Central Collecting and Evaluating of Major Accidents and Near-Miss-Events in the Federal Republic of Germany - Results, Experiences, Perspectives-

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Part 1:

Notifiable Incidents

-ZEMA-

Zentrale Störfallmelde- und -Auswertestelle

(Central Body for Major Accidents Notification and Evaluation)

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Essential Tasks of ZEMA

- Collection, evaluation and forwarding of lessons learnt
- Preparation of the reports to the European Union after SEVESO II Directive
- Collection and evaluation of other international events
- Editing annual reports and instant INTERNET publishing
- Exchange of lessons learnt with other respective organisations.
- Advanced Information Management

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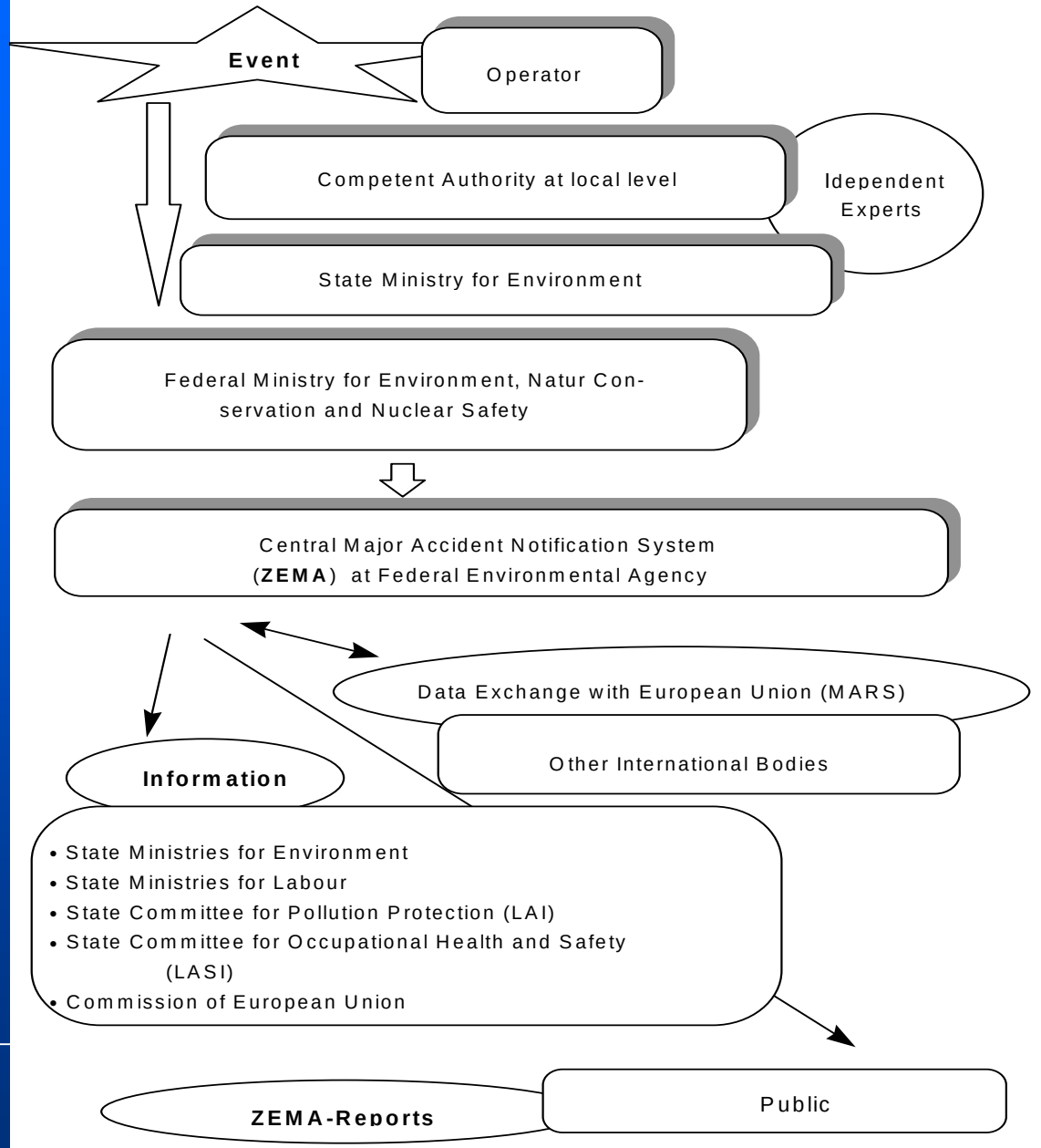
What must be reported ?

Definition is given in Hazardous Incident Ordinance (2000)

- **Major Accidents (with damage to man or environment to certain extend)**
- **Events with the potential of damage in the neighbourhood**
- **Events with a significant learning potential**

Major Accident Reporting System in Germany



Registered Events in ZEMA Database (2002)

Total: 369

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
1999	41	14	27
2000	24	11	13
2001	27	10	17
(2002	9	6	3)*

***Datacollection not yet compleated**

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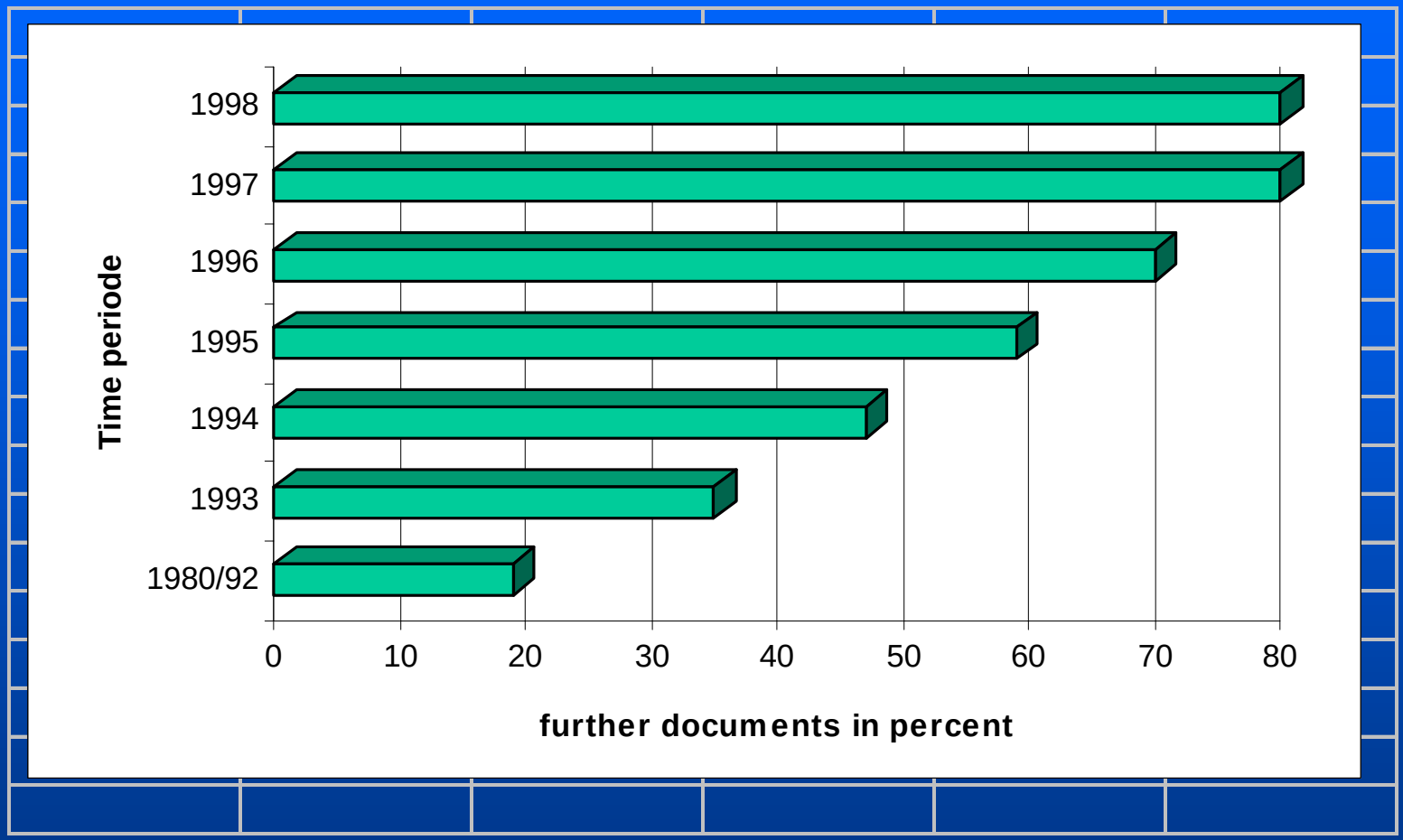
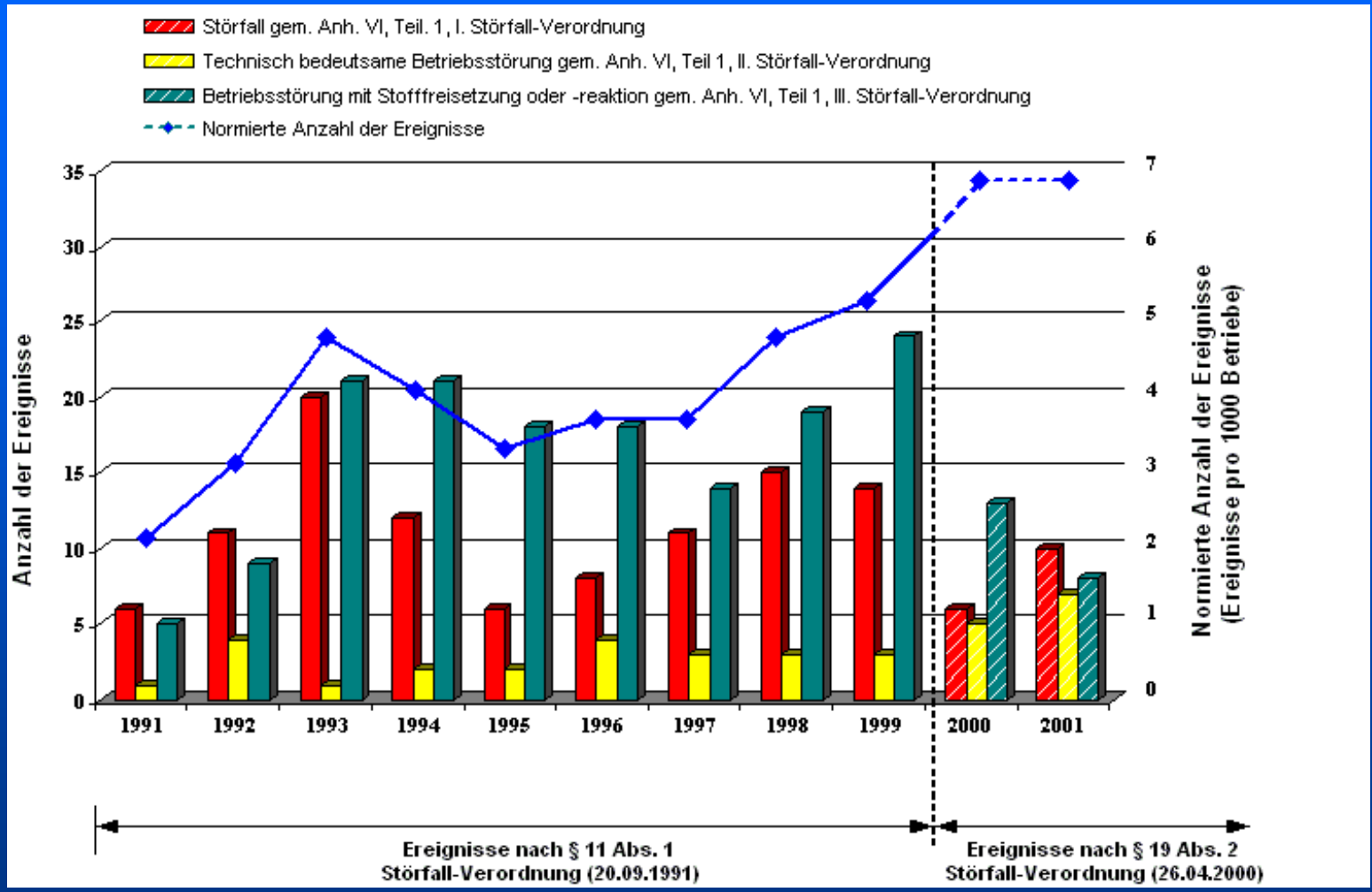
Data Quality



Trend of development of Events



Major Accidents

Minor Accidents with Learning Potential

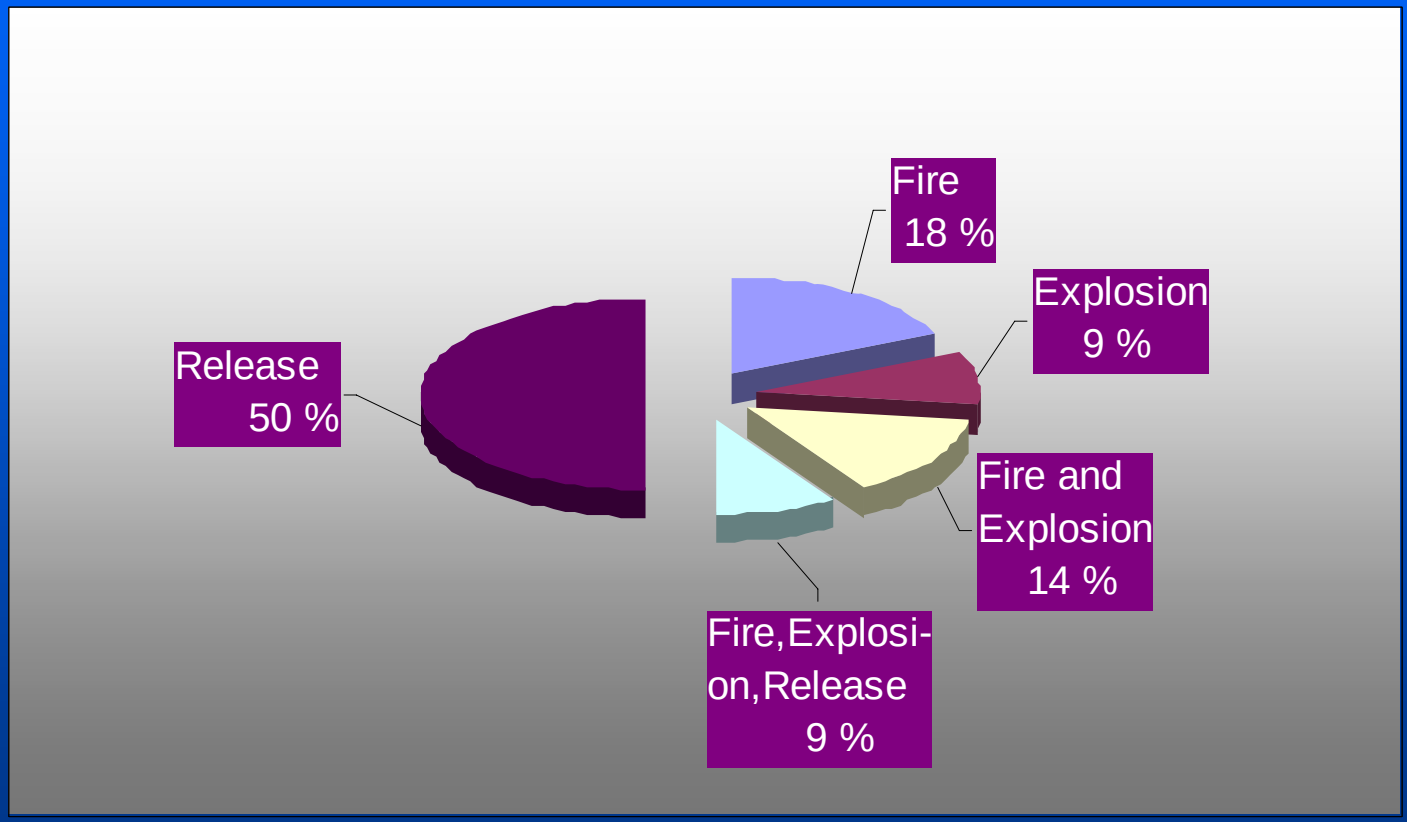
Accidents with the Potential of Damages

Findings

Evaluation of events 1993-2002 (N=313)

- Event Types

Event Types


Fire
18 %
Explosion
9 %
Release
50 %
Fire and
Explosion
14 %
Fire,Explosi-
on,Release
9 %

Findings

Evaluation of events 1993-2002 (N=313)

Event Type: Release of Substances

In Process Industry :

- Main Cause is equipment Failure during normal operating
- Human Failure restricted to start-off/shut down and maintenance

In other Industry:

- Findings vice versa

Findings

Evaluation of events 1993-2002 (N=313)

Event Type: Explosion and Fire

In Process Industry :

Main Cause is Human Failure

In other Industry:

Main Cause is Equipment failure

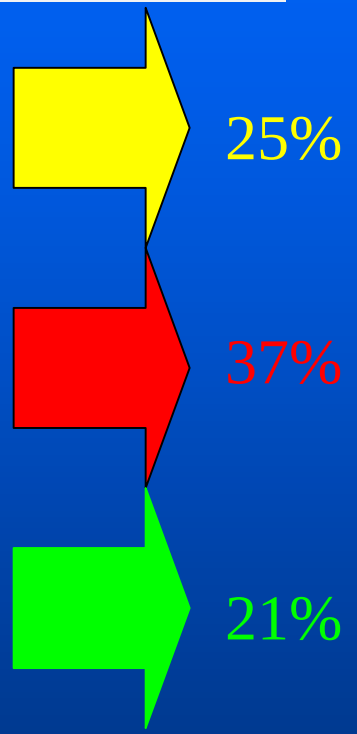
Findings

Evaluation of events 1993-2002 (N=313)

- Event Types
- Primary Causes

Primary Causes (1/3)
Statistical Overview

Cause	Events in %
human failure (organisational failure)	9
human failure (operating error)	13
human failure (during repair works)	2,5
technical failure (container/flange)	6
technical failure(devices/mountings)	21
technical failure(pipes)	3
technical failure(damage, corrosion)	7
physical reaction	2,5
chemical reaction	18
environmental cause	1
unknown	9,5



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Primary Causes (2/3)
Findings - 1

- **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)
Findings - 2

- **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.

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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.

Summary and Outlook Part 1

- **ZEMA became a reliable source and switching board of information**
- **Public information via electronic media www.umweltbundesamt.de/ZEMA/**
- **Near miss reporting by ZEMA has started**
- **Compatible Database in European Format and Information Management**

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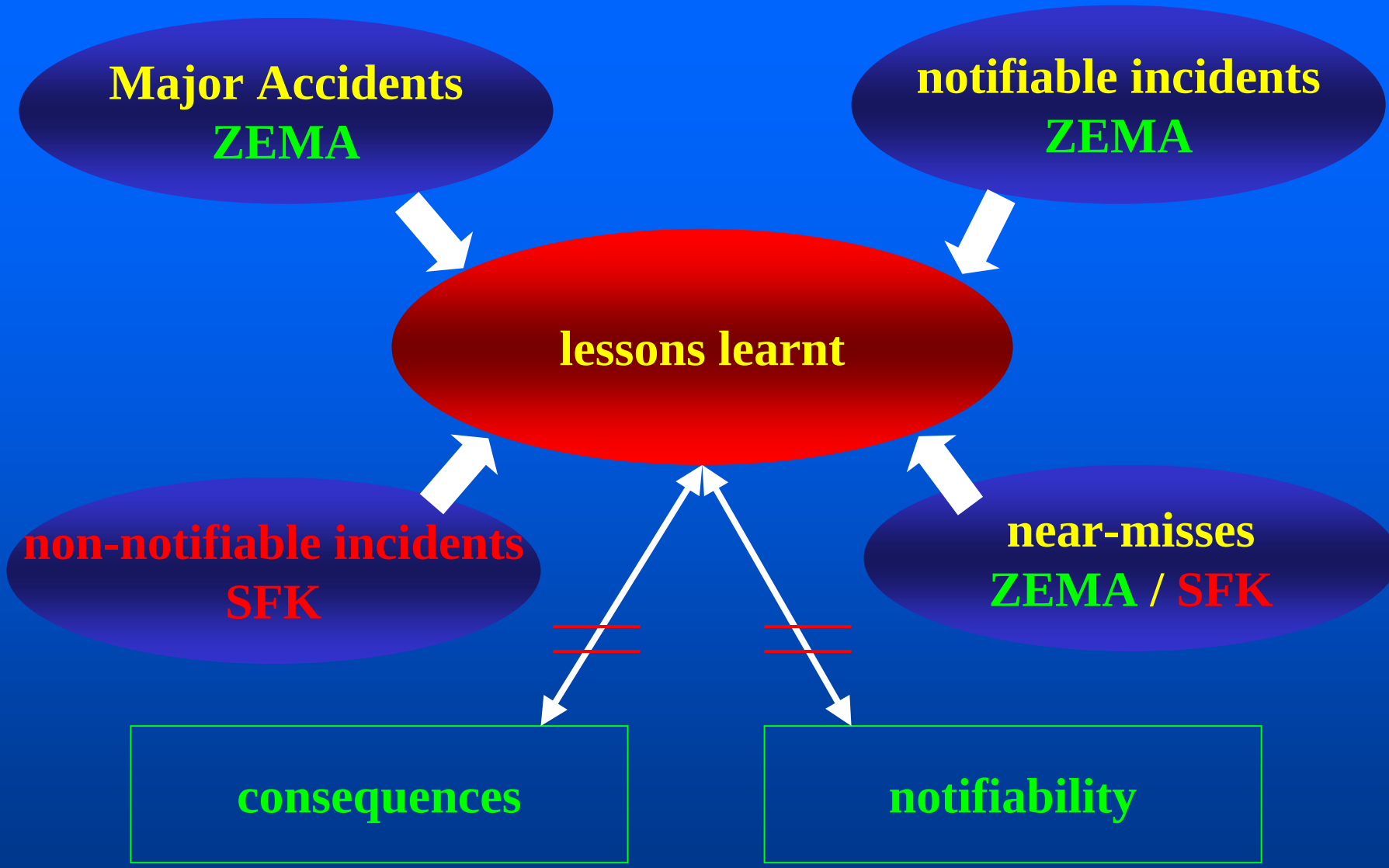
Part 2:

Non-notifiable Incidents



Lessons learnt from accidents

Major-Accident Hazard Commission

Data Working Group (1994 - 2000)

Concept for the Registration and Evaluation Of Safety Relevant Incidents (1994 - 1997)

testing in practise (1997 - 1999)

Subcommittee „Incident Evaluation“ (since 2000)

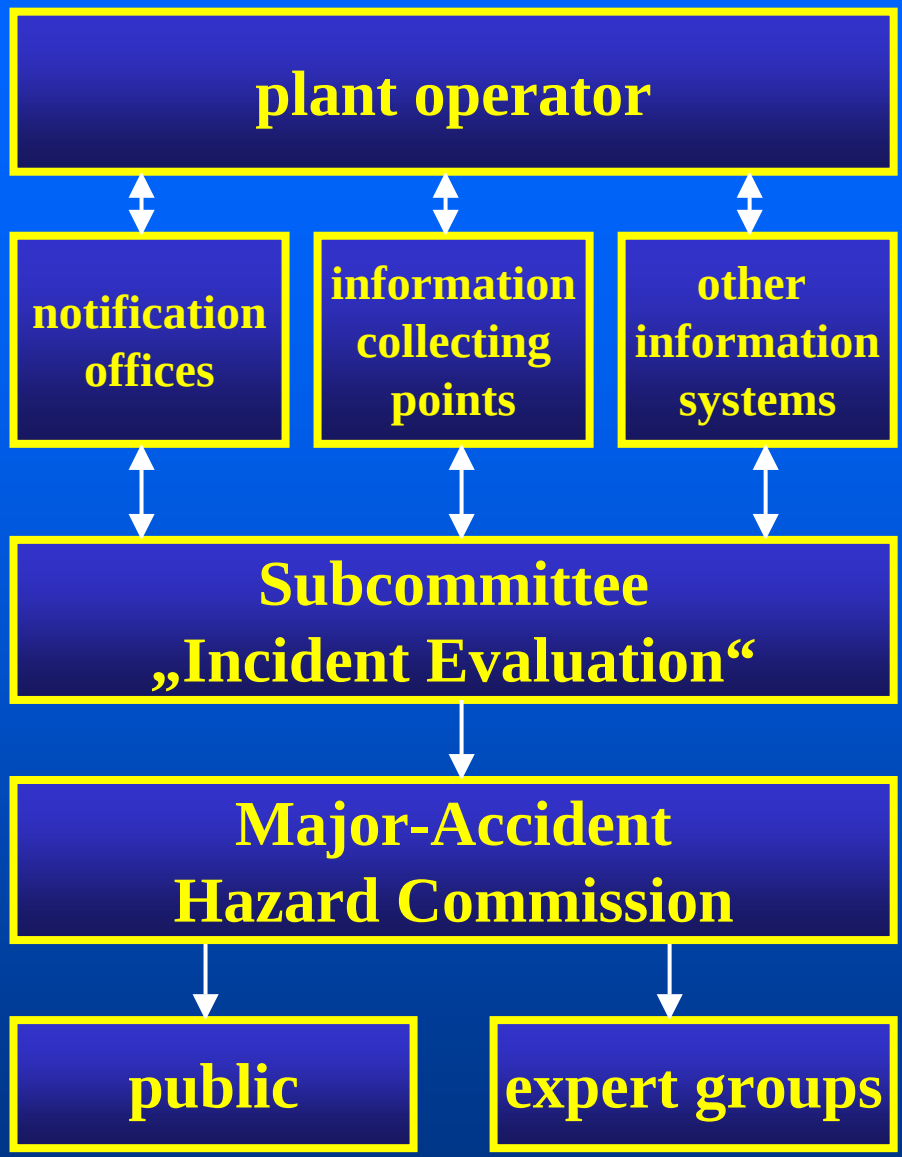
History

reporting incidents

registration, preparation of short-reports, made anonymous

evaluation, elaboration of recommen-dations

passing of the resolutions by the Major-Accident Hazard Commission, documentation and information transfer



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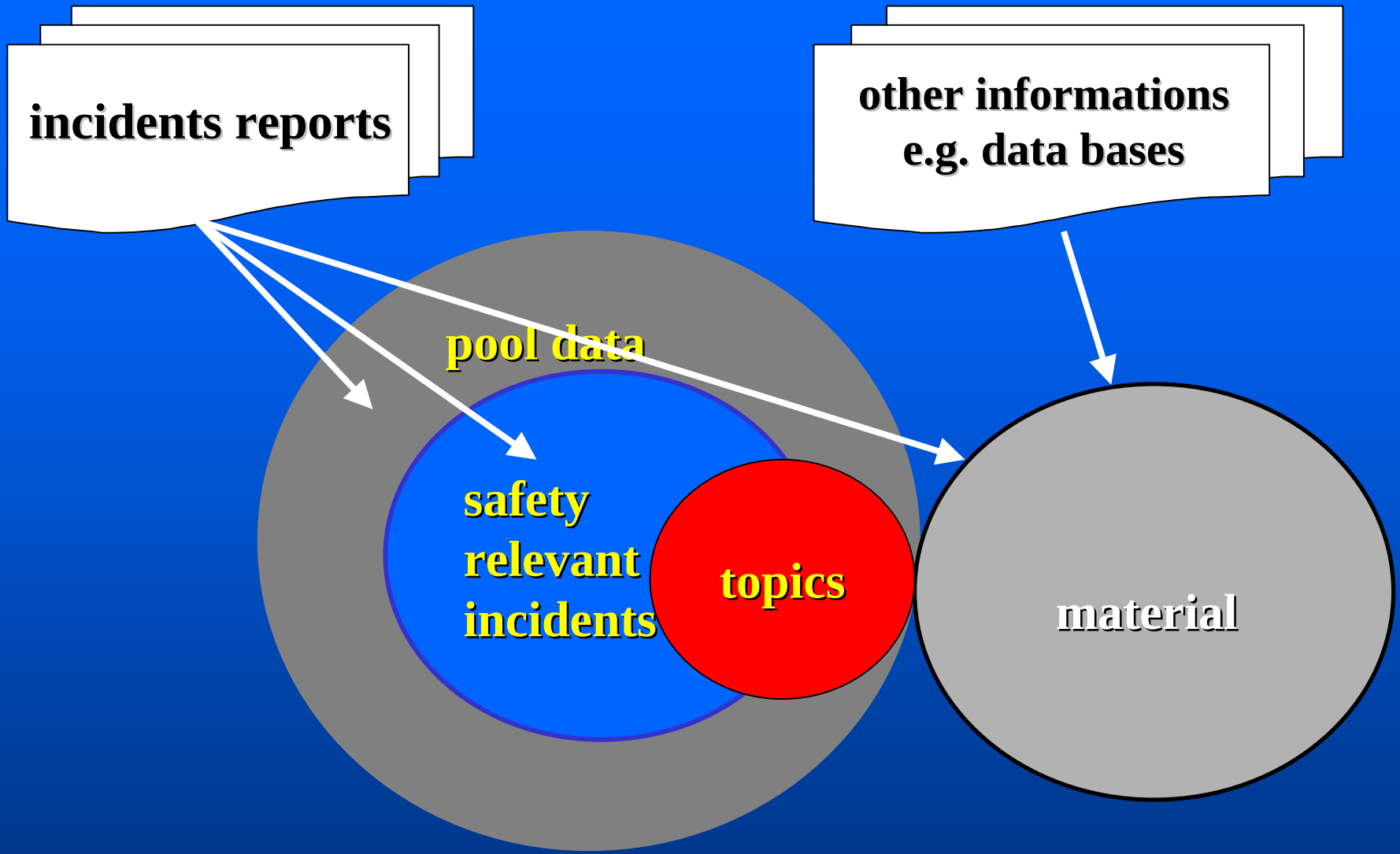
Concept for the registration and evaluation of safety relevant incidents



Information management

New insights

- substance properties
- design and fabrication of components
- failure of safety devices/systems
- failure of technical/organisational systems
- efficacy of limiting the consequences of accidents

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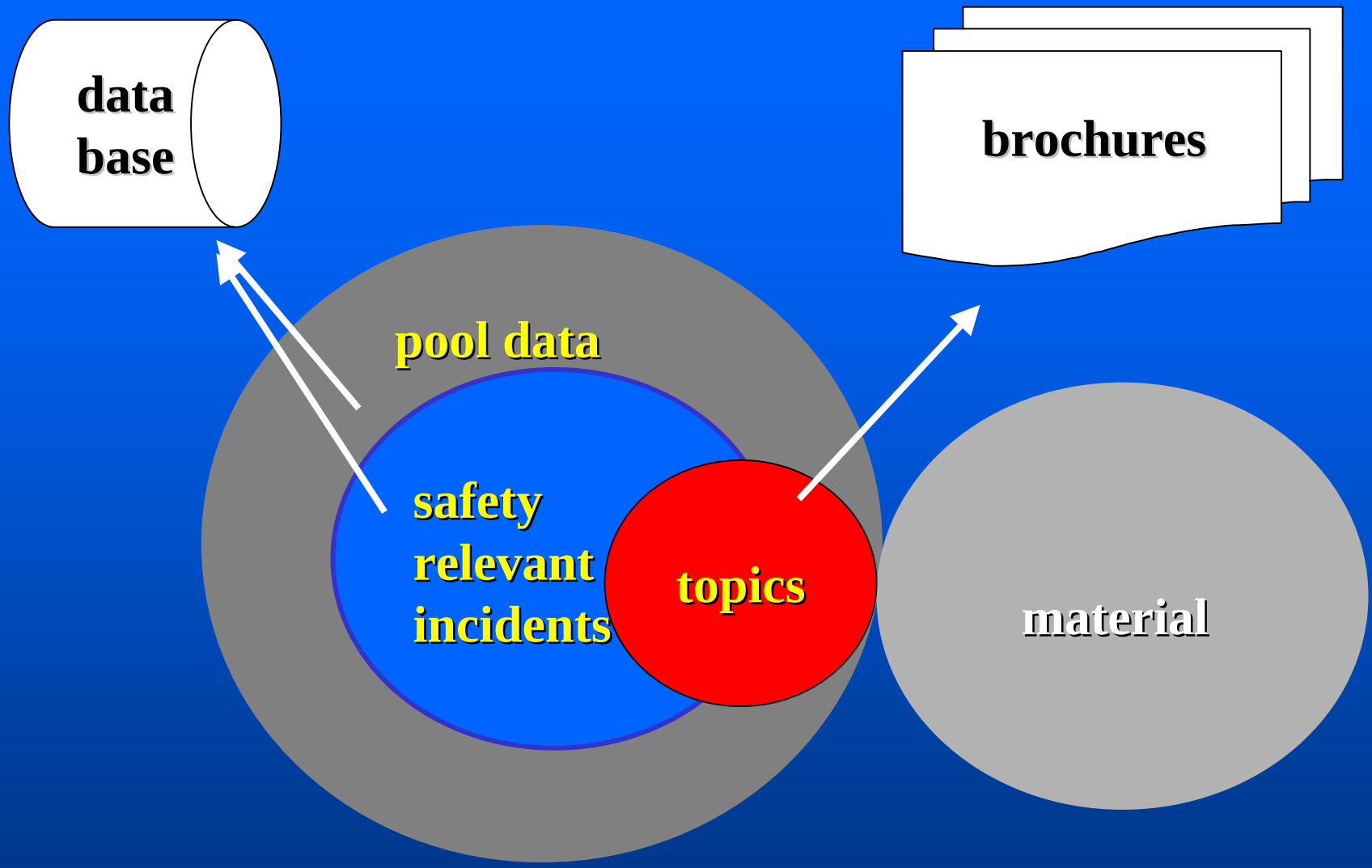
Safety relevant incidents

- plant description
- event description
- consequences
- substances involved
- causes
- emergency measures taken
- measures drawn by the operator or the authority to avoid such incidents in the future
- lessons learnt

Content of incident reports



Information management

Waste Gas Pipes

SFK-GS-20 (appendix)

www.sfk-taa.de

Obstructions of Pipes

SFK-GS-39

www.sfk-taa.de

hazards

consequences

measures

incident reports

aim

making sensitive for risks caused by deviations from

- **normal process conditions**
- **mistakes in planning and maintenance**

Brochures

Experiences

- 139 incident reports,
  23 safety relevant incidents
- voluntary reports
- operators fear with regard to tightening up of regulations
- humain failure respectively disregard of regulations as a numerous cause
- 2 crucial points identified

Outlook

- improvement of data flow
- more data sources
- improvement of data base
- identification of further crucial points
- publicity

Summary and Outlook Part 2