

# Management of extreme Winter Events in Germany

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# 1. STRONG WINTER EVENTS IN GERMANY



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In Germany 3 of the last 4 winter periods were very strong. There was the highest salt consumption ever had in Germany, in all 3 winter periods roundabout 4.5 Mio. Tons.

In the winter periods 2009/10 and 2010/11 we had big problems:

- long periods with cold temperature and heavy snowfall
- salt storage capacities were too low, and the delivery of new salt was not sufficient
- Road Administration and Cities had not enough salt and got very big problems to clear the roads
- results were big traffic problems with blockings and congestions on the roads

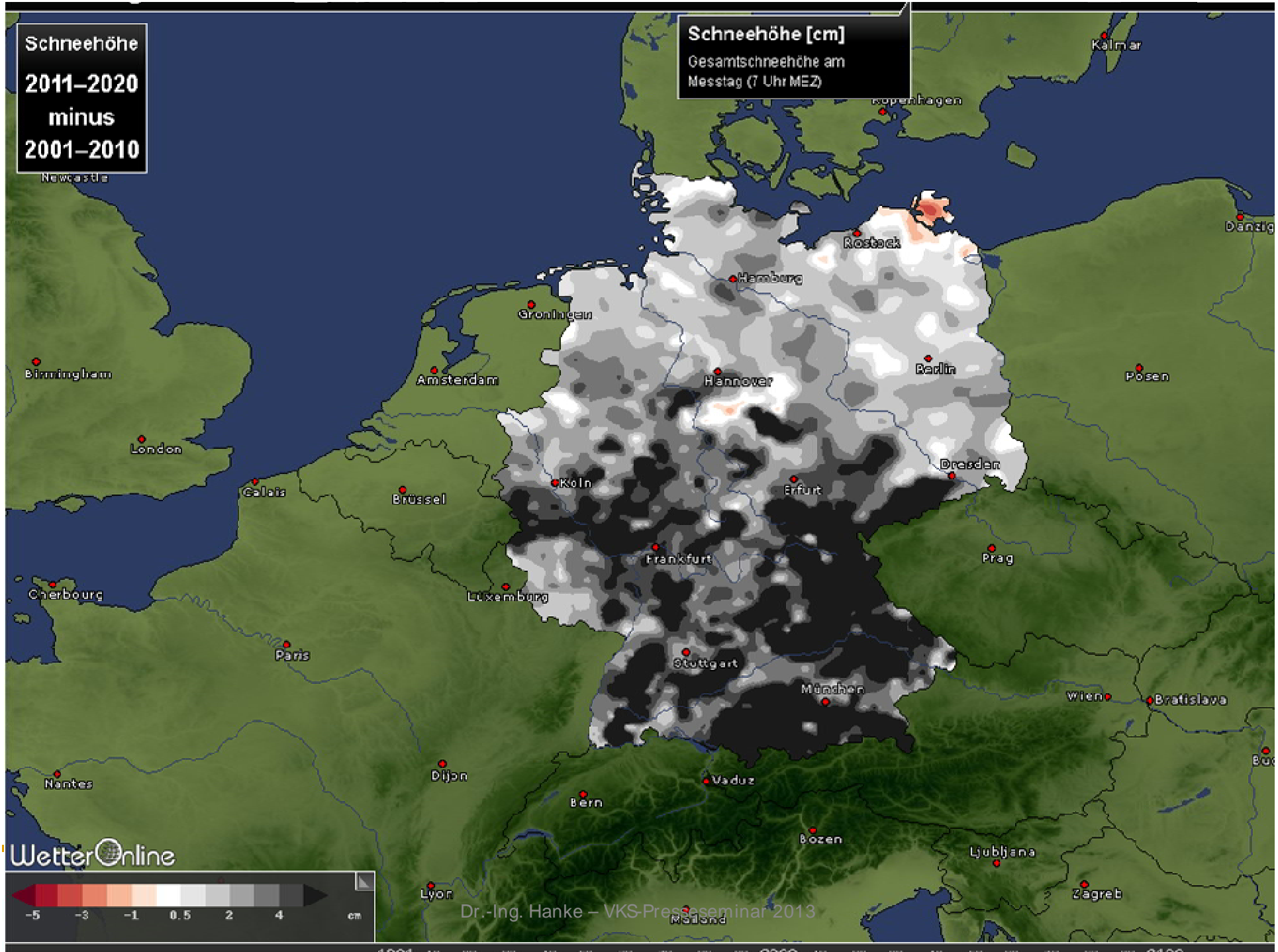
Nowadays the whole economy depends on a functional road network, also in winter time, so that this problems lead to big disadvantages for the whole country and the economy, which have to be avoided in future.



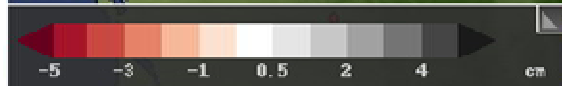
Schneehöhe  
2011–2020  
minus  
2001–2010

Schneehöhe [cm]

Gesamtschneehöhe am  
Messstag (7 Uhr MEZ)

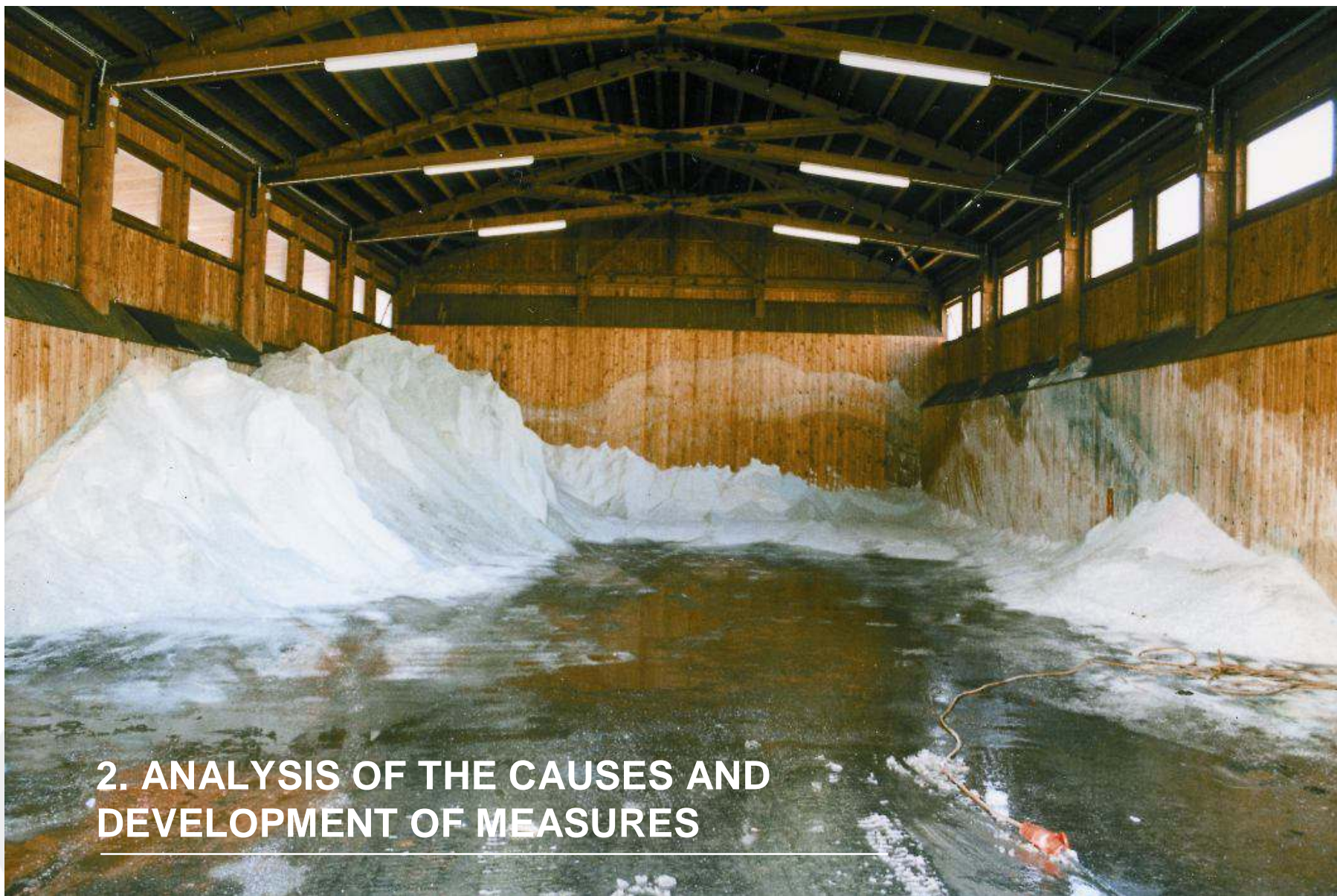


WetterOnline



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1901 20 30 40 50 60 70 80 90 2000 10 20 30 40 50 60 70 80 90 2100



## 2. ANALYSIS OF THE CAUSES AND DEVELOPMENT OF MEASURES

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Great discussion in Germany after the extreme winters  
Analysis of weather data, salt consumptions, delivery amounts and the storage capacities of the maintenance operators

Result:

- many operators had not enough salt storage capacity
- there was no strategic salt delivery management
- equipment and intervention plans were often not configured for heavy snowfalls, especially in Northern and Western Germany

But also:

- Salt producers are not able to deliver as much salt as needed in one day extreme weather  
producers capacity 40,000 t << daily consumption up to 200,000 t
  - salt delivery “just in time” is not possible
- Recommendations for storage capacities, strategic salt delivery management and for emergency plans referring times of salt shortness



### 3. NEEDED STORAGE CAPACITIES FOR STRONG WINTER EVENTS

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Aim: sufficient salt storage capacity to endure a longer period of heavy snow fall in winter time (not the maximum yearly consumption)

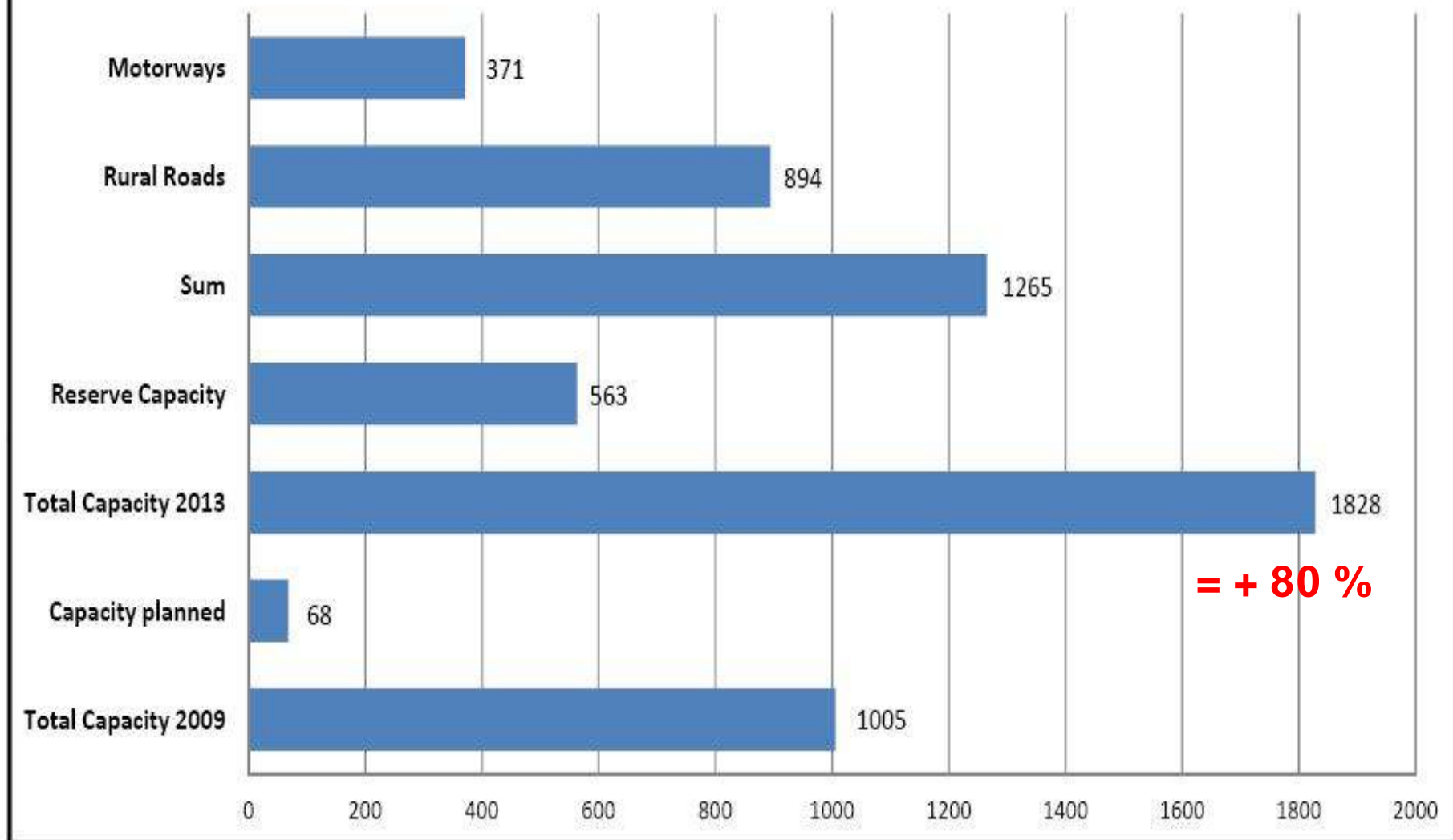
Road Class	Minimum Storage Capacity [t/km]	Optimum Storage Capacity [t/km]
Motorway (4 lanes*)	15 t/km	30 t/km
Rural Roads (2 lanes*)	5 t/km	7 t/km
Urban Roads (2 lanes*)	3.5 t/km	5 t/km

\* roads with more lanes multiply the needed salt in proportion to these number of lanes

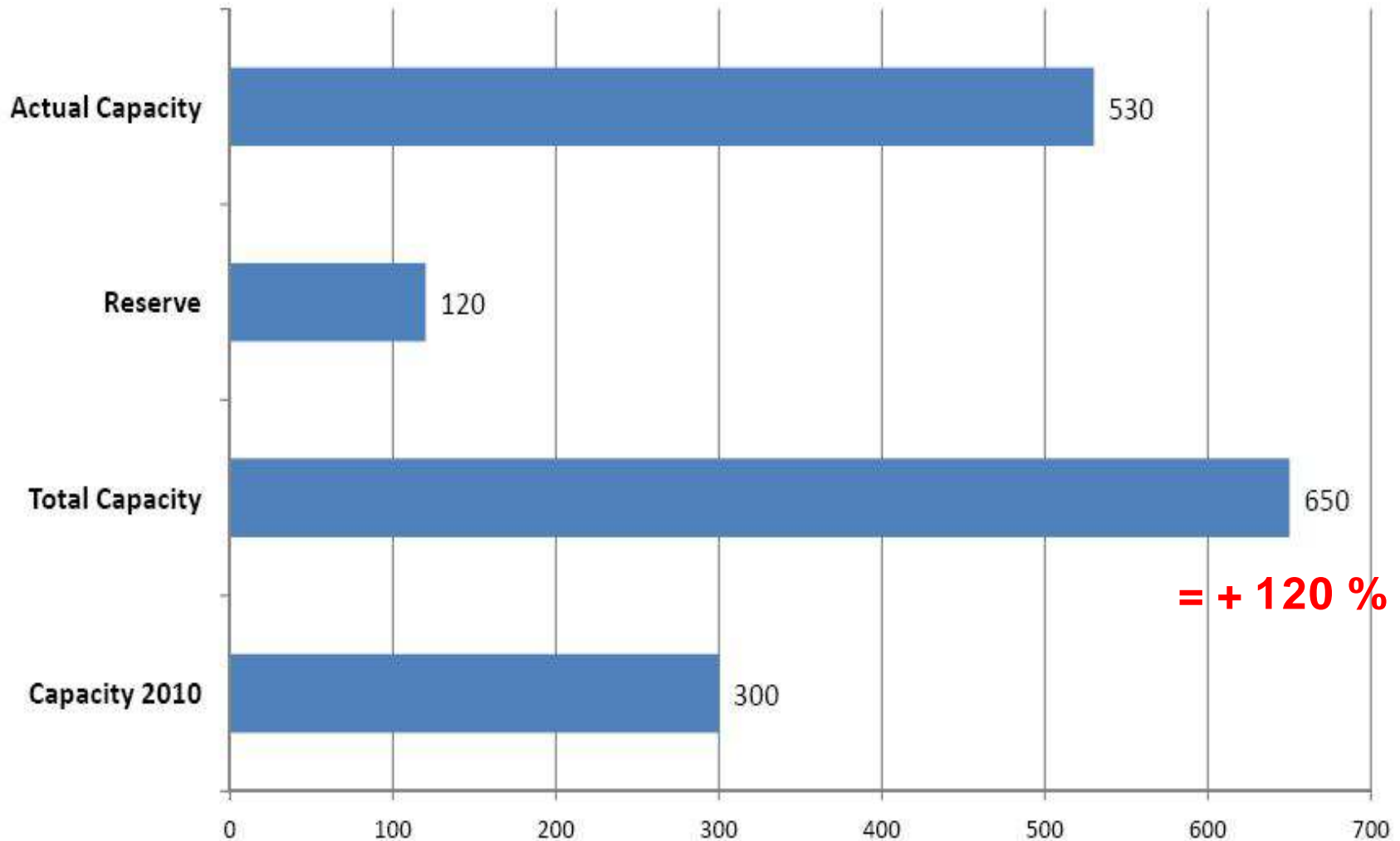
Table 1: New Recommended Salt Storage Capacities in Germany

Recommendations worked out 2011, mostly implemented up to now  
In winter period 2012/13 it mostly stood the test.

## Total Salt Storage Capacity of the German States [1000 t]

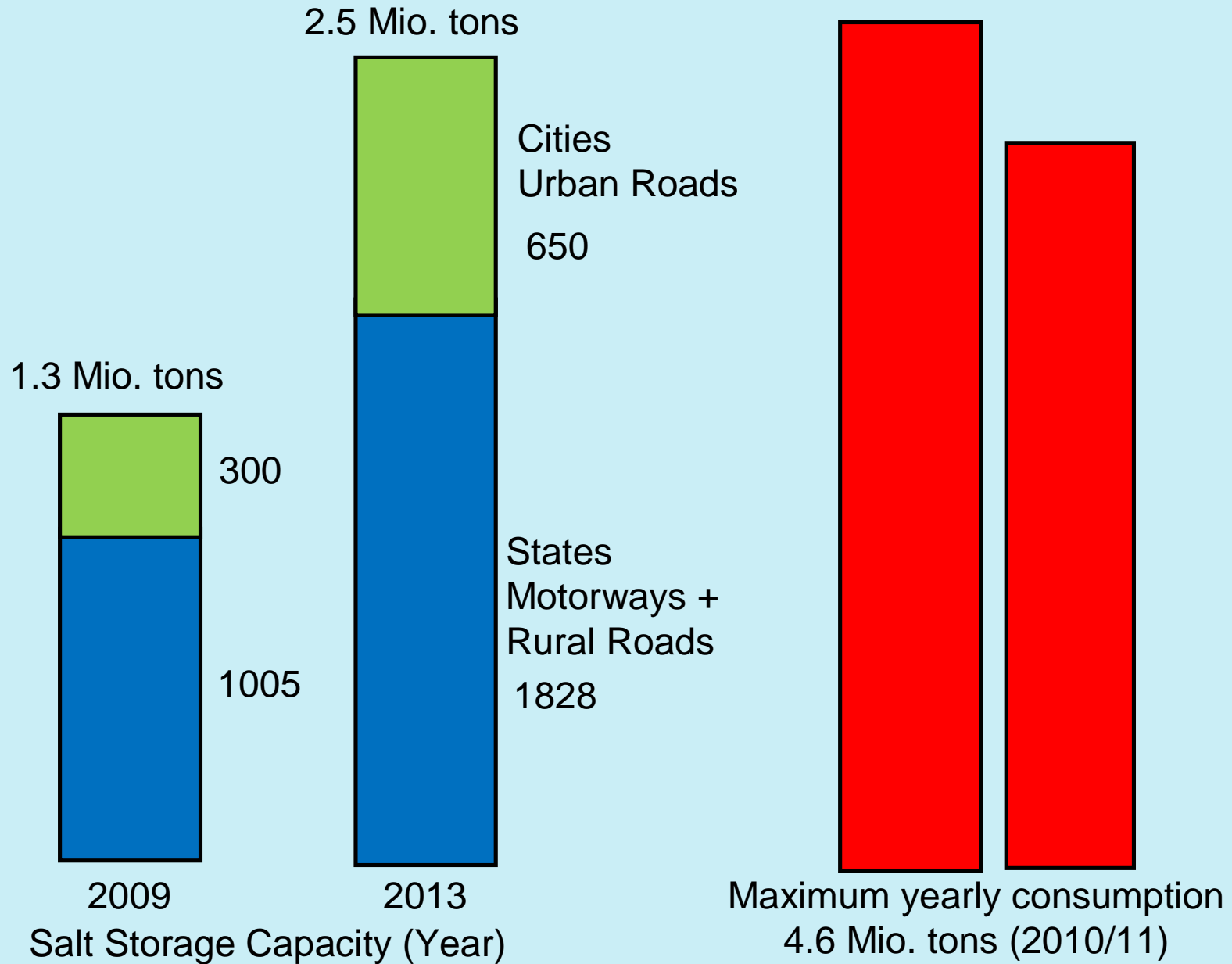


### Total Salt Storage Capacity of the Cities [1000 t]



**= + 120 %**

# Total Balance in Germany [1000 tons]





#### **4. OPTIMIZED SALT DELIVERY MANAGEMENT**

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Recommendation of strategic salt delivery management:

- Filling all storage capacities early enough before the winter period
- Conclude a delivery contract before the winter period including minimum amounts of delivery per day
- Establishment of a salt-storage-monitoring-system which gives an actual overview over all stores and their filling amounts
- Optimized delivery management via orders of new salt as early as possible; the new order should be done at latest when there is only 80 % filling status.
- Forecast of spreading amounts during the winter period for the next 2 weeks on the basis of weather forecast data

Optimum is a computer-aided system for capacity-monitoring, automatic ordering of new salt and consumption forecast

Indunet Webcam Mon Mar 27 15:00:00 2006



Füllstand ermitteln Bild speichern

NEIGUNG NEIGUNG

TIEFE TIEFE

HÖHE HÖHE

Normal Kanten Gitter verschieben bestätigen

Maße

3.57m 12m 12.12m

NEIGUNG NEIGUNG

TIEFE TIEFE

HÖHE HÖHE

Normal Kanten Gitter verschieben bestätigen 680m<sup>3</sup>





## 5. EMERGENCY WINTER MAINTENANCE

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Even with the enlarged capacities a salt shortness cannot be precluded in times of long extreme snowfalls

For these situations there were developed recommendations to ensure a minimum of traffic flow:

- under a critical margin of salt the strategy must be switched
- salting only the main roads and the dangerous points (= legal duty)
- reducing the number of lanes plowed and salted
- good public information





## 6. TRAFFIC MANAGEMENT IN TIMES OF HEAVY SNOWFALL

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In times of heavy snowfall it is not possible to remove the snow quickly

The biggest problem are trucks on critical road sections (gradients)

To avoid this are the following measures recommended:

- Large scale deviation for trucks in the motorways network: Aim is to guide the trucks from critical road sections to others which are flat or where not so much snow fall is expected
- Block Dispatching for the heavy traffic at critical road sections: The heavy traffic is stopped before these sections and guided over the section with snow removal trucks before
- Temporary bans for trucks in the whole regional road network

## 7. CONCLUSION

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Thank You ...

... for your attention

