Soil Environmental Standards/Screening Values in China

Guoqing WANG, Yanhong SHAN

Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection of China (NIES)
Contents

◆ The GB15618-1995 Standards
◆ Analysis on Urgent needs for Revision
◆ A Proposed Framework of SESs
◆ Methodologies for Derivation
◆ Concluding remarks
Land/Soil related Laws & Regulations


◆ **Agricultural** law (1993, 2002)

◆ **Forest** Law (1984, 1998)

◆ **Grassland** Law (1985, 2002)

◆ Regulation on Protection of **Basic Agricultural Fields** (1998)

◆ **Land Reclamation** Regulations (2011)

◆ Quality and Safety of **Agricultural Products** Law (2006)
Environmental Legal System in China

- Environmental Protection Law (1989, in revision)

Recent decision to have in the near future:
--- Soil Environmental Protection Law (in preparation)
--- Start from late 2012
Environmental Quality Standards in China

- **Ambient Air** Quality Standards (GB 3095-1996, GB 3095-2012)
- **Indoor Air** Quality Standards (GB/T 18883-2002)
- **Surface Water** Environmental Quality Standards (GB 3838-2002)
- **Groundwater** Quality Standards (GB/T 14848-1993)
- **Sea Water** Quality Standards (GB 3097-1997)
- Water Quality Standard for **fishery** (GB 11607-1989)
- Standards for **Irrigation Water** Quality (GB 5084-1992)
- **Environmental Quality Standards for Soils** (GB 15618-1995)
The GB 15618-1995 Standards

- Derived/proposed by NIES
- 1987: initiation of a research project
- 1989: development of the standard system;
- 1 July 1995: issued by MEP (previous SEPA)
- 1 March 1996: put into effect till now
The GB15618-1995 Standards

◆ Aims
——To prevent soil pollution
——To protect soil functions, eco-environment, agricultural & forestry production and human health

◆ Scope
——farm land, vegetable and tea producing field, orchard
——soil, pasture and natural reserved area

◆ Classification of standard values
——3 classes

◆ Factors considered
——soil pH, CEC
The GB15618-1995 Standards

◆ Class-1 standards:

— Soil background level
— Natural conserved area, drinking water source area etc.
— Nationally wide background values based
— Sampling locations: more than 4000 samples
— Described by Log-Normal distribution
The GB15618-1995 Standards

◆ Class-2 standards:

—— Ecological and environmental effects based
—— Farm land, fields of vegetable and tea production, orchard soil
—— Healthy plant growth and safe food quality
—— No potential effects on water bodies
The GB15618-1995 Standards

◆ Class-3 standards:

—— Soil of higher adsorption capacity/background levels;
—— Healthy growth of trees/plants, no hazard to environment
—— Derivation method similar as Class-2 standards;
—— Use experimental data based on soil of higher adsorption capacity and artificially contaminated soils.
The GB15618-1995 Standards

Elements considered for derivation of GB15618

- Plant growth
  - Quality
  - Hygienic Criteria
  - Production
  - Decrease by 10%

- Microbial activity
  - Bio-indices
  - Changes > 25%
  - Counting
  - Changes > 50%

- Water bodies
  - Groundwater
  - Quality criteria
  - Surface water
  - Quality criteria

Soil Standard Values
## The GB15618-1995 Standards

<table>
<thead>
<tr>
<th>Contaminants</th>
<th>Class-1</th>
<th>Class-2</th>
<th>Class-3</th>
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<td>&gt;7.5</td>
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<tr>
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<td>100</td>
</tr>
<tr>
<td>Cu Frui.</td>
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<tr>
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<td>0.50</td>
<td></td>
<td>1.0</td>
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</tbody>
</table>

*a: ‘Agri.’ represents agricultural soils, and ‘Frui.’ represents fruit farm soils.

*b: In case soil CEC < 5cmol(+) kg⁻¹, the standard values will be half values of the listed.

*c: HCH (hexachlorocyclohexane), values are the sum of 4 isomers;

*d: DDT (Dichloro-diphenyl-trichloroethane), values represent the sum of DDT, DDD and DDE.*
Evaluation of the GB15618-1995

- been an useful tool for soil environmental management in China for long time;
- more suitable for management of agricultural soil quality
- supporting scientific data is limited for the derivation;
- lack of consideration on human exposure risk;
- less contaminants of concern (no VOCs addressed);
- urgent needs for revised SEQSs i.e.
  —— more contaminants
  —— various land uses, agricultural, residential, industrial…
  —…
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Soil Environ. Policy/Regulations in China

- 6 June, 2008: 《Guidance on Enhancing Affairs on Soil Pollution Control, Prevention and Treatment》（MEP-No.2008.48）;
- 15 December, 2009: 《Ministerial Ordinance on Management of Contaminated Site and Soil Environment》（Draft for approval）;
- 23 January, 2013: 《Circular on Recent Arrangement on Soil Environmental Protection and Integrated Remediation/Treatment》（China State Council No.2013.07）
23 January, 2013: the China State Council Circular (No.2013.07) clarifies main tasks as following:

--- Strict control on newly emerging soil contamination
--- Defining priority protection areas, i.e. cultivated land
--- Enhancing risk control of contaminated soil environment
--- Carrying out soil pollution control and remediation
--- Improving capability of soil environmental monitoring and supervision
--- Accelerating development of soil environmental protection engineering program
Urgent Needs for Protecting Soils

- Agricultural/natural soil
  - large area as an agricultural country
  - important for safe quality of agricultural produces
  - Soil in certain area might be contaminated due to various reasons
  - **Priority** is given to “**Protection of soil quality**”
  - **Risk control and management** in case of slightly contaminated agricultural soils
Urgent Needs for Risk Management

• industrial sites/soils
  — also known as “brown field”
    including Chemical/pesticides production, oil/petroleum industry,
    mining sites, gas works etc.
  — Soil has been heavily contaminated by various types of chemicals
  — Lack of information on site history
  — High economic value for redevelopment (residential use etc.)
  — Risk management process: site investigation, risk assessment, and
    remediation when necessary
Proposed Framework of SEQSs/SSVs

SEQSs for Sustainable Quality Management

SSVs for Screening of Soil Contamination Risk

Site-specific Values for Risk Management

Class

Bg. level
Safe level
Risky level

Contents

Quality

clean
safe
cont.
heavy cont.

Risk

 ignorable
potential
high risk

Countermeasure

quality management
risk control
treatment remediation
Proposed Framework of SESs

◆ **Purpose**
  —— general protection of uncontaminated (natural/agricultural) soils

◆ **Derivation**
  —— extrapolate with statistical method with support of soil environmental backgrounds data
  —— take into account local background and can be area specific SEQSs

◆ **Application**
  —— For sustainable soil quality management
  —— lower than SEQSs: uncontaminated level and no actions is needed
  —— higher than SEQSs: source control measure shall be taken
SSVs for Screening Potential Risk/COCs

◆ **Purpose**

— Screening of potential risks and COCs associated with contaminated soils

◆ **Derivation**

— Derive risk assessment methods based on generic exposure scenarios
— SSVs for various land uses, i.e. residential, industrial land

◆ **Application**

— **ONLY** used for “historical contaminated sites”, never as up limits of contaminants
— lower than SSVs, no significant risk,
— higher than SSVs, unacceptable risks potentially, further action is needed, i.e. investigation.
Site-specific SRLs for Risk Management

◆ **Purpose**
  ——for sustainable remediation/redevelopment of historical contaminated sites/soils

◆ **Derivation**
  ——scientific methods (HRA, ERA), while taking into account other factors, i.e. technological and economic feasibilities
  ——for a specific site/soil and a defined land use

◆ **Application**
  ——**lower than SRLs**, acceptable risk level is achieved after remediation
  ——**higher than SRLs**, further remediation actions in need
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ERA methodology

Potential Affected Percentages (PAPs)

Cd Soil Concentration (Log value, mg/kg)

PAP=50%

PAP=5%
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Concluding remarks

- **Big challenges:**
  1) sustainable management of clean (natural, agricultural) soils,
  2) management of slightly contaminated soils;
  3) remediation of heavily (unacceptable risk) contaminated soils;

- **Urgent needs:**
  ——A suitable framework of Soil Environmental Standards meeting needs of soil environmental management;

- **The proposed framework integrating:**
  1) SEQSs for sustainable soil quality management,
  2) SSVs for screening of potential contamination risks/COCs, and
  3) SRLs for risk management and remediation of contaminated soils;

- **Further studies:**
  1) methodology/guidelines for deriving of SEQSs/SSVs/SRLs
  2) scientific research/survey data supporting SEQSs derivation
Thank You for the Attention!

Wang Guoqing
nies.sepa@163.com