Methods and concepts for assessing the resilience of Transport Infrastructure

Dr. Kalliopi Anastassiadou
Division Bridges and Structural Technology, Federal Highway Research Institute

anastassiadou@bast.de

VIRTUAL | VIRTUEL
XVI WORLD WINTER SERVICE AND ROAD RESILIENCE CONGRESS
XVIᵉ CONGRÈS MONDIAL DE LA VIABILITÉ HIVERNALE ET DE LA RÉSILIENCE ROUTIÈRE
XVI CONGRESO MUNDIAL DE VIALIDAD INVERNAL Y RESILIENCIA DE LA CARRETERA

Motivation

Challenges for owners & managers

- Aging infrastructure

- Increase of traffic, particularly of heavy load traffic

- Natural / man-made hazards

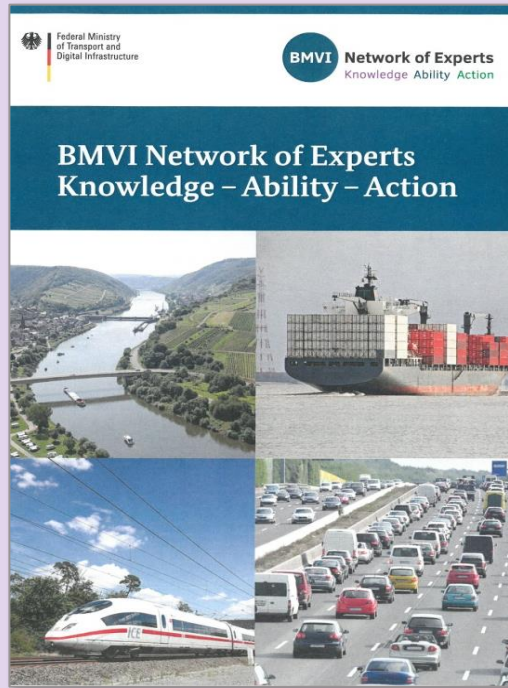- Climate change and extreme weather events
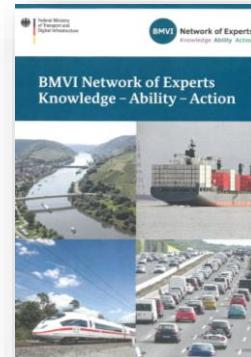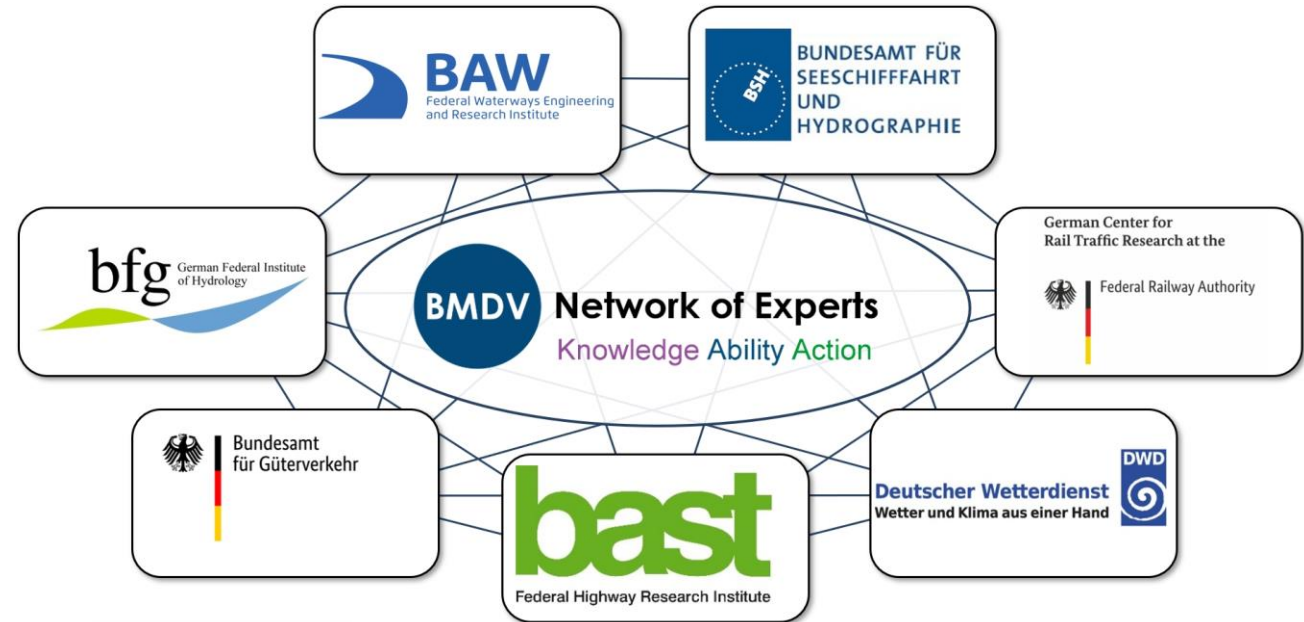
A resilient and environmentally friendly transport system needs an interdisciplinary and intermodal approach
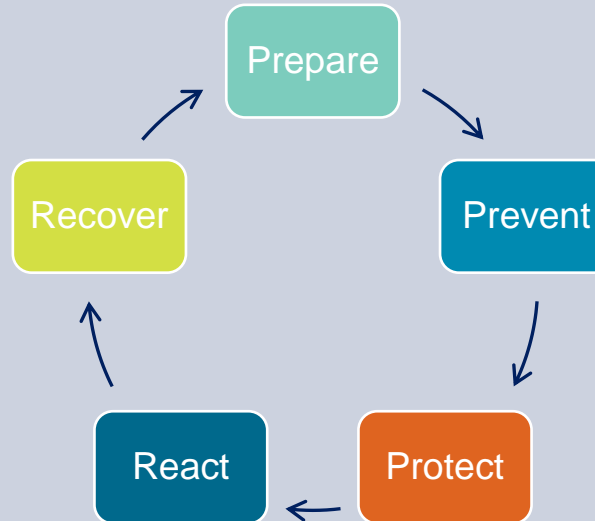
1. Research period (2016-2019)

2. Research period (2020-2025)

Resilience – from knowledge to action

Knowledge

Ability
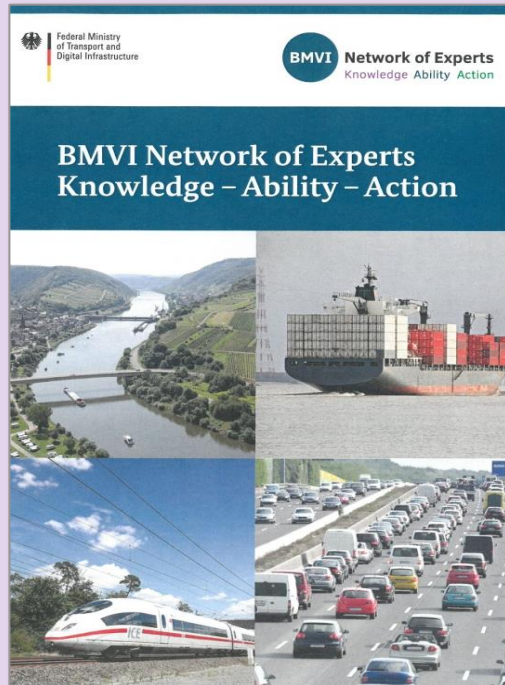
Action

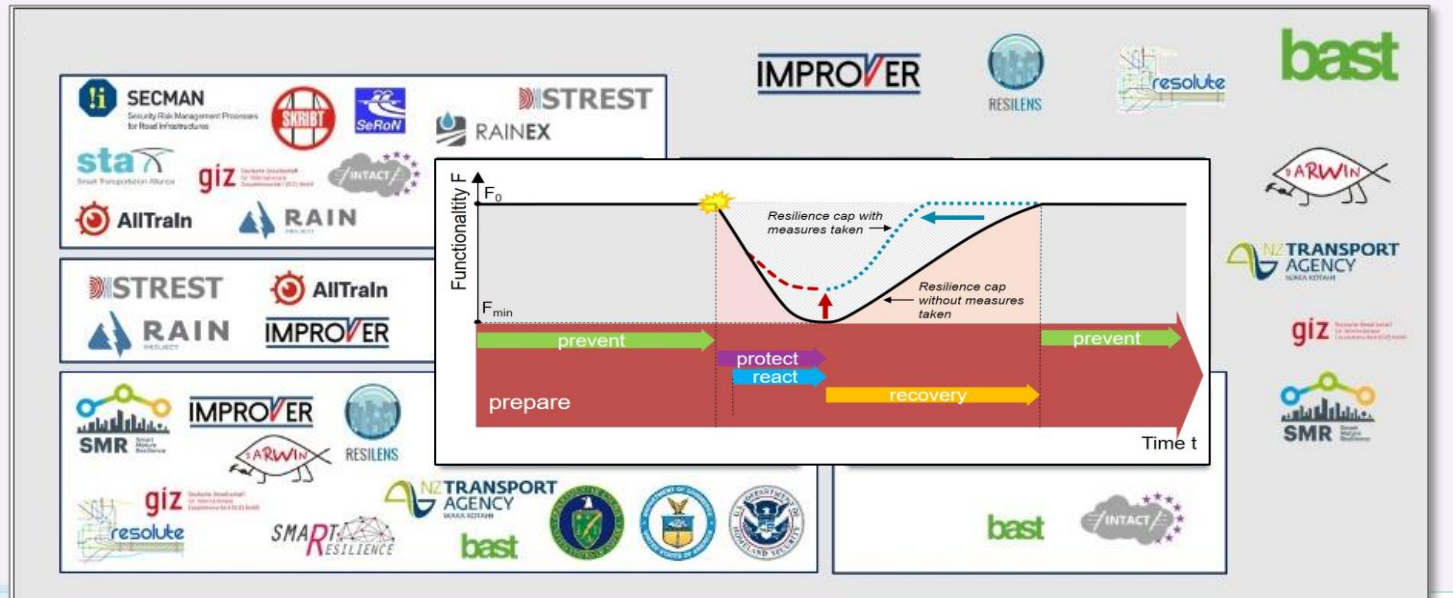Prepare → Prevent → Protect → React → Recover → Prepare
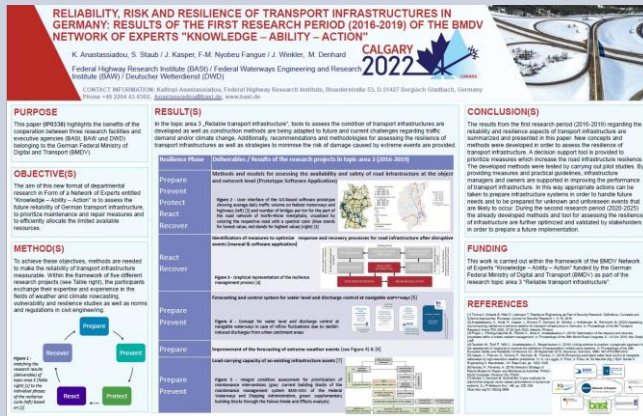
Resilience knowledge

Knowledge

- Definition
- Assessment methods
- Research – State of the art
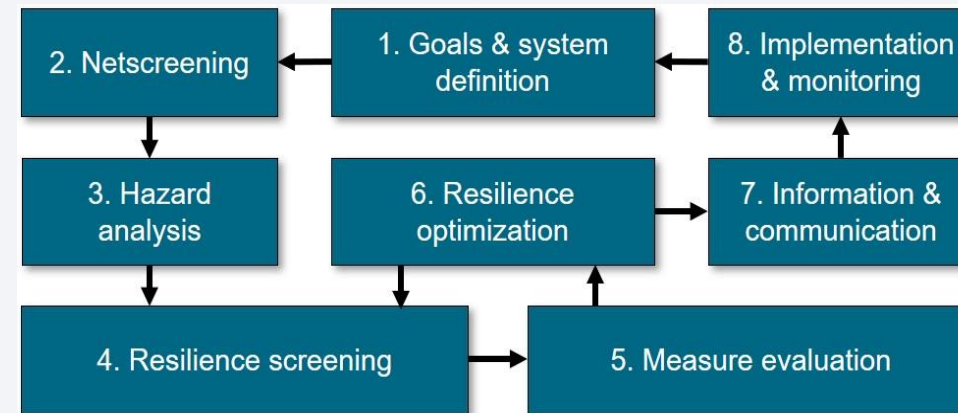- Practical experience

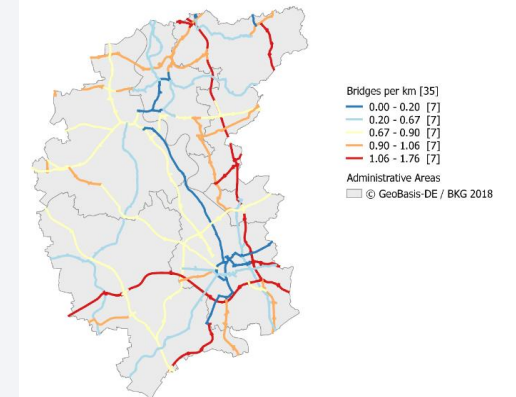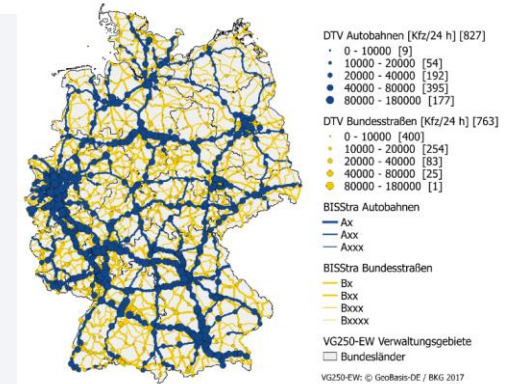# Resilience assessment concepts

Ability

Paper IP0338
Poster Session 7: Topics 4, 6, 8 and 10 (10.February 2022)

- Development of concept & methods
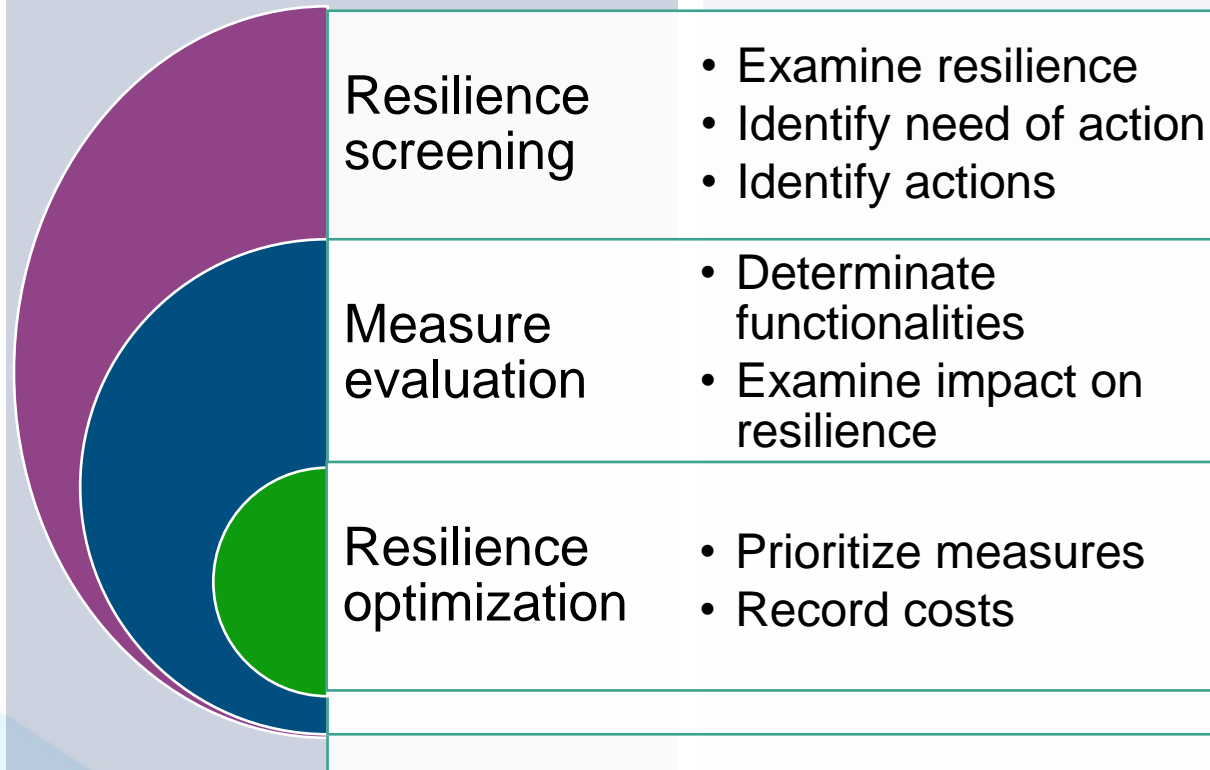- Inclusion of expertise knowlegde / determination of requirements

Graphical representation of the resilience management concept [Deublein et al., 2019]

User interface of GIS-based prototype [Finger et al., 2019]

Resilience assessment further developed

| Ability		
Resilience screening	• Examine resilience • Identify need of action • Identify actions	
Measure evaluation	• Determinate functionalities • Examine impact on resilience	
Resilience optimization	• Prioritize measures • Record costs	

• Practical adaptation of the concept

- Expert interviews / User dialogs
- Embedding in existing process landscapes
- Data and fundamentals
- Methodical adaptations and extensions
- Practical adaptation of processes

CALGARY 2022

Resilience assessment tool

Action

- Technical concept IT tool
- Conception and provision of IT environment
- Implementation concept
- Training documentation
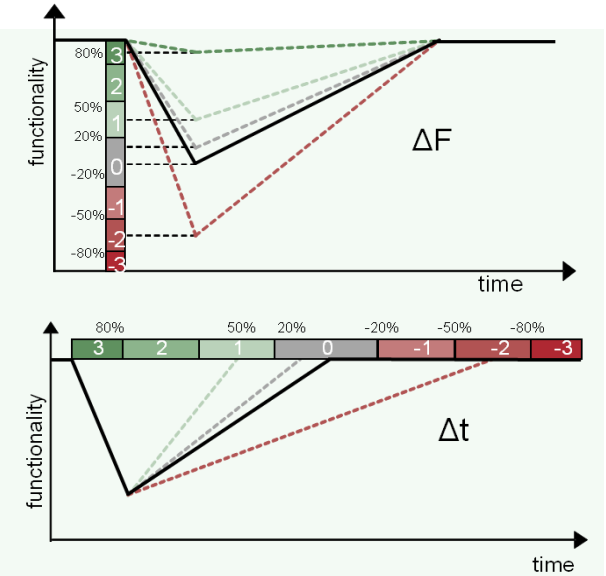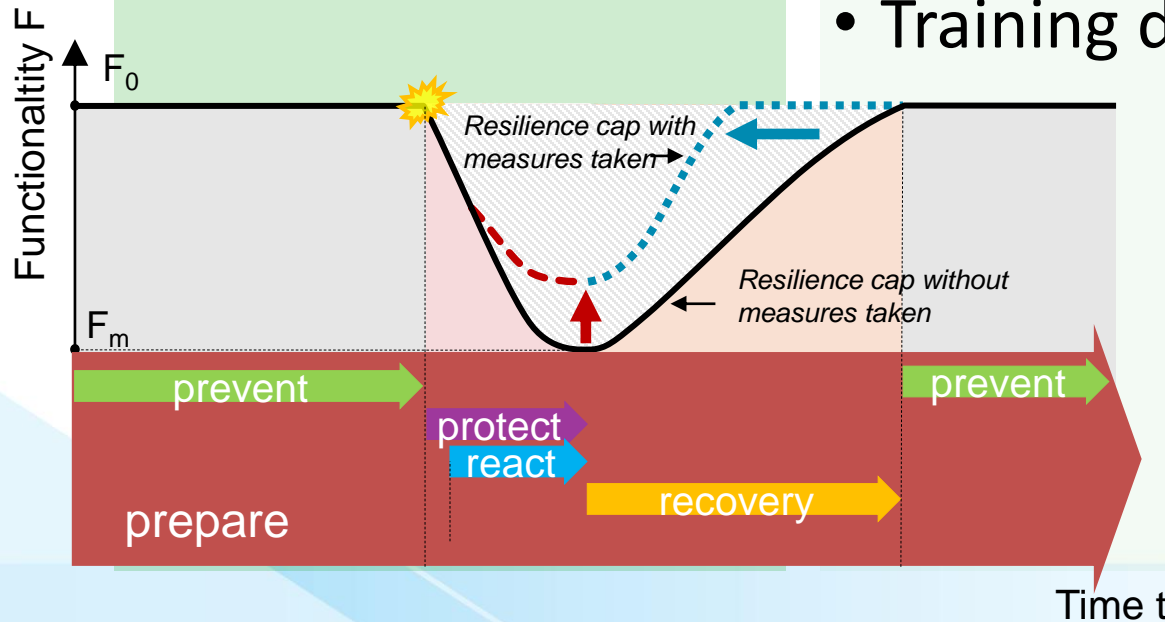
	Functionality loss ΔF	**Time for recovery Δt**
3	Reduction > 80%	Reduction > 80%
2	Reduction > 50%	Reduction > 50%
1	Reduction > 20%	Reduction > 20%
0	Measure has no effect on the fuctionaltity loss	Measure has no effect on time needed until recovery
-1	Increase > 20%	Extension > 20%
-2	Increase > 50%	Extension > 50%
-3	Increase > 80%	Extension > 80%

Summary

Knowledge

- Based on international literature review
- Preparation of knowledge and best practice
- Inclusion of expert knowledge from science and practice
- Definition / understanding of terms
- Concept / Model

Ability

- Determine goals / benefits
- Recognize needs, opportunities, and limitations of practice → pragmatism
- Data and basics: know what is available and what is not
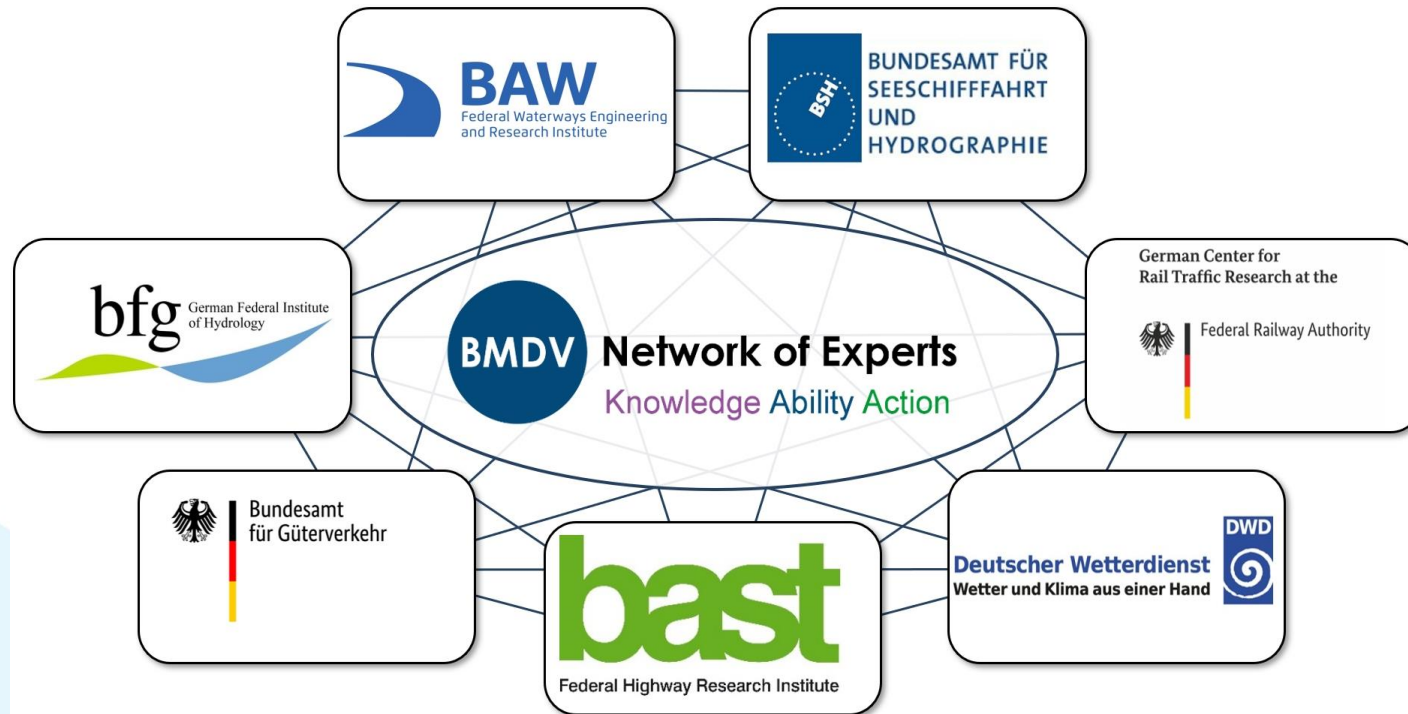- Develop practice-oriented process (with users)
- Test and learn

Action

- Show added value
- Introduction and training
- Provide implementation - oriented tools
- Evaluate experience and incorporate into further development

Thank you for your attention

Acknowledgements

Contact

Federal Highway Research Institute

Dr.- Ing. Kalliopi Anastassiadou

Division Bridges and Structural Technology
Section Tunnel and Foundation Engineering,
Tunnel Operation, Civil Security

Bruederstraße 53
D-51427 Bergisch Gladbach
Germany
Telefon + 49 (0)2204 43 6302
Anastassiadou@bast.de