Paulson Policy Memorandum

Rethinking China's Low-Carbon Strategy

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Introduction

Low-carbon development (LCD) refers to the development of an economy (and society) that emits a much lower amount of greenhouse gases (GHGs).[1] But while many countries are now pursuing LCD strategies, it is important to distinguish between absolute and relative LCD: the former requires a reduction of total emissions, whereas the latter involves only a reduction in the carbon intensity (i.e. emissions per unit of GDP) or a carbon emission elasticity of GDP between 0 and 0.8.[2] Under normal positive GDP growth, absolute LCD is obviously more demanding.

For China to improve its LCD efforts, it needs to rethink its underlying LCD strategy, or rather the lack of it.

The Chinese government has taken many steps to promote LCD. Its efforts include a steadily strengthening political commitment, the integration of the concept of LCD into the national development policy framework, numerous LCD pilot schemes, massive investment, and enthusiastic responses among local urban authorities. But the overall impact of these various Chinese government schemes is still limited. This is evident in China's continuously rising emission levels, the paucity of homegrown low-carbon technologies, and the negative image that China continues to have internationally on environmental issues.

This policy memorandum argues that, for China to improve its LCD efforts, it needs to rethink its underlying LCD strategy, or rather the lack of it. Key elements of this reconceptualization should include: (1) the formulation of a coherent LCD strategy, with absolute emissions reduction targets; (2) less reliance on administrative means and more on market incentives, complemented by greater openness about emissions-related matters; (3) more attention to green innovations; (4) an enhanced role for non-state actors; (5) a re-think of China's national urbanization strategy; and (6) linking the LCD strategy with China's "going out" strategy of overseas investment by Chinese companies.

The memo is organized as follows. The next chapter explores the current state of LCD efforts in China and the actors and factors contributing to it. On the basis of this exploration, subsequent chapters discuss why China should want to up its game. The memo concludes with recommendations for China to re-think its current strategy.

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China's Low-Carbon Development Efforts to Date

The promotion of LCD in China is intertwined with the government's evolving thinking and actions on environmental issues in general and climate change in particular.

Increasing Political Commitment

This evolution has been characterized by two shifts.[3] Initially, China viewed climate change as an issue only for developed countries. But this has now shifted to the view that it represents a development issue for China itself. The first shift occurred between 1988 and 2006; the second shift happened around 2007 when climate change became an issue of national priority in China.

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The context for this latter shift includes not just growing external and internal pressure—for example, from the Chinese public as urban pollution has worsened—but also improved knowledge and growing awareness of the potential effects that environmental degradation can have on social stability and long-term prosperity in China.

As a result, the central government adopted what it termed a "scientific outlook on development" and committed itself to the pursuit of sustainable development in the 11th Five-Year Plan (FYP) (2006-2010). That plan called for the development of a "resource saving, environmentally friendly society," and made four of the eight binding targets environment-related. One of these was to reduce energy intensity by 20 percent during the five-year period. In 2007, China established a National Leading Group on Climate Change, became the first developing country to publish a National Climate Change Program, and issued the Mid- and Long-Term Plan for Renewable Energy, which proposed a goal of increasing the share of non-fossil fuels in the primary energy consumption to 15 percent by 2020.

The year 2009 represented a crucial turning point in China's promotion of LCD. The China Council for International Cooperation on Environment and Development published a groundbreaking report entitled *China's Pathway Towards a Low Carbon Economy.*[4] More important, on November 26, 2009, three weeks before the Copenhagen climate conference, the State Council

announced that China aims to lower its carbon intensity by 40 to 45 percent by 2020 compared with 2005 levels. This goal was to be integrated into China's medium- and long-term development plans.

Thus, while there was no reference to either *jieneng jianpai* (literally, "energy saving and emissions reduction") or *ditan* (literally, "low-carbon") in the 11th FYP, there were seven references to *jieneng jianpai* and nine references to *ditan* in the 12th FYP, which runs from 2011-2015. Moreover, the 12th FYP included three LCD-related binding targets: (1) to increase non-fossil fuels in primary energy consumption to 11.4 percent; (2) to decrease energy intensity by 16 percent; and (3) to reduce carbon intensity by 17 percent.

All but one of the seven main themes and three of the seven priority industries identified in the 12th FYP are connected with LCD. And significantly, in the 12th FYP and other implementing plans, *jieneng jianpai* and *ditan* are integrated with the long-term goal of building a "resource saving, environmentally friendly society." China's increasing political commitment towards LCD is therefore quite firm.

Implementation Mechanisms with Chinese Characteristics

Four types of environmental policy tools are generally used: (1) command-and-control (e.g., banning activities and practices, or requiring the use of a particular technology); (2) economic incentives or market-based mechanisms (e.g., emissions taxes and trading); (3) direct state action and involvement (e.g., subsidies or investment); and (4) education and information.

There is much debate around the world about the pros and cons of each of these four tools. However, the growing consensus is that command-and-control can provide quick results, but usually at high cost because they impose the same standard on all companies regardless of their performance and capability.

Consensus opinion on the second set of tools suggests that these are more flexible and less costly for firms, as they encourage and reward the more able companies to innovate, thus reducing the overall costs of abatement. But these market-based incentives cannot operate without transparent information, which is often lacking in China.[5]

China has relied heavily on the first and third set of tools, but much less on the second and fourth. Two examples of command-and-control measures are the compulsory elimination of inefficient capacity—for example, the elimination of a total of 4.8 million tons of iron making capacity with furnaces of 400 cubic meters or smaller—and the specification of energy-saving targets. For instance, China was expected to achieve total energy consumption reduction of 670 million tons of coal

equivalent (tce) for the 12th FYP. In both cases, the targets were allocated to individual provinces, industries, and key emitters.[6]

In particular, under the "10,000-plus enterprises energy-saving and low-carbon actions" scheme that is designed to save 250 million tce (i.e. 37 percent of the total energy-saving target) during the 12th FYP, auditing was carried out for a total of 16,078 enterprises, 14,542 of which were actually assessed in 2012.[7]

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To ensure meeting these targets, China has developed a unique control system. Since 2006, the central government has incorporated environmental targets into its existing (since 1970s) Cadre Performance Evaluation system and made leading cadres personally responsible for meeting these targets through an "environmental cadre evaluation" system.[8] Strict administrative measures have been used to secure compliance, including the following: approval and registration for key construction projects in areas that fail to meet the allocated targets will be postponed or stopped; enterprises that fail to meet the targets would lose their licenses; enterprise managers and officials in local governments would be held legally responsible for any fraudulent acts in meeting the targets.[9]

China has also experimented with the second type of tools, involving economic incentives and market mechanisms.

To support *jieneng jianpai*, for instance, China has sought to stimulate the growth of registered energy management companies. These companies are exempt from business tax and enjoy 100 percent income tax exemption in the first three years and 50 percent income tax reduction in the fourth to sixth years. Materials and equipment used for the purpose of *jieneng jianpai* are exempt from the value-added tax. The Ministry of Finance allocated 2 billion yuan ($333 million) for this purpose in 2011.[10] Between 2010 and 2014, in five batches, the National Development and Reform Commission (NDRC), China's top state planning body, announced a total of 3,000 such companies. However, a total of only 32 companies have been accused of malpractice and deregistered between 2011 and 2013.[11]

At the same time, by December 2013, China had launched five of the seven designated pilot carbon trading schemes, which are expected to

regulate one gigaton of carbon dioxide (or nearly 10 percent of China's total annual carbon emissions).[12] However, prices in early 2014 varied widely from as much as 80 yuan ($13.33)/ton in Shenzhen to 55 yuan ($9) in Beijing, and around 20 yuan ($3.33) in Hubei. This was attributed to the lack of information: officials divulged the size of the overall caps in most of the pilot markets, but not how the caps were determined, the number of allowances handed out, and what companies had received them, thus "making it hard to understand exactly what is driving prices."[13]

China's use of the third category of tools includes state subsidies and investment in low-carbon technologies.

Over the 12th FYP period, China more than doubled investment aimed at "greening" key economic sectors

Table 1. A Summary of Provincial Level Low-Carbon Pilot Schemes in China

Scheme	Launch date	Responsible government department	Targets
First batch of low-carbon pilot provinces and cities	July 2010	NDRC	8 cities and 5 provinces
Carbon Emission trading pilot programs	June 2011	NDRC	7 cities and provinces
Green and low-carbon pilot small towns	2011	MoF, MoHURD and NDRC	7 small towns
Low-carbon pilot transport systems	2011 & 2012	Ministry of Transport	26 cities
Second batch of low-carbon pilot cities and province	December 2012	NDRC	27 cities, one region and one province (Hainan)
Trials of low-carbon product certification	February 2013	NDRC and CAA	Unknown
First batch of low-carbon pilot industrial parks	May 2014	NDRC and MIIT	55 cities identified
Low-carbon pilot communities	2014	NDRC	1000

NDRC=National Development and Reform Commission; MoF=Ministry of Finance; MoHURD=Ministry of Housing and Urban-Rural Development; CAA=Certification and Accreditation Administration; MIIT=Ministry of Industry and Information Technology.

Source: NDRC (2012; 2013a)

to about $470 billion, compared to $211 billion over the 11th FYP.[14] State-owned enterprises (SOEs) have been encouraged to take a lead in *jieneng jianpai* and *ditan*. However, the most outstanding example of this type of intervention involves the numerous low-carbon pilot schemes that the central government has launched among subnational jurisdictions, mainly cities (see Table 1).

The emphasis here has been on incentivizing local authorities to experiment with low-carbon development. For example, as one of the 16 low-carbon transport systems pilot cities, Qingdao in Shandong province was allowed to undertake 33 projects with a total investment of 18.67 billion yuan ($3.1 billion) during 2012-2014. The investment draws from three sources: central government subsidies, the municipal government (about 40 percent), and enterprises.[15] At a cost of 13 billion yuan ($2 billion), the single largest investment was the construction of a subway for the city.[16]

In its first year (2011), the Special Fund for Energy Conservation and Emission Reduction, administered by the Ministry of Finance and Ministry of Transport, provided prizes and subsidies valued at 948 million yuan ($158 million) for a portfolio of 122 projects (involving a total investment of 8.03 billion yuan [$1.33 billion]).[17]

Despite token symbolism (e.g., Energy Conservation Week), tools in the fourth category—education and information—are only weakly deployed in China. For example, of the 20 countries surveyed by the Pew Global Attitudes Project, the Chinese public was the least concerned with climate change, with only 30 percent of the public considering global warming as a serious problem.[18]

At the same time, the idea of "voluntary simplicity," which encourages individuals and families to adopt a low-carbon lifestyle, is almost non-existent in China.[19] And information on emissions and related issues are treated as state secrets. For example, in Xiamen (another low-carbon pilot city), organizing two international conferences on climate protection apparently required "[a]pproval from three ministries and the NDRC and [was] only obtained shortly before the event."[20]

A Preliminary Assessment of China's Efforts

To some extent, the results of China's unique *jieneng jianpai* system are remarkable. The Energy Saving Target Responsibility System has brought China's energy use elasticity of GDP down from 1.04 during the 10th FYP period to 0.59 in the 11th FYP period. With the exception of Xinjiang, all provincial jurisdictions met their energy-saving target during the 11th FYP period. Indeed, 28 of the provinces exceeded the targets.[21] And during the first two years (2011-2012) of the 12th FYP period, the same system achieved 69 percent of the planned reduction of energy use among the "10,000-plus enterprises" for the entire period.[22]

And yet the picture looks less rosy if China's emissions performance is examined in a global and comparative context (see Table 2).

On the one hand, China's carbon intensity is set to fall by 40-45 percent between 2005 and 2020 according

Table 2. Key Indicators of China's Emissions Reduction Performance

	Per capita emssions as % of world average	KgCO2/GDP as % of world average	Emissions as % of world total	Contribution to annual growth of world emissions (%)
2000	67.5	400	13.7	n/a
2001	65.9	366.7	13.7	14.0
2002	68.3	366.7	14.4	81.7
2003	81.4	400	16.6	54
2004	90.9	433.3	18.5	53.2
2005	95.7	416.7	19.5	48.8
2006	102.1	416.7	20.9	61.5
2007	108.5	383.3	21.6	52.5
2008	108.3	366.7	21.8	30.7
2009	121.3	366.7	14	-415.2
2010	124.5	350	24.7	38.0
2011	132	350	26.2	76.3
2012	140	350	27.1	65.9
2013	144	n/a	27.6	53.3

Source: Global Carbon Project.

to the 12th FYP and it is reportedly responsible for only 11 percent of global historic emissions.[23] On the other, China's absolute emissions and emissions per capita rose by 72 percent and 64 percent, respectively, between 2005 and 2013.[24] The country's emissions in 2013 accounted for 28 percent of the global total, and its contribution to global emissions' annual growth averaged 65 percent between 2011 and 2013. Moreover, China's per capita emissions and carbon intensity were 140 percent and 350 percent, respectively, of the global average in 2012. Recent data suggest that when China reaches "peak carbon" by 2030, its cumulative emissions would total more than twice the amount of US emissions.[25]

All these factors are bound to focus international scrutiny on China. As a recent article points out, "China is now the main decider on the future global temperature and climate of the world, whether it likes it or not."[26]

What makes China's current approach untenable is that achieving the government's climate mitigation goal would still leave the Chinese economy highly carbon-intensive. With high per capita emissions levels, Chinese cities appear to face particularly grave challenges. For instance, three of China's four centrally administered municipalities (Shanghai, Beijing, and Tianjin) all had per capita emissions above 10 tCO2e in 2006.[27]

Looking forward, a recent study shows that a reduction of carbon intensity of 45 percent between 2005-2020 would leave Qingdao—designated as a low-carbon pilot city by the NDRC in 2012—with per capita emissions as high as 13.4 tonnes for 2015 and 17.4 tonnes for 2020, compared with 9.6 tonnes for 2009.[28] This highlights the inadequacy of China's national mitigation target.

But that is not all: China is also falling behind in the development of green technologies, with serious consequences. And this is despite China's massive investment in such technologies: during 2004-2013, for example, China invested $301 billion (18.1 percent of the global total) in renewable power and fuels, on par with the $302 billion (18.2 percent of the global total) invested by the United States.[29]

China is capable of commercializing green products and is the largest exporter of wind turbines and solar panels, yet it is quite weak in green technology innovations and start-ups.

Until 2009, China's share of origins of parent companies of patent assignees (with more than four patents) in six low-carbon sectors (wind, solar photovoltaic, biomass-to-electricity, concentrated solar power, cleaner coal and carbon capture) was never more than 10 percent and typically was only about 5 percent or less, according to a Chatham House study.[30] Moreover, no Chinese

companies or organizations made the top ten in terms of patent ownership across the six clean energy sectors and sub-sectors analyzed.[31]

More recently, China ranked 19th in the 2014 Global Cleantech Innovation Index. It was found to be particularly weak in the area of emerging cleantech innovation, which includes early stage private investment, high impact companies, and environmental patents.[32]

A related fact is that 50 percent of the high value-added and critical components in wind energy production in China were imported.[33] Taken together, all of these caveats about innovation suggest that China is in danger of missing out on a once-in-a-generation opportunity for technological leapfrogging.

Nor have China's efforts on LCD helped its external image on environmental issues. A review of the findings of the Pew Research Center's Global Attitudes Survey since 2008 suggests three interesting features about China's global image.

First, China was the second (after the United States) most-cited country thought to be responsible for the world's environmental problems. Few named China as a country that could be most trusted to address global warming. By contrast, the United States had the distinction of being both the most blamed and most trusted to do the right thing on global warming, according to Pew.

Second, surveys published in July 2009 and June 2010 found that Chinese citizens were the least concerned about global warming, and yet were the most willing to pay for the mitigation of global warming.

Third, a survey in July 2013 found that China's overall soft power was limited, mainly in technology. But surveys in both 2013 and 2014 found that China had significant appeal among young adults around the world.

Survey results suggest that China needs to improve its image on environmental issues.

These survey results suggest that China needs to improve its image on environmental issues, ideally by developing forward-looking new low-carbon and related technologies.

Diagnosis

The above analysis shows that China needs to improve its efforts in LCD, if it wants to reduce its contribution to global emissions growth, narrow the gap with the global average in terms of carbon intensity and emissions per capita, and achieve technological leapfrogging.

Improving China's performance would not only reduce political pressure from abroad, but also help the country to

showcase its "scientific outlook on development" and strengthen its external appeal.

Part of the problem lies in the way that LCD has been framed in China.[34] To date, the emphasis has been placed on *jieneng jianpai*, not LCD, as a long-term national development strategy.

The difference between these two is a matter of both scope and degree: fundamentally, while *jieneng jianpai* is about system improvement, LCD is about system innovation. Thus in China, a central idea is that *jieneng jianpai* can be achieved without major transformation of the system, but LCD cannot.

LCD requires a much more integrated and forward-looking approach, especially in the development of low-carbon technologies.

The distinction is important because while *jieneng jianpai* puts China on the defensive, LCD requires a much more integrated and forward-looking approach, especially in the development of low-carbon technologies.

China's current strategy of linking *jieneng jianpai* with industrial upgrading is sound. But the strategy of linking it with accelerated deindustrialization—more specifically, the proposal in the 12th FYP to raise the share of services to 47 percent or so by 2015—requires more careful consideration, as deindustrialization tends to have a negative impact on economic growth and employment.

At the same time, the lack of private sector participation in China's LCD efforts is likely to have had a negative impact as well. Private firms so far represent just 5 percent of the wind power industry in terms of total grid capacity.[35] China's venture capital investment in renewables during 2011-2013 was only $304 million, compared with $5.2 billion in the United States.[36] This is related to the dominance of SOEs in areas such as energy and infrastructure.[37]

A third problem area involves China's pattern of urbanization.

A striking feature of the Low-Carbon Pilot Cities scheme is that these cities have not attempted to set significantly more ambitious mitigation targets than the national goals. An analysis of the mitigation targets set by the eight first-batch low-carbon pilot cities shows that only two cities (Baoding and Shenzhen) had set more ambitious goals.[38]

Why are Chinese cities so reluctant to set more ambitious emissions targets?

For one, it appears that under the current system, city managers are keener to meet mitigation targets than to find winning solutions for LCD.

Second, there is a limit to which emissions reduction can be obtained without significantly compromising growth targets, as industry-related

emissions typically account for 40 percent of their emissions, with power generation claiming another 40 percent.[39]

Third, the case of Qingdao shows that heavy reliance on industry will not be the only or main barrier to cutting emissions levels in the future. Rather, a key problem will be the rapid growth of transport- and building-related emissions, something that is already locked into China's current infrastructure and urban land use patterns.

An expert study led by the World Resources Institute shows that, under the 2020 45 percent carbon-intensity reduction scenario, the share of emissions from industry and power generation in Qingdao would drop from 49.5 percent in 2010 to 30.5 percent in 2020, while the combined emissions from transportation and buildings would jump from 38.5 percent to 57.7 percent.[40]

Further examination of the Qingdao case shows that the rapid growth in transportation-related emissions is associated with a pattern of low-density urban sprawl in pursuit of world-city status, facilitated by successive cycles of master planning that aggressively sought to expand urban boundaries.[41] To its credit, the government has, at least, recognized this latter problem.

However, Qingdao's situation is not exceptional in China.

A deep decentralization pathway formulated by experts from Tsinghua University and the National Center for Climate Change Strategy and International Cooperation shows that, between 2010 and 2050, electricity and industry-related emissions in China would decline by 88.8 percent and 32.7 percent, respectively. By contrast, transport and building-related emissions would grow by 153 percent and 19 percent.[42] Another study argues, "the existing system of Chinese municipal governance, finance, and planning actually has a detrimental effect on the development of low-carbon urban form."[43]

To put it simply, the pivotal battle for LCD in China will be as much (if not more so) about low-carbon urbanization as it is about deindustrialization.

To put it simply, the pivotal battle for LCD in China will be as much (if not more so) about low-carbon urbanization as it is about deindustrialization. And this fact highlights just how important it will be to shift China's emphasis from tackling industrial emitters toward urban ones.

But this has certainly not been China's approach to date. That is why in the "10,000-plus enterprises energy saving" scheme for Beijing, for instance, industrial firms accounted for a whopping 92 percent of the total number of enterprises monitored while transport firms accounted for a miniscule 1 percent.

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Fixing China's Strategy

There can be no denying that China has made strides toward *jieneng jianpai*: its approach is broad-based, well integrated into official development concepts, and embedded in the country's current development framework. What is more, China has taken advantage of a unique system of effective top-down administrative control to implement its goals and mobilize local authorities.

That said, gaps exist between what China has managed to achieve under the present system and what the world expects China to achieve, not to mention what China must achieve in order to rise to the challenge of technological leapfrogging in LCD.

Photo: Flickr/Department of Energy

This memo argues that, to narrow such gaps, it will be necessary for China to re-think its LCD strategy, or rather the lack of one. Elements of such a re-think should include the following.

First, LCD should be made a national development strategy in the medium and long term, incorporating unambiguous and absolute mitigation goals. Doing so would be compatible with the "scientific outlook on development" and with the stated effort to achieve a "resource saving and environmentally friendly society."

Such an approach would also elevate the importance of developing low-carbon technologies, which in turn will be critical for perceptions of China in the world. The point is, to be a global leader in this area, China must become a leader in developing the low-carbon technologies of tomorrow. In particular, China needs to urgently update its Medium- and Long-Term Science and Technology Plan, which was formulated in 2006 and was devoid of any mention of *ditan*.

Second, the current policy regime relies much too heavily on a command-and-control approach. It should be complemented by a greater role for market-based tools.

To enable this, there should be more openness about emissions data and greater reliability of such data. The public disclosure on emission inventories by organizations, cities, and provinces in China should be made

mandatory in the forthcoming Climate Change Law. This would encourage greater participation by the private sector and the public in LCD efforts.

Third, within industries, more emphasis should be placed on green innovations, rather than deindustrialization. The close link between manufacturing and innovation must be recognized and exploited. A recent report on clean technologies[43] points out that: "High-carbon companies control some of the key knowledge assets needed for the low-carbon economy. Seven out of the top 20 owners of cleaner coal patents are from the steel sector."

China must build on its strong manufacturing base if it is to achieve true technological leapfrogging.

Since almost every developed country is attempting to reindustrialize to take advantage of the new generation of low-carbon technologies, China must build on its strong manufacturing base if it is to achieve true technological leapfrogging. The emphasis should be on encouraging enterprises to innovate so as to comply with regulations and to gain global competitiveness, rather than forcing them to close down and thus take the easy way out.

Fourth, future mitigation efforts should shift from mandated deindustrialization to compact urbanization.

New means of emissions reduction must be found to control the growth of transport- and building-related emissions in the future. Guidelines governing city master plans need to be reviewed to reduce transport- and building-related emissions and to effectively encourage compact urban development. In particular, local authorities should be discouraged from expanding urban boundaries and be incentivized to pursue denser land use patterns, possibly by taxing away land leasing fees in outlying and sparsely populated areas.

Fifth, the private sector and civil society need to be given a greater role in LCD.

Current subsidy regimes discriminate against the private sector. These practices should be ended and the private sector incentivized to actively participate in LCD. Private enterprises in China have achieved much and operate more effectively than do many SOEs. The lesson of that experience must be learned and acted upon.

At the same time, China needs a greater effort to educate and influence the Chinese public in terms of the value of LCD. Citizens should be encouraged to monitor the performance of LCD in their cities and towns.

Sixth and finally, China should link its LCD strategy with its "going global" strategy and actively champion LCD abroad.

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China has carefully relied on its two-pronged argument on climate change—first, that developed countries are responsible for causing global warming so they should take a leadership role; and second, that China is nonetheless acting responsibly on climate change. But given its growing political commitment, China's pronouncements at the global level are ironic.[45] Its line of argument does little to boost China's external image.

As a rising power with a professed interest in strengthening its soft power, China should adopt a stronger and more persuasive rationale for LCD. China seems to offer a powerful combination: the vision to develop a greener economy, real progress in developing a low-carbon economy, and, ultimately, perhaps establish leadership in green technologies.

The fact that China finds it challenging to pursue LCD at home should not stop Beijing from seeking active leadership in this area abroad. Indeed, the pursuit of international leadership may help China to see more clearly the direction that it needs to take in confronting the difficult challenges of executing LCD.

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