

An outline of SinoTERM365 and information for potential subscribers

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Summary

This paper outlines the sources and methods used to devise a 162 sector, 365 region master database of the Chinese economy. The model starts with the 2012 national input-output table.

The approach uses a methodology which is reproducible. This means that should better data arise, for example, for international merchandise trade by port, revised inputs can be added to the database generation programs, enabling a rapid revision of the master database.

The aim is to establish a consortium of subscribers to the model. The sharing of the database will be a lower cost method of establishing and maintaining the database than having users devise their own multi-regional CGE database.

The TERM approach at the Centre of Policy Studies (CoPS) has always been to generate a database rapidly, and then improve through model simulations. With a massive database, it is impossible to have perfect data. It is therefore more important to have methods for redressing observed deficiencies than to wait until there is complete confidence in all aspects of the database.

Subscribers will have several options concerning their access to the database. One option will be for CoPS to provide several aggregations on request. Another option will be the subscribing institution to have access to their own master database (itself an aggregation of SinoTERM365) to be used for aggregations. An appendix to this paper discusses key points in choosing a suitable aggregation.

1. Introduction

SinoTERM365 is a master database for CGE models which includes 365 regions of China, mainly at the prefecture level. This paper summarises the procedures used to estimate the master database. In addition, it summarises the data quality for each province.

The expectation is that maintenance and improvements to the master database will arise from interactions with subscribers to the database. While preparation of the master database has used all available data from the yearbooks of the national and provincial statistical bureaus within China, some deficiencies in sectoral and regional detail remain.

The TERM approach to devising a multi-regional CGE model was established by Mark Horridge (2012). His vision has resulted in TERM models being established for a growing number of nations (see <https://www.copsmodels.com/term.htm>).

2. National database

A typical input-output table requires some modifications to be suitable for CoPS-style CGE modelling. Some modifications are specific to a given input-output table. For example, the NOS (net operating surplus) for rail transport in the raw data of the 2012 Chinese input-output table was a large negative number. This was adjusted to a positive number, based on the given value of depreciation, and the adjustment was added to production taxes (i.e., a production subsidy) so as to maintain database balance.

Household consumption of rail transport also required an adjustment. The raw household usage of rail transport in the database was a smaller number than the production subsidy introduced to eliminate the negative NOS figure.

At a subsequent stage, production taxes are transferred to commodity taxes. The exceptions are for agriculture and rail transport. For these industries, the negative production taxes are assigned as negative values in other costs.

Investment matrix

Input-output tables usually include a vector of commodity sales to investment. The CoPS-style is to devise an investment matrix. The easy option is to assume that the commodity composition of each industry's investment is identical. This implies that livestock, mining, education, health and road transport investment consist of the same inputs.

But we aim to be realistic by allocating different commodity shares to different industry investment inputs. For example, in maintaining herd dynamics, livestock is an important input to livestock sectors. Therefore, all the own-inputs in livestock should be allocated exclusively to livestock investment. Road transport, for example, relies heavily on civil engineering construction inputs.

The investment detail matters most when we are examining the construction and operational phases of particular major projects. With specific investment structures for each industry, the demands of one industry during a construction phase will differ from those of other industries.

Sectoral splits

A major deficiency in the national input-output table for China is that agriculture is represented by only two sectors, farming and livestock. In preparation for a master database, farming is split into rice, wheat, corn, other cereal, soybeans, tubers, other vegetables, cotton, sugar cane, tea, apples & pears, citrus, grapes and other crops. Livestock is split into pigs, sheep & goats and other livestock. Meat products is split into pork and other meat. Electricity supply in the split database includes seven forms of generation, namely coal generation, gas generation, other thermal generation, nuclear generation, hydro generation, wind generation and solar generation. There is also a separate electricity distribution sector.

It is relatively straightforward to find regional prefecture shares for many of these sectors.

3. Initial step: provincial (31 region) shares

The procedure for devising a prefecture level CGE model is to start with a national, highly disaggregated CGE database. At every point, the regional detail needs to be consistent with the national database. This means that regional activities are shares of national activity, with the sum of regional activities equal to activity in the national database (see Horridge 2012).

Before looking at prefecture level data, we estimate shares at the provincial or 31 region level. At this stage, the efforts to impose new provincial shares on the national database have been limited. The first step was to borrow provincial shares from an older version of SinoTERM, detailed in Wittwer and Horridge (2009). Next, provincial level outputs from the national statistical yearbook (accessed via the National Library of Australia) were mapped to around 40 of the 162 sectors in the national CGE database. These sectors covered mainly crops, livestock and some manufactures.

National accounts data were used to provide provincial shares for farming, forestry, livestock, fishing and services to agriculture. In the official input-output table, these data have one-to-one correspondence with sectors. In the split national CGE database used here, farming and livestock are split into many sectors, so that the provincial national accounts data provide control totals for the farming and livestock groups of sectors.

An additional eight national accounts sectors provide control totals at the provincial level for sectors outside agriculture.

Specific shares were added to the database depicting ship building, which is confined to four coastal provinces. Motor vehicle shares estimates came from an online search for the city location of plants and their capacity.

Household and government shares at the provincial level are based on expenditure-side national accounts aggregates.

A key point concerning provincial share estimates is that they can be revisited and re-estimated without changes being made to downstream data generating programs dealing with prefectures. That is, new provincial level control totals will apply at the prefecture level in downstream programs.

We do not use doubts concerning particular provincial level shares as a reason for not proceeding with prefecture level detail. Rather, we are conscious that at any time, we may obtain access to better data with which to generate a new master database. Using the data

processing programs written for this purpose, it is a straightforward matter to revise the master database.

Our aim will be to provide subscribing clients with a revised database shortly after we re-estimate the multi-regional CGE database using improved data.

4. Prefecture shares

Table 1: Summary of prefecture-level data

	No. of regions	Agriculture, food processing	Manufacturing	Employment or national accounts data (19 sectors)
Beijing*	1	Good	Na	Na
Tianjin*	1	Good	Na	Na
Hebei	11	Good	--	2005 census
Shanxi	11	Good	Some	No
InnrMongolia	12	Good	Some heavy industry data	2005 census
Liaoning	14	Good	--	2013
Jilin	9	Good	--	nat ac 17 sectors 2014
Heilongjiang	15	Good	--	nat ac 17 sectors 2014
Shanghai*	1	Good	Na	Na
Jiangsu	13	Limited	Very detailed	2005 census
Zhejiang	12	Good	--	2005 census
Anhui	16	Good	--	2013
Fujian	9	Limited	--	2005 census
Jiangxi	11	Good	Moderately detailed	2005 census
Shandong	17	Good	--	2014
Henan	18	Good	Moderately detailed	2014
Hubei	17	Good	--	Broad sector (5) only
Hunan	14	Intermediate	--	nat ac 17 sectors 2014
Guangdong	21	Good	--	2005 census + 2014 nat ac
Guangxi	14	Intermediate	--	2005 census
Hainan	18	Intermediate	Moderately detailed	2014
Chongqing	5	Intermediate	--	Broad sector (5) only
Sichuan	21	Intermediate	--	2005 census
Guizhou	9	Intermediate	--	2005 census
Yunnan	16	Good	--	2014
Tibet	7	Good	--	2014
Shaanxi	11	Good	--	2005 census
Gansu	14	Good	--	2014
Qinghai	8	Good	--	2005 census
Ningxia	5	Good	--	2005 census
Xinjiang	14	Good	--	6 broad sectors

* Coverage at 31 region level

nat ac = national accounts

Na = not applicable

Table 1 shows the data used to estimate prefecture level industry shares in SinoTERM365. These data were gleaned from various national and provincial yearbooks, plus 2005 census data. Unlike the database preparation of USAGE-TERM (Wittwer 2017) or Australian TERM (Wittwer and Horridge, 2010), comprehensive disaggregated small region data are not available for China. In the US case, county-level employment data are available for many NAICS sectors and in Australia, ANZSIC data at the SA2 level (totalling around 3,000 regions) are available, both from census data. Corresponding data in China cover 19 broad sectors.

Two neighbouring provinces account respectively for the best and poorest data, namely Henan and Hubei. In the case of Henan, good data for agriculture are accompanied by moderately detailed data for manufacturing and 19 sector employment data for 2014. In the case of Hubei, good data are available only for agriculture. Beyond agriculture, the only available data at the prefecture level are national accounts data for four (excluding agriculture) broad sectors.

Clearly, relatively recent employment data are preferable to 2005 census data. The latter were used for prefecture detail in Hebei, Inner Mongolia, Jiangsu, Zhejiang, Fujian, Jiangxi, Guangxi, Sichuan, Guizhou, Shaanxi, Qinghai and Ningxia. Employment data at the prefecture by national accounts level (19 sectors) were available for either 2013 or 2014 in Liaoning, Anhui, Shandong, Henan, Hainan, Yunnan, Tibet and Gansu. The yearbooks of Jilin, Heilongjiang, and Hunan include 2014 national accounts (GDP) data for 17 broad sectors. Guangdong's 2005 employment census data are supplemented by 2014 GDP data for 9 broad sectors. Regions other than Hubei with limited data include Chongqing (divided into five main regions) and Xinjiang.

We are confident that better data may be available from the various provincial statistical agencies. China Data Online may be far from a comprehensive store of available data. It is our expectation that in working with colleagues in China, we can raise the quality of the data we are using.

Electricity generation

The website carma.org contains details for over 3,000 power stations in China. Although the website does not specify the type of generation, often this can be inferred from the name of the power station, its capacity and its emissions. For example, large power stations with high carbon emissions per unit of energy output tend to be coal-generated. Smaller power stations with similar emissions may be diesel generated (other thermal generation in SinoTERM365's database). Large power stations with zero emissions are either nuclear or hydroelectric. The nuclear power stations were identified via a web search.

Sorting the power stations into type of generation required a great deal of web searching, as there are many power stations of intermediate capacity which could have been either coal-fired or diesel-fired.

Given the nature of solar generation, with its highly decentralised base, no attempt was made to estimate solar generation by region. Solar output shares have been set equal to estimates of electricity distribution by region.

Estimating international trade shares by port

The TERM approach is to assign international trade to port of import or export. The regional origin of an export or the regional destination of an import are not direct inputs in the data creation programs.

We anticipate that we will be able to get access to international trade data by port in the near future. Meanwhile, we will rely on estimates of port activity.

A web search indicated the following ports for international trade:

Liaoning: Dalian (medium), Yingkou (small) and Jinzhou (minor)

Hebei: Qinhuangdao (minor)

Tianjin (major)

Shandong: Qingdao (no. 7 port in China), Rizhao, Yantai and Weihai

Jiangsu: Lianyungang, Nantong, Zhenjiang, Wuxi, Nanjing

Shanghai (no. 1 port)

Zhejiang: Ningbo, Zhoushan, Taizhou (small), Wenzhou (small)

Fujian: Xiamen (no. 8 port), Fuzhou (Changle), Quanzhou

Guangdong: Guangzhou, Zhuhai, Shenzhen, Shantou, Jieyang, Zhanjiang

Guangxi: Fengchengang (dedicated coal port), Beihai

Hainan: Haikou, Basuo, Sanya

Within Xinjiang, the following prefectures are designated as land ports for trade with nations of central and southern Asia: Altay, Changji, Hami, Ili, Bortala, Tacheng, Kizilsu and Aksu.

International exports and imports for the provinces with ports are based on preliminary estimates of regional excess supplies and excess demands. The provincial estimates are then assigned to prefecture-level ports, based on relative port sizes.

Coal imports are assigned to Ningbo (26%), Guangzhou (26%), Fengchanggan (26%), Rizhao (12%), Shantou (8%) and Nantong (2%).

5. Information for potential subscribers

The 162 sector, 365 region master database of SinoTERM365 will remain housed at CoPS.

Subscriptions will last for three years. Subscribers will have two options.

1. Request specific aggregations of, for example, 50 sectors and 10 regions, from CoPS. A version of SinoTERM will be provided to all subscribers with short run and long run closures.
2. For a higher fee, subscribers will have access to a smaller version of the master database. This may, for example, contain 120 sectors, all the prefectures of a particular province plus the remaining provinces aggregated into a single region. An aggregator and instructions will be supplied with the database, plus a version of SinoTERM.

Aggregation tool

Subscribers who choose to devise their own aggregations will be issued with an aggregation of the master database. It will be accompanied by a weights file which contains data necessary for weighted aggregations of model parameters. The aggregation tool will consist of a batch file and some examples of aggregations to provide a guide for the subscriber.

Subscription and summary subscriber entitlements

SinoTERM365 subscribers will pay a fee for three years of access of AUS\$12,000. This will cover the costs to the subscribing institution of four places at one of the CoPS courses run in China in this three year period, be it the SinoTERM course or a course using the national model, ChinaGEM. Since places at these courses are AUS\$2,500 each, the marginal cost of subscription to the institution is low. If the subscribing institution chooses to proceed with option 1 above, CoPS will prepare up to two aggregations for the subscriber each year on request.

If the institution chooses option 2, the three year subscription fee will be AUS\$16,000. Again, the subscription will cover the costs of four places at a CoPS course held in China in this three year period.

Subscribing institutions will require a GEMPACK licence. Details are available at <https://www.copsmodels.com/gpprice.htm>. The following is a screenshot showing options:

Payment schemes

There are two payment schemes:

- Under the **permanent licence** scheme your licence is valid forever, but technical support lasts 6 months only and you must pay to upgrade to new versions.
- Most products are also offered under a **Subscription or annual payment** scheme, which gives you all benefits (including continuing technical support and free upgrade to new versions). When we receive your annual payment, we send you a new licence, valid for one year. You can pay 3 years ahead, to get a 17% discount.

Select options below to calculate prices for you:

User Type: ☐ Commercial, ☐ Government, ☒ Educational, ☐ Other

No. of Users: ☐ Single User, ☒ Site

Currency: ☐ US dollar, ☒ AU dollar

☐ discount for poorer country

\$AU, Educational, Site	Permanent Licence	Update	Annual Subscription	3-year Subscription
GEI Executable-Image GEMPACK: Limited	0	0	Not available	Not available
GEU Executable-Image GEMPACK: Unlimited	2,790	1,670	930	2,330
GFM Source-Code GEMPACK: Unlimited	5,370	3,220	1,790	4,470
RDL RunDynam: Limited	Not available	Not available	Not available	Not available
RDM RunDynam: Unlimited	2,090	1,260	700	1,740
RunDynam + Source-Code GEMPACK: Unlimited	6,710	4,030	2,240	5,590

Notes:

- If you want to pay by credit card, you need to pay in \$AUD. It's a requirement imposed by Victoria University. Sorry!
- GEMPACK/RunDynam bundle: if purchased together, the price is 10% less than if purchased separately -- applies to all 'unlimited' versions of GEMPACK and RunDynam.
- Additional operating systems: if you want Source-Code licences for two operating systems (for example, Unix and Windows), all payments are increased by 60% to cover the second operating system.
- Free, time-limited, licences are available to organizers of GEMPACK-based training courses. The Limited version of Executable-Image GEMPACK is available [free to universities](#).
- For Australian customers, prices include GST.

See also

An educational subscriber, for example, may choose an annual GEMPACK subscription for AUS\$930 if they do not have a pre-existing licence. By paying AUS\$12,000 per annum, the subscriber will get four places at CoPS-run CGE course in China in the three year period in addition to SinoTERM database access.

An example of interaction between a subscriber and CoPS

For this example, we use the Hubei Institute of Technology, chosen because we are aware that the data in SinoTERM365 are weakest for Hubei.

The institute chooses to purchase an annual subscription to GEMPACK for AUS\$930 and the basic subscription to SinoTERM365 for AUS\$12,000. The understanding is that CoPS will prepare a demonstration aggregation covering 40 sectors, and in the regional dimension, the

prefectures of Wuhan, Huangshi, Shiyan, Jingzhou, Yichang, Xiangyang, the rest of Hubei and the rest of China (i.e., 8 regions).

Shortly after receiving the SinoTERM aggregation, the institute sends two people to a CoPS-run CGE course in another city in China. They understand that much of the instruction at the course is in English, but a great deal of instruction is also delivered in Mandarin during the week-long course. Although the course participants feel at the end of the week-long course that they still have much to learn about GEMPACK and CGE modelling, they are able to use GEMPACK to inspect the database.

On returning to Wuhan, participants from the CoPS-run course find that some manufacturing industries are too small in Wuhan and Shiyan in the SinoTERM aggregation, and too large elsewhere. The institute has a contact in the Hubei Bureau of Statistics. The contact provides several items of data which at present are not in the China Data Online resource. These are some prefecture-level information on Hubei manufactures. The bureau also provides the institute with GDP data for 17 broad sectors at the prefecture level. Again, these data were not available at China Data Online when the initial version of SinoTERM365 was generated.

The institute passes on the new data to CoPS, on the understanding that CoPS will make available new aggregations to the institute as soon as possible. Meanwhile, the institute has come up with two projects requiring two different aggregations of SinoTERM365. CoPS prepares these aggregations and emails them to the institute.

In the second year, the Hubei Institute of Technology sends two people to one of the CoPS courses. One of the participants is repeating the course, believing that some details will be easier to follow the second time around. The institute receives two more requested aggregations from CoPS early in the second year. However, it becomes apparent that several new aggregations are required.

On negotiation with CoPS, the institute agrees to pay an additional AUS\$4,000 to CoPS. This is the difference between the subscription rates for options 1 and 2. In exchange, the institute receives a SinoTERM master database that covers all 17 prefectures of Hubei and a composite rest of China region. In the sectoral dimension, there are 120 sectors, with more detail in agriculture and electricity than the published national input-output table, and some aggregation of industries of limited importance in Hubei. The institute employee who has now attended two courses is able to use the aggregator to generate aggregations for the institute on request.

Appendix 1: Sectors of SinoTERM365

No.	Set element	Description
1	Rice	Rice
2	Wheat	Wheat
3	Corn	Corn
4	OthCereal	Other cereal crops
5	Soybeans	Soybeans
6	Tubers	Tubers
7	OthVegetable	Other vegetables
8	Cotton	Cotton
9	SugarCane	Sugarcane
10	Tea	Tea
11	ApplesPears	Apples & pears
12	Citrus	Citrus
13	Grapes	Grapes
14	OtherCrops	Other crops
15	Pigs	Pigs
16	SheepGoats	Sheep & goats
17	OthLivestock	Other livestock
18	Forestry	Forestry
19	Fishing	Fishing products
20	AgriSrvces	Agriculture, forestry, animal husbandry and fishery services
21	CoalMineProc	Coal mining products
22	CrudeOilGas	Oil and gas extraction products
23	FerrOre	Ferrous metal mining products
24	NFerrOre	Non-ferrous metal mining products
25	NMtlMine	Non-metallic mining products
26	MiningSrvces	Mining ancillary services and other mining products
27	GrainMilloil	Grain mill products
28	AnimalFood	Feed processing products
29	VegetOils	Vegetable oil processing products
30	SugarRef	Sugar and sugar products
31	Pork	Pork
32	OthMeat	Other meat
33	FishProc	Aquatic products
34	VegFrtNuts	Vegetables, fruits, nuts and other agricultural and sideline products processed products
35	ConvenFoods	instant food
36	DairyProds	Dairy products
37	FlavFermPrds	Condiments, fermented products
38	OtherFood	Other food
39	AlcoholBev	Alcohol and wine
40	OtherBev	Beverages and refined tea processed products
41	Tobacco	Tobacco products

Sectors of SinoTERM365 (cont.)

No.	Set element	Description
42	CottonSpin	Cotton, chemical fiber textile and printing and finishing finished products
43	WoolSpin	Wool and dyeing and finishing products
44	HempSpin	Hemp, silk and processed products
45	KnitMill	Knitting or crochet knitting and its products
46	TextProc	Textile products
47	Apparel	Textile and apparel
48	Leather	Leather, fur, feathers and their products
49	Footwear	Shoe
50	WoodProds	Wood processed products and wood, bamboo, rattan, brown, grass products
51	Furniture	Furniture
52	PaperProd	Paper and paper products
53	PrintingRecd	Printed matter and recording media reproductions
54	CultSportGds	Manufacture of articles for culture, education and sports activities
55	PetrolRef	Refined petroleum and nuclear fuel processed products
56	Coking	Coking products
57	BasicChem	Basic chemical raw materials
58	Fertilizr	Fertilizer
59	Pesticide	Pesticide
60	PaintsDyes	Coatings, inks, pigments and the like
61	SynthtcMatrl	Synthetic materials
62	SpecChemical	Special chemical products and explosives, firearms, fireworks products
63	ChemDly	Daily chemical products
64	Medicine	Pharmaceutical products
65	ChemFibre	Chemical fiber products
66	RubberPrd	Rubber products
67	PlasticPrd	Plastic products
68	CementLime	Cement, lime and gypsum
69	CmtLimePrds	Gypsum, cement products and the like
70	BrickStone	Brick, stone and other building materials
71	Glass	Glass and glass products
72	China	Ceramic products
73	Fireproof	Refractory products
74	NMtlMinPr	Graphite and other non-metallic mineral products
75	IronSmelt	Steel, iron and castings
76	SteelSmelt	Steel calendering products
77	FerroAlloy	Ferroalloy products
78	NFerrSmelt	Nonferrous metals and their alloys and castings
79	NFerrRoll	Non - ferrous metal rolling products
80	ProcMetals	made from metal
81	Boilers	Boilers and original equipment
82	MtlwrkMch	Metal processing machinery

Sectors of SinoTERM365 (cont.)

No.	Set element	Description
83	Lifters	Material handling equipment
84	PumpValvMach	Pumps, valves, compressors and the like
85	CultOffcMach	Culture, office machinery
86	OthMachinery	Other general equipment
87	MinMetConMch	Mining, metallurgy, construction equipment
88	ChmTimNmtMch	Chemical, wood, non-metallic processing equipment
89	AgrForFshMch	Agriculture, forestry, animal husbandry, fishing special machinery
90	OthSpcEqp	Other special equipment
91	MotorVhc	Car vehicle
92	MVParts	Auto parts and accessories
93	RailEqp	Rail transport and urban rail transit equipment
94	Ships	Ship and related equipment
95	OthTransEqp	Other transportation equipment
96	Generators	Motor
97	PwrTrnEqp	Transmission and distribution and control equipment
98	WireCablOptc	Wires, cables, cables and electrical equipment
99	Batteries	Batteries
100	HhldElec	Household appliances
101	OthElecEqp	Other electrical machinery and equipment
102	Computers	Computers
103	CommunctnEqp	Communication device
104	BrdCstEqpRdr	Radio and television equipment and radar and ancillary equipment
105	AudiovislEqp	Audiovisual equipment
106	ElctronParts	Electronic Component
107	OthElctrnEqp	Other electronic equipment
108	OthMeasEqp	Instrumentation
109	OthManufact	Other manufacturing products
110	ScrapRecyc	Waste resources and waste materials recycling processed products
111	RepairMachEq	Repair of metal products, machinery and equipment
112	CoalElec	Coal-generated electricity
113	GasElec	Gas-generated electricity
114	OthThermElec	Other thermal-generated electricity
115	NuclearElec	Nuclear-generated electricity
116	HydroElec	Hydro-generated electricity
117	WindElec	Wind-generated electricity
118	SolarElec	Solar-generated electricity
119	ElecDist	Electricity transmission and distribution
120	GasSupply	Gas production and supply
121	WaterSupply	Water production and supply
122	ResConstruct	Residential construction
123	CivilEngCons	Civil engineering construction

Sectors of SinoTERM365 (cont.)

No.	Set element	Description
124	InstaltnCons	Construction and installation
125	DecorCons	Building decoration and other construction services
126	Trade	Wholesale and Retail
127	RailTransprt	Rail transport
128	RoadTrans	Road transport
129	WaterTrans	Water transport
130	AirTransport	Air freight
131	Pipeline	Pipeline transportation
132	TransService	Loading and unloading and transport agents
133	Warehousing	Warehousing
134	Post	Postal services
135	Hotels	Accommodation
136	Restaurant	Catering services
137	Telecomms	Telecommunications and other information transmission services
138	SftwarITSrv	Software and information technology services
139	MonetServ	Monetary and other financial services
140	Finance	Capital market services
141	Insurance	Insurance
142	RealEstate	Real estate
143	Leasing	Leasing
144	BusinessSrv	Business services
145	Research	Research and experimental development
146	TechSrv	Professional and technical services
147	SciTechSvc	Technology promotion and application services
148	WaterTechSvc	Water management
149	EcoEnvManage	Ecological protection and environmental management
150	PubFaciltyMan	Public facilities management
151	ResidentSrv	Resident Services
152	OthService	Other services
153	Education	Education
154	Health	Health
155	SocialWork	Social work
156	JournlPublsh	News and publishing
157	ArtsFilmTV	Radio, television, film and video recording production
158	CulturalArt	Culture and art
159	Sports	Physical education
160	Entertainmnt	Entertainment
161	SocWelfare	Social Security
162	PublicAdmin	Public administration and social organization

Appendix 2: Regions of SinoTERM365

No.	Province	SinoTERM365 region	Population	No.	Province	SinoTERM365 region	Population
1	Beijing	Beijing	19612000	43		JinzhouLN	3094127
2	Tianjin	Tianjin	12938224	44		YingkouLN	2628303
3	Hebei	Shijiazhuang	9753672	45		FuxinLN	1930705
4		ChengdeHEB	3473201	46		LiaoyangLN	1833805
5		ZhangjiakouH	4345244	47		PanjinLN	1282369
6		QinhuangdaoH	2987605	48		TielingLN	3054479
7		TangshanHEB	7577289	49		ChaoyangLN	3401656
8		LangfangHEB	4358839	50		HuludaoLN	2787032
9		BaodingHEB	11284844	51	Jilin	ChangchunJL	6650377
10		CangzhouHEB	7134053	52		JilinJL	4414681
11		HengshuiHEB	4340773	53		SipingJL	3386325
12		XingtaiHEB	7104103	54		LiaoyuanJL	1176645
13		HandanHEB	9174683	55		TonghuaJL	2325242
14	Shanxi	TaiyuanSX	4201591	56		BaishanJL	1296575
15		DatongSX	3318057	57		SongyuanJL	2880086
16		YangquanSX	1368502	58		BaichengJL	2033058
17		ChangzhiSX	3334564	59		YanbianJL	2271600
18		JinchengSX	2279151	60	Heilongjiang	HarbinHJ	10635971
19		ShuozhouSX	1714857	61		QiqiharHJ	5367003
20		JinzhongSX	3249425	62		JixiHJ	1862161
21		YunchengSX	4619535	63		HegangHJ	1058665
22		XinzhouSX	3067502	64		Shuangyashan	1504426
23		LinfenSX	4316612	65		DaqingHJ	2904532
24		LuliangSX	3727057	66		YichunHJ	1148126
25	Inner Mongolia	HohhotIM	2866615	67		JiamusiHJ	2425403
26		BaotouIM	2650364	68		QitaiheHJ	920419
27		HulunbeierIM	2549278	69		Mudanjiang	2666408
28		XinganIM	1613250	70		HeiheHJ	1673898
29		TongliaoIM	3139153	71		SuihuaHJ	5416439
30		ChifengIM	4341245	72		Daxinganling	511564
31		XilinguoleIM	1028040	73		SuifenheHJ	132315
32		WulanchabuIM	2842556	74		FuyuanHJ	126694
33		ErdosIM	1940653	75	Shanghai	Shanghai	23019148
34		BayannaoerIM	1669915	76	Jiangsu	NanjingJS	8004680
35		WuhailIM	532902	77		WuxiJS	6372624
36		AlashanIM	231334	78		XuzhouJS	8577225
37	Liaoning	ShenyangLN	7233258	79		ChangzhouJS	4591972
38		DalianLN	5833745	80		SuzhouJS	10465994
39		AnshanLN	3502468	81		NantongJS	7282835
40		FushunLN	2237260	82		LianyungangJ	4393914
41		BenxiLN	1709538	83		Huai_anJS	4799889
42		DandongLN	2424200	84		YanchengJS	7260240

Regions of SinoTERM365 (cont).

	Province	SinoTERM365 region	Population		Province	SinoTERM365 region	Population
85		YangzhouJS	4459760	127		JingdezhenJX	1587477
86		ZhenjiangJS	3113384	128		PingxiangJX	1854510
87		TaizhouJS	4467300	129		JiujiangJX	4728778
88		SuqianJS	4715553	130		XinyuJX	1138873
89	Zhejiang	HangzhouZJ	8700400	131		YingtangJX	1124906
90		NingboZJ	7605689	132		GanzhouJX	8368447
91		JiaxingZJ	4501933	133		Ji_anJX	4810340
92		HuzhouZJ	2893542	134		YichunJX	5419575
93		ShaoxingZJ	5207100	135		FuzhouJX	3912312
94		ZhoushanZJ	1121300	136		ShangraoJX	6579714
95		WenzhouZJ	9122200	137	Shandong	JinanSD	6813800
96		JinhuaZJ	4557200	138		QingdaoSD	8715100
97		YiwuZJ	804400	139		ZiboSD	4530600
98		QuzhouZJ	2122700	140		ZaozhuangSD	3729300
99		TaizhouZJ	5968800	141		DongyingSD	2035300
100		LishuiZJ	2116900	142		YantaiSD	6968200
101	Anhui	HefeiAH	7457016	143		WeifangSD	8919500
102		HuaibeiAH	2114276	144		JiningSD	8082100
103		BozhouAH	4850657	145		Tai_anSD	5494200
104		SuzhouAH	5352924	146		WeihaiSD	2804800
105		BengbuAH	3164467	147		RizhaoSD	2801100
106		FuyangAH	7599918	148		LaiwuSD	1298500
107		HuainanAH	2333896	149		LinyiSD	10039400
108		ChuzhouAH	3937868	150		DezhouSD	5568200
109		LuanAH	5611701	151		LiaochengSD	5789900
110		MaanshanAH	2386399	152		BinzhouSD	3396800
111		WuhuAH	3545067	153		HezeSD	8287700
112		XuanchengAH	2532900	154	Henan	ZhengzhouHEN	8626505
113		TonglingAH	723958	155		KaifengHEN	4413919
114		ChizhouAH	1402518	156		LuoyangHEN	6549486
115		AnqingAH	5311000	157		Pingdingshan	4904367
116		HuangshanAH	1359000	158		AnyangHEN	5172834
117	Fujian	FuzhouFJ	7115370	159		HebiHEN	1569100
118		XiamenFJ	3531347	160		XinxiangHEN	5707801
119		PutianFJ	2778508	161		JiaozuoHEN	3539860
120		SanmingFJ	2503388	162		PuyangHEN	2656550
121		QuanzhouFJ	8128530	163		XuchangHEN	4307199
122		ZhangzhouFJ	4809983	164		LuoheHEN	2544103
123		NanpingFJ	2645549	165		SanmenxiaHEN	2089102
124		LongyanFJ	2559545	166		NanyangHEN	10263006
125		NingdeFJ	2821996	167		ShangqiuHEN	7362472
126	Jiangxi	NanchangJX	5042565	168		XinyangHEN	6108683

Regions of SinoTERM365 (cont).

SinoTERM365				SinoTERM365			
Province	region	Population		Province	region	Population	
169	ZhoukouHEN	8953172	211		HuizhouGD	4597002	
170	ZhumadianHEN	7230744	212		ShanweiGD	3298562	
171	JiyuanHEN	675710	213		DongguanGD	6949600	
172	Hubei WuhanHUB	9856784	214		ZhongshanGD	2363000	
173	HuangshiHUB	2429318	215		JiangmenGD	4448871	
174	ShiyanHUB	3340843	216		YangjiangGD	2421812	
175	JingzhouHUB	5691707	217		ZhanjiangGD	7003800	
176	YichangHUB	4059686	218		MaomingGD	5817753	
177	XiangyangHUB	5500307	219		ZhaoqingGD	3918085	
178	EzhouHUB	1048672	220		QingyuanGD	3698394	
179	JingmenHUB	2873687	221		ChaozhouGD	2669844	
180	XiaoganHUB	4814542	222		JieyangGD	5877025	
181	HuanggangHUB	6162072	223		YunfuGD	2360128	
182	XianningHUB	2462583	224	Guangxi	NanningGX	6661610	
183	SuizhouHUB	2162222	225		LiuzhouGX	3758704	
184	EnshiHUB	3290294	226		GuilinGX	4988397	
185	XiantaoHUB	1175085	227		WuzhouGX	3576300	
186	TianmenHUB	1418913	228		BeihaiGX	1539300	
187	QianjiangHUB	946277	229		Fangchenggan	866900	
188	ShennongjHUB	30000	230		QinzhouGX	3791200	
189	Hunan ChangshaHUN	7044118	231		GuigangGX	5033101	
190	ZhuzhouHUN	3855609	232		YulinGX	5487300	
191	XiangtanHUN	2748552	233		BaiseGX	3826300	
192	HengyangHUN	7141462	234		HezhouGX	2231900	
193	ShaoyangHUN	7071741	235		HechiGX	3991800	
194	YueyangHUN	5477911	236		LaibinGX	2498236	
195	ChangdeHUN	5717218	237		ChongzuoGX	2347700	
196	ZhangjiajieH	1476521	238	Hainan	HaikouHA	2171100	
197	YiyangHUN	4313084	239		SanyaHA	732000	
198	YongzhouHUN	5180235	240		WuzhishanHA	115000	
199	ChenzhouHUN	4581778	241		WenchangHA	105000	
200	HuaihuaHUN	4741948	242		QionghaiHA	547300	
201	LoudiHUN	3785627	243		WanningHA	495100	
202	XiangxiHUN	2547833	244		DinganHA	556000	
203	Guangdong GuangzhouGD	12700800	245		TunchangHA	287700	
204	ShenzhenGD	10357938	246		ChengmaiHA	260200	
205	ZhuhaiGD	1560229	247		LingaoHA	476700	
206	ShantouGD	5391028	248		DanzhouHA	436200	
207	FoshanGD	7194311	249		DongfangHA	414500	
208	ShaoguanGD	2826612	250		LedongHA	465500	
209	HeyuanGD	2953019	251		QiongzongHA	175400	
210	MeizhouGD	4240139	252		BaotingHA	148500	

Regions of SinoTERM365 (cont).

SinoTERM365				SinoTERM365		
Province	region	Population		Province	region	Population
253	Chongqing	LinshuiHA	324200	294	BaoshanYN	2506491
254		BaishaHA	169500	295	ZhaotongYN	5213533
255		ChangjiangHA	226500	296	LijiangYN	1244769
256		CoreMetroCQ	2654600	297	PuerYN	2542700
257		ExtendMetCQ	3782300	298	LincangYN	2429505
258		NewUrbanCQ	12494200	299	ChuxiongYN	2684174
259		NEEcoCQ	11074500	300	HongheYN	4501000
260	Sichuan	SEEnvCQ	3746400	301	WenshanYN	3517941
261		ChengduSC	14047625	302	XishuangbYN	1133515
262		ZigongSC	2678898	303	DaliYN	3456000
263		PanzhihuaSC	1214121	304	DehongYN	1211440
264		LuzhouSC	4218426	305	NujiangYN	534337
265		DeyangSC	3615759	306	DiqingYN	400182
266		MianyangSC	4613873	307	Tibet	LhasaTB
267		GuangyuanSC	2484123	308	QamdoTB	598862
268		SuiningSC	3252551	309	ShannanTB	330152
269		NeijiangSC	3702847	310	XigazeTB	679771
270		LeshanSC	3235756	311	NagquTB	424554
271		NanchongSC	7421073	312	NgariTB	83461
272		MeishanSC	3445180	313	NyingchiTB	164331
273		YibinSC	4472001	314	Shaanxi	Xi_anSAA
274		GuanganSC	3205476	315		TongchuanSAA
275		DazhouSC	5468092	316		BaojiSAA
276		YaanSC	1507264	317		XianyangSAA
277		BazhongSC	3283771	318		WeinanSAA
278		ZiyangSC	3665064	319		Yan_anSAA
279		AbaSC	898713	320		HanzhongSAA
280	Guizhou	GanziSC	1091872	321		YulinSAA
281		LiangshanSC	4532809	322		AnkangSAA
282		GuiyangGZ	4324561	323		ShangluoSAA
283		LiupanshuiGZ	2851180	324		YanglingSAA
284		ZunyiGZ	6127009	325	Gansu	LanzhouGS
285		AnshunGZ	2297339	326		JiyuguanGS
286		BijieGZ	6536370	327		JinchangGS
287		TongrenGZ	3092365	328		BaiyinGS
288		QianxinanGZ	2805857	329		TianshuiGS
289		QiandongnanG	3480626	330		WuweiGS
290	Yunnan	QiannanGZ	3231161	331		ZhangyeGS
291		KunmingYN	6432212	332		PingliangGS
292		QujingYN	5855055	333		JiuquanGS
293		YuxiYN	2303511	334		QingyangGS

Regions of SinoTERM365 (cont).

	Province	SinoTERM365 region	Population
335		DingxiGS	2698622
336		LongnanGS	2567718
337		LinxiaGS	1946677
338		GannanGS	689132
339	Qinghai	XiningQH	2208708
340		HaidongQH	1396846
341		HaibeiQH	74354
342		HuangnanQH	256716
343		HainanQH	441689
344		GologQH	181682
345		YushuQH	378439
346		HaixiQH	489338
347	Ningxia	YinchuanNX	1993088
348		ShizuishanNX	725482
349		WuzhongNX	1273792
350		GuyuanNX	1228156
351		ZhongweiNX	1080832
352	Xinjiang	UrumqiXJ	3492689
353		KaramayXJ	391008
354		TurpanXJ	622903
355		HamiXJ	572400
356		ChangjiXJ	1428587
357		IliXJ	2482592
358		TachengXJ	994776
359		AltayXJ	1055401
360		BortalaXJ	472918
361		BayangolXJ	1278486
362		AksuXJ	2370809
363		KizilsuXJ	500007
364		KashgarXJ	3979321
365		HotanXJ	2014362

Appendix 3: Choosing a suitable aggregation for a particular scenario – a note to subscribers of option 2

A tendency with novice modellers is to run scenarios with a larger than necessary database. This is computationally costly, because the solution time increases with database size to the power of 1.7. For example, if one database is 0.2 megabytes and another is 2 megabytes, the model will take 50 times ($=10^{1.7}$) as long to solve with the latter database as the former. This would not matter if we only undertook one simulation in a particular project. In practice, most projects require many runs of the model. Moreover, if we have some doubts about solution results, we are more likely to revisit a scenario if solution time is relatively short.

The largest database used in a serious study with TERM contained 38 sectors and 45 regions. It examined the regional economic impacts of drought (Horridge et al., 2005). It required 45 regions because the authors used information on rainfall shortages by region to infer region-specific productivity losses. But in most studies, only a handful of regions are necessary. For example, a major project in the Chinese context may involve the prefecture or prefectures in which a project proceeds, a composite region covering the rest of the province and a composite region covering all other provinces. That is, three regions may be sufficient. In the sectoral dimension, the sectors represented individually should be scenario relevant. Typical sectoral aggregations have 20 to 40 sectors.

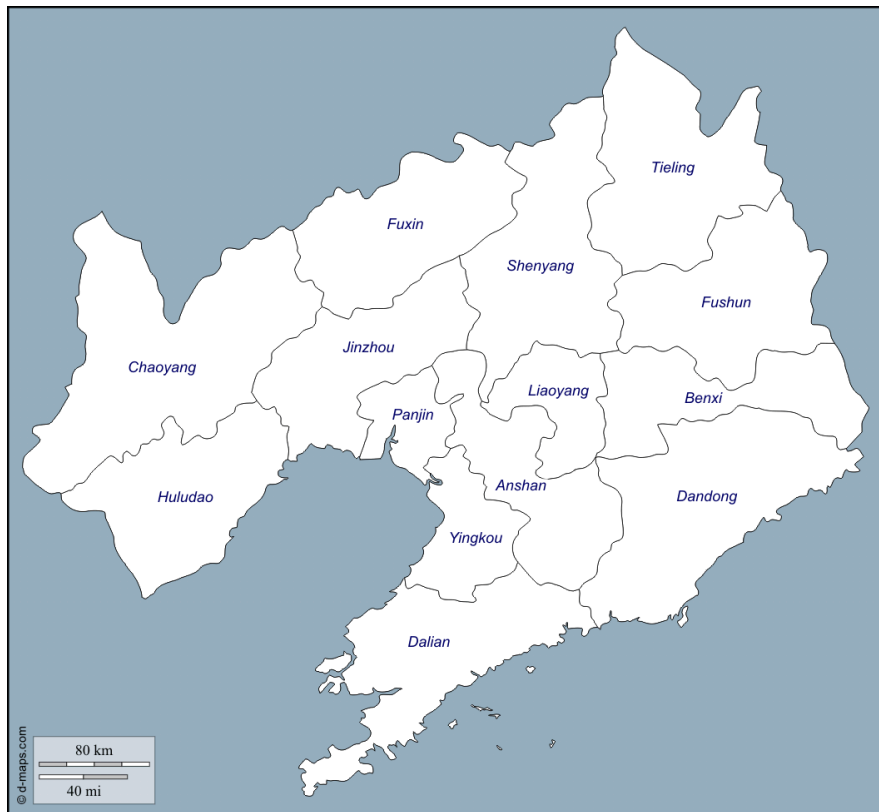
In addition to ensuring that solution time is rapid, a relatively aggregated database provides the user with another advantage: it is possible to fit detailed industry results on a single page in a report.

An optimal approach for any user of SinoTERM365 will be to learn how to use the aggregation tool, and then aggregate any sectors and regions that are not of specific interest in a particular scenario. There are few rewards from working with a larger than necessary database.

References

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- Horridge (2012) The TERM Model and Its Database. In: Wittwer G (ed) *Economic Modeling of Water: The Australian CGE Experience*. Springer, Dordrecht, pp 13-36.
- Horridge M, Madden J, Wittwer G (2005), "Using a highly disaggregated multi-regional single-country model to analyse the impacts of the 2002-03 drought on Australia", *Journal of Policy Modeling* 27: 285-308.

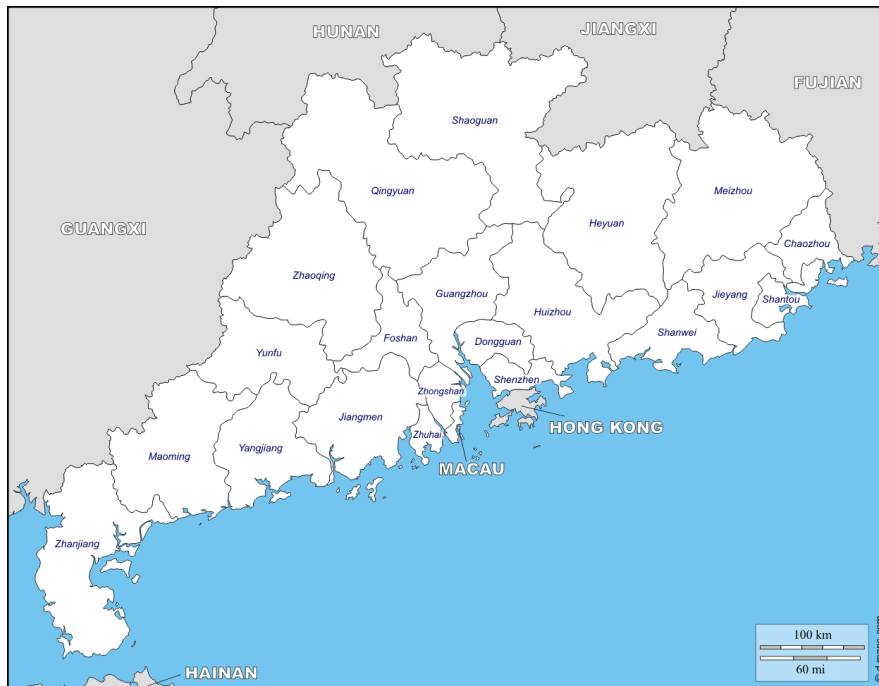
Liaoning



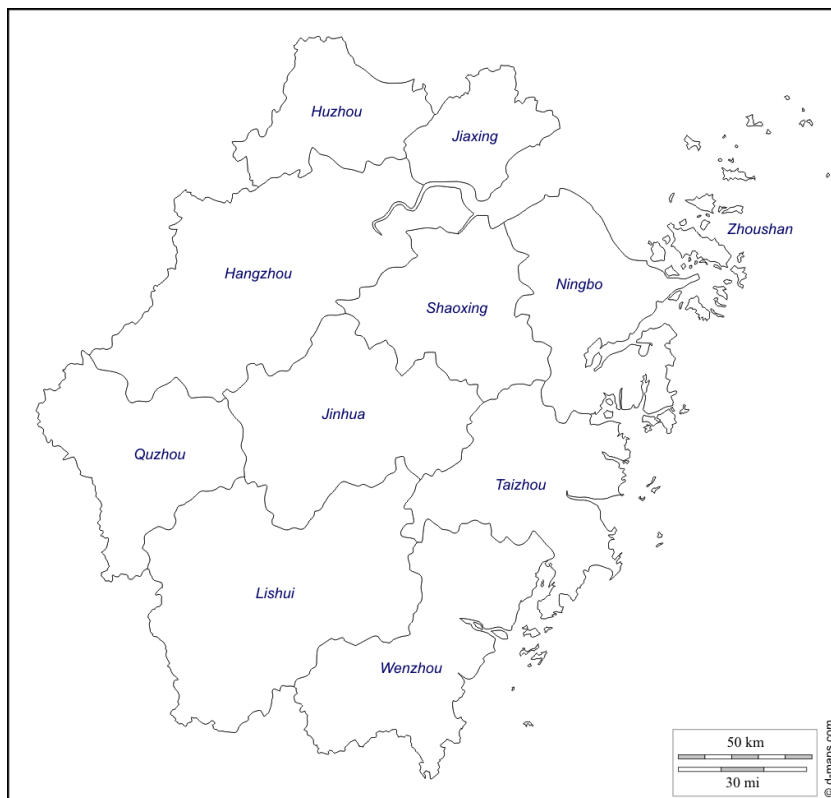
Anhui



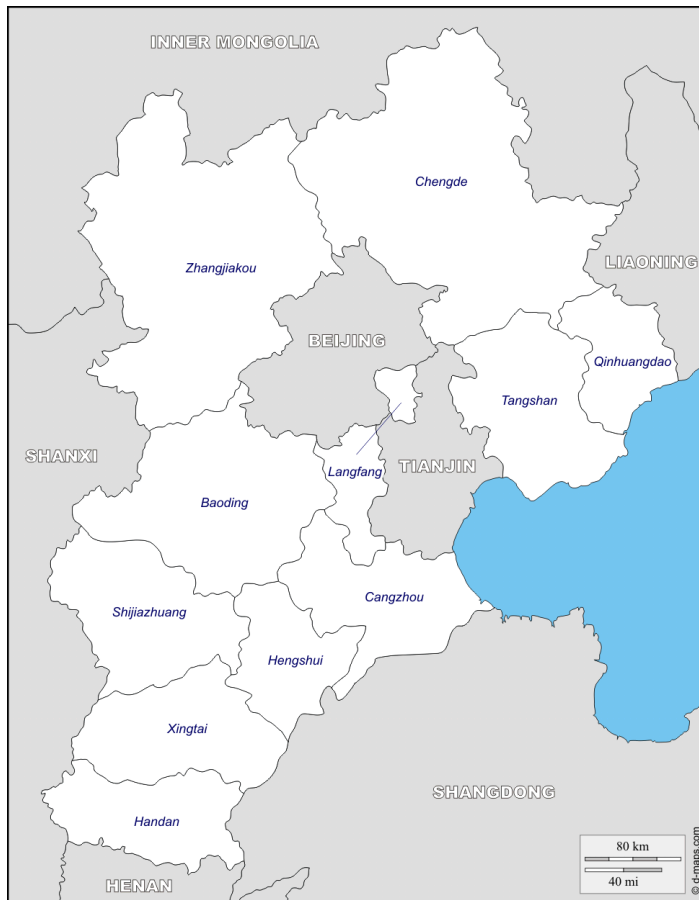
Guangdong prefectures



Zhejiang prefectures



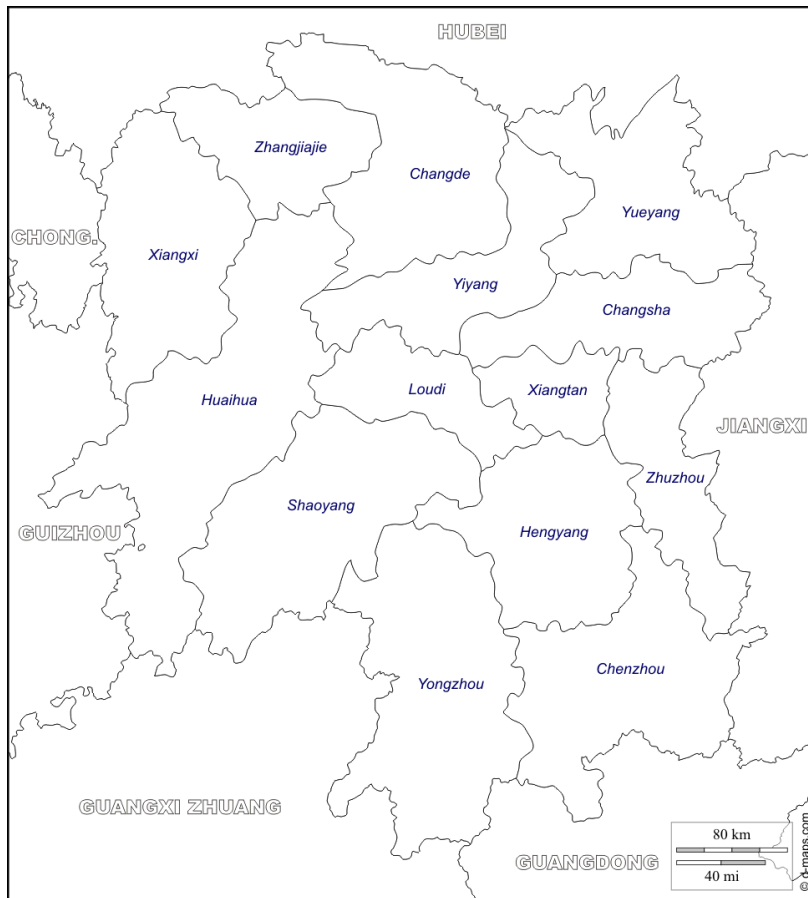
Hebei



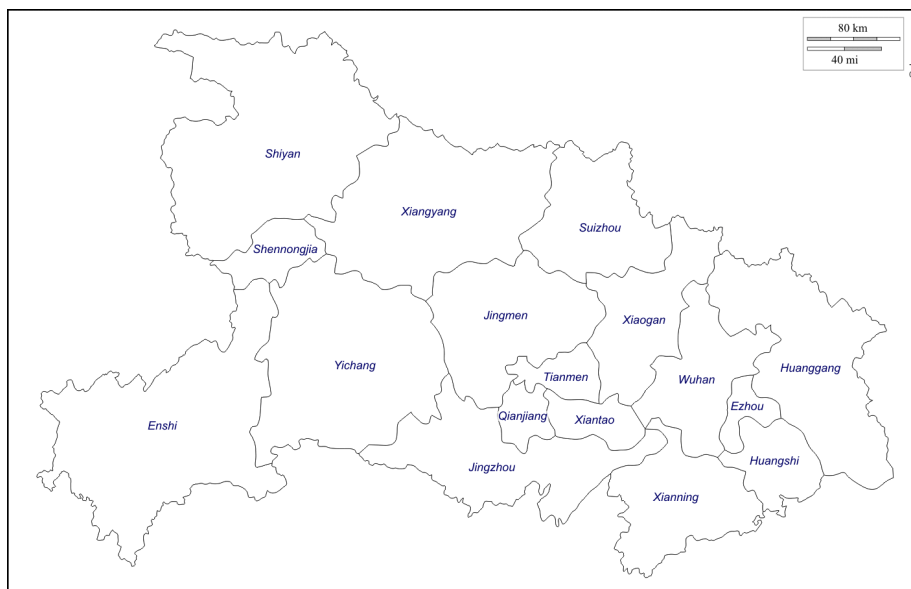
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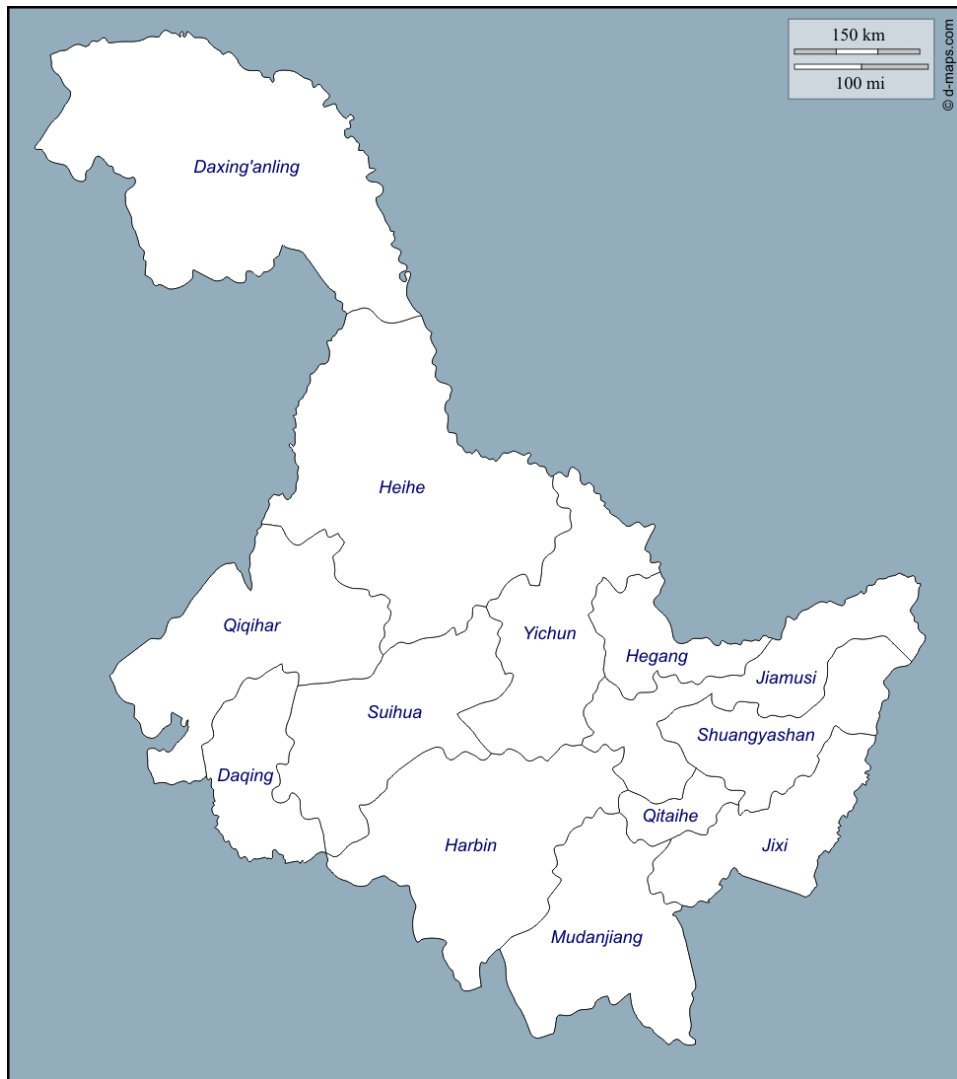
Hunan



Hubei



Heilongjiang



Jiangsu



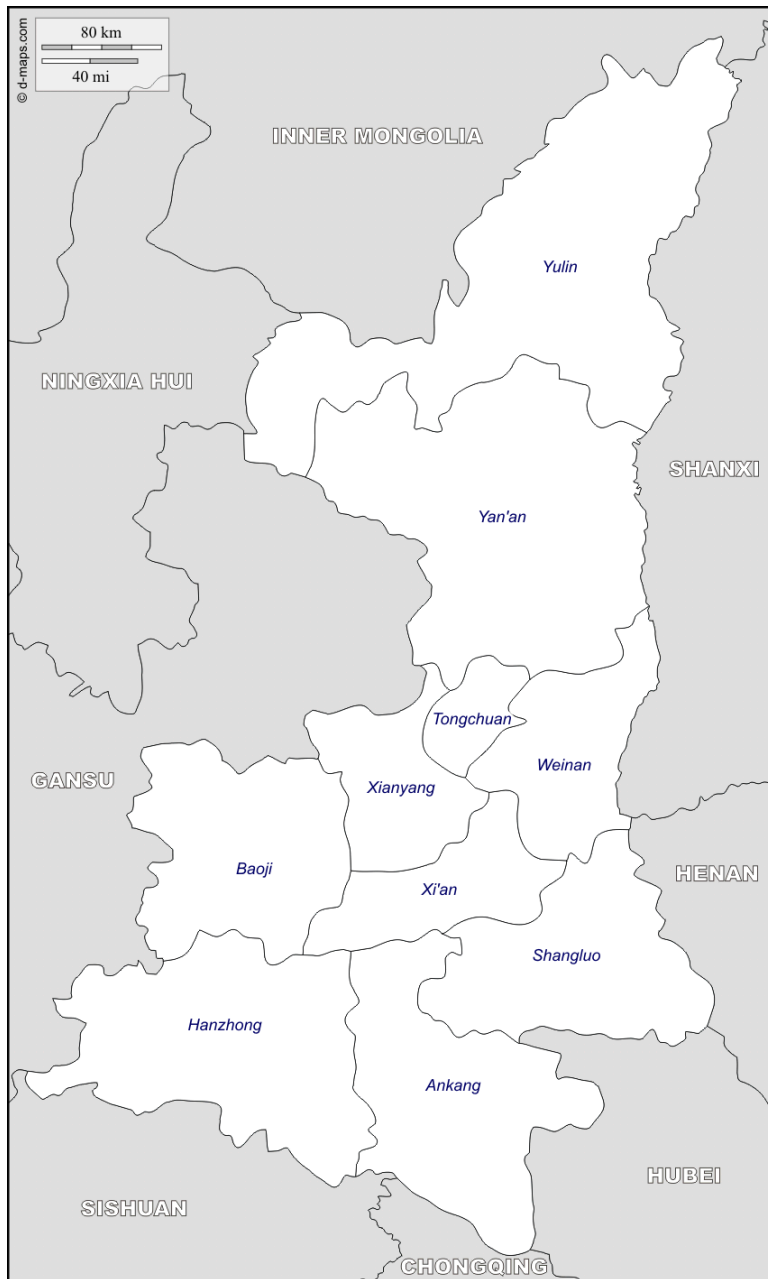
Jiangxi



Shanxi



Shaanxi



Shandong

