國立臺北大學自然資源與環境管理研究所 九十七學年度第二學期 『環境災害與風險管理』課程講義(+m)

主題: Risk Analysis and Simulation Software Packages 風險分析與模擬軟體

• PURPOSES FOR UTILIZING SOFTWARE

- □ Calculation, Computation, Analysis, Visualization, and Reporting (Presentation)
- □ Format, Templates, Procedure, and Flow Chart
- D Program Coding, Spreadsheet, Hierarchical Viewing, and Visualization
- □ Forms, Tables, and Figures => XML => Crystal Report
- □ Reporting, Documentation, and Visualization => Soft Copies or Hard Copies?

• RISK ANALYSIS SOFTWARE

- □ Risk, Reliability, Controllability, Profitability, and Possibility of Lose or Failure
- □ Statistics and Probability: Calculation, Fitting, and Visualization
- □ Event Tree, Value Tree, Fault Tree, and Decision Tree => (Precision Tree)
- □ Templates, Forms, Spreadsheet, and Reports
- □ Graphics, Figures, and Presentation => Report and Documentation
- RELIABILITY, AVAILABILITY, MAINTAINABILITY, AND SAFETY (RAMS) Handout 1
 - □ Reliability and Safety => Fault and Failure
 - ⇒ Fault Tree Analysis, FMEA, and FMECA
 - ⇒ Risk Priority Numbers (RPN) for Failures: Severity, Occurrence & Detectability
 - □ Process and Operation => Hazard and Operability
 - ⇒ Process Hazards Analysis: HazOp, Job Safety Analysis, etc.
 - ⇒ Brainstorming, Countermeasures, and Cost Assessment

• SOFTWARE PACKAGES FOR RISK (RELIABILITY) ANALYSIS

- □ A Relatively Comprehensive List (http://www.ntnu.no/ross/info/software.php)
- Dyadem Software
 - ⇒ FMEA-Pro Failure Modes and Effects Analysis
 - ⇒ PHA-Pro Process Hazards and Analysis: HazOp, What If, Checklist, FMEA & PrHA
 - ⇒ RiskSafe-Pro: improve the safety and ergonomics of your workplace procedures by conducting a Job Safety Analysis (JSA) or Job Hazard Analysis (JHA)
 - \Rightarrow SVA-Pro Security Vulnerability Analysis
- <u>Palisade Corporation</u>: The DecisionTools Suite
 - ⇒ @RISK, PrecisionTree, TopRank, RISKOptimizer, (BestFit & RISKview)

- ⇒ StatTools, NeuralTools & Evolver for prediction, data analysis and optimization.
- \Rightarrow Examples for Applying DecisionTools: Volcano Eruption (Spreadsheet <u>1 & 2</u>)
- QUANTITATIVE RISK ANALYSIS: SIMULATION AND OPTIMIZATION
 - □ Simulation vs. Optimization
 - \Rightarrow System Simulation vs. Systems Analysis => System Dynamics
 - ⇒ Wait-and-See? => Descriptive vs. Prescriptive Approach
 - □ Representation of Uncertainty => Simulation
 - ⇒ Decision Making under Uncertainty (Risk)
 - ⇒ Simulation or Optimization? Simulation/Optimization (?)
 - $\hfill\square$ Monte Carlo Simulation
 - ⇒ Quantitative Risk Analysis
 - ⇒ Simulation and then Optimization
 - \Rightarrow Monte Carlo Simulation Basics (<u>Handout 2</u>)
 - □ Stages involved in Producing a Monte Carlo Risk Analysis Model (Molak, 1997 Chp.I-4)
 - \Rightarrow Designing the structure of the risk analysis model
 - ⇒ Defining distributions that describe the uncertainty of the problem
 - ➡ Modeling dependencies between model uncertainties
 - ⇒ Presenting and interpreting the risk analysis results
 - Software Packages that can do Monte Carlo Risk Analysis
 - ⇒ Palisade @RISK
 - ⇒ Oracle Crystal Ball
 - ⇒ <u>Risk Analysis Overview</u> *
 - ⇒ Example (from Oracle): Groundwater Cleanup (s3)
- Homework #5 (June 3, 2009 Due)
 1.請練習操作Crystal Ball軟體之 <u>Toxic Waste Site Example</u> (s4),
 並回答以下問題:
 - 範例之輸入參數(Input Parameters)有那些?輸 入參數之統計分配為何?



- (2) 該範例主要分析那一輸出變數?該變數之轉換公式(Transfer Function)為 何?模擬後,輸出變數之統計特性為何?成何種統計分配型態?
- 2.請下載、閱讀 <u>Introduction to FMEA</u> (<u>Handout 3</u>),並請利用課程介紹之軟體,執 行該文件中Flashlight案例之FMEA。