New Project SAFE CITY

Eremina Tatiana “Women for Safety” (Russia)
Safe City Project (fire safety)

Safe City:

Safety and comfort for people
Smooth, safe and reliable functioning of infrastructure
Meeting the challenges of a modern megapolis

City is divided into districts — its administrative units

Eremina Tatiana “Women for Safety” (Russia)
Reasons for development \ SAFE CITY Project

Challenges of a modern megapolis:

- Terrorism
- Crime
- Disturbances
- Natural disasters
- Environmental pollution
- Accidents with above the ground communications
- Accidents with underground communications
- Transportation failure
- Technological disasters

Eremina Tatiana “Women for Safety” (Russia)
Emergency Situation - situation in a particular area, developed as a result of an accident, natural hazards, catastrophes, natural or other disasters that may cause or have caused loss of life, damage to human health or the environment, considerable material losses and violation of conditions of life of people.


Eremina Tatiana “Women for Safety” (Russia)
**Incident** -
an occurrence, either human-based or a natural phenomenon, that requires action or support by emergency services personnel to prevent or minimize loss of life or damage to property and/or natural resources

NFPA 1143 Standard for Wildland Fire Management

NFPA 1250 Recommended Practice in Fire and Emergency Service Organization Risk Management

To avoid essential differences we should develop the unified glossary with general definitions.

Eremina Tatiana “Women for Safety” (Russia)
Top-10 safest cities in the world according to «Safe Cities Index 2015» (30-01-2015)

1. Tokio
2. Singapore
3. Osaka
4. Stockholm
5. Amsterdam
6. Sidney
7. Zurich
8. Toronto
9. Melbourne
10. New York

Eremina Tatiana “Women for Safety” (Russia)
MAIN SAFETY FACTORS FOR CITY ASSESSMENT

in «Safe Cities Index 2015»

• Information security
• Health safety
• Infrastructure safety
• Personal safety
• Fire safety

Eremina Tatiana “Women for Safety” (Russia)
Minimalizing the existing risks in all the challenges:

- Development of infrastructure monitoring (administration, suplementary services);
- Improvement of legislation and law enforcement;
- Development of unified system of risk evaluation and risk minimalization criteria.
Reliability and Failure of Facility

Reliability - a set of properties that determine the ability of a facility to continue to operate in certain modes and conditions of use and its adaptability to the recovery in case of failure.

Failure - an event of violation of the working condition of a facility.

A numerical estimation of reliability - the probability $P$ of the facility being in working condition at the time $t$.

![Graph showing probability $P(t)$ decreasing over time $t$]

Probability of a facility being in operation condition $P$ is connected with the probability of failure $Q$:

$$ Q = 1 - P. $$
HAZARD FACTORS FOR VARIOUS FACILITIES (BUILDINGS, STRUCTURES, EQUIPMENT, UTILITY NETWORKS)

<table>
<thead>
<tr>
<th>In use</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical deterioration of the housing stock</td>
<td>Monitoring of wear, control of warranty</td>
</tr>
<tr>
<td>Emergency and dangerous condition of residential buildings (depreciation of ceilings, communications, elevators)</td>
<td>Flexible approaches to monitoring of new (innovative) materials and structures for fire safety</td>
</tr>
<tr>
<td>Moral and physical deterioration of basic equipment of industries</td>
<td>Emergency shutdown of electric networks</td>
</tr>
<tr>
<td>Emergency shutdown of electric networks</td>
<td></td>
</tr>
<tr>
<td>Lack of gas safety equipment in residential buildings (gas leak)</td>
<td></td>
</tr>
<tr>
<td>Need to overhaul gas distribution points (for replacement or permanent diagnostics)</td>
<td></td>
</tr>
</tbody>
</table>

Eremina Tatiana “Women for Safety” (Russia)

New project SAFE CITY

Minimalizing the existing risks in all the challenges:
- Development of infrastructure monitoring (administration, supplementary services);
- Improvement of legislation and law enforcement;
- Development of unified system of risk evaluation and risk minimization criteria.
On “Safe City” Software

The goal - optimal response and risk elimination (megapolis challenge)

Objectives:
- collection of baseline data (information on districts) for administration and support services;
- identification of potential points of vulnerability (risk factors), forecasting, response and prevention;
- development of common functional and technical requirements for the software;
- use of the software in the unified duty-dispatch service (EDDS).

Minimalizing the existing risks in all the challenges:
- Development of infrastructure monitoring (administration, supplementary services);
- Improvement of legislation and law enforcement;
- Development of unified system of risk evaluation and risk minimization criteria.

Eremina Tatiana “Women for Safety” (Russia)
All software systems are implemented in districts as part of a comprehensive system of safety and comfort of life and safe operation of the infrastructure.

"Safe City" software implements infrastructure monitoring within a single duty and dispatch service, which provides:
- the responsiveness of the system;
- the complex nature of assistance required;
- the dependence of the effectiveness of the emergency responders on the time of reception, the amount and accuracy of information, which rescuers have from the beginning.

Eremina Tatiana “Women for Safety” (Russia)
Performance Efficiency of "Safe City" Software

1. Improving preparedness of emergency management structures.
2. Improving efficiency of monitoring and prevention of emergency situations.
3. Reducing the number of emergencies, deaths and injury of people.
5. Maximising the social and economic effects.
Unified Requirements for Technical Parameters of «Safe City» Software

- Unified functional and technological parameters of «Safe City» software for all the city districts;
- modular communications infrastructure (module "Fire Safety", module "Information Security“, module "Transport Security", etc.);
- the ability to replicate and scale;
- single loop control and information exchange on the basis of a common information protocol.

Eremina Tatiana “Women for Safety” (Russia)
Unified Requirements for Technical Parameters of «Safe City» Software

“Fire Safety” Module

- risk assessment for buildings and structures of different fire danger classes (fire scenarios for the most dangerous incidents)

- risk assessment for industrial objects (logical event tree development)
### Legal Base (as for 01.01.2015)

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of state policy</td>
<td>... In the field of public safety and security of the Russian Federation critical and potentially dangerous objects from the threats of natural, man-made disasters and terrorist attacks for the period up to 2020</td>
</tr>
<tr>
<td>Federal Law of 21.12.94 № 68-ФЗ</td>
<td>&quot;On the protection of people and territories from emergency situations of a natural and technological origin&quot;</td>
</tr>
<tr>
<td>Federal Law of 22.07.08 № 123-ФЗ</td>
<td>&quot;Technical Regulations on fire safety requirements&quot;</td>
</tr>
<tr>
<td>Order of Emergency Control Ministry of 30.06.09 № 382</td>
<td>In approval of the procedure for determining the values of fire risk for the buildings and structures of various classes of functional fire hazard</td>
</tr>
<tr>
<td>Order of Emergency Control Ministry of 10.07.09 № 404</td>
<td>On approval of the procedure for determining the values of fire risk for production facilities</td>
</tr>
</tbody>
</table>

New project SAFE CITY
Fire Risk Assessment at Facilities

Analysis of fire hazard for the building

Emergency situations' frequency

Fire Dangerous Factors' Fields
- Fire scenario
- Fire Dynamics Modelling
- Fire Dangerous Factors' Fields
- Time of Escape Route Blocking

Additive Fire Safety Measures

Fire Dangerous Factors' Effect for People
- People Evacuation Modelling
- Evacuation Time
- Evacuation Probability

Individual Fire Risk

- More than normative value
  - Unacceptable Fire Risk
- Not more than normative value
  - Acceptable Fire Risk
Fire risk assessment for various facilities:

verification of compliance with the conditions for safe evacuation of people in case of a fire at the facility;

assessment of performance of automatic fire protection systems: fire alarm, warning and evacuation, fire fighting, smoke removal;

statistical evaluation of the frequency of occurrence of a fire at the facility per year.

Fire risk value:

\[ Q = Fr \cdot (1 - R_{FS}) \cdot P_p \cdot (1 - P_{ev}) \cdot (1 - P_{fp}) \]

Efficient fire protection:

\[ P_{fp} = 1 - (1 - R_{al} \cdot R_{warn}) \cdot (1 - R_{al} \cdot R_{sm}) \]
Fire risk assessment for production facilities:

verification of compliance with conditions of safe evacuation in case of fire at the facility;

assessment of performance of automatic fire protection systems;

statistical evaluation of the frequency of occurrence of a fire at the facility per year;

construction of the logic tree of events with consideration of all possible on-site emergencies.

New project SAFE CITY

Eremina Tatiana “Women for Safety” (Russia)
Methods of assessing fire risk for various facilities and production facilities are regulated by legal documents.

A district includes a large number of facilities of different classes of functional fire hazard, each infrastructure element also has its own regulatory framework.

In order to develop an effective system of risk assessment and risk minimization criteria for a district the regulatory and legal base needs improving.

Eremina Tatiana “Women for Safety” (Russia)
Regulatory and Legal Base Improvement
MAIN CHARACTERISTICS OF A DISTRICT
used for risk assessment

<table>
<thead>
<tr>
<th>Russian regulatory documents</th>
<th>International regulatory documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundaries and composition of the territory, geographical location</td>
<td>Demographic situation</td>
</tr>
<tr>
<td>Historical, natural and cultural features</td>
<td>Geographical location</td>
</tr>
<tr>
<td>Demographic situation</td>
<td>Residential buildings</td>
</tr>
<tr>
<td>Main branches of the economics</td>
<td>Service of prevention and liquidation of emergency situations</td>
</tr>
<tr>
<td>City services (housing and communal services, transport complex, building complex, security</td>
<td>Other organizations and agencies</td>
</tr>
<tr>
<td>services, complex of the consumer market</td>
<td>Hazards, risks</td>
</tr>
<tr>
<td>(trade, catering, consumer services))</td>
<td>Economic situation</td>
</tr>
<tr>
<td>Social sphere</td>
<td></td>
</tr>
<tr>
<td>Investment sphere</td>
<td></td>
</tr>
</tbody>
</table>

Eremina Tatiana “Women for Safety” (Russia)
LIST OF BUILDINGS AND STRUCTURES with large assembly of people in a district (high-risk facilities)

- Hotels
- Theaters, cinemas
- Multifunctional centers
- Restaurants
- Clubs
- Hospitals
- Schools, kindergartens
- Boarding schools, old people homes
- Banks
- Prisons
- Museums
- Stadiums
- Railway stations, trains
- Harbours, Ships

Eremina Tatiana “Women for Safety” (Russia)
LIST OF UNIQUE FACILITIES in a district (high-risk facilities)

Historical buildings, complexes of historical buildings
Airports
Highrise buildings
Facilities of the fuel and energy complex

Eremina Tatiana “Women for Safety” (Russia)
Factors of risk management plan to assess the fire safety of a facility and to form an expert conclusion (NFPA 1250):

Risk identification (who is exposed; the statistics of previous years, the data on the equipment: operation, inspection reports, etc.);

Risk assessment (frequency of occurrence of a hazardous event, the consequences: the victims, the losses);

Determination of the sequence of actions for dealing with the risks identified;

Elimination or control of hazards.
According to the identified and analysed hazards the risk matrix is constructed.

<table>
<thead>
<tr>
<th>Probability</th>
<th>Consequences</th>
<th>Low</th>
<th>Middle</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Small risk</td>
<td>Small risk</td>
<td>Serious risk</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>Small risk</td>
<td>Serious risk</td>
<td>Unaccepted risk</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Serious risk</td>
<td>Unaccepted risk</td>
<td>Unaccepted risk</td>
<td></td>
</tr>
</tbody>
</table>
Coordination Center for Monitoring and Decision-Making

Challenges of a modern megapolis:
- Terrorism
- Crime
- Disturbances
- Natural disasters
- Environmental pollution
- Accidents with above the ground communications
- Accidents with underground communications
- Transportation failure
- Technological disasters

Functional sub-systems
- Monitoring, surveillance, control of infrastructure
- Monitoring of natural objects
- Reception of emergency messages and command and control of response (112 in Russia)
- Videomonitoring and data analysis
- Warning of people
- Transport monitoring and management
- Monitoring of environmental situation
- System of support of decisions made

Users
- Administrative bodies
- Owners and tenants of real estate
- Monitoring responsible bodies
- Businesses and organizations
- Structures of controls and operation of housing complex
- Citizens
- Security forces

New project SAFE CITY
PARTICIPANTS

Participants:
- Avangard JSC
- Optogan Ltd
- Svetlana JSC
- Radar MMS JSC
- Kositsky Plant CJSC
- Transas JSC
- Masshtab research institute
- NIIPS JSC
- Rubin research institute
- Ecolog Science and Production Complex
- «CC and TM» CJSC
- Tehnoros CJSC
- Intel Rossiya CJSC
- Speach Technologies Center Ltd
- Promt Ltd
- Leningrad Electrotechnical University, St. Petersburg
- St. Petersburg Bonch-Bruyevich University
- St. Petersburg ITMO Research Institution
- NIC S&PB Ltd
- ISIC C&FS Ltd
- Specpozhzaschita Ltd

Implementation of the projects that require software development and software engineering is performed by a group of companies:

Eremina Tatiana “Women for Safety” (Russia)
Aspects for discussion and further project development

1. To analyze the challenges in the area of fire safety and all areas connected with it (all consequences of fires to be evaluated (for example, ecological pollution) and included in total risk assessment (No 3)

2. To develop unified glossary with general definitions for safe cities (No 5)

3. To discuss how to add the 5-th index “Fire Safety” in estimation by “Safe Cities Index” (No 7)

4. To share experience in normative document development in the area of fire safety (No 20, 21, 24)

5. To develop criteria of monitoring of fire protection systems (water suppression, alarm system, warning system, smoke removal, fire protective paints quality, using reliable materials) (No 10, 11)

6. To develop unified requirements for software for the unified protocol for functional sub-systems and users (No 14)

Eremina Tatiana “Women for Safety” (Russia)
Aspects for discussion and further project development

7. To work as experts on development of normative documents for “Safe Cities”.

8. To form a work direction “Safe Cities”, collaborate with representatives of Top-10 safe cities (to share experience, to visit city, to invite representatives from Top-10 to meeting...).
References

"Fundamentals of the state policy in the field of public safety and security of the Russian Federation of critical and potentially dangerous objects from the threats of natural, man-made disasters and terrorist attacks for the period till 2020"


Federal Law of 22.07.08 № 123-FZ "Technical Regulations on fire safety requirements"

Order of the Ministry of Emergency Situations of 30.06.09 № 382 on the approval procedure for determining the calculated values of fire risk for the buildings and structures of various classes of functional fire hazard

Order of the Ministry of Emergency Situations of 10.07.09 № 404 on the approval procedure for determining the calculated values of fire risk for production facilities

NFPA 1250 Recommended Practice in Fire and Emergency Service Organization Risk Management

NFPA 1300 Standard on Community Risk Assessment and Community Risk Reduction Plan Development


Eremina Tatiana “Women for Safety” (Russia)

New project SAFE CITY
SHALL WE COLLABORATE FOR SAFE CITIES TO CREATE SAFE PLANET? WE COULD DO THIS!