Political Steering Processes in China in Core Segments of Photonics Industry

EAC Study

PHOTONICS21

Photonics Partnership Annual Meeting 2024 – 15. May 2024 in Brussels

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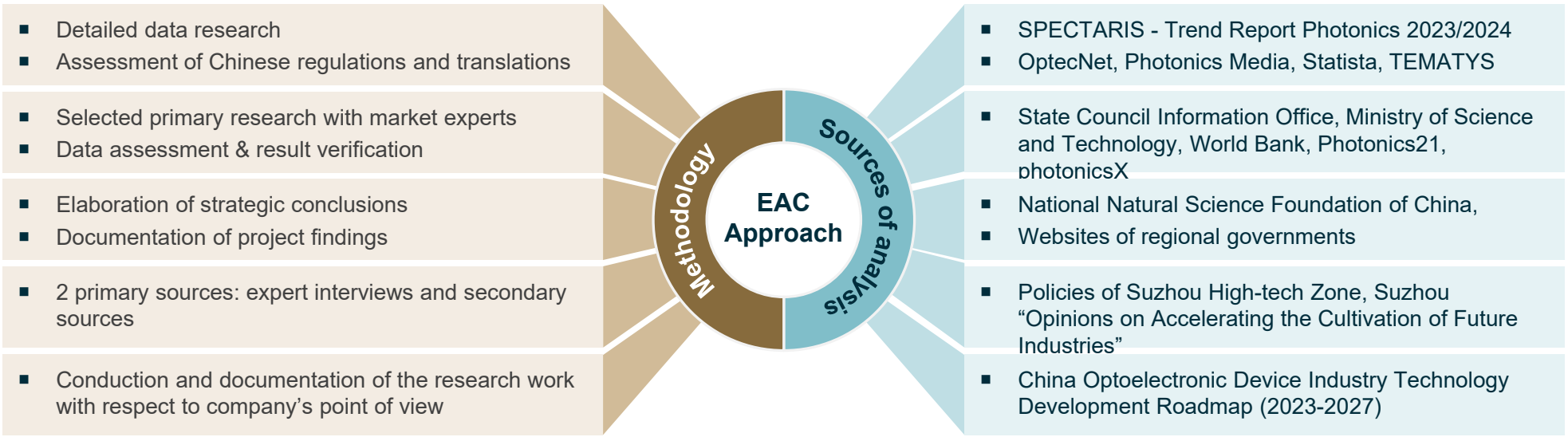
EAC PHOTONICS STUDY 2023: METHODOLOGY

Main target of the study is to understand political steering and funding in Chinese photonics industry – EAC elaborated results upon primary and secondary research tools at EAC Shanghai



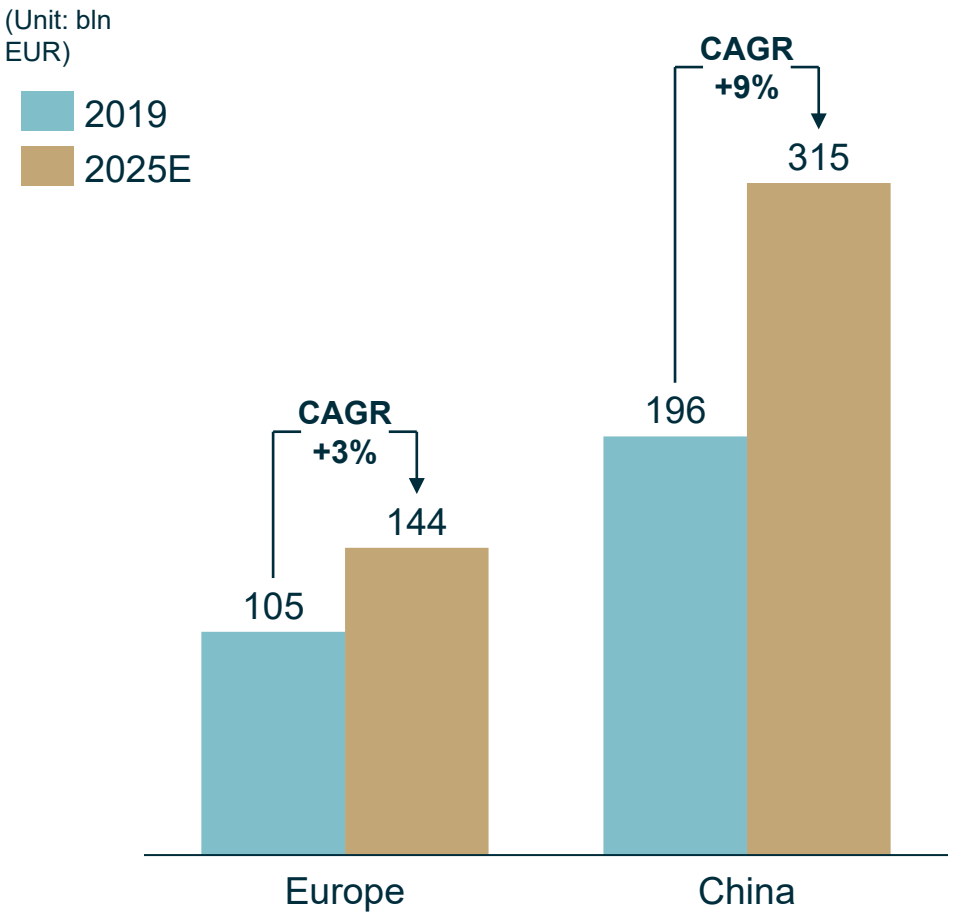
Target of Survey

1	Understand how China's photonics industry developed and how the Chinese political system steer the industry
2	Update of strategic governmental R&D fundings in photonics in China

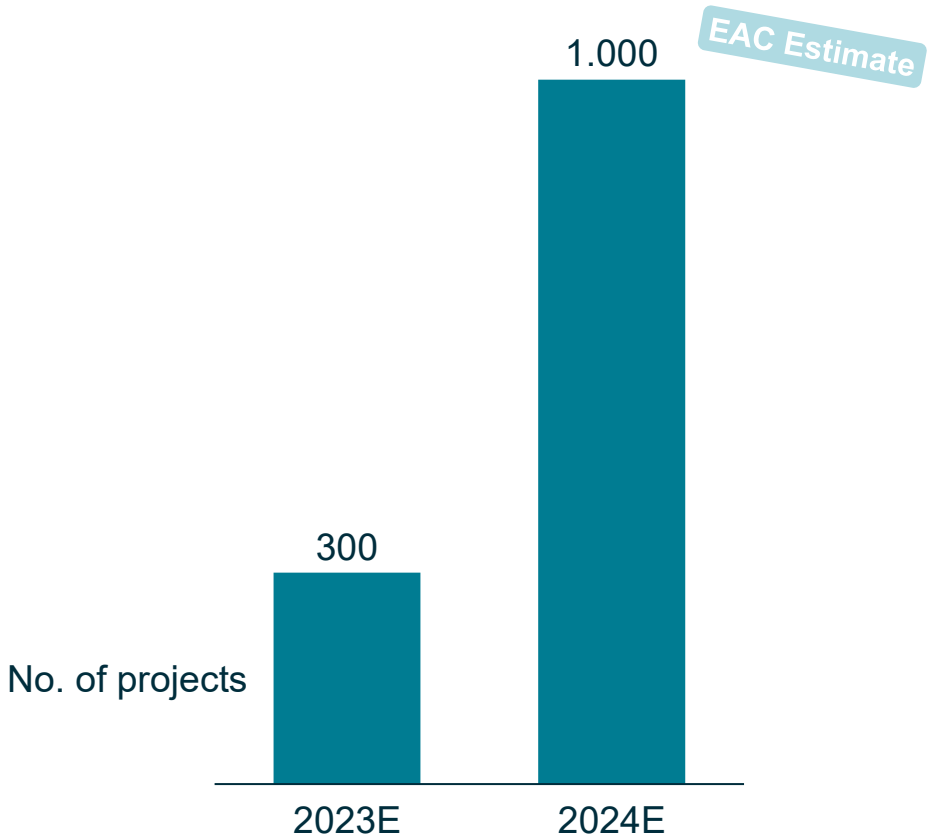
EAC PHOTONICS STUDY 2023

China has rapidly gained market share in photonics over the last years – thumb rule: “3x3” – in terms of growth and dedicated photonics projects

CAGR OF PRODUCTION VOLUME PHOTONICS IN EU & CN



CHINA PHOTONICS TOPICS PROJECT NUMBER



Source: SPECTARIS - Trend Report Photonics 2023/2024, OptecNet, Photonics Media, EAC research

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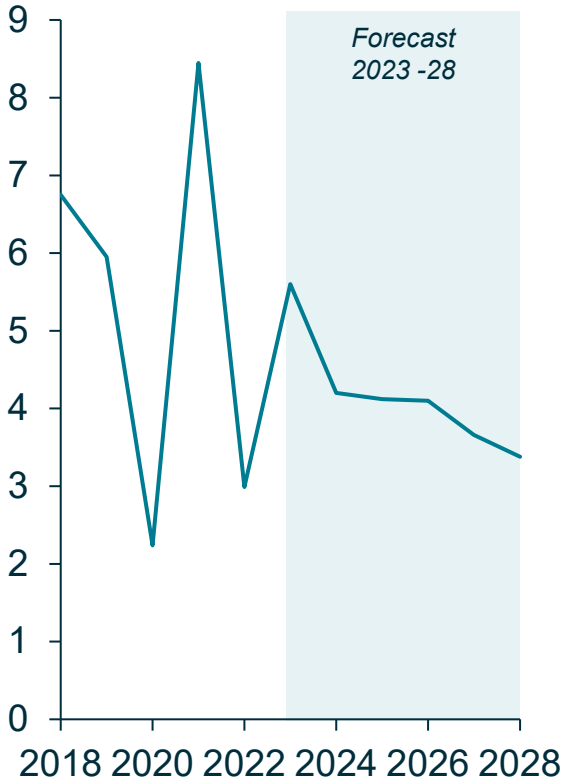
CHINA'S POSITION IN GLOBAL CONTEXT

Intensified global political tension does not affect the position of China being the largest market, but the mandatory rebalancing for photonics players value chain opens up new opportunities in the industry

CHINA'S GDP GROWTH RATE 2018-2028 (%)



EAC "TRUMPOLINE" TOP 3 IMPLICATIONS

The Trump Scenario – Trump wins election

1. Protectionism economic and trade policy toward China will direct major investment and subsidy program to give preference to companies that produce in the USA
2. Decoupling from China with up to 60% tariff increase on US imports from China and 40% tariff increase on imports from the US as retaliation from China
3. Cultivation deeper relationships with other markets like India and Europe

The Biden Scenario – Biden wins election

1. Alliance strategy to isolate and in parallel compete with China
2. Strength chokepoint technology export controls to prevent American high-tech and funding from being used to enhance Chinese military and technological capabilities
3. Rebalancing supply chains from Chinese goods

CONCLUSIONS

- **China will remain the largest market in the World**
- **India is the potential "winner"**
- **Balanced global market value chain is a "MUST" for photonics players**

Source: World Bank, Statista, EAC research

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FUNDING MECHANISM IN CHINA

Compared to EAC's investigation in 2015, China's funds for photonics are currently more raised by local governments and regional clusters with a capital scale much larger than national funds

NATIONAL FUNDS

- Gradually reducing
- Two major national funds allocated to photonics-related subjects, including but not limited to 120 mln EUR in 2022
- Invests more in cutting-edge basic research topics
- Steering role in the future development direction of basic photonics research
- Funding targets are University Research and National R&D Projects

REGIONAL GOVERNMENTAL FUNDS

- Approx. 5 bln EUR in the next few years
- Public funds account for 20 – 30%
- More initiated for industrial integration and industrialization
- Policy shifts to regional level for better commercialization and industrialization
- Funding targets are regional segments/ sectors

GOVERNMENTAL RESEARCH STEERING SYSTEM

Impulse comes from the market/industry with a new centralized structure of steering process and the function of MOST was adjusted in March 2023, which now acts more as supervisors than actors

Top Down

Central Government

Steering Body: Central Science and Technology (S&T) Commission and Ministry of Science & Technology

- Established in March 2023, is the **decision-making and coordinating body** of the Central Government, responsible for **scientific and technological work**
- Major responsibility incl. developing and reviewing major national strategies, plans, and policies for S&T development, coordinating and solving major S&T issues; Responsibility of administrative body is borne by the restructured **Ministry of Science & Technology (MOST)**
- **Members from MOST, MIIT and other ministries of State Council, as well as CAS, NSFT** etc.

Decision Bodies for different fields

National Health Commission (NHC) | National Development and Reform Commission (NDRC) | Ministry of Industry & Information Technology (MIIT) | Other Ministries Of State Council

- Drives overall direction of research funding by making high-level direction decisions within own fields with regards to national strategic targets and industrial and regional development needs
- Overall responsibility for funding allocation – However, does not get involved in the administration of specific programs and the detailed funding distribution

Select Participating Institutes

National Science and Technology Management Information System Public Service Platform

Decide Committee Composition

Project Management Body

National Natural Science Foundation of China (NSFC) | **Professional institutions[1)]**

- Acts as a professional project management body – in charge of fund allocation and project management
- Handles applications, reviews proposed topics, monitors project process and results assessment
- Is held accountable for achieving project objectives

Strategic Consulting and Review Committee

Scientific Experts | **Industrial Experts** | **Economic Experts**

- Selected experts from universities, research institutions, government departments and enterprises with scientific/industrial/economic background
- Review, monitor and consult on strategic planning for national S&T development, programs layout, and important area to focus

Submit research proposals

Research institutes | Universities | Companies[2)]

Provides industry and technical feedback

Industrial Associations | Academic Advisory Bodies

Bottom Up

1) Transformed from selected Governmental / Private research and management institutes discussion

2) Possibility of participation of foreign companies still under discussion

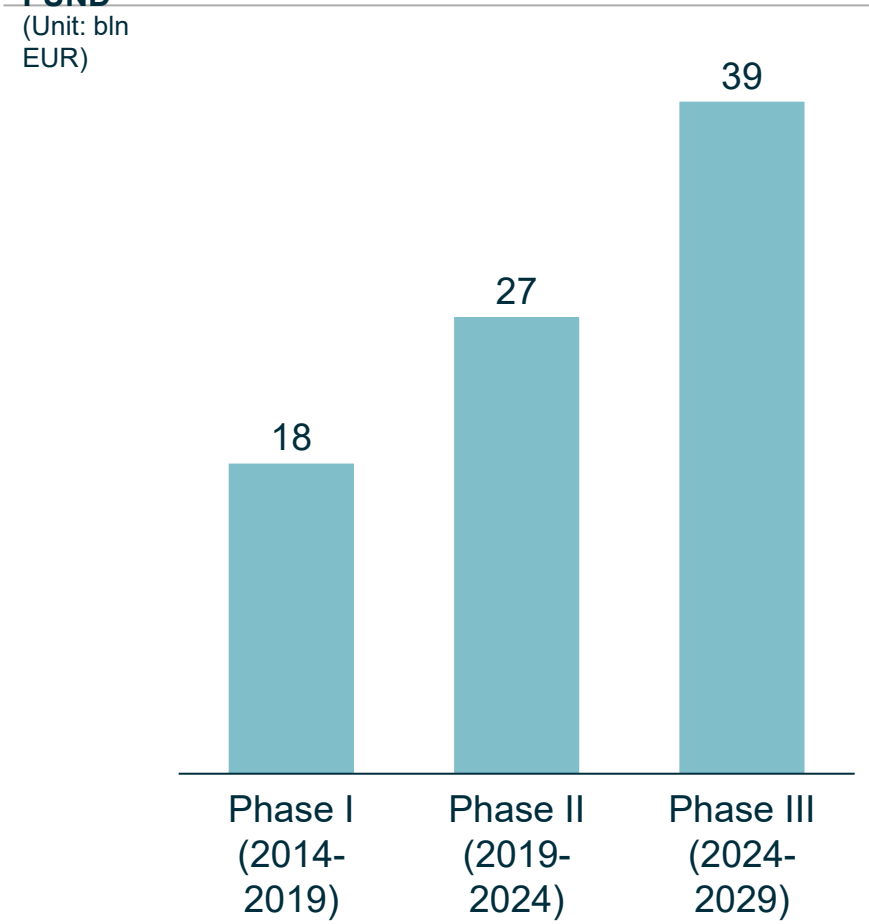
CHINA'S SUCCESS IN PHOTONICS INDUSTRY

Having no dedicated "China Chip Act", 4 key national plans instead support the development in the photonics industry aiming for solving bottleneck problem and reducing reliance on foreign technology

CHINA KEY NATIONAL PLANS SUPPORTING PHOTONICS INDUSTRY

- Made in China 2025
  - Self-sufficiency of up to 70% of core basic components and materials by 2025 in key industries
  - Indigenous photonics capabilities to reduce reliance on foreign technology
- 14th Five-Year Plan and Beyond (2021-2025)
  - "Innovation Powerhouse" and "Dual Circulation" to reduce external reliance
  - A shift from 'speed-centric' to 'quality-centric' direction
- **National Integrated Circuit Industry Investment Fund**
  - Phase I (2014-2019): 18 bln EUR focused on chip design
  - Phase II (2019-2024): 26.5 bln EUR focused on upstream fields
  - Phase III (2024-2029): 39 bln EUR focused on technology shortcomings such as integrated photonics
- National Science and Technology Plan
  - Enhance original independent innovation ability to solve bottleneck problems
  - Promote scientific and technological transformation to commercialization

"NATIONAL INTEGRATED CIRCUIT INDUSTRY INVESTMENT FUND"

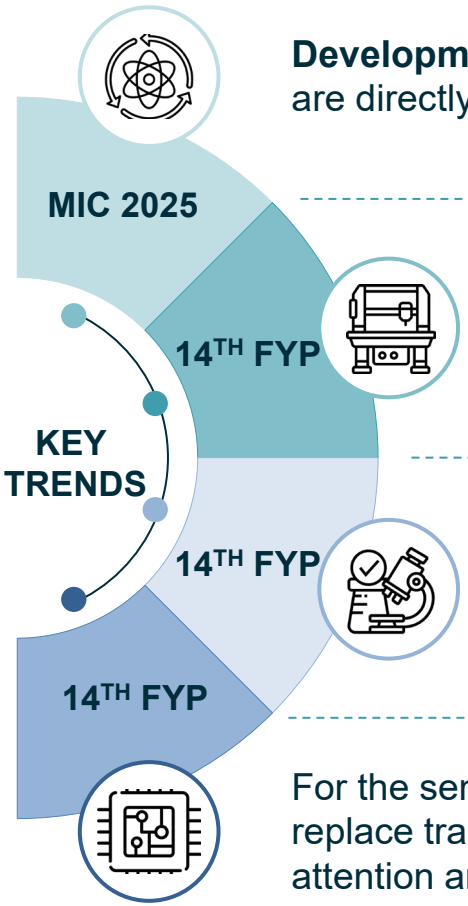


1) Information and communication technologies

Source: SPECTARIS - Trend Report Photonics 2023/2024, OptecNet, Photonics Media, EAC research

NATIONAL PLANS' IMPACTS ON PHOTONICS

The development priorities and the emerging downstream applications highlighted in the policies are directly or indirectly promoting the development of the photonics industry



Development priorities and the **emerging downstream applications** highlighted in the policies are directly or indirectly promoting the photonics industry

Photonic technologies such as **lasers** and **machine vision** are crucial to help the development of **high-end CNC machines** and **robotics**, which are areas that need breakthroughs

Strategic focus of the photonics industry at the current stage is still **strengthening R&D and technological strength**

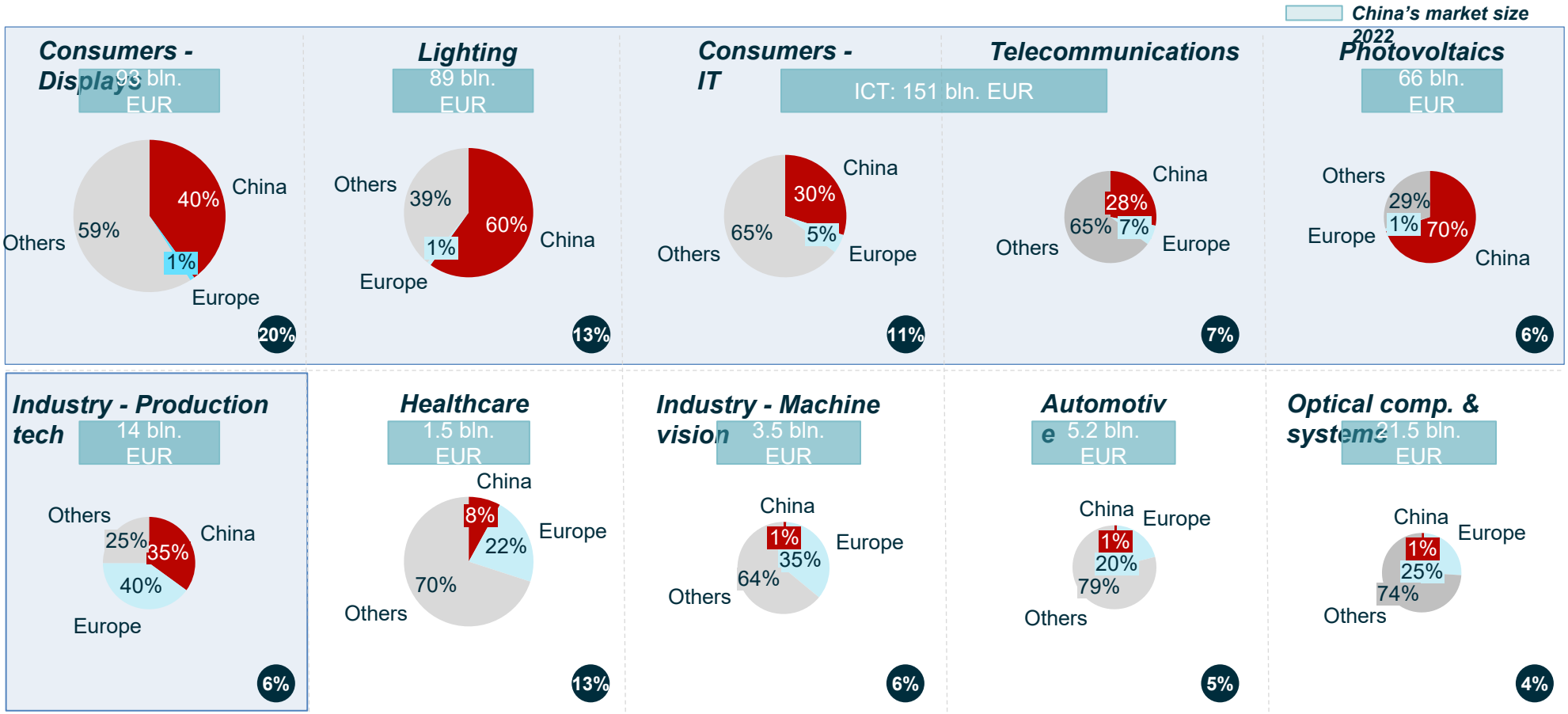
For the semiconductor industry, in this post-Moore era, it is in urgent need of **new methods** to replace traditional methods and "**Integrated Photonic Circuits**" are one of them which will attract attention and funds in China

Sources: State Council Information Office, EAC research

PHOTONICS SEGMENT OVERVIEW

The photonics market in China is **market-driven**, and strongly applied in **industries and consumer markets,** e.g. displays, lighting, IT, telecom, photovoltaics and production tech (laser), etc.

WORLD MARKET SEGMENTATION BY USER MARKETS, CHINA VS. EUROPE SHARE OF GLOBAL PHOTONICS MARKET 2022



Source: Photonics21, TEMATYS

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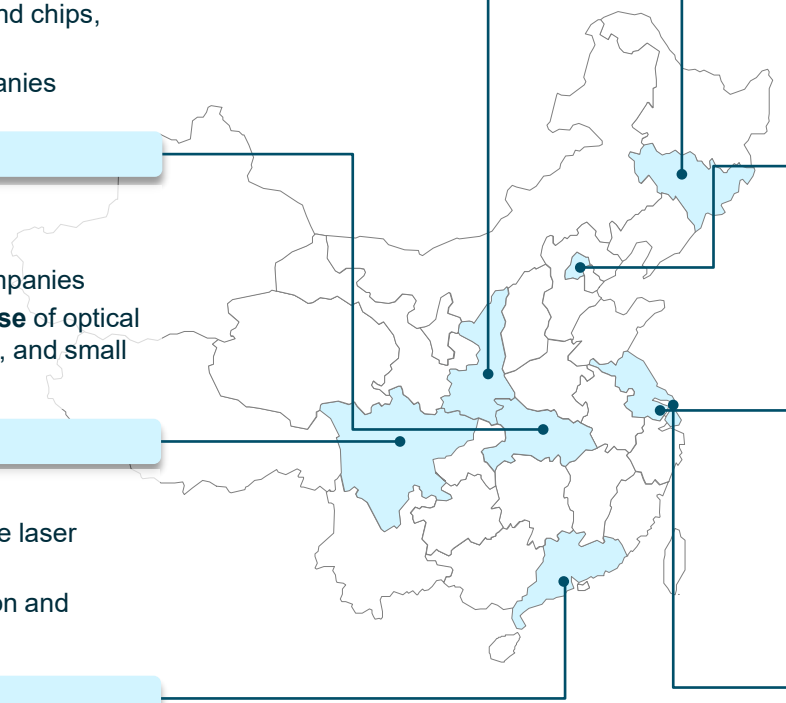
CHINA PHOTONIC REGIONAL CLUSTER TOPICS

With aligned directives from national government, regional governments approach with various plans supporting the development in photonic industry



Xi'an

"Light Chasing Plan" help industry upgrade

- Focus on **3 areas**: advanced laser and photonic manufacturing, photonic materials and chips, and photonic sensing
- Cultivate photonic technology companies

Wuhan

The "Optical Valley of China"

- One of the largest **laser** equipment manufacturing bases with > 200 companies
- **World's largest manufacturing base** of optical fiber & cable, optoelectronic devices, and small and middle-sized display panel

Chengdu

Building "China's Laser Valley"

- Aim to achieve an output value of the laser industry of **13 bln EUR** by 2025
- World's leading electronic information and equipment manufacturing base

Shenzhen

Agglomeration of leading enterprises

- The industrial scale, number of enterprises, and valid patents are domestically leading
- Gather giant companies in laser processing and optical communications such as Huawei

Changchun

Technical talents platform

- Having many research institutions and universities such as CIOMP[1)]
- Industrial clusters in the field of lasers, optical imaging, intelligent manufacturing, semiconductors, etc.

Beijing

Top science and technology resources

- Many top universities and research institutes located in Beijing
- Aim to build a **world-class photonics R&D base** in Beijing

Suzhou & Wuxi

Whole photonics industry chain from photon generation, transmission to application

- Suzhou's industry output reached **~47 bln EUR** in 2022 and is expected to reach **>65 bln EUR** by 2025
- Significant advantages in optical chips, optical manufacturing, and optical communications

Shanghai

Building the world's largest photonics science cluster and quantum technology industry cluster

- Mainly focus on **photonic chips and devices** achieving breakthroughs through quantum technology, e.g., silicon photonics, optical communication devices, and photonic chips

1) Changchun Institute of Optics, Mechanics and Physics, Chinese Academy of Sciences

Source: photonicsX

CHINA PHOTONIC REGIONAL CLUSTER FUNDS

Est. ~5 bln EUR in total of planning funds will be allocated in the industrial layouts of photonics in various regions of China for the next few years

Xi'an

- Shaanxi government established **~97 mln EUR** photonics industry fund in 2022 to help Xi'an build a photonics industry highland
- Xi'an jointly established **~260 mln EUR** funds with investment institutions in Dec 2022, for the industrial upgrading of photonics

Wuhan

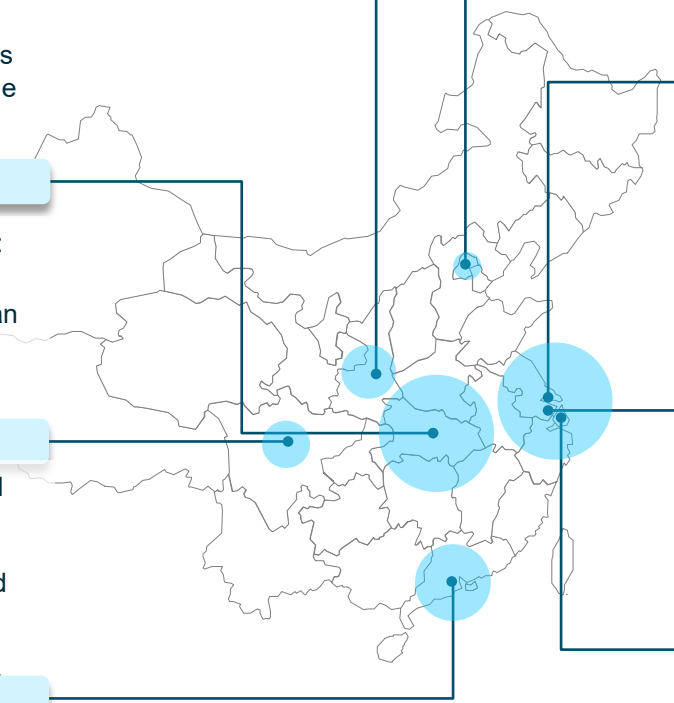
- Optics Valley Venture Capital Guidance Fund: **~1.3 bln EUR** within 5 years (2022-2027)
- Accumulated ~5.2 bln EUR invested to Wuhan East Lake High-tech Zone by Wuhan Optics Valley Industrial Investment Company from 2016 to 2022

Chengdu

- Chengdu government provides incentives and subsidies to enterprises to build up "China's Laser Valley", e.g., grant rewards of ~1.3 mln EUR* to companies whose investment in fixed assets in the optoelectronics industry reaches ~1.3 bln EUR

Guangdong-HK-Macao Greater Bay Area

- ~650 mln EUR funds to smart sensors in Shenzhen, in which est. **~60 mln EUR** allocated to photonics
- Est. **~1 bln EUR*** funds invested in the photonics industry in the Guangdong-Hong Kong-Macao Greater Bay area since 2021



Total up **~5 bln EUR** funds from local for the next few years, est. **20%-30%** are raised by public funds

Beijing

- Plans to establish a government guidance fund of **~30 mln EUR*** for the optoelectronics industry in 2023

Wuxi

- **~390 mln EUR** to build "*Taihu Bay Silicon Photonics Industry Innovation Center*" in 2023
- **~260 mln EUR** to build a silicon-based optoelectrical industrial park in 2023
- **~130 mln EUR** of China's first optical quantum industry angel investment fund in 2023

Suzhou

- **~1.3 bln EUR** photonics industry investment fund until 2025, with Phase I of 1 bln RMB (~130 mln EUR), focusing on investment layout in the optoelectronics industry

Shanghai

- Photonic chips and devices have been identified as "*leading industries for the future*" by Shanghai, with an estimated **~130 mln EUR*** invested in the photonics industry every year

*No official data announced by official channels, the value is estimated by EAC based on secondary research and evaluation

The bigger the bubble, the larger the fund value

Source: Municipal official website, EAC analysis

BREAK-DOWN: SUZHOU HIGH-TECH ZONE

PHOTONICS21 | EAC INTERNATIONAL CONSULTING

Regional government from Suzhou supports the construction of photonics industry innovation clusters with a total of 59 mln EUR reward funds along with 1.3 bln EUR investment fund

5 POLICIES	A SERIES OF INITIATIVES AND FUNDS FOR THE PHOTONICS INDUSTRY			
1. Build a high-innovation platform	**26 mln EUR** in phases to new national key laboratories **2.6 mln EUR** to new provincial key laboratories	Newly built high-level scientific facilities and platforms for photonics supported on a "**one case, one discussion**" basis	**~6.5 mln EUR** to National Tech. Innovation Center **~1.3 mln EUR** to National Enterprise Technology Center	**~2.6 mln EUR** to encourage **leading photonics enterprises** to build advanced technology **research institutes**
2. Accelerate the construction of the original innovation center	Max. **~0.7 mln EUR** to entities of R&D in photonics, focusing on **energy photons, information photons, life, and environmental photons**	Max. **~0.4 mln EUR** to entities solving technical problems in core light sources, optical sensors & chips & communications	Layout **S&T innovation projects** with fund support of **~0.3 mln EUR** to best candidates	Projects on overcoming bottlenecks in engineering stages will be funded up to **~0.7 mln EUR** based on 50% of the research investment
3. Promote application demonstration and industry integration	Accelerate the construction of a **photonics industry innovation consortium** with support up to **0.3 mln EUR**	Application of **key SW, equipment, and materials** for photonics with max. **~1.3 mln EUR** given for 10-30% of the sales price of the unit	Max. reward of **~0.1 mln EUR** to terminal manufacturers & system solution integrators in the photonics field to try out **IC** products	Rewards of up to **~0.1 mln EUR** to those leading the standards technology formulation
4. Vigorously promote high-quality cluster development	**~6.5 mln EUR** for introduction of major innovation teams **~1.3 mln EUR** for leading **entrepreneurship talents**	Up to **~1.3 mln EUR** awarded for enterprises to implement M&A and reorganization to strengthen industrial chains	Max. **~3.9 mln EUR** reward to "***World's Top 500***" 1st time Max. **~1.3 mln EUR** to "***China's Top 500***"	Rewards of max. **~0.3 mln EUR** to global "***lighthouse factories***" conducting **intelligent and digital transformation**.
5. Optimize the innovation and entrepreneurship ecosystem	Establish **~1.3 bln EUR photonic investment fund**	Max. **~0.8 mln EUR** to **listed companies** Up to **~0.4 mln EUR** funds to the **public service platform**	Enhance the ability of **S&T services,** provide support of up to **~0.4 mln EUR** based on service results	For newly introduced high-skilled leading talents, up to **0.2 mln EUR** of salary and a settlement subsidy will be provided

Source: Suzhou High-tech Zone Policies

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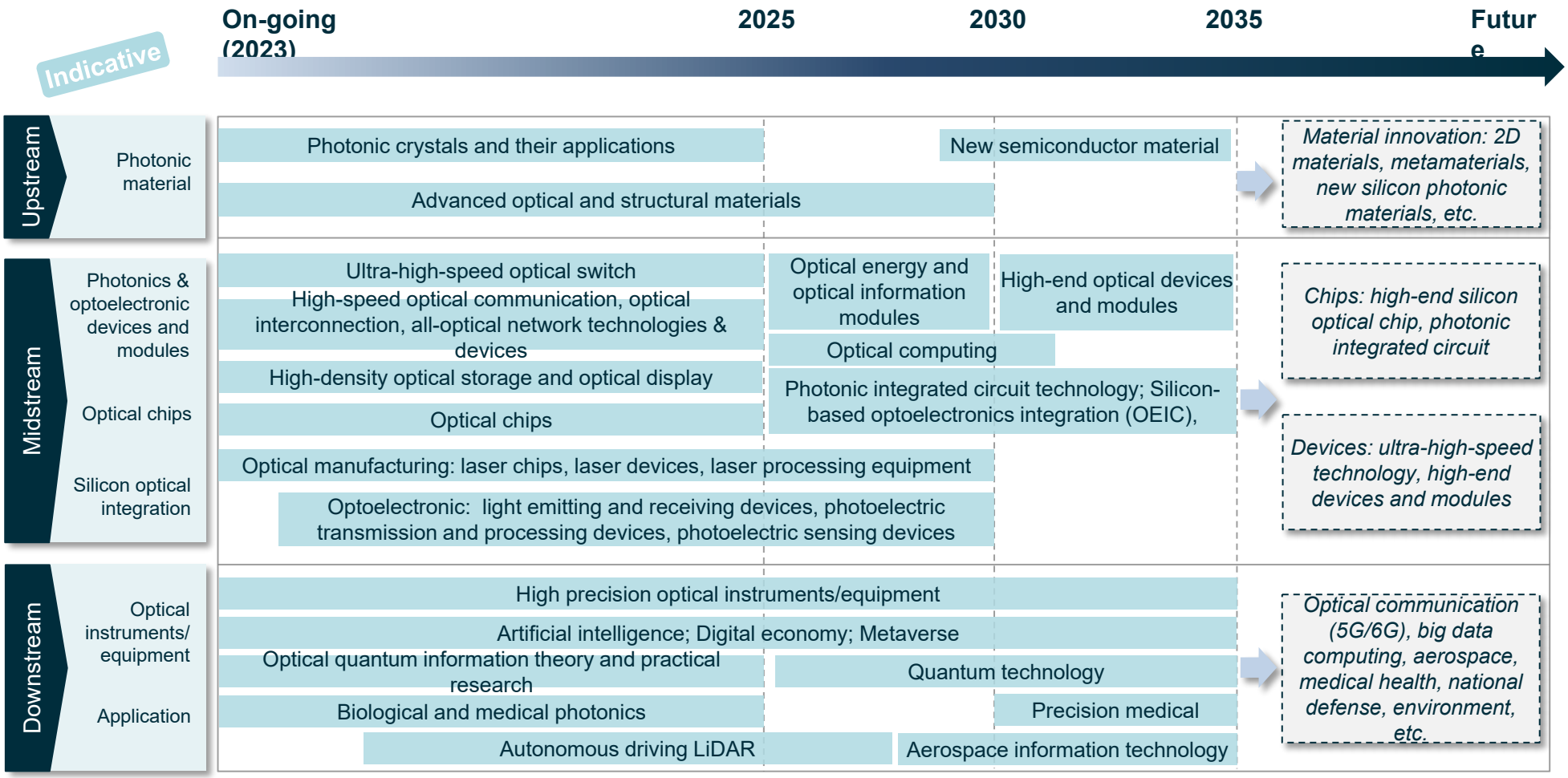
CHINA FUTURE TECHNOLOGY ROADMAP

China will focus their investment on tackling technological bottlenecks along the entire photonics value chain, EAC identified the following technology roadmap for the next 10 years



Source: EAC research and analysis

EAC OUTLOOK FOR EUROPEAN INDUSTRY

Photonics industry in China present huge growth potential despite weak core basic capabilities, majority of investments will flow into R&D in solving bottleneck problems and establishing own industrial chain

1	**CAPABILITIES**	The core basic capabilities of China's photonic industry are still weak, especially in the upstream and midstream of the photonics value chain, such as high-end optoelectronic devices, and chips ***→ High potentials for European Industry***
2	**INVESTMENT**	China will strengthen its R&D and investment to overcome its technology bottlenecks and complete its photonics industrial chain through local governments providing greater support ***→ European investors need to do "regional feasibilities"***
3	**GROWTH**	Photonics industry is still a new field with huge growth potential in China driven by enormous application markets ***→ Market driven development invites European investors technological specifications***
4	**UNCERTAINTY**	With the uncertainty of the international market and geopolitics, China faces challenges in the classical export market i.e. towards the US and India ***→ Urgent demand to balance global value chain for European players***

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ABBREVIATION REGISTER (1/2)

Abbreviations	Full name
14th FYP	14th Five-Year Plan and Beyond
3C	Computer, Communications, Consumer electronic
AI	Artificial Intelligence
Bln	Billion
CAGR	Compound Annual Growth Rate
CAS	Chinese Academy of Science
Etc.	Et cetera
EU	European Union
EUR	Euros
HUD	Head-up Displays
IC	Integrated Circuit
ICF	National Integrated Circuit Industry Investment Fund
ICT	Information and Communication Technologies
IoT	Internet of Things
L1-L3	Level 1 - Level 3
LED	Light-Emitting Diode
IT	Information Technology
LiDAR	Light Detection and Ranging
MEE	Ministry of Environment

ABBREVIATION REGISTER (2/2)

Abbreviations	Full name
MIC 2025	Made in China 2025
MIIT	Ministry of Industry and Information Technology
MIn	Million
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOHRSS	Ministry of Human Resources and Social Security
MOST	Ministry of Science and Technology
NDRC	National Development and Reform Commission
NHC	National Health Commission
NSFC	The National Natural Science Foundation of China
R&D	Research and Development
S&T	Science and Technology
SPIE	The International Society for Optics and Photonics
TIn	Trillion
US	United States