Rapid Environmantal Assessment of POPs Pesticide Contamination Sites

A Simplified Method Developed for Vietnam

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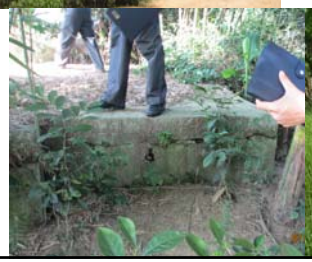
Need for Rapid Environmental Assessment (REA) Method

- >800 identified POPS sites in Vietnam
  - Varying quality and quantity of data
- Limited resources – funds, qualified assessors
- Need to prioritize
  - Assessments
  - Detailed investigation and remediation work
- Focus – public health protection
- Common challenge in developing countries

Types of POPS Sites in Vietnam

- Abandoned storage sites
- Bunkers used for storage or disposal
- Contaminated fields from spills, open storage

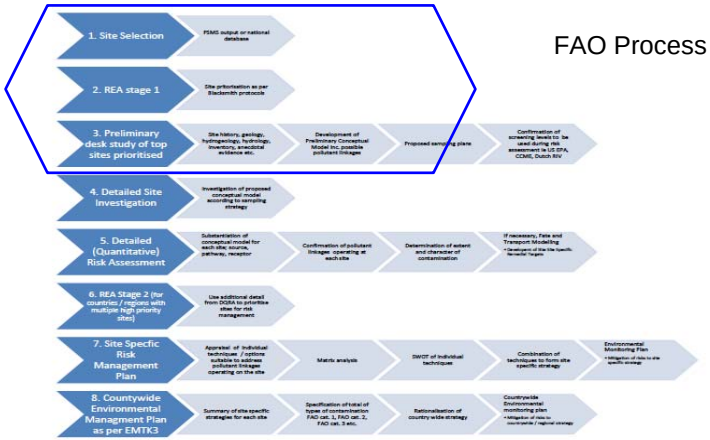


Desires for an REA

- Rapid, low resources – 1 or 2 days in field
- Doable with people with limited expertise
- Consistent methods, quality data
- Gain basic understanding of risks
  - Based on data, quality REA
  - Sufficient to set priorities for further work
- Build on FAO EMTK REA
  - Also learn from other REA processes

Role of This REA in Investigation/Remediation Process

FAO Process



REA Process

DESK SCREEN	• Enter known data about sites • Prioritize sites for visits
RAPID ASSESSMENT	• Collect field data on sites • Sample analysis
DATA ENTRY TO DATA BASE	• Capture data – consistently • Risk evaluation
SET PRIORITIES FOR WORK	• Allow comparison of sites • Prioritize further evaluation

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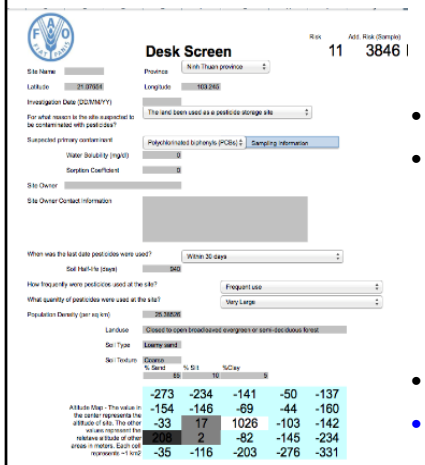


Desk Screen

- Excel based system
- Capture known data
  - Location, geography
  - Population density
  - Pollutant type, amount
  - Sensitive receptors nearby – water, schools
- Use available GIS data
- Usually limited data

GIS Data Upload for Desk Screening

- Readily available, relevant GIS data layers uploaded into desk screen data base
  - Population density - Land use
  - Key receptor locations - Rivers, streams, ponds
  - Elevation, slope - Soils
- Resolution an issue – 1 km in Vietnam
- Can upload through ArcGIS or Excel
  - Novel conversion of GIS data to Excel “pixels”
  - When ArcGIS not usable due to cost, expertise
- GIS data tied to site data by coordinates

Prioritization from Desk Screen

Soil Type	*1 - 3*
Use Frequency	*1 – 4*
Severity	*1 – 3*
(based on samples if avail.)	
Half Life	*time factor*
Land Use	*1 – 3*
(based on population density)	

- Data on POPs preloaded
  - Toxicity, safe levels
  - Half life, solubility, sorption info
- Conclusion - high, medium or low risk
  - Low <5, Medium = 5 – 15, High >15
  - High sites prioritized for site visits/REA

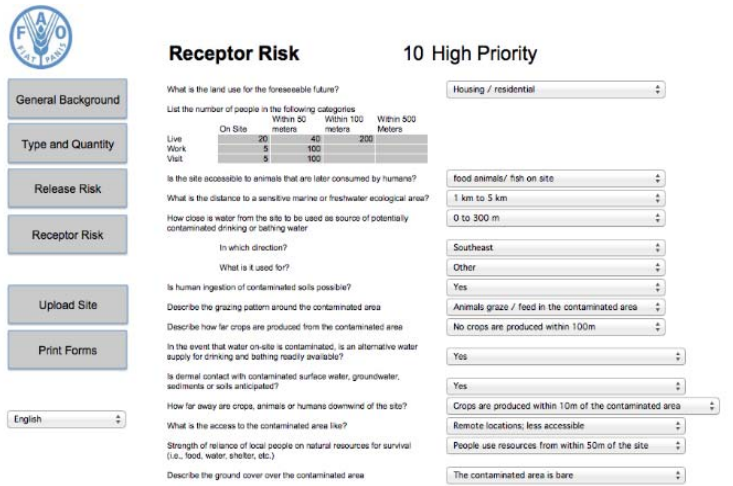
REA Site Visit Process

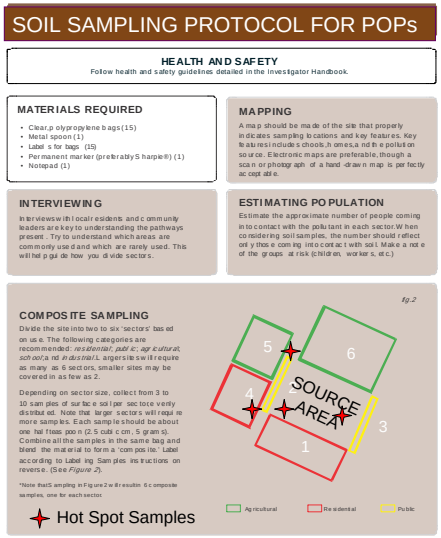
- Plan visit
  - Review desk screen & other data
  - Prepare sampling supplies, arrange for labs
  - Notify local community leaders of visit
- Site visit
  - Go through evaluation questions
  - Prepare site map
  - Interview persons with site knowledge
  - Collect samples
  - Take pictures
- Brief, clear, detailed guidance provided to enable non-experts to do REA

REA Field Questions

- Investigator led through REA by detailed questions
  - Pull down menus where possible
  - Space for text entry
  - Computer or paper
  - Excel based
- Sections for:
  - General site info
  - POP type & quantity
  - Release Risk
  - Receptor Risk

Questions in the Field During REA





REA Sampling Strategy

- Balance time & cost vs. data extent
  - Get enough data to understand risk
- Composite samples at & around source
  - Sectors by land use
  - Typically 5 -10 samples
  - Focus on surface
- Hot Spot samples
- Water samples

Site Map Required

MAP THE SITE

Draw or copy a map of the site that shows the pollution source, the pathways to humans, the location of your samples and any pollution hotspots, neighborhoods that might be affected, and any other relevant landmarks or sites.

A digital map is preferable, though hand-drawn maps are acceptable.

DIGITAL MAPS

Digital maps can be drawn using bing (http://www.bing.com/maps/), Google Earth or a number of other free software applications.

Bing Maps (*Figure 1*)

1. Right Click on location > "Add a Pushpin" Name and Save thew Pushpin
2. Mark area of contamination using area tool in "My Places Editor"
3. Actions > Export > KML

Google Earth

1. Use Path tool to draw area.
2. Save Path
3. Right Click Path in Places Menu > Save Place As > KML

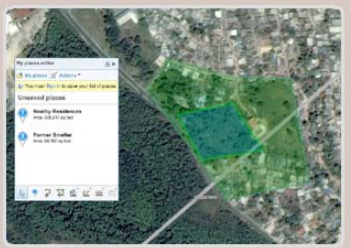


Fig. 1. Created in Bing Maps and exported to KML. This simple map sufficiently demonstrates the pollution source and affected area.

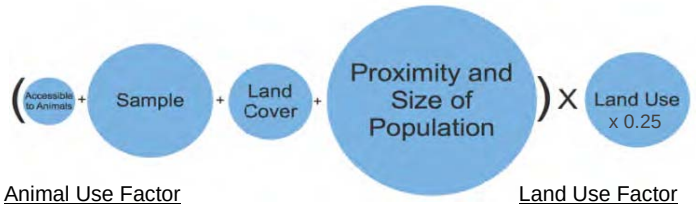
Data Management

- Flexibility regarding how to save data
  - Computer in field, upload in office or by internet
  - Paper in field, transcribe in office
- Data saved in consistent format
  - Integrated with Desk Screen data
  - Unique ID for each site, by coordinates
- Data base searchable by key fields
  - Coordinates, geography, pollutant, risk, investigator, level of pollutants found, etc.
- Map display for sites

REA Risk Evaluation Process

- Risk estimates for source, pathway, receptor
- Combine by addition to get composite risk
- Result: High, Medium or Low Risk
  - Process not sufficient for quantitative risk analysis
  - Qualitative scores for prioritization of further work
- Risk algorithms based on expert experience
  - Distance attenuation factors from USEPA
  - Half life in soil from data in literature
  - "Safe" levels from USEPA, others if not done by EPA

Receptor Risk Algorithm



Animal Use Factor
•2 – milk, meat source
•1 – other

Sample Result Factor
For each composite sector sample, if:
•Sample <2xSL = 0
•Sample >2xSL = 2
•Sample >3xSL = 3
Average all samples

Land Cover Factor
1 – 4 Scale:
•1 – pavement, to
•4 – bare land

Population Factor
Log (pop on-site) + 0.5xlog(pop >50m) + 0.25xlog(pop>100m)

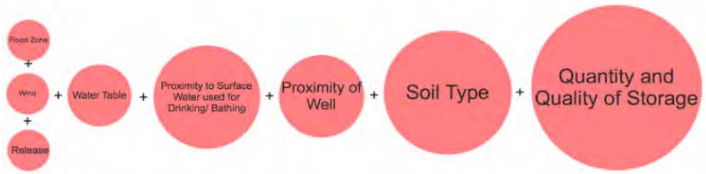
Land Use Factor
0 – 5 Scale:
•5 – houses, schools
•0 – natural area, no human use

Low Risk = <5
Medium = 5 – 9
High Risk = >9

Source & Pathway Risk Algorithms

Type and Quantity Risk = (Source Risk)

Release Risk = (Pathway Risk)



Advantages and Limitations

- Low resource requirements
  - Short time, low cost
  - Can be done by non-experts
  - Commonly available, familiar software
- Incorporates international expertise
- Focuses REAs on sites mostly likely to be high risk through desk screen
- Searchable central database for all data
- Gain basic understanding of sites and risks

- REA not sufficient for intervention design
  - But can be adequate to determine no further work needed
- Method most applicable to smaller sites
  - Sites with a few specific pollutants rather than many

Status and Next Steps

- Piloted by Vietnam Environmental Agency
  - Portions in use
  - Training and roll-out in planning
- Enhancements planned to allow more general use and integration in FAO POPs program
  - Other climates, geological situations
  - Other pollutants
  - Other types of sources

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Thank you for your attention