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Citation for published version:
Chen, D & Jiang, M 2022, 'Assessing the socioeconomic effects of carbon capture, utility and storage investment from the perspective of carbon neutrality in China', *Earth's Future*, vol. 10, no. 4, e2021EF002523. https://doi.org/10.1029/2021EF002523

Digital Object Identifier (DOI):
10.1029/2021EF002523

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Publisher's PDF, also known as Version of record

Published In:
Earth's Future

Earth's Future

RESEARCH ARTICLE

10.1029/2021EF002523

Key Points:

- Both scenarios projected China's Carbon Capture, Utility and Storage (CCUS) investment to exceed US$ 700 billion from 2056 to 2060
- CCUS investment may stimulate gross value-added of US$ 1.2 and US$ 10.4 billion based on the Asian Development Bank and International Energy Agency investment scenarios
- CCUS industry investment may indirectly create a large number of jobs and employment income

Supporting Information:

Supporting Information may be found in the online version of this article.

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Citation:

Chen, D., & Jiang, M. (2022). Assessing the socio-economic effects of Carbon Capture, Utility and Storage investment from the perspective of carbon neutrality in China. *Earth's Future*, *10*, e2021EF002523. https://doi.org/10.1029/2021EF002523

Received 12 NOV 2021
Accepted 5 MAR 2022

Assessing the Socio-Economic Effects of Carbon Capture, Utility and Storage Investment From the Perspective of Carbon Neutrality in China

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Abstract Carbon Capture, Utility and Storage (CCUS) is essential for achieving carbon neutrality and has great development potential in China. CCUS, as a long-term new investment, can address global warming and has significant social and economic impacts. This paper assessed the socio-economic effects of CCUS investment based on carbon neutrality in China by combining the dynamic GTAP model and the Input-output method. The result indicates that: CCUS investment may accumulate US$ 67.09 billion and US$ 776.61 billion from 2026 to 2030 and 2056 to 2060, respectively, based on International Energy Agency (IEA) investment scenario. Moreover, the corresponding value may increase to 8.26 billion and 743.21 billion US dollars from 2026 to 2030 and 2056 to 2060, respectively, based on Asian Development Bank (ADB) investment scenario; CCUS investment may stimulate gross value-added of US$ 1.2 billion and US$ 10.4 billion based on ADB and IEA investment scenarios, respectively. CCUS investment may mainly promote the machinery industry, metal manufacturing industry, other service industries, power equipment manufacturing industry, and light processing manufacturing industry; Furthermore, ADB and IEA investment scenarios showed that CCUS industrial investment may indirectly create about 12,796 and 103,886 jobs, respectively, and US$ 85 million and US$ 692 million of labor employment income, respectively, in 2030. The corresponding values may increase to 0.82 million and 0.85 million jobs, respectively, and US$ 5,168 and US$ 5,396 million employment income, respectively, in 2060.

Plain Language Summary Carbon Capture, Utility and Storage (CCUS) technology, as the only technology capable of large-scale low-carbon utilization of fossil energy, has become an important part of China's technology portfolio to achieve the 2060 carbon neutrality target. This study used two investment scenarios and showed that large-scale investments in CCUS technology deployment may have significant economic and social benefits. CCUS investment may also significantly promote gross value added growth through industry chain transmission and job creation in China.

1. Introduction

Carbon Capture, Utility and Storage (CCUS) is a promising technology due to its pivotal role in large-scale emission reduction. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) showed that most climate models without CCUS technology could not limit temperature increases to within 2°C, thus increasing the decarbonization costs up to about 138% (IPCC, 2014). The energy technology outlook report released by the International Energy Agency (IEA) also showed that CCUS can further reduce carbon emissions by 14% in 2060 compared with the 2015 levels based on the 2°C scenario (2DS); CCUS can further reduce carbon emissions by 32% based on the 2060 net-zero emission scenario if the emission reduction target is raised (IEA, 2017). However, another fact is that the commercial application of CCUS technology still faces the challenge of high costs, which hinders its large-scale adoption. At the same time, CCUS technology has been attracting extensive attention in recent years as most major economies worldwide have been focused on achieving carbon peak and carbon neutralization within the next 40 years. For China, in particular, the current situation as the largest emitter economy shows a more urgent need and a broader market prospect for CCUS application (Department of Science and Technology of Society Development, 2019). Specifically, in China, Fossil energy accounts for more than 80% of China's primary energy supply since coal is the major source. Moreover, Fossil energy may still dominate the primary energy mix in the long run (BP, 2019), thus seriously limiting emission reduction. It is estimated that China will need to capture 27 billion tonnes of CO_2 in 2050 based on the deep emission reduction scenario (Teng, 2015) indicating the pressure on emission reduction, thus providing space for the advancement of CCUS application. Undoubtedly, we can also foresee that this massive investment in CCUS is bound to have a significant impact on the overall socio-economic structure and development.

In the past decades, the existing studies have mainly summarized the development trend, characteristics, carbon reduction effect, and social attitudes of the CCUS demonstration projects in China. For instance, Zheng et al. (2011) presented the overall situation of China's carbon capture and storage (CCS) development and the initial obstacles and advantages of CCS deployment. Jiang et al. (2020) also evaluated China's CCUS regulatory framework and showed its shortcomings. Lai et al. (2012) analyzed the structure of China's CCS effort and assessed the perceived capacity of the CCS innovation system. Zhao et al. (2021) reported the status of the CCS development in coal-fired power generation in GuoNeng Jinjie, the full chain demonstration project in China. Sun et al. (2020) compared the explicit and implicit attitudes of energy stakeholders and the public toward CCS.

Since financing CCUS projects is quite complex and needs to consider the long-term effects. The economic and environmental benefits of China's CCUS application have been widely considered in recent years. Xu et al. (2021) assessed the environmental benefit of CCS-EWR technology for coal-fired power plants in the Yellow River Basin of China. Yu et al. (2019) used the GCAM-China model to examine the role of CCUS in climate mitigation during the period of China's independent emission reduction. Zhu et al. (2015) comprehensively evaluated the development potential of CCS and its contribution to China's emission reduction. Zhang et al. (2021) used a technical-economic model to analyze the economic and environmental benefits of the Recycle-CCS-EOR project. Fan et al. (2020) compared the regional investment income of CCS retrofitting of coal-fired power plants and renewable power generation projects. Lin and Tan (2021) assessed the value of CCUS when considering oil price and carbon trading mechanisms. Nevertheless, most previous studies have primarily assessed the economic cost and environmental benefits of individual CCUS from a project micro perspective, ignoring the broader macro socioeconomic impacts of CCUS as a large-scale investment across sectors. In addition, they mainly used cost-benefit analysis of projects, which may prevent the findings from capturing the overall impact on CCUS investments. Therefore, this study aims to explore how CCUS investments will generate socio-economic benefits across sectors through chain transmission and how much value is generated. We first use the dynamic recursive GTAP model to extrapolate the macroeconomy to 2060 as a benchmark. Then, the IEA and Asian Development Bank (ADB)'s estimates of future new investment in CCUS are applied as exogenous shocks to measure the driving effects of the technology investments on China's gross value added and employment through a full chain transmission perspective. This provides a more well-rounded analytical perspective for assessing the comprehensive socio-economic value of low-carbon technology investments and provides a basis for the long-term rationality of CCUS investment policies.

2. Data and Methods

To assess the socio-economic impacts of CCUS investment, we calculate gross value added, employment opportunities in China. The specific steps are as follows:

Step 1: Time setting and investment scenarios setting.

Step 2: CCUS cost breakdown based on IEA and ADB investment scenarios.

Step 3: The economic development benchmark simulation by GTAP model and Input-Output (IO) database construction.

Step 4: Scenarios implementation in the IO table and calculation of the socioeconomic indicators.

2.1. Time Setting and Investment Scenarios Setting

2.1.1. Time Setting

The National Development and Reform Commission (NDRC) of China announced an Action Plan for Carbon Dioxide Peaking Before 2030 (NDRC, 2021a, 2021b), in which China committed to peaking its carbon dioxide (CO_2) by 2030. At the same time, the Department of Resource Conservation and Environmental Protection released the Work Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy (NDRC, 2021a, 2021b), in which China pledged to be carbon

Table 1
Key Assumptions for Carbon Capture, Utility and Storage Technology Investment Estimation

	Proportion of financing (%)	Annual change ratio (%)
Debt financing	40%	6%
Equity financing	60%	12%
Tax rate for debt interest reduction	–	33%
Fixed O&M cost escalation rate	–	0%
Variable O&M cost escalation rate	–	0%
Real fuel escalation rate	–	3%

neutral and to establish a green, low-carbon and circular economy and energy system. By 2025, China will have created an initial framework for a green, low-carbon and circular economy and greatly improved the energy efficiency of key industries, and such will lay a solid foundation for CO_2 peaking and carbon neutrality. CCUS will also be an indispensable strategy in helping to reach the targets. Therefore, this critical period (2025–2060) before achieving carbon neutrality is our focus in this study.

2.1.2. Investment Scenarios Setting

In the IEA 2DS, CCS delivers 12% of the cumulative emissions reductions needed up to 2050, capturing around 94 gigatonnes (Gt) of CO_2 (IEA, 2016). Therefore, the investment that satisfies the above requirements is defined as IEA investment scenario (Tables S1 in Supporting Information S1). For 2050–2060, we extrapolated the data based on historical trends.

ADB also released A Roadmap for the Demonstration and Deployment of CCS in China in the COP21 in 2015. It proposes a detailed timeline for China to gradually deploy CCS technology from 2015 to 2050. In ADB's scenario, the deployment of CCUS would enable China to reduce accumulated CO_2 of 15 billion tons by 2050 (ADB, 2015). Similarly, the investment that satisfies the above requirements is defined as ADB investment scenario (Tables S2 in Supporting Information S1). For 2050–2060, we extrapolated the data based on historical trends.

2.2. CCUS Cost Breakdown Based on IEA and ADB Investment Scenarios

This study projected the total CCUS investment during different periods, based on the costs of capturing CO_2 and the phased emission reduction targets in China. Meanwhile, we estimate the allocation of CCUS capital requirements (capital cost, variable operation and maintenance (O&M) cost and fixed cost, etc.) based on the real case data in the report (Global CCS Institute, 2017) of Global CCS Institute. The estimated costs were grouped into three main components: plant capital costs, variable O&M costs, and fixed (O&M) costs. Plant capital costs comprise the carbon capture equipment, materials, and labor. The variable and fixed O&M could also be further divided into equipment, material, and labor costs (Tables S1 and S2 in Supporting Information S1). Table 1 summarizes the key economic assumptions for CCUS investment estimation. Debt financing and Equity financing are the proportion of financing, while the other four should be the annual change ratio.

In addition, we divided the investment in each period into different years based on the 6% growth rate of China's fixed assets.

2.3. The Economic Development Benchmark Simulation by GTAP Model and Input-Output (IO) Database Construction

The dynamic recursive GTAP model is a computable general equilibrium model that simulates the long-running economy of the world by stringing together a set of equations for each sector and industry of the whole economy. The economic variables in the model describe the stock or flow of economic agents (e.g., consumers, producers, government), and the solution to the set of equations represents the economy achieving a general equilibrium state, thus simulating the basic state of operation of the economy.

Referring to Ianchovichina and Walmsley (2012), we transform GDP into exogenous variables. Then exogenous variables such as GDP, population, and capital are shocked year by year, and the simulated data are updated to 2060 to form a baseline scenario that describes the future economic state of the world (Figure S1 in Supporting Information S1). The simulation results can generate a long-term social accounting matrix (SAM), which includes IO data, multivariate trade data, tariffs and trade barriers for each region of the world. Based on this, we derive IO tables for China.

In this study, we constructed a dynamic recursive GTAP model based on the standard GTAP model of Corong et al. (2017). van der Mensbrugghe (2018) provides the GAMS version. Here, we extend the standard GTAP model, a comparative static CGE model, to a dynamic version by adding additional equations to the system to define the growth of real GDP (Equation 1) and the productivity growth combined with targeting GDP (Equation 2). $g^{y}_{r,t}$ is the growth of real GDP. Equation 1 can determine the per capita growth rate of GDP. Equation 2 can determine the productivity factor, δ^{f} (Corong et al., 2017).

$$\mathrm{RGDPMP}_{r,t} = (1 + g^{y}_{r,t}) \times \mathrm{RGDPMP}_{r,t-1} \times \frac{Pop_{r,t}}{Pop_{r,t-1}} \tag{1}$$

$$\delta^{f}_{r,l,a,t} = \pi^{a}_{r,l,a,t} + \pi^{m}_{r,l,a,t} \times \gamma^{l}_{r,t} \tag{2}$$

To calibrate the recursive dynamic GTAP model, two types of data are needed. The first one is the SAM of each modeled economy (region) and the trade flows between them. This type of data can be obtained from the GTAP Database (v9), For computational feasibility and simplification, we categorize the 141 economies in the GTAP database into 10 countries and regions (China, East Asia (except China), Southeast Asia, South Asia, Oceania, North America, Latin America, the European Union and the United Kingdom, the Middle East and North Africa, and sub-Saharan Africa), aggregate 57 sectors to 32 sectors (Table S3 in Supporting Information S1), and classify 8 primary factors into 5 factors: land, capital, unskilled labor, skilled labor, and natural resources.

The other type of data is the long-term gross domestic product (GDP) and population projections. These data are derived from long-term scenarios for climate change analysis commonly referred to as the Shared Socio-Economic Pathways (SSPs). SSP2 assumes the world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns.

2.4. Scenarios Implementation in IO Table and Calculation of the Socioeconomic Indicators

IO analysis, based on a top-down economic approach, reflects the interdependence of industries in the economy (Miller & Blair, 2009). In the following equations, **X** is the total output. **A** is the technical coefficient matrix. F is the final demand matrix. L is the Leontief inverse matrix.

$$\boldsymbol{X} = \boldsymbol{A} * \boldsymbol{X} + \boldsymbol{F} = (\boldsymbol{I} - \boldsymbol{A})^{-1} * \boldsymbol{F} = \mathbf{L} * \boldsymbol{F} \tag{3}$$

$$\Delta \boldsymbol{X} = \mathbf{L} * \Delta \boldsymbol{F} \tag{4}$$

The socioeconomic impacts were calculated as: $\boldsymbol{G} * \Delta \boldsymbol{X}$, where **G** is the row vector and represents the gross value added and employment income per unit of total output. Therefore, the IO table was used to determine the transmission relationship between upstream and downstream industry chains to estimate the socio-economic impact of CCUS investment on China's social economy from 2025 to 2060. In this study, the CCUS industry's overall construction activity was divided into a 3-year investment period and a 20-year operation period for social impact assessment using the IEA and ADB investment scenarios. These investments were grouped into the final investment demand sectors throughout the process to calculated the sectoral value-added. Moreover, the measurement of indirect employment opportunities was estimated based on the estimation of labor employment opportunities created by direct investment in the above eight sectors. The volume of jobs is converted by the employment income according to the average wage level of each industry in 2020. The data can be obtained from the "China Labor Statistics Yearbook".

In addition, we divided the CCUS investment into eight sectors for socioeconomic impact assessment, including biofuel production, gas processing, chemical sectors, coal-fired power, gas-fired power, biomass power, iron and steel, and cement sectors. Biofuel production, gas processing, and chemical sectors are high-concentration emission sources, while coal-fired power, gas-fired power, biomass power, iron and steel, and cement sectors are low-concentration emission sources. The classification of high and low concentration emission sources is followed the report Roadmap for Development of CCUS Technology in China, which is produced by the Ministry of Science and Technology, and the Administrative Centre for China's Agenda 21 in 2019. They define high concentration emission sources include industries of coal chemicals, hydrogen and biomass which have a CO_2 concentration above 70%, low concentration emission sources include industries of IGCC, coal-fire power, iron and steel, petrochemical, and cement, which have a CO_2 concentration below 35%.

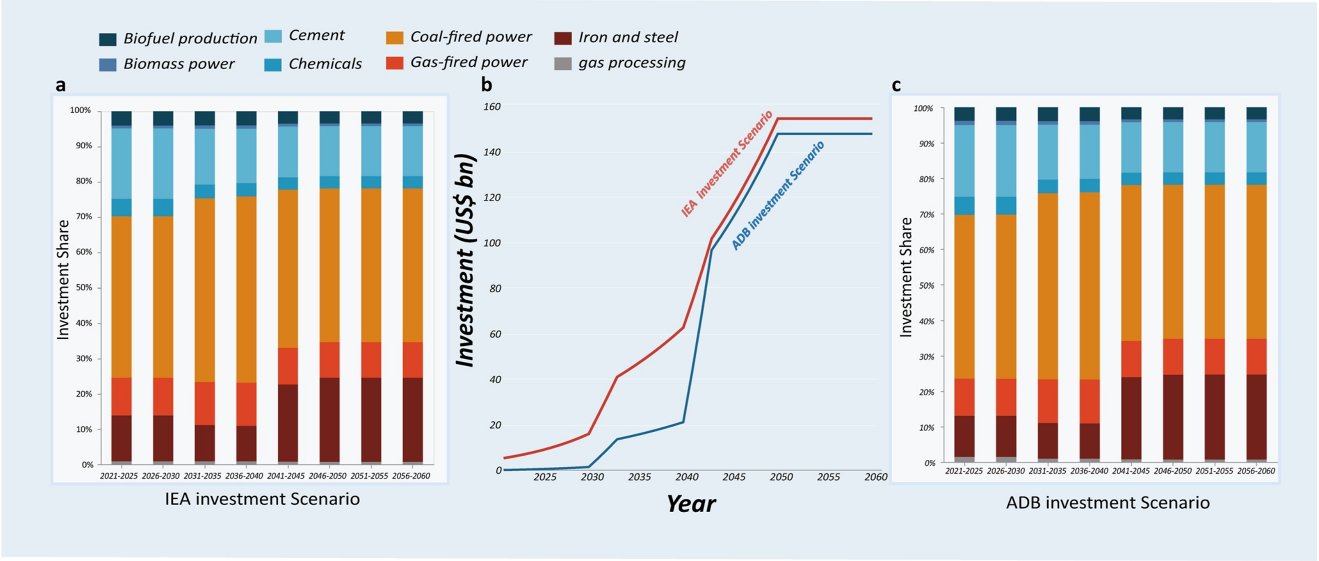

Figure 1. The line chart shows the changes in carbon capture utilization and storage's Investment amount from 2020 to 2060 (b). And annual distribution of the investment under different scenarios (a and c).

3. Results

3.1. Yearly Distribution of Investment in Different Scenarios

The required capital investment in each industry was broken down to the annual investment amount based on IEA and ADB investment scenarios (Figure 1). Overall, China's CCUS investment may increase yearly in 2020 to 2060. Specifically, the investment scenario of IEA is more optimistic than that of ADB. The investment amount from 2026 to 2030, 2031 to 2035, 2036 to 2040, 2041 to 2045, 2046 to 2050, 2051 to 2055, 2056 to 2060 was US$ 67.09 billion, US$ 190.99 billion, US$ 282.51 billion, US$ 490.97 billion, US$ 692.20 billion, US$ 776.61 billion, US$ 776.61 billion, respectively, based on the IEA scenario, and US$ 8.26 billion, US$ 61.45 billion, US$ 96.94 billion, US$ 427.21 billion, US$ 661.41 billion, US$ 743.21 billion, US$ 743.21 billion, respectively, based on the ADB scenario.

Notably, coal-fired power had the largest investment share, followed by cement, iron, and steel regardless of the investment scenario. Besides, CCUS investment in the iron and steel sector may increase from 2040 to 2060 based on the scenarios.

3.2. CCUS-Driven GVA Growth in China

In terms of economic impact, combined with the two investment scenarios, the results showed that: First, CCUS industrial investment may affect various sectors in China during the forecast period (2026–2060, with every 5 years as an estimation period). It is estimated that CCUS investment of US$ 2 billion and US$ 16.6 may create gross value added (GVA) of US$ 1.3 billion and US$ 10.4 billion, respectively, in 2030 (based on the ADB and IEA investment scenarios, respectively). Moreover, GVA impact may progressively increase after 2030, then decrease after 2050 (since the relevant report assumes that CCUS investment peak will be reached in 2050). The total investment in 2060 (US$ 148.6 billion and US$ 155.3 billion in ADB and IEA investment scenarios, respectively), may increase GVA to US$ 114.4 billion and US$ 119.5 billion, respectively, which is equivalent to 0.79% and 0.82%, respectively, of China's GDP in 2019. CCUS investment may mainly affect the machinery industry, metal manufacturing, other service industries, power equipment manufacturing, and light processing industries (Figure 2).

Second, from the perspective of the output value of the industrial sectors with different concentration emission sources, high-concentration emission sources (biofuel production, natural gas processing and chemical sectors) may drive GVA of about US$ 170 million to US$ 1 billion (ADB and IEA investment scenarios, respectively)

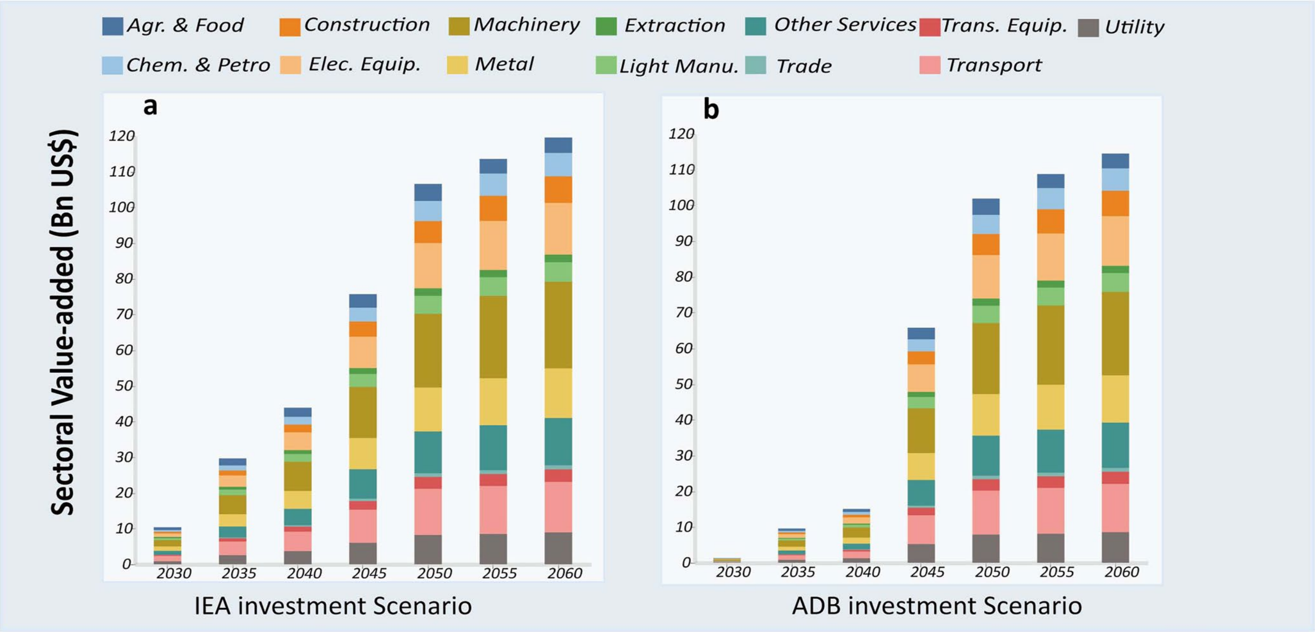

Figure 2. Sector value-added created by Carbon Capture, Utility and Storage investment on major Industries (a and b).

in 2030 and about US$ 8.6 billion to US$ 10 billion (ADB and IEA investment scenarios, respectively) in 2060. Low-concentration emission sources (coal firepower, natural gas power generation, biomass power generation, steel and cement industries) may stimulate a GVA growth of about US$ 1.1 billion and US$ 9.4 billion (ADB and IEA investment scenarios, respectively) in 2030, and US$ 105.8 to US$ 110.5 billion (ADB and IEA investment scenarios, respectively) in 2060 (Table 2). The GVA created by the industrial sector with low-concentration sources is significantly higher than that of the industrial sector with high-concentration sources. This is mainly because in 2030, CCUS investment deployment is focused on carbon capture for existing power generation and industrial processes, such as coal power, chemicals, cement, and steelmaking. Investments in these industries will unlock significant output during this period. And 2030–2060 will see a rapid increase in CCUS deployment, particularly in the cement, steel, and chemical industries.

Table 2
Carbon Capture, Utility and Storage Gross Value Added Growth in Different Industries

Emission source	Department	Unit	2030	2035	2040	2045	2050	2055	2060
Low concentration emission source	Coal-fired power plant	Billion dollars	0.6–4.9	5.2–15.9	8.2–23.8	30–35.1	45.9–48	48.9–51.1	51.5–53.8
	Gas power plant		0.1–1.1	1.2–3.5	1.8–5.3	6.7–7.8	10.2–10.6	10.8–11.3	11.4–11.9
	Biomass energy		0.02–0.1	0.1–0.3	0.2–0.4	0.5–0.7	0.8–0.9	0.88–0.94	0.93–0.99
	Steel		0.1–1.3	0.9–2.9	1.4–4.2	14.6–15.9	23.4–24.4	25.1–26.1	26.4–27.4
	cement		0.3–0.3	1.4–4.3	2.2–6.4	9–10.5	13.8–14.6	14.8–15.6	15.6–16.3
Total			1.1–9.7	8.8–27.1	13.8–40.1	60.8–69.9	94.1–98.5	100.5–105	105.8–110.5
High concentration emission source	Chemical industry	Billion dollars	0.1–0.5	0.4–1.2	0.6–1.7	2.3–2.7	3.6–3.8	3.8–4	4.1–4.2
	Biomass production		0.05–0.4	0.4–1.1	0.6–1.7	2.2–2.5	3.3–3.5	3.5–3.7	3.7–3.9
	Gas processing		0.02–0.1	0.1–0.3	0.2–0.4	0.5–0.6	0.7–0.8	0.8–0.8	0.8–0.9
Total			0.2–1	0.9–2.5	1.4–3.8	5–5.8	7.6–8.1	8.1–8.6	8.6–9

Table 3
Jobs and Income Created by Carbon Capture, Utility and Storage

Source	Unit	2030	2035	2040	2045	2050	2055	2060
Investment period	Jobs (counts)	12,454–101,084	86,393–267,101	124,167–360,350	494,654–563,669	726,792–754,181	753,359–781,749	794,066–823,990
	Labor Income (100 million)	0.83–6.74	5.77–17.83	8.22–23.87	32.22–36.74	46.87–48.63	48.08–49.89	50.22–52.11
Operation period	Jobs (counts)	342–2,782	1,358–5,901	3,048–10,229	9,012–16,749	19,354–26,218	22,624–28,685	23,572–29,909
	Labor Income (100 million)	0.02–0.18	0.09–0.38	0.20–0.66	0.57–1.06	1.21–1.65	1.41–1.79	1.46–1.85
Total	Jobs (counts)	12,796–103,886	87,751–273,002	127,215–370,579	503,666–580,418	746,146–780,399	775,983–810,434	817,638–853,899
	Labor Income (100 million)	0.85–6.92	5.86–18.21	8.42–24.53	32.79–37.80	48.08–50.28	49.49–51.68	51.68–53.96

3.3. CCUS-Driven Employment and Income in China

CCUS industrial investment may create employment for all industries, thus indirectly boosting income. The results of the two investment scenarios are presented in Table 3. First, CCUS may produce a certain indirect employment effect on China (i.e., the chain reaction of CCUS investment indirectly affects the employment of the entire industry). This long-term investment might create about 12,796–103,886 indirect employments, respectively, in 2030, including 12,454–101,084 jobs in the investment period and 342–2,782 jobs in the operation period, respectively. Also, employment still increase from 2050 to 2060, generating about 0.82 million–0.85 million jobs (ADB and IEA investment scenarios, respectively) by 2060, of which about 794,066–823,990, respectively, jobs will be in the investment period and about 23,572–29,909, in the operation period. Second, CCUS may stimulate household income of US$ 85 million and US$ 692 million (ADB and IEA investment scenarios, respectively) in 2030, including US$ 83 million and US$ 67.4 million, respectively, in the investment period and US$ 2 million and US$ 18 million, respectively, in the operation period. CCUS may generate US$5,168 million and US$ 5,396 million (ADB and IEA investment scenarios, respectively) by 2060, of which about US$ 5,022 million and US$ 5,211 million will be increased in the investment period and US$146 million and US$185 million increased in the operation period. CCUS may mainly impact the mining industry, metal manufacturing industry, other service industries, machinery industry, and transportation industry, etc. (Figure 3) CCUS may slightly impact trade and agriculture industries.

4. Conclusions and Implications

This article used IEA and ADB investment scenarios to simulate CCUS investment in each future period. The socioeconomic benefits of CCUS were comprehensively evaluated using the GTAP model and IO method. The main conclusions were:

First, Coal-fired power generation accounts for the largest investment, followed by cement, iron, and steel. However, CCUS investment in the iron and steel industry may significantly increase from 2040 to 2060.

Second, CCUS investment may significantly promote the sectoral value-added of all industries from 2026 to 2060, especially the machinery industry, metal manufacturing, other service industries, power equipment manufacturing, and light processing manufacturing industries.

Finally, CCUS investment may indirectly create 12,796–103,886 jobs (ADB and IEA investment scenarios, respectively) and US$ 85 million–US$ 692 million of employment income (ADB and IEA investment scenarios, respectively) in 2030. Moreover, the corresponding values may increase to 0.82 and 0.85 million jobs respectively, and US$ 5,168 million and US$ 5,396 million employment income, respectively, in 2060. Notably, CCUS investment may mainly promote employment in mining, metal manufacturing, other service industries, machinery, and transportation industries. CCUS investment may have a slight impact on trade and agricultural sectors.

Figure 3. Carbon Capture, Utility and Storage-driven employment in different industries (a, b, c and d).

The construction and implementation of large-scale CCUS projects can bring considerable industrial value added and employment opportunities, boost the development of CCUS-related technology and equipment manufacturing, promote local economic transformation and drive the effective integration of carbon emission reduction and economic development in China. A comprehensive assessment of CCUS should not ignore its reoccurring socio-economic effects. In this sense, the central and local governments should strengthen policy incentives, explore CCUS subsidy incentive policies suitable for China's reality, increase financial investment, and form a sustainable incentive environment to provide momentum for the industry and even the whole society's carbon neutral journey.

Data Availability Statement

The data of the cost of CO_2 avoided-FOAK (US$/tCO2) can be constructed from Global CCS Institute (2017), Global costs of carbon capture and storage - 2017 update, June 2017, available at: https://www.globalccsinstitute.com/archive/hub/publications/201688/global-ccs-cost-updatev4.pdf. The macroeconomic data in the GTAP model comes from the GTAP database (version 9). Available at: https://www.gtap.agecon.purdue.edu/databases/v9/default.asp.

Acknowledgments
The authors wish to thank two referees for their helpful comments. This research was supported by the National Natural Science Foundation of China (Grant No:72073123).

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