

Supplementary File

# Exploring annual urban expansions in Guangdong-Hong Kong-Macau Greater Bay Area: Spatiotemporal features and driving factors in 1986-2017

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31 Table S1. The major policies in GBA during 1979-2017

Year	Area	Policy	Main Contents	Reference
1980	Shenzhen	Regulations of special economic zones of Guangdong province	Establishing the Shenzhen special economic zone.	<a href="http://www.npc.gov.cn/wxzl/gongbao/2000-12/10/content_5009544.htm">http://www.npc.gov.cn/wxzl/gongbao/2000-12/10/content_5009544.htm</a>
1984	Guangzhou	Approval of the report on the opening of Guangzhou to the outside world	The state council agrees to set up economic and technological development zones.	<a href="http://v5.pkulaw.cn/fulltext_fo rm.aspx?Db=chl&amp;Gid=7187">http://v5.pkulaw.cn/fulltext_fo rm.aspx?Db=chl&amp;Gid=7187</a>
1986	Macao	Provisions of the state council on encouraging foreign investment	Encourage enterprises and other organizations or individuals from Hong Kong and Macau to invest inland enterprises.	<a href="http://project.mofcom.gov.cn/1800000121_23_69881_0_7.html">http://project.mofcom.gov.cn/1800000121_23_69881_0_7.html</a>
1988	Huizhou	Notice of the state council on expanding the coastal economic open zones in Guangdong province	Huizhou will be included in the expanded scope of the coastal economic open zone in Guangdong province.	<a href="https://www.pkulaw.com/chl/2dee81fb7c12e05bbdfb.html?keyword=%E6%83%A0%E5%B7%9E%20">https://www.pkulaw.com/chl/2dee81fb7c12e05bbdfb.html?keyword=%E6%83%A0%E5%B7%9E%20</a>
1991	Guangzhou	Notice of the state council concerning the approval of the national high-tech industrial development zone	Upgrading of Guangzhou Tianhe hi-tech industrial development zone to the national hi-tech industrial development zone	<a href="https://www.pkulaw.com/chl/4999c79a449c90e4bdfb.html?keyword=%E5%B9%BF%E5%B7%9E%20">https://www.pkulaw.com/chl/4999c79a449c90e4bdfb.html?keyword=%E5%B9%BF%E5%B7%9E%20</a>
1993	Huizhou	Notice of the state council on approval of the establishment of Guangzhou Nansha economic and technological development zone and Huizhou Daya bay economic and technological development zone	Approved to establish the DaYa bay economic and technological development zone in Huizhou.	<a href="http://www.cnki.com.cn/Article/CJFDTotale/GWYB199311009.htm">http://www.cnki.com.cn/Article/CJFDTotale/GWYB199311009.htm</a>
2000	Shenzhen	Reply from the general office of the state council on the establishment of export zones	The state agrees to set up Shenzhen as a pilot export zone.	<a href="http://www.gov.cn/gongbao/content/2000/content_60225.htm">http://www.gov.cn/gongbao/content/2000/content_60225.htm</a>

2003	Hong Kong, Macao	Notice of the general office of the state council on the implementation of the closer economic partnership arrangement between the mainland and Hong Kong/Macao.	Strengthening the close economic and trade relations between the mainland, Hong Kong and Macao.	<a href="http://www.gov.cn/gongbao/content/2005/content_63362.htm">http://www.gov.cn/gongbao/content/2005/content_63362.htm</a>
	Zhuhai, Macao	Approval of the state council on the establishment of Zhuhai-Macao cross-border industrial zone	The Zhuhai-Macao cross-border industrial zone is planned to be formed by reclamation in Zhuhai and Macao special administrative region, respectively.	<a href="http://www.gov.cn/gongbao/content/2004/content_63058.htm">http://www.gov.cn/gongbao/content/2004/content_63058.htm</a>
2007	Shenzhen	Notice of the state council approving the opening of Futian port in Shenzhen, Guangdong province	The state council approved the opening of Futian port in Shenzhen, Guangdong province.	<a href="http://www.gov.cn/gongbao/content/2007/content_686112.htm">http://www.gov.cn/gongbao/content/2007/content_686112.htm</a>
2010	PRD* (Pearl River Delta)	Notice of the state council on printing and distributing the national plan for functional zones	Establishing the Pearl River Delta.	<a href="http://www.gov.cn/zwggk/2011-06/08/content_1879180.htm">http://www.gov.cn/zwggk/2011-06/08/content_1879180.htm</a>
2012	Guangzhou, Shenzhen, Zhuhai	The notice of the state council on printing and distributing the 12th five-year plan for the development of the national Marine economy	Relying on the major ports such as Guangzhou, Shenzhen, Zhanjiang, Zhuhai and Shantou to build a world-class port group and international logistics centers.	<a href="http://www.gov.cn/zwggk/2013-01/17/content_2314162.htm">http://www.gov.cn/zwggk/2013-01/17/content_2314162.htm</a>
2015	Guangzhou, Shenzhen, Zhuhai	The general plan of the China (Guangdong) pilot free trade zone	Establishing the China (Guangdong) pilot free trade zone.	<a href="http://www.gov.cn/zhengce/content/2015-04/20/content_9623.htm">http://www.gov.cn/zhengce/content/2015-04/20/content_9623.htm</a>
2016	GBA	Guidelines of the state council on deepening Pearl River Delta regional cooperation	Establishing the Guangdong-Hong Kong-Macao Greater Bay Area.	<a href="http://www.gov.cn/zhengce/content/2016-03/15/content_5053647.htm">http://www.gov.cn/zhengce/content/2016-03/15/content_5053647.htm</a>
2017	Guangzhou, Shenzhen, Zhongshan	The development plan for the 13th five-year plan for a modern comprehensive transportation system	Improving the infrastructure networks and promote the construction of comprehensive transportation.	<a href="http://www.gov.cn/zhengce/content/2017-02/28/content_5171345.htm">http://www.gov.cn/zhengce/content/2017-02/28/content_5171345.htm</a>

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Note:

I. The Pearl River Delta (PRD) covers nine cities including Guangzhou, Foshan, Zhaoqing, Shenzhen, Dongguan, Huizhou, Zhuhai, Zhongshan and Jiangmen.

II. The Pan-pearl River Delta Region comprises nine provinces in southern, southeastern and southwestern China and two special administrative regions (Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Yunnan, Hong Kong and Macau).

III. The original government policies are in Chinese.

**Table S2. The annual urban area of 11 cities in GBA during 1986-2017 (Unit: km<sup>2</sup>)**

	Macao	Dongguan	Foshan	Guangzhou	Hong Kong	Huizhou	Jiangmen	Shenzhen	Zhaoqing	Zhongshan	Zhuhai
1986	4.33	95.83	57.43	82.17	70.95	37.38	92.36	74.11	55.91	53.44	28.82
1987	4.96	112.94	97.40	149.54	77.86	43.27	105.84	87.79	65.09	63.27	33.49
1988	5.20	126.77	160.99	240.91	83.01	56.85	113.13	111.89	68.03	68.41	36.27
1989	5.55	134.95	215.12	317.90	85.69	62.60	119.94	123.60	72.26	75.83	39.14
1990	5.82	142.65	273.58	390.53	88.36	69.11	123.36	136.63	73.87	78.55	42.12
1991	6.00	160.17	335.44	456.27	91.05	76.87	127.62	157.92	75.31	85.85	45.85
1992	6.20	188.33	391.36	524.97	93.83	88.03	135.05	188.27	78.45	101.31	49.55
1993	6.48	242.70	439.81	576.96	96.76	109.07	150.38	231.98	85.21	123.16	58.20
1994	7.08	306.65	496.16	638.30	100.15	127.38	165.59	273.33	94.19	145.60	71.26
1995	7.46	362.71	565.37	706.23	103.61	139.81	184.27	305.68	103.88	174.52	79.15
1996	7.71	403.04	669.05	800.57	107.62	149.66	194.81	332.68	111.77	187.27	83.62
1997	7.98	433.08	729.48	857.86	112.08	158.39	205.58	354.45	117.69	198.72	87.72
1998	8.29	468.50	772.12	905.67	116.73	168.02	219.51	379.44	124.73	218.61	91.82
1999	8.52	506.55	803.62	942.36	120.90	177.53	231.42	407.34	128.37	233.49	95.76
2000	8.71	555.48	841.22	988.09	125.73	192.62	245.85	442.46	131.41	252.39	100.74
2001	8.91	622.61	886.09	1040.73	128.97	206.80	261.01	480.53	135.05	279.82	107.59
2002	9.02	678.77	929.51	1086.41	131.41	224.33	273.56	510.18	139.24	302.13	113.18
2003	9.15	727.46	966.49	1122.61	133.18	242.47	287.07	535.24	142.89	325.30	118.08
2004	9.28	783.03	1022.93	1168.23	135.27	261.93	300.49	561.87	148.98	347.84	124.51
2005	9.41	836.28	1060.19	1200.64	137.48	288.29	318.76	590.26	157.73	373.55	131.25
2006	9.58	883.62	1099.07	1234.88	139.78	322.55	357.11	615.81	172.98	408.96	137.86
2007	9.71	921.55	1158.82	1287.97	141.68	350.81	379.97	636.38	186.03	433.84	144.05
2008	9.84	956.72	1203.64	1331.80	143.88	379.76	400.83	655.26	197.70	459.60	150.72
2009	9.96	986.30	1258.86	1390.65	146.68	410.90	420.39	673.96	208.64	482.04	157.81
2010	10.10	1030.87	1287.55	1414.91	152.49	460.58	446.53	699.72	223.83	510.82	168.17
2011	10.29	1069.98	1298.62	1424.80	157.60	511.67	479.16	720.97	242.43	543.34	178.87
2012	10.49	1118.33	1303.84	1430.17	163.53	568.94	513.55	742.59	258.45	576.02	192.07
2013	10.67	1161.17	1319.73	1442.01	169.55	617.98	540.78	761.79	273.58	601.52	199.26
2014	10.86	1203.51	1334.52	1454.42	176.01	663.64	571.72	781.58	288.59	629.08	207.54
2015	11.03	1236.43	1358.26	1479.42	181.15	697.28	595.56	798.22	301.59	650.02	215.67
2016	11.09	1240.28	1403.46	1547.11	182.01	702.53	598.73	800.32	304.04	652.99	216.99
2017	11.31	1272.05	1514.55	1730.42	189.48	739.23	632.18	818.49	322.45	679.54	227.39

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**Table S3. The annual urban area, AI, and AGR of GBA during 1986-2017**

Year	Area (km <sup>2</sup> )	Period	AI (km <sup>2</sup> /year)	AGR %
1986	652.74			
1987	841.45	1986-1987	188.72	28.91
1988	1071.46	1987-1988	230.01	27.33
1989	1252.60	1988-1989	181.14	16.91
1990	1424.59	1989-1990	171.99	13.73
1991	1618.34	1990-1991	193.75	13.60
1992	1845.35	1991-1992	227.01	14.03
1993	2120.71	1992-1993	275.37	14.92
1994	2425.67	1993-1994	304.96	14.38
1995	2732.68	1994-1995	307.01	12.66
1996	3047.81	1995-1996	315.13	11.53
1997	3263.04	1996-1997	215.23	7.06
1998	3473.43	1997-1998	210.40	6.45
1999	3655.86	1998-1999	182.42	5.25
2000	3884.71	1999-2000	228.85	6.26
2001	4158.11	2000-2001	273.40	7.04
2002	4397.75	2001-2002	239.65	5.76
2003	4609.93	2002-2003	212.17	4.82
2004	4864.37	2003-2004	254.44	5.52
2005	5103.83	2004-2005	239.46	4.92
2006	5382.18	2005-2006	278.35	5.45
2007	5650.81	2006-2007	268.63	4.99
2008	5889.77	2007-2008	238.96	4.23
2009	6146.18	2008-2009	256.41	4.35
2010	6405.57	2009-2010	259.39	4.22
2011	6637.73	2010-2011	232.17	3.62
2012	6877.98	2011-2012	240.24	3.62
2013	7098.02	2012-2013	220.05	3.20
2014	7321.47	2013-2014	223.44	3.15
2015	7524.63	2014-2015	203.17	2.77
2016	7659.56	2015-2016	134.92	1.79
2017	8137.09	2016-2017	477.53	6.23

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S2. Figures

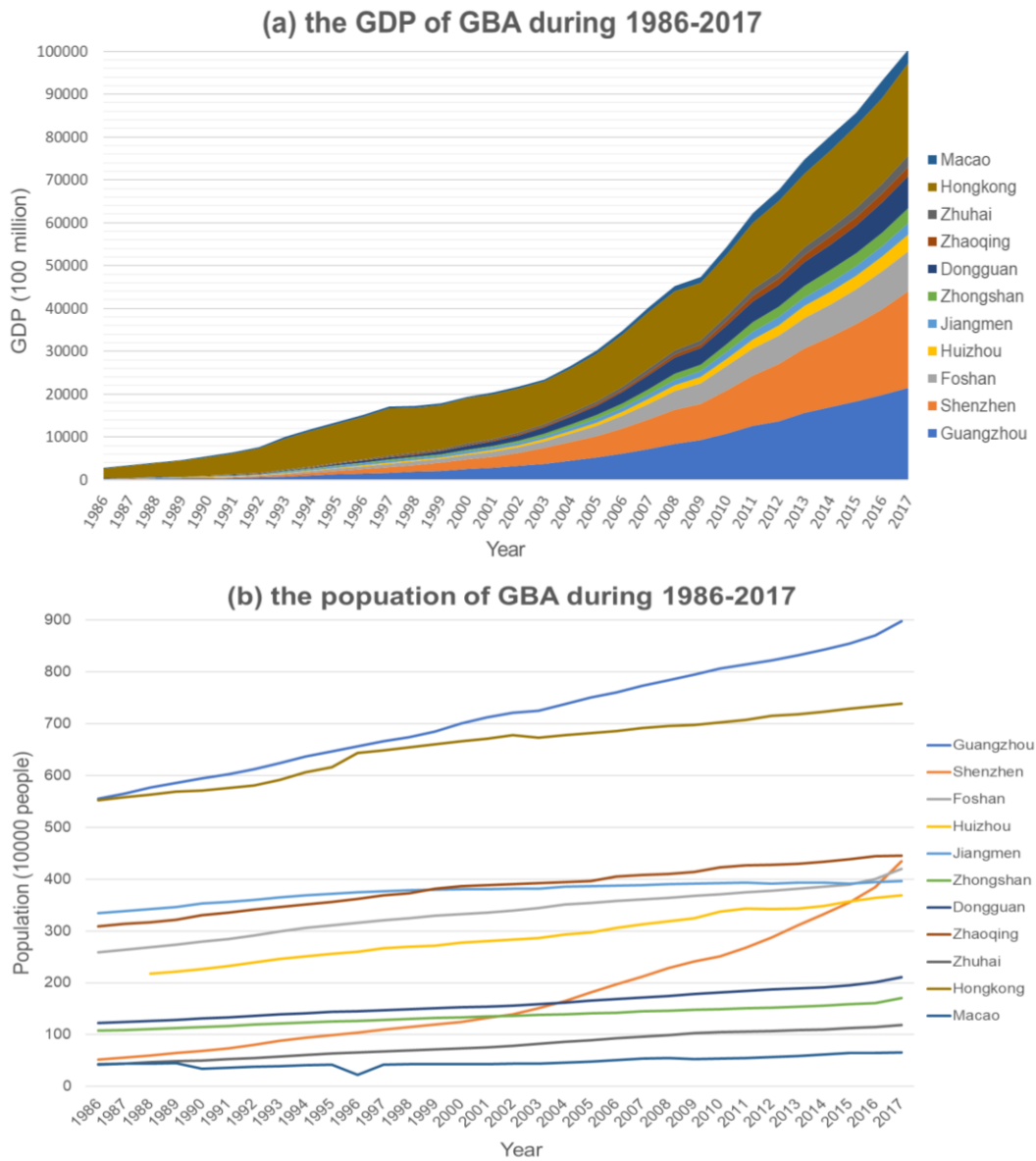


Figure S1. The changes of (a) GDP and (b) population of the 11 cities in GBA during 1986-2017

S3. Video

Movie S1. The annual urban expansion process of GBA during 1986-2017