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REVIEW ARTICLE

Review on new spending of United States Bipartisan Infrastructure Bill

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ABSTRACT

The US Infrastructure Investment and Job Act (IIJA), also commonly referred to as the Bipartisan Infrastructure Bill, passed in 2021, has drawn international attention. It aims to help to rebuild US infrastructure, including transportation networks, broadband, water, power and energy, environmental protection and public works projects. An estimated $1.2 trillion in total funding over ten years will be allocated. The Bipartisan Infrastructure Bill is the largest funding bill for US infrastructure in the recent history of the United States. This review article will specifically discuss funding allocations for roads and bridges, power and grids, broadband, water infrastructure, airports, environmental protection, ports, Western water infrastructure, electric vehicle charging stations and electric school buses in the new spending of the Infrastructure Investment and Job Act and why these investments are urgently necessary. This article will also briefly discuss the views of think tank experts, the public policy perspectives, the impact on domestic and global arenas of the new spending in the IIJA, and the public policy implications.

Keywords*: US Infrastructure Investment and Job Act (IIJA); new spending; transportation networks; broadband; water; power and energy; environmental protection and public works projects; public policy implications*

1. Introduction

Infrastructure involves sustainable systems or structures that enable economic activity. It is an incredibly significant factor in the modern economy by providing an opportunity for private institutions and individuals to effectively produce goods and services. The Infrastructure Investment and Job Act (IIJA) was signed by President Joe Biden on November 15, 2021. It is commonly referred to as the Bipartisan Infrastructure Bill. It aims to help to rebuild US infrastructure, including transportation networks, broadband, water, power and energy, environmental protection and public works projects. An estimated $1.2 trillion in total funding over ten years will be allocated through this Act, including $550 billion in new spending over five years on the infrastructure of the nation. The $550 billion in new spending includes $110 billion for roads and bridges, $66 billion for railroads, $65 billion for power and grids, $65 billion for broadband, $55 billion for water infrastructure, $50 billion for cybersecurity and climate change, $39 billion for public transit, $25 billion for airports, $21 billion for

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environmental protection, $17 billion for ports, $8.3 billion for Western water infrastructure, $7.5 billion for electric vehicle charging stations and $7.5 billion for electric school buses (Office of Senator Ben Cardin, 2021).

1.1. Problem statement

America's infrastructure issue is a sustained or long-lasting problem. Every four years, the American Society of Civil Engineers' (ASCE) Report Card for America's Infrastructure depicts the condition and performance of American infrastructure.

The 2001 report card gave the nation's infrastructure a cumulative grade of D+ for 12 infrastructure areas. To remedy America's current and looming problems, the ASCE estimated a needed $1.3 trillion investment over the next five years and called for a renewed partnership between citizens, the private sector, and local, state and federal governments. The grades ranged from a high of C+ for solid waste to a low of D– for schools (ASCE, 2001).

The 2019 Global Competitiveness Report (Schwab, 2019) ranked the US 13th in global infrastructure quality and 17th in road infrastructure quality. Over the past decades, US public infrastructure has aged dramatically. The American Society of Civil Engineers (2021) classified America's infrastructure as "poor" (a C– score). There is a water main break every two minutes. The ASCE suggested that there is a "growing wear and tear on our nation's roads, which has left 43% of our public roadways in poor or mediocre condition, a number that has remained stagnant over the past several years" (ASCE, 2021, p. 107). **Table 1** provides some of the details of the ASCE's 2021 report card.

Beyer (2021) suggested that the US is required to make a substantial investment in infrastructure to keep its competitiveness. Compared with other high-income countries, US investment in infrastructure is markedly less (Beyer, 2021). In 2018, only 1.47 percent of the nation's GDP (gross domestic product) was invested in physical infrastructure, such that the US was the 14th lowest among 16 high-income countries. Eleven of these 16 countries spent 50 percent more as a share of their GDP on physical infrastructure than the United States. Hence, this continuous underfunding in infrastructure has created maintenance backlogs, expanded travel times and unreliable services and utilities. As a result, underfunding negatively affects the quality of life and economic activities.

According to the infrastructure report of the Congressional Budget Office in 2021, nondefense gross investment by the federal, state and local governments in the US has significantly fallen since 1960 (Weinstock, 2021). For instance, nondefense gross investment in 1960 accounted for 4 percent of GDP in 1960. However, it fell to about 2.7 percent in 2019. Although $1.2 trillion sounds like a huge amount of money, it is not adequate to cover all backlogs in infrastructure.

The Problem Solvers Caucus (2017) suggested that reconsidering how the IIJA finances and treats projects in infrastructure should be completed by the federal government. Improving accountability and enhancing the transparency of the IIJA funding are significant to taxpayers. By doing so, the federal government will be able to monitor the infrastructure funding process by ensuring efficiency.

Table 1. ASCE's 2021 report card on America's infrastructure: Grades and summaries

Aviation: D+. Projections prior to the Covid-19 pandemic indicated that US aviation system would have a 10-year $111 billion funding shortfall. That gap will likely grow significantly as the travel market recovers.	**Bridges: C.** 42% of 617,000 US bridges are at least 50 years old, and 7.5% of those (46,154) are considered structurally deficient. A recent estimate indicated that $125 billion is needed for the nation's bridge repair.
Dams: D. Dams classified as "high-hazard potential" are dams where failure would cause loss of human life and extensive property damage.	**Drinking Water: C–.** The nation's drinking water system includes 2.2 million miles of underground pipes, but the system is aging and underfunded. A water main breaks every two minutes.
Energy: C–	**Hazardous Waste: D+**
Inland Waterways: D+. There have been some improvements in the system, but there is a $6.8 billion backlog in construction projects and ongoing lock closures that cause delays in waterway transport.	**Levees: D+.** The US Army Corps of Engineers estimated that $21 billion is needed to improve and maintain moderate- to high-risk levees, which represent about 15% of the known levees in the US.
Ports: B–. The nation's more than 300 coastal and inland ports supported 30.8 million jobs in 2018. But there is a $15.5 billion funding gap over the next ten years for waterside infrastructure, such as dredging and landside infrastructure.	**Public Parks: D+.** The lack of investment in parks has resulted in deteriorating bridges, trails, parking areas, drinking water systems and other infrastructure. State and local parks face a $5.6 billion and $60 billion maintenance backlogs, respectively.
Rail: B. There are two categories of the nation's rail network: freight rail and passenger rail. Freight rail has a strong network supported by direct shipper fees. However, passenger rail requires federal support and this has created a $45.2 billion backlog in needed repairs.	**Roads: D.** Spending on highways is the largest public infrastructure spending, but 40% of the nation's roads are in a poor or mediocre condition, causing motorists thousands of dollars in wasted time and fuel each year.
Schools: D+. Although there are no comprehensive national data on K–12 public schools, the available data indicate that 53% of public school districts need to replace multiple building systems, including heating, ventilation and cooling (HVAC) systems.	**Wastewater: D+.** The nation's 16,000 wastewater treatment plants are, on average, at 81% of their capacity, while 15% have reached or exceeded their capacity. In 2019, the annual water infrastructure capital investment gap was $81 billion.
Stormwater: D. Federal funding of $250 million annually leaves a growing annual funding gap of $8 billion just to comply with current regulations. A great deal more funding is needed to upgrade aging systems underneath densely populated areas.	**Transit: D-.** 45% of Americans have no access to transit. Existing systems are aging and $176 billion is needed to repair elements such as tracks and tunnels. This transit revenue shortfall is expected to grow to $270 billion through 2029.
Solid Waste: C+	**Overall: C-.** Over a ten-year period, the total investment gap is nearly $2.59 trillion.

2. New spending in IIJA

2.1. Roads and bridges ($110 billion)

Roads play a critical role in US infrastructure. Here, infrastructure refers to the basic physical and organizational structures and facilities (e.g., buildings, roads, bridges, railways, ports and power supplies) needed for the operation of society, especially for transportation networks.

According to the 2021 Report Card for America's Infrastructure by the American Society of

Civil Engineers (ASCE, 2021), more than 40 percent of road systems are now in a poor or mediocre condition and are often underfunded. The National Highway Traffic Safety Administration (2022) highlighted that nearly 42,915 people died due to motor vehicle crashes in 2021.

Kemp (2017) emphasized the grade comparison of the diverse categories of the nation's infrastructure between the ASCE's original 1988 survey and its more recent survey in 2017. Roads received a grade of C+ in 1988 and a grade of D in 2017 in those surveys. According to the ASCE's 2021 report card (ASCE, 2021), roads received a grade of D.

As for bridges, 42 percent of all 617,000 bridges in the US are at least 50 years old (ASCE, 2021). There are 46,154 bridges, or 7.5 percent of the total bridges in the US, that are in a poor condition. As of the year 2017, the nation's backlog of bridge rehabilitation needed was at $123 billion (ASCE, 2017). On the other hand, bridges received a grade of C+ in 1988, a grade of D in 2017 and a grade of C in 2021 (Kemp, 2017; ASCE, 2021).

For years, the US has been inadequately funding its roadways. Thus, it has resulted in a $786 billion backlog of road and bridge capital needs, including $435 billion for repairing roads, $125 billion for repairing bridges, $120 billion for expanding targeted systems and $105 billion for enhancing safety and operational improvements for targeted systems (ASCE, 2021). According to the White House (2021, March 31) and the Committee for a Responsible Federal Budget (2021), President Joe Biden proposed a total of $115 billion to upgrade bridges and roads that are in most critical need of repair. The $115 billion is significantly lower than the $786 billion backlog of road and bridge capital identified by the ASCE (ASCE, 2021). The American Jobs Plan was a $2.65 trillion proposal, which was already too high to be approved. Requesting $115 billion for roads and bridges is only a political expedient. The funding of $110 billion for roads and bridges in the Infrastructure Investment and Jobs Act is less than (but close to) the $115 billion that Biden initially requested in the American Jobs Plan.

According to the ASCE's 2021 report card (ASCE, 2021), an average of $53 billion in funding will be required to restore pavement conditions and other operational conditions. The US government needs to maximize the current investment levels by 29% to address current and future expected backlogs.

2.2. Railroads ($66 billion)

The US railway network is made of two systems, which are freight rail and passenger rail. Passenger rail needs government support because the current state of passenger rail is not in good condition. To fix all problems in passenger rail, $45.2 billion is required as a backlog (ASCE, 2021). As for freight rail, it maintains a strong network, largely through shipper fees, and almost all freight rails are owned and operated by private companies. The nearly 140,000-mile network is maintained and modernized with the investment of an average above $20 billion annually (Association of American Railroads, 2022).

According to Chinowsky et al. (2019), climate change has an extremely negative impact on the rail network because the ability of steel rails to support rail traffic starts to deteriorate when the temperature becomes exceedingly high. The study estimated that the delay-minute expenses of the rail network will range from $103 to $138 billion by 2100 depending on the projected increases in temperature from climate change. According to surveys conducted by the ASCE in 1988, 2017 and

2021, rail received a grade of B in 2017 and a grade of B in 2021. This category was not graded in 1988 (Kemp, 2017; ASCE, 2021).

According to President Biden's American Jobs Plan (2021), $80 billion was requested to improve passenger and freight rail services. Lobosco and Luhby (2021) highlighted that the funding of $66 billion for railroads in the IIJA is less than the $80 billion Biden originally wanted to send to AMTRAK.

2.3. Power grids ($65 billion)

Generation, transmission and distribution are considered as the key three components of electric grids. These three components have been funded differently, and they have an investment gap. The ASCE (2021) report highlighted that annual public spending on high-voltage transmission lines increased from $15.6 billion in 2012 to $21.9 billion in 2017, although there is a large gap. By 2029, this gap will grow to a cumulative $197 billion to meet the latest state-driven renewable portfolio standards in generation infrastructure.

In addition, the federal government increased the annual spending on the last mile of the electricity network by 54 percent over the past 20 years.

The Problem Solvers Caucus (2017) stated that federal policies have made it difficult for the sector to keep up with innovation and growth. For example, burdensome permit processes, laws and regulations have hindered the investment and buildout of the nation's energy infrastructure.

According to the Committee for a Responsible Federal Budget (2021), $100 billion was initially requested by President Joe Biden to improve and expand the power grid infrastructure. The US Department of Energy (2021) highlighted that $100 billion will be invested by the American Jobs Plan to reenergize America's power grid and transmission system.

However, the enacted funding of $65 billion for power grids in the Infrastructure Investment and Jobs Act is lower than the originally proposed $100 billion in the American Jobs Plan.

2.4. Broadband ($65 billion)

According to the White House's estimation, 30 million Americans do not have access to high-speed broadband (Richter et al., 2021). At least 100 million US homes should have cheap access to a robust broadband service, as the National Broadband Plan stated (Kanakis, 2017). According to estimates by the US Bureau of Economic Analysis in 2003, for each $1 invested in broadband, the economy benefits approximately $3 (Mahasuweerachai et al., 2010). In 2009, the US federal government allocated $7.2 billion under the American Recovery and Reinvestment Act (ARRA) for broadband, generally to improve broadband access and adoption rates among populations underrepresented with respect to broadband usage (Hauge and Prieger, 2015). Since the launch of 4G in 2010, the US telecom industry has spent over $253 billion in capital investments, as the Cellular Telecommunications Industry Association reported (ASCE, 2021). In addition, to support 5G, the telecom industry invested $27.4 billion in increasing capacity, expanding coverage, developing infrastructure and upgrading technology in 2019. The federal government spent over $15 billion on various broadband programs across the US between 2000 and 2018 through the Federal Communications Commission (FCC).

Zarracina, Garrison, and Petras (2021) and the White House (2021, March 31) stated that the $100 billion was initially requested in the American Jobs Plan by President Joe Biden to build high-speed broadband networks throughout the US with the objective of letting the broadband to become universal for all people in the US and reducing the cost for internet access. However, the current $65 billion for broadband in the IIJA is significantly less than the $100 billion that was initially proposed for the expansion of broadband in the US.

2.5. Water infrastructure ($55 billion)

The ASCE's 2021 report card stated the annual drinking water and wastewater investment gap will rise to $434 billion by 2029.

Grigg (2021) emphasized that the comparable need for 20 years was $271 billion for wastewater, according to a 2012 EPA survey.

Greer (2020) highlighted that the quality of drinking water in the US is relatively high. However, according to the estimation of the American Water Works Association, $1 trillion is required for maintaining and expanding service to meet demands over the next 25 years.

A study conducted by the Urban Land Institute and Ernst & Young concluded that the water infrastructure has the greatest challenges than other infrastructure categories in the US (Haarmeyer, 2011).

Stevens (2021) and Tuser (2021) highlighted that the $111 billion for water infrastructure was originally proposed and requested previously in American Jobs Plan in 2021. However, $55 billion was finally approved in the IIJA by the end of 2021. The $55 billion for water infrastructure in the IIJA is relatively lower than the initially requested $111 billion.

According to Levin et al. (2002), US public water infrastructure, including its maintenance and repair, was not adequately funded and invested over the past half-century.

2.6. Cybersecurity and climate change ($50 billion)

Cybersecurity is a key part of the nation's IT (information technology) modernization efforts. Nearly $9.8 billion are included in the President's 2022 Budget for civilian cybersecurity-related activities (Office of Management and Budget, 2022). This funding indicates a 14 percent growth from the 2021 budget report. According to Jaikaran (2021), around $2 billion was requested by the American Rescue Plan Act of 2021 for federal IT and cybersecurity. The White House (2021, May 18) highlighted that $2 billion will be invested by the Infrastructure Investment and Jobs Act to secure and upgrade federal, state and local IT networks; protect key infrastructure and utilities; and support public and private organizations as they respond to and recover from cyberattacks and breaches.

Norris et al. (2019) identified major barriers to American local governments practicing a higher level of cybersecurity. As a result of their survey, five significant barriers to practicing a higher level of cybersecurity among local governments were reported, which are inadequate salaries for cybersecurity employees, inadequate number of cybersecurity staff, insufficient funds, inadequately trained personnel and lack of end-user accountability.

The Federal Emergency Management Agency (2022) stated that $183.5 million is allocated in fiscal year (FY) 2022 under the State and Local Cybersecurity Grant Program from the Infrastructure Investment and Job Act.

According to the report by the Office of Management and Budget, the annual federal climate change spending grew by $4.4 billion from FY 2010 through FY 2017 (Lattanzio et al., 2021). For instance, the annual funding for reducing emissions through technology increased by nearly $3.5 billion. In addition, the US Government Accountability Office (2018) reported that public spending on climate change research, clean energy technology and international assistance has increased from $2.4 billion in fiscal year 1993 to $13.2 billion in fiscal year 2017. The American Recovery and Reinvestment Act of 2009 provided an additional $26.1 billion for climate change programs and activities.

According to the White House (2021, May 18), strengthening US cybersecurity capabilities is a top priority, where $20 billion was requested for cybersecurity. In addition, according to the White House (2021, Nov 6), $50 billion was initially requested in the American Jobs Plan to prevent, reduce and withstand the impacts of the climate crisis. However, according to the Infrastructure Investment and Job Act, the federal government will spend a total of $50 billion for both cybersecurity and climate change efforts, less than the initially requested $70 billion.

2.7. Public transit ($39 billion)

Forty-five percent of Americans lack access to transit (ASCE, 2021). Transit agencies often face challenges due to inadequate funds for maintaining their existing system in a good condition. The current backlog of transit is $176 billion. According to the ASCE (2021), this deficit is expected to increase to more than $250 billion by 2029.

The transit system across the US is facing difficulties keeping aging infrastructure due to insufficient funding (ASCE, 2017). In addition, the limited funding leads to a huge backlog in transit systems. Transit received a grade of D– in 2017 and a grade of D– in 2021 according to the ASCE's assessments in 2017 and 2021.

A total of $85 billion was originally requested by President Joe Biden to modernize existing transit systems and assist agencies in extending their systems to meet the demands of riders (White House, 2021, Nov 6). This investment was intended to double federal funding for public transit, reduce the backlog and bring the rail service and bus rapid transit to communities and neighborhoods across the country. However, the $39 billion in the IIJA for the investment in public transit is much lower than the originally requested $85 billion. Ultimately, the investment will not only reduce traffic congestion for everyone but also have the following benefits: aging infrastructure will be repaired, bus and rail fleets will be modernized, stations will be accessible to all users, and transit services will be brought to communities through this investment (White House, 2021, Nov 6). Furthermore, thousands of transit vehicles will be replaced with clean, zero-emission vehicles through the investment.

2.8. Airports ($25 billion)

US airports are facing increasing capacity challenges prior to the Covid-19 outbreak (ASCE, 2021). The Problem Solvers Caucus (2017) highlighted that American airports served more than 932

million passengers annually and moved about a quarter of the country's exports and imports prior to the Covid-19 pandemic. The aviation system is facing a big challenge to recover from the pandemic. Still, it has not recovered yet.

Sheard (2021) stated that nearly 400 commercial service airports host flights and they serve approximately 2.5 million passengers every day. Congress has increased the funding from $11 billion annually to nearly $15 billion from 2017 to 2020 (ASCE, 2021). However, the US aviation system has a 10-year, $111 billion funding shortfall due to the Covid-19 pandemic. This gap is projected to grow as passenger volumes fell in March 2020. In general, airports require $237 billion for the pre-pandemic 10-year total investment need.

Airports received a grade of D in 2017 and a grade of D+ in 2021 as a result of the ASCE's assessments in 2017 and 2021. According to Westgaard (2017), the cost of congestion and delays in airports was calculated to be $22 billion in 2012.

The National Association of Counties (2021) and the White House (2021, Nov 6) highlighted that the initial investment plan for airports was $25 billion to ensure safe and efficient air travel and support terminal renovations through the Airport Improvement Program. The previous funding plan for national airports in the American Jobs Plan is the same as the final approved funding in the IIJA.

2.9. Environment ($21 billion)

The federal government provides environmental protection funds to US states and tribal partners through categorical grant programs.

According to the US Environmental Protection Agency (EPA) (2020), the enacted budget for environmental protection for FY 2021 was $9.23 billion. The key component of the FY 2021 budget request was for environmental infrastructure funding, such as clean water infrastructure funding, drinking water, and brownfield and Superfund projects. Ensuring clean air, water and land and safer chemicals is the core work of the EPA. Hence, the FY 2022 budget also supports the key work of the EPA and improves work in major areas, while cutting unnecessary spending (US EPA, 2021). In the FY 2022 Budget, $11.2 billion is requested for environmental protection.

The White House (2021, March 31) and Armstrong et al. (2021) stated that President Biden requested $50 billion to enhance infrastructure resilience, including environmental protection. The White House (2021, March 31) highlighted $21 billion will be invested in environmental remediation from the IIJA funding.

2.10. Ports ($17 billion)

More than 300 coastal and inland ports of the nation are key drivers of the US economy. In 2018, 30.8 million jobs were supported by ports and 26 percent of the total GDP of the US was accounted for ports (ASCE, 2021).

The major components of the port infrastructure include docks, piers and channel harbors. All ports in the US are facing a huge challenge to maintain their infrastructure in harsh marine environments. Therefore, port owners are required to monitor the structural integrity of their infrastructure in such challenging environments. In addition, many ports were built a century ago. Hence, all owners must continue to upgrade the infrastructure of their ports.

According to the ASCE (2021), $163 billion is planned to be spent on ports and tenants between 2021 and 2025. Ports received a grade of C+ in 2017 and a grade of B– in 2021 according to the ASCE's assessments in 2017 and 2021.

According to Armstrong et al. (2021) and the White House (2021, March 31), $17 billion was initially requested for coastal ports inland waterways, land ports of entry and ferries when President Joe Biden introduced the American Job Plan Act in March 2021. In addition, a Healthy Ports program was included in this investment plan to minimize the negative effects of air pollution on neighborhoods. The previous funding plan for US ports in the American Jobs Plan is the same as the final approved funding in the Infrastructure Investment and Jobs Act.

2.11. Western water infrastructure ($8.3 billion)

To serve its growing communities and encourage settlement of arid regions, the US heavily invested in the storage and delivery of water in the West in the past. This ambitious initiative changed the region by bringing millions of new residents and encouraging a key growth-oriented economy (Thompson, 2020). However, federal funding for water infrastructure has fallen dramatically in recent decades. Hence, insufficient federal funding is placing a burden on state and local administrations to maintain water resource infrastructure systems.

Fahlund, Choy, and Szeptycki (2014) stated that the federal government made an intensive investment in large Western water reclamation and flood control projects between 1930 and 1970. Since that time, investment and support from the federal government in large Western water projects had been more limited. As of today, funding for Western water projects has grown back. In the next 20 years, Western regions are likely to catch up with Eastern regions by investing more in water infrastructure. Western states, including California and Texas, keep funding some water projects through direct appropriations and obligations bonds. Unfortunately, these efforts are facing challenges and becoming more difficult. Due to government funding limitations for water infrastructure, public-private partnerships (PPPs) are becoming a significant way for financing water projects. However, while PPPs might provide the necessary funding, the authorities still must pay back their loans with raising rates.

According to the Bureau of Reclamation of the United States Department of the Interior (2021a), it has leveraged $365 million in federal funding with $1.1 billion in non-federal cost share funding for 749 WaterSMART projects in the Western US since 2016. A wide range of water management activities are included in these projects, such as water delivery system improvements, drought contingency plans, restoration plans by watershed groups, water reuse and recycling projects, and more.

In 2021, US Senator Michael Bennet (D-CO) and three other Democratic senators urged the Biden Administration to include Western water priorities in the infrastructure proposal. According to the Office of Senator Michael Bennet (2021), "The Bureau of Reclamation (BOR) estimates they will need $3.8 billion over the next five years to address immediate, short-term need" (para. 9). However, the Bureau of Reclamation's reclamation total is $13.52 billion for the 2022–2032 period (Bureau of Reclamation, 2021b).

According to Western Growers (2021), more than $8 billion was included in the Infrastructure Investment and Jobs Act to improve water supply reliability across the West, including building

new groundwater storage and conveyance facilities, fixing old dams and canals, financing water conservation and recycling projects, and enhancing ecosystem management.

2.12. Electric vehicle charging stations ($7.5 billion)

The Federal Highway Administration (2021) stated that 500,000 new electric vehicle (EV) chargers will be installed by 2030. To plan for and build EV chargers, several Department of Transportation funding and finance programs are available.

In 2011, President Obama set a goal of having one million plug-in electric vehicles on the road by 2015 (US Department of Energy, 2012). With the assistance of government-supported projects, the number of non-residential charging units has increased and is already surpassing 7,000 in 2012. In addition, the Obama administration extended a $7,500 tax credit that was implemented by President W. George Bush for the purchase of electric vehicles (Lee and Clark, 2018). Volkswagen implemented the Electrify America initiative to promote greater zero-emission adoption by providing a convenient and fast network in 2016. A total of $360 million for fast-charging corridors, $330 million for public and workplace charging and $14 million for home charging have been allocated by Volkswagen's Electrify America funding.

M. Nicholas (2019) analyzed and evaluated the capital costs (installation and hardware) for a scenario of 2.6 million new electric vehicle sales in the top 100 US metropolitan regions from 2019 to 2025. As a result of his findings, a total of $1.3 billion is needed to support these electric vehicles for home charging, and a total of $940 million is needed for new workplace infrastructure, public Level 2 infrastructure and DC fast-charging infrastructure.

Brown (2021) highlighted that the $7.5 billion allocated in the IIJA for electric vehicle charging infrastructure is significantly less than the $174 billion that President Biden initially asked for in the American Jobs Plan. When introducing the American Jobs Plan, Biden said that $174 billion would be needed for the US to win the EV market. According to the International Energy Agency (IEA) (2021), President Biden planned to build a national network of 500,000 electric vehicle chargers by 2030 by creating grant and incentive programs for both the public and private sectors with the initially requested $174 billion.

2.13. Electric school buses ($7.5 billion)

According to Evans and Folger (2021), 95 percent of America's school buses are dependent on diesel. Diesel is the main source of several serious health risks, specifically respiratory illnesses. Several grant programs, such as the Low-or-No emission grants program, the Congestion Mitigation and Air Quality Improvement program, the State of Good Repair program, the School Bus Rebate program and others, are offered by the federal government to offset the upfront expenses of electric buses. Congresswoman Hayes introduced the "Clean School Bus Act of 2021" legislation to protect the health of America's schoolchildren in February 2021 (Clean School Bus Act of 2021, 2021). To help school districts across the nation replace traditional school buses with electric ones, this bill will provide $1 billion. In addition, if the bill becomes law, it will provide grants of up to $2 million for school districts to change diesel buses with electric buses, support workforce development and invest in charging infrastructure.

President Biden requested $20 billion to convert 20 percent of the fleet of school buses to electric

when he introduced the American Jobs Plan in early 2021 (White House, 2021, March 31; Walton, 2021). However, the final funding for school bus electrification was agreed upon at $7.5 billion.

The lack of sufficient funding from the federal government for school buses is considered a big problem although school buses are the largest type of mass transit in the US (Thomas Built Buses, 2021). To jump-start school bus electrification across the country, a significant amount of federal focus, leadership, support and investment are needed.

3. Views of think tank experts

The think tank experts' views regarding the effects of the IIJA are quite different. Those who support the IIJA identified the benefits of the IIJA, while those who are against it found a number of problems associated with the IIJA.

Supporters of the IIJA believe that the increased investment in infrastructure is incredibly significant, as well as the benefits to the economy. Concerning the potential effect of the bill, many economists agree that the IIJA will bring some long-term economic benefits. Badlam et al. (2021) furthermore stated that through extensive upgrades for bridges and roads, the IIJA will transform the nation's aging infrastructure.

On the other hand, critics of the Act argue that this will result in a high increase in public deficit in the future. As Congressional Budget Office had analyzed, the 2021–2031 deficit will be increased by $256 billion through the Infrastructure Investment and Jobs Act (Weinstock, 2021). In addition, critics emphasize that this law does not have enough spending; thus, it will not be able to address the needs of US infrastructure.

The Associated General Contractors of America (2021) identified the benefits and weaknesses of the IIJA. Several benefits of the IIJA were identified: a record-setting investment is provided, the Surface Transportation Reauthorization Act is included, taxes on construction companies are not increased, states are allowed to build new roads without new restrictions, and investments in water infrastructure, energy infrastructure and direct federal construction are expanded. On the other hand, the Act does not address the long-term solvency of the highway trust fund. In addition, Q4 2021 Employee Retention Tax Credit (ERTC) was canceled by the IIJA. Furthermore, the Act provides broad discretion to federal agencies.

The Congressional Budget Office in 2021 highlighted the future macroeconomic effect of the Infrastructure Investment and Job Act. Over the 2021–2031 period, the effects on growth will be small but positive (Weinstock, 2021).

4. Public policy perspectives

The Infrastructure Investment and Job Act is considered the highest among other types of federal government spending and tax policy (Zandi and Yaros, 2021).

According to Huntley and Ricco (2021), the funding sources of the infrastructure bill will come from a combination of additional deficits, user fees and other tax provisions. The debt will be reduced by 0.9 percent and output will grow by 0.1 percent according to their estimation via a

budget model.

As Zandi and Yaros (2021) emphasized, the IIJA will increase the budget deficit over 10 years on a static basis. However, gradually, the increased infrastructure spending will contribute to economic growth by generating more tax revenues and reducing other government spending on income support programs, including unemployment insurance (Zandi and Yaros, 2021).

Boushey (2021) emphasized that low interest rates enable IIJA investments to become cost-effective, and the effects of climate change make these investments urgent.

According to the American Association of State Highway and Transportation Officials (2021), rural infrastructure development and dedicated new funds for key projects are included in the IIJA.

5. Impact on American life and society

According to the American Association of State Highway and Transportation Officials (2021), the IIJA is regarded as a historic investment in US core infrastructure priorities, including rebuilding roads, bridges and highways; improving highspeed internet; upgrading airports and ports; expanding clean drinking water; fighting climate crises and enhancing the environment.

Zandi and Yaros (2021) highlighted that the Infrastructure Investment and Job Act will improve the quality of life and reduce social inequalities by supporting lower- and middle-income Americans.

Past infrastructure investments had a lack of positive impacts on low-income and minority communities. Equity is addressed in every section of the IIJA, such as broadband, public transportation, safety, water infrastructure, environment, etc. According to Badlam et al. (2021), the Act will help to build a more sustainable and inclusive economy. Lead pipes that supply drinking water will be replaced and pollution in disadvantaged communities will be remediated by the IIJA.

Watson (2021) stated that the IIJA will expand and extend critical infrastructure programs in local entities, such as counties or municipalities, through direct funding.

According to the Joint Economic Committee (2021), the investments of the IIJA will create additional 600,000 jobs in 2024 and 800,000 jobs in 2025. Additionally, frontline workers will receive direct assistance thanks to the IIJA.

Boushey (2021) stated that all Americans will be able to benefit from all sector investments, including maintenance of bridges and roads, access to high-speed internet and substantial progress in public transit, electric vehicles and electricity transmission thanks to IIJA investments.

It was reported that there is a strong relationship between recent infrastructure spending and the following private investment. From the Korean War to the 1970s, government investment stimulated private investment and thus the economy (Carr, 2021).

We believe, based on the review of relevant literature, that the overall effect of passing the IIJA is at least positive. Americans have waited too long for an act to address US infrastructure on such a comprehensive scale. Since the spending will happen over the next five-year period, its effects will only occur in the long term. This bill is an investment in the future. The IIJA is the largest federal investment addressing climate change so far. For example, by adding more electric vehicle charging

stations and switching to electric-powered public transportation, the IIJA started an agenda toward a greener America.

6. Global impacts of Bipartisan Infrastructure Bill

Students of world affairs are not a stranger to the phrase "when America sneezes, the world catches a cold". "As a global leader, other nations tend to follow America. What happens in America affects the rest of the world, be it for good or bad" (E. Nicholas, 2018, para. 1).

The economy of the US has a major impact on the global economy due to its scope and international linkages. About 22 percent of global output is produced in the US; thus, the US is considered as the largest economy in the world (Kose et al., 2020). According to Neufeld (2021), the US economy was 24.4 percent of the global GDP in 2021. In addition, the US accounts for over a third of stock market capitalization. In international trade and financial transactions, people around the world use the US dollar the most. The world's economy is closely linked to the US economy.

According to the American Association of State Highway and Transportation Officials (2021), the IIJA will strengthen economic efficiency, productivity, GDP and revenue and reduce inflation.

Zandi and Yaros (2021) emphasized that the Infrastructure Investment and Job Act will enhance the long-term economic growth of the US. Weinstock (2021) stated, "With respect to overall economic output, increased public infrastructure spending generally leads to higher economic output in the short term by stimulating demand and in the long term by increasing overall productivity" (2021, p. 2). This might positively affect the global economy as well because the US is the key player in global finance and economy. Hence, it is believed that the IIJA is good for the US and global economy in the short and long terms.

7. Public policy implications of IIJA

Implication 1: The IIJA is a giant step toward building and improving US infrastructure. Yet there is a long way to go for US infrastructure to reach the "A" level.

The American Society of Civil Engineers' 2021 Report Card for America's Infrastructure (ASCE, 2021) indicated that the total investment gap was about $2.59 trillion. The estimated $1.2 trillion in total funding of the IIJA is less than half suggested by the ASCE. The backlog of America's infrastructure has accumulated over many decades and catching up may take decades. The initial proposal of $2.6 trillion was eventually slashed to $1.2 trillion dollars for political compromise. Still, the IIJA is a step in the right direction. The whole package of the IIJA is the most important step in a couple of generations toward upgrading critical infrastructure.

Implication 2: There is a lot of planning to do in managing the implementation of the IIJA funding and making it efficient and effective. Otherwise, there may be a huge waste of taxpayers' money.

The federal money will be allocated through different levels of government and a variety of programs. At the federal level, federal agencies—from the Department of Transportation to the Department of Energy to the Environmental Protection Agency—will be administering new grants

and designing new programs. At the subnational level, state and local officials must be prepared to handle the influx of new federal funding. Some of the funds will be awarded to selected applicants through competitive grant programs. There are intergovernmental collaborations and there is a great demand for public-private partnership.

All three levels of government must be prepared to hire talents: budget experts, various skilled tradespeople, conservationists, environmental engineers, construction workers and so forth. The IIJA also will mean greater aggregate demand for input materials. New federal programs launched by the IIJA require internal planning and internal and public review.

All of the above efforts necessitate careful planning.

Implication 3: The IIJA funding may cause inflation. Planning and preventive measures are necessary.

There are arguments about whether the IIJA funding will lead to inflation. Some stated that the near-term effect on price increase will be small. Advocates of the IIJA contend that potential inflationary risks are not a good reason for the government to restrain its ambitions on priorities.

As a matter of fact, the inflation rate in the US has been above 7.0% for all months of 2022 and surpassed 8.0% since March 2022. Republicans have asserted that IIJA spending, much of which is spread over several years, will push prices higher.

We understand that quite a number of factors have contributed to the inflation rate in 2022. The IIJA funding may be just a small portion of the equation. However, we feel that the government can do a better job in anticipating the increase in inflation and adopt relevant measures to check inflation using preemptive policies.

Implication 4: It is our concern that the IIJA will partially contribute to the increase in US national debt, which is 31 trillion dollars in 2022.

Although Democrats maintain that the legislation pays for itself without raising taxes, the Congressional Budget Office found that the package will add $256 billion to the deficit over the next 10 years. Other analyses predicted an even higher amount of deficit to be added to the national debt. The large-scale national debt increase started in the Reagan years in the early 1980s. Since then, the trend of national debt increase becomes unstoppable. The US national debt is a time bomb. A responsible government should curb the growth of the national debt. If spending such as the IIJA is absolutely necessary, funding should be settled in the proposal stage.

Implication 5: Implications on the economy, public spending and prioritization of economic drivers

The Infrastructure Investment and Job Act allocates $550 billion in new spending over five years on the infrastructure of the nation. Among them, $110 billion will be spent on roads and bridges. It was estimated that every $1 billion in roads and bridge infrastructure investment supports at least 13,000 jobs throughout the US economy. The overall IIJA funding can generate millions of jobs over the next 10 years. The $550 billion in new spending will be invested in roads and bridges, railroads, power and grids, broadband, water infrastructure, cyber security and climate change, public transit, airports, environmental protection, ports, Western water infrastructure, electric

vehicle charging stations and electric school buses.

The major economic benefits of the IIJA ("New analysis says", 2021) include:

- The combined investment in new highways, bridges and public transit under the IIJA will add about half a trillion dollars to the US GDP by 2027.
- As federal highway and public transit investment spurs economic growth, the additional funding from the IIJA supports more than 250,000 new jobs by 2025. Over half of these positions will be outside of the construction sector.
- More economic activities mean that federal, state and local tax revenues will increase by more than $160 billion. These revenues can be reinvested throughout local communities.
- New jobs and higher wages benefit American households, with personal disposable income increasing by $69 billion by 2027, or more than $500 per household.

Overall, these IIJA investments will go a long way and have long-term positive impacts on the US economy.

8. Conclusion and future prospect

According to the ASCE's 2017 report card (ASCE, 2017), the cumulative infrastructure score for the US was D+, and according to the 2021 report card (ASCE, 2021), America's infrastructure scored a C–. Therefore, rebuilding the nation's infrastructure is essential and it is irrational for the rebuilding to be further postponed.

The IIJA will play a significant role in the rebuilding process of US infrastructure by providing public investment in areas such as transportation networks, broadband and public works projects. Most experts emphasized that the IIJA will provide a tangible benefit for all states by improving their physical infrastructure, whereby it can enhance the quality of life and the economy.

On the other hand, some critics and professionals believe that the IIJA will affect the budget deficit in the coming years and increase the national debt to a greater extent.

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