

RMIS Demonstration



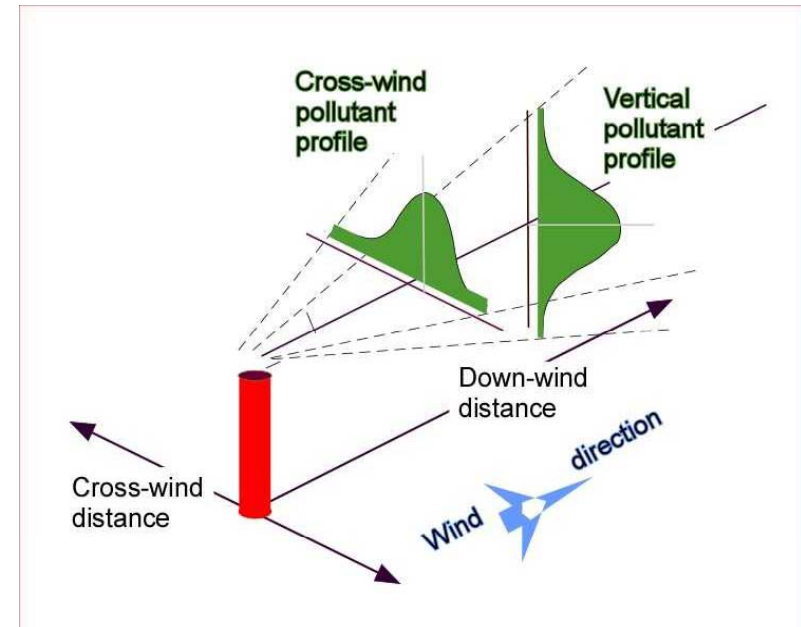
Presentation Flow

- Key issues in managing chemical risk;
- Need for GIS-enabled integrated information systems and modelling tools;
- The Risk Management Information System (RMIS);



The Issues

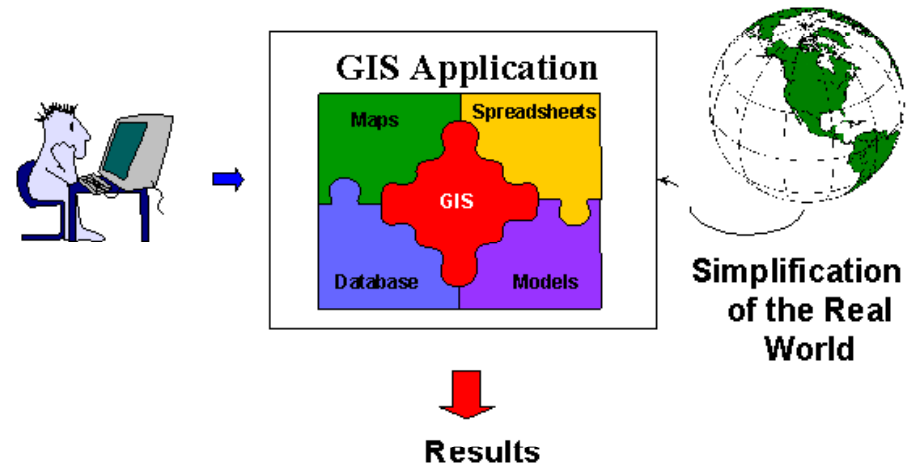
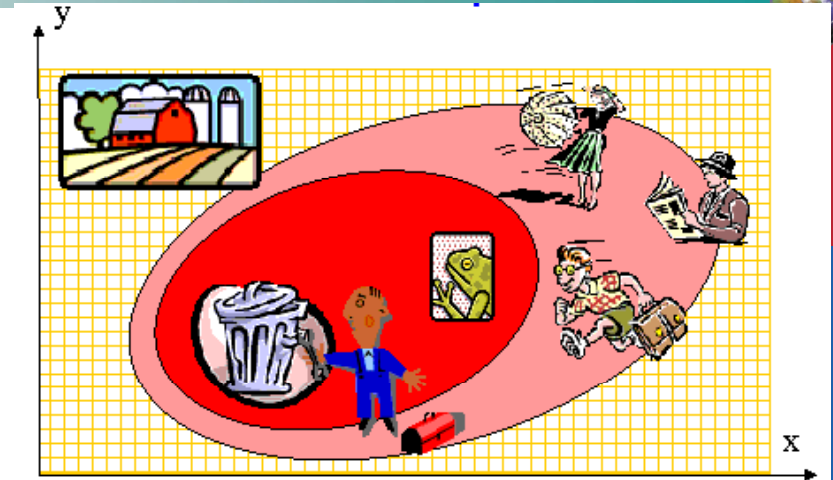
- Technological risk events typically unfold in matter of hours - short response time
- Requires updated information from diverse sources to assess damage
- Prediction needs solving of complex algorithms and spatial analysis



$$C(x, y, z) = \frac{Q}{u \sigma_y \sigma_z 2\pi} e^{-\left(\frac{y^2}{2\sigma_y^2}\right)} \left[e^{-\left(\frac{(z+H_e)^2}{2\sigma_z^2}\right)} + e^{-\left(\frac{(z-H_e)^2}{2\sigma_z^2}\right)} \right]$$

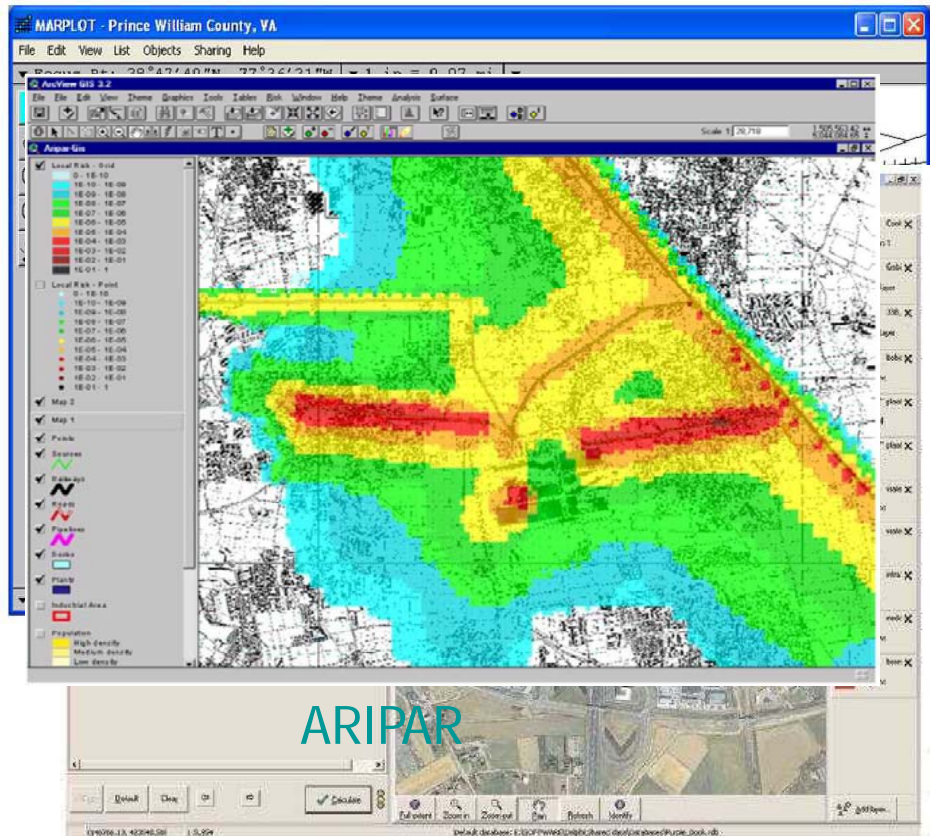
Why we require information system support?

- Management of a chemical risk scenario is information intensive;
- Models require high processing power;
- Strong spatial dimension;



Gaps in existing tools

- Provide end point effect distances for different incidents;
- Hazard footprints displayed for better visualization;
- Risk maps shown as contours;
- But, not closely coupled with GIS;



ARIPAR

EFFECTS

Risk Management Information System (RMIS)



Key Features:

- Aggregate information on industries, chemicals, hazards, vulnerability, emergency responders in a single database;
- Provides for spatial analysis and better understanding of chemical risks;
- Transparent mechanism for sharing risk related information;
- Integrated with QRA based consequence analysis models for providing decision support to risk management actors;

RMIS - Key Benefits

- High scale of Maps - better representation of hazards and vulnerabilities;
- Hazard Data and Maps can be updated / managed in a distributed manner or centrally;
- [Active] Modeling of accident scenarios - MCLS or any quantity of chemical;
- Live Meteorology Information while the risk event is unfolding;



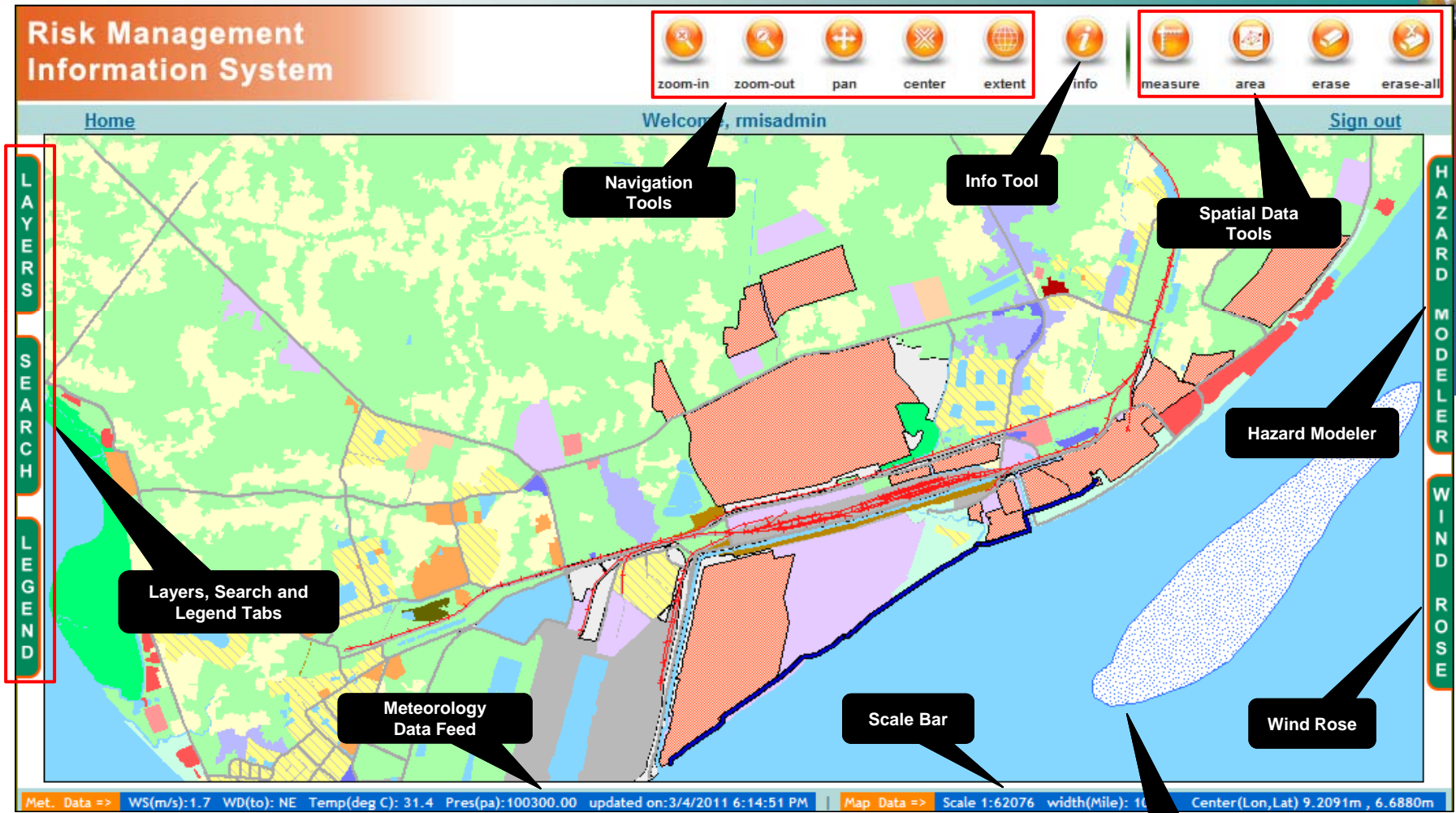
Building the RMIS



- Industrial town of Haldia in West Bengal;
- Identifying and mapping chemical hazards;
- Mapping elements at risk;
- Appending information in a central database;
- Integrating Risk Analysis Models for prediction of accident scenarios;



RMIS Interface



Custom Built User Controls integrated with the web interface



RMIS Interface (contd...)

The screenshot displays the Risk Management Information System (RMIS) interface. At the top, the title "Risk Management Information System" is visible. Below the title is a navigation bar with a "Home" link, a user greeting "Welcome, rmisadmin", and a "Sign out" link. A toolbar contains icons for zoom-in, zoom-out, pan, center, extent, info, measure, area, erase, and erase-all. On the left side, there is a vertical menu with "LAYERS", "SEARCH", and "LEGEND" options. The main map area shows a geographical area with various colored regions representing different layers. A "Layer Management" panel is open on the left, listing various layers with checkboxes and a scale of 5.0. The layers include Landmark, Industry, Chemical Storage, Building, Infrastructure, Pipeline, Road, Railway, Land Use, Administrative Block, and Ward. On the right side, there is a vertical menu with "HAZARD MODELER" and "WIND ROSE" options. At the bottom, a status bar provides metadata: "Met. Data => WS(m/s):1 WD(to): NW Temp(deg C): 35.1 Pres(pa):100490.00 updated on:3/8/2011 12:29:51 PM | Map Data => Scale 1:60344 width(Mile): 10.02 Center(Lon,Lat) 9.2090m , 6.6880m".

Layer Name	Visible	Scale
Landmark	<input checked="" type="checkbox"/>	5.0
Industry	<input checked="" type="checkbox"/>	
Chemical Storage	<input checked="" type="checkbox"/>	5.0
Building	<input checked="" type="checkbox"/>	5.0
Infrastructure	<input type="checkbox"/>	
Pipeline	<input checked="" type="checkbox"/>	
Road	<input checked="" type="checkbox"/>	
Railway	<input checked="" type="checkbox"/>	
Land Use	<input type="checkbox"/>	
Landuse	<input checked="" type="checkbox"/>	
Administrative Block	<input type="checkbox"/>	
Ward	<input type="checkbox"/>	



Layer Management

RMIS Interface - Search Function

The screenshot displays the RMIS interface with a search function. The search panel on the left includes the following filters:

- Search for: Chemical Nature
- Industry Name: -Select a Industry-
- Chemical Name: -Select a Chemical-
- Chemical Nature: Flammable, Explosive, Toxic, Highly Toxic
- Chemical Quantity: >= 10000 MT.

The search results are displayed in three panels on the right, each titled "FACILITY & STORAGE INFORMATION".

Facility 1: Haldia Petrochemicals Limited
Address: Post Box 12 Durgachak, Haldia, Purba Midnapore, Haldia-721602

Storage	Chemical	Capacity (Avg. Full)	Map
HPL-TK01	Naptha	29000 MT (85%)	Map
HPL-TK02	Naptha	29000 MT (85%)	Map
HPL-TK03	Naptha	29000 MT (85%)	Map
HPL-TK04	Naptha	29000 MT (85%)	Map

Facility 2: Haldia Refinery, Indian Oil Corporation Ltd.
Address: Post- Haldia Oil Refinery, Purba Medinipur, Haldia-721606

Storage	Chemical	Capacity (Avg. Full)	Map
IOCTK-06	Motor spirit	18076 MT (80%)	Map

Facility 3: Indian Oil Petronas Pvt. Ltd.
Address: LPG Import / Export Terminal, Haldia, Haldia-721602

Storage	Chemical	Capacity (Avg. Full)	Map
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Search by Chemical Nature & Quantity

Search Results



RMIS Interface - Meteorology

The screenshot displays the RMIS interface with a central map and a Wind Rose chart. The map shows a coastal area with various colored zones and a road network. The Wind Rose chart shows wind frequency by direction and speed. The interface includes a top navigation bar with icons for zoom-in, zoom-out, pan, center, extent, info, measure, area, erase, and erase-all. A sidebar on the left contains 'LAYERS', 'SEARCH', and 'LEGEND' buttons. A sidebar on the right contains 'HAZARD MODELER' and 'WIND ROSE' buttons. The bottom status bar provides meteorological data: WS(m/s): 1.7, WD(to): N, Temp(deg C): 35.0, Pres(pa): 100430.00, updated on: 3/8/2011 12:44:51 PM, Map Data => Scale 1:5183.

Risk Management Information System

Home Welcome, rmisadmin Sign out

zoom-in zoom-out pan center extent info measure area erase erase-all

LAYERS SEARCH LEGEND

HAZARD MODELER WIND ROSE

Wind Rose

Day Period
 Today Month
 Season

Time Period
 12am-6am 6am-12pm
 12pm-6pm 6pm-12am
 All

[Refresh](#)

Wind Speed (m/s)
Green: < 2 Yellow: 2 - 4 Red: 4 - 6 Blue: >= 6

Met. Data => WS(m/s): 1.7 WD(to): N Temp(deg C): 35.0 Pres(pa): 100430.00 updated on: 3/8/2011 12:44:51 PM | Map Data => Scale 1:5183

Daily and Seasonal
Wind Patterns

RMIS Interface - Hazard Modeler

Risk Management Information System

Home Welcome, rmisadmin Sign out

Hazard Modeler

Atmospheric Data **Hazard Modeler**

Wind

Direction

Feed Data From Met Station User

Speed Meters/sec

Absolute Pressure Pa

Temperature Degrees C

Relative Humidity %

Time of Event (hh:mm)

Cloud Cover

Complete Cover Mostly Cloudy Partly Cloudy Light Cloud Clear

Ground Roughness

Open Country Urban or Forest

Set Parameters

Met. Data => WS(m/s):1 WD(to): NE Temp(deg C): 36.0 Pres(pa):100350.00 updated on:3/9/2011 1:44:51 PM | Map Data => Scale 1:46816 width(Mile): 8.02 Center(Lon,Lat) 9.2347m , 6.6874m



Setting up atmospheric data

RMIS Interface - Hazard Modeler (contd...)

Risk Management Information System

Home Welcome, rmisadmin Sign out

Hazard Modeler

Atmospheric Data Hazard Modeler

Risk Wizard Summary

Storage & Chemical Data:
Facility name: Sanjana Cryogenic Storages Limited
Storage Name :SCTK01
Chemical Name : Ammonia
Risk Event : Toxic Release
Hazardous Chemical Properties : Liquid, Highly Toxic
Maximum Quantity: 10000 MT (Average Fullness : 50%)
Environmental Condition-Storage : Liquefied Gas under Refrigeration
IDLH Value (in mg/m³):210

Calculate Vulnerability based on : Habitation Building

Delineate Level of Concern -

Red - High : (in mg/m³)
Orange - Moderate : (in mg/m³)
Yellow - Low : (in mg/m³)

Generate Risk Event

Met. Data => WS(m/s):1 WD(to): NE Temp(deg C): 36.0 Pres(pa):100350.00 updated on:3/9/2011 1:44:51 PM | Map Data => Scale 1:46816 width(Mile): 8.02 Center(Lon,Lat) 9.2347m , 6.6874m



Preparing the hazard model

RMIS Interface - Hazard Modeler (contd...)

Risk Management Information System

Home

Affected roads and intersections

Risk Event Information

Facility Name : Sanjana Cryogenic Storages Limited
 Name of Storage : SCTK01 - Ammonia (10000 MT)
 Risk Scenario : Toxic Release
 Amount Involved : 75 MT
 Distance : End-point Distance to IDLH Concentration
 Exposure of Toxic Gas= Red:1920.01
 Orange:2320.01
 Yellow :2940.01 Meters

Affected Industries

Facility Name	Emergency Contact Nos	Map
Sanjana Cryogenic Storages Limited	9332341643	Map
Tata Chemicals Limited	9434060902	Map

Estimation of affected population

Population of buildings at 12:30 AM 7416

Affected Responder/Receptor

Name	population	Map
Akash Ganga Commercial Complex	35	Map
Basudevpur Paschimpally Primary School	0	Map
Durga Chak Police Station	22	Map
Durgachak Colony	1526	Map
Durgachak New Market	17	Map
Durgachak Uttarpalli Primary School	0	Map

Met. W5(m/s):2 WD(to): SE Temp(deg C): 29.0 Pres(pa):99520.0 dated on:5/10/2011 5:41:19 Map Scale 1:31729 Dist(Mile): 5.05 Center(Lon,Lat) 9.2566m , 6.6965m

Hazard Footprint

Vulnerability Data



Conclusion



- The RMIS has been developed as a versatile and integrated information system that can assist decision makers to effectively plan for and manage a chemical risk event

Thanks!

