Understanding China’s Innovative Development

Five Year Plan 2021-25
and global business implications

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International and Independent China Strategist

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Global Geopolitical Context: US and EU
China has become the centre of global supply and value chain.

Top 10 countries by share of global manufacturing output in 2018:

- China: 28.4%
- United States: 16.6%
- Japan: 7.2%
- Germany: 5.8%
- South Korea: 3.3%
- India: 3.0%
- Italy: 2.3%
- France: 1.9%
- United Kingdom: 1.8%
- Mexico: 1.5%

* Output measured on a value-added basis in current U.S. dollars.

Shares of US and China in global industry value-added (current prices):

- China: 28.7%
- US: ...%

Source: National Accounts Database, United Nations.

China’s rare earth monopoly is diminishing:

- Known reserves of rare earths (in tonnes):
  - China: 84,980,000
  - India: 8,000,000
  - Australia: 6,440,000
  - Brazil: 12,000,000
  - Vietnam: 9,000,000
  - United States: 3,400,000
  - Russia: 3,000,000
  - Myanmar: 2,000,000
  - Others: 4,500,000

But still substantial.
China surging ahead in 21st Century Tech Trends

Mind-Blowing Tech Trends to 2030

<table>
<thead>
<tr>
<th>ENABLERS</th>
<th>FOUNDATION</th>
<th>DISRUPTORS</th>
<th>NEXT HORIZON</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGITAL EXPERIENCE</td>
<td>BUSINESS of TECHNOLOGY</td>
<td>DIGITAL REALITY</td>
<td>AMBIENT EXPERIENCE</td>
</tr>
<tr>
<td>From Channel to Human Centered design</td>
<td>Reengineering “capital T” Technology</td>
<td>Reimagining Engagement</td>
<td>Transparent, Ubiquitous Interfaces</td>
</tr>
<tr>
<td>ANALYTICS</td>
<td>RISK</td>
<td>COGNITIVE</td>
<td>EXPONENTIAL INTELLIGENCE</td>
</tr>
<tr>
<td>Data Management, Architecture, Insights</td>
<td>Cyber, Regulatory, and Ethics</td>
<td>Predict, Prescribe, Augment, and Automate</td>
<td>Symbolic, Deep, and Broad Reasoning</td>
</tr>
<tr>
<td>CLOUD</td>
<td>CORE MODERNIZATION</td>
<td>BLOCKCHAIN</td>
<td>QUANTUM</td>
</tr>
<tr>
<td>Flexibility and Ubiquity</td>
<td>Reshaping the Heart of the Business</td>
<td>Distributed Trust and Assets</td>
<td>Exponential Computation</td>
</tr>
</tbody>
</table>

5G connections, in billions

(Source: Deloitte Tech Trends 2020-2030; Redrawn by Frank Feather 2020 At-Future.Net)
Global growth gravitating towards China-centric Asian Century

WEF 2019 - Asian economies 2020 > Rest of World, first since 19th Century

124 countries have China as largest trading partner vs. 56 for the US.

Intra-Asian trade and trade between Europe and Asia > respective trade with US

RCEP world’s largest FTA – 15 nations with combined population (2.2 billion) + GDP ($26.2 T) = 1/3 world, 50% of world manufacturing even absent India; 90% tariffs eliminated within 20 years

* India has not yet agreed to join the RCEP
China’s Belt and Road Global Reach

More than 160 countries and international organizations with 190 cooperation agreements signed.
Palpable fear of waning American global dominance

Top three countries by economic dominance

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>China</th>
<th>Germany</th>
<th>Japan</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1870</td>
<td>16.4</td>
<td></td>
<td>9.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>18.6</td>
<td></td>
<td>8.0</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>13.3</td>
<td></td>
<td>12.3</td>
<td>6.9</td>
<td>6.3</td>
</tr>
<tr>
<td>2030 Forecast</td>
<td>18.0</td>
<td></td>
<td>10.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Weighted by share of world GDP, trade and net capital exports

Source: Arvind Subramanian
China Scare drives frenzied bipartisan across-the-board pushback

We do not offer a constricting belt or a one-way road

Substantial decoupling unrealistic

US sanctions on Xinjiang human rights

Support the Hong Kong Human Rights and Democracy Act

U.S. - CHINA TECH WAR: CAN HUAWEI SURVIVE?

Statista

Negative Views of China Rise Sharply

McCarthyism and the Red Scare
Clash of Great Powers to continue and intensify

• Secretary of State Antony Blinken: “US-China relations will be competitive when it should be; collaborative when it can be; and adversarial when it must be”.
• Anti-China strategy shifts from scotched-earth decoupling to targeted “Smart Garden, High Fence”
• Is there a realistic American “China Strategy” with achievable end-goals or just a bipartisan posture?
Semiconductor and other de-coupling wars

- Race to more and more compact high-end chips (< 5 nm)
- Extreme ultraviolet (EUV) lithography (7nm and below) now 5nm dominated by Taiwan’s TSMC while Netherlands’ ASML sole global provider of EUV machines
- China’s Achilles Heel – SMIC able to produce chips using 14-nanometre process
- Moore’s Law limit? – no. transistors in circuit doubles every 2 years
- Biden orders 100-day review of US supply chain vulnerability
  - @average large company > 5,000 suppliers across global tiers
  - In 2019, 4/6 new semiconductor plants based in China, none in US.
  - US produces only 28% of domestic active pharmaceutical ingredients
  - TSMC to open a plant in Arizona.
  - Other bottlenecks - technology development, food production, transport and energy, public health and biological products
  - No ‘magic bullet’ for reliance on China and other countries
Demonization of China continues apace

China’s “debt-trap diplomacy”
China is funding dual-use infrastructure projects from the Pacific to the Horn of Africa, fuelling “debt traps” that will give Beijing leverage to gain strategic and military power.

1 Vanuatu: Beijing has provided US$54 million loan to build 360-metre wharf at Luganville and US$47m to expand Bauerfield International Airport. Both projects can double as military bases.

2 Myanmar: China is building $7.3 billion deep sea port and $2.3bn industrial park at Kyauk Pyu.

3 Sri Lanka: Struggling to pay its $8bn debt to Chinese state-controlled firms. Sri Lanka hands over $1.3bn strategic port of Hambantota to China.

4 Pakistan: China is constructing major port facilities at Gwadar as part of Beijing’s $62bn Belt and Road investment in Pakistan, mostly in loans. Pakistan’s external debt already stands at $82bn.

5 Djibouti: Home of China’s first overseas military base. China has taken over Djibouti’s container terminal and is lending $660m for infrastructure development. Djibouti hosts strategic U.S. and French military bases.

Source: Center for Global Development
Picture: Getty Images
© GRAPHIC NEWS

Debt trap on China’s new “Silk Road”
China’s “Belt and Road Initiative” (BRI) is reportedly burying some countries under massive debt. Of the 68 countries involved, eight are vulnerable to debt distress, owing almost $18 billion to Beijing.

DEBT RISK BY COUNTRY
Figures show debt to China (D $ millions)

- High
- Significant
- Low

<table>
<thead>
<tr>
<th>Country</th>
<th>Debt to China (D $ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tajikistan</td>
<td>1,197</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>1,483</td>
</tr>
<tr>
<td>Mongolia</td>
<td>3,046</td>
</tr>
<tr>
<td>Laos</td>
<td>4,186</td>
</tr>
<tr>
<td>Montenegro</td>
<td>200</td>
</tr>
<tr>
<td>Djibouti</td>
<td>1,200</td>
</tr>
<tr>
<td>Maldives</td>
<td>240</td>
</tr>
<tr>
<td>Pakistan</td>
<td>6,029</td>
</tr>
</tbody>
</table>

President Xi Jinping denies Beijing is engaging in “debt diplomacy”

GOVERNMENT GROSS DEBT (% of GDP)
IMF forecast for 2018

<table>
<thead>
<tr>
<th>Country</th>
<th>Debt (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maldives</td>
<td>89.0</td>
</tr>
<tr>
<td>Mongolia</td>
<td>87.5</td>
</tr>
<tr>
<td>Djibouti</td>
<td>80.9</td>
</tr>
<tr>
<td>Montenegro</td>
<td>70.3</td>
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<tr>
<td>Laos</td>
<td>67.6</td>
</tr>
<tr>
<td>Pakistan</td>
<td>65.5</td>
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<tr>
<td>Kyrgyzstan</td>
<td>56.8</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>56.8</td>
</tr>
</tbody>
</table>

Source: Center for Global Development
Picture: Getty Images
© GRAPHIC NEWS

BRI = “New Silk Road” announced by Xi in 2013 – envisions construction of railways, roads and ports across globe, with Beijing providing billions of dollars in loans to many countries.

Source: Bloomberg, Lowy Institute, U.S. Naval Institute
Picture: Getty Images
© GRAPHIC NEWS
**Hype and reality**

- Recent survey by [Washington-based Centre for Global Development headed by Larry Summers](http://www.cgdev.org)
- “Only 8 out of 68 B&R borrowers are debt-distressed”
- “The majority of BRI countries will likely avoid problems of debt distress due to BRI projects”

**China-Africa Research Initiative at Johns Hopkins University**: 1,000 Chinese loans in Africa 2000-2017 > $143 billion; [Boston University’s Global Development Policy Centre](http://gdpcenter.bu.edu) - Chinese loans to Latin America and the Caribbean since 2005, both **no evidence of “predatory lending”** – Deborah Brautigam, John Hopkins University

**Sub-Sahara Africa data – China lending miniscule**

**The wrong road**

Belt-and-road countries identified as dangerously indebted by the Centre for Global Development Debt as % of GDP, 2018 estimates

- Public debt (excluding to China)
- Existing debt to China
- Expected additional debt to China, 2024 forecast

<table>
<thead>
<tr>
<th>Country</th>
<th>Public Debt (excluding China)</th>
<th>Existing Debt to China</th>
<th>Expected Additional Debt to China, 2024 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Djibouti</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Mongolia</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Montenegro</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Laos</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Tajikistan</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Maldives</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Sources: Centre for Global Development; World Bank; IMF; Economist Intelligence Unit
Nikkei Asian Review, 29 August, 2018

“The country's accumulated foreign debt is estimated at $55 billion. Chinese lenders hold 10% of this total, Japan accounts for 12%, the Asian Development Bank 14% and the World Bank 11%.

Sri Lanka's mounting burden has earned it some notoriety, with some observers saying the country is falling into a debt trap of Chinese design. This view gained currency last year, after $1.1 billion in debt was written off in exchange for a long-term lease on the deep-water port of Hambantota, near the southern tip of Sri Lanka. Chinese loans worth $1.5 billion were used to build the port, the lease to which is held by a state-owned Chinese company.”

But Sri Lanka is by no means most indebted to China

Sri Lanka’s external debt service payment (in billions of dollars)

As of June 2018; commercial excludes debt service payments of foreign investments in Treasury bills and Treasury bonds

Source: Central Bank of Sri Lanka
Chinese premier Li Keqiang, visiting December 2014, pushed for a multi-party agreement with Macedonia, Serbia and Hungary to set up a ‘China-Europe Land-Sea Express’ (中欧陆海快线) to facilitate shipping of goods from Greece to Hungary (and further on to western Europe).

Amounting to 10 billion Euro, the China-CEE Fund, incorporated in Luxemburg, is sponsored by Export-Import Bank of China and Hungarian Export-Import Bank.

Six countries account for 95 percent of 16+1 investment

Source: Liu Zunkui's compilation based on data from the Ministry of Commerce of the People's Republic of China and the National Statistics Bureau
Italy bets on becoming European hub for Maritime Silk Road

500 billion euro plan for Trans-European Transport Network (TEN-T)
• Lithuania notifies departure from 16+1
• BJ woos staunch supporters Poland, Hungary, Serbia and Ireland
• Real benefits will decide support
EU : China a “Strategic Competitor” requires across-the-board constructive engagement

STRENGTHENING EU-CHINA CONNECTIVITY

The EU’s Strategy on Connecting Europe and Asia provides a basis for confident engagement with EU’s partners, enabling the Union to seek possible synergies with China in different areas, on the basis of international norms and standards.

The key principles of EU’s engagement on connectivity are sustainability, transparency, open procurement and level playing field.

The EU-China Connectivity Platform aims at promoting sustainable transport corridors based on the principles of the Trans-European Transport networks policy.

FOREIGN AND SECURITY POLICY

EU-China cooperation was a major factor in first securing the Iran nuclear agreement and now in ensuring its full and effective implementation.

The EU and China work towards fighting global challenges and tackling difficult situations in our respective neighbourhoods. The EU wants to work more closely with China to promote peace and security, for example in Afghanistan.

The EU and China agree that the denuclearisation of the Korean Peninsula is essential to ensure stability in the East Asia region and beyond. The EU seeks a regular and substantial dialogue with China on disarmament and non-proliferation issues.

The EU wants to further build on cooperation with China on peace-keeping and security and defence matters in Africa. EU and Chinese coordinated approaches to counter-terrorism operations in the Gulf of Aden and off the Horn of Africa have increased security of shipping in those areas.

RULE OF LAW, HUMAN RIGHTS AND GLOBAL GOVERNANCE

EU-CHINA HUMAN RIGHTS DIALOGUE: The EU will continue to work with China and its people to promote human rights and to foster the rule of law and civil society. A dedicated human rights dialogue is held on an annual basis.

SUPPORT FOR GLOBAL STANDARDS AND INSTITUTIONS, EFFECTIVE MULTILATERALISM: The European Commission on China play a more active role in the WTO and other multilateral initiatives, in particular strengthening the open, rules-based international trading system. The Joint EU-China working group on WTO reform was established in 2018.

CLIMATE CHANGE, ENERGY AND RESOURCE EFFICIENCY: Based on the Paris Agreement, the EU and China are reinforcing their climate-related cooperation to advance the international climate negotiations process and in areas like carbon markets, long-term development strategies, clean energy and energy efficiency, low emission transport and cities.

COOPERATION IN THE CYBER AREA: The annual EU-China Cyber Taskforce is an opportunity to exchange views in areas such as governmental structure and strategy, norms of responsible State behaviour in cyberspace and cyber confidence building measures.

OCEAN GOVERNANCE: The EU and China signed in 2018 an ocean partnership agreement as means to improve the international governance of the oceans in all its aspects, including by combating illegal fishing and promoting a sustainable blue economy.
The China Dream
Reality check – “Unstable, Unbalanced, Uncoordinated, Unsustainable”

- Inequality
- Ecological degradation
- Suppression of dissent
- Ethnic unrest

Aging demographics
Middle-income trap
Energy security
The Thucydides Trap

Box 1 Figure: Few countries escape the middle-income trap

<table>
<thead>
<tr>
<th>Country</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>10000</td>
<td>12000</td>
<td>14000</td>
</tr>
<tr>
<td>Iran</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
</tr>
<tr>
<td>Jordan</td>
<td>8000</td>
<td>9000</td>
<td>10000</td>
</tr>
<tr>
<td>Malaysia</td>
<td>11000</td>
<td>13000</td>
<td>15000</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>17000</td>
<td>19000</td>
<td>21000</td>
</tr>
</tbody>
</table>

Legend:
- Argentina
- Iran
- Jordan
- Malaysia
- United Arab Emirates

Map: Gulf of Oman

- Strait of Hormuz
- Oman
- United Arab Emirates
- Iran

Map: The Thucydides Trap

- Strait of Hormuz
- Oman
- United Arab Emirates
- Iran

Suppression of dissent
- End suppression of China human rights lawyers
CCP has proven its legitimacy and resilience for China

• Harvard Kennedy School Ash Center report - Under CCP stewardship, the country and lives of 1.4 billion Chinese people miraculously transformed. 800 million lifted out of poverty, accounting for 70% of the world total. The CCP government most supported by people, multiple ranks above US.

• Quincy Institute for Responsible Statecraft – China Scare overblown. China unlikely to amass enough global power to supplant US dominance in key domains including military reach, technological lead, financial depth, and ideological appeal. Nor is China bent on overturning the existing global order or changing other countries’ regimes.

• China has 56 ethnic groups, 23 provinces, 5 autonomous regions, 4 national municipalities, and 2 special administrative regions, at different levels of development. Western multiparty adversarial democracy hardly fits the bill.

• China Dream envisages a more equitable and democratic country. Democracy to achieve the greatest good for most of the people. China X stick to America’s “one-taste-for-all Coca-Cola formula” (China’s Foreign Minister Wang Yi)
China’s Renaissance

The Two Centenary Goals

- Building a moderately prosperous society in all respects in celebration of the CPC’s centenary in 2021.
- Turning China into a modern socialist country that is prosperous, strong, democratic, culturally advanced, and harmonious in celebration of the People’s Republic of China’s centenary in 2049.
UK Centre for Economics and Business forecasts China’s economy to overtake US by 2028, 5 years earlier due to Covid-19. For 18 out of the past 20 centuries, China’s economy had been the largest in the world. (Lord Patten)

Prof. Angus Maddison, Contours of the World Economy, 1-2030 A.D., Oxford University Press, 2007


- Han dynasty 汉朝 206 BC – 220 AD 26% of global GDP; economic centre of eastern world vs Roman Empire in western world.

- Tang Dynasty 唐朝 618 – 907 AD 58% of world GDP vs 2nd Eastern Roman Empire 9%; 3rd Arab Empire 7%; 4th Ancient India 7%.

- Song Dynasty 宋朝 960-1279 AD At its height, 80% of world’s GDP but declined midway

- Yuan Dynasty 元朝 1271-1368 AD 30% -35% of world GDP

- Ming Dynasty 明朝 1368–1644 AD 45- 55% of world GDP but late Ming Dynasty rapidly declined with famine and war

- Qing Dynasty 清朝 1644-1922 AD 35% -10% of World GDP (to 5% by 1950)

• As early as 1078, China was the world’s major producer of steel (125,000 tons); vs Britain in 1788 produced 76,000 tons.

• China was the world’s leader in technical innovations in textile manufacturing, seven centuries before Britain’s 18th century “textile revolution”.

• China was the leading trading nation, with long distance trade reaching most of Southern Asia, Africa, the Middle East and Europe. China’s ‘agricultural revolution’ and productivity surpassed the West down to the 18th century.

• Its innovations of paper, book printing, firearms and tools led to a manufacturing superpower whose goods were transported throughout the world by the most advanced navigational system.

• China possessed the world’s largest commercial ships. In 1588 the largest English ships displaced 400 tons, China’s 3,000 tons. Even as late as end of 18th century China’s merchants employed 130,000 private transport ships, several times that of Britain. China retained this pre-eminent position in the world economy up until early 19th century.

• China’s stable paper money economy, manufacturing and high yields in agriculture resulted in China’s $@ income matching that of Great Britain as late as 1750.

• In 1820, China’s economy was 6 x Britain’s, then largest in Europe — and almost 20 x GDP of the still-fledgling US.
Era of Innovative Competition
An era of new paradigm shifts

10 themes for the next 10 years

1. Peak globalization
2. Recession
3. Quantitative Failure
4. Splinternet
5. Moral Capitalism
6. Smart Everything
7. Space

Source: Bank of America
Fourth Industrial Revolution

1. Digitization / Integration of value chains
2. Digitization of product and service offerings
3. Digital business models and customer access

1.0 1760-1840 Steam Engineering
2.0 1830s-1915 Assembly Line
3.0 1969-2010s Computing / Internet Nuclear Energy
4.0 2010s-2040s Internet of Things

Cloud Computing
Mobile Devices
IoT platforms
Augmented Reality
Location detection technologies
Advanced human-machine interfaces
26
Brave new world of emerging 21st century technologies

- Population Health Analytics
- Wearable Sensors
- Augmented / Virtual Reality
- Wellness Gamification
- Robotic Care
- Electroceuticals
- Advanced Materials
- 3D Printed Drugs
- Nanorobotics
- 3D Bioprinting
- Brain-Computer Interface
- Medical Tricorder
- Digital Avatars
- 3D Printed Medical Devices
- Enhancement Prosthetics
- Surveillance Tools
- Artificial Intelligence
- Precision Medicine
- Embedded Sensors
- Bio-printed Sensors
- Quantum Computing
- Regenerative Medicine

*Bars represent the horizon for technology commercialization and maturation

Source: Frost & Sullivan
Five Year Plan 2021-25
and associated strategies
Five Year Plan 2021-25 - Changing course

Dual Circulation

- Increase the role of the consumer
- Technological advancement
- Higher-end manufacturing and services
- HK & China’s Free Trade Zones
- Further trade integration
- Economic reforms and liberalization
- Capital account opening
- Renminbi internationalization

Major targets of China’s 14th Five-Year Plan (2021-25)

1. Keep major economic indicators within an appropriate range
2. Above 7% annual growth in research & development spending
3. Keep urban unemployment rate within 5.5%
4. Raise urban residents to 65% of the population
5. Increase life expectancy of Chinese citizens by 1 year
6. Promote green development
7. Promote the high-quality development of the Belt and Road
8. Usher in new stage in building a Peaceful China

- Dual Circulation
- Indigenous Innovation
- Domestic consumption
- Managed opening-up
- Green economy
- Fairer society
- Proactive foreign relations

Source: Scotiabank Economics
China catching up with the West

- China excels in applied research but lags behind in basic research and private-sector-driven original inventions.
- However, NATURE, world-renowned scientific journal, hails China’s lead in chemistry research (May, 2021)
Made in China 2025 remains against Western headwinds

- Total R & D expenditure to grow > 7% p.a. emphasizing basic research.
- Seven key areas to lead by 2035—AI, quantum information, integrated circuits, brain sciences, genetics and biotechnology, clinical medicine and health care, and deep earth, sea, space and polar exploration
- To invest $1.4 tn through PPPs in 5th generation 5G networks, Cloud Computing, AI software, autonomous vehicles, automated factories, and the Internet of Things (IoT).
- Huawei uses own HarmonyOS system in lieu of Android
- Huawei’s cloud-based full-spectrum services to the developing world, notwithstanding security, operational, financial and geopolitical issues.
- Green energy a high priority – environment and energy security
Sci-Tech Innovation 2030 + China Standards 2035

China’s plan for science and technology development

By research areas

- **Computing**
  - By 2020
    - 14nm process chip
    - Independent chip industry chain
    - World-leading supercomputers
  - By 2030
    - 7nm process chip
    - Quantum computer (prototype)
  - By 2035 (Prediction)
    - 5nm process chip
    - Quantum computer

- **Internet infrastructure**
  - By 2020
    - Commercial 5G
    - Commercial gigabit internet connection
  - By 2030
    - Global coverage and integration of satellite, mobile and ground networks
    - National big data exchange standards
    - Better network safety
    - Quantum network
  - By 2035 (Prediction)
    - Market leader in 6G mobile network
    - Ubiquitous optical network
    - Commercial quantum-based network encryption

- **Space exploration**
  - By 2020
    - Heavy rocket
    - Next-generation spacecraft
    - Earth observation system
    - BeiDou navigation
    - Landing on far side of Moon
    - Reaching Mars
  - By 2030
    - Key breakthroughs in rocket engine
    - Self-repairing satellite
  - By 2035 (Prediction)
    - Manned Moon project
    - More Mars projects

- **Power**
  - By 2020
    - Deep sea oil platform
    - CAP1400 nuclear power plant
  - By 2030
    - Clean coal technology
    - Smart power grid
  - By 2035 (Prediction)
    - Hydrogen fuel

- **Life and biotech**
  - By 2020
    - Genetically modified food
    - Control spread of AIDS and hepatitis
  - By 2030
    - Precision medicine
    - Better control of contagious diseases
  - By 2035 (Prediction)
    - Modernization of Traditional Chinese Medicine (TCM)

 .......... influencing how the next-generation of technologies, from telecommunications to artificial intelligence, will work.
Productivity jump: high-speed rail, urbanization, demographics, digitization, automation

- “2035 Vision” to nearly double 36,000-km high-speed rail, > 2/3 global total, to 70,000 km over 15 years, to link up all cities over ½ million people.
- Extra 200,000 km (124,274 miles) railway to link all towns of 200,000 people.
- Even remotest parts of nation to be connected.
- Urbanization rate to be increased from 60.6% in 2019 to 65%, doubling consumer middle class to 800 million by 2035.
- Hukou household registration system will be reformed to turn more migrant workers to urban residents.
- China already lifted > 800 m people out of poverty > 60% of global total. Remainder out of poverty line $2.30 @day > World Bank’s threshold of $1.90.
- Universal compulsory schooling, matching average high-income countries; almost universal access to electricity and safe drinking water. Child mortality rate has plummeted, according to UN.
- To address aging demographics, 3-Child Policy announced 31.5.21. with child & maternity care support and birth insurance.
- Statutory retirement age to ease in “a phased manner”. (Men currently can retire at 60, and female factory workers as early as 50. Female public-sector and white-collar workers can retire at 55.)
- Robotics reduces unskilled labor.
- Virtual work mitigates costs of housing and transport
- State share of economy reducing.
- Market-oriented reforms including foreign investments to extend to energy, railway, telecommunications, and public utilities sectors.
- New opportunities in health, elderly care, childcare, culture, tourism, sports, housekeeping, property, public welfare, and basic service industries.
- Labor productivity growth expected to outpace overall GDP growth.
City Cluster Strategy – some cluster economies larger than certain European nations

A clustering approach can help companies target consumers more effectively in Chinese cities, some of which are economically larger than entire European countries.

2010 GDP for urban clusters in China vs selected countries, $bn (US)

- Shanghai: 2,527
- Switzerland: 2,127
- Tokyo: 1,475
- Belgium: 1,049
- Shandong: 418
- Norway: 413
- Austria: 318
- Guangzhou: 367
- Denmark: 310

Source: The Economist Intelligence Unit
A greener China with leading smart-city technologies

- Peak carbon emission by 2030 and carbon neutrality (net zero emission) by 2060. By 2025, China to reduce energy intensity by 13.5% from 2020 levels, and carbon intensity by 18%. Share of non-fossil sources in its energy mix to “around 20%”.

- National Bureau of Statistics: coal provided only 56.8% of total energy consumed in 2020, a historic low.

- Carbon emission to peak around 2025, followed by a plateau and then a sharp decline. By 2035, a further 20% reduction. By 2050, more than a 70% reduction, leading to carbon neutrality by 2060.

- Coal use will taper off after 2025, with the usage of natural gas peaking at that time and oil consumption peaking around 2030. Contribution of renewables and nuclear power will reach 25% by 2030, rising to 80% by 2060.

- China has become a leader in smart city technologies of Internet of Things, like networked cameras, sensors, and location services—to harvest big data for better traffic, energy usage, and crime management. and to augment state power.

- Already the largest car market, China mandates at least 40% electric cars by 2030 and full replacement of gas-burning vehicles by 2035, becoming the world’s largest nation of electric cars.

- Embrace of greener future is also dictated by geopolitical choke points (Malacca Strait, Hormuz etc) threatening its global energy transit routes – Hence China’s pivot to Eurasian overland pipelines through Belt and Road.
China introduces digital sovereign currency
Advances in space explorations

Tianwen-1 on Mars, 15 May, 2021

Chang’e 3 – far side of Moon, January, 2019

China’s first female astronaut Liu Yang, 2012

Experimental space lab 2016

First space walk, 2008

Space station on track for 2022 with core module launched early 2021

Achievements of China’s space program since 18th CPC National Congress

- **Deep Space Exploration**
  - 2014/11: China achieved success in the reentry and landing flight test of the second-phase lunar exploration engineering.
  - 2013/12: The Chang’e-3 lunar probe made a soft landing on the extraterrestrial body, a first for a Chinese spacecraft.
  - 2012/12: The Chang’e-2 lunar probe made a successful trip over the asteroid Toutatis.

- **Manned Space Flight**
  - 2016/09/15: The Tiangong 2 space lab is successfully launched into orbit.
  - 2015/09/11: The Shenzhou 11 is successfully launched into orbit.

- **Navigation Satellites**
  - 2017/09/11: A Chinese-developed regional jammer, which has the Beidou navigation system installed, has successfully completed a test flight.
  - 2012/12/27: A Chinese satellite began providing services to users in the Asia-Pacific region.

- **Space Transport System**
  - 2017/03/03: Long March 5 is first launched.
  - 2016/03/26: New carrier rocket Long March 7 is first launched.

- **Space Telemetry**
  - 2016/09/07: China has FAST, the world’s largest single-dish telescope, which is completed and opened for operation.

- **Cooperation**
  - China has signed 43 space cooperation agreements or MOUs with 39 countries, 5 space agencies, and international organizations.
Vast business opportunities amidst spectrum of bilateral relations

- Largest trading partner of 124 nations worldwide.
- The Belt and Road has covered 160 countries and international organizations.
- Soon to become the world’s largest economy.
- 800 million middle class by 2035.
- World’s largest ubiquitous e-commerce and e-payment systems.
- 36,000-km high-speed rail (> 2/3 global total) to 70,000 km over 15 years, linking up all cities and towns.
- Leading in hydro, solar and wind installed capacities.
- World’s largest EV market just starting to grow
- > 8-9 m university graduates every year, > US and India combined. ~ 45 m in 2018. > 40% in STEM.
- Second only to US in scientific publications, while climbing up global leading university rankings
- Leapfrogging in 5G, AI, Big Data, IoT, quantum computing, biotechnology, and space exploration.
- Numerous modern and smart cities.
- Notwithstanding warts and all, a country on the move – daring to invent the future x clinging to the past; not as demonic or an existential threat as it is made out to be.
Prominent international and independent China Strategist. Over 40 years’ experience in senior Hong Kong Government positions. China Futures Fellow, Massachusetts Berkshire Publishing Group; Brain Trust Member, IMD Lausanne Evian Group; Gerson Lehrman Group Council Member; Thomas Reuters Expert; Senior Analyst with Wikistrat. Elected Member, Royal Society for Asian Affairs. Advisory Board Member, e-Centre, European Centre for e-Commerce and Internet Law. Think-tank Research Fellow, Beijing Normal University, Zhuhai Campus. Visiting Professor, London Metropolitan University Business School. Honorary President, China Hong Kong Economic and Trading International Association. Formerly Governing Council Member, King's College London; Advisory Board Member, China Policy Institute of Nottingham University; Visiting Professor, Sun Yat-sen University Business School (2005-10). In the 1980s, oversaw Hong Kong’s industrial transmigration into Mainland China and helped launched Quality Campaign and Technology Centre. Invited by US government to month-long visit to brief Fortune 50 CEOs personally, including one-on-one with Steve Forbes of Forbes Magazine, on China post-1989. In 2002, invited by Prince Andrew for a private briefing leading to HRH’s first visit to China as UK’s Ambassador for Trade and Investment. Advised on cross-cultural management in Lenovo's take-over of IBM Computers. Invited as Editor-at-large for an international consultancy on China's energies. Regular contributor, commentator, and speaker on China at conferences and on live television with dozens of media channels worldwide. He also spoke at St. George's House, Windsor Castle, and featured in a National Geographic TV documentary. Topics include trade, finance, economics, energies, geopolitics, international relations, science and technology, sustainable industrial development, and green cities. Graduate qualifications from University of London, postgraduate qualifications from Cambridge University, PMD from the Harvard Business School, and solicitors' qualifying examination certificate from the Law Society, London. Included in UK's Who's Who since 2002. Awarded Silver Bauhinia Star (SBS) in July 2005 Hong Kong Honors List.