Section D

System Architecture
System Architecture

- **Environmental Stewardship & Public Health Actions**
  - Track health, disease, and exposure risk/trends
  - Detect & evaluate risk of exposure to env. hazards
  - Develop & evaluate public health & environmental stewardship policies & programs

- **Exposure Detection & Risk Analysis**
  - Develop rapid-response mechanisms to investigate outbreaks and clusters
  - Develop prevention guidelines/standards
  - Generate hypotheses and initiate applied research

- **Integrated Environmental Health Indicators Data Warehouse**

- **Data Integration Transformation & Geocoding**

- **Environmental Hazards, Ecology and Disease Data Collection Systems**
  - Hazardous Substances-Emergency Event Surveillance
  - Toxic Release Inventory

- **GIS/Spacial Epidemiology**
  - Natural
  - Accidental
  - Intentional

- **Risk Analysis**
  - Exposure

- **Data Mining & Knowledge Discovery**

- **Statistical Models**

- **Environmental Hazard**
  - Hazardous Material Profile
  - Exposure Profile
  - Biomonitoring

- **Population Demography**
  - Population
  - Ecological Indicators
  - Disease Indicators

- **Health Outcomes**

- **Metadata**
  - Data Standardization
  - Geocoding
  - Data Linking/Integration
  - Data Quality Assurance

- **Hazards Tracking**
  - Hazardous Substances-Emergency Event Surveillance
  - Toxic Release Inventory

- **Exposure Tracking**
  - Human Exposure to Environments
  - Chemicals
  - Toxic Exposure Surveillance

- **Ecological Tracking**
  - Marine Life
  - Animals
  - Plants

- **Population Demographics**
  - Census Data

- **Disease Tracking**
  - Hospital Discharge
  - Birth Defects
  - BRFSS
  - Cancer Registries
  - Health Surveys
  - Vital Statistics

*Based on risk assessment and national priorities.
Adapted by CTIT from Nabil Issa, CDC/NCEH, Brussels, Belgium June 2002.
The **top layer** of the diagram depicts environmental stewardship functions aimed to solve environmental health problems (knowledge)
- That is, system goals

The **middle layer** shows the relationships between data on hazards, exposure, outcomes, and affected population
- This data is manipulated/analyzed/displayed (that is, statistically analyzed, mined, GIS-based) and presented as information

The **bottom layer** of the EPHTN architecture shows Data from data sources on hazards, exposure, disease outcomes, and affected population
Requirements Elicitation Includes:

- Specifying goals
- Specifying actors (business and technical)
- Specifying functional and non-functional requirements
- Specifying use cases
- Developing models/diagrams
  - Use case, workflow, and dataflow
- Specifying high-level system architecture
- Specifying hardware and software requirements
- Specifying system evaluation plan
- Specifying project timeline and documentation
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During **testing**, developers find differences between the system and its model by executing the system (or parts of it) with sample input data set.

The **goal** of testing is to discover as many faults as possible so that they can be repaired before the delivery of the system.

During **unit testing**, developers compare the object design model with each object and subsystem.

During **integration testing**, combination of subsystems are integrated together and compared with the system design model.

**System tests** are planned during requirement elicitation and analysis activities; integration tests are planned during system design activity.
Four Levels of Information System Evaluation

- Level I: technical level—*does system work?*
  - Does system support data entry (input)?
  - Can system generate reports (output)?

- Level II: usability level—*does the user like the system?*
  - Does user like screen layout, color scheme, font size (input)?
  - Does user like the report layout, font size (output)?

- Level III: functional level—*does system support user functions?*
  - Does system support the user workflow and dataflow?

- Level IV: knowledge level—*does system support defined goals?*
  - Does system support user expectations in solving the problem?
Pilot Testing

- The first three levels of system evaluation are conducted during **pilot testing**—a step that follows the system development phase prior to the full implementation.

- System faults detected during the pilot testing are documented in the *Pilot Testing Report*, corrected and tested again; and documented in the *Pilot Testing Report* again.

- Accepted by user after pilot testing, the system is ready to be implemented.
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Information System Development Timeline

- Information system is a commercial product; as any commercial product, it has a strict timeline in which it is delivered as follows:
  - Requirement analysis and design: two to three months
  - Development: six months
  - Pilot testing - during the ninth month
  - Implementation: 10-24 months

- If you do not have working system in two years:
  - You incorrectly specified the requirements
  - You chose wrong vendor

- Next slide shows the example of the information system development timeline and deliverables by system design phase
Timeline and Deliverables

Requirement elicitation and design
- Requirement Analysis Document (RAD)

System development
- System Development Specification Document

Pilot testing
- Pilot Testing Protocol and Report

System implementation
- System Documentation Prototype

System evaluation
- System Evaluation Protocol and Report

System operation
- System Documentation and Operational Manual