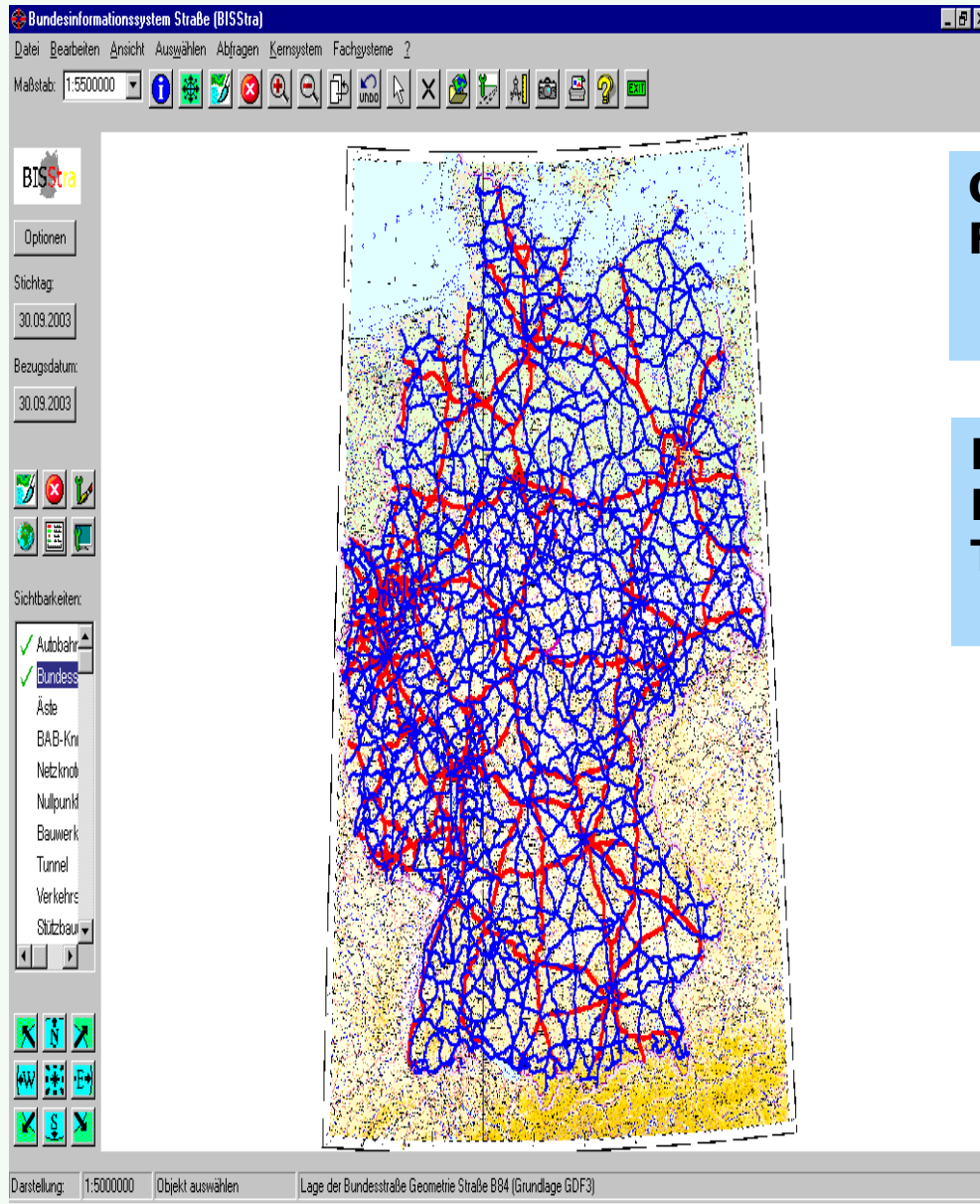
- 1 Organisation of Maintenance
- 2 Statistics**
- 3 Data-(base)
- 4 Inspection
- 5 Management
- 6 Closure and Outlook

Traffic Loads



bast





Overall road network: 688.243 km
Federal Highways: 12.718 km
Federal Trunk Roads: 40.203 km
(01.01.2010)

Federal Roads: 39.039 bridges
Highways: 17.422 bridges
Trunk Roads: 21.617 bridges
(01.03.2012)

(01.03.2012)

39.039 Bridges
Bridge Deck Area = 29,95 Mio m2



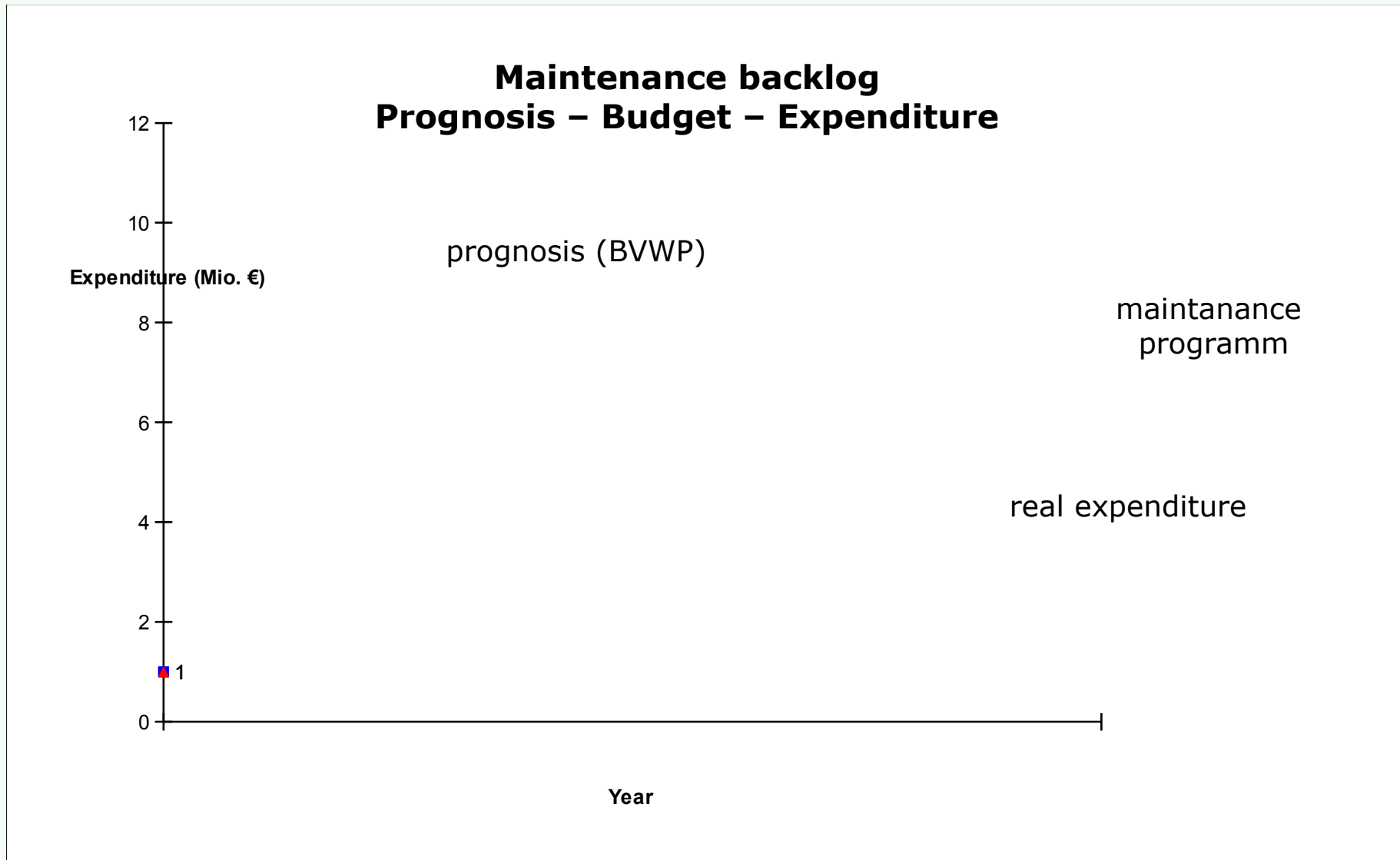
(01.03.2012)



[%] of Bridge Deck Area

Condition Index

(01.03.2012)

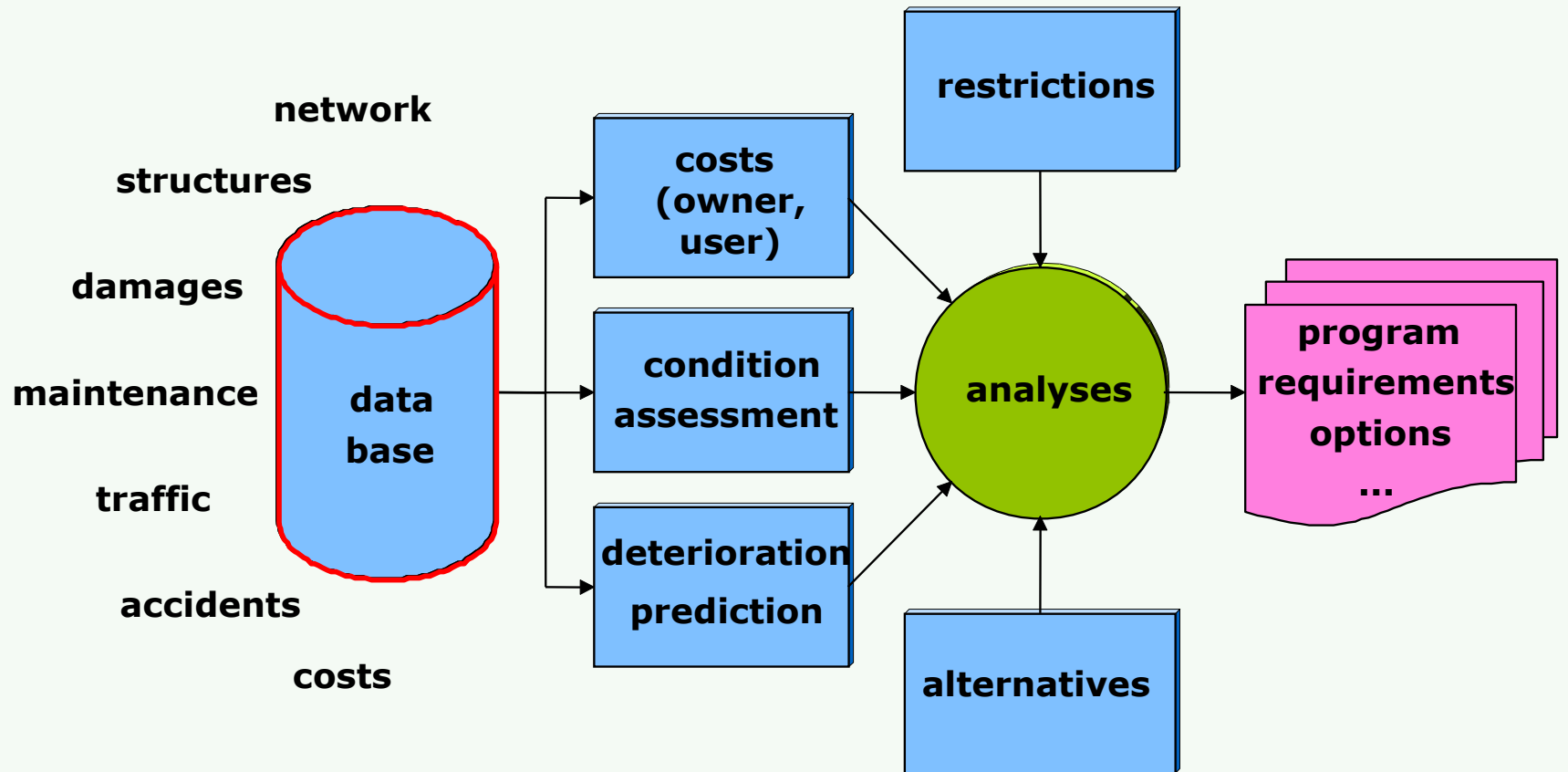


- **insufficient durability of structures**
- **growing volumes of traffic / higher weights**
- **restricted resources**
- **no standardized maintenance planning procedures**



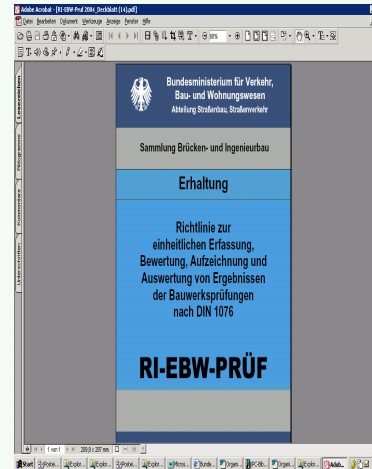
BMS (planning, controlling, implementation)

- 1 Organisation of Maintenance
- 2 Statistics
- 3 Data-(base)**
- 4 Inspection
- 5 Management
- 6 Closure and Outlook

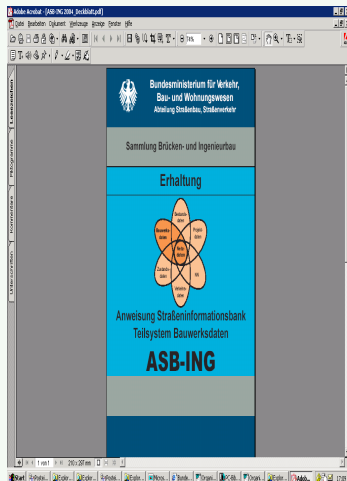


(OECD 1992)

DIN 1076, Engineering structures in connection with roads; inspection and test, 1999



Guideline RI-EBW-PRÜF, 2007
Recording and assessment of damages, condition assessment



ASB Structures Inventory instructions, 2008
Extent and structure of data



Software SIB-Bauwerke, Version 1.8, 2008

Recording and evaluation of data;
inspection software

SIB-BAUWERKE Verwaltungsprogramm V 1.8 SP2.2 ORACLE Db1

BASt, Brücken- u. Ingenieurbau
Referat B4 "Bauwerkserhaltung"

SIB-BAUWERKE

Übersichtsblatt

Bauwerksnummer **4311687** 2 Interne Bwnr. **km 413,600** Kamen

Name **A2 / K9 "Bergkamener Str."/A2 / K9, FR Hannover**

Bemerkung: **Das ursprüngliche Bauwerk wurde 1937 errichtet. Aufgrund der Kriegereigni**

Art: **Plattenbalkenbrücke, Trägerrostbrücke**

Konstrukt.: **Stahl-Vollwandträger mit Ortbetonplatte (6-stegig)**

Stadium: **Bauwerk unter Verkehr**

Stat. Sys. Q: **Plattenbalken / Trägerrost (mit Querverteilung)**

Amt: **ANL Hamm**

SM **AM Kamen**

Zustand: 3,0 EP: **16.04.2007** Baujahr: **1947**

BrKI: DIN: 60 HP: **18.11.2010** MLC RJK: **100/50 | 80/50**

Bst. Ubb.: **Stahlbetonfertigteile mit Ortbeton ohne Verbund**

Ges.länge: **17,60** m

Bröte: **19,65** m

Br.fläche: **346** m²

Winkel: **80,00 - rechts** gon

UI/UA: **UI bei SBV**

Baulast: **Bund** m

Condition Index

Length, Width, Bridge Deck Area

Bridge Class (60)

MLC

Felder: **1** Stw: **17.60**

Lage	Straße	Von Nk	Nach Nk	Netzkn.-abschnitt	Station Mitte [m]	KM	Min B [m]	Min H [m]	Schilder StVO/Menge
O:	A 2	4312017A	4411082A	18	2547	413,600	0,00		
U:	K 9	43110490	44110880	12	2774		10,50	4,50	
U: Geh- und Radweg									

Tabelle

Suchen

Zurück

Zustand

Druck / PDF

Bilder

Zeichnungen

Dokumente

SIB-BAUWERKE Verwaltungsprogramm V 1.8 SP2.2 ORACLE Db1

BAST, Brücken- u. Ingenieurbau
Referat B4 "Bauwerkserhaltung"

SIB-BAUWERKE

Schäden Bauwerkszustand

Bauwerksnummer **4311687** 2 Interne Bwnr. km 413,600 0 %

Bauteilsortiert	ID-sortiert	frei sortiert
{48}	Überbau	0,0,2 10H 10H
{46}	Überbau	0,0,2 10H 10H
{44}	Überbau	0,0,1 10H 10H
{21}	Überbau	0,0,2 10H 10H
{22}	Überbau	0,0,1 10H 10H
{6}	Überbau	0,0,1 10H 10H
{5}	Überbau	0,0,2 10H 10H
{2}	Überbau	0,0,2 10H 10H
{34}		
{43}		
{24}		
{49}		
{45}		
{50}		
{10}		
{26}	Lager	0,0,1 10H 10H
{52}	Abdichtung	0,0,3 11zu 11zu
{53}	Kappe	0,0,3 11zu 11zu
{51}	Kappe	0,0,2 10H 10H
{23}	Kappe	0,0,1 10H 10H
{28}	Kappe	0,0,1 10H 10H
{29}	Kappe	0,0,3 10H 10H
{42}	Schutzeinri	0,1,0 10H 10H
{35}	Schutzeinri	1,1,2 10H 10H
{30}	Schutzeinri	0,0,1 10H 10H
{33}	Ausstattung	0,0,2 10H 10H
{47}	Ausstattung	0,1,0 10H 10H
{40}	Beläge	0,0,2 10H 10H
{38}	Beläge	0,2,2 10H 10H
{37}	Beläge	0,3,2 10H 10H

Überbau - Plattenbalkenbrücke, Trägerrostbrücke -
Hauptträger des Trägerrostes · Stahl / Metall · verrostet ·
bereichsweise · S=0, V=0, D=2 · (Kantenbereiche, besonders
in den Endbereichen und bei der Längsfuge zu Teilbauwerk
3). · Bild: KANTENROST.JPG

Damage description

[5]: Superstructure;
Corrosion; S = 0; V =
0; D = 2

09 - - 24.11.2010 - Robert Saager

Sortierung

Historie

Suchen

Neu

Löschen

Ändern

Kopieren

Bild an

Zurück

- 1 Organisation of Maintenance
- 2 Statistics
- 3 Data-(base)
- 4 Inspection**
- 5 Management
- 6 Closure and Outlook





Damage Assessment "Structural Stability"	
Assessment	Description
0	The defect/damage has no effect on the structural stability of the structural element/structure.
1	<p>The defect/damage negatively affects the structural stability of the structural element; however, it has no effect on the structural stability of the structure.</p> <p>With respect to the as-planned utilization, individually occurring, small deviations in the condition of the structural element, the quality of the construction material or the element's dimensions are still clearly within the scope of the admissible tolerances.</p> <p>Repairs to be carried out within the scope of regular maintenance.</p>
2	<p>The defect/damage negatively affects the structural stability of the structural element; however, it has little effect on the structural stability of the structure.</p> <p>The deviations in the condition of the structural element, the quality of the construction material or regarding the dimensions or the as-planned stresses resulting from the utilization of the structure are still within the scope of the permissible tolerances. In individual cases, the admissible tolerances of the structural element may be exceeded.</p> <p>Repairs must be undertaken within the medium term.</p>
3	<p>The defect/damage does affect the structural stability of the structural element negatively. the deviations with respect to the condition of the structural element, the quality of the construction material or regarding the dimensions or the as-planned stresses resulting from the utilization of the structure exceed the permissible tolerances.</p> <p>The required restrictions on the use are not in place or are ineffective.</p> <p>The damage must be repaired at short notice. Restrictions regarding utilization must be put in place immediately.</p>
4	<p>The structural stability of the structural element and the structure no longer exists.</p> <p>Immediate measures must be taken during the inspection of the structure. Restrictions regarding the utilization must be put into place immediately. The repair or renovation must be initiated.</p>

Calculation of Condition Index



Bewertungsschlüssel (Basiszustandszahl in Abhängigkeit von der Schadensbewertung)

D = 0

4	4,0	4,0	4,0	4,0	4,0
3	3,0	3,2	3,4	3,6	4,0
2	2,1	2,2	2,3	2,7	4,0
1	1,2	1,3	2,1	2,6	4,0
0	1,0	1,1	2,0	2,5	4,0
	0	1	2	3	4

V

D = 1

4	4,0	4,0	4,0	4,0	4,0
3	3,1	3,3	3,5	3,7	4,0
2	2,2	2,3	2,4	2,8	4,0
1	1,5	1,7	2,2	2,7	4,0
0	1,1	1,3	2,1	2,6	4,0
	0	1	2	3	4

V

D = 2

4	4,0	4,0	4,0	4,0	4,0
3	3,2	3,4	3,6	3,8	4,0
2	2,3	2,5	2,6	2,9	4,0
1	2,2	2,3	2,4	2,8	4,0
0	1,8 2,0	2,1	2,2	2,7	4,0
	0	1	2	3	4

V

Bewertungsschlüssel (Basiszustandszahl in Abhängigkeit von der Schadensbewertung)

D = 0

4	4,0	4,0	4,0	4,0	4,0
3	3,0	3,2	3,4	3,6	4,0
2	2,1	2,2	2,3	2,7	4,0
1	1,2	1,3	2,1	2,6	4,0
0	1,0	1,1	2,0	2,5	4,0
	0	1	2	3	4

V

D = 1

4	4,0	4,0	4,0	4,0	4,0
3	3,1	3,3	3,5	3,7	4,0
2	2,2	2,3	2,4	2,8	4,0
1	1,5	1,7	2,2	2,7	4,0
0	1,1	1,3	2,1	2,6	4,0
	0	1	2	3	4

V

D = 2

4	4,0	4,0	4,0	4,0	4,0
3	3,2	3,4	3,6	3,8	4,0
2	2,3	2,5	2,6	2,9	4,0
1	2,2	2,3	2,4	2,8	4,0
0	1,8 2,0	2,1	2,2	2,7	4,0
	0	1	2	3	4

V

D = 3

4	4,0	4,0	4,0	4,0	4,0
3	3,0	3,2	3,4	3,6	4,0
2	2,1	2,2	2,3	2,7	4,0
1	1,2	1,3	2,1	2,6	4,0
0	1,0	1,1	2,0	2,5	4,0
	0	1	2	3	4

V

D = 4

4	4,0	4,0	4,0	4,0	4,0
3	3,1	3,3	3,5	3,7	4,0
2	2,2	2,3	2,4	2,8	4,0
1	1,5	1,7	2,2	2,7	4,0
0	1,1	1,3	2,1	2,6	4,0
	0	1	2	3	4

V

➔ 1 = ♦ 0,1 (Extension of damage)

➔ 2 = ♦ 0,1 (Number of damage)

➔ 3 = ♦ 0,1 (Number of damaged structural components)

D = Dauerhaftigkeit

Bewertungsschlüssel (Basiszustandszahl in Abhängigkeit von der Schadensbewertung)

D = 0

4	4,0	4,0	4,0	4,0	4,0
3	3,0	3,2	3,4	3,6	4,0
2	2,1	2,2	2,3	2,7	4,0
1	1,2	1,3	2,1	2,6	4,0
0	1,0	1,1	2,0	2,5	4,0
	0	1	2	3	4

V

D = 1

4	4,0	4,0	4,0	4,0	4,0
3	3,1	3,3	3,5	3,7	4,0
2	2,2	2,3	2,4	2,8	4,0
1	1,5	1,7	2,2	2,7	4,0
0	1,1	1,3	2,1	2,6	4,0
	0	1	2	3	4

V

D = 2

4	4,0	4,0	4,0	4,0	4,0
3	3,2	3,4	3,6	3,8	4,0
2	2,3	2,5	2,6	2,9	4,0
1	2,2	2,3	2,4	2,8	4,0
0	1,8 2,0	2,1	2,2	2,7	4,0
	0	1	2	3	4

V

Condition number

Klassenübersprünge über Zustandsnotenbereiche (siehe Definitionen der Zustandsbewertung) durch Abschnitte zur Berücksichtigung der Einflussgrößen "Schadensausbreitung", "Schadensmenge" und "Schadigungsgrad anderer Kategorien" sind nicht zugelassen. Klassenübersprünge durch Zuschläge sind nur an den Anfang des nächsten Zustandsnotenbereiches zugelassen.

S = Standsicherheit
V = Verkehrssicherheit
D = Dauerhaftigkeit

Example

2 (Stability)

2 (Traffic Safety)

3 (Durability)

Grade	Description
1.0-1.4	Very good structural condition The structural stability, traffic safety and durability of the structure are given. Continuous maintenance is required.
1.5-1.9	Good structural condition The structural stability and traffic safety and durability of the structure are given In the long term, the durability of the structure may be negatively affected to a small degree . Continuous maintenance is required.
2.0-2.4	Satisfactory structural condition It is possible that, in the long term, the durability of the structure may be negatively affected . An expansion of the damage or consequential damages which, in the long term , would lead to considerable deterioration of the structural stability and/or traffic safety and increased wear and tear. Continuous maintenance is required. Maintenance is required in the medium term . Measures to eliminate the damage or warning signs to maintain traffic safety might be necessary at the short notice .
2.5-2.9	Unsatisfactory structural condition The structural stability of the structure is given . Traffic safety might be negatively affected . The durability of the structure may be negatively affected quite a bit. An expansion of the damage or consequential damages which, in the medium term , would lead to considerable deterioration of the structural stability and/or traffic safety and increased wear and tear is to be expected. Continuous maintenance is required. Maintenance at short notice is required. Measures to eliminate the damage or warning signs to maintain traffic safety might be necessary at short notice .

Condition Index



Grade	Description
1.0-1.4	Very good structural condition The structural stability, traffic safety and durability of the structure are given. Continuous maintenance is required.
1.5-1.9	Good structural condition The structural stability and traffic safety and durability of the structure are given In the long term, the durability of the structure may be negatively affected to a small degree . Continuous maintenance is required.
2.0-2.4	Satisfactory structural condition It is possible that, in the long term, the durability of the structure may be negatively affected . An expansion of the damage or consequential damages which, in the long term , would lead to considerable deterioration of the structural Continuous maintenance is required. Maintenance is required in the medium t Measures to eliminate the damage or w the short notice.
2.5-2.9	Unsatisfactory structural condition The structural stability of the structure is Traffic safety might be negatively affect The durability of the structure may be ne consequential damages which, in the me structural stability and/or traffic safety and Continuous maintenance is required. Maintenance at short notice is required. Measures to eliminate the damage or w short notice.

Grade	Description
3.0-3.4	Critical structural condition The structural stability and/or traffic safety of the structure are negatively affected . Possibly, durability of the structure is no longer given . An expansion of the damage or consequential damages may, in the short term , lead to the fact that structural stability and traffic safety are no longer given. Continuous maintenance is required. Immediate repairs are required. Measures to eliminate the damage or warning signs to maintain traffic safety or restrictions in its use might be required as soon as possible.
3.5-4.0	Inadequate structural condition The structural stability and/or traffic safety are negatively affected quite a bit or is no longer given . Possibly, durability of the structure is no longer given . An expansion of the damage or consequential damages may, in the short term , lead to the fact that structural stability and traffic safety are no longer given and that it will result in an irreparable deterioration of the structure. Continuous maintenance is required. Immediate repairs or renovations are required. Measures to eliminate the damage or warning signs to maintain traffic safety or restrictions in its use might be required immediately .

4 Recalculation Levels

- Level 1: German „Fachbericht“ or DIN EN 1992 – 1994, 1996,
- Level 2: supplementary regulations,
- Level 3: Results from measurements (e.g. Monitoring)
- Level 4: scientific methods (reliability based Methods)

Goal:

- realistic Assessment of Bridge Condition (structural stability and usability)

Bundesministerium für Verkehr, Bau und Stadtentwicklung

Abteilung Straßenbau

Richtlinie zur Nachrechnung von Straßenbrücken im Bestand (Nachrechnungsrichtlinie)

Ausgabe: 05/2011

- 1 Organisation of Maintenance
- 2 Statistics
- 3 Data-(base)
- 4 Inspection
- 5 Management**
- 6 Closure and Outlook

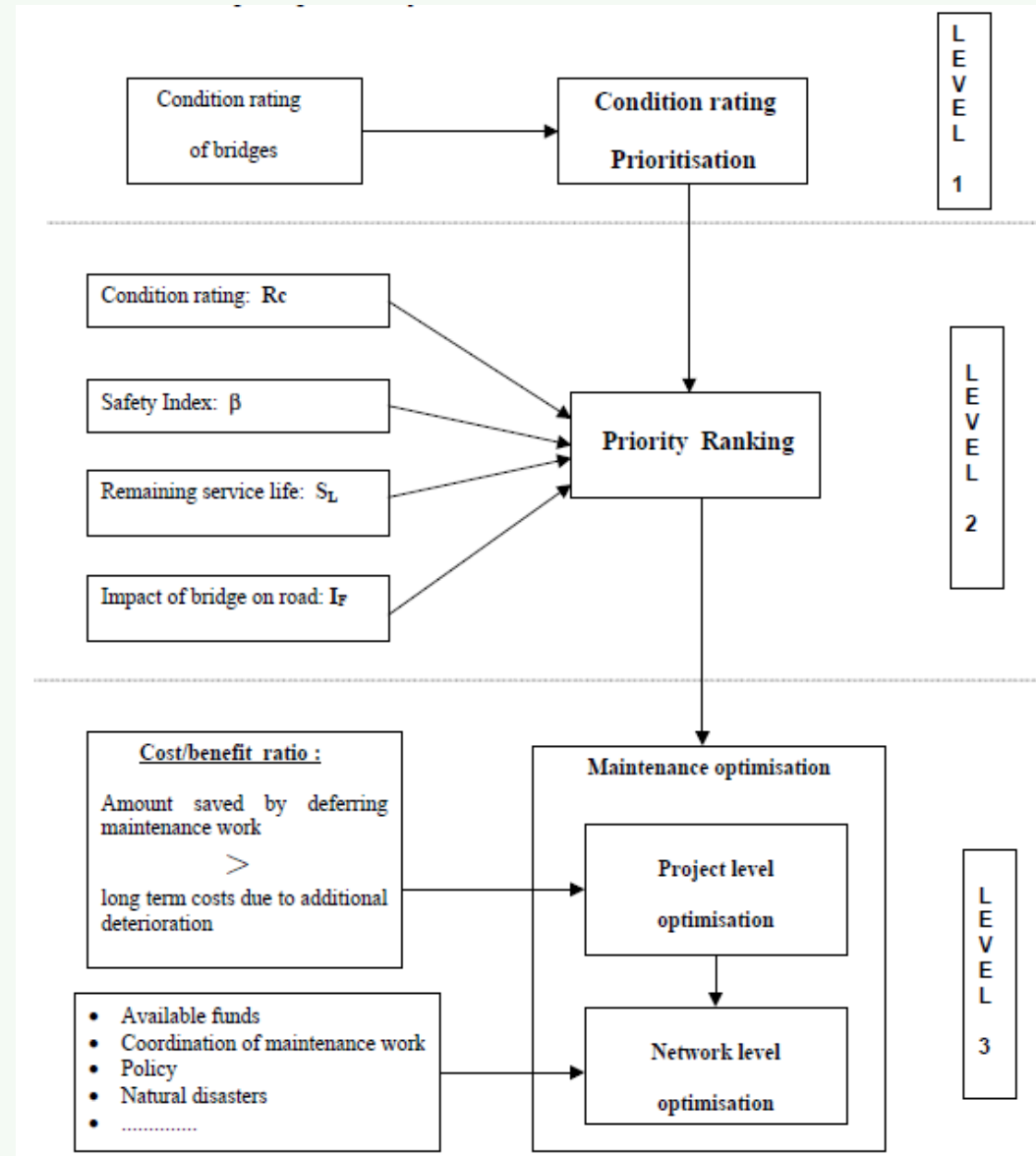
Important Topics for a BMS (BRIME (BRIdge Management in Europe (1998-99))

- condition appraisal (DIN 1076),
- assessment of load carrying capacity (Guideline for Recalculation)
- rate of deterioration (RI-EBW-PRÜF),
- structural assessment of deteriorated structures
- deciding maintenance strategies and methods (Federal Ministry and State Administrations)
- prioritizing maintenance work (Federal Ministry and State Administrations)

regular Bridge Inspection

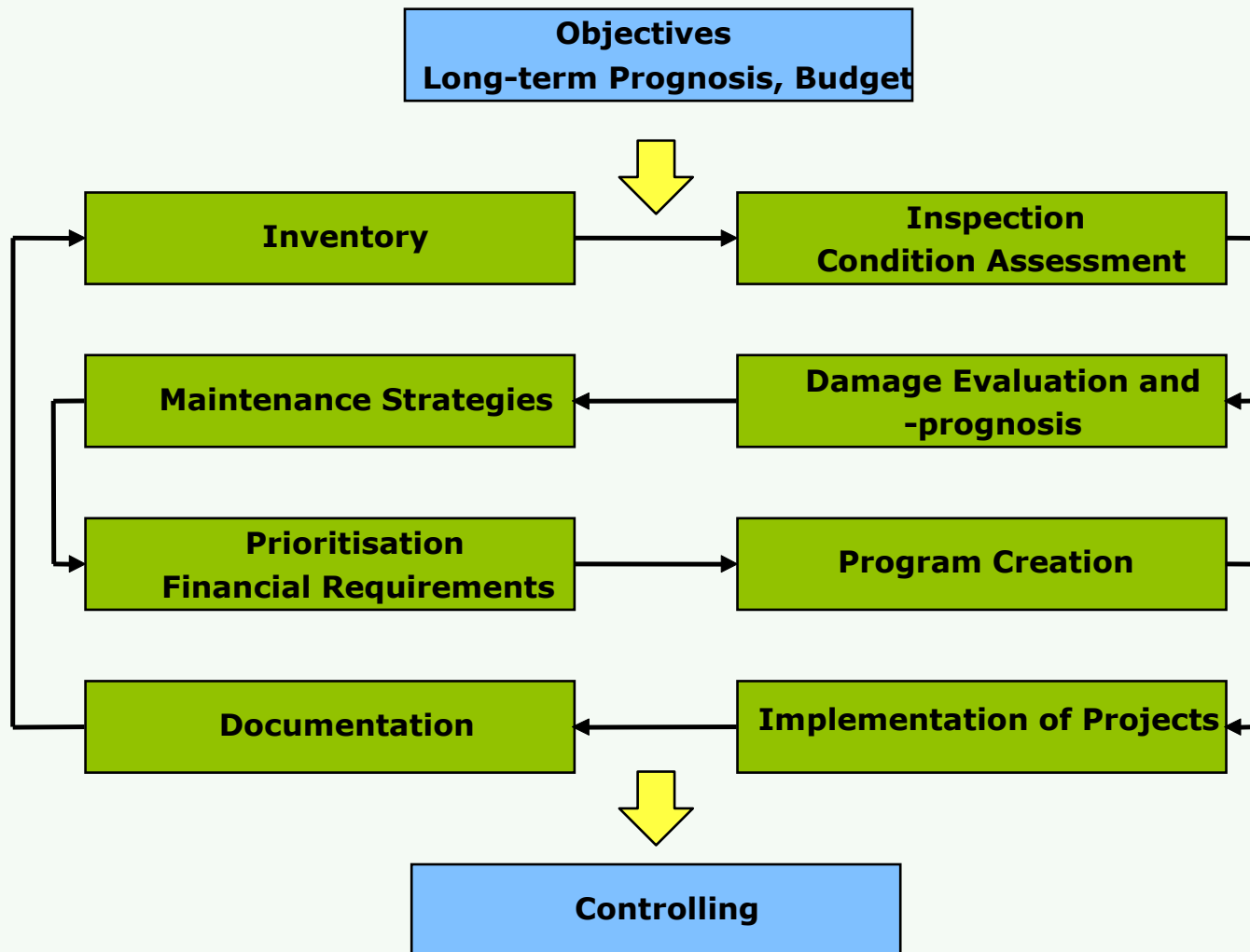
Guideline for Recalculation

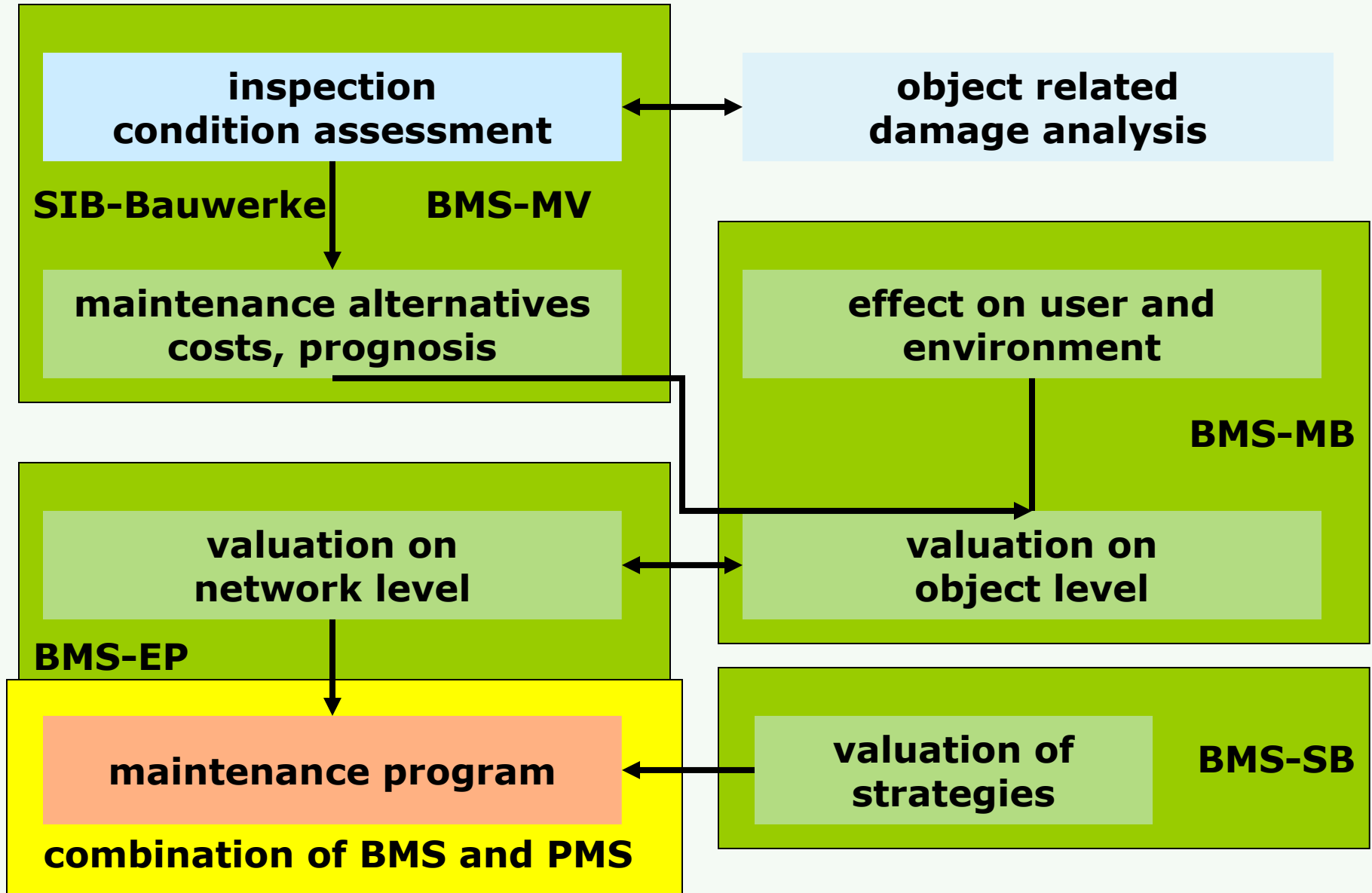
BMS-MB; BMS-EP



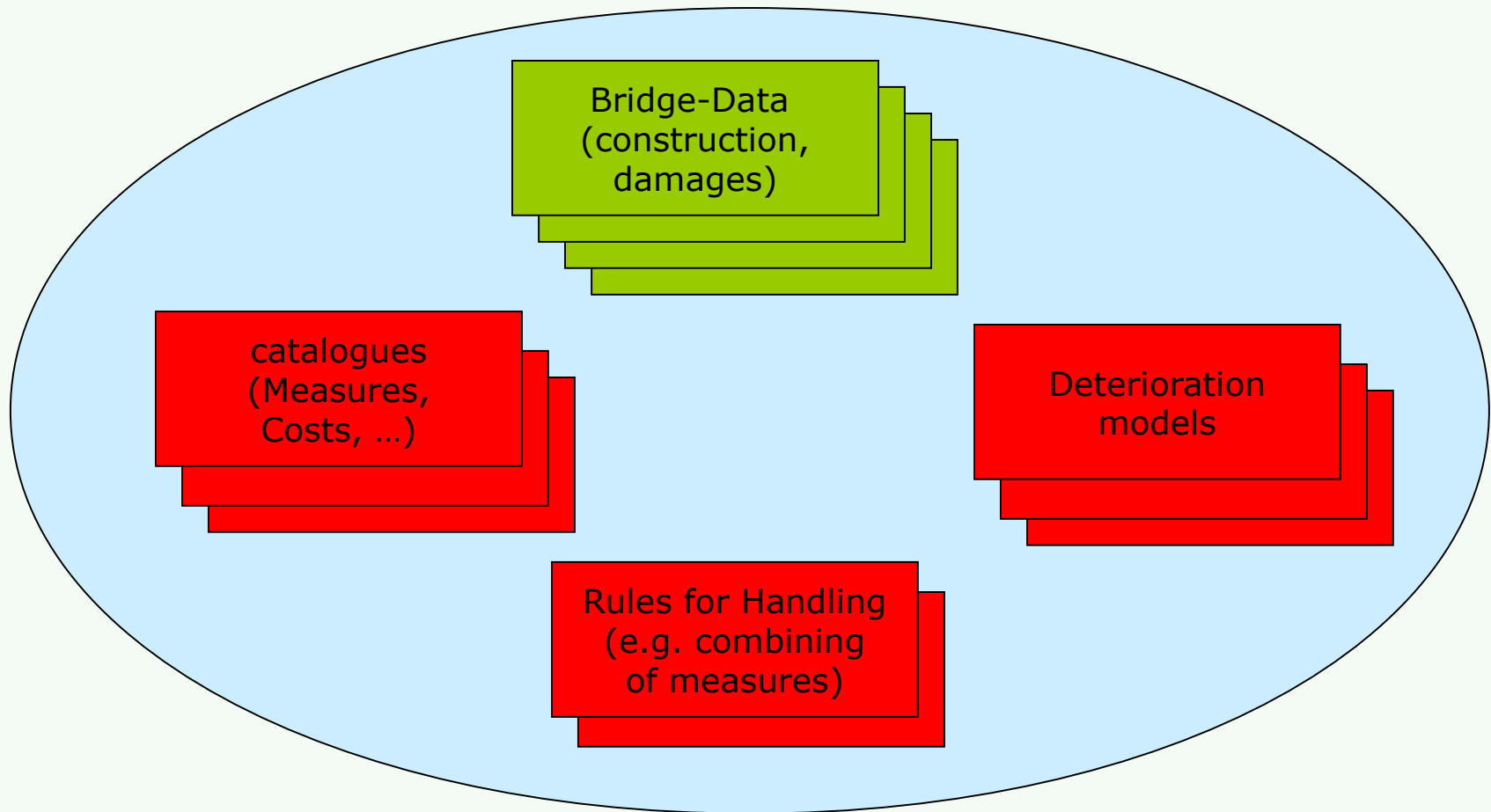
Principles of maintenance planning

- Ensuring the safety and ease of traffic,
- Minimize traffic-interference,
- combination of actions (BMS, PMS, Asset Management)
- Results of Recalculation (structural weaknesses: securing off remaining service life)
- Prioritization:
 - Condition,
 - Importance of Highway/ of the structure in the network,
 - Reconstruction of Highways,
 - Requirements from PMS,
 - Political requirements,





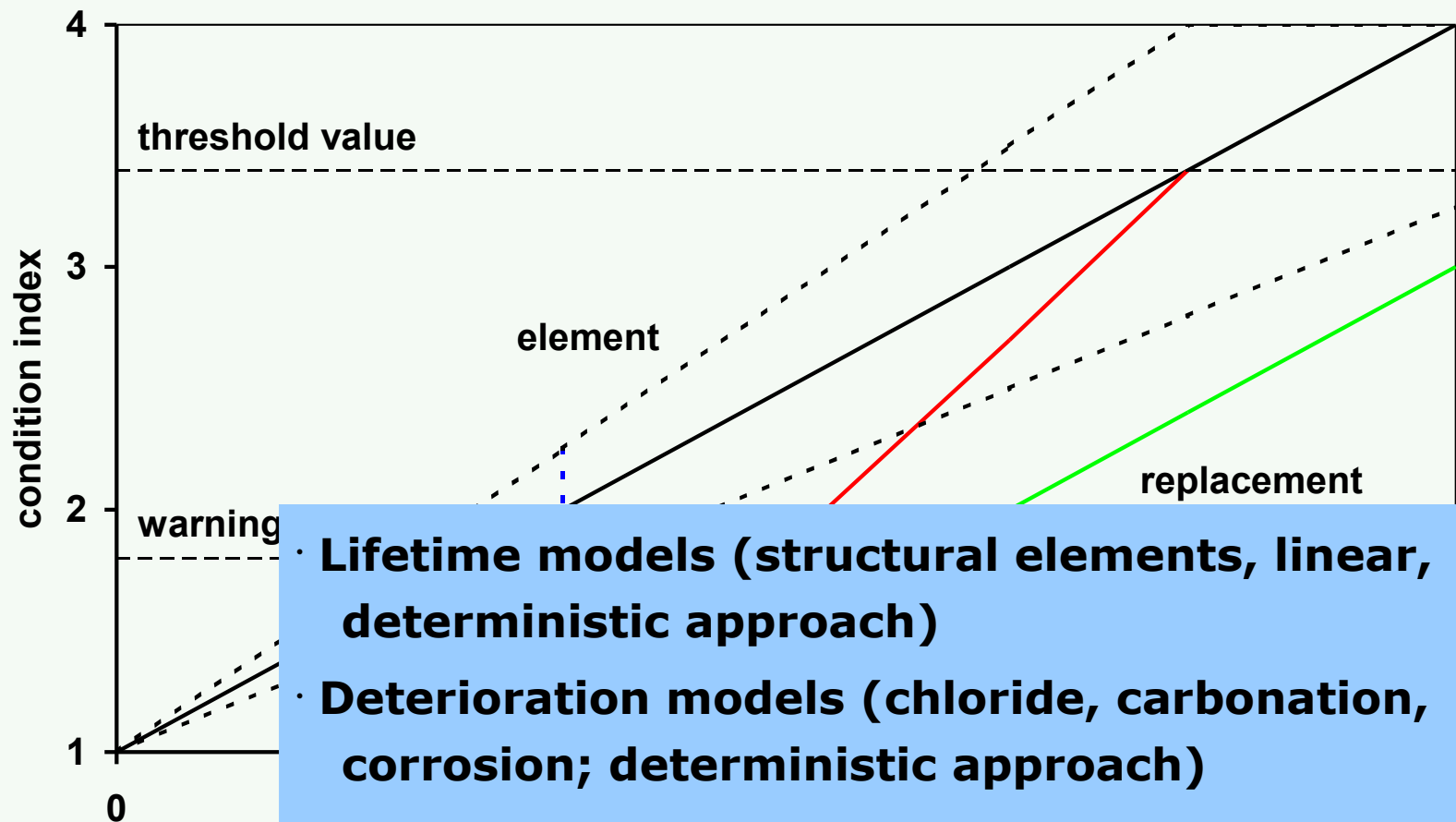
Generation of strategies



Bauwerksart, Hauptbauteil, Konstruktionsteil, Bauteilergänzung oder Hauptbaustoff, Schaden	Einheit des max Instandsetzungs-umfangs	Verhaltensmodell (Fett: maßgebend (Standard))	S	V	D	Maßnahme 1	Einheit der Maßnahme	Rück- setzung	Maßnahme 2	Einheit der Maßnahme	Rück- setzung				
BRÜCKEN, ÜBERBAU, ---, ---, --- (weitere BSP durch Angabe des Baustoffs, Schadens) durchgebogen (Bewertung abhängig vom Grad der Durchbiegung)		OSA	S	V	D			S	V	D					
BRÜCKEN, ÜBERBAU, ---, BETON außer Betondeckung, ---			S	V	D			S	V	D	S				
Abplatzungen im oberflächennahen Bereich mit oder ohne freil. Bewehrung, D = 1-2	m² (Instands.fläche) Überbau unten	FTB, AKR, Ka, CI	0	0		Reaktionsharz- mörtel an Unter- seiten (PC U)	m² Instands.fläche	0	0	0	Zementmörtel mit Kunststoff- zusatz (PCC II)	m² Instands.fläche	0	0	0
Abplatzungen wie vor, aber über Verkehrsraum, V = 1-3, D = 1-2	m² (Instands.fläche) Überbau unten	FTB, AKR, Ka, CI	0			Reaktionsharz- mörtel an Unter- seiten (PC U)	m² Instands.fläche	0	0	0	Zementmörtel mit Kunststoff- zusatz (PCC II)	m² Instands.fläche	0	0	0
freiliegende Tragbewehrung mit korrodierter Bewehrung (keine nennenswerte Querschnittsminderung)	m² (Instands.fläche) Überbau unten	Ko, CI	1	0	2	Reaktionsharz- mörtel an Unter- seiten (PC U)	m² Instands.fläche	0	0	1	Zementmörtel mit Kunststoff- zusatz (PCC II)	m² Instands.fläche	0	0	1
Tragbewehrung liegt im karbonatisierten Bereich und ist korrodiert (nicht Spannbewehrung)	m² (Instands.fläche) Überbau unten	Ko, CI	1	0	3	Spritzbeton BII	m² Instands.fläche	0	0	0	Spritzbeton mit Kunststoff- zusatz (SPCC II)	m² Instands.fläche	0	0	0
freiliegende Tragbewehrung mit korrodierter Bewehrung (einsetzende Querschnittsminderung)	m² (Instands.fläche) Überbau unten	Ko, CI	2	0	3	Reaktionsharz- mörtel an Unter- seiten (PC U)	m² Instands.fläche	1	0	1	Zementmörtel mit Kunststoffzusatz (PCC II)	m² Instands.fläche	1	0	1
stark korrodierte Tragbewehrung (fortgeschrittene Querschnittsminderung)	m² (Instands.fläche) Überbau unten	Ko, FTB, AKR	3	0	3	Zusatzbewehrung	OSA	0	0	0	Kohlefaser- lamellen zur Biegeverstärkung	OSA	0	0	0
stark korrodierte Tragbewehrung (teilweiser Ausfall von Tragbewehrung)	m² (Instands.fläche) Überbau unten	Ko, FTB, AKR	4	0	4	Zusatzbewehrung	OSA	1	0	1	Kohlefaser- lamellen zur	OSA	1	0	1
großflächige Durchfeuchtungen/Ausblühungen/Aussinterung, D = 2-3		OSA, Ka, CI, Ko	0	0		Abdicht- erneuer									
BRÜCKEN, ÜBERBAU, ---, BETONDECKUNG, ---			S	V	D										
Betondeckung der Tragbewehrung > 30 mm - 45 mm schlechte Betonqualität	m² (Instands.fläche) Überbau unten	Ka, CI	0	0	2	Hydropl OS-A									
Betondeckung der Tragbewehrung > 15 mm - 30 mm, gute Betonqualität	m² (Instands.fläche) Überbau unten	Ka, CI	0	0	2	Hydropl OS-A									
Betondeckung der Tragbewehrung > 15 mm - 30 mm, schlechte Betonqualität	m² (Instands.fläche) Überbau unten	Ka, CI	0	0	3	Hydropl OS-A									

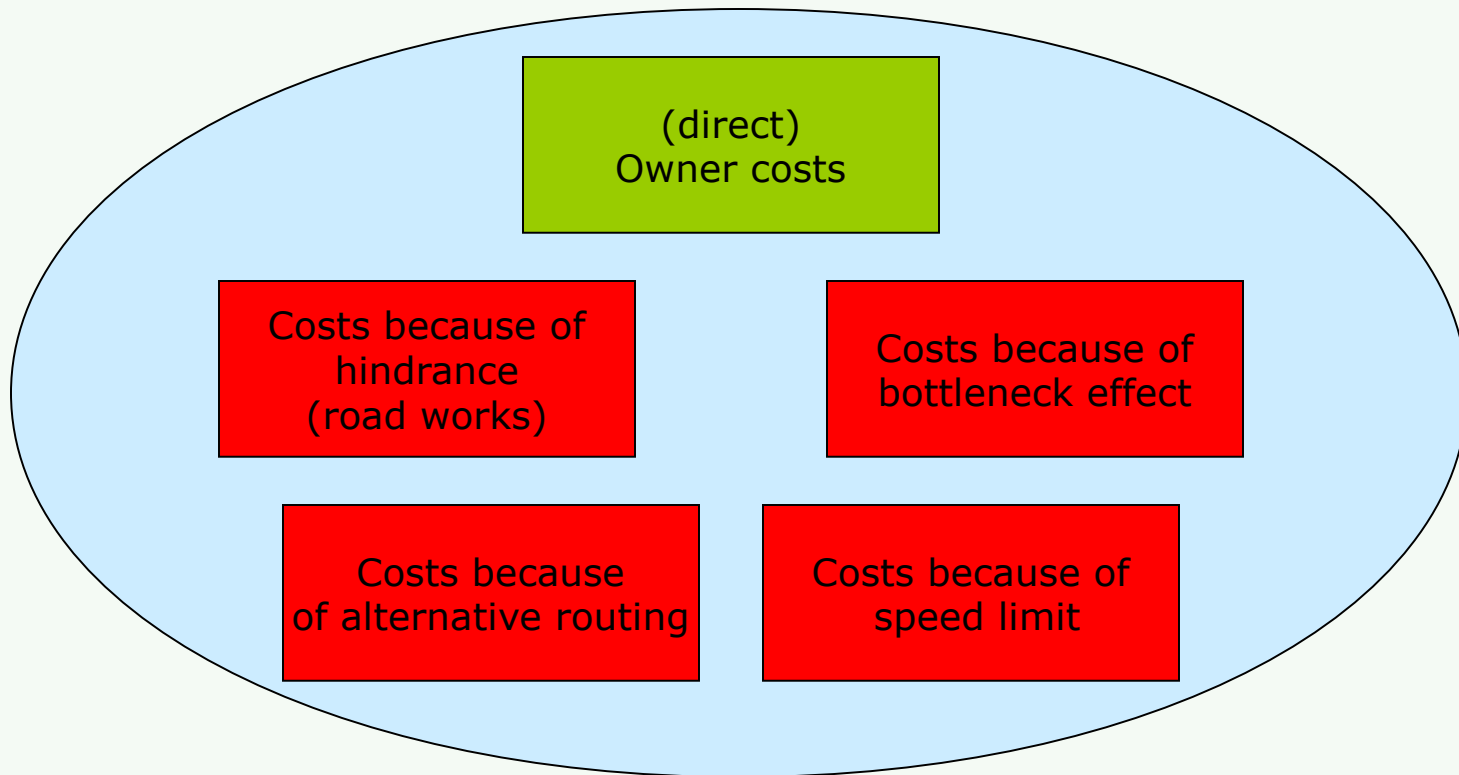
- maintenance alternatives
- object related strategies
- traffic safety measures
- owner costs

- maintenance alternatives
- object related strategies
- traffic safety measures
- owner costs



- **Lifetime models (structural elements, linear, deterministic approach)**
- **Deterioration models (chloride, carbonation, corrosion; deterministic approach)**
- **Consequence of maintenance**
- **Intervention interval (warning-/threshold v.)**

Macroeconomic Evaluation on Object level



Analysis on Object Level



Bauwerk Management System - Projekt: Test ANL Hamm - [MB - Strategiebewertung]

Standardparameter Ergebnisse

Nr	Teilbauwerkname	Teilbauwerksnr	Bauwerk	Teilbauwerk	Strategie	Rang-NKD	Rang-NKV	Kosten absolut	VWL Kosten abgezinst
3713755 1	A 1 / TB Habichtswald	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2013-Nr. 7	16	28	1.101.000 €	4.209.000 €
3713755 2	A 1 / TB Habichtswald	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2014-Nr. 8	5	5	1.022.000 €	0 €
3718886 2	A30 / L773 "Lübecker Str." -A3 Löhne-	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2015-Nr. 9	32	17	993.000 €	5.956.000 €
3718888 2	A30 / WERRE u. WW	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2016-Nr. 10	52	42	965.000 €	11.808.000 €
3719606 0	Gem. Str. "Sachsenweg" / A30	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2017-Nr. 11	64	64	658.000 €	17.559.000 €
3719614 0	L546 "Weser Str." / A30	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2018-Nr. 12	82	92	911.000 €	23.207.000 €
3812723 1	A 1 / "Eltingmühlenbach u. Weg"	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2013-Nr. 19	27	35	1.145.000 €	4.209.000 €
3812723 2	A 1 / "Eltingmühlenbach u. Weg"	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2014-Nr. 20	11	11	1.063.000 €	0 €
3812736 1	A 1 / Ladberger Aa u. WW	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2015-Nr. 21	38	22	1.033.000 €	5.956.000 €
3817855 2	A30 / L546 "Osnabrücker Str."	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2016-Nr. 22	54	48	1.002.000 €	11.808.000 €
3817856 2	A30 / Gem. Str. "Friedrich-List-Str."	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2017-Nr. 23	74	77	973.000 €	17.559.000 €
3817860 0	L546 "Osnabrücker Str" / A30	3713755 1	A 1 / TB Habichtswald	FR Köln	0002202020110-2018-Nr. 24	87	86	945.000 €	23.207.000 €
						31	19	1.101.000 €	4.209.000 €
						32	3	1.022.000 €	0 €
						33	33	993.000 €	5.956.000 €
						34	51	965.000 €	11.808.000 €
						35	67	938.000 €	17.559.000 €
						36	83	911.000 €	23.207.000 €
						43	26	1.145.000 €	4.209.000 €
						44	12	1.063.000 €	0 €
						45	34	1.033.000 €	5.956.000 €
						46	58	1.002.000 €	11.808.000 €
						70	73	973.000 €	17.559.000 €

4011704 0 L510 "Steinfurter Straße" / A1
4017591 2 A33 / Gem. Str. "Falkenstrasse"

Bester Rang Minimalstrategie Alle Strategien Gewählte Strategie anzeigen Strategieliste

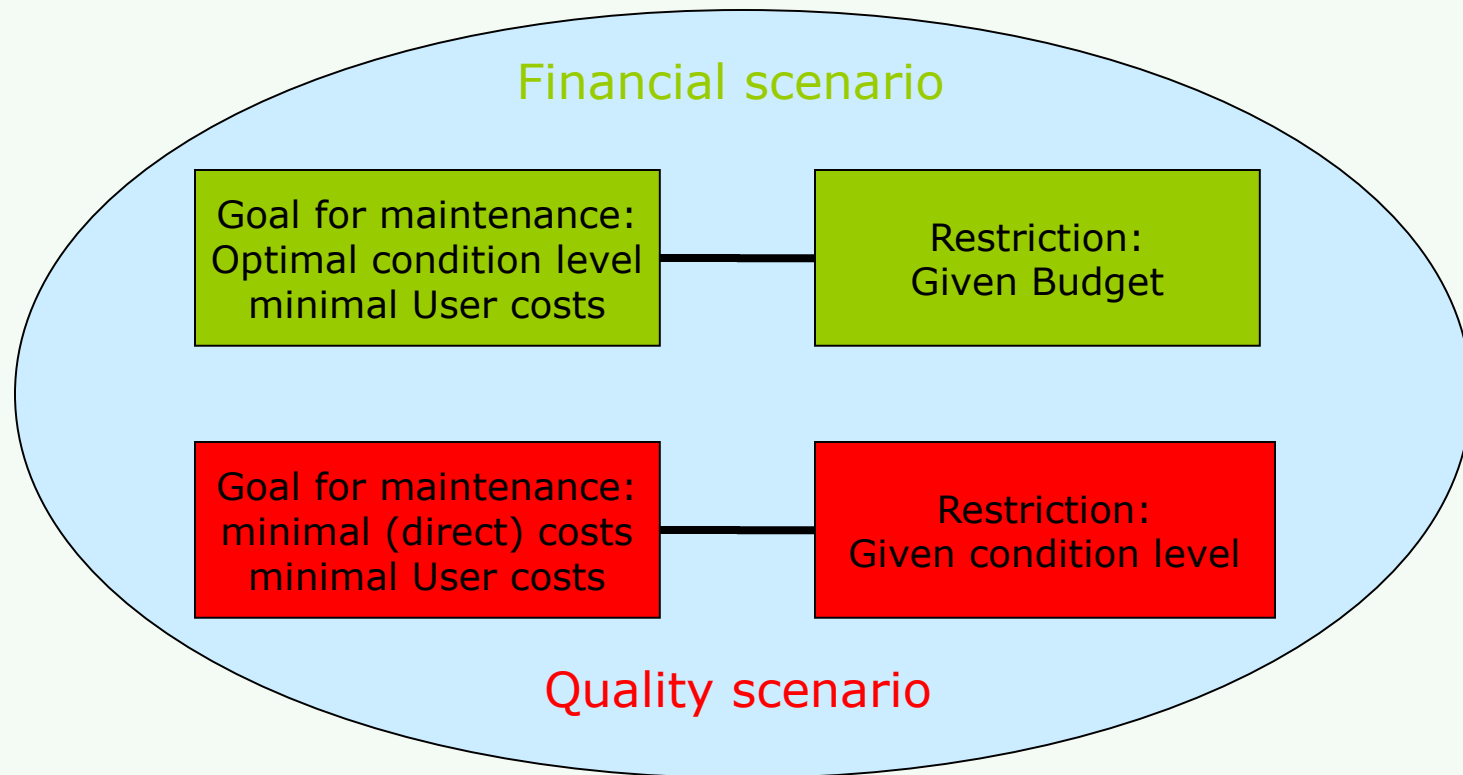
Holst

- Rating of alternatives for every object (network-wide)
- Maintenance program without restrictions

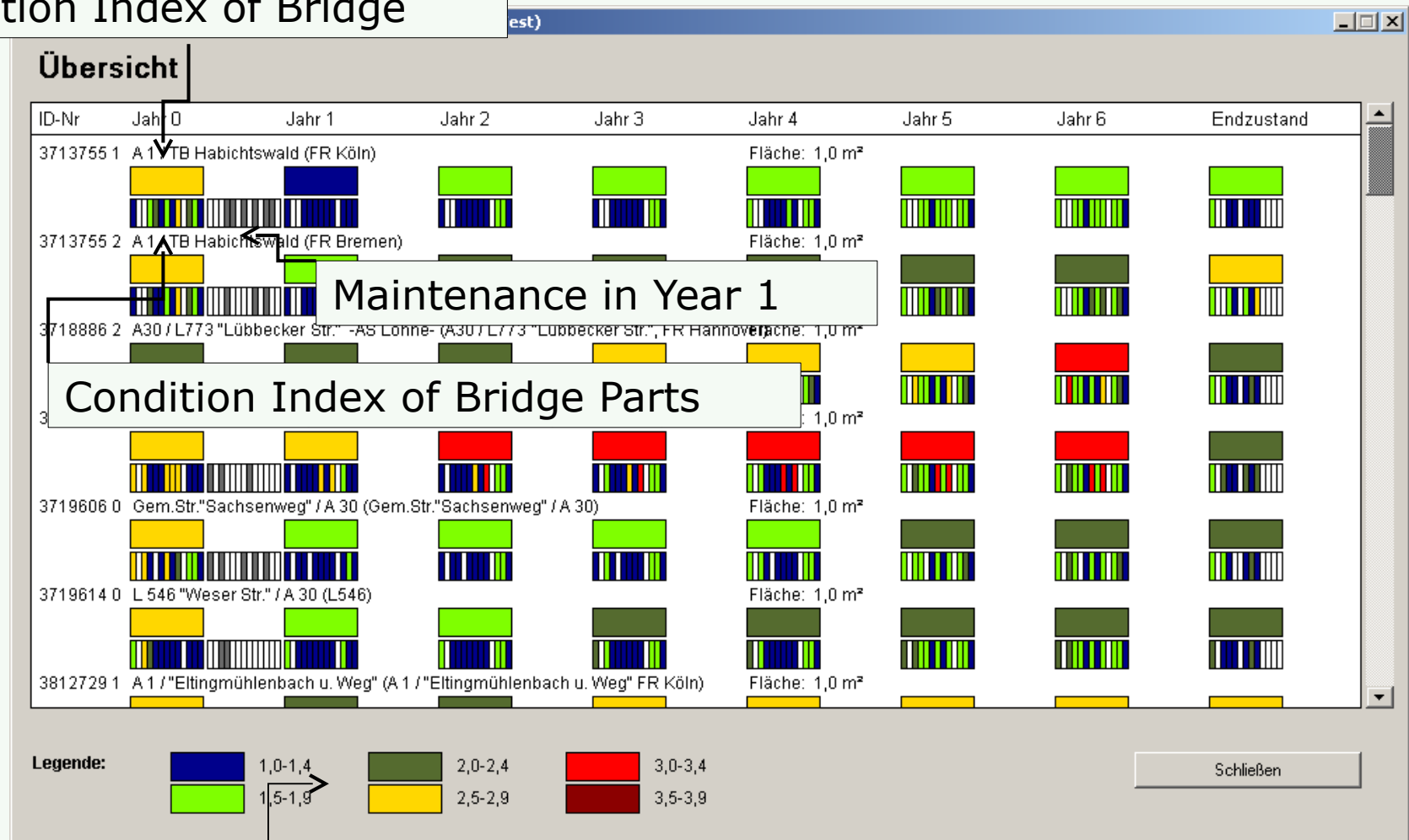
Wanted:

**Optimised maintenance program
(budget, other constraints)**

Macroeconomic Evaluation on Network level



Condition Index of Bridge



Condition Index Class

- 1 Organisation of Maintenance
- 2 Statistics
- 3 Data-(base)
- 4 Inspection
- 5 Management
- 6 Closure and Outlook**

- Need for systematic maintenance is rising steadily,
- the information of the regular bridge inspection and additional investigations are the most important basis,
 - Data quality,
 - Data availability,
- A management system for optimization of financial resources with consideration of intervention in the traffic and technical possibilities is necessary,
 - Direct costs,
 - User costs,
- Selective use of sensors / sensor networks for better/earlier information about bridge condition,
- Extension to probabilistic approaches for the future (bridge inspection and management),

Thank you very much for your attention!