### Additional file 1: The list of research cities

| Province/municipalities/autonomous regions | # of cities | Name of the cities |
|------------------------------------------|-------------|--------------------|
| Beijing                                  | 1           | Beijing            |
| Tianjin                                  | 1           | Tianjin            |
| Hebei                                    | 11          | Shijiazhuang, Tangshan, Qinhuangdao, Handan, Xingtai, Baoding, Zhangjiakou, Chengde, Cangzhou, Langfang, Hengshui |
| Shānxi                                   | 11          | Taiyuan, Datong, Yangquan, Changzhi, Jincheng, Shuozhou, Jinzhou, Yuncheng, Xinzhou, Linfen, Lvliang |
| Inner Mongolia                           | 12          | Hohhot, Baotou, Wuhai, Chifeng, Tongliao, Ordos, Hulun Buir, Bayan Nur, Ulanqab, Hinggan League, Xilingol League, Alxa League |
| Liaoning                                 | 14          | Shenyang, Dalian, Anshan, Fushun, Benxi, Dandong, Jinzhou, Yingkou, Fuxin, Liaoyang, Panjin, Tieling, Chaoyang, Huludao |
| Jilin                                    | 11          | Changchun, Jilin, Siping, Gongzhuling, Liao yuan, Tonghua, Meihekou, Baishan, Songyuan, Baicheng, Yanbian Korean Autonomous Prefecture |
| Heilongjiang                             | 13          | Harbin, Qiqihar, Jixi, Hegang, Shuangyashan, Daqing, Yichun, Jiamusi, Qitahe, Mudanjiang, Heihe, Suihua, Daxinganling, |
| Shanghai                                 | 1           | Shanghai           |
| Jiangsu                                  | 13          | Nanjing, Wuxi, Xuzhou, Changzhou, Suzhou, Nantong, Lianyungang, Huaian, Yancheng, Yangzhou, Zhenjiang, Taizhou, Suqian, |
| Zhejiang                                 | 11          | Hangzhou, Ningbo, Wenzhou, Jiaxing, Huzhou, Shaoxing, Jinhua, Quzhou, Zhouran, Taizhou, Lishui, |
| Anhui                                    | 16          | Hefei, Wuhu, Bengbu, Huainan, Ma'an shan, Huaibei, Tongling, Anqing, Huangshan, Chuzhou, Fuyang, Suzhou, Lu'an, Haozhou, Chizhou, Xuancheng |
| Province/municipalities/autonomous regions | # of cities | Name of the cities |
|-----------------------------------------|-------------|--------------------|
| Fujian                                  | 9           | Fuzhou, Xiamen, Putian, Sanming, Quanzhou, Zhangzhou, Nanping, Longyan, Ningde, |
| Jiangxi                                 | 11          | Nanchang, Jingdezhen, Pingxiang, Jiujiang, Xinyu, Yingtan, Ganzhou, Ji’an, Yichun, Fuzhou, Shangrao |
| Shandong                                | 16          | Jinan, Qingdao, Zibo, Zaozhuang, Dongying, Yantai, Weifang, Jining, Tai’an, Weihai, Rizhao, Linyi, Dezhou, Liaocheng, Binzhou, Heze |
| Henan                                   | 18          | Zhengzhou, Kaifeng, Luoyang, Pingdingshan, Anyang, Hebi, Xinxiang, Jiaozuo, Puyang, Xuchang, Luohe, Sanmenxia, Nanyang, Shangqiu, Xinyang, Zhoukou, Zhumadian, Jiyuan |
| Hubei                                   | 17          | Wuhan, Huangshi, Shiyan, Yichang, Xiangfan, Ezhou, Jingmen, Xiaogan, Jingzhou, Huanggang, Xianning, Suizhou, Enshi Tujia and Miao Autonomous Prefecture, Xiantao, Qianjiang, Tianmen, Shennongjia Forestry District |
| Hunan                                   | 14          | Changsha, Zhuzhou, Xiangtan, Hengyang, Shaoyang, Yueyang, Changde, Zhangjiajie, Yiyang, Binzhou, Yongzhou, Huaihua, Loudi, Xiangxi Tujia and Miao Autonomous Prefecture |
| Guangdong                               | 21          | Guangzhou, Shaoguan, Shenzhen, Zuhai, Shantou, Foshan, Jiangmen, Zhanjiang, Maoming, Zhaoping, Huizhou, Meizhou, Shanwei, Heyuan, Yangjiang, Qingyuan, Dongguan, Zhongshan, Chaozhou, Jieyang, Yunfu |
| Guangxi                                 | 14          | Nanning, Liuzhou, Guilin, Wuzhou, Beihai, Fangchenggang, Qinzhou, Guigang, Yulin, Baise, Hezhou, Hechi, Laibin, Chongzuo |
| Province/municipalities/autonomous regions | # of cities | Name of the cities |
|------------------------------------------|-------------|--------------------|
| Haikou                                   | 18          | Haikou, Sanya, Danzhou, Wuzhishan, Qionghai, Wenchang, Wanning, Dongfang, Dingan, Tunchang, Chengmai, Lingao, Baisha, Changjiang, Ledong, Lingshui, Baoting, Qiongzhong |
| Chongqing                                | 1           | Chongqing          |
| Sichuan                                  | 21          | Chengdu, Zigong, Panzhihua, Luzhou, Deyang, Mianyang, Guangyuan, Suining, Neijiang, Leshan, Nanchong, Meishan, Yibin, Guangan, Dazhou, Yaan, Bazhong, Ziyang, Tibetan Qiang Autonomous Prefecture of Ngawa, Tibetan Autonomous Prefecture of Garzê, Liangshan Yi Autonomous Prefecture |
| Guizhou                                  | 9           | Guiyang, Lupanshui, Zunyi, Anshun, Tongren, Qianxi’nan Buyi and Miao Autonomous Prefecture, Bijie, Qiandongnan Miao and Dong Autonomous Prefecture, Qiannan Buyi and Miao Autonomous Prefecture |
| Yunnan                                   | 16          | Kunming, Qujing, Yuxi, Baoshan, Zhaotong, Lijiang, Puer, Lincang, Chuxiong, Hani-Yi Autonomous Prefecture of Honghe, Wenshan Zhuang and Miao Autonomous Prefecture, Sipsongpanna, Dali Bai Autonomous Prefecture, Dehong Dai and Jingpo Autonomous Prefecture, Nuijiang of the Lisu Autonomous Prefecture, Diqing Tibetan Autonomous Prefecture |
| Tibet                                    | 7           | Lhasa, Qamdo, Shannan, Xigaze, Nagqu, Ngari, Nyingchi |
| Shānxi                                    | 10          | Xi’an, Tongchuan, Baoji, Xianyang, Weinan, Yanan, Hanzhong, Yulin, Ankang, Shangluo |
| Province/municipalities/autonomous regions | # of cities | Name of the cities |
|-----------------------------------------|------------|-------------------|
| Gansu                                   | 14         | Lanzhou, Jiayuguan, Jinchang, Baiyin, Tianshui, Wuwei, Zhangye, Pingliang, Jiuquan, Qingyang, Dingxi, Longnan, Linxia Hui Autonomous Prefecture, Gannan Tibetan Autonomous Prefecture |
| Qinghai                                 | 8          | Xining, Haidong, Tibetan Autonomous Prefecture of Haibei, Tibetan Autonomous Prefecture of Huangnan, Tibetan Autonomous Prefecture of Hainan, Tibetan Autonomous Prefecture of Golog, Yushu Tibetan Autonomous Prefecture, Haixi Mongolian and Tibetan Autonomous Prefecture |
| Ningxia                                 | 5          | Yinchuan, Shizuishan, Wuzhong, Guyuan, Zhongwei |
| Xinjiang                                | 18         | Urumqi, Karamay, Turpan, Hami, Changji Hui Autonomous Prefecture, Bortala Mongol Autonomous Prefecture, Bayingol Mongolian Autonomous Prefecture, Aksu, Kizilsu Kirghiz Autonomous Prefecture, Kashgar, Hotan, Ili Kazak Autonomous Prefecture, Tacheng, Altay, Shihezi, Alaer, Tumushuke, Wujiaqu |