



**USAID**  
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**VIETNAM**

# DIOXIN ASSESSMENT / REMEDICATION TRAINING PROGRAM

## Human Health Risk Assessment Training Part 1

Training Materials

October 18 – 19, 2017



## HUMAN HEALTH RISK ASSESSMENT TRAINING PART 1

### AGENDA

18 to 19 October 2017

Hotel de l'Opera – Hanoi, Vietnam

#### Day 1: 18 October 2017

Time	Description
8:00-8:30	Registration and Coffee
8:30-8:45	Opening of training workshop and welcome
8:45-9:00	Key objectives of the HHRA training
9:00-9:30	Human health hazard and risk assessment: theory and approach (high level introduction)
9:30-10:00	Group photos and coffee break
10:00-10:45	Introduction to POPs Toolkit (structure/modules)
10:45-11:45	Pre-Assessment Planning – Module 1 (include site prioritization tool)
11:45-12:00	Questions and Discussion
12:00-13:00	Lunch break
13:00-14:30	Hands-on application of site prioritization tool (hand out to be provided with examples from Laos, Cambodia and Malaysia) + Discussion and Q&A
14:30-15:00	Coffee Break
15:00-15:30	Pre-Assessment Planning – Module 2 & 3
15:30-16:30	Risk Assessment – Module 1
16:30-17:00	Questions, Discussion and recap of Day 1

#### Day 2: 19 October 2017

Time	Description
8:00-8:15	Recap of Day 1
8:15-10:00	Risk Assessment – Module 2 (problem formulation) and Module 3 (Exposure assessment).
10:00-10:15	Coffee break
10:15-12:00	Risk Assessment - Module 4 (toxicity assessment), Module 5 (risk characterization), Module 6 (risk assessment tools) (~30 minutes for each)
12:00-13:00	Lunch break
13:00-15:00	Hands-on application of risk calculation tools (handout to be provided with exposure scenarios, i.e., selected priority site from Day 1)
15:00-15:15	Coffee Break
15:15-16:15	Presentations by each group on risk calculation results
16:15-16:45	Explain assignments and mentorship period. Hand out class assignments
16:45-17:00	Wrap-up and closing, and training evaluations



# OVERVIEW OF USAID's HUMAN HEALTH RISK ASSESSMENT TRAINING PROGRAM & RISK ASSESSMENT TOOLKIT FOR CONTAMINATED SITES

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18 October 2017

# BACKGROUND

Building upon the 4-part training/certificate program conducted from September 2014 to April 2016, the following additional capacity building activities are being conducted for Vietnamese stakeholders:

- Human Health Risk Assessment (HHRA) Training;
- Scientific Writing Skills Training (Part I completed); and
- Manual for the Characterization and Remedial Selection for Cleanup of Dioxin-contaminated Sites in Vietnam (to be provided to trainees for review and comment).



# OBJECTIVES OF USAID TECHNICAL ASSISTANCE & TRAINING PROGRAM

## Overall:

- To build capacity of GVN officials to conduct environmental assessment/remediation activities
- Provide participants with in-depth training on the application of HHRA concepts, site prioritization, HHRA problem formulation, risk management, and HHRA case studies using data from Danang Airport, Bien Hoa Airbase and other contaminated sites in SE Asia.



# OBJECTIVES OF USAID TECHNICAL ASSISTANCE & TRAINING PROGRAM (2)

The Risk Assessment Toolkit also aligns with key objectives presented in the GVN's *National Action Plan to Overcome the Consequences of Toxic Chemicals used by the U.S. in the War in Vietnam*, which includes specific objectives focused on:

- Enhancing the capacity of research on toxic chemicals and analysis of dioxin content in samples of fat, blood, and environment to international standards;
- Assessing potential and long-lasting consequences of toxic chemicals on human health;
- Building capacity in research for overcoming the consequences of toxic chemicals; and
- Training and building a team of scientific researchers to address toxic chemicals/dioxin in Vietnam.

# RISK ASSESSMENT TOOLKIT FOR CONTAMINATED SITES

- The Risk Assessment Toolkit platform provides trainees with an online and offline resource for managing contaminated sites (based on [www.popstoolkit.com](http://www.popstoolkit.com)).
- It includes direct learning content, an online “knowledge sharing and collaboration system” using Moodle, and data-secure interactive tools designed to lead participants through the HHRA process.

# RISK ASSESSMENT TOOLKIT FOR CONTAMINATED SITES (2)

The Risk Assessment Toolkit will be used to conduct a 2-part training program focused on:

- the HHRA process;
- the identification of contaminant sources, exposure pathways, receptors; and
- overall risks associated with dioxin and other persistent organic pollutant (POPs) contaminated sites (e.g., polychlorinated biphenyls [PCBs]).

Information in the Risk Assessment Toolkit is applicable to other contaminated sites (e.g., heavy metals).



# HHRA TRAINING OBJECTIVES

Provide participants with in-depth training on the application of:

- HHRA concepts;
- Site prioritization;
- HHRA risk characterization;
- Risk management;
- Risk communication;
- HHRA case studies using data from Danang Airport, Bien Hoa Airbase and other South-East Asian contaminated sites.



# HHRA TRAINING PROGRAM OUTLINE

## Workshop I (October 2017):

- Basics of HHRA;
- Site prioritization; and
- HHRA risk characterization.

Mentorship period – October 2017-March 2018

## Workshop 2 (March 2018):

- Review and presentation of risk assessment case studies;
- Risk management; and
- Risk communication.



# HHRA TRAINING WORKSHOP I – AGENDA

## – Classroom Day 1 – October 18, 2017:

- Introduction to HHRA, including theory and approaches.
- Pre-assessment planning using the site prioritization tool. Case studies will be introduced using data from ASEAN countries.

## – Classroom Day 2 – October 19, 2017 :

- Basic components of Human Health Risk Assessment, including Problem Formulation, Exposure Assessment, Toxicity Assessment and Risk Characterization.
- Use of the Risk Calculation Tools in the Risk Assessment Toolkit. ASEAN country case study data will be used as a demonstration. Participants will then use these data to obtain practical experience using the Toolkit.
- Participants will be assigned a case study and be provided with instructions on using the Risk Assessment Toolkit for conducting an HHRA, sharing knowledge and learning, and collaborating on assignments using Moodle.



## MENTORSHIP PERIOD October 2017– March 2018

- Participants will interact online with CDM Smith and Hatfield trainers as they complete their case study assignments.
- Conducted online using Moodle.org open-sourced learning platform.
- Forum for participants to communicate with their colleagues and exchange information and ideas.
- Additional background materials, discussion topics and assignments will be provided to trainees during the mentorship period.
- Questions will be answered online, and guidance provided where needed to complete the assignments.



# HHRA TRAINING WORKSHOP 2 (March 2018)

## – Classroom Day 1:

- Review of the HHRA process.
- Participants will review and present their HHRA reports. Topical discussions that took place during the mentorship period will be presented and concluded.
- Group discussions on participants' experiences with the HHRA process and the use of the Risk Assessment Toolkit will also take place.

## – Classroom Day 2:

- Training and exercises/practice in risk management and risk communications.
- Offline versions of the Risk Assessment Toolkit will be distributed.



# RISK ASSESSMENT TOOLKIT TRAINING:

# HUMAN HEALTH HAZARD AND RISK ASSESSMENT: THEORY AND APPROACH

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18 October 2017

# WHAT IS RISK?

- Risk is an intrinsic part of life
- Any activity is associated with some risk
- For a risk to exist, there needs to be some kind of hazard or danger
  - e.g., chemical, explosive, mechanical hazard



# WHAT IS ENVIRONMENTAL RISK?

- Environmental Risk:
  - the probability of adverse effects from exposure to environmental hazards [*per USEPA Risk Assessment Guidance for Superfund*]
    - Human health risk (e.g., cancer)
    - Ecological risk (e.g., population decline)
- What causes environmental risk?
  - Hazardous contaminants in environmental media
    - e.g., soil, water, fish, etc.





# WHY IS ENVIRONMENTAL RISK ASSESSMENT IMPORTANT?

- Protection of human and ecological health
- Environmental stewardship
- Compliance with environmental standards and regulations



# ENVIRONMENTAL REGULATIONS



- Ministry of Natural Resources and Environment (MONRE)
  - Law on Environmental Protection
    - Prevention of environmental pollution and degradation
      - Environmental impact assessment
      - Environmental protection in production, business, and service amenities
      - Waste management
    - “Polluter pays”
  - National Technical Regulations
    - e.g., QCVN 45:2012/BTNMT – *Allowed Limits of Dioxin in Soils*
    - QCVN 07: 2009/BTNMT – *Hazardous Waste Thresholds*
    - QCVN 06: 2009/BTNMT – *Hazardous Substances in Ambient Air*
- Regional Department of Natural Resources and Environment (DONRE)

# WHEN TO EVALUATE RISKS?

- PROACTIVE

- Avoid/limit risk before performing a potentially hazardous activity
- e.g., Environmental Impact Assessment

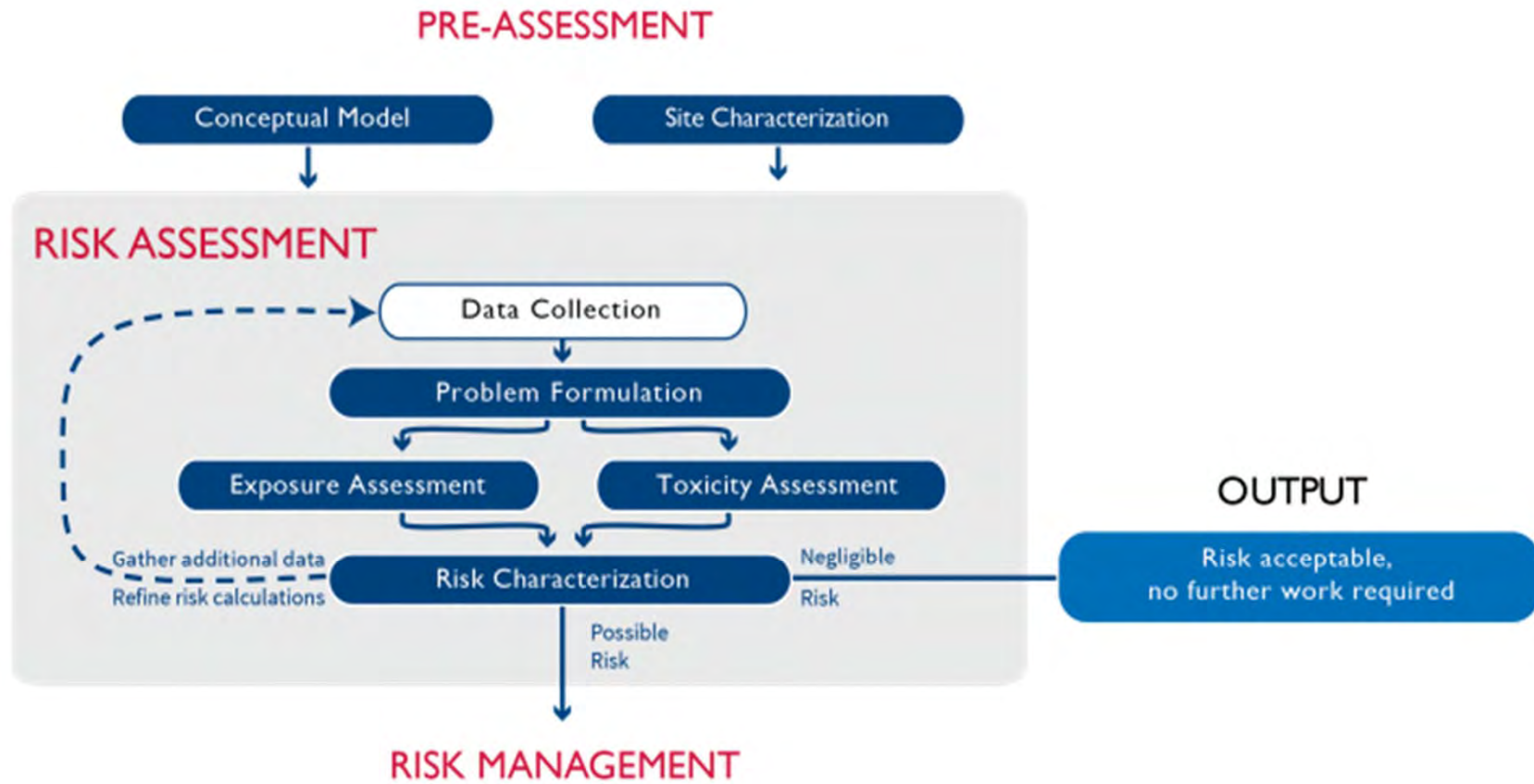


- RETROACTIVE

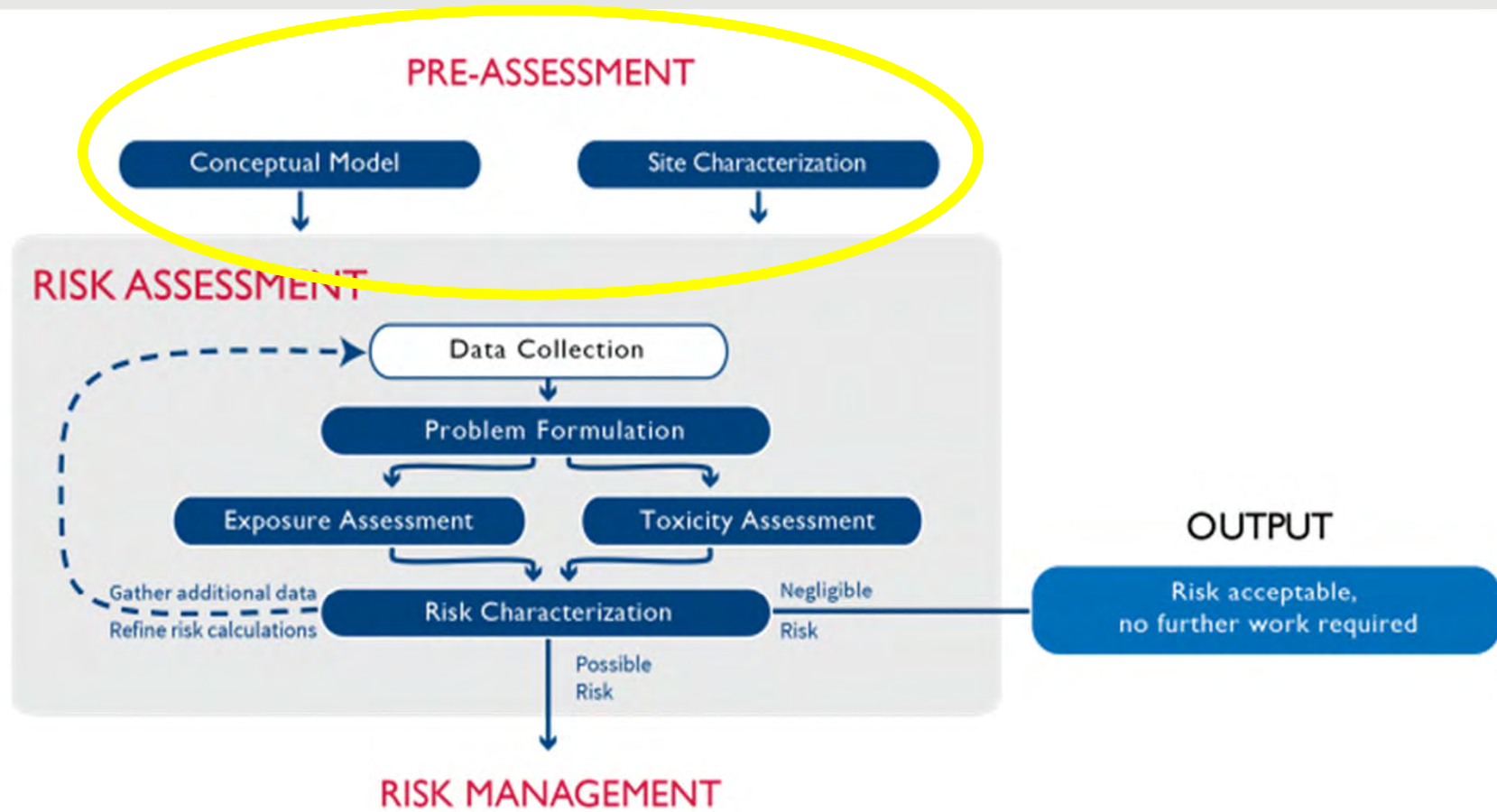
- Remediate/reduce risk after a hazardous activity has occurred
- e.g., Baseline Human Health Risk Assessment



# RISK-BASED EVALUATION APPROACH



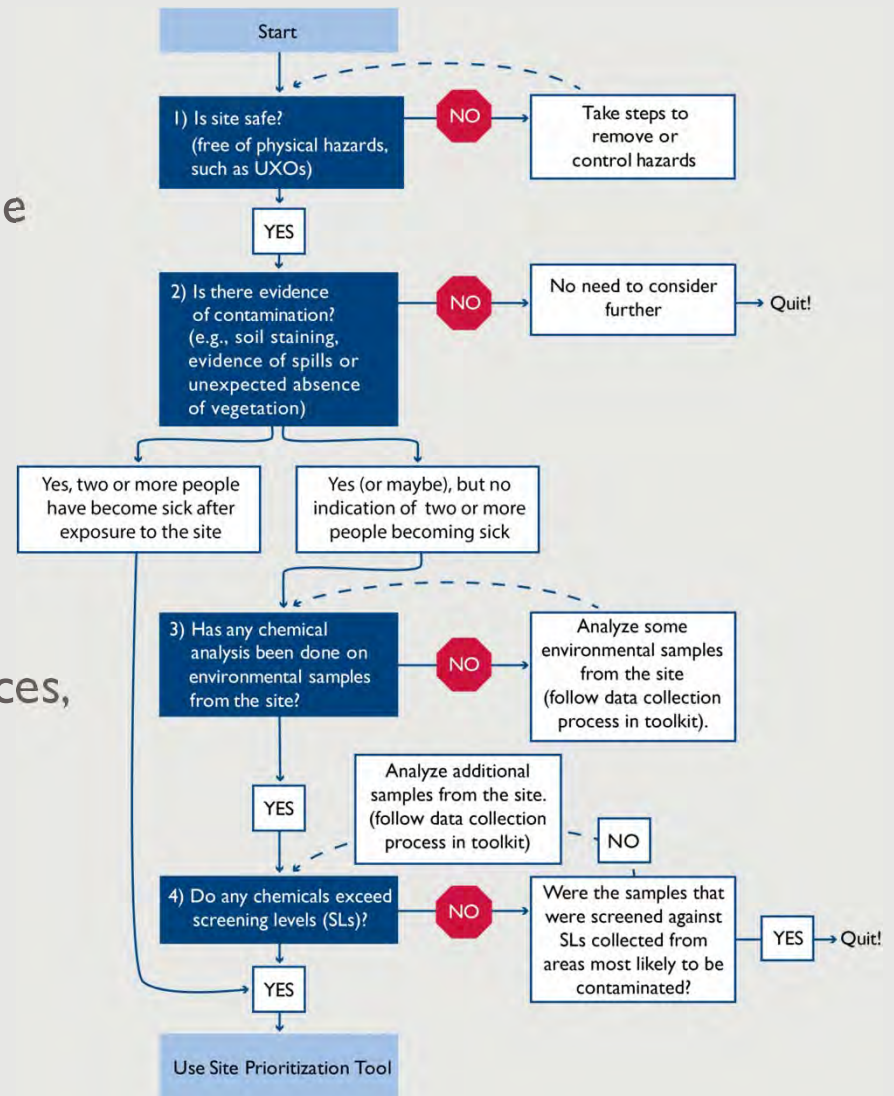
# RISK-BASED EVALUATION APPROACH



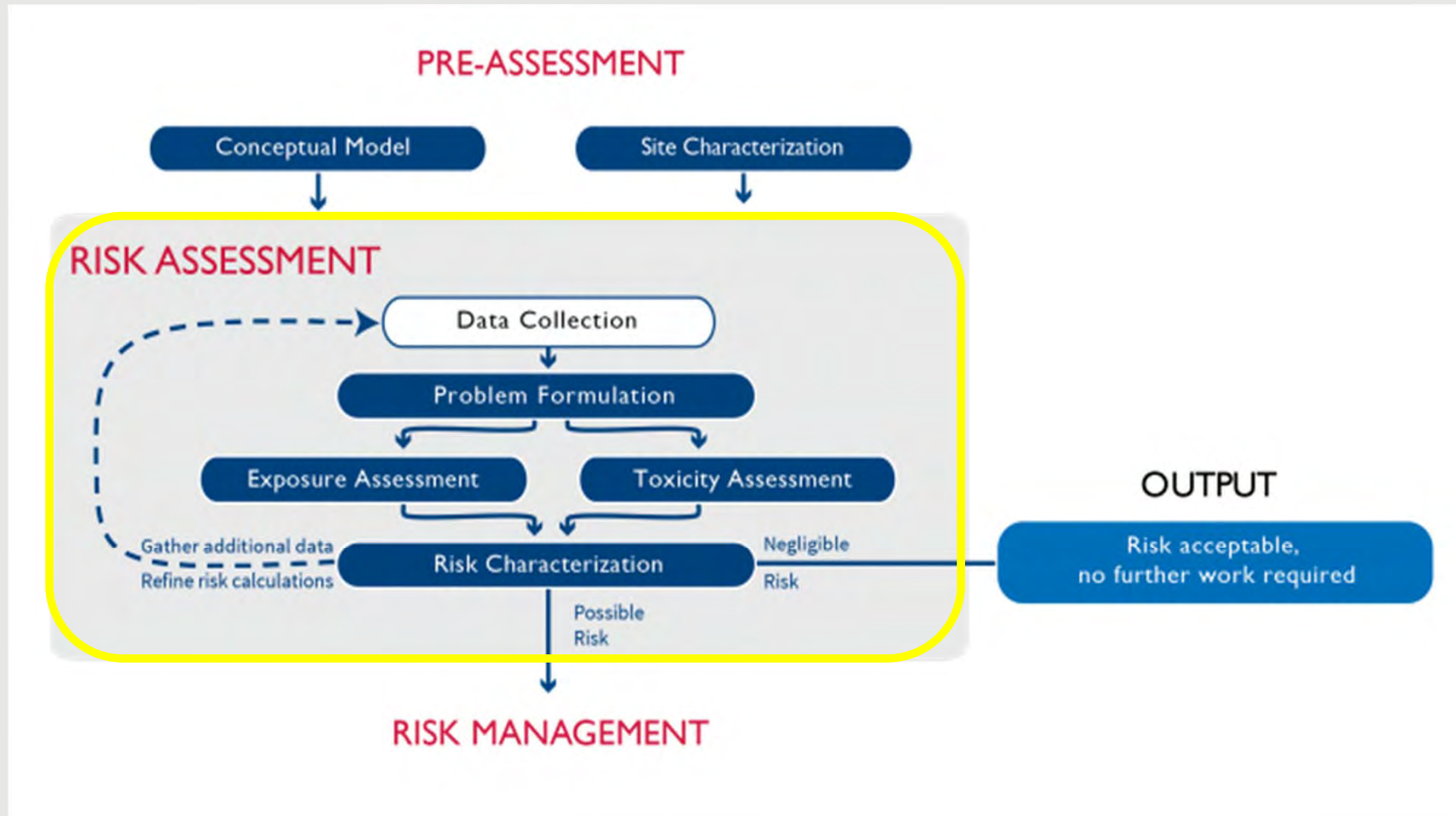


# PRE-ASSESSMENT

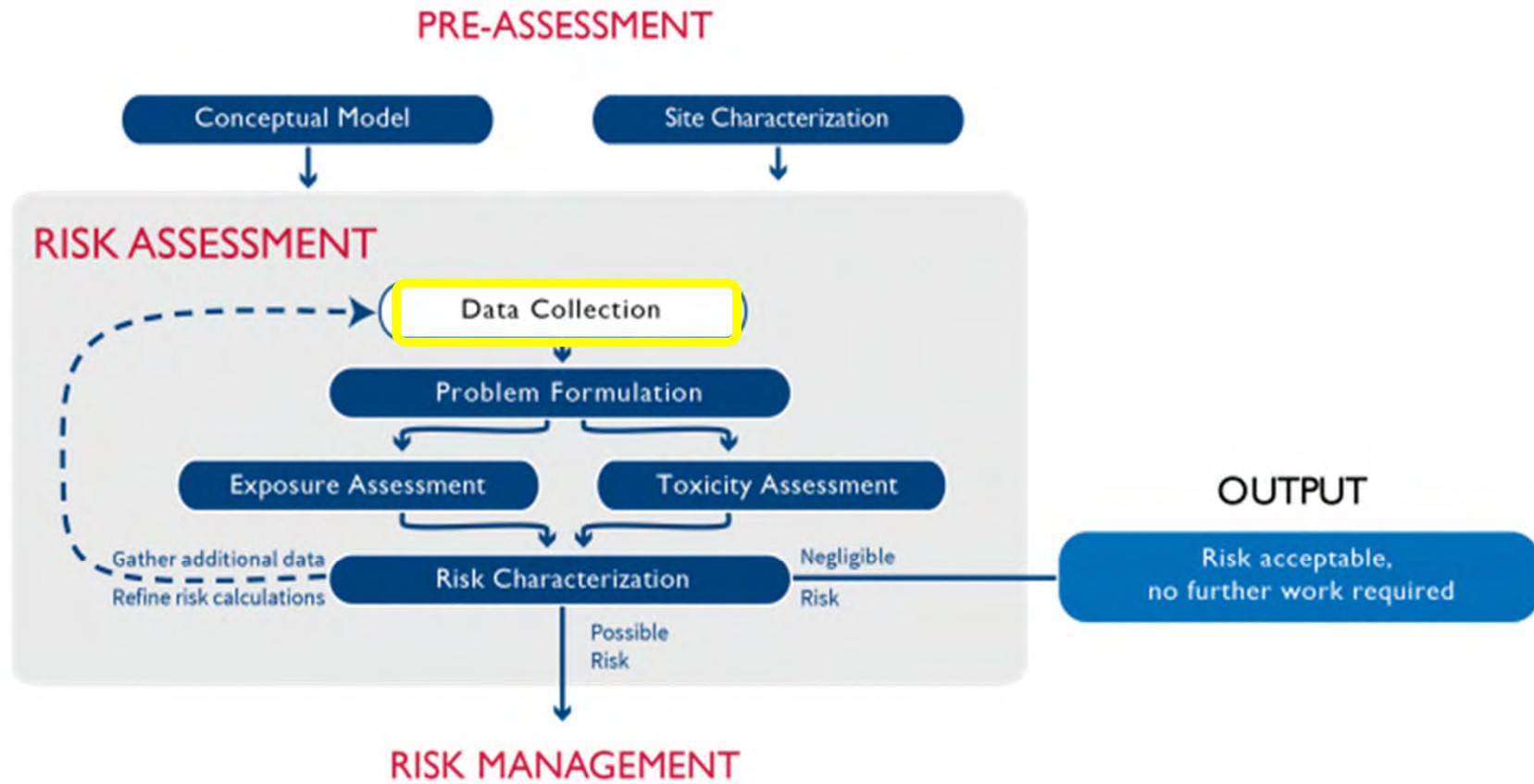
- Pre-screening
  - Determine which sites should be carried forward for further evaluation
  - Prioritize sites based on risk potential
- Preliminary Conceptual Site Model
  - Summarizes contaminants, sources, release mechanisms, exposure media, receptors/pathways
  - Identify data gaps
- Preliminary Site Characterization



# RISK-BASED EVALUATION APPROACH



# RISK-BASED EVALUATION APPROACH



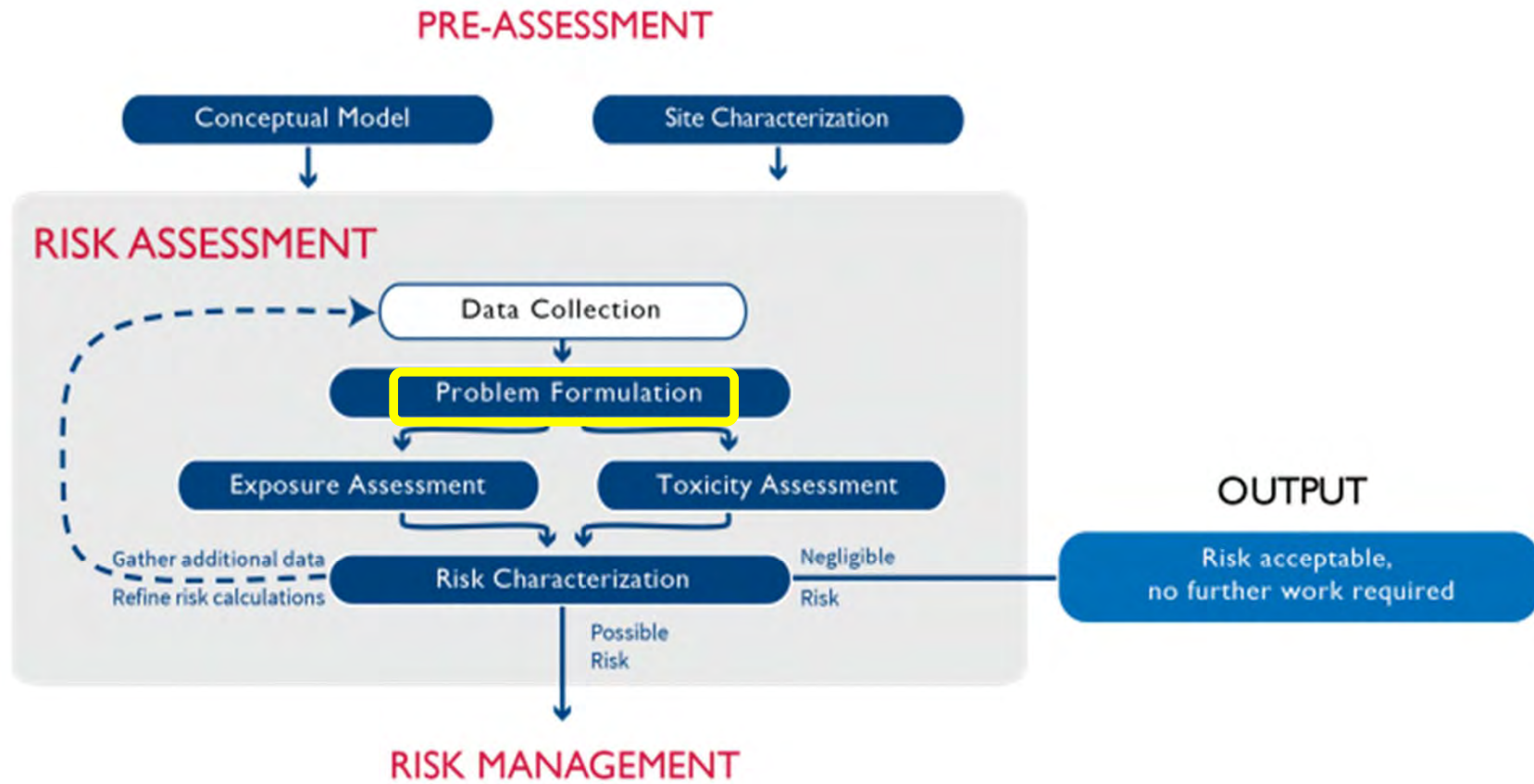


# DATA COLLECTION

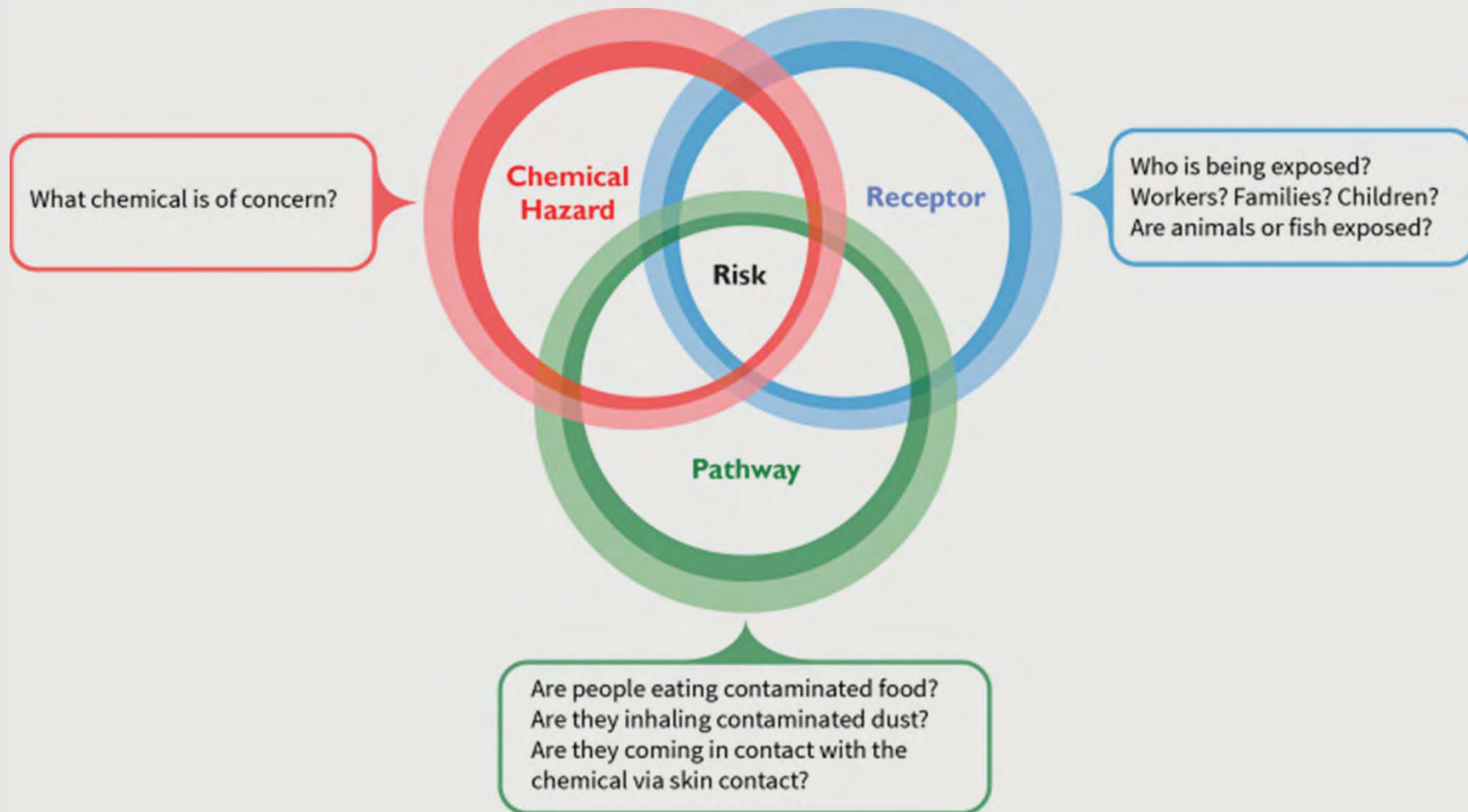
- Develop Data Quality Objectives (DQOs)
  - Why? When? Where? How many?
- Conduct Site Investigation
  - Visual, physical, biological observations
  - Samples for contaminant analysis
  - Ancillary data (e.g., interviews)



# RISK-BASED EVALUATION APPROACH



# RISK COMPONENTS



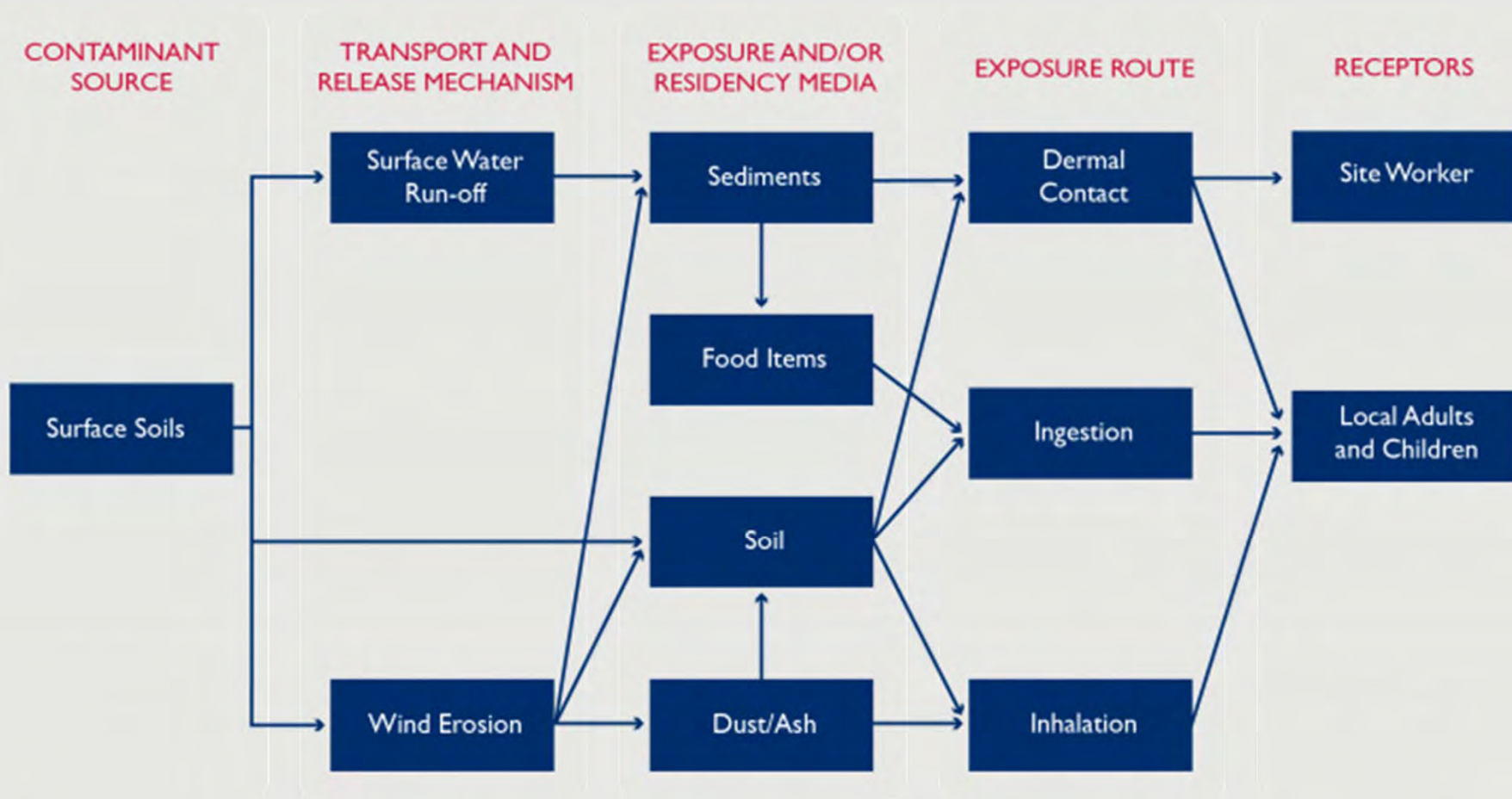
# PROBLEM FORMULATION

- Determine **Receptors** of Interest
  - e.g., residents, workers, ecological (plants, fish, birds)
- Determine Environmental **Media** of Interest
  - e.g., soil, surface water, groundwater, food
- Determine **Exposure Routes** of Interest
  - i.e., ingestion, inhalation, dermal contact
- Determine **Chemicals** of Interest
  - Comparison to screening levels
  - Comparison to background



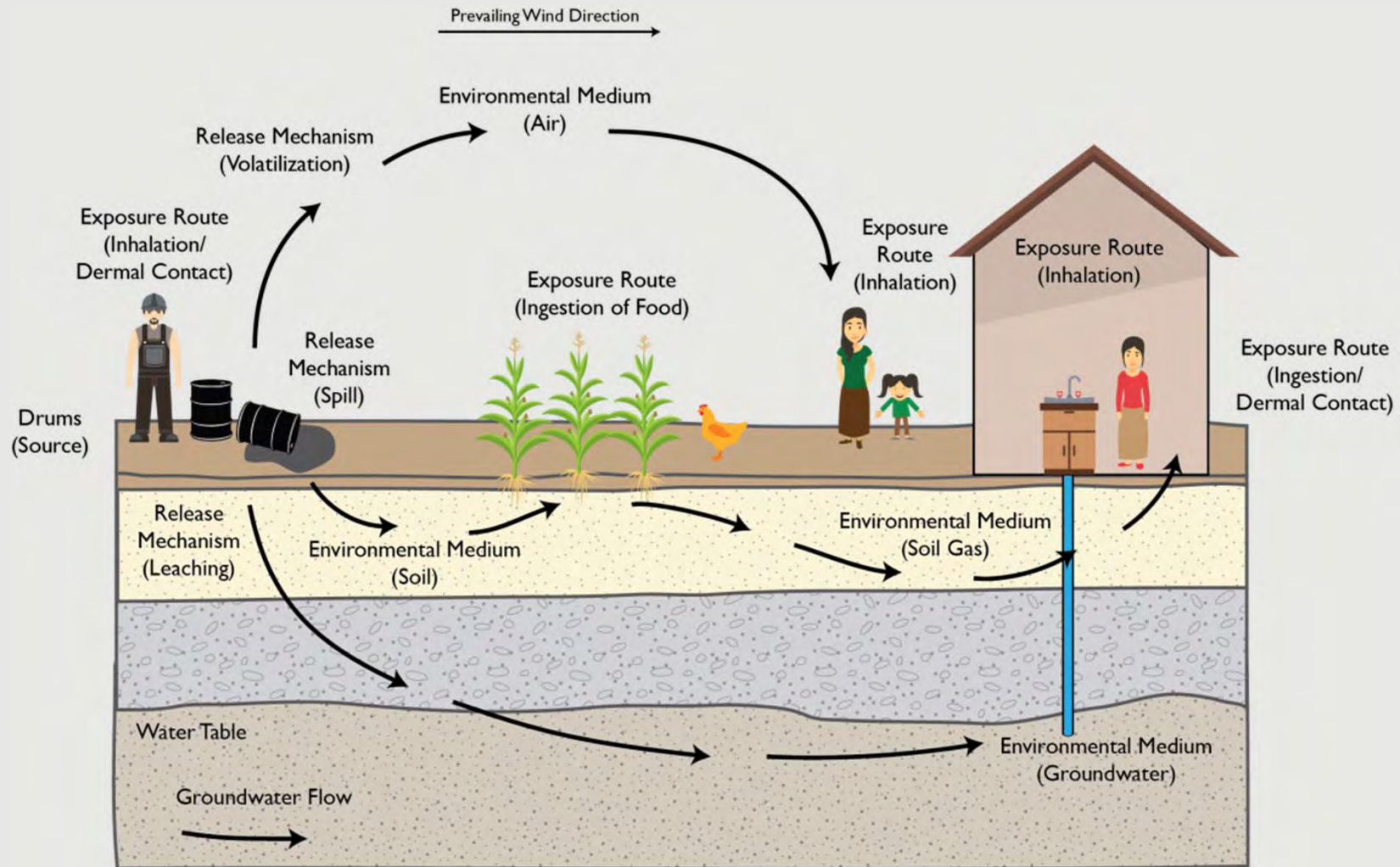
# ILLUSTRATION OF CONCEPTUAL SITE MODEL

## Example I



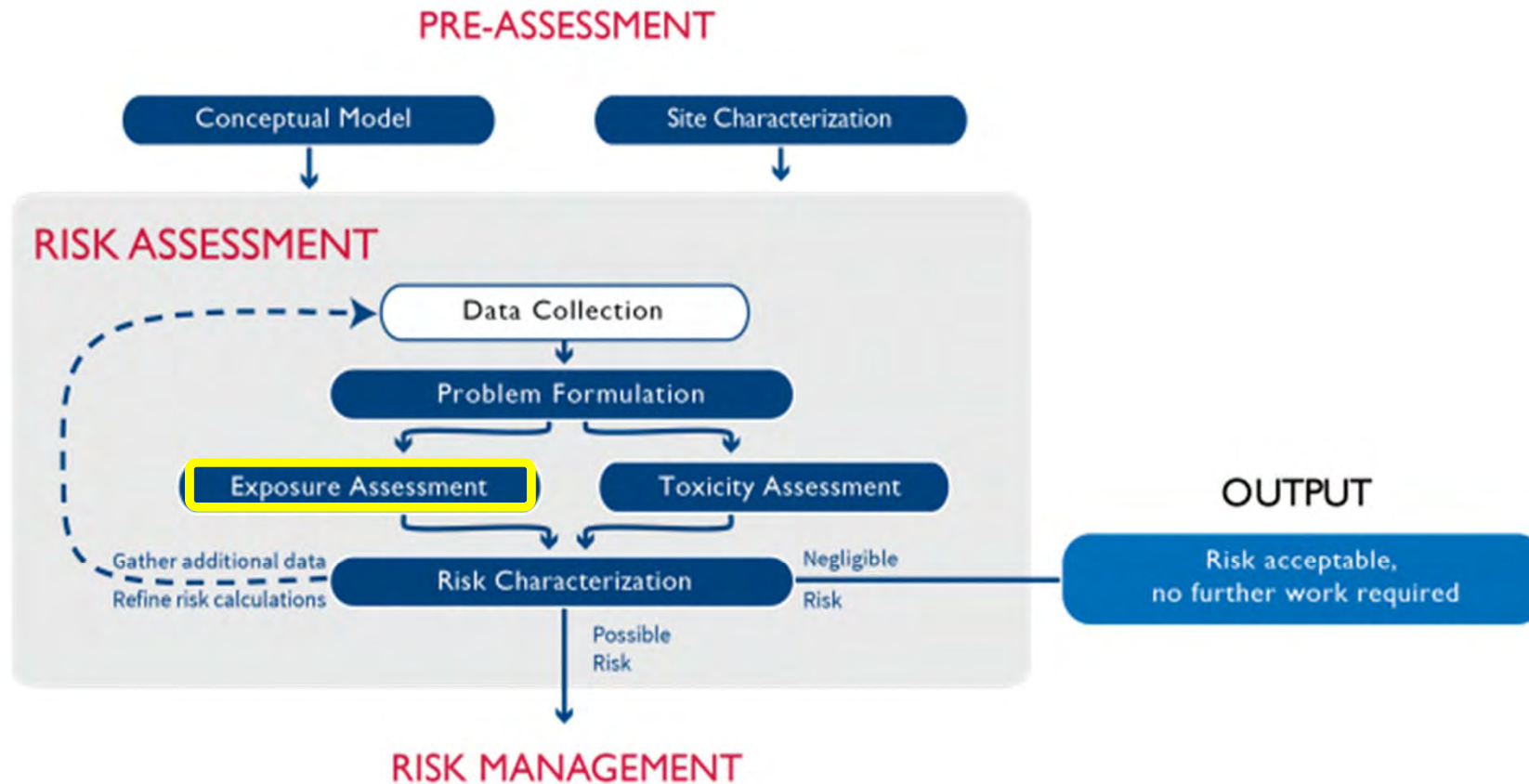
# ILLUSTRATION OF CONCEPTUAL SITE MODEL

## Example 2



Adapted from Agency for Toxic Substances and Disease Registry, Public Health Assessment Guidance Manual (2005 Update) (ATSDR, 2005)

# RISK-BASED EVALUATION APPROACH



# EXPOSURE ASSESSMENT

- Quantifies contaminant intake (dose) for each exposure scenario
  - each receptor, route, medium combination
- Data Needed:
  - Environmental media concentrations
    - Measured or modeled
  - Exposure parameters
    - i.e., intake rate, body weight, exposure frequency, etc.
  - Absorption factors



# EXPOSURE ASSESSMENT

- Quantifies contaminant intake (dose) for each exposure scenario
  - i.e., each receptor, route, medium combination

$$\text{Dose} = \frac{\text{Csoil} \times \text{IRsoil} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

Dose = Average daily intake of chemical (mg/kg BW/day)

Csoil = Chemical concentration in soil (mg/kg)

IRsoil = Intake rate of soil (kg/day)

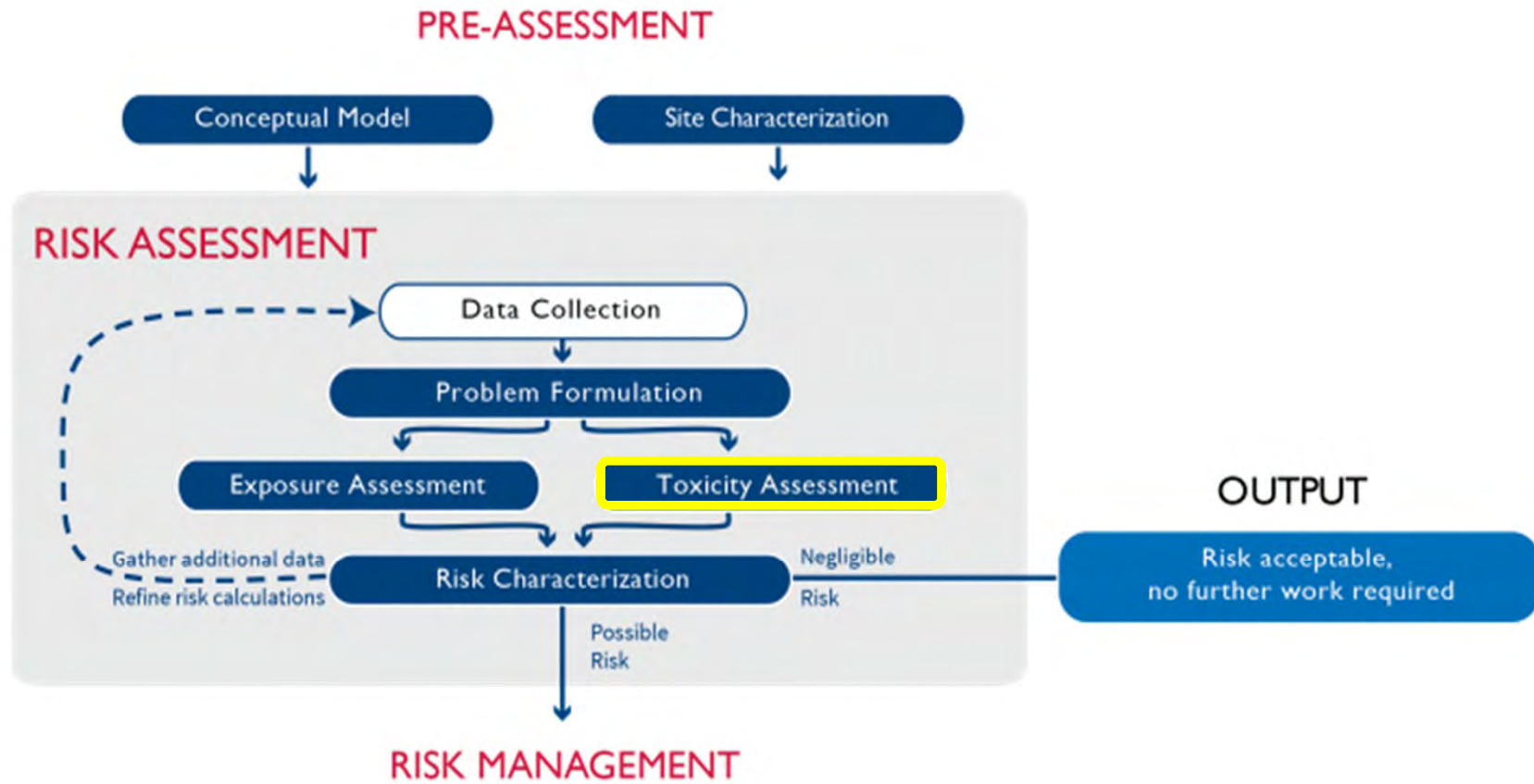
EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

BW = Body weight (kg BW)

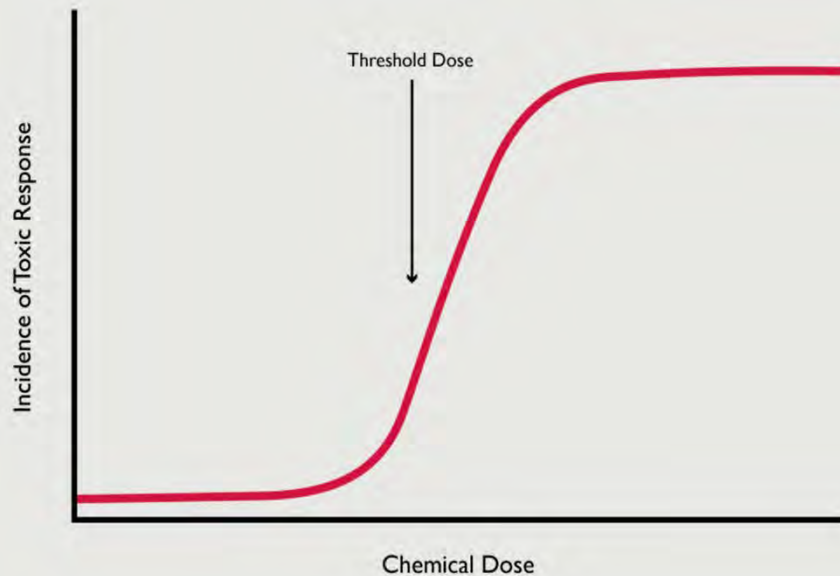
AT = Averaging time (days)

# RISK-BASED EVALUATION APPROACH

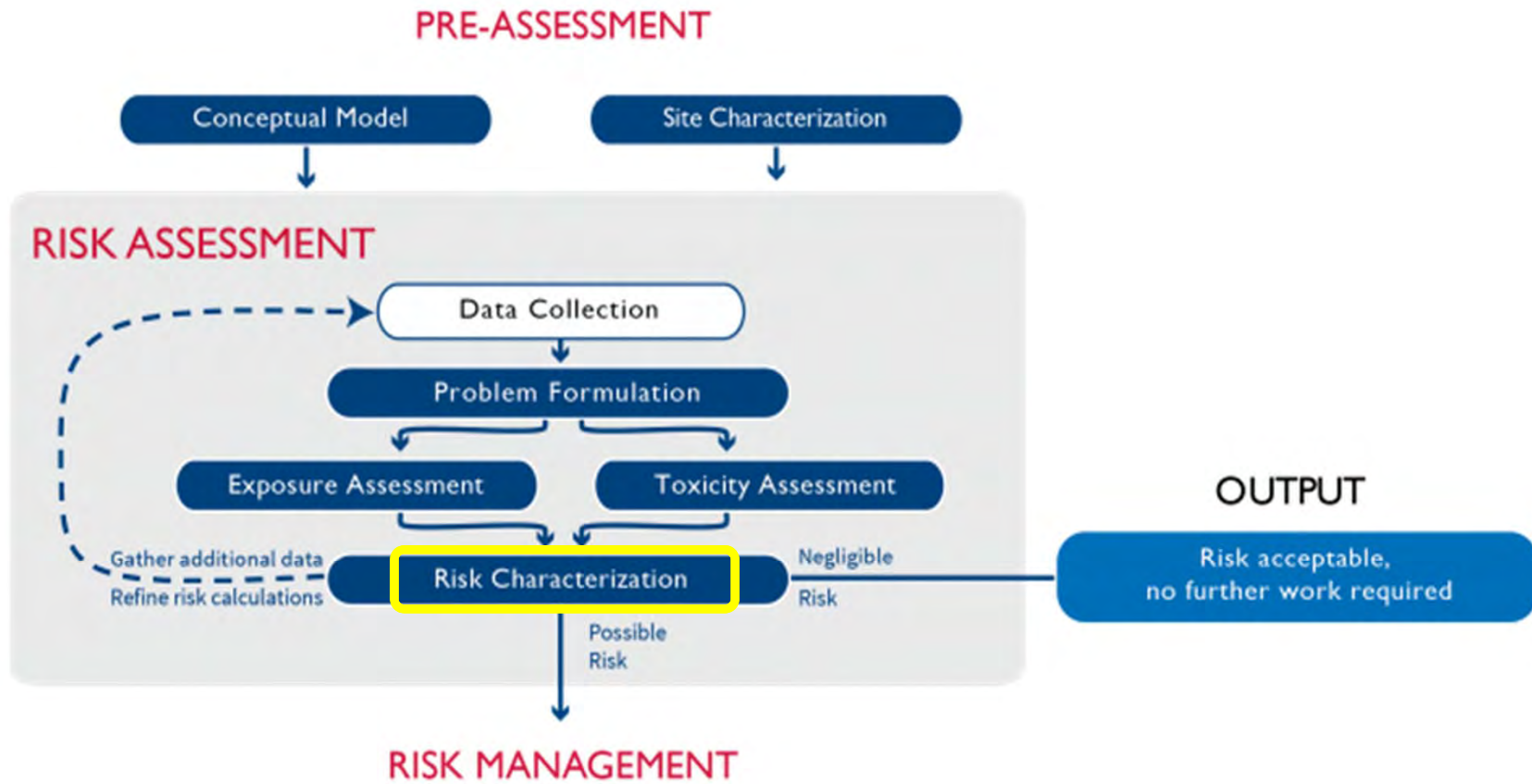


# TOXICITY ASSESSMENT

- Human Health Toxicity Assessment
  - Type of effect
    - Carcinogenic vs. Non-carcinogenic
  - Shape of dose-response curve
    - Threshold vs. Non-threshold
  - Route of exposure
    - Oral vs. Inhalation



# RISK-BASED EVALUATION APPROACH



# RISK CHARACTERIZATION

- Human Health
  - Carcinogenic: Incremental Lifetime Cancer Risk (ILCR)
    - Probability of cancer occurring as a consequence of exposure to contaminant

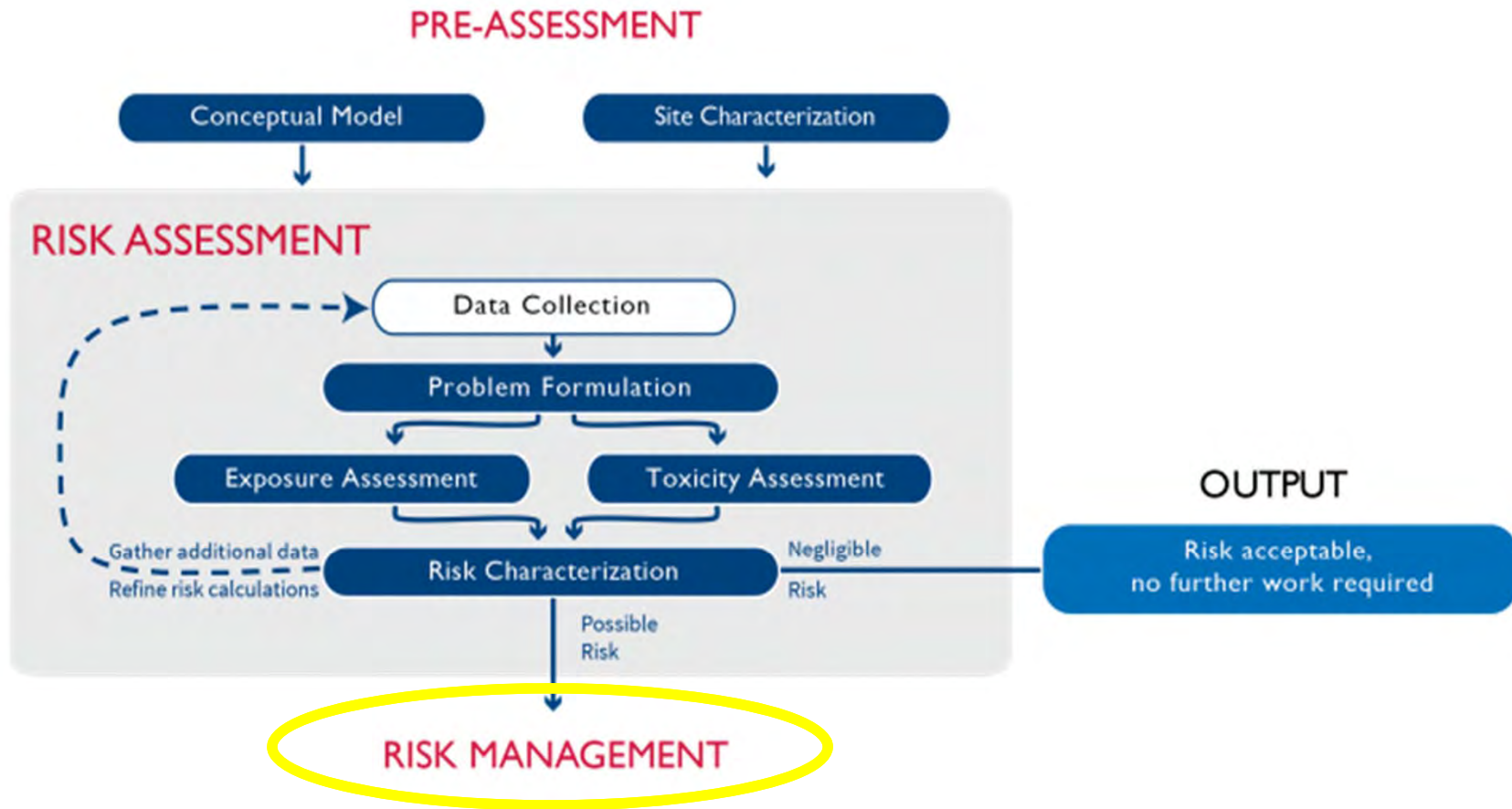
$$\text{Risk} = \text{Dose} \times \text{Toxicity Value}$$

- Non-carcinogenic: Hazard Quotient (HQ)
  - Exposure ratio relative to an appropriate effect threshold

$$\text{Hazard} = \text{Dose} / \text{Toxicity Value}$$

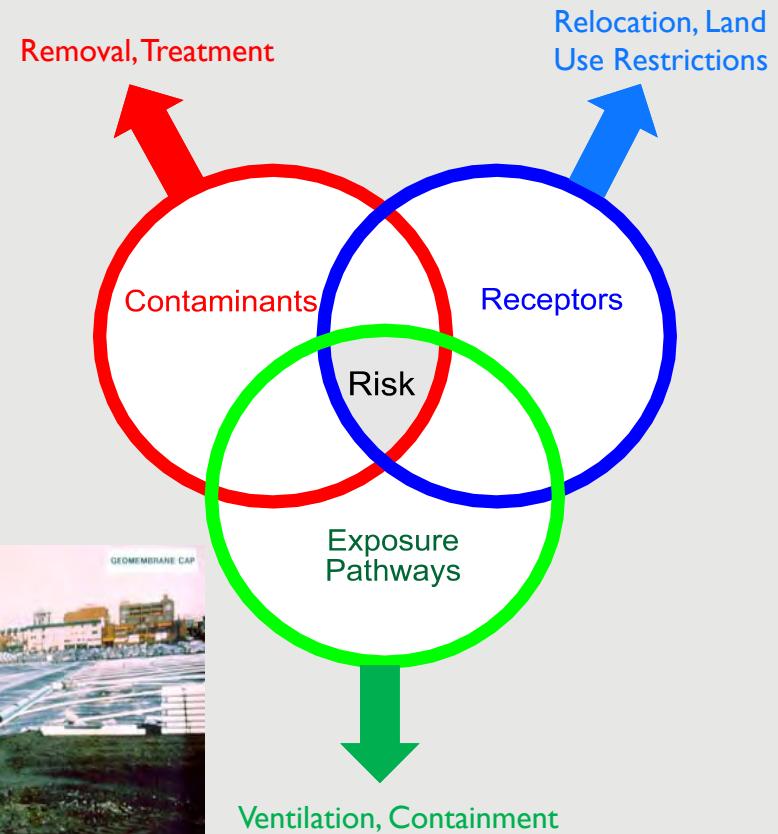
➤ Uncertainty Assessment is important component of risk evaluation

# RISK-BASED EVALUATION APPROACH



# RISK MANAGEMENT

- Develop Risk-based Remediation Goals
  - Cleanup levels in environmental media
- Evaluate Remedial Alternatives
  - Acceptable risk
  - Technically feasible
  - Cost effective
  - Socially acceptable



# RISK COMMUNICATION

- Important component of risk management
- Goals:
  - Include stakeholders in decision-making
  - Disseminate information
  - Improve transparency and credibility
  - Raise awareness
  - Change behavior







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# MENTORSHIP PERIOD: OCTOBER 2017-MARCH 2018

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19 October 2017

# OBJECTIVES OF USAID TECHNICAL ASSISTANCE & TRAINING PROGRAM

## Overall:

- To build capacity of GVN officials to conduct environmental assessment/remediation activities
- Provide participants with in-depth training on the application of HHRA concepts, site prioritization, HHRA risk characterization, risk management, and HHRA case studies using data from Danang Airport, Bien Hoa Airbase and other contaminated sites in SE Asia.



# HHRA TRAINING PROGRAM OUTLINE

## Workshop I (October 2017):

- Basics of HHRA;
- Site prioritization; and
- HHRA risk characterization.



## Mentorship period – October 2017-March 2018

## Workshop 2 (March 2018):

- Review and presentation of risk assessment case studies;
- Risk management; and
- Risk communication.



# MENTORSHIP PERIOD OBJECTIVES

- Provide practical experience in Risk Assessment, Risk Management and Risk Communication through an online collaborative platform ([usaid.popstoolkit.com/moodle](http://usaid.popstoolkit.com/moodle)).
- Provide an opportunity for participants to complete a Risk Assessment on their own.
- Obtain Comments and Feedback on the *Manual for the Characterization and Remedial Selection for Cleanup of Dioxin-contaminated Sites in Vietnam* (by December 31, 2017).





## MENTORSHIP PERIOD October 2017– March 2018

- Participants will interact online with Hatfield and CDM Smith trainers as they complete their case study assignments.
- Conducted online using Moodle, an open-sourced learning platform.
- Forum for participants to communicate with their colleagues and exchange information and ideas.
- Additional background materials, discussion topics and assignments will be provided to trainees during the mentorship period.
- Questions will be answered online, and guidance provided where needed to complete the assignments.
- Assignments are due **by March 2, 2018.**



## Discussion Board

- Set up on Moodle.org ([usaid.popstoolkit.com/moodle](https://usaid.popstoolkit.com/moodle))
- All participants will be provided with a username and password for accessing the site.
- Participants are requested to check weekly - **every Tuesday morning** - for updates, new content, and discussion topics.
- Course assignments, reading materials and quizzes will be added during the mentorship period.
- Questions may be posed to the trainers and to other participants to facilitate discussion and information sharing – participants can also assist others in their group.
- English will be the main language used; Vietnamese language questions/answers are also welcome.



## Case Studies for Risk Assessment

1. Former Waste Deposit Area (FWDA), Cay Dep recreational area - dioxins and furans.
2. Tonkin Bay residential area (TBRA) – agricultural pesticide use - DDT and HCB and lindane ( $\gamma$ -HCH) was discovered.
3. XYZ manufacturing (XYZ) - leaking above-ground used-oil storage tank – PAHs.
4. 3R Pesticide Distributing (3R) - abandoned pesticide warehouse site - DDT and  $\gamma$ -HCH.

## Questions to Answer – by March 2, 2018

- Who are the potential receptor populations at the site (both human and ecological)?
- What are the potential exposure pathways?
- Use the Risk Assessment Toolkit to calculate the human health risk from exposures to site contaminants for each potential human receptor population of interest.
- Is there additional information or data that would help to inform the risk assessment process? If so, what types of information are missing?
- Consider what risk management actions (institutional controls/remediation) could be taken to reduce/remove risks.
- For the risk management actions identified, list at least two positive and two negative attributes.
- Consider how risks could be communicated to the potentially affected populations to ensure that institutional controls are effective.
- Consider government policies that may help in a scenario such as this. Please list at least one potential policy.

# HHRA TRAINING WORKSHOP 2 (March 2018)

## – Classroom Day 1:

- Review of the HHRA process.
- Participants will review and present their HHRA reports. Topical discussions that took place during the mentorship period will be presented and concluded.
- Group discussions on participants' experiences with the HHRA process and use of the Risk Assessment Toolkit.

## – Classroom Day 2:

- Training and exercises/practice in risk management and risk communications.
- Offline versions of the Risk Assessment Toolkit will be distributed.



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