User's Manual of ABaCAS-SE

1 Introduction

ABaCAS-SE (Air Benefit/Cost and Assessment System: Streamlined Edition) is an integrated system to connect six individual ABaCAS tools (ICET, RSM-VAT, SMAT-CE, BenMAP-CE, Data Fusion and Model-VAT) to provide policy makers with a user-friendly framework for conducting integrated assessments of emissions control cost and their associated health and economic benefits and air quality attainment.

1.1 Functional framework of ABaCAS-SE

ABaCAS-SE will call and run the five modules sequentially in the background using a master script. ICET will estimate the emission costs associated with futureyear control strategies. RSM-VAT/CMAQ will take the emissions reduction from ICET to provide a real-time air quality response of emissions change. Then SMAT-CE combines the monitoring data as well as the air quality data from RSM-VAT/CMAQ and to assess if the air quality goal or attainment has been reached. Subsequently, BenMAP-CE uses the air quality surface generated from SMAT-CE to estimate the health and economic benefits resulting from changes in air quality. And then, Data Fusion superimposes the optimized assessment results of relevant emission reduction measures with localized data like remote sensing, population, monitoring and so on. Finally, ABaCAS-SE will integrate the results from these five modules to provide assessments of emissions control cost and their associated air quality, health and economic benefits as well as estimate the cost/benefit ratio (\$\$ benefit per \$\$ cost). A user-friendly graphical user interface (GUI) together with graphical and tabular functions is also provided for users to easily visualize and analyze these assessment results.

1.2 Who Can Use ABaCAS-SE?

ABaCAS-SE can be used by a wide range of persons, including scientists, policy analysts, and decision makers. Most end users (policy makers) can directly use the ABaCAS-SE to analyze the pollution situation under the existing control scenarios and then adjust control measures based on these analyzed results.

In a word, ABaCAS-SE can be used in the following aspects:

Strategy design and assessment screening tool

➤ "What If?" Analyses

• Provide real-time cost-benefit results for real scenarios.

1.3 Computer Requirements

Recommend screen resolution: 1024 by 768 pixels; Font size: normal.

CPU	Intel, Duo-Core, 1.6GHz
Memory (RAM)	2GB
Free Disk Space	10GB
Operation System	32-Bit Windows XP
D 10 4	
Recommend Syst	em Environment:
CPU Recommend Syst	Intel, Quad-Core, 3GHz
CPU Memory (RAM)	Intel, Quad-Core, 3GHz 6GB
CPU Memory (RAM) Free Disk Space	em Environment: Intel, Quad-Core, 3GHz 6GB 10GB

Minimum System Environment:

1.4 Installing/Uninstalling ABaCAS-SE

1.4.1 Installing ABaCAS-SE

➤ Download ABaCAS-SE Software Package on the ABaCAS website. This tool and corresponding example data are available for registered users at this website: http://www.abacas-dss.com/abacas/Software.aspx.

> Double click ABaCAS-SE_Setup.exe to install the program, it will appear the following figure.



Fig. 1 Setup Window

Click "Next" button, users should choose install location in Fig.

🖟 ABaCAS	- InstallShield Wizard			×
Destinati Click Nex	on Folder ct to install to this folder, or click	Change to insta	all to a different folder	ABaCAS
	Install ABaCAS to: C:\Program Files (x86)\			Change
InstallShield -		< Back	Next >	Cancel

Fig. 2 Choose Install Location

> Click "Next" button, it will show the "Ready to Install" window as shown in Fig. .

🖟 ABaCAS - InstallShield Wizard		X
Ready to Install the Program		
The wizard is ready to begin installation.	ABaCA	5
Click Install to begin the installation.		
If you want to review or change any of exit the wizard.	f your installation settings, click Back. Click Cancel to	
InstallShield		
	< Back Install Cancel	



➤ Click "**Install**" button and ABaCAS-SE will be installed.

🖟 ABaCAS	- InstallShield Wizard		_		×
Installing The prog	ABaCAS	being installed.		A	BaCAS
ABeCAS	Please wait while the InstallSł several minutes,	nield Wizard installs	ABaCAS. This may	take	
	Status:				
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Fig. 4 Installation Processing

No Abacko - Instalioneu (InstallShield Wizard Completed	^
SAVIANMENTED STATES	The InstallShield Wizard has successfully installe Click Finish to exit the wizard.	ed ABaCAS.
	< Back Finish	Cancel

Fig. 5 Installation Complete

Click "Finish" button and installation complete.

After finished installation, please download the corresponding ABaCAS-SE input data and unzip it to My Documents directory under \My Documents\My ABaCAS-SE Files\Data* to replace the old Data folder. These data and tool are available at: http://abacas-dss.com/abacas/Software.aspx.

1.4.2 Uninstalling ABaCAS-SE

- ➢ Go to Control Panel.
- Select ABaCAS-SE and click Change/Remove, it will appear following figure.



Fig. 6 Uninstallation Processing

> After a few seconds, uninstallation will finish.

1.5 Contacts for Comments and Questions

For comments and questions, please contact Prof. Yun (Dustin) Zhu at South China University of Technology, Environmental Simulation and Information Laboratory.

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1.6 Sources for More Information

For files that you can use in ABaCAS-SE:

Air Benefit and Cost and Attainment Assessment System (ABaCAS) website, available at: <u>http://www.abacas-dss.com/abacas/Software.aspx</u>.

2 Terminology and File Types

The first section of this chapter explains common terms used in this user's manual. Section 2.2 describes in detail the necessary format for externally-generated model and monitor data files that can be read into ABaCAS-SE.

2.1 Common Terms

> ABaCAS-SE: Air Benefit/Cost and Assessment System: Streamlined Edition.

2.2 File Types

> ABaCAS-SE Project File: An existing ABaCAS-SE project file.

> ICET Project File: An existing ICET project file.

➤ **Control Input File**: it should be in the form of a simple text file (*.csv). This file contains:(1) Unit control costs in various control factors under different emission reductions;(2) The default control level;(3) Unit of Emission and Cost;

Data Sources mainly come from those control strategy models (e.g., EMF/CoST, GCAM, TECAS, GAINS-Asia, LEAP, etc.) or research reports/references or field investigation of local factories in the areas/cities.

➤ **Mapping File**: it is a simple text file (*.csv), which is used to link the Region, Pollutant, Source in ICET with those in RSM. For example, "Shanghai" used in ICET will be instead of "SH" in RSM.

RSM configuration Files: Those existing pre-processed RSM format files (*.rcfg).

➤ Region Grid Ratio File: A *.txt file defines the grid ratio of the analyzed cities, which represents the percentage of the grid covered by those analyzed cities.

CMAQ output Files: Those existing pre-processed CMAQ output files.

> Grid Shape File: A *.csv file defines a sequence of points for each state or county,

or any other contour, in terms of X, Y coordinates.

▶ PM_{2.5} Monitor Data: A *.csv file for PM_{2.5} concentration of each monitor site. It contains each site's geographic location、station name and PM_{2.5} concentration.

➤ O3 Monitor Data: A *.csv file for O3 concentration of each monitor site. It contains each site's geographic location, station name and O3 concentration.

Species Fraction Data: A *.csv file which uses to calculate the concentration of each component in the corresponding monitoring point and space area.

➤ Grid Definition File: A *.txt or *.shp file contains a series of information of a total number of columns and rows, column index, row index and so on.

➤ **Pooled Grid Definition**: it is used to aggregate the grid value into the value of a target region level (e.g., county or state level). It is noted that this file should have overlaps with the grid definition file in SMAT-CE input options.

➤ CFG Configuration File: it is a configuration file (*.cfgx), which is used for health impact assessment.

➤ APV Configuration File: it is a configuration file (*.apvx or *.apvrx), which is used for environmental benefit assessment.

Table 1 presents the above the different file types, their name and their file extension.

Filename	File Extension
ABaCAS-SE Project File	*.projx
ICET Project File	*.projx
Control Input File	*.csv
Mapping File	*.txt
RSM configuration Files	*.rcfg
Region Grid Ratio File	*.txt
CMAQ output Files	*.csv
Grid Shape File	*.csv
PM _{2.5} Monitor Data	*.csv
O3 Monitor Data	*.csv
Species Fraction Data	*.csv
Grid Definition File	*.txt or *.shp

Table 1 File types generated by ABaCAS-SE

Pooled Grid Definition	*.shp
CFG Configuration File	*.cfgx
APV Configuration File	*.apvx or *.apvrx

3 Main Interface

The main interface of ABaCAS is shown in Fig. .

On the left-hand of the main interface, it's four standalone ABaCAS tool buttons (ICET, RSM-VAT, SMAT-CE, and BenMAP-CE). You can click any one of the four buttons to run the standalone tool according to your own demand.



Fig. 7 The interface of ABaCAS

➤To start ABaCAS-SE, you can click ABaCAS-SE button and the main window of ABaCAS-SE will appear, as shown in 错误!未找到引用源。.



Fig. 8 Main interface of ABaCAS-SE

Click File button on the toolbar of the main interface, there are seven options that users can choose.

- 1) Go to file, click **New Project** button to create a new project.
- 2) Click **Open Project** button, locate the *.proj file and open it.
- 3) Click **Save Project** button to save a created project.
- 4) Click **Example Cases** button to choose and open the existing example cases that have been successfully run.
- 5) Click **Options** button to modify the executable path of each subsystem of ABaCAS-SE and data storage path.
- 6) Click **Case Settings** button to use the configuration files of the relevant projects that have been configured without having to select and set each module one by one.
- 7) Click **Exit** button to exit system.

Click Tool button to set and run related tools individually according to the needs of users, including ICET, RSM-VAT, SMAT-CE, BenMAP-CE, Model-VAT and Data Fusion Tool.

Click Case button to view the existing case studies in China, the US or the other regions. > Click **Start Page** button to open the main interface of ABaCAS.

➤ In addition, there are four different input options for inputting different data or configurating the calculation parameters, including ICET input option, RSM/CMAQ input option, SMAT-CE input option and BenMAP-CE input option.

3.1 ICET Input Option

➤ The ICET Input Option allows users to set Control Input File and Mapping File.
And users can also select specific region for calculation and analysis, as shown in 错

误!未找到引用源。.

File Tool Case Start Page		
ICET input option RSM/CMAQ input option SMAT-CE input option RomMD CE input option	Project Name:	
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ICET input option		
ABaCAS-SE Project File:		
Annual PM Ozone		
O Enter pre-run ICET project file:		
No pre-run ICET project file		
* Control Input File:		2-2-0
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Available Regions: Selected Regions:	En TREE Contraction	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Jiangsu Zhejiang Other >> Zhejiang Other Set up details>>		
Mapping File:		mad 2
Mapping_Factors_ICET2RSM_YRD.csv		Xu
Shanghai Jiangsu Zhejiang Other		16.20
PowerPlant		
NOx Emission Reduction (%) 64.9		
PM25 Emission Reduction (%) 10		ABaCAS-SE
Domestic		
NOx Emission Reduction (%) 75.5		
SO2 Emission Reduction (%) 56.1		
Save Back Next		Current Setup: China

Fig. 9 ICET Input Option

> Annual PM/Ozone: allow users to choose the analyzed pollutant according to their needs.

➤ Pollutant control: allows users to set emission reduction ratios of different pollutants of various sectors in different regions/cities, which base on their data sources like control strategy models or research reports/references or field

investigation of local factories in the areas/cities. With these data, the rationality of the model prediction value can be guaranteed.

3.2 RSM/CMAQ Input Option

➤ The RSM/CMAQ Input Option includes RSM Input option and CMAQ Input Option. Users can choose one of them to calculate and analyze, as shown in 错误!未找到引用源。.



Fig. 10 RSM/CMAQ Input Option

3.2.1 RSM Input Option

➤ The RSM Input option allows users to enter pre-run RSM configuration files and set the base year and control year according to their needs, as shown in 错误!未找到 引用源。. In addition, the Region Grid Ratio File is not necessary here.



Fig. 11 RSM Input option

3.2.2 CMAQ Input Option

The CMAQ Input Option allows users to enter pre-run CMAQ output files and set the base year and control year according to their needs, as shown in 错误!未找到 引用源。. In addition, the Region Grid Ratio File and Shape File are necessary here. And it's noted that when users choose pre-run CMAQ output files as input files, the result can't be displayed in the form of Chart.



Fig. 12 CMAQ Input option

3.3 SMAT-CE Input Option

➤ The SMAT-CE Input Option includes Monitor Data, Monitor Data Year, Spatial Field Option, Species Data and Grid Definition File, as shown in 错误!未找到引用 源。.



Fig. 13 SMAT-CE Input Option

➤ Monitor Data: allows users to choose Quarterly Average Data or Daily Average Data. It's noted that the calculation speed and output files are related to the type and size of monitoring data.

➢ Monitor Data Year: allows users to set the monitor data year according to different monitoring data.

Spatial Field Option: allows users to choose interpolation methods. For example, users can check eVNA to interpolate monitor data to spatial field, gradient adjusted by model data and check VNA to interpolate monitor data to spatial field. Through this option, the result files can be used to analyze health benefits.

➢ Species Data: this option is available only when users choose PM as analyzed pollutant. It allows users to calculate the concentration of each component in the corresponding monitoring point and space area.

> Grid Definition File: allows users to set the grid information of specific region.

3.4 BenMAP-CE Input Option

> The BenMAP-CE Input Option includes Pooled Grid Definition, CFG configuration file or result file, APV configuration file or result file and Audit

Trail Report, as shown in 错误!未找到引用源。.



Fig. 14 BenMAP-CE Input Option

> Pooled Grid Definition: allows users to set the grid information of specific region.

> CFG configuration file or result file: includes a list of parameter information needed for a health impact assessment.

> APV configuration file or result file: includes a list of parameter information needed for an environmental benefit assessment.

> Audit Trail Report: allows users to view the detailed configuration information.

4 Run ABaCAS-SE

After the input settings are complete, users need to click "Next" to start running ABaCAS-SE. And users can view the running messages through "Log/Msg", as shown in 错误!未找到引用源。.



Fig. 15 Running Messages

5 Operation Results

When the ABaCAS-SE is finished, the system provides various display ways for its four subsystems (ICET, RSM-VAT, SMAT-CE and BenMAP-CE) of visualized analysis, including MAP, Chart or Data, as shown in 错误!未找到引用源。.



Fig. 16 Data Viewer of ABaCAS-SE results

5.1 The results of ICET

▶ In Data module, it provides more details information about pollutant control strategies, e.g., total removal cost, removal cost of each pollutant, and baseline emission and so on. Users can check their interest fields to show or export data for further study, as shown in 错误!未找到引用源。.

Data	Chart					Data	Chart				
ystem Output	t Regional Level	Regional Cont	trol&Cost RSM C	ontrol Factor		System Output	Regional Level	Regional Contr	rol&Cost RSM (Control Factor	
otal Removal (Cost wal Cost (Million Year	, Show d	ata detail	of total re	movah	Region	Pollutant	Baseline_Emissi	Control_Cost(RM	I Removed_Emiss	i Remained
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Total SO2 Remo	val Cost (Million Yuar	, cost, be	isenne en	10,545.4		Shanghai	SO2	238,898.6	924,813,049.4	105,314.2	133,584.5
		remova	il cost of e	each pollut	ant	Shanghai	PM25	66,079.9	494,709,184.6	24,623.0	41,456.9
Total PM25 Rem	noval Cost (Million Yu	in)		7,453.1		Jiangsu	NOx	837,795.3	21,495,041,255.9	613,686.1	224,109.2
Total NOX Remo	oval Cost (Million Yua	1)		2,781.0		Jiangsu	SO2	767,395.2	8,047,800,974.1	518,277.1	249,118.1
		-9				Jiangsu	PM25	417,134.7	4,051,092,661.0	309,955.3	107,179.3
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			(Yuan/Ton)	-,		Zhejiang	SO2	543,954.1	1,022,074,815.4	191,819.4	352,134.7
NOX Emission I	Removed (Thousan	d Ton) 326.0	NOX Emissi	ion Removed (%) 4	3.9	Zhejiang	PM25	177,158.5	1,262,933,243.8	83,657.7	93,500.8
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DM25 Emircian	Personed (Thomas	599.1	phase pairs	Los Removed (8/1	62.6	Other	PM25	297,146.6	1,644,351,272.2	180,889.7	116,256.9
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Data Data Data Data Data Data Data Data	mission (Thousand Removed (Thousand Chart Pollutant NOx SO2 PM25 NOX SO2 PM25 NOX SO2 PM25 NOX SO2 PM25	Ton) 980.3 Ton) 980.3 Regional Cont Source PowerPlant PowerPlant PowerPlant Domestic Domestic Transport Transport Transport Industry Industry	(Vuan/Ton) SO2 Emissi Limit 0.35 0.77 0.90 0.245 0.44 0.65 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.4	on Removed (%)	ach emission f selected	Data Data System Output Region Shanghai	Chart Regional Level Sector PowerPlant Power	Regional Control Pollutant NOx NOx	nission of col&cost asmo Current_Emissio 157215 157215 157215 157215 157215 157215 157215 157215 157215 157215 157215 157215	Selected ontrol Factor Cost_Estimate(% 5 10 15 20 25 30 35 40 45 50 55 60	Cost_Uniti 818.214748 1636.42949 2454.64424 3272.85899 4091.07374 4909.28849 5082.05031 5254.81177 5427.57340 5600.33504 7410.9223 5600.33504
Data Data Contemport stem Output egion anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai anghai	mission (Thousand Removed (Thousand Chart Regional Level Pollutant NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX	Regional Cont Source PowerPlant PowerPlant PowerPlant Domestic Domestic Domestic Transport Transport Industry Industry Area	(Yuan/Ton) SO2 Emissi Trol&Cost RSM C Limit 0.35 0.77 0.90 0.25 0.44 0.65 0.44 0.44 0.42 0.22 0.25 0.44 0.45 0.44 0.45 0.44 0.45 0.44 0.44	on Removed (%)	the end of	Data Data System Output Region Shanghai	Chart Regional Level Sector PowerPlant Power	Regional Contr Pollutant NOX NOX	nission of col&cost asm of tool asm of to	Selected ontrol Factor Cost_Estimate(% 5 20 25 30 35 40 45 50 55 60 65	Cost_Unit(518 214748 1636 42940 2454 64424 3272 85899 4091 07374 4909 28849 5082 05013 5082 05013 5092 05013 5093 05014 5092 05013 5092 05013 5092 05013 5092 05013 5092 05013 5092 05013 5092 05013 5092 05013 5093 05015 5092 05005 5092 05005 5092 05005 5092 05005 5092 05005 5090 0
Data Societ Soci	mission (Thousand Removed (Thousand Chart Pollutant NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX 502 PM25 NOX	Regional Cont Source PowerPlant PowerPlant PowerPlant Domestic Domestic Domestic Domestic Transport Transport Transport Industry Industry Industry Area Area	(Yuan/Ton) SO2 Emissi Umit 0.35 0.44 0.44 0.44 0.44 0.44 0.44 0.44 0.4	on Removed (%) 4	the RSM input	Data Data System Output Region Shanghai	And rem Chart Regional Level Sector PowerPlant Po	Regional Contr Pollutant Nox Nox Nox Nox Nox Nox Nox Nox Nox Nox	nission of rol&Cost nsm co Current_Emissio 157215 157225 1572	selected ontrol Factor cost_Estimate(% 10 15 20 25 30 35 40 45 50 55 60 65 20	regiol cost_Unit(<u>818 2147488</u> 1636 429494 2454 644244 3272 558999 4909 288492 5082 050131 5254 81177 5427 573400 5600 335044 7410 922234 9221 509422 11032 09697 11032 09677 11032 0977 11032 09777 11032 09777 11032 09777 11077 110777 11077 110777 1

Fig. 17 Data detail results and configuration of ICET

➢ In Chart module, users can also view the results of different pollutant control strategies, including configurating plot according to their preferences, as shown in 错误!未找到引用源。.



Fig. 18 Chart results and configuration options of ICET

5.2 The results of RSM-VAT

In Map module, users are allowed to show the concentration that responds in real time to the emission reduction control. Users can also perform different operations on map (e.g., save image as... or save data as CMAQ), as shown in 错误!未找到引用源。
 19.



Fig. 19 Map results and configuration options of RSM-VAT

➢ In Data module, it provides more details information about concentration of selected pollutant e.g., baseline value, control value, and difference value and so on. Users can check their interest fields to show, as shown in 错误!未找到引用源。.

Иар	Data	Chart			Expo data	rt the o to local	utp pa
) Bas	e 🔿 Control	🔿 Delta		I4 4 1	/1741 🕨 🔰	Outpu	ut
	_ID	_TYPE	LAT	LONG	Quarter	PM25	^
•	1001		28.1	117.1	201001	40.8	
	2001		28.1	117.1	201001	40.0	
	3001		28.1	117.2	201001	39.5	
	4001		28.1	117.2	201001	38.4	
1	5001		28.1	117.2	201001	37.2	
	6001		28.1	117.3	201001	35.4	
	7001		28.1	117.3	201001	32.2	
-	8001		28.1	117.4	201001	31.3	
1	9001		28.1	117.4	201001	30.5	
	10001		28.1	117.5	201001	29.4	
	11001		28.1	117.5	201001	28.9	
	12001		28.1	117.5	201001	28.8	
	13001		28.1	117.6	201001	28.5	
	14001		28.1	117.6	201001	28.2	
	15001		28.1	117.7	201001	27.7	
	16001		28.1	117.7	201001	27.2	~

Fig. 20 Data detail results and configuration of RSM-VAT

➢ In Chart module, users can also view the emission reduction effects of emission control, including configurating plot according to their preferences, as shown in 错误! 未找到引用源。.



Fig. 21 Chart results and configuration options of RSM-VAT

5.3 The results of SMAT-CE

➢ In Map module, users are allowed to show the analysis results of monitoring sites in the selected model area. Users can also configurate legend as needed, as shown in 错误!未找到引用源。22.



Fig. 22 Map results and configuration options of SMAT-CE

➢ In Data module, it provides more details information about pollutant concentration of each monitor site e.g., baseline value, predicted value and so on. Users can check their interest fields to show, as shown in 错误!未找到引用源。.

Map	Data	Chart			
Data Detail		,			
id	type	LOCATION_NAME	STATION_NAME	monitor_lat	monitor_long ^
1		常州	1.安家	31.9108	119.9051
2		常州	2.常工院	31.8089	119.962
3		常州	3.城建学校	31.7786	119.9327
4		常州	4.监测站	31.7793	119.9746
5		常州	5.潞城	31.7639	120.0395
6		常州	6.武进监测站	31.7039	119.935
7		杭州	1.滨江	30.2102	120.2107
8		杭州	2.城厢镇	30.1821	120.2697
9		杭州	3.富阳监测站	30.0511	119.9589
10		杭州	4.富阳镇二中学	30.047	119.9516
11		杭州	5.和睦小学	30.3121	120.1196
12		杭州	6.临安第四中学	30.232	120.6849
<		1			>
				Digits After Decir	nal Point: 1 📮
					Export

Fig. 23 Data detail results and configuration of SMAT-CE

➢ In Chart module, users can also view the comparison between the baseline and predicted values of different regions/cities, including configurating plot according to their preferences, as shown in 错误!未找到引用源。.



Fig. 24 Chart results and configuration options of SMAT-CE

5.4 The results of BenMAP-CE

➢ In Map module, users are allowed to show the mortality and valuation results.
Users can also confugurate legend as needed, as shown in 错误!未找到引用源。25.



Fig. 25 Map results and configuration options of BenMAP-CE

➢ In Data module, it provides more details information about mortality and a range of benefits of each region e.g., low benefit, median benefit, high benefit and so on, as shown in 错误!未找到引用源。.

Мар	Data	Chart				
					1	1
Region		Benefit	Mortality	LowBenefit	MedianBenefit	HighBenefit
shanghai	1	118,441,025,536.0	10,465.8	49,424,551,936.0	124,180,709,376.0	172,592,070,656.0
zhejiang	1	196,339,691,520.0	17,349.2	81,090,116,608.0	205,988,806,656.0	287,798,237,184.0
jiangsu	3	390,511,120,384.0	34,506.7	170,906,976,256.0	408,171,245,568.0	553,766,047,744.0
Total	7	705,291,837,440.0	62,321.7	301,421,644,800.0	738,340,761,600.0	1,014,156,355,5

Fig. 26 Data detail results of BenMAP-CE

➢ In Chart module, users can also visually view the mortality and valuation results in different regions/cities, including configurating plot according to their preferences, as shown in 错误!未找到引用源。.



Fig. 27 Chart results and configuration options of BenMAP-CE

6 Case Study in China

In order to better introduce how to use ABaCAS-SE, we will take a case study in China for example.

6.1 Create a new project

> Click **File** button, and choose **New Project** option to create a new project.

6.2 Set input parameters

> Choose Annual PM as analyzed pollutant.

> Choose **No pre-run ICET project file**.

Click the file button to select a Control Input File and open it. The details of Control Input File is shown in Fig.28.

Region/Se	ector/Pol	lutant Co	ntrol Set	up & Input:	Control	Cost Setu	up & Input	:			
	Currency	RMB	Emission	Ton							
Availabl	Control_	Control_S	Control_	Control(%)	Region	Sector	Pollutan	Current_	Cost_Est:	Cost_Unit	(\$/ton)
Shanghai	Shanghai	PowerPlan	NOx	64.9	Shanghai	PowerPla	u NOx	157215	5	818. 2147	
Jiangsu		PowerPlan	s02	23		PowerP1a	u NOx	157215	10	1636. 429	
Zhejiang		PowerPlan	PM25	10		PowerPla	u NOx	157215	15	2454.644	
Other		Domestic	NOx	75.5		PowerPla	u NOx	157215	20	3272.859	
		Domestic	S02	56.1		PowerPla	ar NOx	157215	25	4091.074	
		Domestic	PM25	35		PowerPla	u NOx	157215	30	4909.288	
		Transport	NOx	82.2		PowerPla	u NOx	157215	35	5082.05	
		Transport	S02	56.1		PowerPla	u NOx	157215	40	5254.812	
		Transport	PM25	77.6		PowerPla	ar NOx	157215	45	5427.573	
		Industry	NOx	75.5		PowerPla	ar NOx	157215	50	5600.335	
		Industry	S02	56.1		PowerPla	u NOx	157215	55	7410.922	
		Industry	PM25	35		PowerPla	u NOx	157215	60	9221.509	
		Area	NOx	82.2		PowerPla	u NOx	157215	65	11032.1	
		Area	S02	56.1		PowerPla	ar NOx	157215	70	12842.68	
		Area	PM25	77.6		PowerPla	ar NOx	157215	75	40584.51	
	Jiangsu	PowerPlan	NOx	75.9		PowerPla	u NOx	157215	80	59764.55	
		PowerPlan	S02	58.4		PowerPla	u NOx	157215	85	78944.58	
		PowerPlan	PM25	78.4		PowerPla	u NOx	157215	90	98124.62	
		Domestic	NOx	69.5		PowerPla	ar NOx	157215	95	117304.7	
		Domestic	S02	74.5		PowerPla	ar NOx	157215	100	136484.7	
		Domestic	PM25	73.5		PowerPla	ar SO2	86731	5	267.3824	
		Transport	NOx	75.7		PowerPla	u S02	86731	10	534.7649	
		Transport	1S02	74.5		PowerPla	ar S02	86731	15	802.1473	
		Transport	1PM25	86		PowerPla	ar SO2	86731	20	1069.53	
		Industry	NOx	69.5		PowerPla	ar SO2	86731	25	1336.912	
		Industry	S02	74.5		PowerPla	ar SO2	86731	30	1604.295	
		Industry	PM25	73.5		PowerPla	ar S02	86731	35	2049. 447	
		Area	NOx	75.7		PowerPla	ar S02	86731	40	2494.599	
		Area	S02	74.5		PowerPla	ar S02	86731	45	2939.752	
		Area	PM25	86		PowerPla	u S02	86731	50	3384.904	
	Zhejiang	PowerPlan	NOx	73.3		PowerPla	u S02	86731	55	12379.14	
		PowerPlan	s02	44.9		PowerPla	u S02	86731	60	20527.15	
		PowerPlan	PM25	45		PowerPla	u S02	86731	65	28675.16	
		Domestic	NOx	70.5		PowerPla	ar SO2	86731	70	36823.17	
		Domestic	S02	24.9		PowerPla	u S02	86731	75	52412.14	
		Domestic	PM25	45		PowerPla	u S02	86731	80	68001.11	
		Transport	NOx	80.8		PowerPla	ar S02	86731	85	83590.08	

Fig. 28 Control Input File

➢ Select one or more of the four options in the Available Regions column as shown in the 错误!未找到引用源。, and the click ≫ button, the selected options will appear in the Selected Regions column which as shown in the 错误!未找到引用 源。.



Fig. 29 Available Regions



Fig. 30 Selected Regions

➤ Click the file button [▶] to select a Mapping File and open it. The details of Mapping File is shown in Fig.31.

Cost_Reg	RSM_Regio	Cost_Sect	RSM_Secto	Cost_Pol	RSM_Pollutant
Shanghai	SH	PowerPlan	PP	NOx	NOx
Jiangsu	JS	Industry	IN&DO	PM25	PM25
Zhejiang	ZJ	Domestic	IN&DO	S02	S02
Other	OTH	Transport	TR&AR	NH3	NH3
		Area	TR&AR	VOC	VOC
				PMC	PMC

Fig. 31 Mapping File

➢ Click Next button to enter the interface of RSM/CMAQ Input Option, as shown in the 错误!未找到引用源。.



Fig. 32 ICET Input Option

> Choose From Importing File and RSM results are available.

➤ Choose PM2.5 and PM2.5 Species, and then click the file buttons which are the pre-run RSM configuration files corresponding to PM_{2.5} and PM_{2.5} species and open them.

Set the **Base Year** to 2010, the **Control Year** to 2030.

➢ Click Next button to enter the interface of SMAT-CE Input Option, as shown in the 错误!未找到引用源。.



Fig. 33 RSM/CMAQ Input Option

Choose From Importing File.

Choose Quarterly Average Data, and then click the file button is to select a corresponding file and open it. The details of Quarterly Average Data is shown Fig.34.

Quarter							
_ID	_TYPE	LAT	LONG	Quarter_I	PM25	LOCATION	STATION_NAME
1		31.9108	119.9051	201301	112.9662	常州	1. 安家
1		31.9108	119.9051	201304	67.84835	常州	1. 安家
1		31.9108	119.9051	201307	34. 60286	常州	1. 安家
1		31.9108	119.9051	201310	92.37324	常州	1. 安家
2		31.8089	119.962	201301	115.4451	常州	2. 常工院
2		31.8089	119.962	201304	69.33719	常州	2. 常工院
2		31.8089	119.962	201307	35. 36217	常州	2. 常工院
2		31.8089	119.962	201310	94. 40024	常州	2. 常工院
3		31.7786	119.9327	201301	115.4451	常州	3. 城建学校
3		31.7786	119.9327	201304	69.33719	常州	3. 城建学校
3		31.7786	119.9327	201307	35.36217	常州	3. 城建学校
3		31.7786	119.9327	201310	94. 40024	常州	3. 城建学校
4		31.7793	119.9746	201301	109.2479	常州	4. 监测站
4		31.7793	119.9746	201304	65.6151	常州	4. 监测站
4		31.7793	119.9746	201307	33. 46389	常州	4. 监测站
4		31.7793	119.9746	201310	89. 33274	常州	4. 监测站
5		31.7639	120.0395	201301	118. 5437	常州	5. 潞城
5		31.7639	120.0395	201304	71.19823	常州	5. 潞城
5		31.7639	120. 0395	201307	36. 31131	常州	5. 潞城
5		31.7639	120.0395	201310	96.93398	常州	5. 潞城
6		31.7039	119.935	201301	112.3465	常州	6. 武进监测站
6		31.7039	119.935	201304	67.47614	常州	6. 武进监测站
6		31.7039	119.935	201307	34. 41303	常州	6. 武进监测站
6		31.7039	119.935	201310	91.86649	常州	6. 武进监测站
7		30. 2102	120. 2107	201301	100.7155	杭州	1. 滨江
7		30. 2102	120. 2107	201304	71.44604	杭州	1. 滨江
7		30.2102	120.2107	201307	46. 48453	杭州	1. 滨江
7		30. 2102	120. 2107	201310	101.3038	杭州	1. 滨江
8		30. 1821	120.2697	201301	66.71082	杭州	2. 城厢镇
8		30. 1821	120. 2697	201304	47.32365	杭州	2. 城厢镇
8		30.1821	120.2697	201307	30.78992	杭州	2. 城厢镇
8		30. 1821	120.2697	201310	67.10047	杭州	2. 城厢镇
9		30.0511	119.9589	201301	98.44309	杭州	3. 富阳监测站
9		30.0511	119.9589	201304	69.83404	杭州	3. 富阳监测站
9		30.0511	119.9589	201307	45. 43573	杭州	3. 富阳监测站
9		30. 0511	119.9589	201310	99.01809	杭州	3. 富阳监测站
10		30.047	119.9516	201301	99.01119	杭州	4. 富阳镇二中学
10		30.047	119.9516	201304	70.23704	杭州	4. 富阳镇二中学
10		30, 047	119,9516	201307	45, 69793	杭州	4. 富阳镇二中学

Fig. 34 Quarterly Average Data

- Set the **Start Year** to 2013, the **End Year** to 2013.
- ≻ Check eVNA.

> Check PM2.5 species fraction data available, and then click the file button \swarrow to select a species data file corresponding to PM_{2.5} and open it. The details of Species Data is shown Fig.35.

Quarter															
_ID	_TYPE	LAT	LONG	Quarter_	I S04	N03	NH4	OC	EC	CRUSTAL	H20	OTHER	LOCATION	STATION_NA	ME
21024		28.88179	117.9729	201301	5. 327441	1.233222	1.876913	2. 456423	0.550741	3. 471466	0.908408	0.908408		Station1	
21024		28.88179	117.9729	201307	4. 028065	0.932436	1.41913	1.857295	0.416414	2. 624767	0.686845	0.686845		Station1	
21024		28.88179	117.9729	201304	3. 04561	0.705012	1.073	1.404296	0.31485	1.98458	0.519322	0.519322		Station1	
21024		28.88179	117.9729	201310	2.302778	0.533058	0.811293	1.061785	0.238057	1.500536	0.392658	0.392658		Station1	
22058		30.11118	118.1211	201301	7.769868	1.798606	2.737406	3. 582598	0.803235	5.063	1.324877	1.324877		Station2	
22058		30.11118	118.1211	201307	5.874778	1.359922	2.069746	2.708793	0.607324	3.828122	1.001737	1.001737		Station2	
22058		30.11118	118.1211	201304	4. 441905	1.028234	1.56493	2.048112	0.459196	2.894434	0.757411	0.757411		Station2	
22058		30. 11118	118. 1211	201310	3. 358514	0.777445	1. 18324	1. 548573	0.347197	2.188474	0.572676	0. 572676		Station2	
25094		31. 40813	118.3645	201301	15.75283	3.646542	5. 549889	7.263453	1.6285	10.26486	2.686091	2.686091		Station3	
25094		31. 40813	118.3645	201307	11.91068	2.757141	4. 196257	5.491879	1.231305	7.761234	2.030947	2.030947		Station3	
25094		31. 40813	118.3645	201304	9.005635	2.084668	3. 17278	4.152396	0.930986	5.86825	1. 535594	1. 535594		Station3	
25094		31.40813	118.3645	201310	6.809139	1.576212	2.398931	3.139617	0.703917	4. 43697	1.161059	1.161059		Station3	
43016		28. 529	118.8502	201301	4. 606187	1.066262	1.622808	2. 123861	0. 476179	3.001483	0.785423	0.785423		Station4	
43016		28. 529	118.8502	201307	3. 482727	0.806198	1.227001	1.605846	0.360038	2.269414	0.593856	0.593856		Station4	
43016		28. 529	118.8502	201304	2.633281	0.609565	0.927733	1.214176	0.272224	1.715898	0.449013	0.449013		Station4	
43016		28. 529	118.8502	201310	1.991018	0.46089	0.701456	0.918036	0.205828	1.297387	0.339498	0.339498		Station4	
46082		30.91005	119.2078	201301	11.11386	2.57269	3.91553	5.124475	1.148931	7.242012	1.895078	1.895078		Station5	
46082		30.91005	119.2078	201307	8. 403163	1.945205	2.960523	3.874603	0.868704	5. 475668	1. 432864	1. 432864		Station5	
46082		30.91005	119.2078	201304	6.353611	1.470765	2.238444	2.929578	0.656825	4. 140139	1.083385	1.083385		Station5	
46082		30.91005	119.2078	201310	4. 80395	1.112041	1.692482	2.215047	0.496624	3. 130349	0.819145	0.819145		Station5	
73069		30. 34933	120. 2885	201301	13. 57268	3.141869	4.781798	6.258209	1.403119	8.844227	2.314343	2.314343		Station6	
73069		30. 34933	120. 2885	201307	10.26227	2.37556	3.615506	4.731816	1.060895	6.687099	1.749869	1.749869		Station6	
73069		30. 34933	120. 2885	201304	7.759277	1.796155	2.733675	3. 577715	0.80214	5.056099	1. 323072	1. 323072		Station6	
73069		30. 34933	120. 2885	201310	5.866771	1.358068	2.066925	2.705101	0.606496	3.822904	1.000371	1.000371		Station6	
77114		31.96398	120.644	201301	13. 39237	3.100129	4.718272	6.175068	1.384479	8.726732	2.283597	2.283597		Station7	
77114		31.96398	120.644	201307	10.12594	2.344	3. 567474	4.668954	1.046801	6. 59826	1.726622	1. 726622		Station7	
77114		31.96398	120.644	201304	7.656195	1.772293	2.697358	3. 530185	0.791484	4. 988929	1.305495	1.305495		Station7	
77114		31.96398	120.644	201310	5.788831	1.340026	2.039466	2.669164	0. 598439	3. 772117	0.987081	0.987081		Station7	
94028		28.79039	120.987	201301	4. 032463	0.933454	1. 420679	1.859323	0.416869	2.627633	0.687595	0.687595		Station8	
94028		28.79039	120.987	201307	3.048935	0.705782	1.074172	1.40583	0.315194	1.986747	0.519889	0.519889		Station8	
94028		28.79039	120.987	201304	2.305293	0.53364	0.812179	1.062944	0.238317	1.502174	0.393087	0.393087		Station8	
94028		28.79039	120.987	201310	1.743026	0.403484	0.614086	0.80369	0.180191	1.13579	0.297212	0.297212		Station8	
101092		31.077	121. 5603	201301	11.17943	2. 587868	3. 938631	5.154708	1.15571	7.284738	1.906258	1.906258		Station9	
101092		31.077	121.5603	201307	8.452739	1.956681	2.977989	3.897462	0.873829	5.507973	1. 441317	1. 441317		Station9	
101092		31.077	121.5603	201304	6.391096	1. 479442	2. 25165	2.946862	0.6607	4. 164565	1.089776	1.089776		Station9	
101092		31.077	121.5603	201310	4.832292	1.118602	1.702467	2. 228115	0. 499554	3.148817	0.823977	0.823977		Station9	
103057		29.80381	121.4849	201301	6.048694	1.400181	2.131019	2.788984	0.625303	3.941449	1.031392	1.031392		Station10	
103057		29.80381	121. 4849	201307	4. 573403	1.058673	1.611258	2.108744	0.47279	2.98012	0.779833	0.779833		Station10	
103057		29.80381	121.4849	201304	3. 457939	0.80046	1.218268	1. 594416	0.357476	2. 253262	0. 58963	0. 58963		Station10	

Fig. 35 Species Data

> Click the file button it is select a Grid Definition File and open it. The details

of Grid Definition File is shown in Fig.36.



Fig. 36 Grid Definition File

➢ Click Next button to enter the interface of BenMAP-CE Input Option, as shown in the 错误!未找到引用源。.



Fig. 37 SMAT-CE Input Option

Click the file buttons Pooled Grid Definition, CFG configuration file and APV configuration file and then open them, as shown in the 错误!未找到引用源。. And the details of Pooled Grid Definition is shown in Fig.39.



Fig. 38 BenMAP-CE Input Option



Fig. 39 Pooled Grid Definition

➢ Click Next button and 错误!未找到引用源。 will appear, choose yes to run the program.



Fig. 40 Save project and run

6.3 View Result

6.3.1 ICET

6.3.1.1 Data results

▷ From the 错误!未找到引用源。, we can view more summary information which contains total removal cost, baseline emission and removal cost of each pollutant. For example, the total PM_{2.5} removal cost in YRD is about 7453.1 million yuan, the baseline PM_{2.5} emission is about 957.5 thousand ton and the removal cost of PM_{2.5} is about 12439.9 yuan/ton and so on.

ICET input option SSM/CMAQ input option	Project Name: China_YRD_PM_2030	
BenMAP-CE input option	5 1077 0	
	ICET SMAT-CE BenMAP-CE BenMAP-CE	fit/Cost 💿 Log/M
ICET input option	Data Chart	
BaCAS-SE Project File: China_YRD_PM_2030.prv 📴	System Output Regional Level Regional Control&Cost RSM Control	actor
Annual PM O Ozone	Total Removal Cost Total NOx Removal Cost (Million Yuan)	58,109.7
) Enter pre-run ICET project file:	Total SO2 Removal Cost (Million Yuan)	10 545 4
1	Total SSE nemotal Cast (minion ruan)	10,343.4
No pre-run ICET project file	Total PM25 Removal Cost (Million Yuan)	7,453.1
* Control Input File: CET_Config_China_YRD_example_2030.csv	Total NOX Removal Cost (Million Yuan)	2,781.0
Available Regions: Selected Regions: Shanghai Shanghai	NOX Emission Baseline NOX Emission (Thousand Ton) (Yuan/Ton)	8,530.7
liangsu Zhejiang >> Zhejiang	NOX Emission Removed (Thousand Ton) 326.0 NOX Emission Removed	oved (%) 43.9
Other Other	PM25 Emission	
	Baseline PM25 Emission (Thousand Ton) 957.5 PM25 COST per TON (Yuan/Ton)	12,439.9
<	PM25 Emission Removed (Thousand Ton) 599.1 PM25 Emission Rem	loved (%) 62.6
	SO2 Emission	
et up details>>	Baseline SO2 Emission (Thousand Ton) 2,205.9 SO2 COST per TON (Yuan/Ton)	10,757.8
Aapping File:	SO2 Emission Removed (Thousand Ton) 980.3 SO2 Emission Remo	ved (%) 44.4
	NOx Emission	
Pollutant control:	Baseline NOx Emission (Thousand Ton) 2,033.6 NOx COST per TON (Yuan/Ton)	39,395.5
Save Back Next		Current Setup: C

6.3.1.2 Chart results

▶ From the 错误!未找到引用源。, we can directly view the emissions or control cost comparison of different regions in different pollutants.



Fig. 42 Chart results of ICET

6.3.2 RSM-VAT

6.3.2.1 Map results

➢ From the 错误!未找到引用源。, we can intuitively know that the maps show the PM_{2.5} concentration that responds in real time to the emission reduction control.



Fig. 43 Map results of RSM-VAT

6.3.2.2 Data results

➢ From the 错误!未找到引用源。, we can view more details information about the emission reduction effects.

File Tool Case Start Page		Projec	t Nam	e: China_YF	RD_PM_2030			
Benwar-CE input option		S	CET	SM-VAT	SMAT-CE	BenMAP-CE	Benefit/Cost 💿	Log/Msg
RSM/CMAQ input option	?	Map	Da	ta Chart				
Annual PM Ozone	^	⊖ Ba	se 🔿 Co	ntrol 🖲 Delta		■ I I I I	/1741 🕨 🔰	<u>Output</u>
From Database			_ID	_TYPE	LAT	LONG	Quarter	PM25 ^
		+	1001		28.1	117.1	201001	5.8
From Importing File			2001		28.1	117.1	201001	5.9
PSM results are available			3001		28.1	117.2	201001	6.0
Set up details>>			4001		28.1	117.2	201001	6.1
Enter pre-run RSM configuration files:			5001		28.1	117.2	201001	5.7
PM2.5 only PM2.5 and PM2.5 Species			6001		28.1	117.3	201001	5.2
Annual Quarter1 Quarter2 Quarter3 Qu +			7001		28.1	117.3	201001	4.3
Crustal: PM_Crustal_Annual.rcfg			8001		28.1	117.4	201001	4.1
EC: DAA EC Annual refe			9001		28.1	117.4	201001	3.9
			10001		28.1	117.5	201001	3.7
NH4: PM_NH4_Annual.rcfg			11001		28.1	117.5	201001	3.5
NO3: PM_NO3_Annual.rcfg			12001		28.1	117.5	201001	3.5
OC: RM OC Appual refe			13001		28.1	117.6	201001	3.4
			14001		28.1	117.6	201001	3.3
SO4: PM_SO4_Annual.rcfg			15001		28.1	117.7	201001	3.1
PM10: PM_PM10_Annual.rcfg 🔗			16001		28.1	117.7	201001	3.0
PM25: PM PM25 Annual.rcfg			17001		28.1	117.7	201001	2.9
	~		18001		28.1	117.8	201001	2.8 🗸
5.uz (<					1	>
Save Back Next							Current	Setup: China

Fig. 44 Data results of RSM-VAT

6.3.2.3 Chart results

From the 错误!未找到引用源。, we can directly view the emission reduction effects of emission control. For example, the $PM_{2.5}$ reductions in SH is about 9.0 $\mu g/m^3$.



Fig. 45 Chart results of RSM-VAT

6.3.3 SMAT-CE

6.3.3.1 MAP results

▶ From the 错误!未找到引用源。, we can know that the maps show the PM_{2.5} concentration of baseline value, predicted value and difference value and so on.



Fig. 46 Map results of SMAT-CE

6.3.3.2 Data results

▷ From the 错误!未找到引用源。, we can view more details information which contains station name, location name and the annual average concentration of $PM_{2.5}$ of each station and so on. For example, the annual average concentration of $PM_{2.5}$ of Anjia station is about 76.9 µg/m³.

File Tool Case Start Page								
ICET input option RSM/CMAQ input option SMAT-CE input option]	Project N	Name: Chi	ina_YRD_PN	/_2030		C	
BenMAP-CE input option		S ICE	T 🎑 RSN	/I-VAT 🔬 SI	MAT-CE 🔵 Ben	MAP-CE	efit/Cost 🙆 Lo	og/Msg
SMAT-CE input option		Map		ata	Chart			
○ From Database	^	LOCATIO	STATION_NAME	monitor_lat	monitor_long	monitor_gridcell	b_pm25_ann_DV	f_pm2! ^
From Importing File		常州	1.安家	31.9108	119.9051	60111	76.9	55.1
PM2.5 Monitor Data		常州	2.常工院	31.8089	119.962	61108	78.6	53.8
Ouarterly Average Data		常州	3.城建学校	31.7786	119.9327	61107	78.6	53.6
Daily Average Data		常州	4.监测站	31.7793	119.9746	62107	74.4	51.4
DM35 Mass Data Ousterly 2012 VDD cov		常州	5.潞城	31.7639	120.0395	63107	80.7	57.1
		常州	6.武进监测站	31.7039	119.935	61105	76.5	53.8
Monitor Data Year		杭州	1.滨江	30.2102	120.2107	72065	79.9	60.7
Start Year 2013 End Year 2013		杭州	2.城厢镇	30.1821	120.2697	73064	52.9	40.3
Spatial Field Option		杭州	3.富阳监测站	30.0511	119.9589	66060	78.1	61.2
Interpolate monitor data to spatial		杭州	4.富阳镇二中…	30.047	119.9516	66060	78.6	61.5
field,gradient adjusted by model data (eVNA)		杭州	5.和睦小学	30.3121	120.1196	69068	79	59.8
Interpolate monitor data to spatial field (VNA)		杭州	6.临安第四中	30.232	120.6849	83067	76.3	59.7
(杭州	7.临安市府大…	30.2368	120.7186	84067	79	61.7
Species Data		杭州	8.临平镇	30.4184	120.3005	73071	79.5	60.7
PM2.5 species fraction data available (used for calculate RRF)		ارال حد ا	o en da séa	00.000	440.0050	45047		> ×
PM25_Species_Fraction_Quarterly_2013_Y						Digits	After Decimal Poin	t: 1 🛓
Grid Definition File	~							Export
Save Back Next							Current S	etup: China
Duch NCAL							carrone o	- promine ,

Fig. 47 Data results of SMAT- CE

6.3.3.3 Chart results

▷ From the 错误!未找到引用源。, we can directly view the comparison between the baseline and predicted values of different regions. For example, the baseline value in Changzhou is about 77.65 μ g/m³ but its predicted value is about 54.17 μ g/m³.



Fig. 48 Chart results of SMAT- CE

6.3.4 BenMAP-CE

6.3.4.1 Map results

▶ From the 错误!未找到引用源。, we can know that the maps show the mortality and valuation results of different regions.



Fig. 49 Map results of BenMAP-CE

6.3.4.2 Data results

➢ From the 错误!未找到引用源。, we can view more details information which contains benefit, mortality, median benefit and so on. For example, the benefit in Shanghai is about 1184410255360 yuan.

File Tool Case Start Page							
 ICET input option RSM/CMAQ input option SMAT-CE input option 	Project	Name:	China_YR	D_PM_2030			00
BenMAP-CE input option	🗽 IC	ET 🏼 🕵	RSM-VAT	🎡 SMAT-CE	BenMAP-CE	Benefit/Cost	💩 Log/Msg
BenMAP-CE input option	Map	Data	Chart				
						3	
 From Database 						:	
	Region		Benefit	Mortality	LowBenefit	MedianBenefit	HighBenefit
From Importing File	shangh	ai 1	118,441,025,536.0	10,465.8	49,424,551,936.0	124,180,709,376.0	172,592,070,656.0
Set up details>>	zhejian	g 1	196,339,691,520.0	17,349.2	81,090,116,608.0	205,988,806,656.0	287,798,237,184.0
Pooled Grid Definition: YRD_04km_city.shp	jiangsu	8	390,511,120,384.0	34,506.7	170,906,976,256.0	408,171,245,568.0	553,766,047,744.0
CFG configuration file or result file (*.cfgx)	Total	7	705,291,837,440.0	62,321.7	301,421,644,800.0	738,340,761,600.0	1,014,156,355,5
BenMAP_YRD_2030.cfgx							
APV configuration file or result file (*.apvx or *.apv	/rx)						
BenMAP YRD 2030.apvx							
Audit Trail Report:							
Name							
<	>						
Save de e							
Back Next						Cu	rrent Setup: China

Fig. 50 Data results of BenMAP-CE

6.3.4.3 Chart results

➢ From the 错误!未找到引用源。, we can directly view the mortality and valuation results in different regions/cities. For example, the mortality in Shanghai is about 1.05E+4.



Fig. 51 Chart results of BenMAP-CE

6.3.5 Benefit/Cost

6.3.5.1 Chart results

▶ From the 错误!未找到引用源。, we can directly view total benefit/cost ratio under the pollutant control scenario determined from the beginning is about 9.6.



Fig. 52 Chart results of Benefit/Cost

6.3.5.2 Data results

▶ From the 错误!未找到引用源。, we can view more details information which contains cost, benefit, benefit/cost and so on. For example, the benefit/cost ratio in Shanghai is about 10.4.

RSM/CMAQ input option SMAT-CE input option BenMAP-CE input option		T SRSN	I-VAT 🔬 SI	ИАТ-СЕ	enMAP-CE	enefit/Cost 🥃	Log/Msg
BenMAP-CE input option	Chart	Data Ba	r Chart	I			
O From Database	Province shanghai	Cost 11,384,727,846	Benefit 118,441,025,5	Low Benefit 49,424,551,936	Median Benefit 124,180,709,376	High Benefit 172,592,070,656	Benefit/Cost 10.4 (4.3~15.
From Importing File	jiangsu	33,593,934,891	390,511,120,3	170,906,976,2	408,171,245,568	553,766,047,744	0.8 (2.8 10) 11.6 (5.1~16.
et up details>> soled Grid Definition: YRD_04km_city.shp FG configuration file or result file (*.cfgx) BenMAP_YRD_2030.cfgx PV configuration file or result file (*.apvx or *.apvrx) BenMAP_YRD_2030.apvx Audit Trail Report: Name ⊕-benmap							
sava	۲						3

Fig. 53 Data results of Benefit/Cost

6.3.5.3 Bar Chart results

➢ From the 错误!未找到引用源。, we can view the benefit/cost ratios in different regions/cities more intuitively.



Fig.54 Bar Chart results of Benefit/Cost