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Central Collection and Evaluation of Major Accidents and Near-Misses in the Federal Republic of Germany

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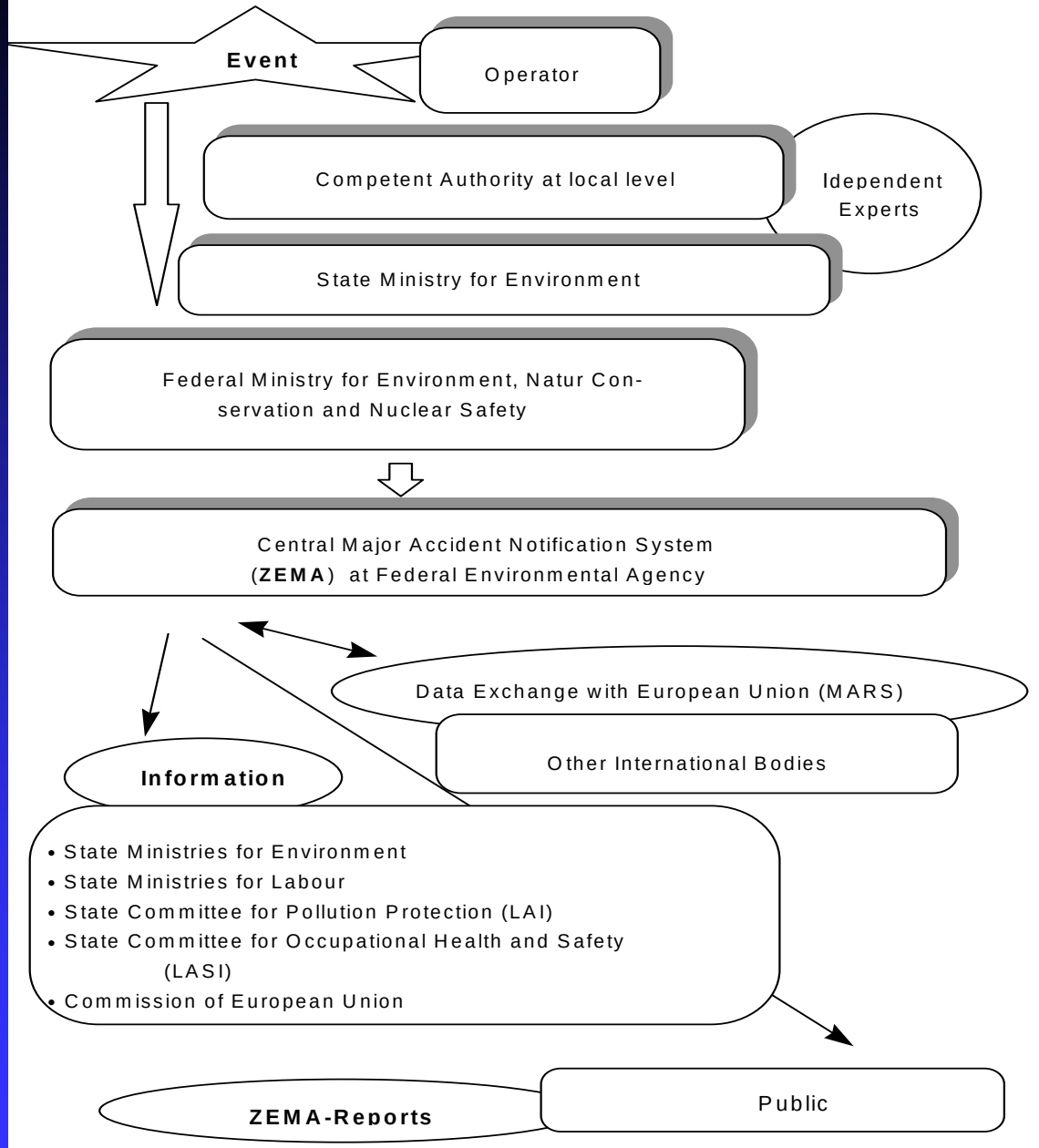
Essential Tasks of ZEMA

- Collection, evaluation and forwarding of lessons learnt
- Selection and preparation of the reports of the European Union after SEVESO II
- Collection and evaluation of comparable international events
- Editing annual reports and instant INTERNET publishing;
- Exchange of lessons learnt with other organisations in charge of evaluating major accidents.

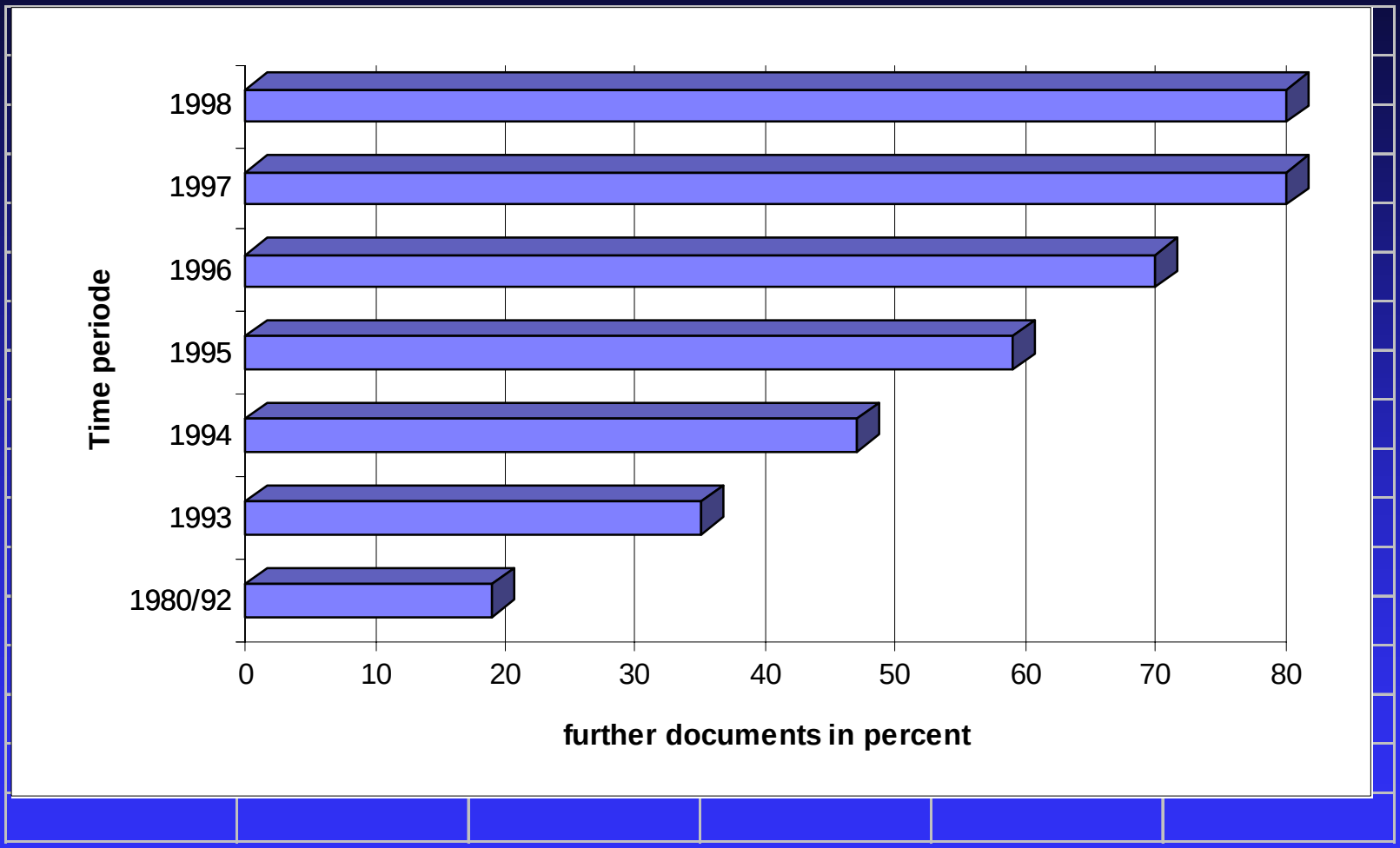
Major Accident Reporting System in Germany



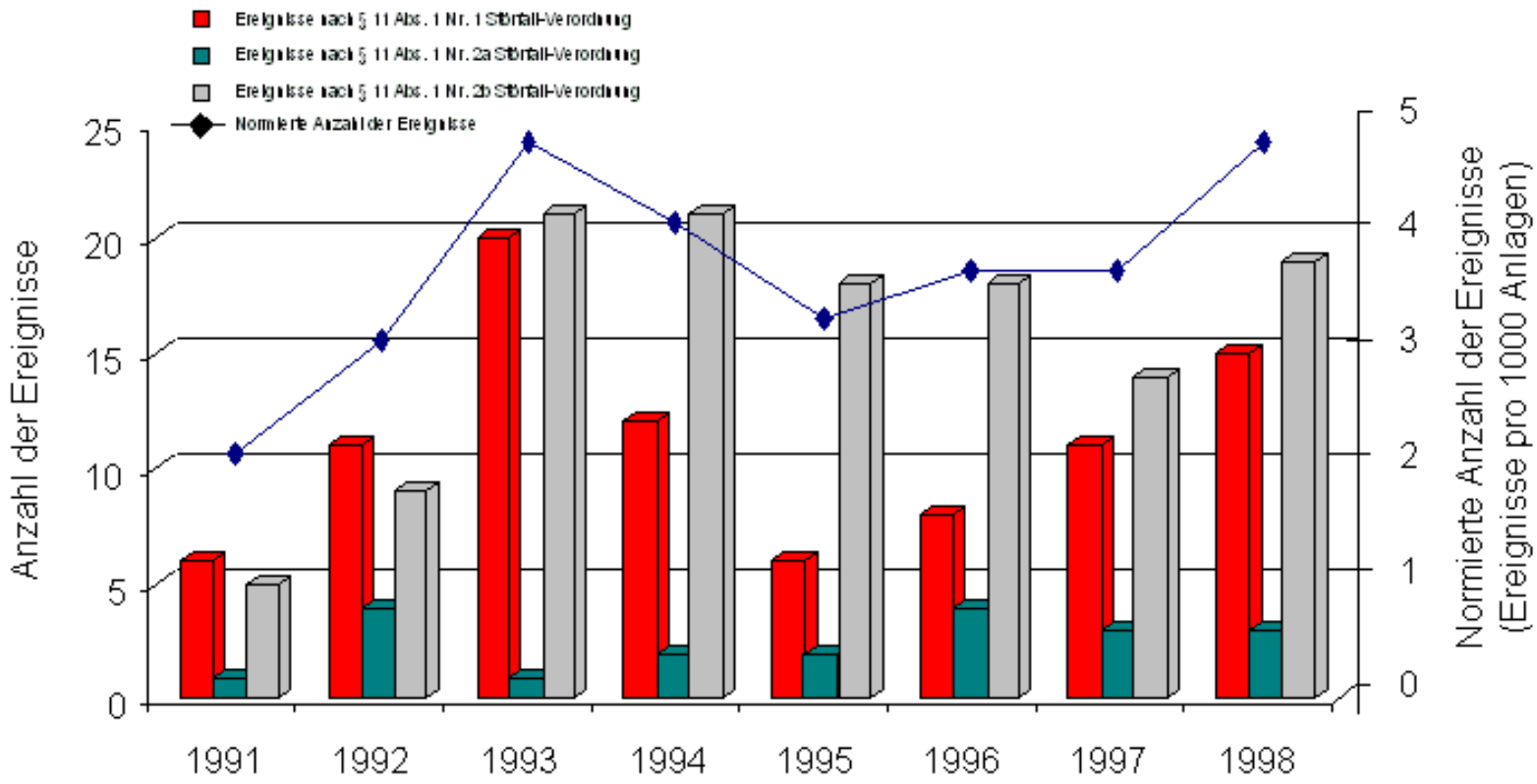
Reistered Events in ZEMA Database (1998)

Period under review	Total number	Major Accidents	Disturbances
1980 - 1992	73	29	44
1993	40	20	20
1994	34	12	22
1995	27	6	21
1996	30	8	22
1997	27	11	16
1998	37	15	22
Summary	268	101	167

Data Quality



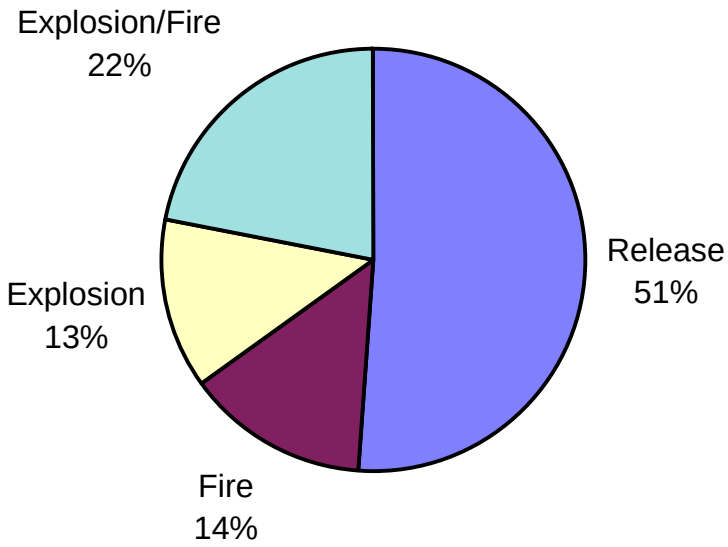
Trend of development of Events



- Major Accidents
- Minor Accidents with Damages
- Accidents with the Potential of Damages

UMWELTBUNDESAMT Berlin, September 2000

Event Types (1/2)



Event Types (2/2)

Operating processes	Relative part in %
Process	50.5
Loading/Unloading	6.25
Maintenance/repair	14.5
Start-off and shut-down process	7
On site transport	0.75
Storage	14.75
Final shut down	4.75
Unknown	1.5

Primary Causes (1/3)
Statistical Overview

Cause	Events in %
human failure (organisational failure)	8.5
human failure (operating error)	12.25
human failure (during repair works)	7.75
technical failure (container/flange)	9
technical failure(devices/mountings)	23.25
technical failure(pipes)	3.25
technical failure(mechanical damage, corrosion)	7.75
physical reaction	1.75
chemical reaction	13.75
environmental cause	1.5
unknown	11.25

Primary Causes (2/3)
Findings

- Maintenance plays a key role in accident prevention.
- Clear characterisation of the basic chemical reactions is crucial. This applies particularly to areas which are not counted to the core region of chemical industry.
- The high amount of the operating error stresses the needs of intensified qualification and training.
- Since an operating error always reflects the conditions in which the failure occurs, the safety management is also addressed.

Primary Causes (3/3)

Summary

- The observed presence of unknown chemical reactions as a cause for events shows shortcomings in expert knowledge and qualification.
- The analysis shows that unknown chemical reactions in the area of chemical industry are observed mainly during maintenance/repair, at the other areas this is true during "normal operation". Maintenance/repair are carried out often by third parties, often with lack of experience and insufficient knowledge of the conditions in the installation.

General Conclusions (1/2)

- As primary causes you can identify errors in the complex system switching process units. These system connections are often fuzzy in the event and lead to imperfect reactions which often develop to disturbances or accidents. The operating rules did not reflect these relations sufficiently.
- It was recognised in a whole series of events that the operating rules were provided as imperfect or dated and often did not reflect critical operating states.
- During maintenance operations the personal had no sufficient information. Significant communication problems also occurred with serious consequences.

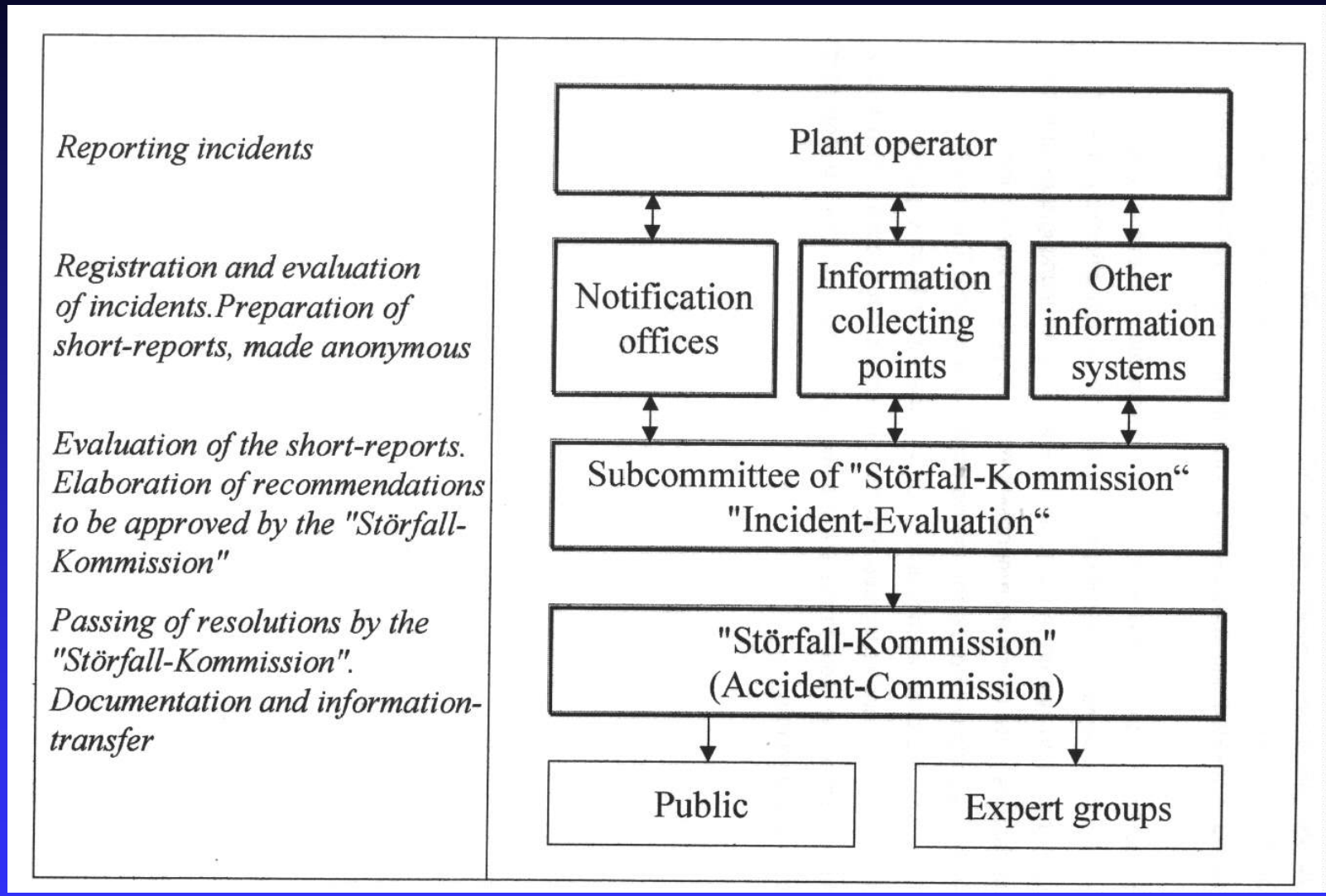
General Conclusions (2/2)

- Lacking expert knowledge was observed not only during maintenance operations but also in some cases incompatible materials were stored or put together, which finally led to irregularities.
- Imperfect operating actions were in particular observed in the case of deviations from routine tasks. These situations should be particularly addressed in the operating instructions and especially considered for training purposes.

Near Miss Reporting

- Activity of Hazardous Incident Commission
- Activity of Chemical Industry

Collecting of events by Hazardous Incident Commission



Summary and Outlook

- ZEMA became a reliable source of information
- Near miss reporting by SFK has started
- Public information via electronic media
  www.umweltdaten.de/ZEMA/
- Tools for Accident Investigation
- Compatible Database in European Format