Feasibility Research and Implementation Plan of Establishing a Climate Protection Manager System in Jiangsu Province

Supporting the Low Carbon Development of Jiangsu Province Phase III

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SCS sustainable energy and climate strategies
Hohmeyer | Partner

Author
Emöke Kovac

Consultant / author of sections on China:
Zhongping Wu

Prepared on behalf of GIZ

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SCS Hohmeyer | Partner GmbH

Eckernförder Landstraße 65
D-24941 Flensburg

Contact: Emöke Kovac

Phone: 0049 (0) 461- 4938 8399

E-mail: kovac@scs-flensburg.de
Web: www.scs-flensburg.de

Executive Summary

Climate protection management (CPM) as established in Germany can be a building block for effective climate protection but must be strongly supported by general national and international rules. From the German experience, climate-active municipalities stress that the national government must set the right frame with strong legislation, especially regarding farming, mobility and power and heat production (difu, 2018, p. 36), and also serve as a role model in its own actions (difu, 2018, p. 34).

It is strongly recommended to design the Jiangsu CPM roadmap according to the time-efficient Luxembourgian Pacte Climat (cp. section 3.2.9, p. 26), including the following central elements:

a. mandatory contract with all municipalities and, if applicable, companies

b. general set of concrete measures for municipalities/companies to choose from

c. automatic funding scheme skipping individual applications and bureaucracy

d. twofold funding scheme with a flat-rate element and a performance-based sum depending on real CO2 savings

e. recurring monitoring and certification system with expert advice and support to all municipalities and eligible companies.

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Regarding the transferability of German experience with CPM to Jiangsu province, these are the central recommendations resulting from the present analysis:

1. It is strongly recommended to design the Jiangsu CPM roadmap according to the **time-efficient** Luxembourgian Pacte Climat (cp. section 3.2.9, p. 26), including the following central elements:

a. mandatory contract with **all** municipalities and, if applicable, companies
b. **general** set of concrete **measures** for municipalities/companies to choose from
c. **automatic** funding scheme skipping individual applications and bureaucracy
d. twofold funding scheme with a flat-rate element and a **performance-based** sum depending on real CO_2 savings
e. recurring monitoring and certification system with expert advice and support to all municipalities and eligible companies.

2. A stringent and among each other comparable monitoring system must be implemented with all participants, possibly along the lines of Klimaschutz-Planer which sets the standard for German municipalities with CPM (Alianza del Clima e.V., 2020). When designing a monitoring system, experiences from the Chinese project on "Low-Carbon Provinces and Low-Carbon Cities" should be taken into account (Baidu, 2020).

3. A major obstacle to CPM's effectiveness in Germany is the lack of financial resources (difu, 2018, p. 34). In a "Jiangsu version", financial budgets should be provided for, not only for the CP managers' salaries, but also for projects, actions and investments.

4. For participating companies, tax cuts are recommended as a viable incentive.

5. CP managers in China should be officials to provide for sufficient authority and standing.

6. CP managers in Germany can often not provide hands-on services like energy management themselves but have to recur to energy advisors. The job description for Jiangsu Province could be altered accordingly.

1 Introduction

At the time of writing, millions of pupils and their grown-up supporters all around the world demonstrate for climate justice in all areas of human behaviour (FFF, 2020). As climate change features literally textbook conditions of classic market failure, even the most liberal and economy-centred governments must admit that there won't be a feasible pathway towards the achievement of the UN's Two-Degree Target (or even a 1.5-Degree Target) without strong political signposting.

In recognition of this fact, we assume that any two political systems, as diverging as they may seem, will be able to mutually draw some transferrable lessons learnt from their respective climate policies and measures. In this report, we analyse the climate protection systems in the Chinese province of Jiangsu as compared to the German climate protection framework with focus on Climate Protection Management (CPM). We propose a roadmap towards the implementation of climate protection management in Jiangsu Province, keeping in mind the diverging political backgrounds and options of both geographical regions.

The relevance of decisive and timely international action is shown by recent emission developments. The outsourcing of industrial production from Europe and the USA to China has resulted in massive emission rises in the PRC as shown in Figure 1. This is at least partly the result of Carbon Leakage, of too different climate policies between nations, and can only be stopped by **coordinated international action.** The exchange of experiences and the analysis of transferability of concepts like CPM should contribute to this goal.

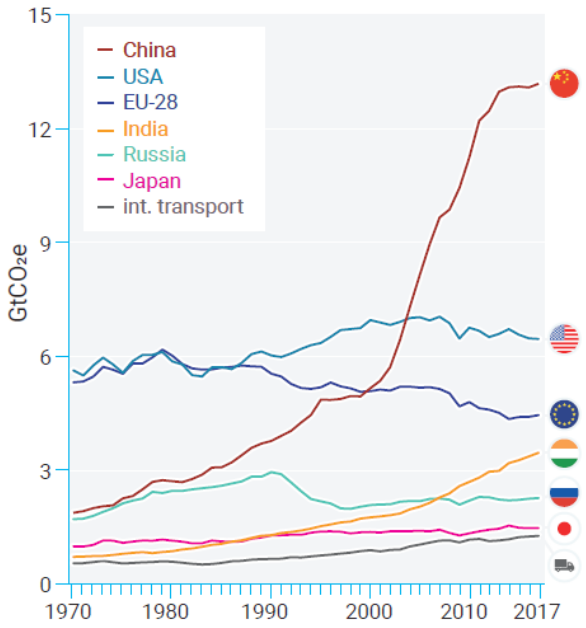

Figure 1: Global GHG emissions per top emitters excluding LULUCF (UNEP, 2018, p. 6)

2 Analysis of the current climate protection system in Jiangsu Province

Politically, "the state organs of the People's Republic of China apply the principle of democratic centralism" (Constitute, 2020, pp. 1, Art. 3).

In China, there are in total 5 autonomous regions, 4 municipalities, 23 provinces, and two special administrative regions. The governors of China's provinces and autonomous regions as well as the mayors of its centrally controlled municipalities are appointed by the central government in Beijing after receiving the nominal consent of the National People's Congress (NPC) (Wikipedia, 2020a).

This principle of centralism applies also to the provincial level. Cities and counties belonging to a certain province are obliged to implement the regulations issued by provincial government.

Under the guideline of central government, provinces in China can set objective and goals, work out climate protection measures corresponding to their own situation, which are then going to be implemented by cities and counties under its regime.

The implementation of those measures is financed either by the corresponding government/ department budget or the so-called "Special financial funds" (hereinafter referred to as special funds). This term refers to funds allocated by the people's government at a higher level to the administrative region and the people's government at the same level for the purpose of social management, public service development, social security, economic construction, and policy subsidies (Baidu, n.d.). Such funds will require separate accounting, and the funds will be used exclusively for those purposes (Baidu, n.d.). According to the budget report of 2020 of the Ecology and Environment Department of Jiangsu Province, the expenditure for „Air issues" accounts to 6,610,000 CNY, which saw an increase of 83,61 % referring to last year (DEEJS, 2020, p. 35). This is due to the fight against climate change and thus the increase of corresponding budget.

2.1. National background: China's achievements and goals

China, as the largest developing country in the world, has seen a fast economic growth in the past three decades. Since the policy "opening and reform" in the late 1970s has been introduced and implemented, China has achieved an average annual growth rate of 10 %. China's is now the second largest economic unit in the world and its GDP per capita has increased to around US$ 8826 in 2017 (see Figure 2). This rapid growth has enabled it to cut its poverty rate1 from 98.3 % in 1990 to 27.2 % in 2017 (see Figure 3).

The achievements have been reached through intensive consumption of natural resources, labour and capital. In 2018, China's CO_2 emissions from fossil-fuel combustion and cement production reached 11.3 Gt CO_2, the equivalent of almost 28 % of the world's total emissions from these sources (JRC-EC, 2019, p. 13).

1 The poverty headcount ratio at $5.50 a day is the percentage of the population living on less than $5.50 a day at 2011 international prices.

The current growth model has been proven not to be sustainable due to limited resources in China as well as on the earth and China already has suffered from environmental degradation. China has to find a novel way to achieve the economic growth with sustainable features. Recently, green development has been raised to an unprecedented importance on the policy agenda.

China has drawn up a two-stage development plan for the period from 2020 to the middle of this century. The new characteristics of China's mid- and long-term strategies address climate change in the new era.

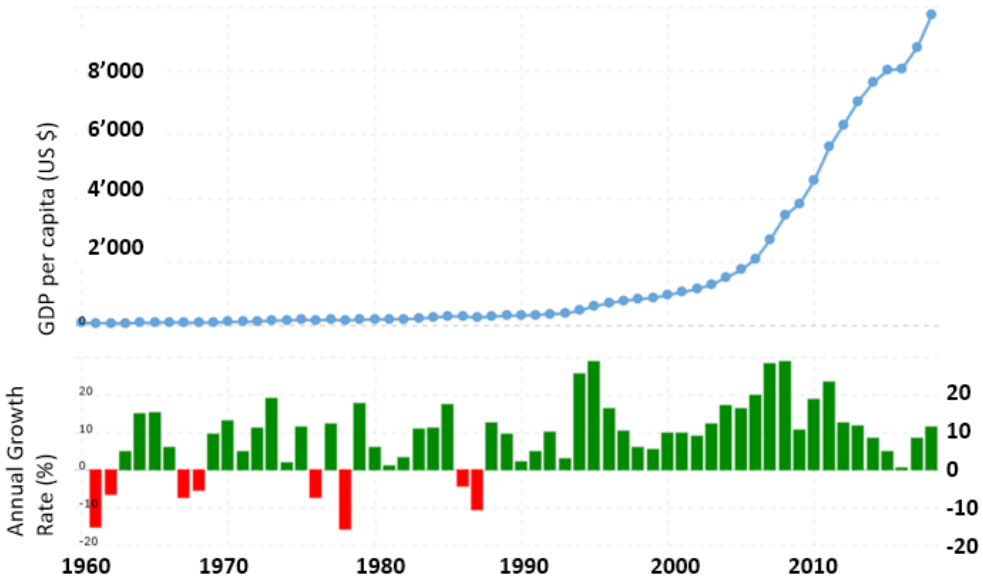

Figure 2: China's GDP per Capita in USD (Macrotrends, 2020a)

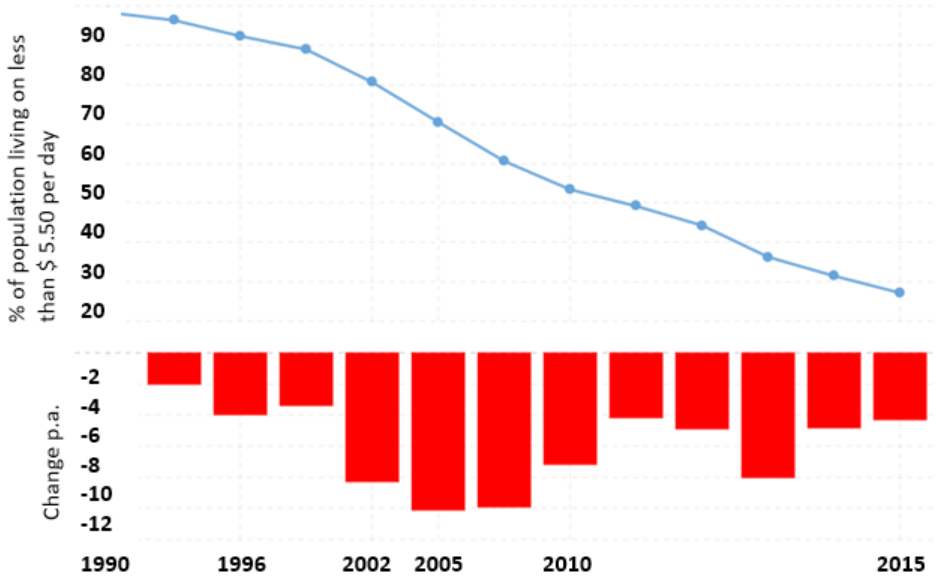

Figure 3: Development of the Poverty Rate in China (Macrotrends, 2020b)

On July 19th, 2010, the National Development and Reform Commission (NDRC) released "The Notice on Pilot Work of Low-Carbon Provinces and Low-Carbon Cities" (Baidu, 2020). According to the "Notice", pilot regions are required to:

- measure and determine the total greenhouse gas emission control targets in the region;
- work out the allocation schemes on GHG emission index;
- establish a regional carbon emission trading regulatory system and registration system;
- develop the transaction platform for a pilot system to support carbon trading.

Next to the "role model effect", one of the aims of "pilot cities" is no doubt "learning by doing". Many places have proposed the development of low-carbon industries, the construction of low-carbon cities, and the promotion of low-carbon living. Some provinces and cities have also applied for low-carbon pilot city.

On January 7, 2017, the National Development and Reform Commission issued the "Notice on Carrying out Pilot Work of the Third Batch of National Low-Carbon Cities", which required that pilot work should commence before the end of February. From 2017 to 2019, staged results must be achieved, and replicable and scalable experiences must be gathered. In 2020, the gradually successful experiences in pilot regions are supposed to be expanded nationwide (Baidu, 2020). When establishing municipal Climate Protection Management in the Jiangsu Province, process organizers should build upon these experiences and network with the relevant stakeholders from Low-Carbon Cities to mutually learn and define best practices.

2.1.1. Nationally Determined Contributions

According to the nationally determined contribution (NDC), which was submitted on 30th June 2015, China has worked out concrete goals for climate change mitigation and adaption, one of them is to achieve peak carbon dioxide emissions by 2030 and as soon as possible reduce the CO2 emission per unit of GDP by 60-65 % of the 2005 level (NDRC, 2015, p. 4 Art. I). These commitments are rated as "Highly Insufficient" by a consortium of non-profit institutes and the Potsdam Institute for Climate Impact Research (PIK), meaning that it would miss the targets of the Paris Agreement and lead to global warming between 3 and 4 °C if all countries would take this pathway (Climate Action Tracker, 2019a).

2.1.2. Climate-relevant objectives of the 13th national FYP (2016-2020)

While the above-mentioned NDC are reported to the UNFCCC, the 13th national Five-Year-Plan sets internal targets, such as the 18 % CO2 emission reduction per unit of GDP between 2015 and 2020 (PRC, 2016, p. 19). Also, the share of non-fossil energy on total primary energy consumption is targeted to grow by 3 percentage points compared with 2015 to 15 % (PRC, 2016, p. 19).

Important for this report and the actions planned in Jiangsu Province is the declared intention of the Chinese government to „support leading development regions in becoming the first to reach their carbon dioxide emissions peak" and to "push forward pilot programs for low-carbon development and demonstrate the establishment of near-zero carbon emissions zones" (PRC, 2016, p. 137).

2.2. Introduction to Jiangsu Province

Jiangsu Province is a coastal province, located in the Yangtze River Delta in Eastern China. According to the official published statistic, Jiangsu's population amounts to 80.5 million (2018) (BSJP, 2019a) which equals to the total population of Germany. The province covers an area of 102,600 km² (2013) (Knoema, n.d.), resulting in a population density of 784.7 person/km² which is more than three times the German population density. As one of the most developed provinces, Jiangsu has seen rapid growth of gross provincial product (LTP). Even the growth rate has slowed down, the LTP of Jiangsu in 2018 has reached 9.26 trillion CNY, a growth of 6.7 % compared to 2017 (BSJP, 2019a). Figure 4 below shows the development of GPP and its annual growth rates in Jiangsu from 2009-2018 (BSJP, 2019a).

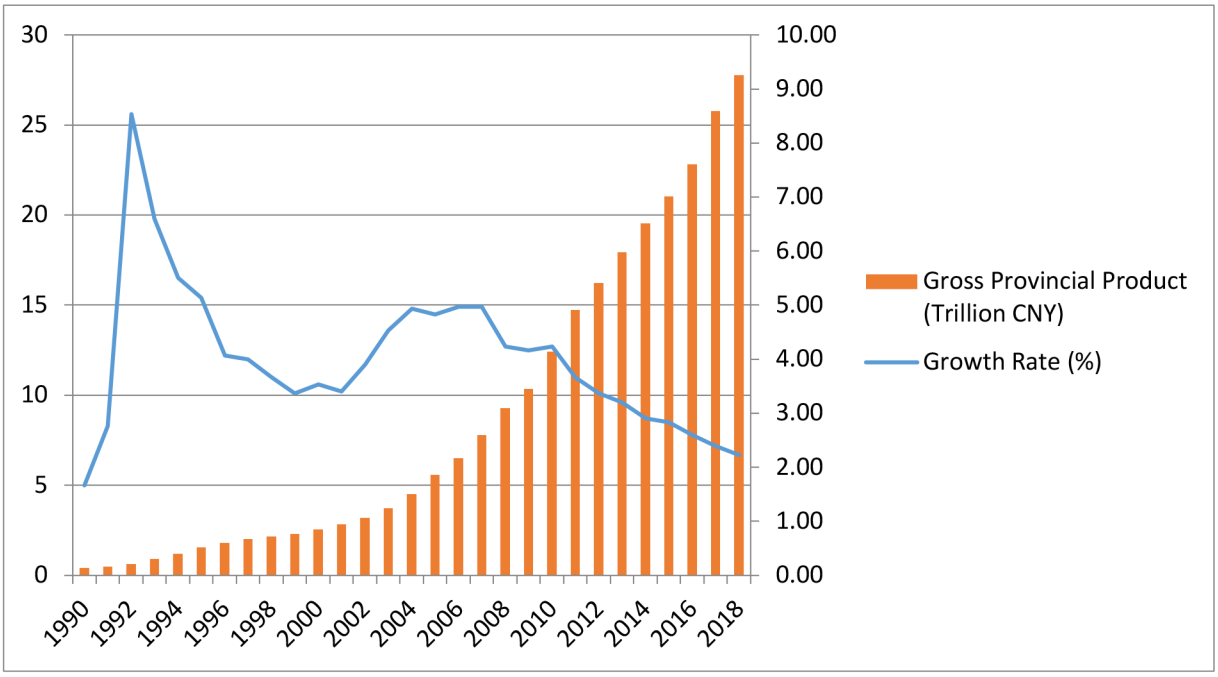

Figure 4: Jiangsu gross provincial product 1990-2018 (BSJP, 2019a)

At the meantime, in 2018, Jiangsu's total energy consumption exceeded 300 million tons of standard coal, an increase of 5.4 times compared to 1987 and an average annual increase of 6.2 %. From 2000 to 2008, the growth rate of energy demand was significantly accelerated, and the average annual growth rate of total energy consumption reached 12.3 %. Among them, in 2005, the total energy consumption growth rate exceeded 20 %, the largest growth rate in history (BSJP, 2019b). The consumption of electricity has also seen a similar growth, reached 612.827 TWh in 2018 (CEIC, n.d.). The content of fossil energy in the energy consumption is very high, and emission of carbon dioxide and other gases in the atmosphere continues lead to local air pollution and the gradual strengthening of the greenhouse effect.

2.3. Green Plans in Jiangsu Province

Being aware of the increasing resource and environmental constraints and for a healthy and sustainable growth, Jiangsu has carried out energy conservation and consumption reduction and promoted energy-supply-side structural reforms. In 2006, State Council issued the „Indicative Plan for Reducing Energy Consumption of Unit Product Value in Each Region" (China

State Council, 2006), setting the goal that the energy consumption per unit of product value must see a 20 % reduction of that value by the end of the "11th Five-Year Plan". Under this instruction, the Provincial Party Committee and the Provincial Government have issued a series of policies and measures to strengthen energy conservation and consumption reduction, including financial support, the price leverage adjustment mechanism.

During the "11th Five-Year Plan" period, Jiangsu set the total amount "Cap" over textiles, coal, metallurgy, and petrochemical industries to higher requirements for new projects. The energy consumption efficiency of new projects must meet the advanced national or international advanced level, and the product energy consumption quota set by the province must not been exceeded. One of the "12th Five-Year Plan" tasks is to eliminate backward production capacity.

The "13th Five-Year Plan for the National Economic and Social Development of Jiangsu Province" (2016-2020) provides guidance for Jiangsu to set development indicators and targets for the next five years. Section 8 of the 13th Five-Year plan (PGJP, 2016) is designated to the ecological, sustainable development of the province. In this section, these objectives are set:

Strengthening the nature protection area control

- Strict obedience to the ecological "red line"
- Implementation of ecological reservation projects
- Protection of biological diversity

Highly efficient and integrated utilisation of energy and resource

- Ceiling of the total energy consumption: the total energy consumption must be controlled under 340 million tons of standard coal, striving to be fewer than 337 million.
- Energy saving and resource saving: by 2020, the GDP per area must increase by 38 % and energy consumption per unit of industrial growth must be reduced by 18 % compared with 2015.
- Development of circular economy: by 2020, the comprehensive utilization rate of industrial solid waste will reach 95 %, and the recycling rate of urban renewable resources will reach 80 %.

Promotion of green and low-carbon lifestyle

- Promote the development of green cycle and low-carbon transportation industry
- Prioritize public transportation and encourage low-carbon travel such as bicycles
- Comprehensively build a low-carbon society
- Focus on promoting the construction of low-carbon cities and low-carbon parks
- Enhance the construction of low-carbon pilot cities such as Zhenjiang, deepen the cooperation between low carbon technologies and products in Sino-Sweden and (Wuxi) Eco-City

Improvement of the environment quality - Reduce the output of main pollutants; Intensively solve the problem of severe environmental problems; Support on building the beautiful countries.

Improvement and completion of the ecological system and mechanism - Enhance the control and surveillance of the environment protection; Improve the protection mechanism; Improve the performance evaluation and accountability mechanism of ecological civilization.

These targets are in line with the "Thirteenth Five-Year Plan for Energy Development of Jiangsu Province" which may

account most vital for the climate protection and sustainable development in Jiangsu province.

In this plan, apart from the goal about energy supply security, a ceiling of total energy consumption was specified, the goal of **energy saving** of 17 % with striving for the saving of 22 % was set and **energy intensity drop** from 0.46 tons of standard coal to below 0.38 tons of standard coal, striving for 0.36 tons of standard coal was proposed to maintain a leading position in the country (PGJP, 2017).

In 2020, the province's non-fossil energy production will exceed 21 million tons of standard coal, and renewable energy production will exceed 12 million tons of standard coal, accounting for about 41%. The direct conversion and utilization of coal in the province dropped from 270 million tons to about 240 million tons, and the proportion of total energy consumption dropped from 64.4 % to 50.9 %. Natural gas consumption reached about 35 billion cubic meters, and its share of energy consumption increased from 6.6 % to 12.6 % (PGJP, 2017).

By 2020, clean power generation installed capacity will reach about 46 million kilowatts, the installed capacity of renewable energy for power generation will reach about 22 million kilowatts, the proportion will increase to about 35% and 17% respectively. The proportion of coal power installed capacity will drop to 63%. CHP units will steadily increase (PGJP, 2017).

To promote the new energy vehicles and achieve the objective of "green transport", the "13th Five-Year Plan" New Energy Vehicles in Jiangsu Province Promotion and implementation plan" (PGJP, 2016) was issued.

During the 13th Five-Year Plan period, more than 250'000 standard new energy vehicles are planned to be used throughout the province. By 2020, private consumers should be the main purchasers and users of the new energy vehicles. By 2020, the intelligent and efficient charging infrastructure system is planned to have accumulated about 170'000 charging stations, striving to build 200'000 charging stations to meet the needs of 200'000 new energy vehicles. New energy vehicles, power batteries, key parts and components shall have reached the international advanced level as a whole, and a number of highly competitive enterprises in the field of new energy vehicles and their key parts and components shall have been built up (PGJP, 2016).

2.4. Measures, achievements and challenges

2.4.1. Measures

In line with the national plans, Jiangsu already implemented a lot of measures in the period of the "11th and 12th Five-Year-Plan" to meet the overall requirements of green development and accelerate high-quality development with Jiangsu characteristics. Under the framework and guidelines of the "13th Five-Year-Plan", plenty of sector-specific plans were released and distributed to set more concrete goals and objectives, for which regional governments have organised resources, both manpower and capitals to implement projects and campaigns.

Setting protection area and redlines

On 08.01.2020, Jiangsu issued the "Regional Plan of Nature Protection Area Control in Jiangsu Province" aiming to achieve the effective combination of the "Jiangsu Ecological Red Line Regional Protection Plan" and "Jiangsu Province National Ecological Protection Red Line Plan", so that the nature protection area be adapted to the current economic and social development plan and the actual situation of ecological environment protection. Based on the "Regional Protection Plan", the

delineation of nature protection areas is carried out. 15 categories of 811 terrestrial ecological space protection areas were finally determined, with a total area of 23'216.24 km², accounting for 22.49 % of the province's land area (PGJP, 2020). As early as in 2013, the provincial government issued the "Provincial Ecological Red Line Regional Protection Plan", delimiting 779 ecological red line areas in 15 categories. Among them, the area of the ecological red line in the land area is 22'800 km², accounting for 22.23 % of the province's land area; the area of the ecological red line in the sea area is 1'263 km² (PGJP, 2020). The ecological compensation funds of 10 billion CNY have been arranged for the implementation of supervision and assessment and ecological compensation measures (PGJP, 2020).

Instruments of approval and inventiveness

In the "Implementation Plan of Total Coal Consumption Control and Target Responsibility Management in Jiangsu Province", it is ruled clearly that no approval from the responsible departments for projects that fail the energy and environmental assessment review, No approval for land for construction and no Permission for production, even no supply of electricity or water. And the responsibilities are also clearly specified, they go to departments: Municipal People's Governments, Provincial Economic and Information Commission, Development and Reform Commission, Environmental Protection Department, Land and Resources Department, Finance Office, Power Company (GOPGJ, 2014).

For those who complete the phase-out in advance and on time and install new clean energy or low-pollution fuel boilers, financial subsidies will be provided for each ton of steam boilers. For boilers that use electricity instead of coal, power supply companies should open up fast-lane service, simplify related processes, and implement preferential power policies in accordance with relevant regulations (GOPGJ, 2014).

Subsidies, pricing mechanism and requests

Provincial and municipal finances provide a certain percentage of local subsidies to who buys new energy vehicles that meet the national requirements, with reference to the national subsidy standards. Construction and operation enterprises of charging facilities with advanced scale, technology, management, capital, service network, etc. will get certain subsidies according to service capacity and number of services in case their charging facilities constructed to provide charging services in the public area. For operating centralized charging facilities which applied for installation and connection directly at the grid operators, the large-scale industrial electricity pricing and peak-to-valley pricing policies will be implemented and there is no charge on the basic electricity before 2020 (PGJP, 2016).

In the meantime, "Special Plan for Charging Facilities for Electric Vehicles" was worked out to improve the infrastructure for the development of new energy vehicles, requiring specifically that

- 100% of newly built residential parking spaces should be equipped with charging facilities or reserved for future installations
- The proportion of parking spaces for large public buildings with built-up parking spaces, social public parking lots for charging facilities or reserved construction and installation conditions should not be less than 10%.
- At least one public charging station shall be built for every 2000 new energy vehicles (PGJP, 2016).

Penalties and punishments

At the 15th meeting of the Standing Committee of the 12th People's Congress of Jiangsu Province on March 27th, 2015, the "Regulations on the Development of Green Buildings in Jiangsu Province" were passed. „Green buildings" in the regulation

refer to civil buildings that save resources, protect the environment and reduce pollution to the greatest extent during the entire life cycle, provide people with healthy, applicable and efficient use of space and harmony with nature and classified into three levels: one star, two stars, and three stars (JSRD, 2015).

In the regulation, specific penalty measures are also stated for breaking the regulations, such as in Article 52 stating that the construction authority shall order a construction unit to make corrections within a time limit and impose a fine of 200'000 to 500'000 CNY if it commits one of the following acts:

(1) express or imply that the design unit or construction unit violates the green building standards for design and construction

(2) using technologies, processes, materials and equipment listed in the prohibited use catalogue

(3) issuing a Completion Acceptance Report for a civil construction project that does not meet the green building standards.

Measures including policies and regulations are representing the decisiveness of Jiangsu Province in fighting against climate change and environment challenges which rose up along with the economic development and improvement of the social welfare. These policies and regulations have been featured with following characteristics:

Financial policies play an important role in the implementation.

Powerful government finance is necessary for the implementation of various plans, measures of green transition. The provincial government has issued a number of financial subsidy policies to support the development of strategic emerging industries and industrial restructuring and green economy.

Some policies need cross-sectoral support.

As various sectors and fields are involved in the transition to a green economy, policy measures cannot be implemented until these sectors are well coordinated.

Major government-led projects have demonstrative effects.

To achieve the objects, the provincial government has promoted the implementation of energy conservation, emissions reduction and clean production policies through major government projects, such as energy conservation of public institutions, circular economy transformation of industrial parks, etc. (PAGE, 2016, p. 28).

2.4.2. Achievements

After entering the „13th Five-Year-Plan", Jiangsu has been strengthening the effort in fighting against environmental degradation and climate change by the induction of stricter polices and enhanced incentives.

In 2018, the average PM2.5 concentration in the province is 48 micrograms per cubic meter; the quality of surface water is 68.3 % for class III, 1 % for class V; the total reduction of chemical oxygen demand, sulphur dioxide, ammonia nitrogen, and nitrogen oxygen, the four major pollutant discharges of the compound, have fulfilled the targets set by the state (PGJP, 2018).

According to "2017-2018 Jiangsu Province Low-Carbon Development Report" (DEEJS, 2019), Jiangsu has been making

great efforts to consolidate the foundation for low-carbon development and achieved positive results in recent years. In 2018, the province's energy consumption per unit of GDP decreased by 6.18 % over the previous year, exceeding the annual reduction target of 3.7 %; the cumulative consumption reduction since the 13th Five-Year Plan period was 15.5 %, which exceeded the assessment target requirements. (DEEJS, 2019). The province's CO2 emission per unit GDP fell by 6 % in 2018, exceeding the target of annual reduction of 4.5 %. (DEEJS, 2019, S. 1) In general, the achievements can be represented in following aspects:

Improved Energy structure and efficiency---Jiangsu's energy consumption has been undergoing the continuous transition to electrification and low-carbonization. Electricity has replaced coal's leading role regarding to the end-user energy consumption. In 2018, the proportion of Jiangsu's coal end-user consumption to total end-user energy consumption decreased by about 46 percentage points from 50.8 % in 1987; the proportion of natural gas terminal consumption increased by about 5 percentage points from 0.1 % in 1987. The province's share of renewable energy in energy consumption was 8.4 %, the proportion of electricity consumed by renewable energy in the entire society was 14.4 % and the total coal consumption was reduced by more than 18 million tons compared with 2016. The continuous increasing proportion of Jiangsu's low-carbon consumption leads to Jiangsu's energy consumption structure more optimized (DEEJS, 2019).

Optimised industrial structure--- In 2017 and 2018, the province has accumulated a total of 97 national green factories, 9 green parks and 4 green supply chain management companies, ranking first in the country (DEEJS, 2019).

Low-carbon transport--- In 2018, the relatively large amount of road freight transport reduced carbon dioxide emissions by about 2 million tons, a decrease of 15.9%. As of the end of 2017, the number of new energy vehicles in Jiangsu province was 105'000, an increase of 48'300 compared with 2016; there were 24,000 and 74,000 new energy vehicles and natural gas vehicles and in 2018, this number was doubled, a total of more than 48,000 new electric vehicles such as pure electric vehicles have been registered (DEEJS, 2019).

Green buildings--- In 2017, the green building area amounted to 205 million square meters, accounting for about 20% of the country's total green building area. In 2018, there came 783 new green building identification projects with a construction area of 81.97 million square meters. In 2018, the energy-saving renovation area of existing buildings was 9.9 million square meters, and the total energy-saving renovation scale of existing buildings in the province reached 53.47 million square meters, accounting for 1.6% of the total urban construction. By the end of 2018, 13 provincial districts and cities in the province have completed municipal-level public building energy-saving supervision platforms (DEEJS, 2019).

2.4.3. Challenges

Large Economy, large energy consumption

Jiangsu is China's second largest economy, contributing more than 10 % of the country's total GDP, reaching 926 million yuan in 2018 (BSJP, 2019c). In 2018, Jiangsu's total energy consumption exceeded 300 million tons of standard coal, accounting for about 6.5 % of the country's total energy of 4.64 billion tons of standard coal. It is also the second largest energy consumption province in the country, and its consumption More than 90 % of the primary energy is imported from outside the province.

High population density and small environmental capacity

In 2018, Jiangsu's population density reached 742 people per square kilometre (BSJP, 2019c). It belongs to the province with

the highest population density, second only to Shanghai, Beijing and Tianjin, and ranks fourth in the country.

Jiangsu has the smallest per capita environmental capacity in the country, and resource and environment capacity are constraining economic and social development.

High energy intensity and low share of renewables

Although the proportion of Jiangsu's fossil energy production in total primary energy production has been declining, the proportion of raw coal production in total primary energy production was still 27.5 % in 2018. In 2018, natural gas production accounted for 4.1 % of total primary energy production, and primary electricity production accounted for 49 % of total primary energy production. In spite of the yearly growth, the proportion of renewable energy is still very low - it is only 7.7 % in the total power generation, see Figure 5 below (PGJP, 2019a), much lower than in Germany, where renewable energy accounted for 40.4 % of total power generation in 2018 (statista, 2019).

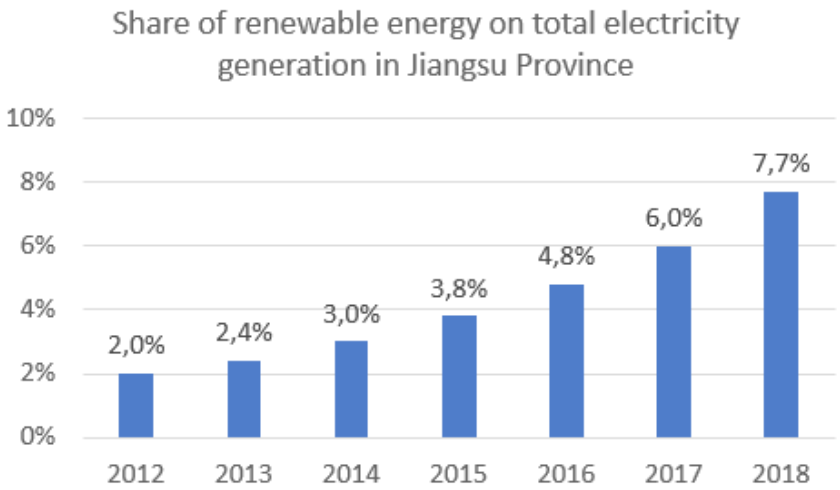

Figure 5: Renewable energy share in power generation (PGJP, 2019a)

Increasing consumption and consuming behaviour

With the economic growth, residents in Jiangsu have a steadily increasing income. In 2018, the per-capita disposable income of Jiangsu residents in 2018 was 38'096 CNY, increase of 8.8 % of the same time last year. The income gap between urban and rural residents has further narrowed, and the income ratio between urban and rural residents has narrowed from 2.277 : 1 in the previous year to 2.264 : 1 (PGJP, 2019b). The average monthly expenditure is around 50 % of the households' income in northern Jiangsu, central Jiangsu and southern Jiangsu (Xinhua Daily, 2019), which means that each family in Jiangsu will expend more than 50'000 CNY annually. This expenditure has been automatically leading to increase of personal or household energy consumption directly or indirectly. By the end of 2017, the number of civilian cars was 16.19 million, an increase of 12.9 %, amounting to a net increase of 1.85 million; the number of private cars was 9.87 million, an increase of 10.7 % or a net increase of 955'000 pieces (PCGC, 2019). By the end of 2018, the per capita housing construction area in the province's cities and towns reached 46.9 square meters, an increase of 41.2 square meters compared with 1978 (MOHURD, 2020). On one hand, we would like to have a high quality of living standard; on the other hand, we need to tackle the constraints of development. To achieve it, a novel pattern of "high quality of living standard" must be understood, it consequently requires "green" or "low-carbon" awareness and change of consuming behaviour.

3 Climate Protection Efforts in Germany

3.1. Policies, politics and public opinion

Although the threat of climate change is long-known in Germany, politics have not matched this evident urgency during decades (Anzlinger, 2020) (SZ, 2020). While specific policies did and do aim at protecting the climate, the overall picture shows heavy conflicts of aims, deficient stringency and sometimes even perverse incentives leading in the opposite direction as intended, e.g. „Dienstwagenprivileg“, a financial subsidy supporting the (excessive) private use of (big) company cars. As member of the EU, Germany's climate protection policies are subsumed as "insufficient" to reach the international goal of the Paris Agreement (Climate Action Tracker, 2019b).

Even the most recent legislation for climate protection, the "Klimapaket", was "ghost-written by fear" of not being elected again, as analysed in the German newspaper "Die Zeit" (Ulrich, 2019). Economists have calculated that the "Klimapaket" will fail to reach German climate targets (Bach, Isaak, Kemfert, & Wägner, 2019). Nevertheless, German climate legislation has in some aspects lead the way towards a more sustainable economic system and has served as a role model for other nations. This is especially true for the promotion of electricity production from renewable energies (EEG) and the modernising insulation of buildings (EnEV).

In Germany, some policy instruments as carbon pricing took very long decision-making processes, often with the aim of "not hurting anybody", i.e. not raising the anger of electors and thus losing votes. For example, the Green Party called for relevantly higher prices on car fuels as early as the election 1998, when they promoted a step-by-step raise of the gasoline price up to 5 DM per litre until 2008 (BÜNDNIS 90/DIE GRÜNEN, 1998) – a price level not even halfway reached in 2020. The rationale for this and other climate-related procrastinations becomes obvious when looking into voter surveys. These show a general and growing opinion that "politics doesn't do enough for climate protection", but just a minority agreeing with concrete measures as CO2 taxes (Presseportal, 2019), as shown in Figure 6.

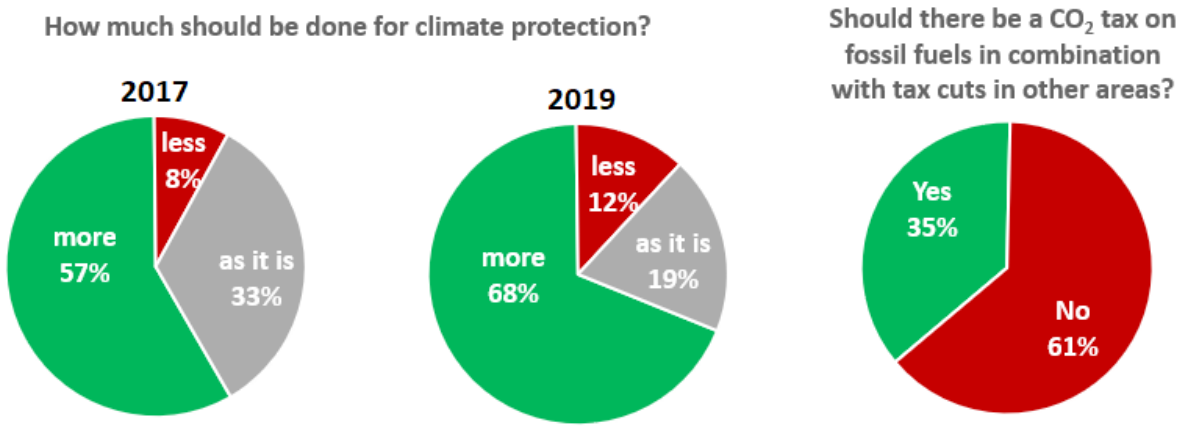

Figure 6: Voter survey on general and concrete climate protection (Presseportal, 2019)

In a nutshell, voters seem to want the omelette (climate protection) without breaking any eggs (changing their own lifestyle and paying for climate protection). This is a textbook example of how the global climate is a classical tragedy of the commons: individuals know what they should do to safeguard the long-term, sustainable usability of the common resource. But they don't behave accordingly, i. a. because they fear being cheated by other participants. There is evidence that "learning to

trust others is central to cooperation" (Ostrom, 2009, p. 27) – and thus central to implement climate protection in real life. The local level can help building this trust as local stakeholders know each other well and they will likely try to keep their reputation amongst the community by being true to their word. Also, communication, which is much more direct and frequent on the local level, can be key to prevent the overuse of resources (Ostrom, 2009, p. 17). Better information, participation and involvement of local stakeholders are elements of (municipal) climate protection management in Germany, which is the focus of this report.

We need all levels to act now.

Having emphasized the contribution of local initiatives, this should not conceal the fact that climate protection needs determined action on all levels. Climate-active municipalities stress that the national government must set the right frame with strong legislation, especially regarding farming, mobility and power and heat production (difu, 2018, p. 36), and also serve as a role model in its own actions (difu, 2018, p. 34).

3.2. Climate Protection Management in Germany

Since the year 2008, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) subsidizes and initiates projects for climate protection all over Germany. The basis for these activities is the "Nationale Klimaschutzinitiative" (NKI; national initiative for climate protection). The NKI consists of legislation, regular calls for funding applications and projects aiming at stakeholders from economy, municipalities and consumers [cp. (Öko-Institut et al., 2019)]. This report focuses on **climate protection management** (CPM) which is one important strategic building block within the NKI's portfolio of financeable measures, especially since the year 2011 [cp. ibid., p. 7].

3.2.1. Demarcation of CPM's

The idea behind municipal CPM is to tackle GHG emissions at their source: heating our homes, commuting by bus, car or bike, powering local offices and production sites. The **focus** is not on the fewer and more special occasions like air travel, but on our every-day life. The **stakeholders** are not anonymous international corporations, but municipal and other local enterprises, the administration of municipal properties, landlords and tenants, teachers, pupils, neighbours and commuters. The **instruments** are not prohibitions, taxations or penalties, but information campaigns, participation and brainstorming workshops, co-funding of climate-friendly measures and investments in the stakeholders' daily life, on the local level.

Just this demarcation of municipal CPM shows exactly what CPM **needs** as a complement and support to be able to work at all: a strong (inter-)national legal framework of taxation, regulation and legislation. Within this frame, it **can** be successful – without it, there is no chance to succeed.

3.2.2. Underlying legislation and funding for the NKI

The funding for NKI is legally secured by the German Federal Law on a Federal Special Fund (Gesetz zur Errichtung eines Sondervermögens "Energie- und Klimafonds", EKFG) for energy efficiency, renewable energies, energy storage, modernizing the insulation of buildings, international climate protection, e-mobility and national climate protection, which is sourced from revenue generated by emission trading [ibid., p. 8]. In 2018, this Special Fund EKF was planned with 3.7 billion €, of

which 7 % or 264 M€ were to be dedicated for the NKI [ibid., p. 8 + 9]. The same sum was planned for 2019, so the budget was substantially increased as compared to the previous years where the sum of 261.5 M€ had to suffice for three years instead of one.

3.2.3. Concept on climate protection as a precondition for CPM

As a precondition for any funding of CPM, applicants had to present a concept on climate protection ("KSK"), not older than three calendar years (BMU, 2017, p. 5). These concepts were also applicable for funding – since 2008, around 73.4 M€ have been spent on the preparation of concepts. The average funding per concept amounted to 26'150 € in the funding period 2015-2017 [own calculation based on data given in (Öko-Institut et al., 2019, p. 17)]. Since 2012, the concepts have to aim at a GHG reduction of 95 % and a reduction of energy consumption by 50 % for the respective applying entity. This funding scheme is known as "Masterplan 100 % Klimaschutz". Up to now, 2'180 KSKs have been developed to support mostly municipalities (but also some other entities as universities or religious communities) on their way towards climate protection (BMU, 2019, p. 11) – compared to a whole of around 14'000 municipalities all over Germany, this amounts to a coverage of 15 % of all applicable cities and villages that have their own concept for climate protection.

3.2.4. Status Quo of CPM funding and coverage

Between 2015 and 2017, nearly 13 % of the NKI's funding of 261.5 M€ for this period has been spent on CPM, i.e. 33.7 M€ [ibid., p. 8]. CPM was funded in 512 cases during the funding period 2015-2017 (Öko-Institut et al., 2019, p. 17), resulting in an average funding of 65'886 € per project.

This average financial budget was spent on the hiring of climate protection (CP) managers. These are mainly hired for part-time jobs in small and medium municipalities and for full-time positions (sometimes shared between two or three persons) for bigger cities or cooperation of smaller villages, generally paid according to the tariff for civil service "TVöD" ranging from stages 10 or 11 to 12 or 13 (Spohr, 2013, p. 4) and (Bauer, Gebauer, Hertle, & Paar, 2013, p. 6 and 9).

As most municipal budgets in Germany are in deficit and many of them are closely monitored by "Kommunalaufsicht" (supervision of local authorities by the state), so the government-funded main financing of the first three years of CPM is crucial (Spohr, 2013, p. 2). The funding rate amounts regularly to 65 % of spending, for municipalities with financial deficits, it can amount up to 90 % (BMU, 2017, p. 7).

Compared to the above-mentioned coverage rate of 15 % of applicable cities and villages that have their own KSK, the coverage rate for municipalities with own **CP managers** is lower than that, approximately 3 - 5 %. No exact coverage rate can be calculated from the reported 670 CP managers that have been financed since 2008 (BMU, 2019, p. 6), because funding covers only three years and some positions have been shared between two or more persons.

In a recent survey among municipalities, 93 % of responding communities **knew** about the funding for CP concepts (difu, 2018, p. 21), 72 % **of respondents** have already seized this opportunity, while another 14 % plan to do so (ibid., p. 22). The awareness level for the funding scheme is thus very high **among respondents**, but surely not among all municipalities, as the real coverage rate of 15 % shows.

70% of recipients of funding stated that they plan to keep the position of CPM after the termination of the funding, while financing this plan will be challenging to a number of municipalities (Öko-Institut et al., 2019, p. 47). Often, a discontinuation will lead to a loss of competence as the person involved leaves for another job (ibid.).

3.2.5. Tasks and qualifications of Climate Protection Managers

According to the funding body BMU, climate protection managers are supposed to **inform** about CP concepts, both inside the administration and towards the public, but also **implement** substantial parts of the concept. They should initiate processes and projects for cooperation and networking of relevant stakeholders. The implementation of the concept as a whole and of single CP measures should be supported and initiated via information and public relations, moderation and management, aiming at the integration of climate protection aspects in all administrative processes and decisions (BMU, 2017, p. 3).

The funding body BMU lists a number of tasks that are eligible for funding as follows (BMU, 2017, pp. 7, original list in own translation):

- Process and project management (e.g. coordination and initiation of measures)
- Research, examination of eligibility of and advisory for funding options
- Implementation of information events and trainings for the administration
- Coordination, moderation and reorganization of cross-county administrative cooperation
- Coordination of climate-relevant data collection and evaluation
- Methodical advisory for the development of concrete quality goals, climate protection standards and guidelines (e.g. for energy efficiency retrofits or procurement)
- Networking with other climate-active municipalities and institutions
- Build-up of networks, participation of external stakeholders and cooperation with initiatives of civil society (e.g. assemblies, NGOs, transition town groups) who could act as multipliers for the CP concept and support the implementation of climate protection measures,
- Impulse or intensification of the process in civil society
- Continuation and concretion of the strategy towards continuity of CPM as proposed in the CP concept
- Support, preparation and implementation of the concept for public relations and awareness
- Introduction of EMAS (Eco-Management and Audit Scheme).

This list of rather coordinative and not always immediately tangible tasks indicates that although climate protection managers often qualify in technical disciplines as engineering or urban planning, they also have to be „motivators, moderators, coordinators, psychologists and social workers […] project planners […] strategists […and] generalists" (Spohr, 2013, pp. 3-4).

Applicants' job qualifications range from architects and urban planners over geographers and biologists to electric and mechanical engineers (ibid., p. 4). At the same time, they need to have and acquire a certain knowledge of German bureaucracy and be painstaking enough to implement exact monitoring and controlling of the progress of climate protection measures and their calculable effects on target achievement (ibid.).

CP managers in Germany also must **network** between relevant stakeholders of municipal climate protection (utilities, local craftspeople as HVAC, carpenters, also architects, energy consultants) (ibid. p. 2), but also consumers, tenants, landlords, poorer households, pupils and teachers, if climate protection is to be implemented and supported all across society.

In Germany, **funding advisory** is an important task for CP managers, as many citizens, companies, but also municipalities are unable to cope with the multitude of funding schemes and their preconditions. A recent survey among German municipalities shows that not all climate-relevant funding options are well-known among decision-makers (difu, 2018, p. 21).

The CP manager's personality and network are key to success, as the quote "sparkle your energy to let others save energy" shows (Spohr, 2013, p. 1).

3.2.6. Action areas of CPM

A recent survey among German municipalities shows that there is a striking discrepancy between (theoretical) significance and real-life activities in different action areas of CPM, which is likely to be caused by lacking financial budget and staff resources (difu, 2018, p. 17).

When asked for the frequency and scope of their activities, respondents from public administrations didn't even name **one single climate-relevant action area with "manifold/frequent" activity**! Action areas that scored at least with "some" in the survey were municipal energy management, energy consulting for citizens, publicity campaigns for climate protection and intercommunal cooperation with networks. All other areas scored with "few" or "none" (difu, 2018, p. 17).

However, the Terms of Reference for this report demand a description of the following action areas of CPM in Germany (GIZ, 2019, p. 2 IV):

1. New building / existing building renovation
2. Urban development, master urban plan, landscape plan
3. Transportation and transportation plan
4. Energy efficiency in the industry and commercial sector
5. Energy production and distribution
6. Energy management of governmental buildings and transportation infrastructure
7. Procurement, official vehicles, official travel
8. Public awareness raising

Most of these action areas are not under CPM's control as no governmental or legislative powers are granted to CP managers in Germany. The specific circumstances for each topic are explained in the following chapters.

3.2.6.1. New building / existing building renovation

In Germany, the "Energieeinsparverordnung" (EnEV) is a federal law setting minimum requirements regarding the energy demand of new and renovated buildings. Compliance with these standards are a precondition for obtaining a building license for any private and many commercial buildings that are regularly heated. The EnEV has been amended several times since its first issue in 2002 to stay abreast of technical progress.

Figure 7: Guided walks with a thermographic camera can visualize energy losses and the demand for refurbishment (Pacher, 2020)

Municipal CP managers in Germany **encourage** and **advise** local stakeholders to renovate their buildings according to EnEV standards and **inform** them on subsidised loans for energy-efficient refurbishment. They initiate awareness campaigns (cp. Figure 7) and maybe interactive competitions, but they normally don't have a budget of their own on their disposal to provide for extra subsidies. Also, they are typically not entitled to conduct a fully blown energy consulting for individual buildings, as this is the job of energy consultants in Germany (Energieberater) and it is not a precondition for employment in CPM to be qualified as energy consultant.

However, they can work toward substantial energy savings within their **own portfolio**, as public real estate on local level amounts to 176'000 buildings all over Germany (dena, 2018, p. 8). To provide for effective measures in that area, it is crucial that CP managers are **enabled and entitled** to closely cooperate with administrative entities like public facility management, municipal works service and education authorities (dena, 2018, p. 12), as day-care and school buildings are often publicly owned. Energy savings are also financial savings which take some strain off public budgets – but are often not "harvested" because of staff shortages in the administration (Öko-Institut et al., 2019, p. 67). The German experience shows that the financial support for CPM or — alternatively or additionally — an energy manager, contributes considerably to strengthen CP issues in administrations (ibid.). This will also apply to the Jiangsu context.

Since the EnEV's 2014/15 amendment, Energy Performance Certificates (EPC, in German: *Energieausweis*) are mandatory for new buildings, changes on buildings and when selling or renting out real estate (EnEV, pp. 11 ff., §§ 16 ff.). This feature could be useful for the Jiangsu context to give owners an incentive to become active. A comparative study shows different key aspects that EU countries focus on when designing their EPC regulations (BPIE, 2014), it might be useful for Jiangsu Province.

3.2.6.2. Urban development and landscape planning

Settlement structures can be energy-saving and climate-protecting in themselves – or they can contribute to even more energy consumption and natural damage. Obviously, they are based on very long-term decisions and developments. CP managers are relatively new in administrative teams, so their direct effect on urban planning is not representative or even visible yet. However, they need to be **enabled and entitled** to closely cooperate with administrative entities like urban planning to avoid counterproductive decisions. These decisions involve the planning of new residential districts without local supply facilities

or public transport connections or the continuous expansion of motorways without considering cycle lanes. Both examples make it harder for citizens to choose climate-friendly modes of transport – one decision made by urban planning determines a long row of individual decisions.

CPM can support town councils to exercise its planning authority and decide on an **energy efficiency standard** and / or mandatory renewable heating sources for buildings constructed on developed sites that are bought from the municipality (DUH, 2015a, p. 5). This can also contribute to climate -friendly urban development, although new build constitutes only a small percentage of all buildings and is anyway subjected to the national legislation of the EnEV (cp. section 3.2.6.1).

3.2.6.3. Transport

A recent survey among German municipalities indicates that CP managers have only implemented **very few measures** in the action area of climate-friendly transport so far (difu, 2018, p. 17). Only 3 % of respondents stated that they don't need more support in this action area, while 97 % claimed their need for financial, educative, informative and/or **legislative** support (difu, 2018, p. 25).

This is in line with the fact that legislative power for most transport issues lies on the national or even EU-level, e.g. the CO_2 limits of vehicles (EU 2019/631). And although lower speeds would save GHG emissions, reduce noise and improve local air quality, municipalities cannot decide on **generally** lower tempo limits within their city area. This legislative power is anchored on the national level and regulated by the *Straßenverkehrs-Ordnung* (StVO) and its ancillary administrative regulations, only for special areas of 300 m length maximum (VwV-StVO, 2017, pp. Zeichen 274, 13, XI.).

Figure 8: Example for CPM's activity in cycling competitions (Ilm-Kreis, 2017a)

However, given a certain level of determination on the local political sphere, CPM can contribute to propelling climate-friendly modes of transport, as examples like Kreis Segeberg, Landkreis Grafschaft Bentheim or Landkreis Mainz-Bingen show. These county-like administrative levels have adopted **own county-level funding guidelines** for electric charging facilities (KSB, 2019) (LGB, 2019)(LMB, 2018) and also for cycling infrastructure (KSB, 2017). They are based on political decisions of their respective county councils and partly co-funded by the NKI. CPM, as designed in Germany, can foster these decisions and promote them with information, research and advisory for funding, but is not enabled to achieve these results **without the political level**.

Transport-related activities of CPM include also **awareness campaigns** with interactive and competitive elements. One frequently used example are cycling competitions between teams that collect points when cycling to work in a given timespan. This low-cost measure can be used to involve pupils, teachers, neighbours, but also **local industry and commerce** on a low-threshold level that can serve as an initial spark for following industrial activities. In the 2019-season of the CPM-supported initiative "Wir radeln (immer noch) zur Arbeit", 16 schools and 73 companies took part, cycling 2.5 times "around the world" and saving more than 17 tons of CO_2 (Klimapakt, 2019a).

In March 2020, already 117 municipalities had registered for another, nation-wide competition taking place on 21 freely eligible days between May and September (Stadtradeln, 2020). Not all of them have CPM in place, but in case they do, this is

a classic action area for CP managers to organize participation, motivate and network (cp. for example (Ilm-Kreis, 2017a) or "Kontaktinformationen" on (Stadtradeln, 2020) where many CP managers are named as contact persons).

Another action area for CPM in the transport sector can be the cooperation with public transport (PT) authorities. These are often wholly-owned by the municipality so that networking should be uncomplicated.

Cooperations between CPM and local private companies can contribute to mobility management in the companies, e.g. information on tax reliefs for e-bikes, promotion of car pooling and job tickets for PT.

Further examples of transport-related measures initiated by CPM include:

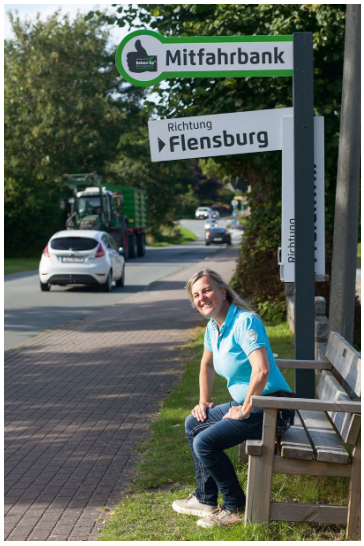

Figure 9: Car pooling benches in public space can help reduce car traffic (BobenOp, 2017)

- *Mitfahrbänke*: Benches in public space as meeting point for car pooling (Ilm-Kreis, 2017b)
- *Laufbus*: Scheduled walking offer to and from school for young pupils supervised by one or two adults (parents) as an awareness campaign for climate-friendly modes of transport, better health, fitness and school performance (VCD, n.d.)
- *Mobilitätsstationen*: Combine different climate-friendly modes of transport on central points in town, lockable boxes for (e-)bikes, car sharing offers, charging options and PT stations (DUH, 2015d, p. 8)

3.2.6.4. Energy efficiency in the industry and commercial sector

CPM **informs** local companies on subsidies for investment in efficient technologies, granted e.g. by the *Bundesamt für Wirtschaft und Ausfuhrkontrolle* (BAFA). To raise awareness, local competitions are organized or promoted (KSMGVH, 2017), and companies are motivated to implement low-cost incentives like PT job tickets for their employees as a first step towards operational mobility management.

Local companies can be involved in workshops or energy efficiency networks (Initiative Energieeffizienz-Netzwerke, 2020), but their preparedness to invest time in these events and fora is limited by economic needs.

3.2.6.5. Energy production and distribution

CPM can support municipalities with establishing their own renewable energy production, be it in their own public utility company or, for smaller towns and villages, on municipal properties and municipal buildings' roofs.

Actually, the investment in renewable (electric) energy amortizes in Germany within several years thanks to the *Erneuerbare-Energien-Gesetz* (EEG) that guarantees fixed feed-in tariffs for 20 years. At the time of writing, the current amendment of the EEG features an upper limit for photovoltaics ("Deckel") at 52 GW installed capacity which harshly inhibits the financing of new projects (Haufe, 2020). This is another example how local CPM is **disabled to work properly if national legislation doesn't set the right frame**.

Although the upper limit inhibits investment, the EEG itself provides good planning reliability and profitability for renewable energy. Municipalities should invest here, not only for climate protection, but also to improve their financial situation

(DUH, 2015b). This is especially important in the long run, when fossil fuels will experience rising and instable prices. CPM can be used as extra planning capacity here and should be able to conduct competent funding advisory.

In some towns, earnings from public-owned renewable energy sources or leasing income from wind energy on public real estate is used for **extra funding** for citizens who invest in energy-efficient devices (Unzenberg, 2020). This combination of measures results in very high visibility and good publicity: citizens see the renewable energy source, perceive its immediate advantage for their own life and save money, energy and CO_2 while using the energy-efficient devices.

To encourage citizens to invest themselves in renewable energies, CPM can also support the preparation of a "*Solarkataster*", a register of private real estate that would be apt for solar use and thus motivating the owners of the properties to act.

3.2.6.6. Energy management of governmental buildings and transportation infrastructure

Local and regional administrations in Germany spend more than 4.8 billion € per year on their energy consumption (dena, 2018, p. 4). If CPM succeeds in **municipal energy management**, it contributes not only to climate protection, but also to substantial improvement of the financial situation of administrations. Labour expenses for energy management are often completely refinanced by its achieved savings (cp. for example (Flensburg) (EA-RP, 2019, p. 2)). With only low-investment measures, the heating demand of municipalities can be lowered by up to 15 %, while power consumption can go down by up to 10 % (DUH, 2015e, p. 3).

Monitoring and controlling are the first necessary steps where CPM can support local administrations. More frequent check-ups with automated energy meters instead of just the annual energy bill can unveil inefficient devices and clarify energy losses. Low-investment measures like frequency-controlled circulating pumps, hydraulic balancing, timers, motion sensors, insulation of heating pipes can often be installed without individual decisions by the town council and supported by CPM.

Energy consumption is determined by technology, but also by the **behaviour** of those who frequent the buildings. Energy-saving behaviour can be influenced by information campaigns that definitely should be part of CPM, but also by more interactive measures like competitions on energy saving in schools (LRA-AÖ, 2018) or energy saving campaigns with financial rewards for schools, day-care, municipalities and counties in many parts of Germany known as "fifty-fifty" model because 50 % of saved spending is given to the users (UfU e.V., 2018).

The energy management of transportation infrastructure is not an action area of CPM in Germany.

3.2.6.7. Procurement, official vehicles, official travel

The above-mentioned recent survey among German municipalities indicates that CP managers have only implemented **very few measures** in the action area of climate-friendly procurement so far (difu, 2018, p. 17). This action area, however, could constitute a powerful lever for climate protection, as German municipalities spend a yearly minimum of 60 billion € -- which includes a broad range of items, office material as well as buses for public transport (Institut für den öffentlichen Sektor e.V., 2013). Spending this money on climate-friendly products and services can send a strong signal towards suppliers – but also towards all citizens, as public procurement is visible and can serve as a powerful role-model for individual decisions (DUH, 2015c, p. 3).

CP managers can prepare procurement guidelines for administrations which should then be decided upon by the town council. Common measures include (cp. for example (Nordkirche, 2012, p. 19 ff.)):

- Recycling paper for all office and printing applications
- Printers that allow double-sided and toner-saving printing
- Cotton towels or hand-dryers instead of paper towels in public bathrooms
- Energy-efficient electrical devices
- LEDs instead of electric bulbs
- Seasonal and regional food from biological farming
- Energy-efficient laptops instead of desktop computers, allowing also (part-time) home-offices, thus saving commuting emissions
- Electric cars or low-consumption cars with limited CO_2 emissions

Some of these measures bring economic advantages in themselves: avoided printing, for example, doesn't cost money. Others will amortize higher investment via lower energy costs during their usage period. Instead of the usual tender by lowest price, administrations should tender by lowest **Life Cycle Costs** (DUH, 2015c, p. 3) and CPM should support them in this argumentation towards possible sceptics. They should include **ecological criteria in each tender**.

The same applies to **official vehicles** for administration and local politicians. Public vehicle fleets can serve as a role-model for citizens as they are very visible in public space. CPM should support town councils to decide on guidelines limiting the CO_2 emissions of official vehicles. Furthermore, a prioritisation of cycling, public transport and car sharing options for **official travel** must be strongly advocated for to overcome long-lasting routines.

3.2.6.8. Public awareness raising

This is the most frequent action area of CPM in Germany, as also indicated by the above-named recent survey (difu, 2018, p. 17). Public betting games, competitions, information and motivation campaigns on climate change, climate protection in general and especially in the own municipality are tasks that CP managers fulfil regularly. They must clarify their target groups that can range from pupils to industrial companies and adapt the measures and their tonality accordingly.

Figure 10: "The Mayor's Betting Game" has competitive and playful elements (Klimapakt, 2018)

Figure 11: CPM motivates citizens to exchange their circulation pumps (Klimaschutz Region Rheinhessen-Nahe, 2016)

Figure 12: Climate protection campaigns reach pupils (and their parents, too) (NKI, 2018a)

Figure 13: Local notables can raise awareness for CPM and their campaigns (Klimapakt, 2019c)

3.2.6.9. Monitoring and Controlling

An important action area of CPM in Germany is the regular monitoring and controlling of energy demand and GHG emissions over time. CPM is regularly supposed to gather the necessary data from all relevant stakeholders and to compile an energy and GHG balance. It makes sense to go for a widely used standard to allow for comparison between municipalities.

The NKI has therefore supported the development of a standardized balancing and reporting tool with funding amounting to 1‘890’627 € during a project duration of four years (NKI, 2018b). Between 2012 and 2016, a consortium of scientific institutions and several *Masterplan* municipalities (cp. section 3.2.3, p. 15) developed a tool called *Klimaschutz-Planer* which already in 2018 was used by 408 municipalities (NKI, 2018b). The tool has the following features to be used by CPM:

Figure 14: Screenshot of the Klimaschutz-Planer’s balancing module (Alianza del Clima e.V., 2020)

The **balancing module** is meant to reduce the effort for the first calculation of a municipal energy balance. The balancing method is based on end energy consumption and based on the territorial balancing principle, aggregating the end energy consumption of all applicable sectors within the political impact area of the respective municipality. The GHG balance is then calculated along specific emission factors per end energy carrier. To ensure comparability, each data entry is accompanied by a description of data quality and data source (NKI, 2018b).

The **benchmarking module** compares climate goals of all participating municipalities, allowing them to evaluate the ambition of their self-commitment, identify further action areas and find inspiration for CP measures (Alianza del Clima e.V., 2020).

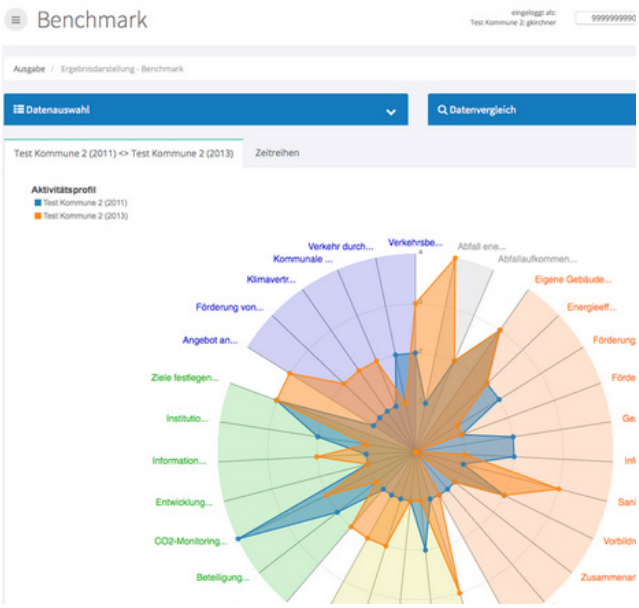

Figure 15: Screenshot of the Klimaschutz-Planer's benchmarking module (Alianza del Clima e.V., 2020)

Modules calculating saving potentials and visualizing scenarios are meant to support users in the development of concrete measures (NKI, 2018b)

Municipalities engaged in the initiative Covenant of the Mayors for Climate and Energy can also use the tool for their so-called SECAP (Sustainable Energy and Climate Action Plan) (Alianza del Clima e.V., 2020).

3.2.7. Evaluation of CPM

Climate protection management ranges as "informative intervention" (Öko-Institut et al., 2019, p. 15), these can only trigger "induced GHG savings" (p. 20). These effects are not as easily proven as technical measures or investments as their causal loops are far less direct, as shown in Table 1. Causal loops of informative interventions involve the number of reached stakeholders, the type of climate protection measure or investment, the duration of the CP action's effect and the life-span of the CP investment as compared to status quo (Öko-Institut et al., 2019, p. 19)

Type of intervention	Addressed GHG-saving behaviour (consumer, economy, municipality, education)
Economic incentives	Monetary incentives to invest in efficiency to tap technical saving potentials
Informative interventions	Enhance or modify the perception of options to invest or to behave (changing routines)

Table 1: Types of interventions and their (supposed) effects on GHG emissions (Öko-Institut et al., 2019, p. 14)

GHG savings	However, a recent evaluation report assumes GHG savings in the dimension of 5 Mt CO_{2eq}, achieved by measures initiated or coordinated by CP managers during the funding period 2012-2017, calculated for the overall life-span of measures of 10 years (Öko-Institut et al., 2019, pp. 23-30). As a comparison, the NKI as a whole is calculated to have saved 19.5 Mt CO_{2eq}.
Efficiency of funding	The same uncertainty applies to any efforts evaluating the efficiency of funding for CPM. The same report as cited above calculates for the NKI as a whole effective GHG savings of 4 to 246 kg per € funding (Öko-Institut et al., 2019, p. 32) – a bandwidth that shows the diversity of measures combined in the NKI, but also the challenges of evaluating "soft" policy measures.

How immeasurable the effects of CPM might be, the report attests high ratings for CPM when it comes to feasibility, visibility and transferability of the measure (Öko-Institut et al., 2019, p. 36).

The economic effect of CPM was not separately estimated in the named report but given as an overall figure for the NKI in general. The leverage effect of ca. 25'000 projects completed within the NKI between 2008 and 2017 is calculated with around 2.5 billion €, of which 715 million were provided as funding and more than 1.7 billion € as equity capital and third-party funds (Öko-Institut et al., 2019, p. 48). This leverage effect of 3.5 for all projects in the NKI could not be reached by CPM projects, where a leverage of 2.1 was calculated for the timespan 2015-2017 (Öko-Institut et al., 2019, p. 55).

The employment effect of the NKI as a whole amounted to 26'000 full-time equivalents (FTE) in direct or indirect employment between 2008 and 2017. Per year, this amounts to 1'500 direct FTEs and 1'200 indirect FTEs in intermediate sectors (Öko-Institut et al., 2019, p. 48). A separate figure for CPM is stated as 1'229 FTEs for the three years from 2015-2017 (Öko-Institut et al., 2019, p. 63)

A recent survey among municipalities shows that the significance of climate protection in administrations has risen substantially within ten years. While 17 % of respondents judged that their administration had given high or even very high priority to CP in 2007, this proportion has risen to 56 % in 2017 (difu, 2018, p. 12).

3.2.8. Recommendations of experts for continuation of CPM

In a recent survey among municipalities with CPM, 81 % of respondents claimed that financial support is a crucial precondition for effective measures which is insufficient in the current scheme (difu, 2018, p. 34). Especially for climate-friendly mobility, municipal energy management and climate-friendly heat and power production, stronger financial funding is required (difu, 2018, p. 35). Respondents claim that funding should focus more on projects and less on concepts (difu, 2018, p. 27). This supports the hands-on approach that is often missed by municipalities when evaluating their CPM.

A recent report on the evaluation of the NKI recommends that multipliers like teachers, headmasters, advisory boards, mayors, district administrators, but also citizens' initiatives should be involved in good times in any CPM activity. This early involvement is proposed to be described already in the application for funding. It is proposed to introduce a new criterion for the evaluation of CPM's success: the indirect contribution of CPM to the CP activities of other stakeholders (Öko-Institut et al., 2019, p. 71).

3.2.9. Comparison with other European countries

The Terms of Reference (ToR) for this report demand a comparison with CPM in other European countries, if applicable (GIZ, 2019, p. 2 II.). As calls to expert fora suggest, CPM is said to be a unique German feature and not matched with similar programs in Europe, and there seem to be no networks to similar programs outside Germany yet (Paar, 2020) (SK:KK, 2020) (Schacht, 2020).

The funding system for CPM bypasses the usual hierarchy of the German system "national → federal → local level", as municipalities address their applications directly to the national government, indicating the exceptional position granted to climate protection. The international climate protection network Climate Alliance states that Southern European countries often act rather on regional than on municipal level and use the Convent of the Mayors to book external experts rather than employing a municipal CP manager (Kleinenkuhnen, 2020).

However, the conducted calls to expert fora adverted to the Luxembourgian funding scheme, the so-called **Pacte Climat**. This arrangement could serve as a role-model for the funding design in Jiangsu and is therefore described more thoroughly in this section.

PacteClimat
Ma commune s'engage pour le climat
KlimaPakt
Meng Gemeng engagéiert sech

Figure 16: Logo of Luxembourgian Pacte Climat (My Energy G.I.E., 2020a)

In Luxembourg, the national government has signed a **contract** with all 102 Luxembourgian municipalities that obliges them to implement in their territory a program to reduce greenhouse gas emissions (Grand-Duché de Luxembourg, 2012, pp. 2, Art. 1er).

From 2013 to 2020, an annual **flat-rate grant of 10'000 € for operating costs** was allocated for each municipality complying with the conditions of the so-called **Pacte Climat** (ibid, (pp. 2, Art. 2 (a)). This lump-sum is topped up according to the municipality's individual energy and climate performance, certified according to the "European Energy Award®" (ibid, (pp. 2, Art. 2, (c)). Furthermore, the costs of **internal and external climate advisors** are allocated annually to the municipalities (ibid, (pp. 2, Art. 2 (b)). While the qualification and scope of these climate advisors are surely comparable to those of German CP managers, the **allocation mechanism** reverses the onus of proof: while German municipalities must **actively apply** to receive funding for CPM, complying with a number of bureaucratical regulations, **all** Luxembourgian municipalities are included **by default**. Not surprisingly, the participation rate is much higher than in Germany – after only five years, 88 of 102 municipalities had taken action to be certified (Hoffmann, 2018) – and thus taken climate protection measures. In 2020, all municipalities have been certified and the competitive element of the regulation seems to work.

The variable grant ranges from 5 € to 35 € per inhabitant, determined by date of certification and achieved score, rewarding early and decisive action, with an absolute annual maximum of 350'000 € per municipality (Grand-Duché de Luxembourg, 2012, pp. 2, Art. 2 (c)). Measurable successes in terms of GHG savings are also incorporated in the calculation of the total grant, starting in the second year:

- 20 % of the grant is determined by the GHG savings from municipal infrastructure (buildings, lighting, vehicles), based on real data collection
- 10 % of the grant is determined by the GHG savings from households within the municipality. These savings are not directly measured, but quantified by the proxy-indicator of the number of subsidies for the rational use of energy and renewable energy allocated to households (Grand-Duché de Luxembourg, 2012, pp. 2, Art. 2 (d))

Total spending in the first five years amounted to 55.2 million € (Hoffmann, 2018). The spending amount is plannable due to fixed caps. The outcome is also more plannable as it doesn't depend (so heavily) on the municipality's proactivity. The comparability is higher than in Germany as all municipalities are certified by the same entity and choose their measures from the same catalogue. The following Table 2 compares central aspects of German and Luxembourgian funding schemes.

	German CPM	Luxembourgian Pacte Climat
Procedure	Municipality needs to apply for funding and comply with certain preconditions (political decision on local level, KSK, municipal financial situation)	Funding is granted by virtue of signing the contract
Coverage rate	3-5 % of all municipalities with CPM 15 % with KSK or Masterplan	100 % of all municipalities
Measures	Developed individually in KSK or Masterplan 100% Klimaschutz with average costs of 26'150 € per concept (cp. section 3.2.3)	Prepared **generally** for all municipalities as a catalogue of 79 measures in 6 main categories to be selected by the individual municipality (My Energy G.I.E., 2020a)
Role	**Climate protection manager** selected and employed by the individual municipality, mainly funded by the national government	**External climate advisors** chosen on national level can be booked by municipalities on state cost
Funding amount	Calculated by every municipality when applying for CPM	Determined by national law, combined flat-rate and performance-based variable grant
Funding period	Max. 3 years	2012-2020, to be extended 2021-2030 (Grand-Duché de Luxembourg, 2019)
Reporting on emission savings	Obligatory during funding period (BMU, 2017, p. 14)	Obligatory for all municipalities, renewed at least every four years (My Energy G.I.E., 2020b)

Table 2: Comparison of central elements in German CPM and Luxembourgian Pacte Climat

4 Comparison and Transferability of CPM to Jiangsu Province

4.1. Comparison of awareness for climate protection needs

Figure 17: Future generations need a political megaphone: today's voters! (picture: (Rosewell))

As climate change is not as immediately perceptible as acid rain or pollution of rivers, but really a long-term threat, it is a matter of **intergenerational inequity**: those who will suffer most are underage or not even born. They cannot show their preference via electoral votes **in time** to avoid the consequences of late or insufficient measures. They need the present generation to be aware of a **future** problem and to act accordingly **today**.

As long as today's voters seem to be just fine with the political measures taken, most politicians will go for business as usual in intergenerational issues to be re-elected again (Wikipedia, 2020b). Citizens must **demand** stricter climate policies to support politicians against their fear of not being elected again. In China, 68 % of respondents to a 2017 comparative survey stated that they were satisfied with the government's efforts to protect the environment (Crabtree, 2018), not giving an incentive for politicians to change their pathway.

For politicians to be pushed forward and bolstered up in their sometimes-inconvenient efforts to channel (economic) activities in climate-friendly directions, they need **strong public awareness**.

Comparative surveys indicate that **awareness raising** should be a crucial effort in any Chinese CP activity:

- When asked if climate change was "a very serious problem", 18 % of Chinese respondents agreed, while this rate amounted to 55 % in Germany and a global median of 54 % (Stokes, Wike, & Carle, 2015, p. 13).
- When asked for their knowledge about global warming or climate change, 62 % of Chinese respondents stated that they knew "something" or "a great deal" (Pelham, 2009), and only 21 % stated that it constituted a serious personal threat to them (Pugliese & Ray, 2009). Although these numbers are not very recent, they are still relevant for a long-term threat as climate change that needs early action and long-term decisions.

When considering the transfer of the German CPM scheme to Jiangsu Province, the focus on public awareness, education and publicity is not easily overvalued. **A lively mutual exchange of experiences between German CP managers and stakeholders in successful Chinese awareness campaigns should be enabled in the kick-off phase of CPM activities.**

The same applies to educational initiatives to raise awareness for climate change amongst pupils. Successful programs in Germany should be analysed by Chinese teachers and educationists to carve out elements that should be transferred into the Jiangsu context and implemented at local schools.

4.2. Comparison of the role of industrial and commercial partners

In Germany, CPM often focuses mainly on GHG saving potentials in the municipal administration, while only few industrial partners are involved. When considering the transfer to Jiangsu Province, the much stronger industrial activity and resulting ecological impact must be kept in mind. It is recommended to involve industrial and commercial partners right from the beginning in any CPM activities.

4.3. Comparison of the visibility of environmental damage

The time of dead fish in the chemical-coloured River Rhine being gone thanks to stricter environmental laws (and of course large-scale industrial outsourcing to, for example, China), there are much fewer immediately perceptible environmental damages in Germany than in China in general. In Jiangsu Province, there are numerous beauties of nature to be visited by tourists, so that the conservation of nature has also tangible economic aspects. CPM should build upon these circumstances by designing measures and awareness campaigns that safeguard and enhance the attraction of natural monuments (cp. section 5.3.3, p.36).

4.4. Comparison of institutional design

In Germany, CP managers have no governmental function or power and (next to) no financial budget. They are mostly directly employed at the municipal administration, not on a political level. They cannot grant any extra subsidies to private or commercial stakeholders, but they provide advisory on how to apply for existing subsidies at the national or regional level. They cannot render any administrative decision depending on other than governmentally prescribed preconditions. They always depend on the political bodies to set the course in the right direction.

If possible, these shortcomings should not be transferred to the Jiangsu context. CP managers should be granted administrative and to some extent even legislative powers, e.g. for less restrictions for electric vehicles in the registration process or mandatory energy management for participants in industrial greenfield developments.

The German experience with CPM shows that the national and regional funding for CP managers' salaries allows also municipalities in financial trouble to implement CPM. As Jiangsu Province is financially sound and seriously committed to climate protection, the province should support municipalities also financially.

4.5. Necessity of Climate Protection Management

While recent reports and evaluations suggest that the current design of CPM in Germany lacks central powers and options for action, the position of a CP manager can still support climate protection in crucial ways:

1. Raise awareness on and spread knowledge about climate protection needs and measures
2. Connect central administrative positions that are relevant for climate protection, such as building authorities, urban planners, transport authorities, and set CP on each of their agendas as a cross-cutting issue and guiding stars for every decision (cp. (Öko-Institut et al., 2019, p. 67)).

3. Stimulate competition and best-practice-oriented networking between industrial actors
4. Coordinate climate protection efforts of different stakeholders, network between them and copy successful examples between regions

All four named areas need strengthening in China. Jiangsu Province, as a progressive and financially sound region, should initiate a pilot project to be transferred to other Chinese provinces.

CPM is considered necessary to outperform China's "highly insufficient" NDCs (cp. section 2.1.1, p. 4 and (Climate Action Tracker, 2019a)).

4.6. Expected Positive Impact on Climate Protection Goals

The ToR for this report demand a chapter on the positive significance of CPM for achieving medium- and long-term climate protection goals (GIZ, 2019, p. 2 III). As section 3.2.6.9 (p. 23) on the evaluation efforts for CPM indicates, there can't be an exact numeric answer to this question, as most of the measures included in (German) CPM are informative interventions with long and rather indirect causal loops between measure and GHG savings. However, orders of magnitude are given with 5 Mt CO_{2eq} in Germany (cp. section 3.2.6.9, p. 23, for details). The data base for this estimate contains too many uncertainties to serve as a quantitative calculation base for Jiangsu Province.

On the qualitative level, it is surely true that CPM strengthens climate protection efforts and public awareness, identifies saving potentials for administrations, citizens and companies and thus surely has a strong positive impact on the achievement of CP goals.

5 Proposed Roadmap for CPM in Jiangsu Province

Time's up. Climate protection needs primacy in every decision, across all policy fields, now.

When considering the transferability of any CP project, we need to state first and foremost that the political process from decision to goal achievement needs to be much more stringent and faster in Jiangsu than it has been in Germany. While it took decades for German politicians (and society as a whole) to realize that climate policies cannot be detached from other policy fields (Anzlinger, 2020), every (Chinese) decision-maker needs to recognize from the beginning of any CPM activity that climate protection is a real **cross-cutting issue** to be considered (and, what's more, given primacy) in industrial, fiscal and economic politics.

As a tribute to the exhaustively proved **urgency to act now**, it is strongly proposed to design the Jiangsu roadmap according to the **time-efficient** Luxembourgian Pacte Climat (cp. section 3.2.9, p. 26), including the following central elements:

1. mandatory contract with all municipalities and, if applicable, companies
2. general set of concrete measures for municipalities/companies to choose from
3. automatic funding scheme without the need for individual applications and bureaucracy
4. twofold funding scheme with a flat-rate element and a performance-based sum depending on real CO2 savings
5. recurring monitoring and certification system with expert advice and support to all municipalities and eligible companies.

These elements should save time in comparison with the German CPM process involving individual political decisions, applications and measure sets.

5.1. Involved governmental departments

For a long time, the mega department "Commission of reform and development" was responsible for "low carbon development". After the reform of ministry in 2018, the responsibility has been relocated to the newly formed "Ministry of Ecology and Environment", so that emissions of CO and CO_2 can be regulated and controlled in one hand.

This responsibility was also relocated on the provincial level. Department of Ecology and Environment of Jiangsu Province (DEEJS) has since then also taken care about the policy-making, implementation of policy and monitoring and control of the implementation as well as funding of special projects in the area of low carbon development and environment protection. Even other departments like Commission of Economy and Information and General Office of Provincial Government do also release orders and regulations relevant to low carbon development, the nature of CPM fits well to the DEEJS. It is suggested that DEEJS set a position in the department or finance – at least co-finance – and entitle the position in an independent institute or organisation on the provincial level. Without support and entitlement of an authority, the position will be quite weak and lacking assertiveness. One of the advantages of this setup is that it can be copied downwards even to the county level which can lead to a well-organised and structured CPM team and therefore a better communication and cooperation among them. With the entitlement, a CPM is enabled to collaborate with other departments and tackle the cross-department problems.

A setup which adopts advantages of German Model as well as Luxembourgian Model and is equipped with administrative power and special CPM budget establishes the stable fundament for the achievements of CPM.

5.2. Participation of industries

Considering the much stronger industrial activity in Jiangsu Province compared with Germany, it is proposed to find inspiration at **public-private CP initiatives** like *Klimapakt Flensburg* or *Project Zero Sonderborg*. Both associations go beyond the scope of municipal action areas as they are based on an agreement between public authorities and private companies to save CO_2 along a certain pathway (Klimapakt, 2015). The Danish initiative provides its contents also in Mandarin (ProjectZero, 2020a). Both initiatives make use of competitive elements, networking between different stakeholders and best-practice databases to provide for mutual learning. Klimapakt Flensburg is co-funded by its industrial or commercial partners according to their economic performance (Klimapakt, 2015), ProjectZero was made possible by an especially established private foundation by a group of entrepreneurs (ProjectZero, 2020b). It is to be scrutinized for Jiangsu **which industrial stakeholders could play a leading role** in climate protection initiatives. Criteria for the search for possible candidates could be:

1. Economic performance → a certain revenue is necessary to allow for co-funding commitments
2. Economic interest → products and services of environment-oriented industry branches will sell better in the wake of CP initiatives, e.g. frequency-controlled circulating pumps, insulation, electric cars, bikes…
3. Saving potential → energy-intensive companies should have a huge self-interest in raising their energy efficiency, although dedicated and smart awareness campaigns are surely necessary here
4. Public attention → companies with high public visibility could be interested in participating in a public-private CP initiative with good marketing and awareness campaigns

Along these criteria, the first industrial partners should be identified and motivated to participate. Successes should be published in existing industry networks to motivate further participants.

5.3. Outline of CPM tasks for Jiangsu Province

The proposed CPM for Jiangsu Province should focus on four major action areas as described below. They should of course be complemented by further topics if experiences suggest it.

One area that is important in German CPM, the funding advisory for citizens, might be of lower interest in Jiangsu. For in China, there is no private property on land, but real estate investors can buy the right to build on the state-owned ground for 70 years. Apartment houses prevail in the cities, there are few detached houses that could be individually refurbished. The German focus on homeowners might therefore be misleading for Jiangsu. As there's only one landlord, namely the state, decisions on energy-efficient refurbishment can only be made by the state itself.

5.3.1. Energy management for administrations with financial results

The introduction of energy management should unveil large saving potentials, for example in space heating which in Southern China is based on air conditioning, i.e. electrical power. Variable frequency drives (VFD) for air conditioning adjust the speed of the motors in fans, pumps and compressors based on the actual system load requirements or a scheduled operation timetable which can result in substantial cuts in energy consumption. CPM should either examine potential measures themselves or organize respective advisory from energy managers or consumer advice centers.

Priority should be given to rather low investment measures like LEDs, renewal of window and door seals, automatic night setback of HVAC etc. The induced savings from these measures should then be re-invested in bigger measures. This revolving fund can also be used as an excellent publicity measure as it can show how climate friendly decisions can save money. As savings induced by energy efficiency grow, they should be invested in renewable energy sources to provide for climate-friendly energy supply for public entities. CPM should use these achievements again for publicity campaigns, with publicly **visible electric meters** showing the energy produced and the emissions saved by the renewable energy installation. If the installation is e.g. on the rooftop of a public school building, the energy metering can serve as a building block for a cross-cutting climate protection curriculum (cp. p. 36).

CPM should also promote **public procurement** from energy-efficient companies only, develop respective standards and encourage local governments to come to the necessary budgetary and regulatory decisions for public tenders.

5.3.2. Involvement of industrial partners

While some cities may impress others with their progressive industries like Silicon Valley, not all cities can be proud of high-tech, low-pollution companies. Some are suffering from the local emissions caused by their industries like textile, steel or chemical industry.

In the past, when environment and ecology were not an issue, any industry that could bring employment and GDP was warmly welcome. Now, under the pressure of environmental degradation and climate change, city administrations, especially industry zone or industry park administrations are racking their brains to find ways to not only upgrade industrial plants, but also safeguard local employment. This will only be possible with committed and progressive industrial stakeholders.

CPM should therefore work on the timely and continuous involvement of strong and manifold partners from all industrial branches. CPM should develop several ways to address the various groups differing by size, branch, interest and economic power. For a first strategic approach, please compare section 5.2, p. 32).

Given that interest and willingness to participate are achieved by CPM, the first important step is the implementation of a continuous and at best among themselves comparable **monitoring and controlling** system of energy consumption. CPM can promote and support the implementation of an in-house energy management for industrial companies by networking between energy advisors and companies and organizing events, knowledge data bases and exchanges of experiences to establish best practices for various production processes.

State-owned companies should participate right from the beginning to serve as a role model for other key industrial players.

The administration of Jiangsu Province should grant tax reliefs and other incentives for industrial companies with energy management. CPM should support these efforts with legal research, analyses of emission saving potentials and good argumentations.

Companies could be asked for a membership fee like Klimapakt Flensburg does or sponsorship as Project Zero does. These financial contributions should be re-invested in direct advantages for participating enterprises or in public relations that have an indirect impact for the image of companies.

5.3.3. Awareness campaigns / publicity

Figure 18: Example of an interactive, visible planting action (BobenOp, n.d.)

Surely all publicity campaigns initiated by CPM in Jiangsu must be coordinated with and approved by the Publicity Department of the Central Committee of the Communist Party of China (CCPPD).

Apart from this specific Chinese feature, matching two major differences between the German and the Jiangsu context could provide a blueprint for a specific awareness campaign: one, the overall awareness for climate protection needs is much lower in Jiangsu; two, the immediate vulnerability for the effects of climate change is much higher. Combining both could **overcome the problem of low perceptibility of climate change**, for example:

Figure 19: Greened facade in Avignon (Wikimedia Commons, 2006)

In cooperation with urban planning authorities, CPM could start a showcase project for the improvement of the **urban microclimate**.

1) CPM could involve local schools, neighbourhoods, shops, NGOs etc. in **plantation activities** on roundabouts (cp. Figure 18), playgrounds, façades (cp. Figure 19) etc. which results in very visible results, perceptible change of microclimate by higher evaporation of plants. GHG savings will be minor in comparison to coal phase-out or other megaprojects, but could over the years add up to considerable amounts, as initiatives like "Plant for the Planet" show (Plant for the Planet, 2020).

2) Cooperation with construction authorities for energy-efficient refurbishment regarding air conditioning, cooling and protection against summer overheating could make citizens **perceive** the advantages of well-insulated buildings.

Another very well visible action area for publicity campaigns is everyday mobility. Klimapakt Flensburg, for instance, initiates competitions between participating companies whose employees collect points when cycling to work. A similar campaign could be started in Jiangsu province.

Figure 20: Mobility campaigns are highly visible in public space (Klimapakt, 2019b)

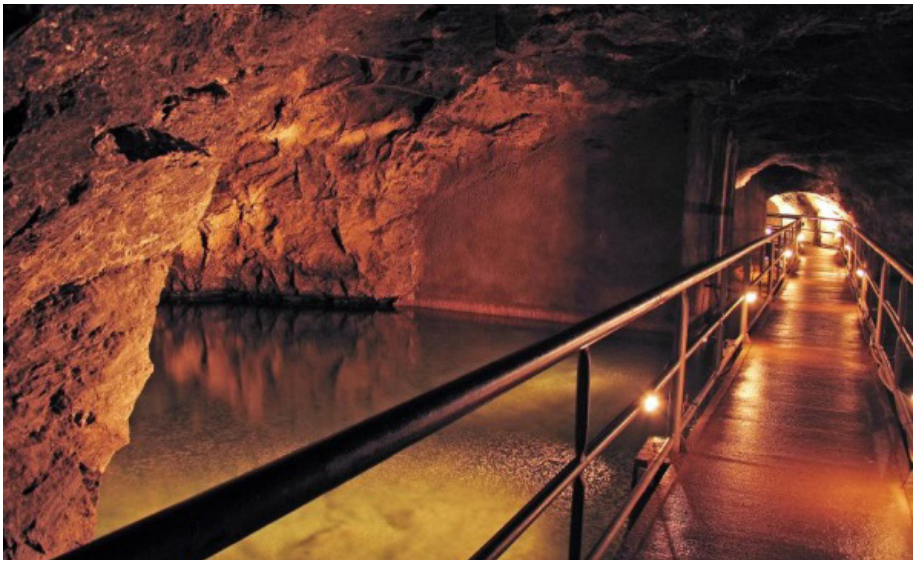

Figure 21: Energy management for touristic attractions can work as tangible publicity (NKI, 2019)

Also, CPM can and should focus on **touristic attractions** where many social groups can be targeted at once. For example in Friedrichroda, CPM exchanged an outdated lighting system in a very popular **natural monument** to energy-efficient LEDs with an investment of 26'000 €, lowering energy consumption by 95 % and saving 540 t of CO_2 within 20 years (NKI, 2019). While enhancing the light quality and security, this measure reaches tens of thousands of tourists from all social groups whose interest is supposedly not mainly climate protection. This is an important aspect of publicity campaigns: their ranges of influence and the involvement of groups outside the "eco-bubble" of ecologically interested people.

5.3.4. Educational initiatives for schools

Figure 22: Participation in this world-wide network of pupils planting trees would raise awareness in schools (Plant for the Planet, 2020)

Schools should also be one of the first target groups in the schedule of CPM as climate protection safeguards the future of the pupils. In cooperation with the local educational authority, curricula could be developed for all climate-relevant topics. A kick-off awareness campaign could be participation in the world-wide tree planting project (Plant for the Planet, 2020) – high visibility, good sense of ownership, easy-to-understand, hands-on application.

An emission-saving initiative that brings tangible advantages for each individual is the "Walking Bus" (cp. section 3.2.6.3, p. 20). Instead of bringing children to school by car, they walk there together, following a schedule similar to a timetable for buses, with fixed "departure times" at marked "bus stops", and supervised by one or two adults (parents) to guide the way and safeguard road safety (VCD, n.d.).

As no larger investment is needed, this is recommended as one of the first measures initiated and organized by CPM. Walking buses enhance awareness for climate-friendly modes of transport while providing for better health, fitness, orientation, road safety and school performance of pupils. Calculating the initiative's climate protection effect could be part of a **cross-cutting climate-protection curriculum** to be developed in close cooperation between CPM, school authorities and local teachers.

Figure 23: "Walking buses" can raise awareness while delivering advantages to individuals (Offenburg, n. d.)

Such a curriculum should also include age-appropriate, vivid scientific experiments on energy efficiency, renewable energies and emissions. They could be inspired by the pedagogic concept of "artefact" (artefact , 2016) or as a national initiative like "Wissenschaftsjahr Energie" (BMBF, 2010).

5.3.5. Monitoring and Controlling

An important task for CPM in Jiangsu Province should be the regular monitoring and controlling of energy demand and GHG emissions over time. CPM is regularly supposed to gather the necessary data from all relevant stakeholders and to compile an energy and GHG balance. It makes sense to go for a widely used standard to allow for comparison between municipalities. When designing a monitoring and controlling system, experiences from the Chinese project on "Low-Carbon Provinces and Low-Carbon Cities" should be taken into account (Baidu, 2020). There were no publicly available data on the plot regions' progress on GHG balancing (cp. section 2.1, p. 3) at the time of writing. If it should turn out that monitoring and controlling in this project was insufficient for the needs of CPM, inspiration for the design of a standard tool could be found at the webpages on *Klimaschutz-Planer* (cp. section 3.2.6.9, p. 23). It should be understood that energy and GHG balances should be publicly available to make successes and drawbacks transparent and to create a sense of ownership among the citizens.

5.4. Qualifications of CP managers

CP managers should be generalists (cp. section 3.2.5, p. 16) with the ability to not only understand energy and climate topics, but also to communicate them to relevant stakeholders. If Human Resources had to decide for this position between a very specialized doctor in electrical engineering and a person with a less stringent academic CV, but broad experiences in campaigning, educating, moderation and a functional network to industries, schools and NGOs, they should clearly go for the second option. It will be crucial for CP managers to succeed that they spark relevant stakeholders to act in their respective action area and this affords outstanding communication and project management skills – of course ideally matched with knowledge of engineering, urban planning and administrative rules.

Compared with the German context, specified industrial knowledge might be of higher relevance in Jiangsu Province, especially when filling a vacancy for CPM in industrial parks. Decision-makers should have a close look into the respective special local requirements for the position of CPM. For example, CP managers at industrial parks, like Yixing Ceramic Industrial Park, should be familiar with ceramic manufacturing and processes, so that they can make rational and constructive proposals for low-carbon solutions. For the same reason, CPM at Yangzhou Chemical Industry Park should have some knowledge of chemistry and peripheral industries.

5.5. Pilot cities

To figure out the feasibility and functionality of CPM, it is advisable to draw it under test. The selected pilot cities are supposed to meet following criteria:

"ProjectZero is a commercial foundation with the stated mission of making the Sonderborg region carbon-neutral by 2029.

ProjectZero has dedicated all its efforts to realising this aim – and nothing else. ProjectZero actively and closely collaborates with the municipality, large businesses in the region and organisations.

All constructive stakeholders in the Sonderborg region support ProjectZero and the idea of a carbon-neutral region. This makes ProjectZero stronger than a municipal organisation and ensures greater freedom to take action."
–from introduction of ProjectZero
(ProjectZero)

- which have a more ambitious climate protection plan than the province
- which are vulnerable to environmental damage and visible drawbacks are likely to have higher awareness or
- which own strong and committed industrial partner like Danfoss for Project Zero in Denmark (cp. blue text box)

Changzhou, a city located between Shanghai and Nanjing, the capital of Jiangsu province, worked out the "Changzhou low-carbon development plan" in June 2016 (Ding, 2017). This plan has been approved by National Development and Reform Commission (NDRC). In 2017, Changzhou has been qualified as one of the third batch of the pilot cities for low carbon development by NDRC. During the establishment period, Changzhou has budget an investment of 169.32 billion CNY to implement 71 major projects in seven categories: industry, energy, construction, transportation, infrastructure, forest carbon sinks, and low-carbon living (Ding, 2017). To achieve goals, such as by 2023 the CO_2 emission peak will be reached, Changzhou has to complete following TASKS (Ding, 2017) by 2020:

- The urbanization rate will reach 75 %, a low-carbon production system will be established
- The share of the service industries sector will increase to 55 % of the regional GDP; low-carbon energy sources will have been explored and energy efficiency improved
- Non-fossil energy will account for 3.4 % of primary energy consumption, natural gas consumption will increase to 13.8 % of primary energy consumption, clean energy utilization will account for 17.2 % of primary energy consumption, and coal consumption will be reduced to less than 44 % of primary energy consumption
- The proportion of green buildings in newly-built buildings will reach 50 %
- Urban residents' public transport share on the modal split will reach more than 30 % to strengthen environmental protection
- The proportion of days with good air quality will be increased to 80 %, and the average PM2.5 concentration will be reduced to 47.2 micrograms per cubic meter; the construction of green cities will carry on.
- The city's forest coverage rate will reach more than 26 %, and the green coverage rate of urban built-up areas will reach more than 42 %
- Build a low-carbon ecological society and establish two national low-carbon communities
- Domestic waste separation in residential areas in urban areas will reach 50%
- Increase publicity awareness and education to encourage economical consumption.

This ambition is ideal for the setup of the CPM. On one hand, the CPM can be challenged by the concrete goals and projects. On the other hand, the effect of the CPM's contribution can be analysed and evaluated. In addition to the ambition, there are many enterprises which are very active in low carbon development in Changzhou. CRRC Qishuyan, one of the biggest manufacturers of diesel locomotives and Trina Solar, one of the biggest PV players in the world and other 13 pioneer companies were awarded 100'000 CNY for outstanding achievements in low-carbon concepts, energy saving and emission

reduction, resource conservation, and environmental protection (People, 2018). These companies will be very good committed partners for certain projects of climate protection.

5.6. Pilot entities

Figure 24: Ecological information events in SIP raise the awareness of residents (SIP, 2020a)

Industrial parks in China may themselves constitute a **local administrative entity**. Their administrative structures are often parallel to local authorities and communist party structures exist in industrial companies.

Not only cities, but also industrial parks should therefore be eligible for CPM. Outdated production capacities are very common and contribute to climate change and local environmental damage. The refurbishment of backwards technology is not only climate-friendly, but economic in the mid- to long-run as it saves energy costs and creates competitive advantages.

The China–Singapore Suzhou Industrial Park (SIP) is recommended as pilot entity. On a total jurisdiction area of 288 km^2, it provides space for a planned residential population of 1.2 million (Wikipedia, 2020c). It accommodates companies from the branches electronic information and equipment manufacturing, cloud computing to biomedicine, nanotechnology and other new emerging industries. The accelerated development of new technology industries has promoted the integration and development of low-carbon economy and emerging industries (MIIPRC, Ministry of Industry and Information of PRC, 2017).

SIP is already active in ecological awareness campaigns upon which CPM could build. Residents are already contacted and involved in the existing activities (SIP, 2020a).

Also, SIP engages in water-saving activities that are framed by very visible beautification projects (SIP, 2020b). CPM should build upon these projects to make up for the problem of low perceptibility of climate change and raise awareness via measures that give residents a tangible increase in their quality of life.

5.7. TOT program

As a generalist, a CPM should have not only sufficient knowledge of climate protection but also good training skills to help many professionals from other areas getting qualified for this new job profile. This training can be performed in a top-down structure: CP managers of the provincial level and other main cities might be trained by external experts to cascade knowledge and methods down to local CP managers.

The purpose and goals are:

- Enabling the potential trainer to act with a unified training approach with respect to climate protection in Jiangsu province

- Enabling the potential trainer to motivate future participants by using their knowledge and training methods
- Enabling the potential trainer to design, organise and plan the training and learning process
- Enabling the potential trainer to acquire the sufficient knowledge how to work with their personal appearance to achieve maximum impact
- Conveying project planning, didactic and moderation skills and extend their knowledge on climate protection measures

This TOT program might take a week to go through the following points:

- Active listening
- Questioning techniques
- Moderation techniques for participative formats like workshops or round tables
- Rhetoric skills
- Language choice and tone
- Body language
- Strategy
- Project planning
- Teacher Authority

5.8. Evaluation System

The efficiency of CPM should be regularly evaluated to avoid misleading routines and to safeguard the achievement of the set goals. It is proposed to differentiate between quantitative and qualitative indicators for evaluation to respect the partly long-term and indirect causal loops (cp. section 3.2.6.9).

Indicators for the evaluation of CPM in Jiangsu Province might include:

1. Number of municipalities and entities equipped with energy management
2. Energy savings per municipality or entity and year in MWh
3. GHG savings per municipality or entity and year in t of CO2eq
4. Number of awareness campaigns implemented per municipality or entity and year
5. Number of participants in workshops and other events
6. Number of companies committed to cooperate with CPM

Evaluation should be conducted by an independent research institution capable of scientific analysis and independent comparison.

6 Conclusion

It is concluded from the present analysis that Jiangsu Province could profit from CPM to support:

- Energy efficiency in municipal administrations and at industrial partners
- Networking between local educational, industrial and commercial partners and municipal administrations
- Raising awareness among all local stakeholders, including pupils, teachers and civil society in general

It is recommended to build upon the experiences made with the project on "Low-Carbon Provinces and Low-Carbon Cities" (Baidu, 2020), especially when designing a monitoring and controlling tool. It would be ideal to use an existing tool to safeguard comparability. If the balancing system of the "Low-Carbon Cities" project should turn out insufficient for the needs of CPM, inspiration for a viable tool can be found at the webpages of *Klimaschutz-Planer* (Alianza del Clima e.V., 2020). It should be understood that energy and GHG balances should be publicly available to make successes and drawbacks transparent and to create a sense of ownership among the citizens.

Given the urgency to act now, it is strongly recommended to design the Jiangsu CPM roadmap according to the **time-efficient** Luxembourgian Pacte Climat (cp. section 3.2.9, p. 26), including the following central elements:

a. mandatory contract with **all** municipalities and, if applicable, companies
b. **general** set of concrete **measures** for municipalities/companies to choose from
c. **automatic** funding scheme skipping individual applications and bureaucracy
d. twofold funding scheme with a flat-rate element and a **performance-based** sum depending on real CO_2 savings
e. recurring monitoring and certification system with expert advice and support to all municipalities and eligible companies.

Having emphasized the contribution of local initiatives, this should not conceal the fact that climate protection needs determined action on **all** levels. Climate-active municipalities stress that the national government must set the right frame with strong legislation, especially regarding farming, mobility and power and heat production (difu, 2018, p. 36), and also serve as a role model in its own actions (difu, 2018, p. 34).

Annex – List of Jiangsu policies

Under the guidance of the "12th five year plan" and "13th five year plan" a plenty of provincial and local Polices have been introduced as shown in the table

Rules and policies	Year
Upgrade and Transformation Action Plan for Energy Saving and Emission Reduction in coal plants in Jiangsu Province	2014
Notification about printing and distributing the "Administrative Measures for trading the saved energy" in Jiangsu Province (Trial)	2015
Implementation plan for the special action of "two reductions, six governances and three improvements" in Jiangsu	
Notification from the General Office of the Jiangsu Provincial Government about Printing and Distributing Energy Development Plan of the "Thirteenth Five-Year Plan" of Jiangsu Province	2017
Provincial Government's Notification about printing and distributing the comprehensive implementation of energy conservation and Emission Reduction in the "Thirteenth Five-Year Plan" of Jiangsu Province	2017
Notification on forwarding detailed implementation rules for pilot projects of reforms of incremental power distribution business in Jiangsu province issued by Jiangsu Provincial Regulatory Office Development and Reform Commission Jiangsu Energy	2017
Implementation Plan of "Double Control" Assessment System for Total Energy Consumption and Energy Intensity of Municipal Governments under Jiangsu provincial "13th 5-year Plan".	2017
Notice of the Jiangsu Provincial Government on Issuing the Ecological Civilization Construction Plan of Jiangsu Province (2013-2022)	2013
Notification on Printing and Distributing the Interim Measures for the Administration of Greenhouse Gas Emission Reports of Key Units in Jiangsu	2015
Notice of the General Office of the Provincial Government on Printing and Distributing the Jiangsu Province's Climate Change Plan (2015-2020)	2015
Notice on Planning to Include Province Jiangsu into Historical Carbon Emission Report of Key Emission Units of the National Carbon Trading System	
Notice on the establishment of the Jiangsu Carbon Market Construction Office	2016
Notice on Forwarding the Administrative Measures (Interim) by the Provincial Development and Reform Commission for the Third-Party Verification Agency for Carbon Emission Trading in Jiangsu Province	2016
Notice on Planning to Include Province Jiangsu into Historical Carbon Emission Report of Key Emission Units （second of the National Carbon Trading System	2016
Notice on Strengthening Ecological Environmental Protection along the Yangtze River	2016
Notice of the Provincial Government on Issuing the National Ecological Protection Red Line Plan in Jiangsu Province	2018
Notice of the Provincial Government on Printing and Distributing the Implementation Plan to the "Blue Sky" Three-Year Action Plan in Jiangsu Province	2018
Industrial Park Recycling Promoting Work Plan in Jiangsu Province	2013
Advices of the Provincial Government on Further Accelerating the Development of Circular Economy	2013
Notice on accelerating the transformation circular economy of the park	2014
Circular Economy Promotion Regulations in Jiangsu Province	

Notice of the Provincial Government on Issuing Guidance on the Promotion and Application of New Energy Vehicles in Jiangsu Province	2012
Notice on Issuing the Development Plan of Green Cycle and Low Carbon Transport in Jiangsu Province (2013-2020)	2014
Instruction on Further Implementing the Strategy of Prioritizing the Development of Urban Public Transport	2014
Several suggestions on further supporting the promotion and application of new energy vehicles	2014
Implementation suggestions on Accelerating the Development of Green Cycle and Low Carbon Transportation	2015
Research on the Low Carbon and Environmental Protection Policy Requirements of Jiangsu Province	
Notice on Printing and Distributing the Implementation Plan for the Promotion and Application of New Energy Vehicles in the "Thirteenth Five-Year Plan" of Jiangsu Province	2016
Notice of the Provincial Government Office on Issuing the Implementation Plan of Green Building Action in Jiangsu Province	
Jiangsu Green Building Development Regulations-	2013

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List of Abbreviations

BAFA	German Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle)
BMBF	German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung)
BMU	German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit)
CCPPD	Central Committee of the Communist Party of China
CNY	Chinese yuan, renminbi
CP	climate protection
CPM	climate protection management (Klimaschutzmanagement, KSM)
DEEJS	Department of Ecology and Environment of Jiangsu Province
EEG	Feed-in law for renewable energies (Erneuerbare-Energien-Gesetz)
EMAS	Eco-Management and Audit Scheme
EnEV	regulation in Germany describing minimum requirements regarding energy use of new and renovated buildings (Energieeinsparverordnung)
GDP	gross domestic product
GHG	greenhouse gases
HVAC	heating, ventilation, and air conditioning
KSK	concept on climate protection (Klimaschutzkonzept)
LED	light-emitting diodes
LULUCF	land use, land use change and forestry
MOHURD	Ministry of Housing and Urban-Rural Development of PRC
NDC	nationally determined contribution
NDRC	National Development and Reform Commission
NKI	national initiative for climate protection (Nationale Klimaschutzinitiative)
NPC	National People's Congress
PCGC	People's Central Government of China
PGJP	People's Government of Jiangsu Province
PRC	People's Republic of China
SECAP	Sustainable Energy and Climate Action Plan
TOT	Training of trainers

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