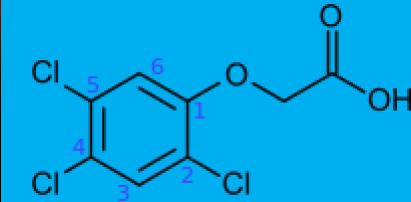
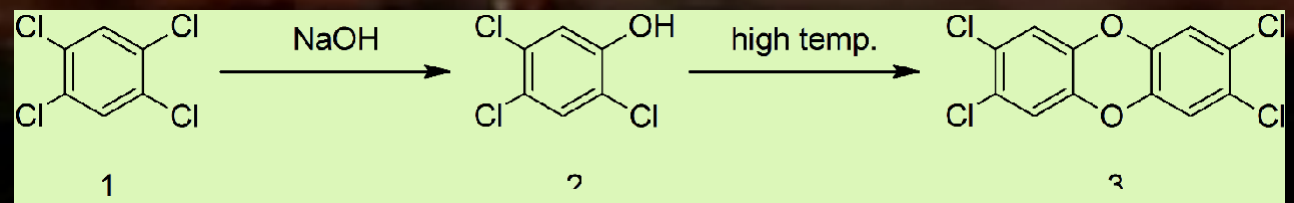




The **Seveso disaster** was an industrial accident that occurred around 12:37 pm on 10 July 1976, in a small chemical manufacturing plant approximately 15 km north of Milan in Italy.



**2,4,5-Trichlorophenoxyacetic acid**



**2,3,7,8-tetrachlorodibenzo-p-dioxin**

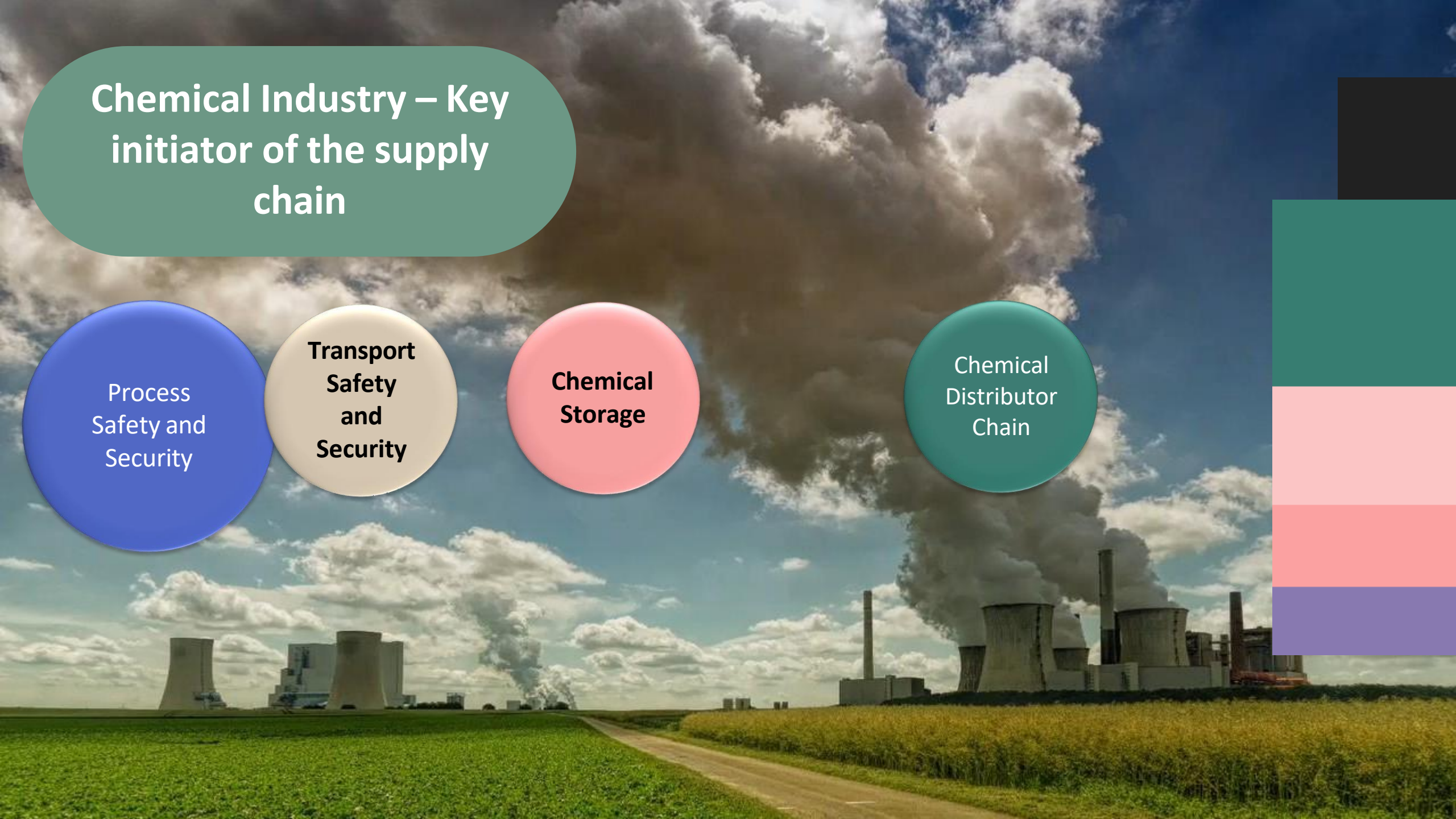
# Chemical Industry – Key initiator of the supply chain

Process  
Safety and  
Security

Transport  
Safety  
and  
Security

Chemical  
Storage

Chemical  
Distributor  
Chain





# 1. Scenario-Based Strategy

What do you think about  
when I say:

**Strategy?**

1. A plan of  
action designed  
to achieve a  
**long-term** or  
**overall aim**

2. The art of planning  
and directing  
**overall important**  
**operations** and  
**movements** in  
scenarios

What is the long-term goal(s) to prevent chemical  
accidents/incidents in your country?

Policy

Action  
Plan

Training





# Scenario-Based Strategies to Enhance Chemical Plant Safety and Security

**Joshua H. MUSTAFA**

**Chemical Inspector & Government Analyst**

**Government Chemist Laboratory Authority (GCLA)  
Northern Zone Laboratory,  
P.O. Box 2095, ARUSHA**

Rohan Perera, *GHM Risk Mitigation*



# Blueprint of the Course: Chemical Security Management

## Who are the learners

Learners for this course are professionals, supervisors and those who are directly or indirectly engaging with chemical safety and security management.

They can have a substantial experience in misuse chemicals and security management in chemical facility/supply chain, and chemical plant safety and need to enhance their knowledge of safety and security management strategies and security audit methodologies to prevent misuse of chemicals in the life

## Mission statement

This course is primarily focused on chemical safety and security management strategies in the chemical life cycle of chemicals towards the prevention of chemical incidents/terrorist attacks.

## Learning objectives

During this course, learners will improve their understanding of security best practices for the life cycle of chemicals and emerging threats to chemical infrastructure security and how to mitigate chemical incidents based on scenarios.

At the end of this course, participants would be able to recognize new comprehensive and operative methodologies for chemical facilities safety and security based on future possible catastrophic scenarios.

## Look & Feel

Participants will be able to understand the importance to secure misuse chemicals to prevent chemical incidents regardless of security barriers and developing scenarios to prevent them, and what strategies we could utilize to overcome possible chemical incident scenarios in the future.

## Quote

This course provides new insight on chemical plant security management systems to improve process security and vulnerability assessment through the supply chain.

## Assessment


Assessment is based on identifying unforeseen and undetected scenarios leading to chemical incidents and identifying emerging threats that would contribute to future chemical incidents.

Table-top exercises on multiple uses of chemicals will be provided to evaluate tasks sensitive to human error in the chemical process and decision-making strategies for accident prevention and preparedness.


What do you think  
about when I say:

**Strategy?**





1. A plan of action designed to achieve a ***long-term*** or ***overall aim***



2. The art of planning and directing **overall important operations and movements in scenarios**



# What is the long-term goal(s) to prevent chemical accidents/incidents in your company/facility?

## Policy



## Action Plan



## Training

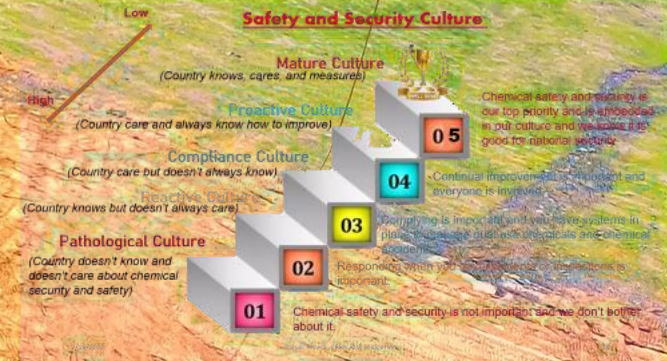




# 2. Safety and Security Culture

*Chemical Safety*  

*Chemical Security*  





*Chemical Safety*



*Chemical Security*





A man with a beard and dark hair, wearing a grey puffer jacket and dark pants, is sitting on a large rock in a forest. He is looking upwards and to the right with a thoughtful expression. The background is filled with green foliage and trees. A blue thought bubble is overlaid on the top left of the image.

Where  
are we?

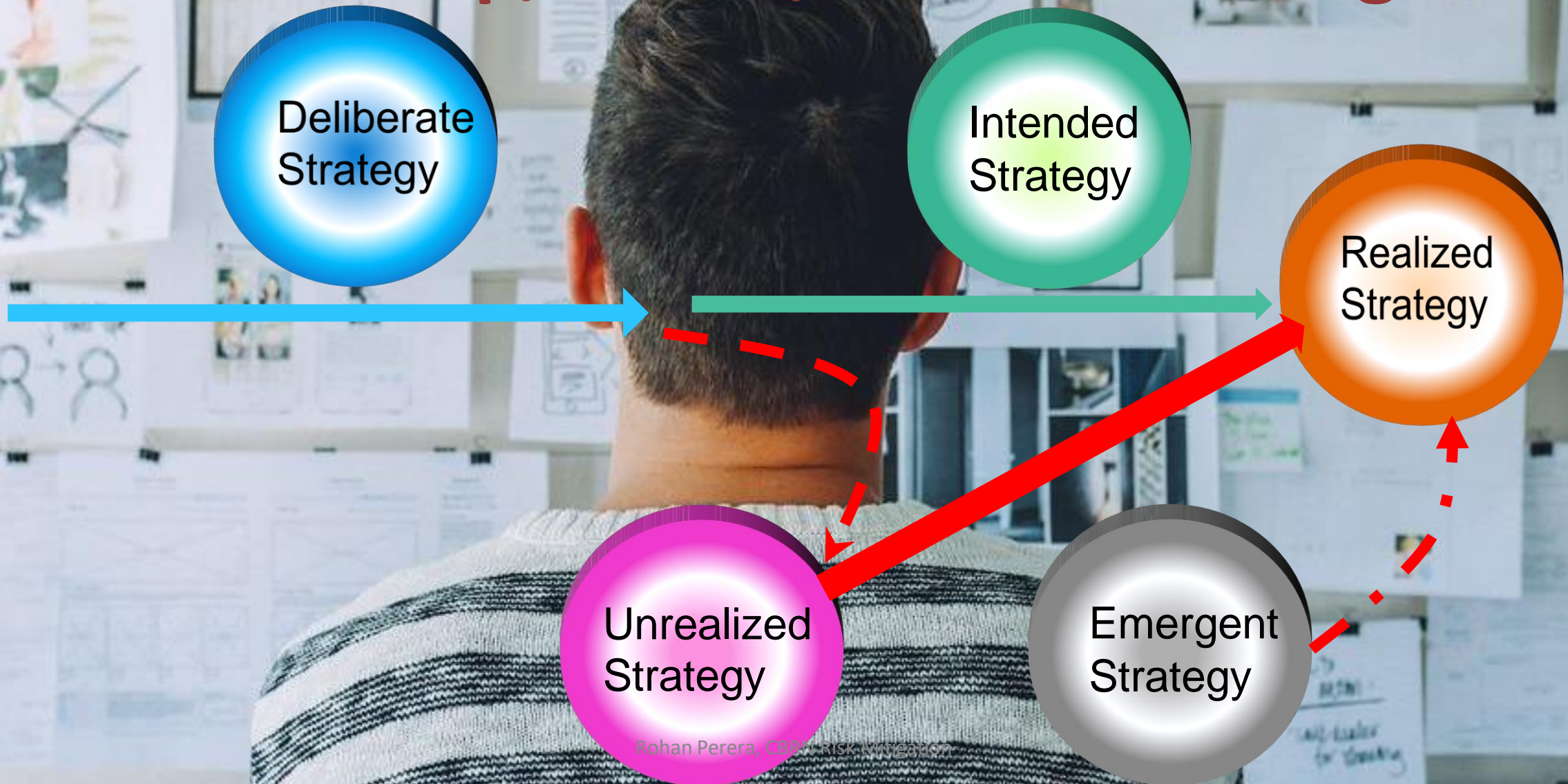


# Safety and Security Culture





# Mission, vision, trends, scenarios, options, roadmap, action, and monitoring





# PREVENT

Prevent the risk of chemical related accidents/incidents on chemical plant

# SECURE

Secure chemical industries and related assets in the company

# DEVELOP

Develop innovative strategies to protect chemical plants by developing novel tools

# STRENGTHEN

Strengthen and enhance stakeholders' ability to understand, aware, of safety and security





### Even the Best Barriers Can Fail

*"Even the best barrier will not achieve perfect reliability."*

- Barriers will have holes (weaknesses).
- The holes can be hidden for a long time or created at the moment.
- Their strength changes with time and with the technology.

7/18/2022 Rohan Perera, CBRN Risk Mitigation

# 3. Strategic Barriers as Layers of Protection



### Barriers

7/19/2022

Rohan Perera, CBRN Risk Mitigation

### Barriers

7/18/2022 Rohan Perera, CBRN Risk Mitigation



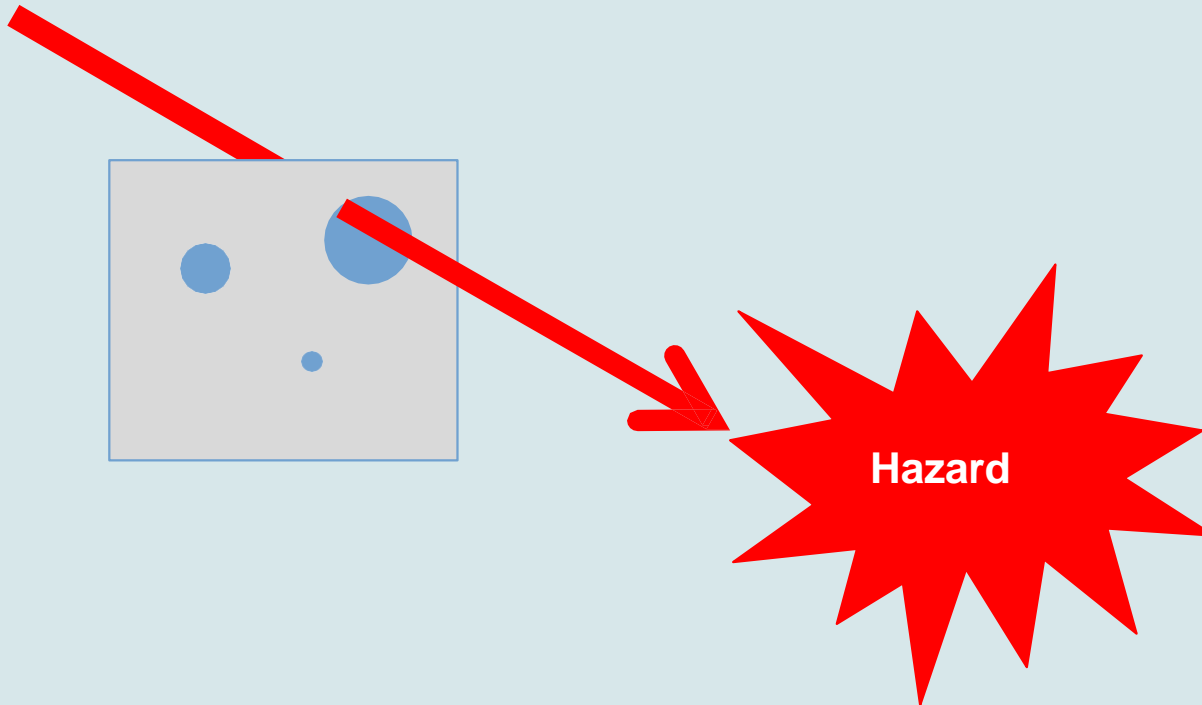
# Even the Best Barriers Can Fail

***“Even the best barrier will not achieve perfect reliability.”***



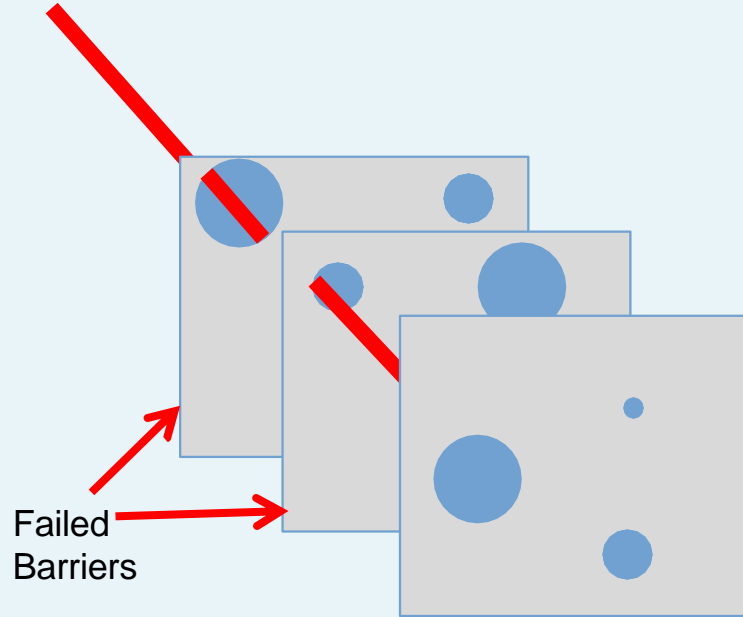
- Barriers will have holes (weaknesses).
- The holes can be hidden for a long time or created at the moment.
- Their strength changes with time and with the technology.

CSB Macondo Investigation Report, Volume 2, <https://www.csb.gov/file.aspx?DocumentId=5931>, p 51.





# Barriers



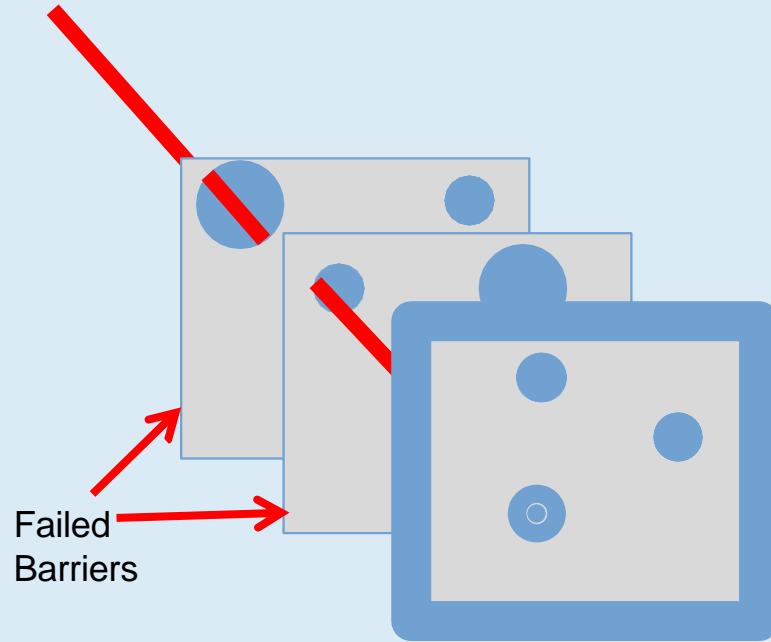
Failed  
Barriers

## New Barriers





# Barriers



**Strengthening Existing Barriers**







## **4. Safety and security of chemical plant– What is a Barrier?**



**Operational**

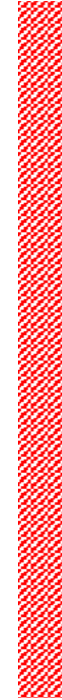
**Physical**

**What is a barrier?**

**Organizational**



# Protect Chemical Plant - What is a **barrier**?



**Physical Barriers:** contain, protect, or separate

- Alarm system
- Automated valves system
- Fences
- Fume hoods
- Locks
- Gates/Doors
- Cameras

## 1. Physical

2. Operational
3. Organizational



# Protect Chemical Plant - What is a barrier?



## Operational Barriers:

Tasks performed by a person or group of people

- **Procedures**
- **Inspections/Audits**
- **Self-control of work/checklists**
- **Quality system documents**

1. Physical

**2. Operational**

3. Organizational

# Protect Chemical Plant - What is a barrier?



## Organizational Barriers

- Policies
- Rules
- Management systems
- Directives

1. Physical
2. Operational

**3. Organizational**



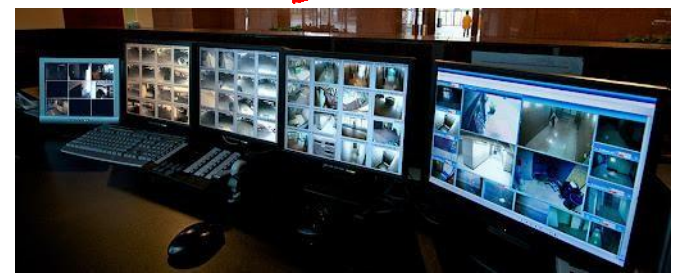
# Protect Chemicals from Intruders



Physical

Operational

Organizational



# Chemical Safety Case Study 1





# Safety Case Study: UCLA Chemistry Lab Fire

On Dec. 29, 2008, Sheri Sangji, 23, was injured by the chemical fire and died on Jan. 16, 2009, from injuries sustained in a fire in a UCLA chemistry laboratory. Working with *tert*-butyllithium, which ignites spontaneously in air, she was drawing the chemical from a bottle into a syringe when the plunger came out of the syringe barrel.

*UCLA police dispatch recorded the 911 call at 2:54 PM as an “unknown type chemical fire.” Emergency crews were dispatched at 2:57 PM, and emergency medical personnel arrived at the building at 3:01 PM. Lutton donned full protective gear and went up to the lab to assess the situation, with dispatch recording at 3:06 PM that the fire was out upon arrival.*

([C&EN, Aug. 3, 2009, page 29](#)).



**Prof Harran**

SUPERIOR COURT OF THE STATE OF CALIFORNIA  
FOR THE COUNTY OF LOS ANGELES

FILED

2011 DEC 27 AM 11 55  
CASE NO. BA392069

LOS ANGELES SUPERIOR COURT

FELONY COMPLAINT  
FOR ARREST WARRANT

THE PEOPLE OF THE STATE OF CALIFORNIA,  
Plaintiff,

v.

01 THE REGENTS OF THE UNIVERSITY OF  
CALIFORNIA, A PUBLIC CORPORATION,  
UNIVERSITY OF CALIFORNIA, LOS  
ANGELES,  
and

02 PATRICK HARRAN (7-13-69)

Defendants.

The undersigned is informed and believes that:

COUNT 1

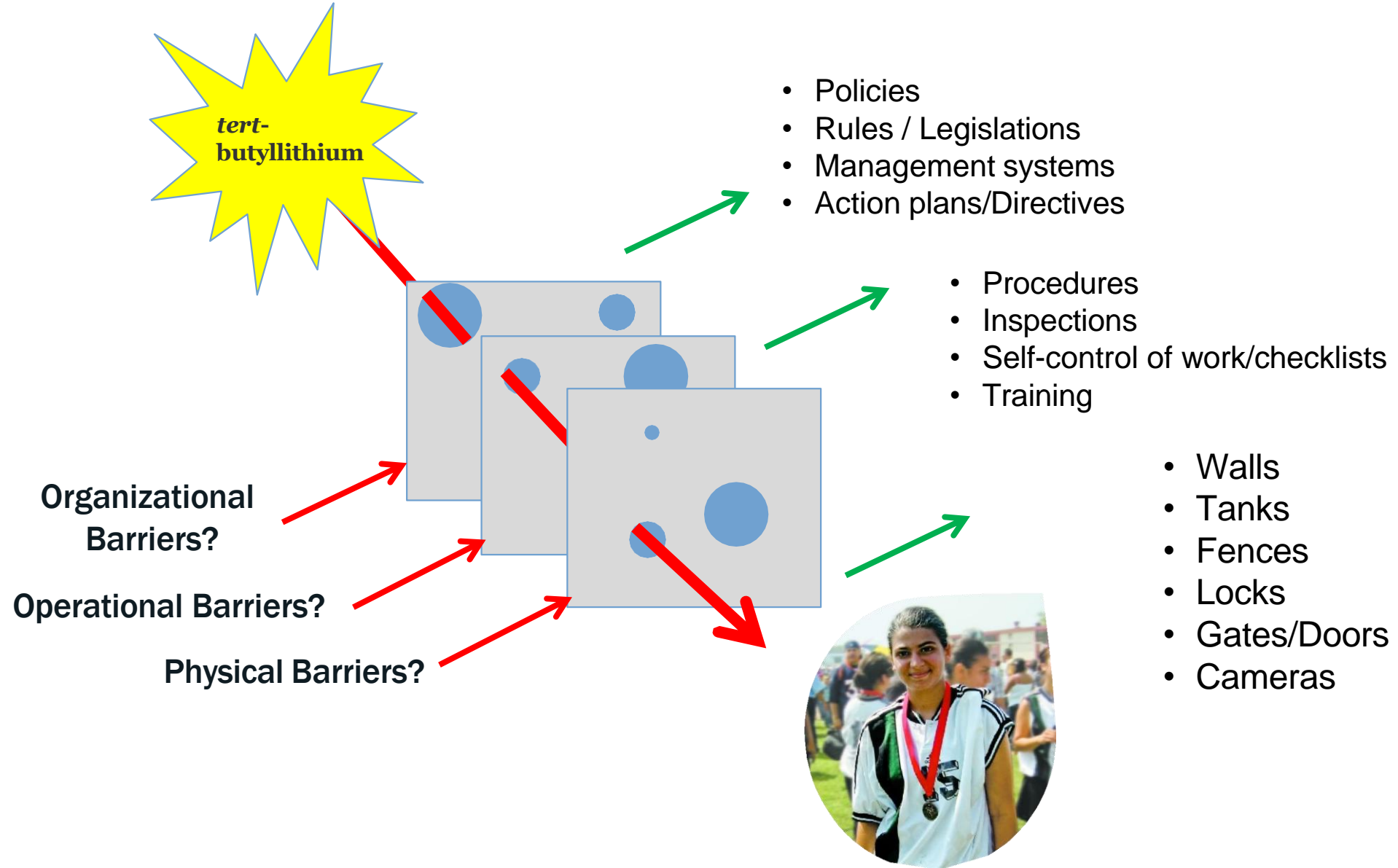
On or about December 29, 2008, in the County of Los Angeles, the crime of WILLFUL VIOLATION OF AN OCCUPATIONAL SAFETY & HEALTH STANDARD CAUSING THE DEATH OF AN EMPLOYEE, in violation of LABOR CODE SECTION 6425(a), a Felony, was committed by THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, A PUBLIC CORPORATION, UNIVERSITY OF CALIFORNIA, LOS ANGELES, and PATRICK HARRAN who

How could this incident have been prevented?





# Layers of Protection: How Could UCLA Incident Have Been Prevented







U.S. Chemical Safety and Hazard Investigation Board

# Key Lessons for Preventing Inadvertent Mixing During Chemical Unloading Operations

## Chemical Reaction and Release in Atchison, Kansas

MGPI Processing, Inc.

Incident Date: October 21, 2016

Over 140 Sought Medical Attention, 6 Hospitalized

**No. 2017-01-I-KS**

*Published December, 2017*




### KEY ISSUES:

- Design of Chemical Transfer Equipment
- Automated and Remote Emergency Shut-offs
- Pipe Markings
- Chemical Unloading Procedures
- Human Factors
- Emergency Planning





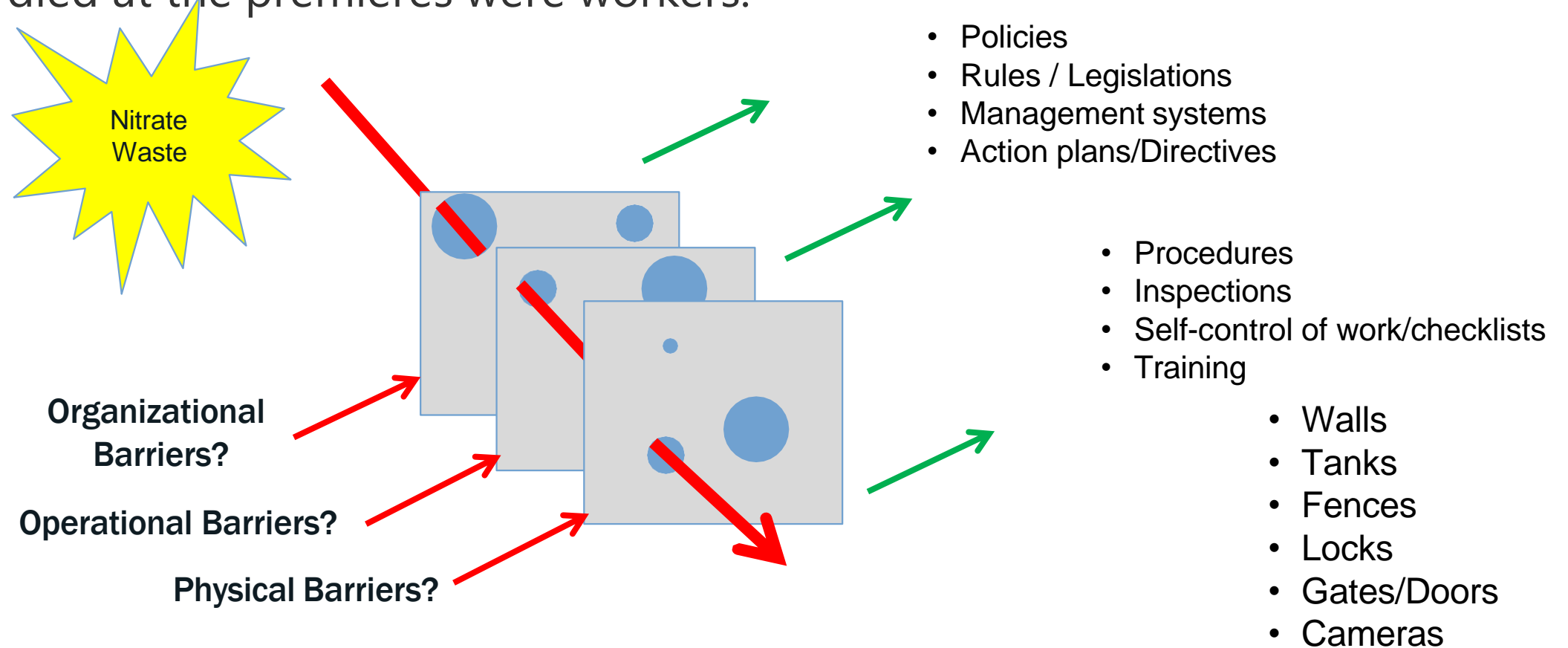
# Nitrified Waste $\text{NO}_3^-$ $\text{NO}_2^-$

An aerial photograph showing the aftermath of a massive industrial explosion. The scene is dominated by thick, billowing white and grey smoke that rises from a large area of destruction. In the foreground and middle ground, several multi-story industrial buildings are in various states of collapse or severe damage, with exposed structural frames and charred remains. Debris is scattered across the ground. In the background, a residential area with smaller buildings and green fields is visible under a hazy sky. The overall atmosphere is one of devastation and environmental impact.

**An explosion occurred at Jiangsu Tian Jiayi chemical co., LTD which was located in Chenjiagang town, Xiangshui county, Yancheng city, east of China's Jiangsu province. That happened at about 14:48 on March 21, Beijing time.**

**Hazardous Waste Explosion -  
Jiangsu Tianjiayi Chemical Co. Ltd**

Data showed that the solid waste storage capacity of Jiangsu Xiangshui Tianjia Yihua factory was up to 1078 cubic meters, which is used to store the waste liquid and solid waste produced in the factory. In addition, the plant has a hazardous waste storage yard for the storage of hazardous waste, with an annual output of 4,500 tons. There were 64 people who died at the premieres were workers.







**Chemical safety and  
security is the  
responsibility of everyone  
– play your part well!**

***THANK YOU.***