中国疾病预防控制中心
环境与健康相关产品安全所
Institute of Environmental Health and Related Product Safety, China CDC

China National Environmental Health Tracking

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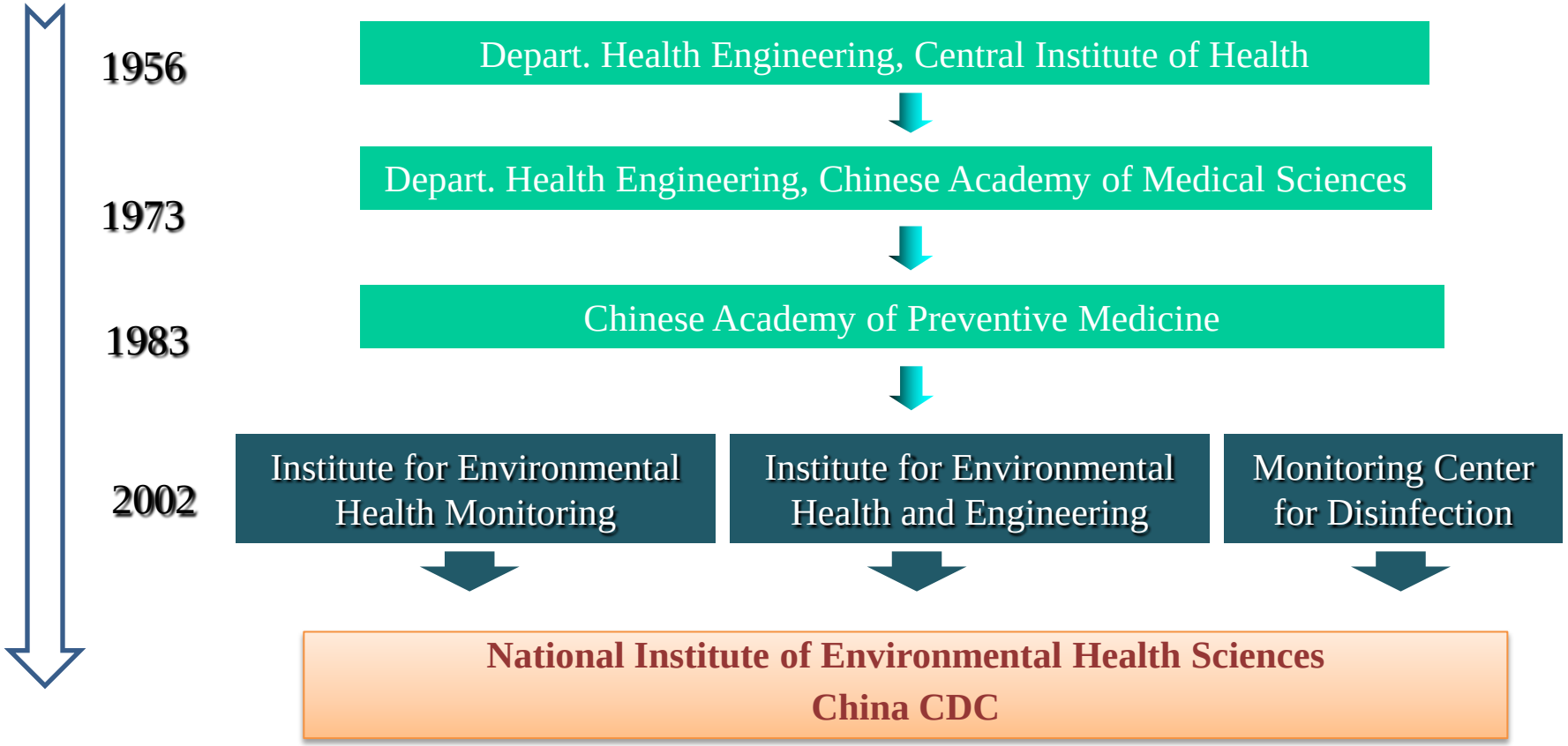
Outlines

1. About NIEHS
2. Main Challenges
3. Progress of CNEHT

About NIEHS

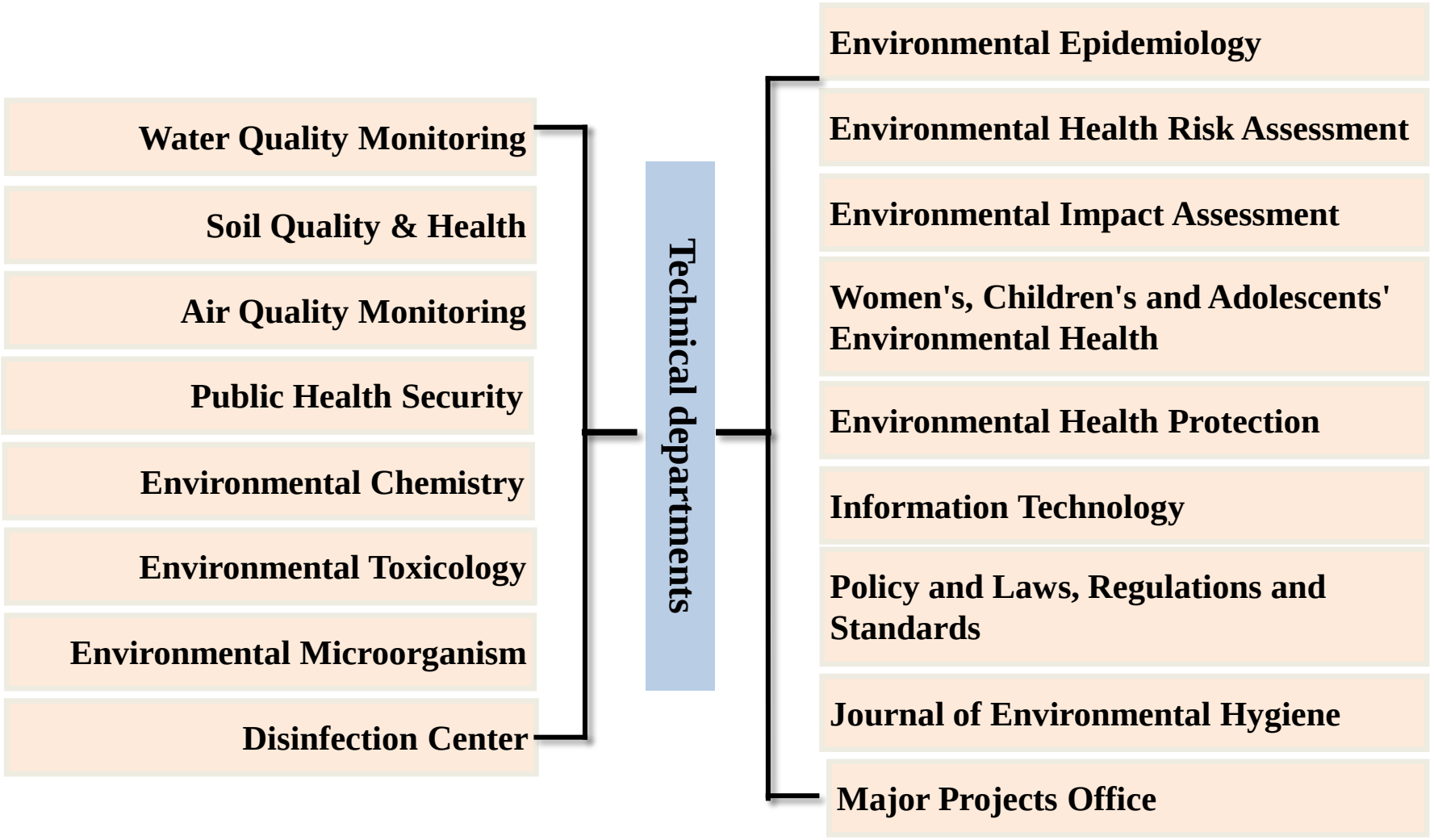
History of NIEHS

National Institute of Environmental Health Sciences (NIEHS), China CDC, was established in May, 2002.



Organization chart

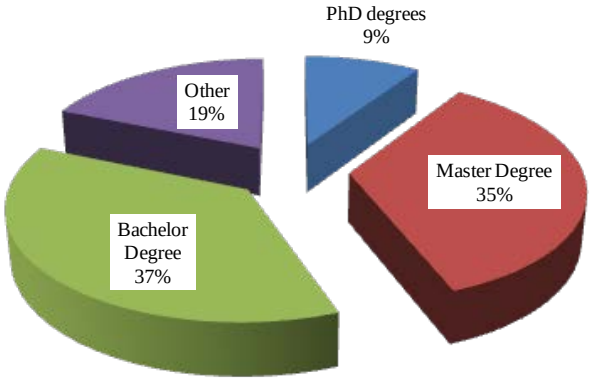
9 **administrative divisions;** ***17*** **technical departments**

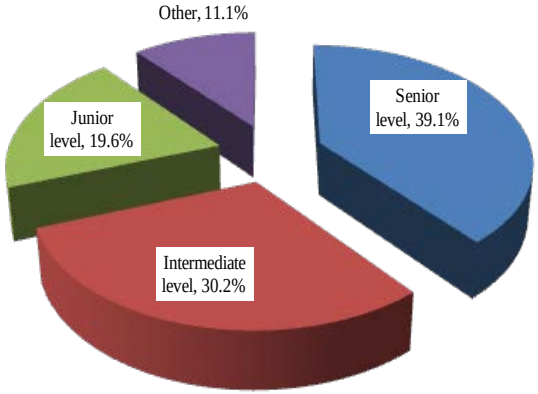


HR and equipment

In NIEHS,

- **235 full-time professionals**
- **92 senior level**
- **22 PhD degree**

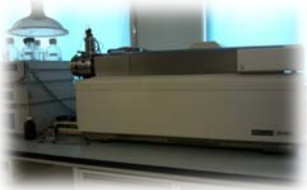




In NIEHS, there are many sets of large advanced equipments, including *ICP-MS, LC-MS, LC-MS-MS, GC-MS, MALDI-TOF-MS* etc.

ICP-MS

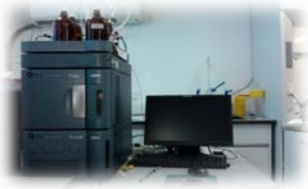
LC-MS



LC-MS-MS

GC-MS

HRGC-HRMS



UPLC

Main missions

(a) *Survey, Surveillance and Scientific Research* on population exposure, health effects and health impacts of environmental hazards as well as the disinfection and infection control.

(*b*)*Technical Support* for the development of related laws, regulations, policies, standards, norms of environmental health as well as disinfection and infection control.

(c) *Research, Evaluation and Promotion* of technology and methods of environmental health as well as disinfection and infection control.

(d) *Health Emergency Response and Assessment* of environmental pollution, natural disasters and infectious diseases outbreaks.

(e) *Environmental Health Data Application Platform Establishment*, environmental health impact prediction and warning, risk assessment and information exchange.

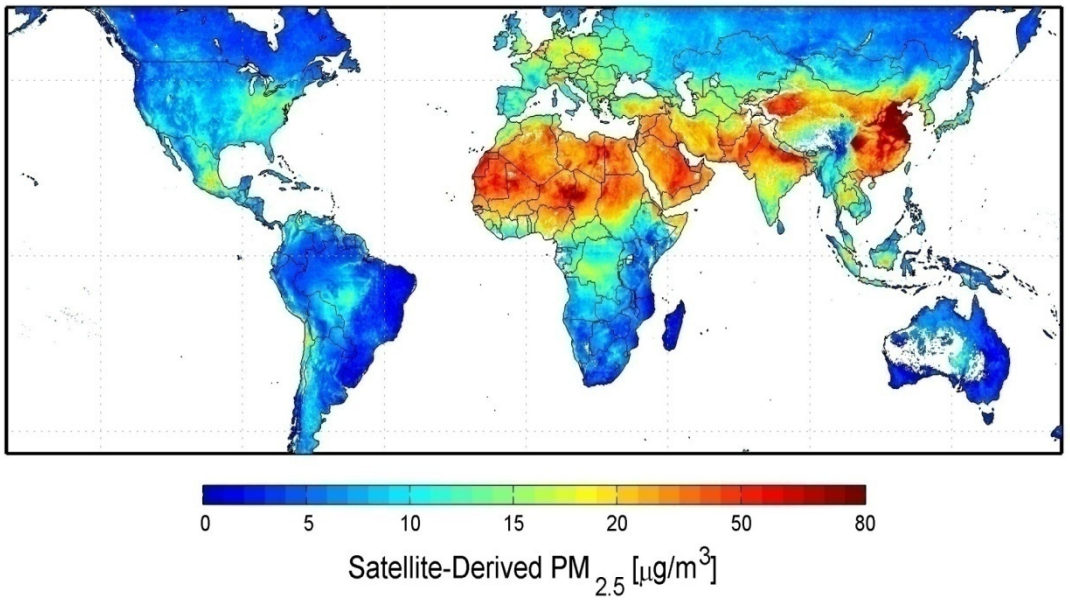
(f) Laboratory quality control and standards management, technical training and guidance to local disease control agencies.

(g) International cooperation and exchanges.

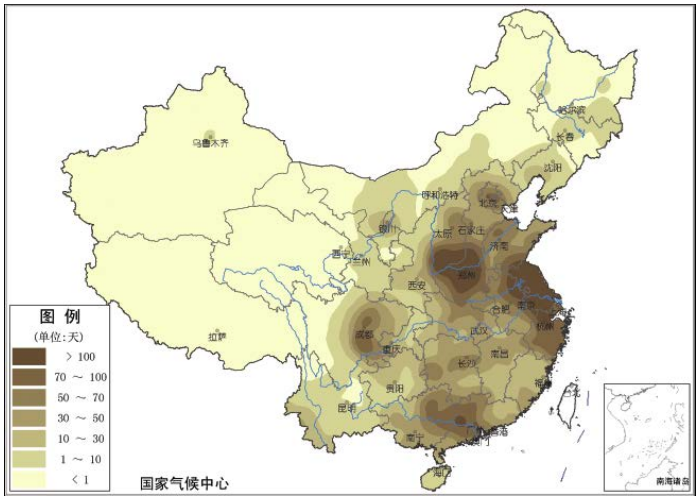
Main Challenges

Air pollution in China

Haze in Chinese mega-cities in 2013

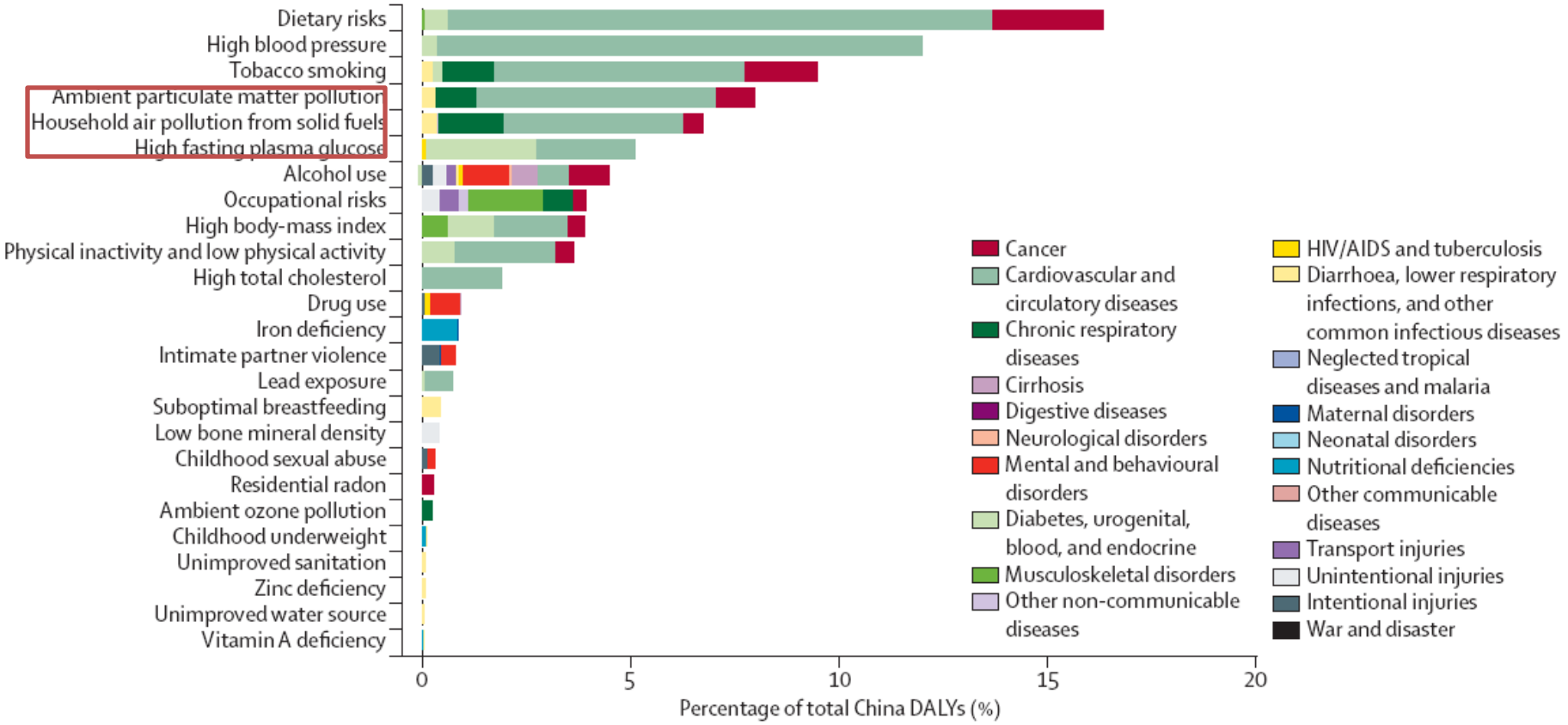


Massive ambient $PM_{2.5}$ pollution in China
(NASA 2010)



Distribution of haze days in 2013

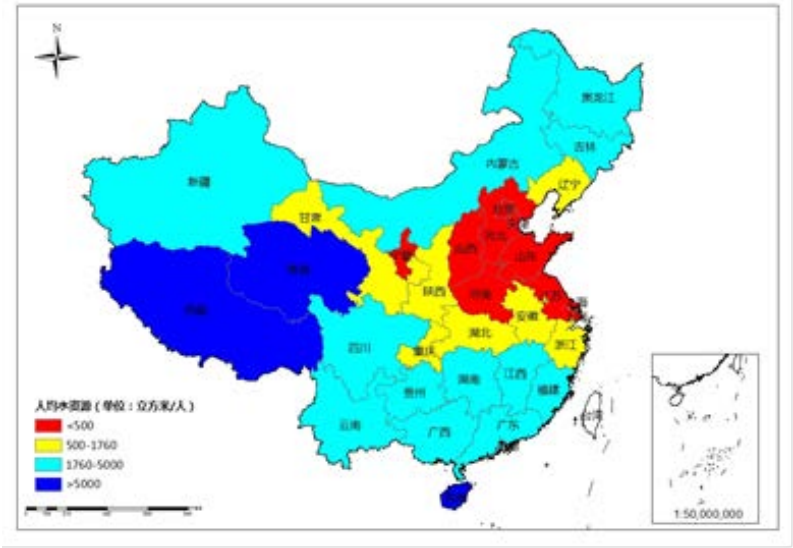
Burden attributed to air pollution

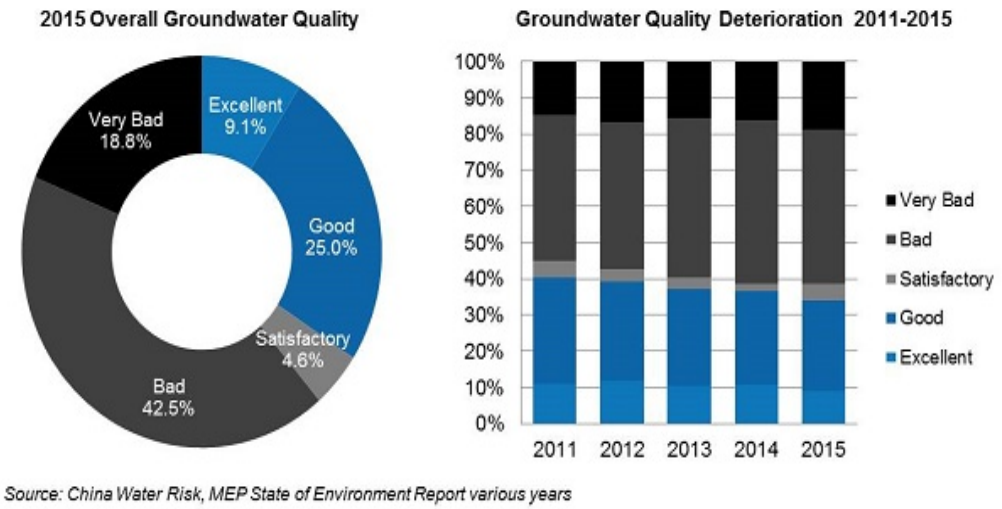


Yang G, Wang Y, Zeng Y, et al. Rapid health transition in China, 1990-2010: findings from the Global Burden of Disease Study 2010[J]. Lancet, 2013, 381(9882):1987-2015.

Double threat of water shortage

Water quantity-induced shortage* and *water quality-induced water shortage



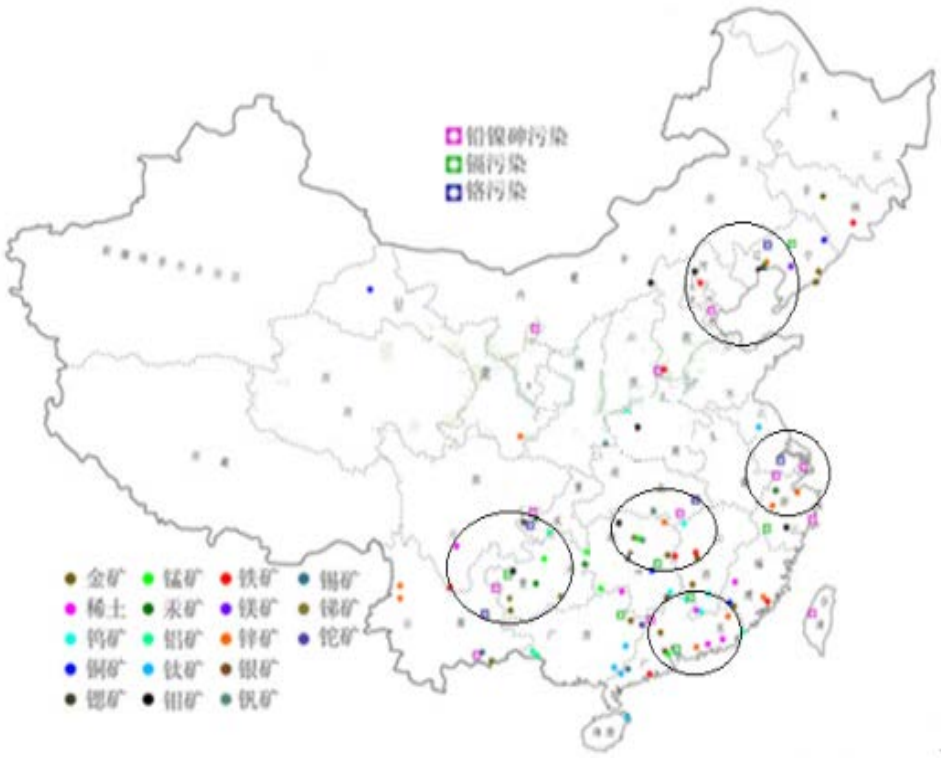


Distribution of water resources per capita in 2013

Ground water quality Deterioration

- **Distribution of water resources: *more in east and south, less in west and north***
- **Wastewater emissions: increase trend in the total, especially *domestic sewage***

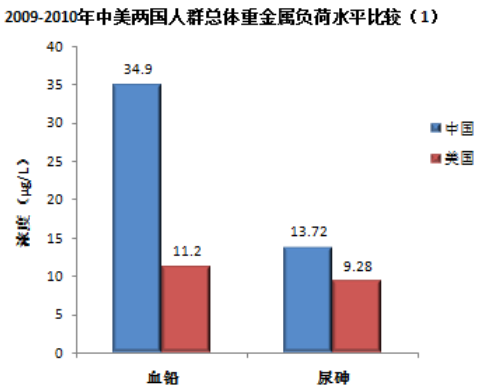
Soil pollution in China



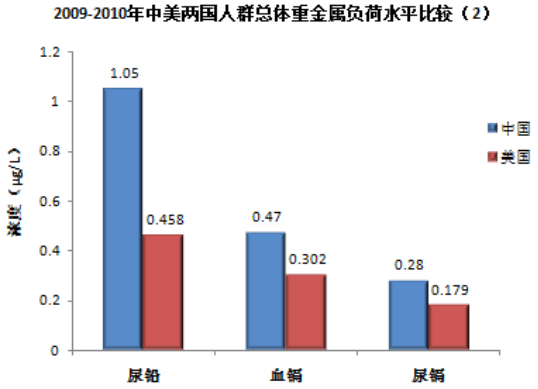
Distribution of heavy metal pollution in soil

- **Inorganic components are the main pollution in soil environment, especially *heavy metals* such as cadmium, nickel, arsenic, copper and lead.**
- **Soil pollution is *more serious* in Yangtze River Delta, the Pearl River Delta, Old Industrial Base in Northeast, southwest and central south area, etc.**

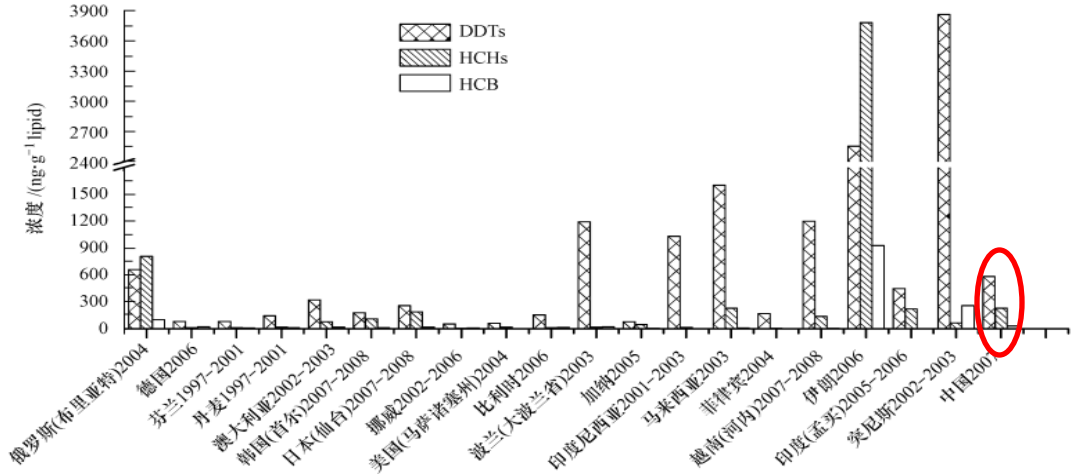
Heavy metals and POPs in body



Concentration of blood lead and urine arsenic between China (2009-2010) and America (2011-2012)



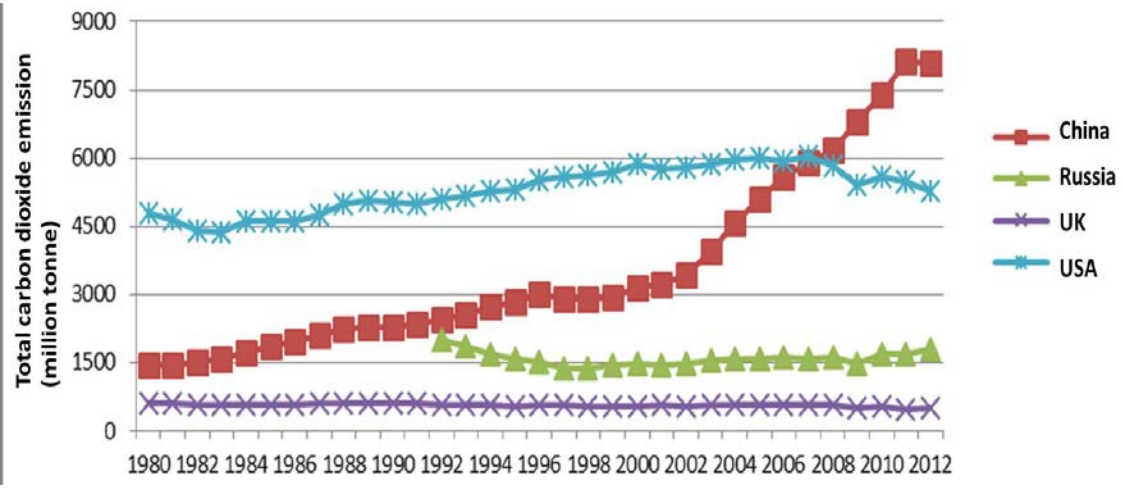
Concentration of urine lead, blood cadmium and urinary cadmium between China (2009-2010) and America (2011-2012)



Levels of organochlorine pesticides in breast milk among different countries (ng/g lipid)

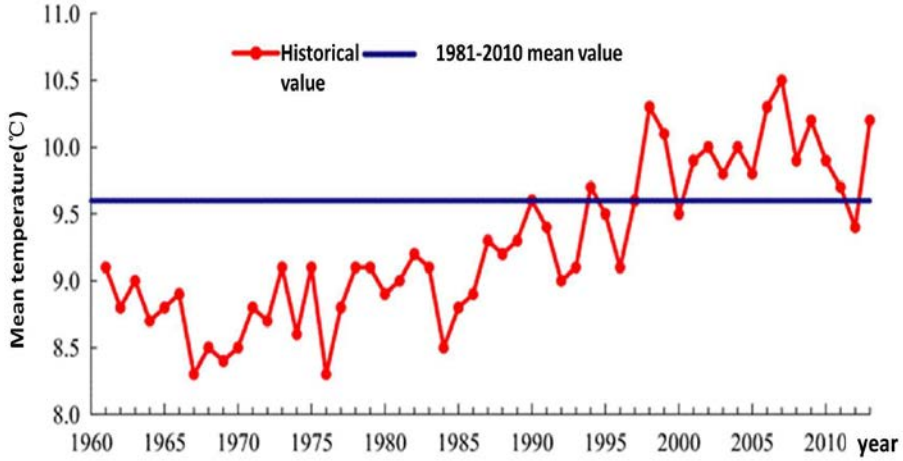
The load levels of *heavy metals* and *POPs* are still high, health effects are being gradually obvious in recent years.

Climate change

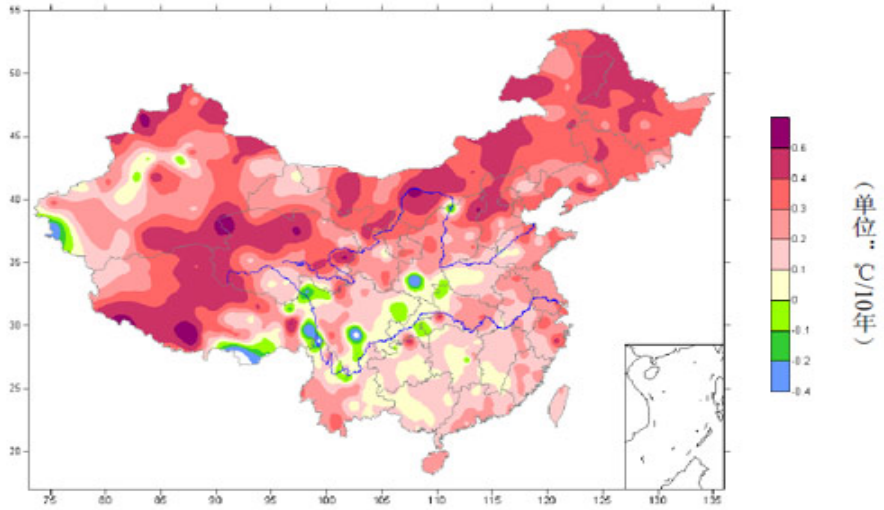


Comparison of CO_2 emissions between China and other major countries

In China, greenhouse gas emissions continue to rise every year, leading to climate warming.

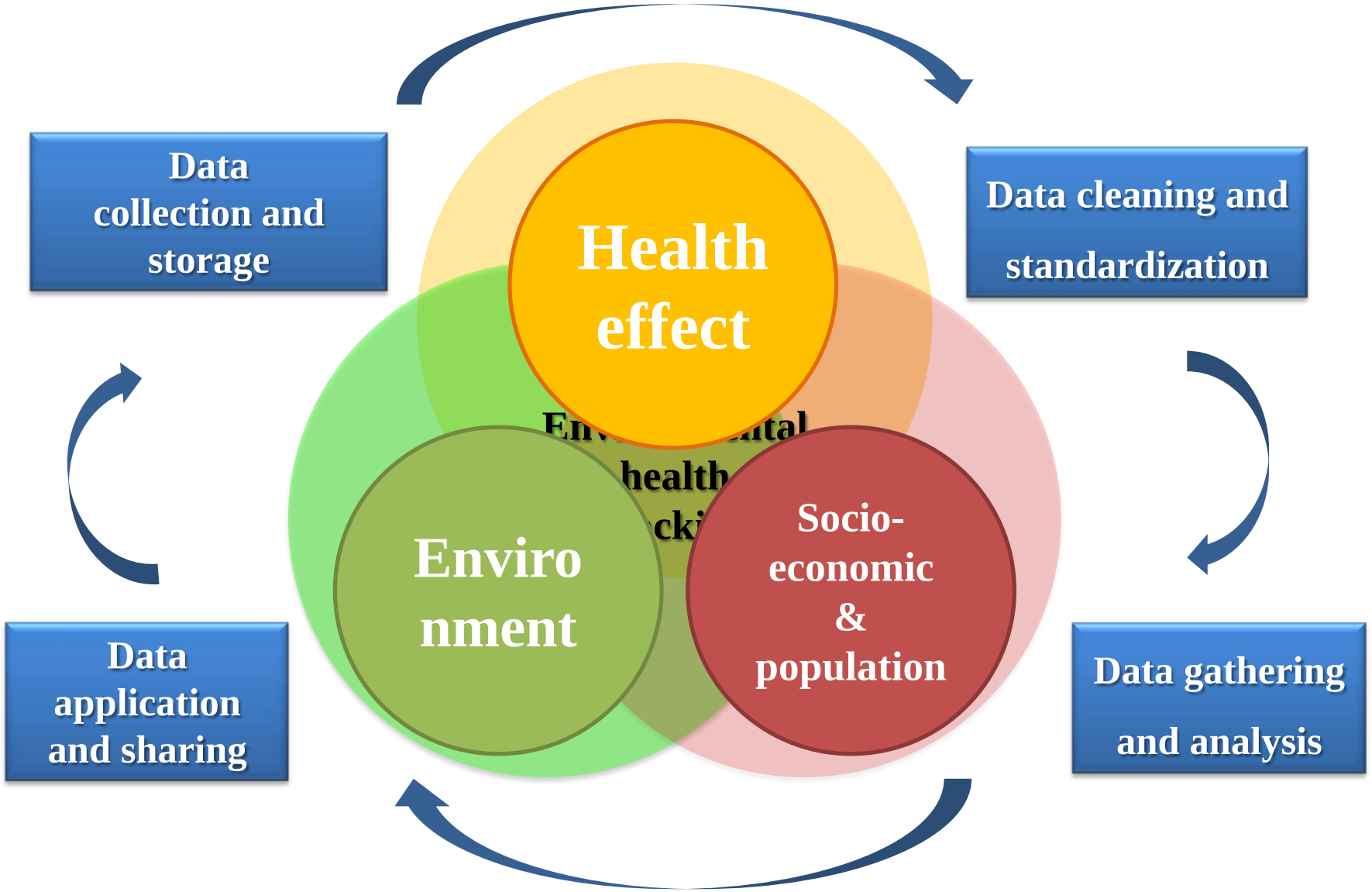


Trend of annual average temperature in 1996-2010

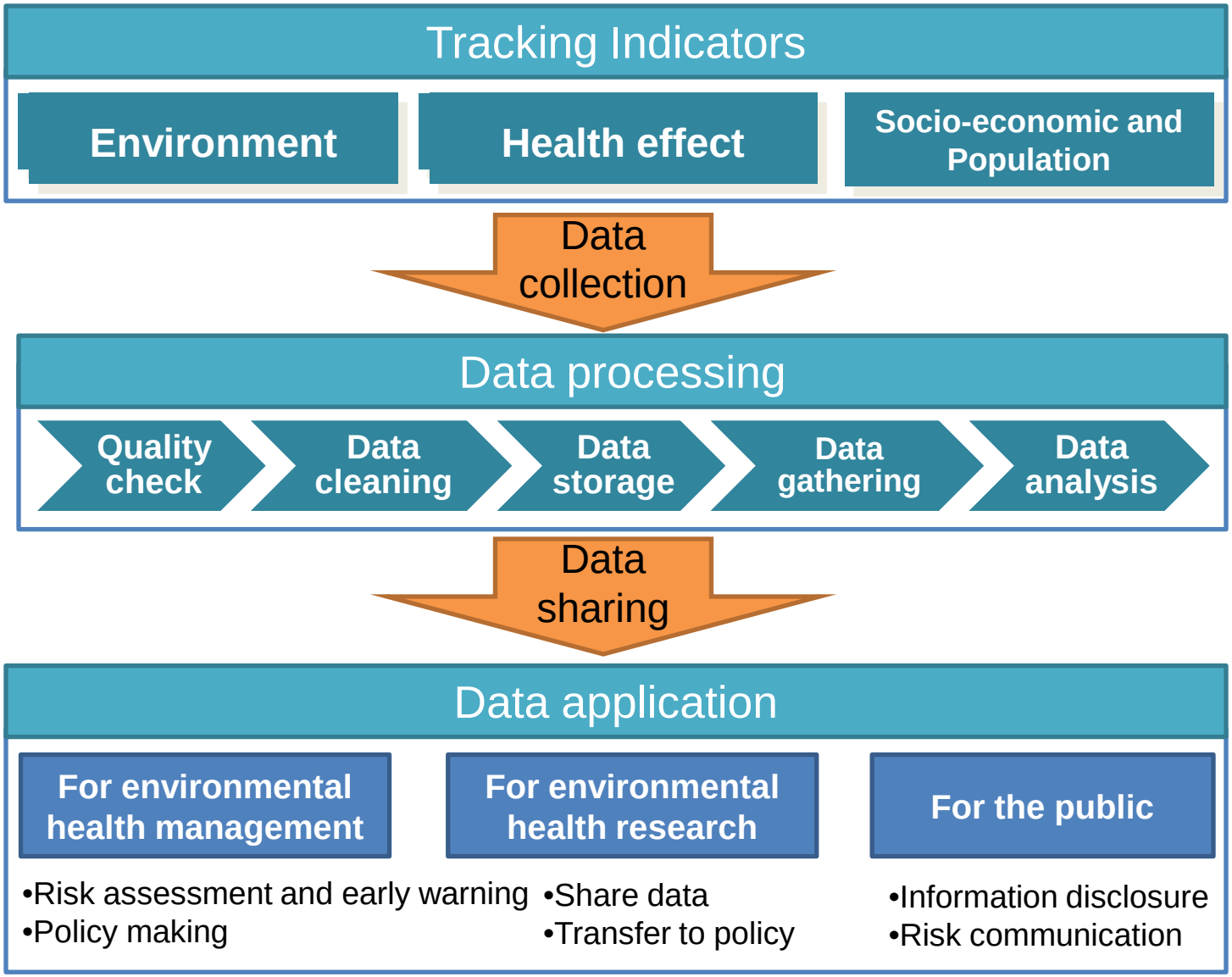


Distribution of temperature changes (1958-2007) (China Meteorological Bureau)

Introduction of CNEHT

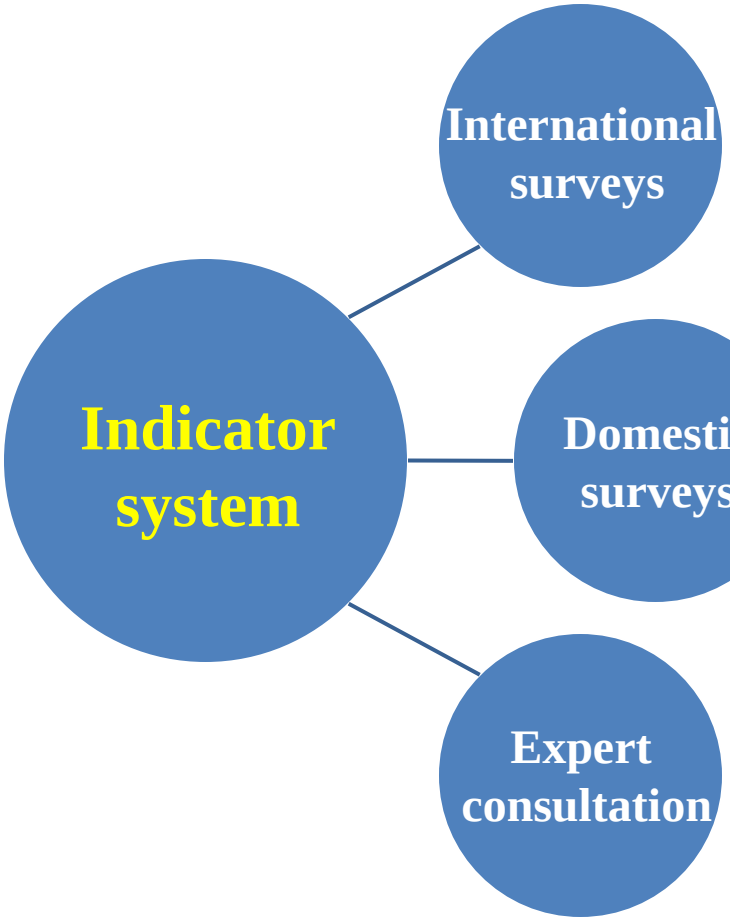

Data collection and storage
Data cleaning and standardization
Health effect
Enviro nment
Socio-economic & population
Data application and sharing
Data gathering and analysis

Framework of CNEHT



1. Indicators Screening & Data Availability

Building up environmental health indicators



- *Experience of tracking systems in other countries*
- *Environmental health framework of WHO*
- *Comparison between China and other countries*

- *Field survey on data availability of local CDCs*
- *Collection of national opening datasets*

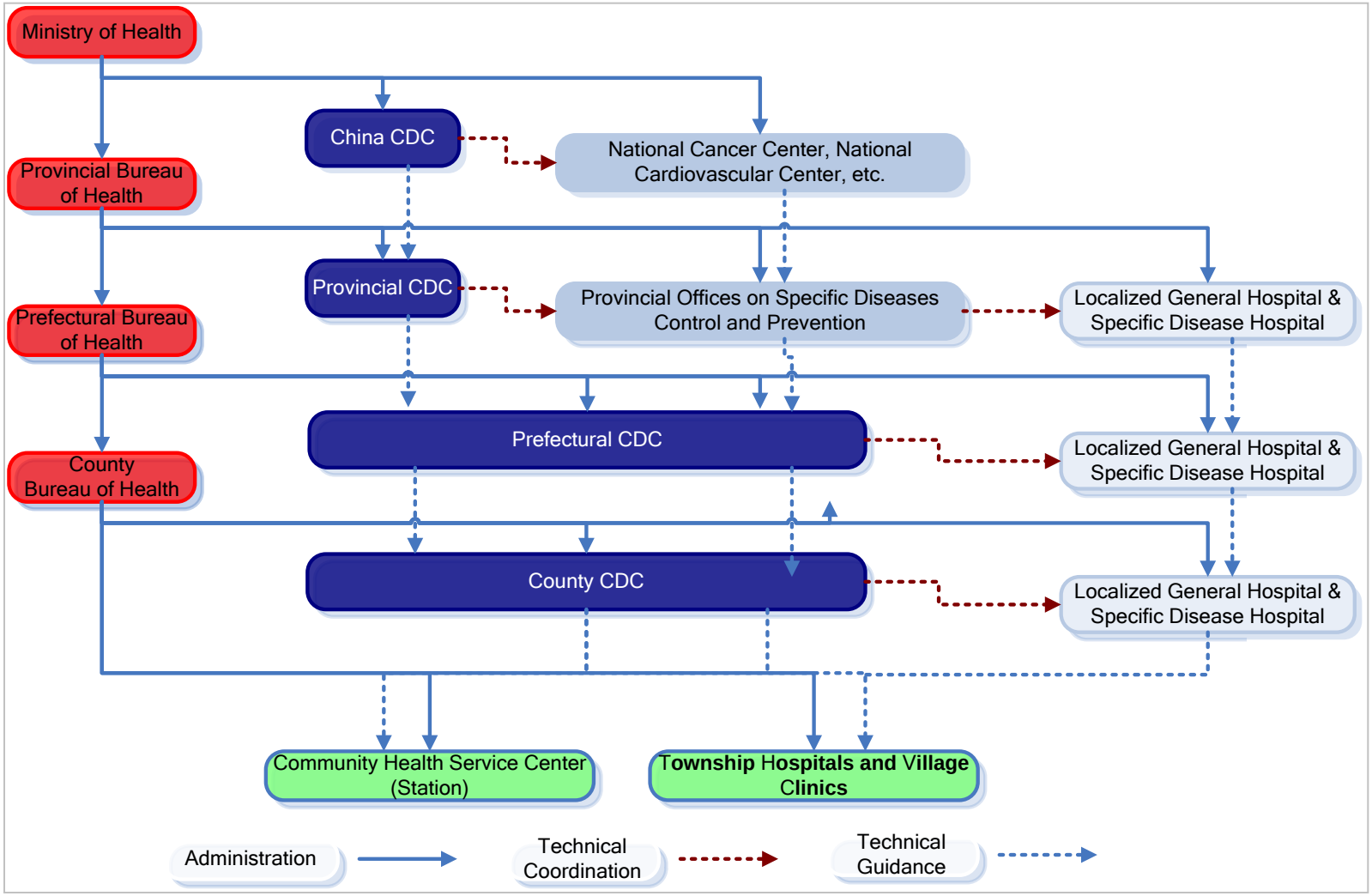
- *Workshop on environmental health indicators among professionals from universities and research organizations.*

International surveys

- **Study on tracking indicators in these advanced tracking systems and framework.**

Country/Organization	Tracking systems
USA	National Environmental Public Health Tracking Network
UK	Environmental public health surveillance system (EPHSS)
Canada	Environmental Public health Program
Australia	Environmental health Australia
Europe	European Environment and Epidemiology (E3)
WHO	Environmental Health Indicators: Framework And Methodologies

Survey of surveillance and monitoring system in China



Key activities of NIEHS

-Air pollution & Health Effects Monitoring

-Drinking Water Monitoring

-Human Bio-Monitoring Project

Air pollution & health effects monitoring

Launched by *National Health and Family Planning Commission (MOH) since 2013*, and technical supported by *IEHS*.

Monitoring Sites:

***126 sites* in 2016.**

Monitoring indicators:

Air pollution、related symptoms、lung function、activity-travel pattern

Drinking water monitoring

- **Launched by National Institute of Environmental Health**
- **106 indicators included in drinking water monitoring network**

2007 — *7 provinces and municipalities* (Beijing, Shanghai, Jiangsu, Zhejiang, Guangdong, Hunan, Heilongjiang), a total of 27 prefecture-level cities and 28 counties or districts

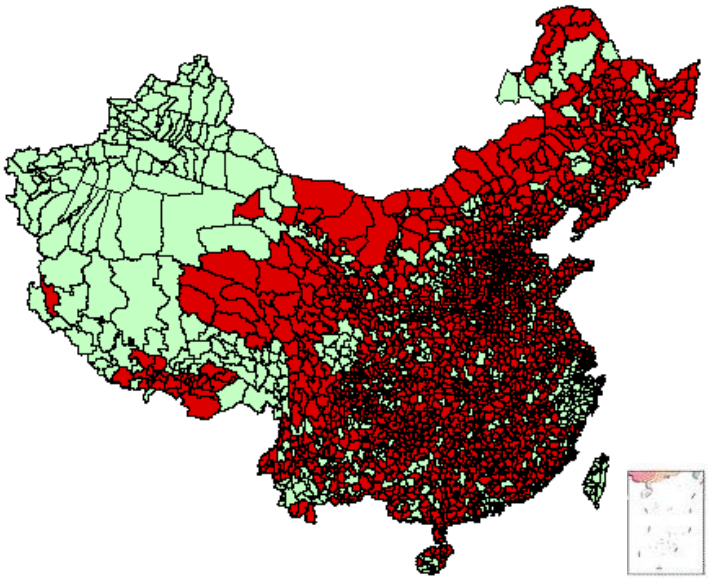
2008 — *15 provinces and municipalities* (Added Hebei, Jilin, Fujian, Sichuan, Chongqing, Gansu, Qinghai, Ningxia), a total of 47 prefecture-level cities and 34 counties or districts

2011 — *32 provinces and municipalities*, a total of 145 prefecture-level cities and 840 counties or districts

2012 — *32 provinces and municipalities*, a total of 271 prefecture-level cities and 874 counties or districts

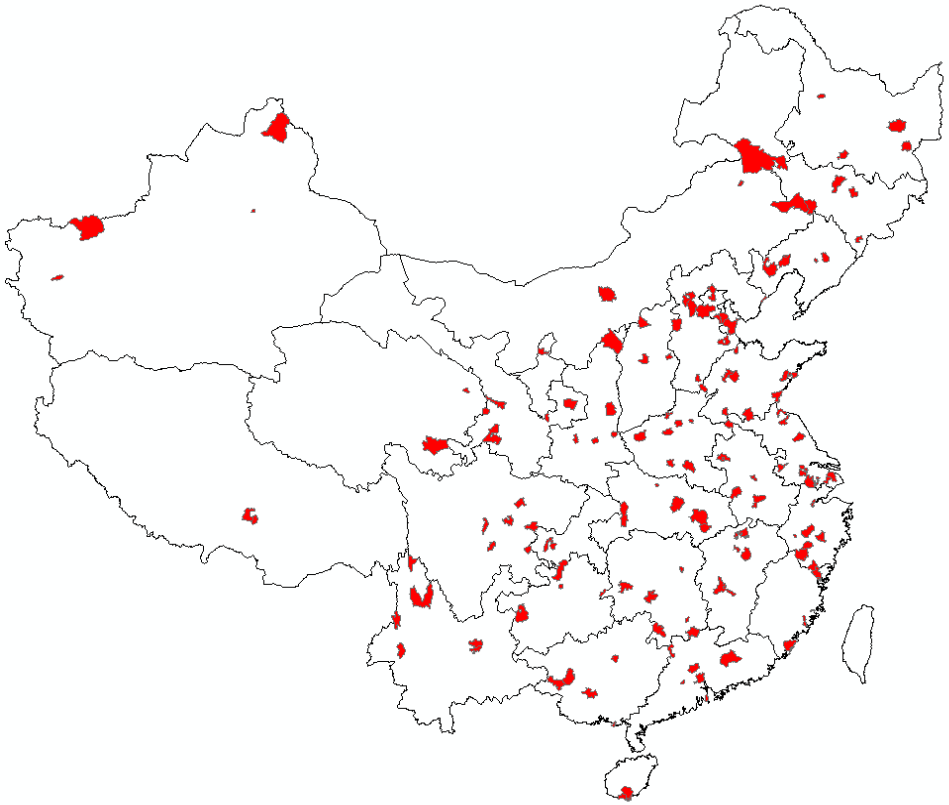
2013 — prefecture-level cities increased to 317,counties or districts were increased to ***1523***.

2014 — counties or districts were increased to ***2570.***



Coverage counties of urban drinking water monitoring in 2014

Human bio-monitoring project



- Start from 2015
- Organized by NIEHS
- Covering 2,869 counties
- 152 counties,
  ×3 communities (villages),
  ×48 persons
  =21,888 persons

This project aims to provide human bio-monitoring data to scientists and governors to aid in assessing exposure to environmental chemicals and in developing policies to reduce exposure to toxic chemicals for the protection.

Other national-scale surveillance systems

Surveillance system	Start time	Data source	Main indicators
The national air quality monitoring system	1997	367 city level and above, 1436 monitoring stations are included	Air Quality index(AQI), and $PM_{2.5}$, PM_{10} , SO_2 , NO_2 , CO , O_3
The national rural environmental health monitoring	2011	700 county,14000 administrative villages from 31 provinces are covered	Rubbish, sewage, the harmless treatment process of toilet and stool, vectors, soil hygiene : soil parasite, heavy metal pollution, et. al
China Death Registry Information System	1990	161 sites (2013) to 605 sites (2016)	All deaths cases
Notifiable infectious diseases surveillance system	1950	31 provinces, 3483 CDCs, 10,000,000 cases per year	37 kinds of notifiable infectious diseases
Behavioral Risk Factor Surveillance System	2004	162 surveillance sites from 31 province, 64 urban and 97 rural sites	4 Major NCD: stroke, COPD, cancer, diabetes, and related behavioral factors
China NCD Disease and Nutrition Surveillance	2015	302 sites at provincial level Covering 180 thousand population	Current situation and future trend of chronic diseases and related impact factors; dietary and nutritional status
Birth defects monitoring system	1986	About 470 hospitals from 31 province, covering 80 millions population	19 kinds of birth defects

Expert consultation

- **Consulting experts from universities, research institutes, and relative organizations in environmental public health area.**

The final CNEHT indicator system (2015-2017)

Data	Indicators	Details
Environmental factors	Air pollution	Hourly data of $PM_{2.5}$,O_3,SO_2,NO_2,CO $PM_{2.5}$ components
	Meteorological factors	Temperature, relative humidity, et al.
	Soil Surveillance	Heavy metal concentration in soil
	Drinking water surveillance	106 indicators
Health Data	NCD Surveillance	Stroke, CHD, cancer, diabetes, hypertension
	Hospital data	Sentinel hospitals data
	Death	Death surveillance
	Heat-stroke	Cases
	Birth data	Premature birth, low birth weight
Socio-economic & Population data	Demographic data	Sex, age, birth rate, death rate, infant mortality, life expectancy, et al.
	Socio-economic data	Income, education, occupation, et al.
	GIS	District and county maps
	Social survey	Lifestyle surveys, et al.

2. Pilot Study in Selected Sites

Selection criteria

1. Related working foundation on environment and health surveillance
2. Information-based construction on basic data collection
3. Good corporation relationships with other departments

Working mechanisms

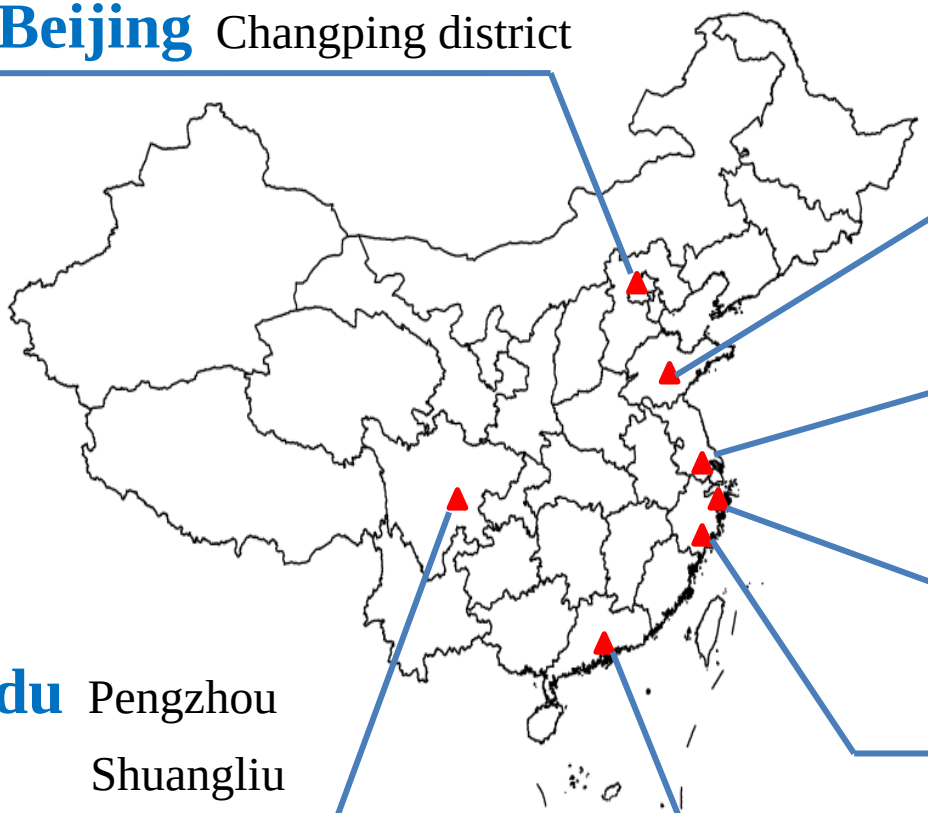
National Institute of Environmental Health takes charge of the overall design and cooperate with local CDCs.

Mission of Institute of Environmental Health

- provide technical assistance to local CDCs
- promote the tracking work of local CDCs
- enhance the disease prevention and control

Establishing pilot tracking sites (2015-2016)

- **7 cities and 11counties are included.**



Beijing Changping district

Jinan Changqing district

Licheng district

Suzhou Zhangjiagang

Gusu district

Hangzhou Xihu distirct

Xiacheng district

Ningbo Jiangbei district

Chengdu Pengzhou

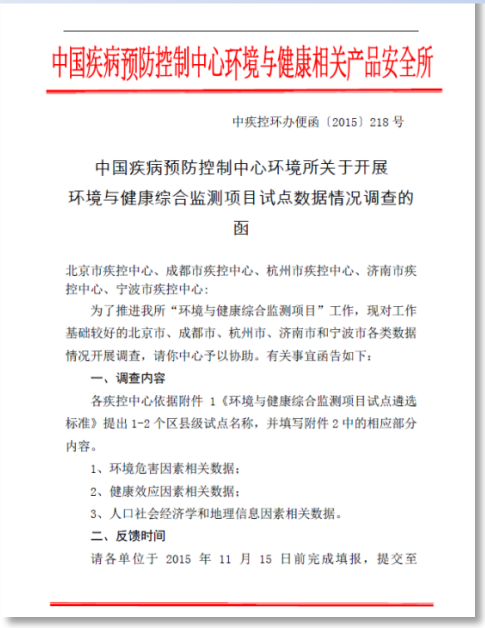
Shuangliu

Shenzhen Longgang district

Pilot survey

- Develop pilot surveys of the available data in the 7 city-level CDCs.

Survey form delivered to local CDCs and the feedback



中国疾病预防控制中心环境与健康相关产品安全所

中疾控环办便函〔2015〕218 号

中国疾病预防控制中心环境所关于开展环境与健康综合监测项目试点数据情况调查的函

北京市疾控中心、成都市疾控中心、杭州市疾控中心、济南市疾控中心、宁波市疾控中心：

为了推进我所“环境与健康综合监测项目”工作，现对工作基础较好的北京市、成都市、杭州市、济南市和宁波市各类数据情况开展调查，请你中心予以协助。有关事宜函告如下：

一、调查内容

各疾控中心依据附件 1《环境与健康综合监测项目试点遴选标准》提出 1-2 个区县级试点名称，并填写附件 2 中的相应部分内容。

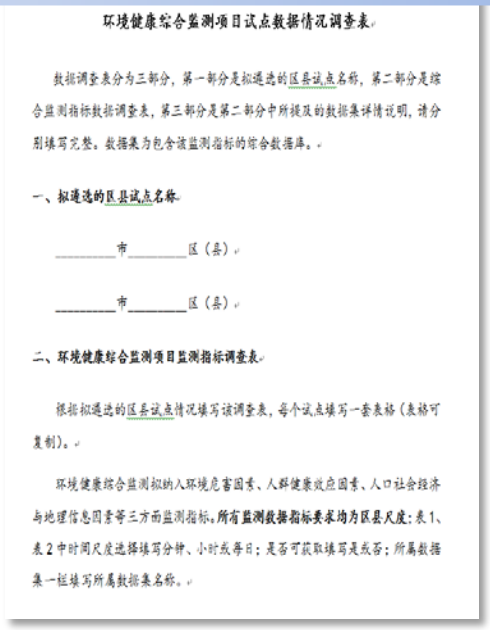
1、环境危害因素相关数据；

2、健康效应因素相关数据；

3、人口社会经济学和地理信息因素相关数据。

二、反馈时间

请各单位于 2015 年 11 月 15 日前完成填报，提交至



环境健康综合监测项目试点数据情况调查表

数据调查表分为三部分，第一部分是拟遴选的区县试点名称，第二部分是综合监测指标数据调查表，第三部分是第二部分中所提及的数据集详情说明，请分别填写完整。数据集为包含该监测指标的综合数据库。

一、拟遴选的区县试点名称

_____市_____区（县）

_____市_____区（县）

二、环境健康综合监测项目监测指标调查表

根据拟遴选的区县试点情况填写该调查表，每个试点填写一套表格（表格可复制）。

环境健康综合监测拟纳入环境危害因素、人群健康效应因素、人口社会经济与地理信息因素等三方面监测指标。所有监测数据指标要求均为区县尺度：表 1、表 2 中时间尺度选择填写分钟、小时或每日；是否可获取填写是或否；所属数据集一栏填写所属数据集名称。

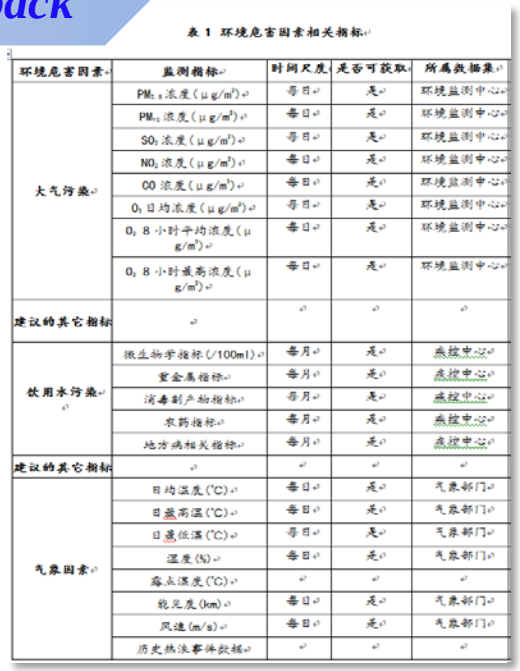
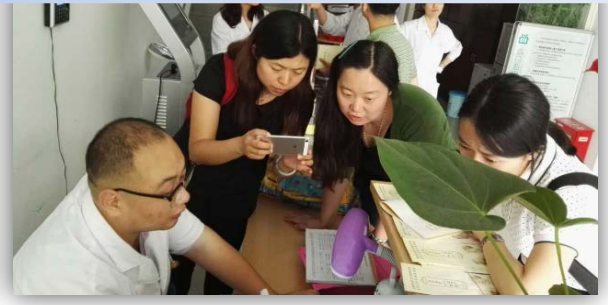


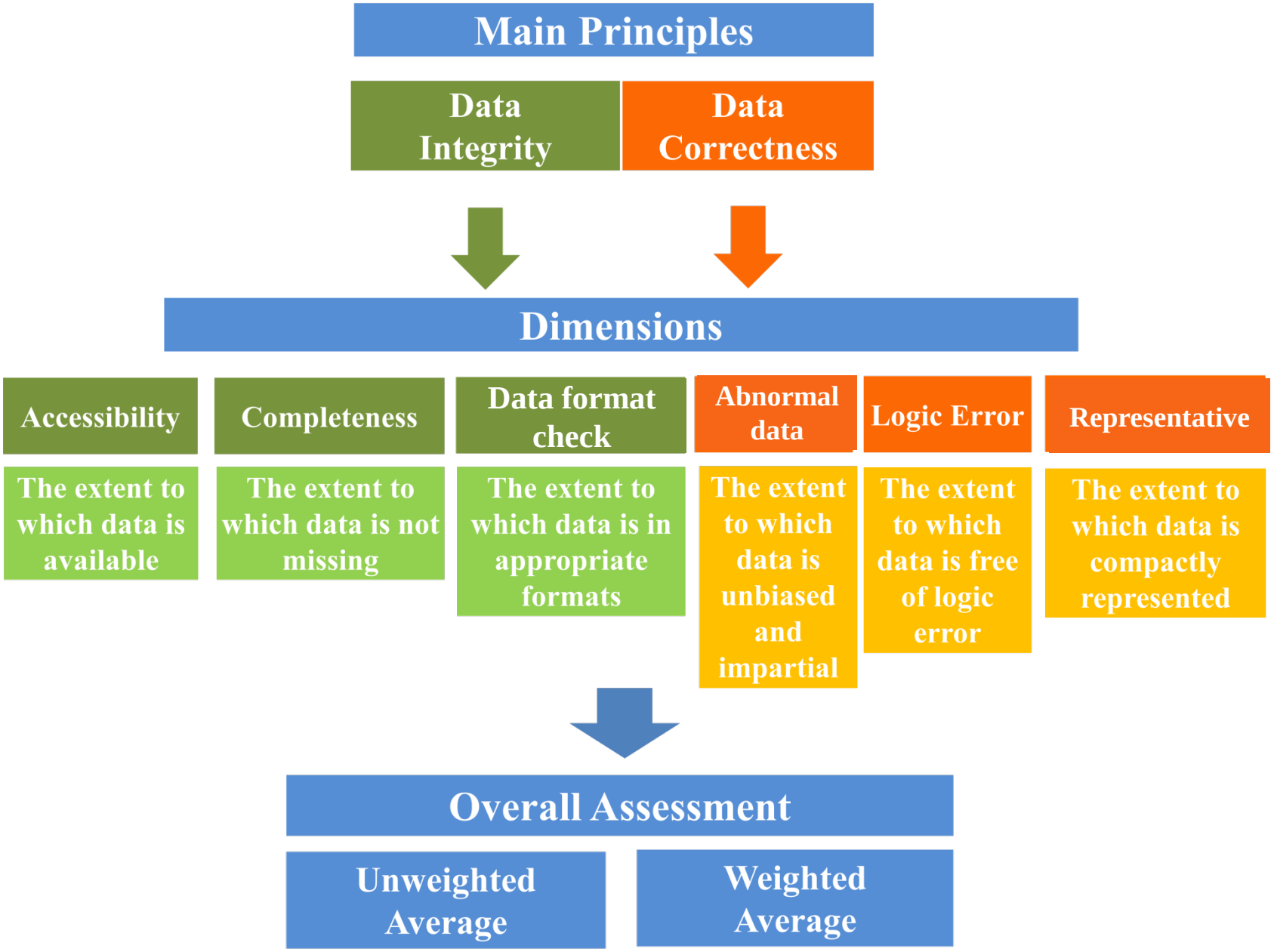
表 1 环境危害因素相关指标

环境危害因素	监测指标	时间尺度	是否可获取	所属数据集
大气污染	$PM_{2.5}$ 浓度（μg/m³）	每日	是	环境监测中心
	PM_{10} 浓度（μg/m³）	每日	是	环境监测中心
	SO_2 浓度（μg/m³）	每日	是	环境监测中心
	NO_2 浓度（μg/m³）	每日	是	环境监测中心
	CO 浓度（μg/m³）	每日	是	环境监测中心
	O_3 日均浓度（μg/m³）	每日	是	环境监测中心
	O_3 8 小时平均浓度（μg/m³）	每日	是	环境监测中心
	O_3 8 小时最高浓度（μg/m³）	每日	是	环境监测中心
建议的其它指标				
饮用水污染	微生物学指标（/100ml）	每月	是	疾控中心
	重金属指标	每月	是	疾控中心
	消毒副产物指标	每月	是	疾控中心
	农药指标	每月	是	疾控中心
	地方病相关指标	每月	是	疾控中心
建议的其它指标				
气象因素	日均温度（℃）	每日	是	气象部门
	日最高温（℃）	每日	是	气象部门
	日最低温（℃）	每日	是	气象部门
	湿度（%）	每日	是	气象部门
	露点温度（℃）			
	能见度（km）	每日	是	气象部门
	风速（m/s）	每日	是	气象部门
	历史热浪事件数据			

Field Survey in local CDC and pilot tracking sites



Framework of data quality control and evaluation



Checklist form of data quality control

(*data quality check for all indicators*)

Data	Indicators	Accessibility	Completeness	Interpretability	Objectivity	Concise representation	Logic error	Overall assessment
Environmental factors	Air pollution	√	√	√	√		√	
	Meteorological factors	√	√	√	√		√	
	Soil Surveillance	√	√	√	√	√	√	
	Drinking water surveillance	√	√	√	√	√	√	
Health Data	NCD Surveillance	√	√	√	√	√		
	Hospital data	√	√	√	√	√		
	Death	√	√	√	√	√	√	
	Heat-stroke	√	√	√	√			
	Birth data	√	√	√	√			
Socio-economic & Population data	Demographic					√	√	√
	Socio-economic					√	√	√
	GIS					√	√	√
	Social survey					√	√	√

Data availability in pilot sites

(*data availability check in 11 pilot tracking sites*)

Data	Indicators	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11
Environmental factors	Air pollution	√	√		√	√	√	√	√	√	√	√
	Meteorological factors	√	√	√	√	√	√	√	√		√	√
	Soil	√	√	√	√			√	√			√
	Drinking water	√	√	√	√	√	√	√	√	√	√	√
Health Data	NCD	√	√	√	√	√	√	√	√		√	√
	Hospital data	√	√	√		√		√	√		√	
	Death	√	√	√	√	√	√	√	√	√	√	√
	Heat-stroke	√	√	√	√	√		√	√		√	√
	Birth data	√	√	√	√	√		√	√		√	
Socio-economic & Population data	Demographic	√	√	√	√	√	√	√	√	√	√	√
	Socio-economic	√	√		√	√		√	√		√	√
	GIS	√	√			√					√	√
	Social survey	√	√	√		√	√	√	√		√	√

3. Information System Construction

A feasible system integrating data collection, processing, and sharing

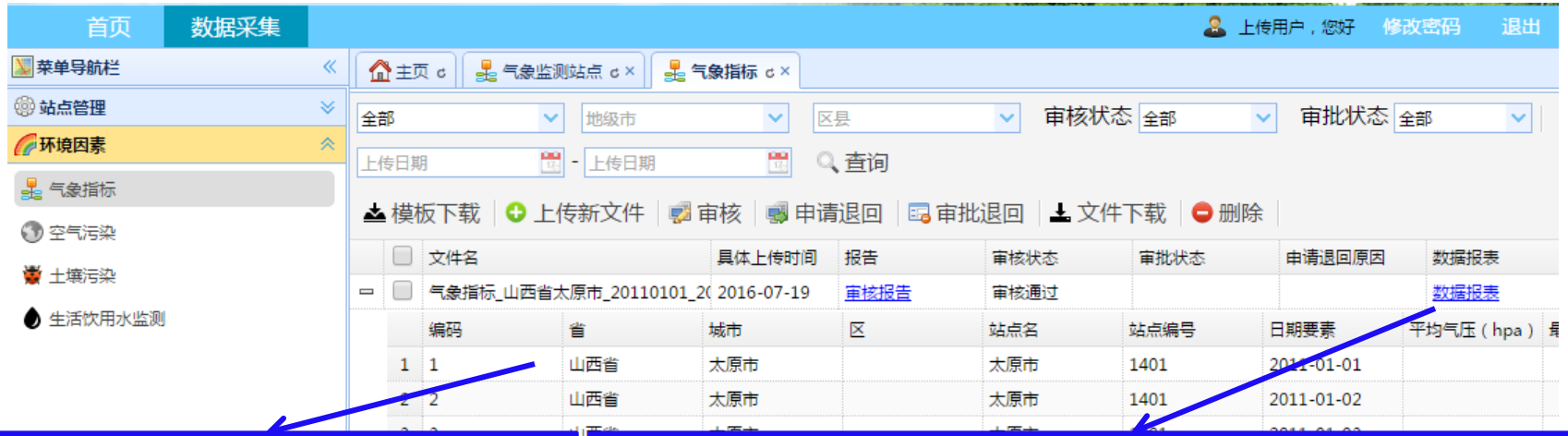
Data collection

Environmental factors

Health effect factors

Population and socio-economic factors

Data quality check and clean



Automatically generated report of uploaded data quality

Automatically generated report of descriptive statistical analysis of uploaded data

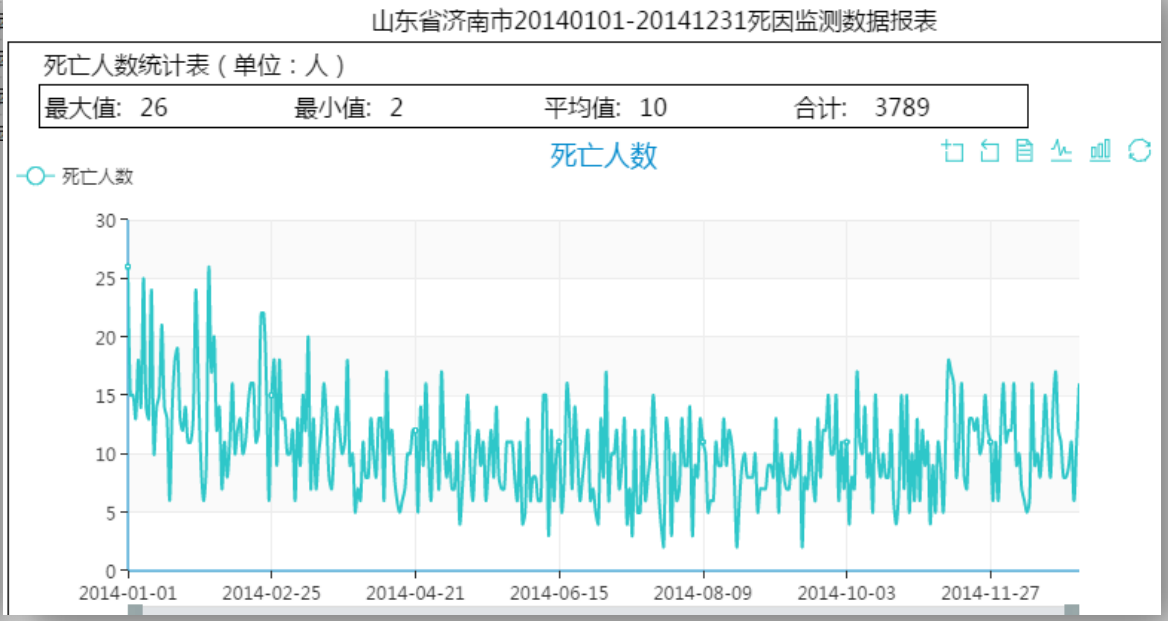
审核报告

文件名 气象指标_山西省太原市_20110101_20121231.xls

数据总条数:730条，其中文件内重复条数：0条，文件与库内重复条数：730条

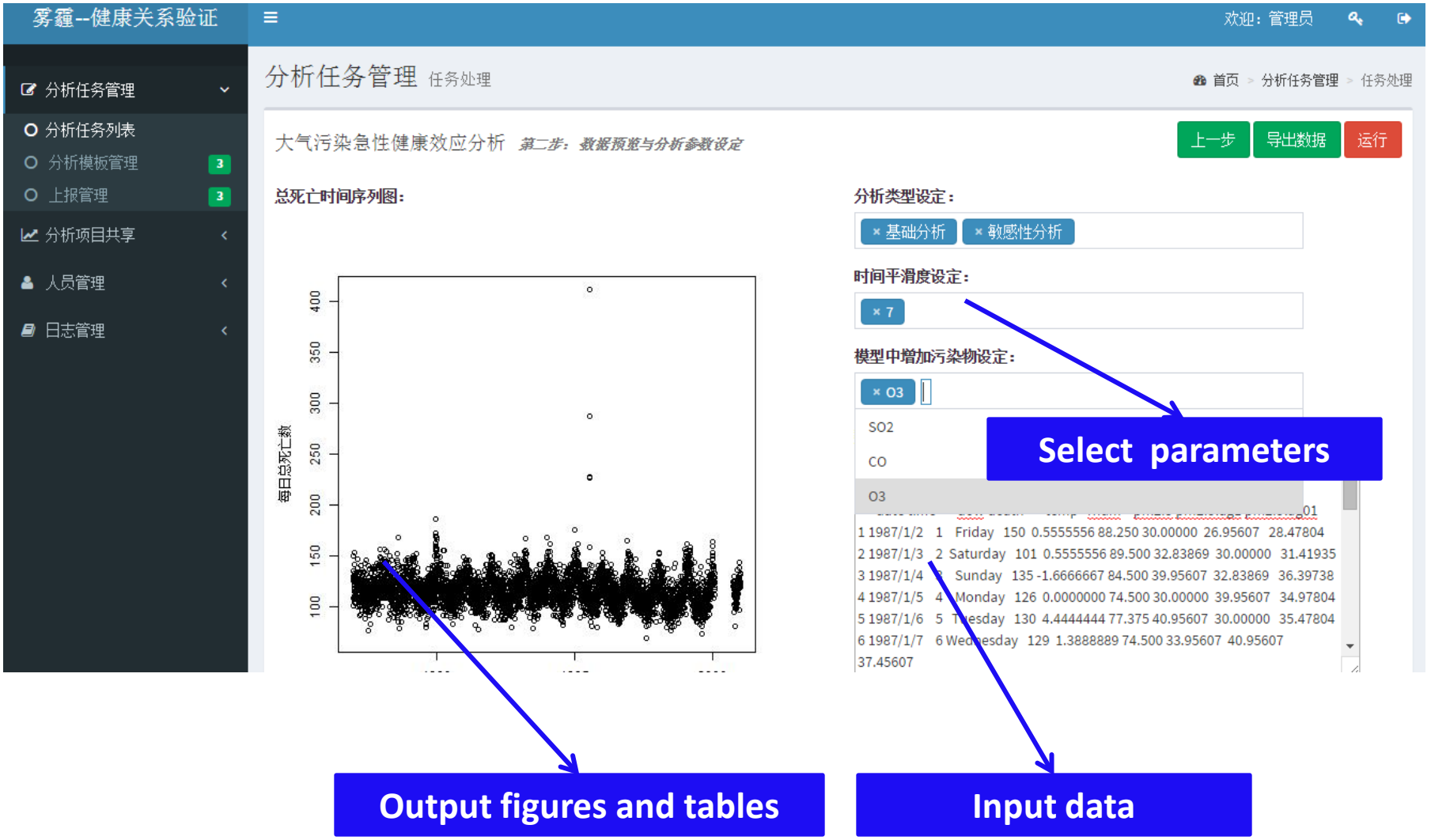
变量	缺失条数	缺失率
站点名	0	0%
站点编号	0	0%
日期	0	0%
平均温度	0	0%
最高温度	0	0%
平均相对湿度	0	0%
最大湿度	730	100%
最小湿度	730	100%
日平均风速	0	0%
平均气压	730	100%
最高气压	730	100%
最低气压	730	100%

查看详情



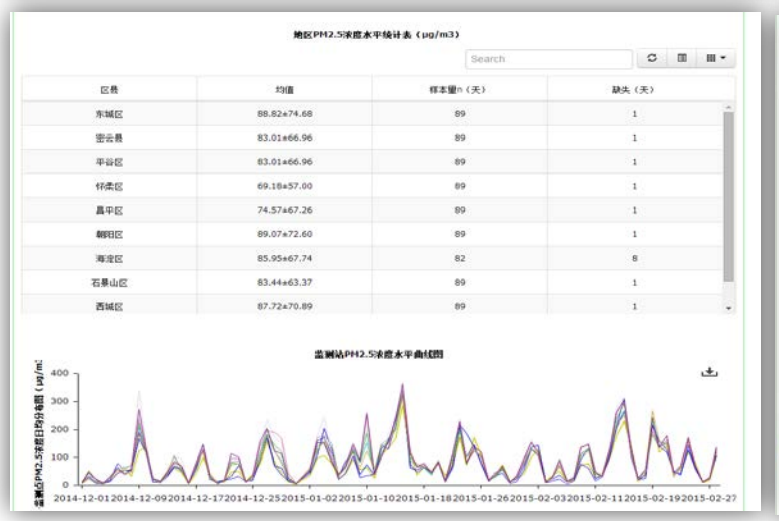
Quick data analysis toolkit

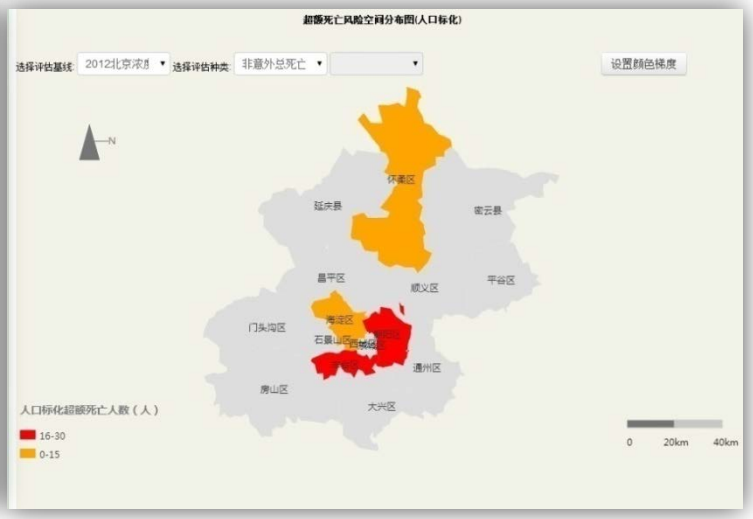
- R-based toolkit makes analysis easier and quicker



Health risk assessment toolkit

- Input $PM_{2.5}$ data and select parameters
- Output results of local environmental risk level





Data standardization and data query

Environment datasets

Health effects datasets

Population datasets

Socio-economic datasets

Geographic datasets

Data query and download

Data visualization

4. Perspectives

Long-term plan

2015-2017

- Build up environmental health tracking indicator system;
- Establishing **30** pilot tracking sites, **11** sites have been established;
- Start data collection in pilot sites.

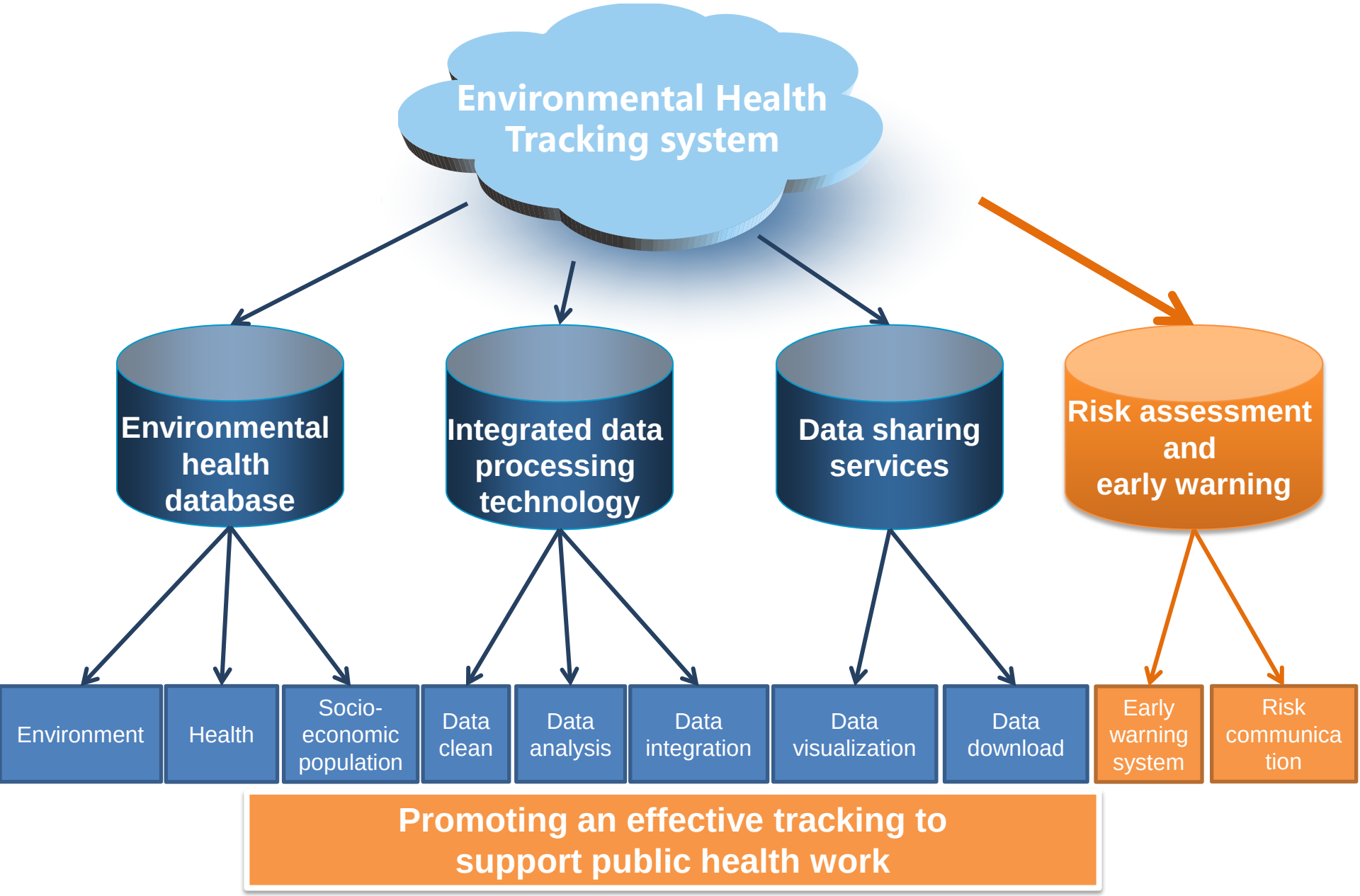
2018-2020

- Expand to **150** county-level tracking sites;
- Develop technical standards and tools for tracking work
- Develop environmental health risk assessment and early warning tools

2021-2025

- Promote tracking data sharing service and application
- Implement environmental health intervention in tracking sites
- Promote public health policy making based on CNEHT
- Promote provincial/city level environmental health tracking

What will be achieved



Concluding Comments

- ***Enhancement of the international environmental health tracking network***
- ***Regular workshops on***

  implementation of environmental health tracking

  application of environmental health data

  supports for public health policy
- ***Staff exchange***

Welcome to
1st China Environmental Health Conference
(July, 2017)

- Key issues on environmental health, including surveillance, research, policy, etc.
- International participants from WHO, Health departments, universities and institutions
- Domestic participants from CDCs, universities, institutions, etc.
- Potential session on environmental health tracking

Thanks