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ANNUAL PRIVATIZATION REPORT: TRANSPORTATION FINANCE

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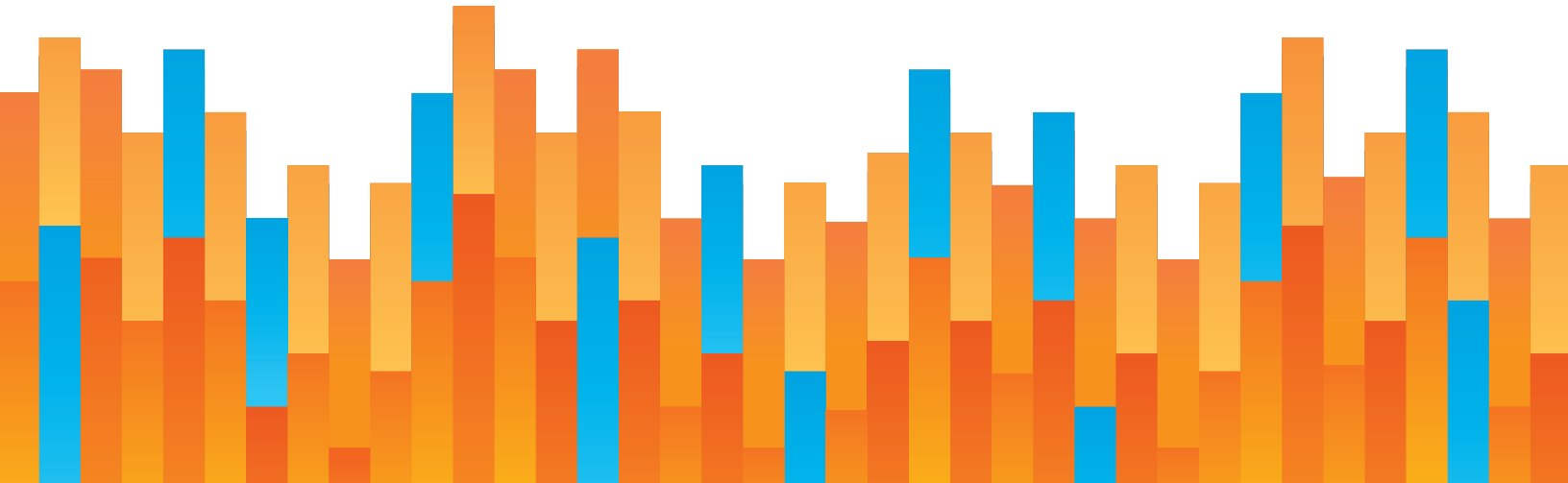

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TABLE OF CONTENTS

PART 1

INTRODUCTION

Historically, much major infrastructure was owned and operated by governments as state-owned enterprises. Starting in the 1990s, many governments in developed countries privatized such infrastructure as electricity, natural gas, telecommunications, and railroads, as well as airports, seaports, and toll roads. Some infrastructure was sold to investors, either in whole or in part. But in many other countries, such enterprises were leased under long-term public-private partnership arrangements (PPPs). A growing number of governments also began to use long-term PPPs to develop brand new infrastructure, such as a new airport (India) or toll road (numerous countries in Latin America). The sale or lease of an existing facility is termed a "brownfield" transaction, while PPPs for new facilities are referred to as "greenfield" transactions.

The need to finance both types of transactions has spurred the creation of a new kind of financial entity: the infrastructure investment fund. These funds enable various kinds of investors (insurance companies, investment banks, pension funds, etc.) to pool their capital and hire staff experienced in infrastructure finance and management to build a portfolio of infrastructure assets. Some of these funds are set up for a limited term (often 10 years), at which point the assets are sold to others and the proceeds distributed. Other funds are open-ended, with no set time frame but generally much longer expected duration. Some infrastructure investment funds specialize in a geographic region (e.g., Europe) or in a sector (such as energy or transportation).

During 2018, *Infrastructure Investor* reported that investors put a record $80 billion in new money into infrastructure investment funds. Pension funds continued to expand their

participation in infrastructure, viewing this as a way to diversify their portfolios in hopes of increasing the overall return on their assets. Conventional and renewable energy displaced transportation as the number one interest of infrastructure investors in 2018.

This report reviews 2018 developments in the infrastructure investment fund arena, explores a relatively new concept called “infrastructure asset recycling,” explains growing interest in this sector by public-sector pension funds, and summarizes major PPP projects worldwide and in the United States as of 2018.

PART 2

MAJOR INFRASTRUCTURE INVESTMENT FUNDS IN 2018

2.1 OVERVIEW

The amount raised by infrastructure investment funds in 2018 reached a new high of more than $80 billion, a nearly 40% increase from 2017's previous peak of $57.9 billion.[1] The magazine *Infrastructure Investor* released its annual "Infrastructure Investor 50" tabulation of the funds that had raised the most money in the previous five-year period.[2] Table 1 is reproduced, with permission, from *Infrastructure Investor*. The table includes the name of each fund, the country where it is headquartered, and the five-year total it has raised.

TABLE 1: INFRASTRUCTURE INVESTOR 50, 2018

Rank	Firm	Headquarters	5-Year Total ($B)
1	Macquarie Infrastructure and Real Assets	Australia	$55.530
2	Brookfield Asset Management	Canada	$27.698
3	Global Infrastructure Partners	USA	$26.000
4	KKR	USA	$18.653
5	IFM Investors	Australia	$17.702
6	Stonepeak Infrastructure Partners	USA	$14.946
7	I Squared Capital	USA	$12.000
8	Colonial First State Global Asset Mgt.	Australia	$11.128

Rank	Firm	Headquarters	5-Year Total ($B)
9	Ardian	France	$10.652
10	Energy Capital Partners	USA	$10.556
11	AMP Capital	Australia	$10.533
12	BlackRock	USA	$10.495
13	KCB Infrastructure Investments	South Korea	$ 9.551
14	Antin Infrastructure Partners	France	$ 8.173
15	EQT Partners	Sweden	$ 7.275
16	ArcLight Capital Partners	USA	$ 7.247
17	DIF	Netherlands	$ 6.361
18	Copenhagen Infrastructure Partners	Denmark	$ 6.095
19	Infracapital	UK	$ 5.988
20	Partners Group	Switzerland	$ 5.975
21	Hermes Investment Management	UK	$ 5.380
22	Carlyle Group	USA	$ 5.321
23	F2i*	Italy	$ 5.050
24	Blackstone*	USA	$ 5.000
25	InfraRed Capital Partners	UK	$ 4.647
26	Actis	UK	$ 4.364
27	LS Power Group	USA	$ 4.330
28	Dalmore Capital	UK	$ 4.208
29	Sunvision Capital	China	$ 4.148
30	QIC	Australia	$ 3.890
31	Greencoat Capital*	UK	$ 3.846
32	Ping An Asset Management	China	$ 3.810
33	Morgan Stanley Infrastructure	USA	$ 3.600
34	Equitix	UK	$ 3.542
35	DWS	Germany	$ 3.490
36	Axium Infrastructure	Canada	$ 3.380
37	Meridiam Infrastructure	France	$ 3.327
38	Capital Dynamics*	Switzerland	$ 3.309
39	Digital Colony*	USA	$ 3.300
40	Mirova	France	$ 3.073
41	iCON Infrastructure	UK	$ 3.030
42	Goldman Sachs Infra. Partners	USA	$ 2.969
43	Starwood Energy Group	USA	$ 2.794
44	Equis	Singapore	$ 2.582
45	China Communications Construction Co.	China	$ 2.383
46	Aviva Investors*	UK	$ 2.336
47	Oaktree Capital Management	USA	$ 2.240
48	Northleaf Capital Partners	Canada	$ 2.151
49	Basalt Infrastructure Partners*	UK	$ 2.115
50	3i Group*	UK	$ 1.984
	TOTAL		$ 386.173

*** indicates fund is new to list for 2018**

Source: Alves, Bruno. "For the Few, Not the Many: The Infrastructure Investor 50." *Infrastructure Investor*. November 2018.

There are no reliable estimates of the total funds raised by all infrastructure investment funds since the category began about two decades ago. The largest fund in Table 1—Macquarie Infrastructure and Real Assets (MIRA)—has raised $83 billion since its inception 23 years ago. That is 50% more than its past-five-years' total. Thus, one guess at the total raised by major funds over this long period might be 50% more than the five-year total of $388 billion in the table: $582 billion. Since this sum is mostly equity, and equity accounts for perhaps 25% of the financing of a facility, that amount of equity might make possible $2.3 trillion worth of infrastructure transactions.

From Table 1's identification of the headquarters location of each fund, we can extract the fraction of the $388 billion five-year total amassed in each of five regions. That breakdown is: Europe 41%, the United States 33%, Australia 11%, Canada 9%, and Asia 6%. But that is not necessarily where the funds are being invested. By focus of investment, the most common is multi-regional (44%), Europe (29%), North America (22%), Asia/Pacific (5%), and less than half of 1% elsewhere.[3]

In its annual survey of infrastructure investors, Probitas found that transportation had slipped from being in a tie for first place (with energy and power) in 2017 to third place in 2018.[4] Transportation continues to remains a strong focus, of interest to 60% of investors.

TABLE 2: INFRASTRUCTURE SECTORS OF INTEREST, 2018

Renewable Energy	66%
Water & Waste Management	66%
Transportation	60%
Telecom	57%
Energy & Power	54%
No Sector Focus	49%
Social Services	37%

Source: Probitas Partners. "Infrastructure Investor Trends: 2018 Survey Results."

Infrastructure Investor also reported on infrastructure funds that, as of January 1, 2019, were actively in the market, raising funds. The total sought by 255 funds is $192 billion. Of that total, the largest share ($63 billion) is targeted for the U.S. market, with multi-regional focus a close second at $60 billion. Europe was third with $41 billion being sought, followed by smaller amounts targeted at Asia-Pacific, Latin America, and Sub-Saharan Africa.

The above discussion concerns sums *raised* by the infrastructure funds. The other question is what they are spending those funds on. On a global basis, Inframation's data show a rising trend in global transport deals, rising from $117 billion in FY 2016 to $147 billion in FY 2018.[5] Of the 278 transport deals in 2018, 62 were greenfield PPPs worth $35 billion. Some of the largest transport deals were the $2.3 billion Navi Mumbai Airport in India, the $2.68 billion Gordie Howe bridge between Michigan and Ontario (Canada), and the $6.7 billion private investment in the WestConnex toll road project in Sydney, Australia.

In its newsletter, Inframation provided a summary of 2018 "deal flow" in North America. For all categories of infrastructure, the company reports that 398 deals reached financial close in 2018, with a total value of $110.9 billion.[6] Inframation's data distinguish between PPP brownfield deals ($53.4 billion) and greenfield deals ($10.4 billion). Other deals included in the overall total were mergers and acquisitions of infrastructure companies. The two largest U.S. transportation PPPs were the $2 billion Los Angeles International Airport Consolidated Rental Car facility and the $629.5 million I-75 project in Michigan. Both of these are financed based on the government's commitment to pay availability payments over the long term of the agreements.

In its 2018 investor survey, Probitas asked respondents whether their firm's appetite for infrastructure investment would increase, decrease, or remain the same in 2019. The largest fraction (47%) said it would remain the same, while another 44% said it would increase—a large jump from the 25% giving that response in the 2017 survey.[7] This group of investors showed the strongest interest in North America, followed by Global and Western Europe, with significantly lower levels of interest in other parts of the world. Preqin's annual survey found that 70% of the investors it surveyed expect to increase their allocations to this sector over the next five years.[8]

2.2 FUND ACTIVITIES IN 2018

Near the end of December, *Infrastructure Investor* celebrated 2018 as "the start of a rapid expansion in the asset class's fundraising prowess," saying there's a good chance that 2019 will see $100 billion raised, 20% more than in 2018.[9] One factor the author cited was that two of the industry's largest firms—Global Infrastructure Partners and Brookfield Asset Management—"are currently in the market with the next iteration of their flagship funds." And several commentators have noted that Blackstone is still aiming to raise the entire $40 billion that it announced last year, having raised only $5 billion in 2018.

Another fast-rising fund is Stonepeak Partners (#6 in Table 1), which achieved a $7.2 billion final close of its third infrastructure fund in mid-July, about the same time it hired D. J. Gribbin as a senior operating partner. Gribbin was the White House infrastructure guru during the first year of the Trump administration, drafting an infrastructure plan heavy on private capital, long-term PPPs, and users-pay financing. Another prominent hire was Martin Klepper, who headed the U.S. DOT Build America Bureau; he was hired by Canada's Fengate Real Asset Investments in May 2018. Fengate has more than C$2.8 billion in more than 36 infrastructure projects, and has launched a new fund that will focus more on U.S. PPPs.[10]

As noted previously, many infrastructure funds are closed-end, with a fixed term, after which the assets are sold. But others are open-end, with potentially unlimited life. Macquarie Infrastructure & Real Assets in June 2018 announced the first close of a long-life Super Core fund. Technically structured as a 20-year fund, it has the potential to be extended indefinitely. This longer term has attracted several pension funds that have long-term liabilities to their retirees, one of which is the South Carolina Retirement System. Brookfield has also begun raising funds for its first open-ended fund, Brookfield Super-Core Infrastructure Partners.

Some infrastructure funds are willing to invest in bankrupt infrastructure entities, which they can acquire at low cost and return to viability. One example is Strategic Value Partners, which along with Cross Ocean Partners announced (in January 2019) the acquisition of a bankrupt toll concession company in Portugal, Auto Estradas do Douro Litoral, which operates three toll roads near Porto. Several years ago, Strategic Value Partners acquired out of bankruptcy the SH 130 Concession Company, operator of the Texas toll road SH 130.

PART 3

TRANSPORTATION INFRASTRUCTURE DEVELOPERS AND PPPS

The newsletter *Public Works Financing* has been tracking global transportation PPP projects for 26 years, compiling a comprehensive database on this subject. In its final published issue, it summarized major greenfield PPP projects that reached financial close in 2018. Table 3, reproduced from that source, identified 12 major greenfield transportation projects in seven countries, worth nearly $19 billion.[11]

Companies in this field announced several important changes during 2018. One of the largest and most notable was the acquisition of global toll road operator Abertis by Atlantia (Italy) and ACS (Spain), both of which were already major players in that industry. Agreed to in May, that transaction reached financial close in October, in a deal worth $18.8 billion.[12] Atlantia itself was in the news due to the collapse of its Morandi Bridge in August, which is part of its subsidiary Autostrade per l'Italia. Atlantia's stock lost one-third of its value following the disaster, and Moody's downgraded its bond rating from Baa2 to Baa3. In early 2019 Atlantia said it was ready to sell assets to reduce debts and fund growth.[13]

TABLE 3: MAJOR GREENFIELD TRANSPORTATION PPPS FINANCED IN 2018

Country	Project	Type	Developers	Value ($B)
Australia	Melbourne tunnel/stations	Rail	Bouygues/John Laing	$4.300
Australia	Melbourne western roads	Motorway	Ferrovial/Plenary	$0.550
Canada	Ontario, Finch LRT	Rail	ACS/Aecon	$1.090
Canada	Ontario, Gordie Howe Bridge	Bridge	ACS/Fluor/Aecon	$2.990
Chile	El Tepual	Airport	Sacyr	$0.100
Chile	Santiago 68-78	Motorway	Atlantia	$0.260
Colombia	Bogota-Villavicencio 1	Motorway	Coviandina	$0.560
Germany	A10/A24	Motorway	BAM PPP	$0.800
Norway	RV3/RV25	Motorway	Skanska	$0.670
United States	LAX Automated People Mover	Rail/Airport	ACS/Hochtief/Fluor/Balfour Beatty/Bombardier	$2.700
United States	Colorado, Central 70	Motorway	Kiewit/Meridiam	$1.170
United States	Virginia, Transform 66	Motorway	Cintra/Meridiam	$3.685

Source: Reinhardt, William. "International Major Projects Report 2018." *Public Works Financing*. November-December 2018. 11.

In another toll-roads-related transaction, Italy's second-largest tollway operator, Gruppo Gavio, agreed to a joint venture with French investment fund Ardian Infrastructure to fund international ventures by Gavio. The focus will be Europe, Latin America, and the United States.[14] And Spanish toll road company Globalvia reached a deal with three other firms to buy out their stakes in Itinere. If the complex deal goes through, it would give Globalvia six more toll roads in Spain, which would bring its total to 32 road and rail assets in eight countries.[15]

Every year *Public Works Financing* has published a list of the world's largest PPP transportation developers. The 2018 edition of this table is reproduced here as Table 4.[16]

TABLE 4: WORLD'S LARGEST PPP TRANSPORTATION DEVELOPERS, 2018

Company	Headquarters	Operating or Under Construction	Current Pursuits
ACS/Hochtief	Spain	50	48
Vinci	France	48	15
Macquarie	Australia	40	5
Abertis	Spain	40	na
Ferrovial/Cintra	Spain	38	14
Meridiam	France	33	4
Sacyr	Spain	31	6
Egis	France	26	16
Globalvia	Spain	25	1
John Laing	UK	25	7
Bouygues	France	25	4
Atlantia	Italy	22	na
NWS Holdings	China	21	na
Odebrecht	Brazil	20	2
Transurban	Australia	20	2
SNC-Lavalin	Canada	17	0
Balfour Beatty	UK	15	1
Strabag	Austria	14	4
Acciona	Spain	13	7
Plenary	Australia	13	2
BBGI	Luxembourg	13	1
Ideal	Mexico	11	na
Roadis [Isolux]	Holland	10	2
Eiffage	France	10	2
Fluor	US	9	5
Skanska	Sweden	8	3
Salini Impregilo	Italy	7	3
Kiewit	US	7	6
Aecon	Canada	7	1
Itinere	Spain	7	na

Source: Reinhardt, William. "World's Largest Transportation Developers." *Public Works Financing*. November-December 2018. 10.

In terms of numbers of companies and numbers of projects, Europe is far in the lead, with seven leading companies based in Spain, five in France, two each in Italy and the UK, and one each in Austria, Holland, Luxembourg, and Sweden. Australia alone has three companies in the top 30, and Canada has two. These numbers reflect the much longer history and use of long-term PPP arrangements for developing and operating major transportation facilities in Europe, Australia, and Canada than elsewhere in the world. Though the United States is a latecomer to PPPs, it does have two companies in the global top 30: Fluor and Kiewit.

Another way to measure the extent of PPP transportation infrastructure is to rank companies by total invested from 1985 through 2018. Once again, *Public Works Financing*'s database provides this information, summarized in Table 5 for the top 10 companies by dollar volume of projects.[17]

TABLE 5: TOP 10 PPP TRANSPORTATION DEVELOPERS BY PROJECT VALUE, 1985-2018

Company	Headquarters	Project Value	Number of Projects
ACS (incl. Hochtief)	Spain	$101.68B	116
Ferrovial/Cintra	Spain	$ 94.94	68
Vinci	France	$ 82.90	57
Macquarie	Australia	$ 53.55	70
Meridiam	France	$ 53.84	34
Bouygues	France	$ 48.80	32
John Laing	UK	$ 43.88	35
Sacyr	Spain	$ 32.60	56
Egis Projects	France	$ 28.28	28
Globalvia	Spain	$ 27.50	37

Source: Reinhardt, William. "Transportation Developers Ranked by Invested Capital (1985-2018)." *Public Works Financing*. November-December 2018.

In terms of investment over 33 years, European firms win by a large margin, with only Australia's Macquarie making the top 10.

Since most of the audience for this report is in the United States, it is also interesting to review the distribution of PPP transportation projects in this country, drawing on the same source as before.[18] In this table, there is some duplicative counting, since some projects

involved several of the major firms listed, and in those cases the project value is listed for each of the companies.

TABLE 6: TOP PPP TRANSPORT DEVELOPERS IN U.S. MARKET, 1985-2018

Company	Headquarters	US Projects	Project Value	DB Cost
Meridiam	France	9	$20,182M	$15,143M
Ferrovial/Cintra	Spain	7	$12,350	$ 9,235
ACS/Hochtief	Spain	5	$ 6,601	$ 4,654
John Laing	UK	4	$ 9,256	$ 6,211
Macquarie	Australia	4	$ 4,649	$ 3,207
Skanska	Sweden	3	$10,167	$ 7,770
Walsh	US	3	$ 7,637	$ 5,671
Fluor	US	3	$ 7,396	$ 5,220
Kiewit	US	3	$ 2,736	$ 1,835
Transurban	Australia	2	$ 1,938	$ 2,513
Plenary	Canada	2	$ 1,293	$ 1,019

Source: Reinhardt, William. "Top Transport Developers U.S. PPP Market." *Public Works Financing*. November-December 2018. 13-14.

The DB cost is the construction cost carried out by a design-build contractor. The project value includes the operating and maintenance costs over the life of the long-term concession for each project. This table shows that a small selection of the firms listed in Table 4 have succeeded in winning and carrying out PPP transportation projects in the United States. It will be encouraging to many people to see that three of the 11 firms listed in Table 6 are based in the United States—Walsh, Fluor, and Kiewit.

Table 7 presents a recap of large greenfield transportation PPP projects financed in the United States since 1993. The projects are grouped into two sets, with those financed by toll revenue in the upper half (noted as RR, meaning "revenue-risk") and those financed via

TABLE 7: PROJECT FINANCE OVERVIEW OF U.S. LONG-TERM GREENFIELD PPP PROJECTS

Project	Type	Govt. (M)	TIFIA (M)	PABs (M)	Bank Debt (M)	Equity (M)	Total (M)	% Equity	Financial Close
91 Express Lanes, CA	RR	0	0	0	$100	$30	$130	23	1993
Dulles Greenway, VA	RR	0	0	0	$298	$80	$378	21	1993
S. Bay Expressway, CA	RR	0	$140	0	$340	$130	$611	21	2003
I-495 Express, VA	RR	$495	$598	$589	0	$630	$2,303	27	2007
SH 130, Seg. 5-6, TX	RR	0	$430	0	$686	$210	$1,326	16	2008
N. Tarrant Express, TX	RR	$594	$650	$398	0	$426	$2,068	21	2009
LBJ Expressway, TX	RR	$490	$850	$606	0	$682	$2,628	26	2010
Midtown Tunnel, VA	RR	$582	$422	$675	0	$272	$1,951	14	2012
I-95 HOT, VA	RR	$83	$300	$253	0	$280	$916	31	2012
N. Tarrant 3A/B, TX	RR	$379	$531	$274	0	$442	$1,626	27	2013
US 36, Ph. 2, CO	RR	$75	$60	$21	0	$41	$197	21	2014
I-77 Managed Lanes, NC	RR	$95	$189	$100	0	$248	$632	39	2015
SH 288, TX	RR	$17	$357	$100	0	$375	$1,048	36	2016
I-66, VA	RR	$0	$1,229	$737	0	$1,549	$3,515	44	2017
Total		$2,810	$5,756	$3,753	$1,424	$5,395	$19,329		
Average		$201	$411	$268	$102	$385	$1,381	27.9	
Percent		14.6	29.8	19.4	7.4	27.9	100		
I-595, FL	AP	0	$603	0	$781	$208	$1,592	13	2009
Port Miami Tunnel, FL	AP	$100	$341	0	$342	$80	$863	9	2009
Denver Eagle rail, CO	AP	$1,312	$280	$396	$0	$54	$2,042	3	2010
Presidio Pkway Ph 2, CA	AP	0	$150	0	$167	$45	$362	12	2012
East End Bridge, IN	AP	$526	$162	$508	$0	$78	$1,274	6	2013
Goethals Bridge, NY	AP	$125	$474	$453	$0	$107	$1,159	9	2013
I-69, IN	AP	$80	$0	$244	$0	$41	$365	11	2014
I-4 , FL	AP	$1,035	$950	$0	$484	$103	$2,572	4	2014
Penn. Rapid Bridges, PA	AP	$255	$0	$721	$0	$59	$1,005	6	2015
Portsmouth Bypass, OH	AP	$178	$209	$227	$0	$49	$663	7	2015
Purple Line rail, MD	AP	$1,599	$875	$313	$0	$139	$2,925	5	2016
LaGuardia Terminal, NY	AP	$1,200	$0	$2,400	$0	$200	$3,800	5	2016
Central 70, CO	AP	$687	$404	$141	$0	$65	$1,297	5	2017
LAX People Mover, CA	AP	$1,031	$0	$1,295	$269	$103	$2,700	4	2018
Total:		$8,128	$4,448	$6,698	$2,043	$1,331	$22,619		
Average		$581	$318	$478	$146	$95	$1,616	5.9	
Percent		36.0	19.8	29.6	9.0	5.9	100		

Source: "$5bn Private Equity Invested in 25 Transportation DBFOM Deals." ***Public Works Financing*****. April 2017.**

availability payments (AP) in the lower half. From the standpoint of investors seeking a return on equity, the differences between the two types of PPP financing are quite significant. The average fraction of project finance provided by equity is 27.9% for the revenue-risk projects compared with just 5.9% in the AP projects. A given percentage return would be much larger in dollar terms for a RR project compared with an AP project. From the state government's standpoint, the average RR project had a state investment of 14.6% of the project cost, while the average AP project required 36%.

PART 4

THE GROWTH OF PENSION FUND INVESTMENT IN INFRASTRUCTURE

4.1 OVERVIEW

The idea that public pension funds should invest in infrastructure companies developed first in Australia and Canada. In 1992 the Australian government made it compulsory for employers and employees to set aside 3% of nearly all employees' wages in their choice of approved pension funds (called superannuation funds or "supers"). That amount was increased over time to 9.5%, which has allowed the government to fund only means-tested pensions for lower-income people. As of 2018, those pension funds had assets of $1.9 trillion and growing.

Those privately managed funds built diversified portfolios, including shares of ownership in newly privatized utilities and other infrastructure, such as airports, electric utilities, seaports, and toll roads. But since Australia is such a small country (only 15 million working citizens, according to *The Economist*), those funds diversified their investments to other countries, including those countries' privatized and PPP infrastructure. Canada's public pension funds followed a similar course. In both cases, some of the larger Australian and

Canadian funds developed considerable expertise in infrastructure, and are now seen as world-class managers of broad infrastructure portfolios.

The focus of these pension funds on privatized and PPP infrastructure is important. The large majority of all infrastructure funds, whether pension funds or the kinds discussed in Part 2, raise equity—not debt—to invest. Only for-profit, private-sector entities have equity in which it is possible to invest. Traditional U.S. public pension funds were limited to private-sector railroads, pipelines, electric utilities, etc. until recently. The global wave of privatization of state-owned utilities and other infrastructure beginning in the late 1980s created the opportunity to invest equity in airports, seaports, toll roads, and numerous formerly state-owned electric, natural gas, telecom, and water utilities. Long-term PPP leases of U.S. government-owned airports, toll roads, seaports, and municipal utilities would significantly expand the U.S. market for equity investments in infrastructure.

Interest by pension funds in investing in infrastructure continues to grow. In Preqin's 2019 survey of institutional investors in infrastructure, 18% of the respondents were from pension funds in 2018, compared with 15% in 2014.[19]

4.2 RECENT PENSION FUND INFRASTRUCTURE DEVELOPMENTS

The fifth-largest global infrastructure fund is Australia's *IFM Investors*. It is owned by 27 Australian pension funds. Its business model is to build a well-diversified global infrastructure portfolio in which member funds (and other pension funds) can invest. This enables those pension funds without experienced infrastructure experts on staff to invest in a balanced infrastructure portfolio that is likely to be lower-risk but better-performing than one assembled by the pension fund itself. In a joint venture with the Polish Development Fund, one of IFM's 2018 investments was 100% of the largest container terminal in Poland. *Inspiratia* estimated the acquisition price as being in the range of $1.3 billion to $1.5 billion.[20] Later in 2018, IFM raised $500 million for its first debt fund dedicated to U.S. infrastructure. This open-ended fund seeks to provide senior-secured floating-rate loans.[21] IFM managed the buy-out and refinancing of the Indiana Toll Road Concession Company in 2015, on behalf of U.S. and Australian pension funds.
The largest Canadian pension fund is the Canada Pension Plan Investment Board (CPPIB), which manages pensions for some 20 million Canadians, 54% of the country's total population. It is one of several Canadian infrastructure funds that own the Chicago Skyway Concession Company. In 2018 CPPIB joined with Transurban and an Abu Dhabi Investment

Authority subsidiary to purchase 51% of the WestConnex motorway project in Sydney, Australia, for $6.7 billion.[22] In March 2019, *The Economic Times* of India reported that CPPIB was in advanced talks to acquire 12 toll roads of Sadbhav Infrastructure Project Ltd. in a deal estimated to be worth $400 million to $500 million.[23] CPPIB's head of infrastructure, Scott Lawrence, expects the fund's infrastructure portfolio to reach $30 billion within five years.[24]

A major South Korean pension fund hopes to emulate the success of IFM and CPPIB. In September 2018, the chief investment officer of Public Officials Benefit Association, Jang Dong-hun, said the $11 billion pension fund is seeking joint-venture infrastructure investments with global pension funds. POBA is also interested in investing in open-ended infrastructure funds. He also said that POBA had already committed more than $1 billion across 20 different infrastructure funds.[25]

The largest U.S. public pension fund is California's public employee retirement fund, CalPERS. It was one of the first large U.S. pension funds to invest in infrastructure, purchasing 12.7% of the shares in privatized Gatwick Airport in 2010. And in 2016 it acquired a 10% stake in the Indiana Toll Road Concession Company from IFM Investors. In July 2018, CalPERS reported an overall 8.6% return on its total portfolio of $351 billion for the 2017-18 fiscal year. Its infrastructure portfolio led all others with a 20.6% return.[26] Later in the year, CalPERS reported that its infrastructure portfolio was worth $4.3 billion, accounting for 1.2% of its then-total value of $360 billion.[27] Nearly half of CalPERS' infrastructure investments are in the transportation sector.

Other examples of large U.S. pension fund infrastructure activity in 2017-18 include the California State Teachers Retirement System (CalSTRS), which increased its potential allocation for infrastructure to $430 million from the then-current limit of $250 million, to allow pursuit of a wider opportunity set of infrastructure assets.[28] The New York State Common Retirement Fund (NYSCRF) announced a revision to its infrastructure policy in January 2018, pointing to "compelling opportunities in the North American infrastructure sector." At that point in time the fund's infrastructure target was $1 billion, but "We will probably revise this target higher," a spokesperson said.[29] And in January 2019, the $80 billion Virginia Retirement System (VRS) approved a $200 million commitment to Global Infrastructure Partners IV. VRS had invested in GIP II and GIP III, and more recently in IFM Infrastructure's Debt Fund and Stonepeak Infrastructure Fund III.[30]

A table published in mid-2018 compared infrastructure allocations of seven large U.S. public pension funds in 2013 and 2017 to illustrate the growth of infrastructure investing over that five-year period, as shown in Table 8.[31]

TABLE 8: COMPARISON OF INFRASTRUCTURE ALLOCATION OF U.S. PENSION FUNDS, 2017 VS. 2013

Pension Fund	Infrastructure Allocation, 4Q 2013	Infrastructure Allocation 4Q 2017
Maine PERS	$292 million, 2.6%	$1.03 billion, 9.1%
CalPERS	$1.2 billion, 0.4%	$3.7 billion, 1.1%
NYCERS	0%	$234 million, 0.4%
Michigan Retirement Systems	$345 million, 0.6%	$775 million, 1.14%
Virginia Retirement System	$485 million, 0.74%	$1 billion, 1.64%
Milwaukee ERS	$132 million, 7.2%	$159 million, 9.1%
Fresno County ERA	0%	$146 million, 3.1%

Source: Navedo-Perez, Stefan. "News Analysis: U.S. Pension Funds Eyeing Direct Infra Investing." *Inframation News*. June 18, 2018.

Some public officials have expressed concerns that pension funds may be influenced by elected officials to favor certain infrastructure sectors or facilities for political reasons. To safeguard against that, CPPIB has two protections against such actions. First, its charter mandates that it focus on returns, to the exclusion of "public policy"; second, it has a strict transparency requirement.[32]

Another concern is that smaller pension funds may be unhappy with the fees charged by large infrastructure investment funds and may decide to make "direct" investments in specific infrastructure projects or assets. While CalPERS has done well with some direct investments, and CalSTRS is considering steps in that direction, only very large funds are likely to be able to afford to hire and retain a team of experienced infrastructure analysts to build their own portfolio. The large Canadian funds that have built extensive portfolios (CPPIB, OMERS, OTPP) may have teams of 30 to 40 infrastructure specialists, which is unlikely to be feasible for most U.S. state or local pension funds.

A recent policy paper by three academics reported that "U.S. public pension funds perform worse than other institutional investors in their infrastructure fund investments."[33] Their methodology said that the public funds in their database invested in "deals with very

similar project stage, concession terms, ownership structure, industry, and geographical location." Yet their average financial performance was worse than that of other institutional investors.[34] This suggests either (a) an undue focus on direct investments without benefit of professional assessment or (b) selecting infrastructure investment funds with poor performance. Whether any of the low returns may be due to political or "public policy" influence on the public pension funds is not possible to discern from the information in the paper.

PART 5

ASSET RECYCLING AND PENSION FUNDS

5.1 OVERVIEW

Infrastructure asset recycling refers to a policy under which a government sells or long-term leases a revenue-producing asset and uses the net proceeds either for other needed infrastructure or to strengthen its balance sheet (e.g., by reducing the unfunded liabilities of its public employee pension system(s)). Worldwide, many governments have done this without using the term, but the national government of Australia formalized the policy in 2014. Over a several-year period, A$6 billion in federal incentives to state governments stimulated more than A$20 billion in new infrastructure investment by those governments.

In the United States, the 2018 White House infrastructure proposal included federal incentives for state and local governments to engage in asset recycling.[35] These included expanding the scope and volume of tax-exempt private activity bonds (PABs) and allowing them to be used not just for greenfield projects (as under current law) but also to refurbish brownfield infrastructure. The proposal also included an increase to the federal TIFIA loan program and creating an Infrastructure Incentives program under which $100 billion of new federal funding would be available to cover 20% of a project's cost, with the balance financed by the state or local government in question. A companion report from the secretary of transportation's office referred explicitly to Australia-type asset recycling and explained the benefits of long-term PPP concessions.[36] Although no infrastructure bill

emerged in Congress during 2018, the issue is back on the federal agenda in 2019, with the White House continuing to stress the kinds of provisions included in its 2018 proposal.

A 2018 Reason Foundation policy study offered a detailed overview of asset recycling, including several actual U.S. cases (e.g., the long-term PPP leases of the San Juan, Puerto Rico airport and the Indiana Toll Road).[37] It also included a suggested set of federal policy changes to encourage infrastructure asset recycling.

Worldwide, a number of governments are pursuing asset recycling, though without using that term. For example, the reform government of France under Emmanuel Macron is planning a new round of privatizations of state-owned enterprises (including Groupe ADP, formerly known as Aéroports de Paris, which owns and operates Parisian airports Charles de Gaulle, Orly, and Le Bourget), intending to use most of the proceeds to reduce the government's national debt. India's government is offering groups of toll roads under long-term PPP leases to use the proceeds for additional highway upgrades across the country. And the Greek government, under severe financial constraints following a series of bailouts from the European Union, has embarked on an extensive set of asset sales, including its remaining stake in the Athens airport, the railroad rolling stock company, two seaports, and a natural gas company.[38]

5.2 TWO ALTERNATIVES FOR PENSION FUNDS

There are two ways in which the financial condition of under-funded public employee pension funds might benefit from asset recycling. The conventional way is for the state or municipal government to use a competitive process to sell or long-term lease a revenue-producing infrastructure asset (airport, toll road, seaport, municipal utility, etc.), and—as is common worldwide for such transactions—to structure the deal so that much or all of the asset's value is paid up front. If the asset has monopoly aspects (e.g., a toll bridge with no nearby alternative, a municipal water system), then the long-term PPP lease agreement must include provisions governing the pricing, in addition to all the usual performance requirements. The government would shift the net proceeds to the ailing pension fund(s), reducing their unfunded liabilities.

An alternative approach, which has received attention in the latter half of 2018, is for the state or municipal government to transfer the revenue-producing asset to its ailing pension fund(s), which would then own and operate it, adding its asset value to the fund's balance sheet and benefiting from its net revenues, if any. *Governing* magazine published a column on this idea late in 2018.[39] That article noted a 2018 bill on this in Congress that did not pass

(and whose author was not re-elected). It also noted that New Jersey transferred ownership of its state lottery to its pension funds in 2017, at a nominal value of $13.5 billion (but there was no market test of the lottery's actual market value). Author Liz Farmer noted that federal legislation would be needed in order for pension-owned utilities to continue to issue tax-exempt debt. In February 2019, New Jersey Gov. Phil Murphy proposed that the state transfer the New Jersey Turnpike and possibly other revenue-producing assets to its ailing pension funds.[40] And the state treasurer issued a request for qualifications for an asset financial advisor to estimate the value of all the state's marketable assets.

An argument in favor of this approach has been circulated by Ray Kljajic of a group called American Public Infrastructure (Ameri-pi.com).[41] The presentation's subtitle is "Partnering with U.S. Public Pensions to Transform American Infrastructure Into Sound, Long-Term Investments." The presentation argues that long-term PPPs have higher capital costs and that there are stakeholder (public official) concerns about control of infrastructure by private firms. It proposes "*public-public* partnerships" that would "avoid the 'value destruction' associated with PPPs and privatization." The government would engage in an "asset-in-kind" (AIK) transfer of the facility to the pension fund. The latter would engage a private-sector manager to "transform the asset into a performance-driven enterprise." Thereafter, the pension fund might sell a 5% to 10% stake in the enterprise to an independent third party. The presentation proposes several federal tax-code changes needed to make this a viable process.

Several key assumptions are built into this model.

- First, it assumes that the asset would be valued by the pension fund at "fair market value." As anyone knows who has observed large-scale real estate transactions or mergers and acquisitions, the only way to ascertain true market value is a competitive process. Would-be private sector purchasers or lessees (under long-term PPPs) would value the asset based on its potential after transformation, not on any kind of static assessment.
- Second, the model assumes that private contract management—without an ownership interest—would be capable of truly transforming the asset into a performance-driven enterprise. The absence of meaningful incentives for a contract manager to make such sweeping changes is one reason why long-term PPPs have emerged, after decades of only minor efficiency improvements under contract management.
- Third, this model assumes that the higher capital costs of a PPP (meaning the potential return on the equity invested) do not add value. But there are significant

risk transfers in long-term, revenue-based PPPs.[42] In exchange for the opportunity to seek, say, a 12% return on the equity invested in the asset, the private partner takes on the risk of cost overruns on new/rebuilt facilities, insufficient revenue to fully cover capital and operating costs, and insurance, among other things. Those costs are all borne by taxpayers in government-owned/operated facilities.

The presentation cites as evidence of the viability of this approach the transfer of the New Jersey Lottery to the state's pension funds and the Queensland Motorways transfer to a major pension fund in Australia. Both examples are worth reviewing.

NEW JERSEY LOTTERY

Two major rating agencies—Moody's and Standard & Poor's—have criticized the lottery transfer. While the transaction is projected to generate $1 billion a year from the lottery (assuming it remains popular with gamblers over the next 30 years), Moody's still expressed skepticism that the state would have the political will to continue making its required annual contributions out of general revenues.[43] S&P Global Ratings was even more skeptical. Its recent report on asset transfers reminded readers that the asset, per se, does not help a pension fund meet its obligation to retirees; the only thing that counts is the revenue it generates.[44] "The temptation with [such] revenue streams is to develop assumptions around future revenue growth, discount future years' assumed growth back to today, and treat the entire stream as an asset in the pension plan. This 'ghost asset' would immediately inflate the funded status of the plan and lower required contributions." And as analyst Anthony Randazzo has noted, even though the lottery transaction was touted by then-Gov. Chris Christie as "revenue neutral," the $1 billion per year that now flows to the pension funds is $1 billion a year no longer in the general fund budget.[45]

QUEENSLAND MOTORWAYS

The Global Projects Center at Stanford University did a detailed case study of this 2011 asset transfer from the state government (Queensland, Australia) of several bankrupt highway/tunnel projects that the state had acquired post-bankruptcy to the pension fund called Queensland Investment Corporation (QIC).[46] Over several subsequent years, QIC acquired several additional highway assets in the Brisbane metro area, and put them all under single management as Queensland Motorways Ltd (QML). QML made a number of upgrades to convert the highways into a network financed by increases in toll rates. In late 2013 QIC's board decided that, due to an increase in its value, keeping QML in its portfolio

was inconsistent with its policy of a diversified infrastructure portfolio. QIC then organized a competitive process for a long-term PPP lease of QML, which was won in July 2014 by a consortium of a leading toll road company, a major Australian pension fund, and a sovereign wealth fund.

On the surface, this sounds like an excellent example of the benefits to a pension fund of an asset-in-kind transfer. However, the authors of the case study point out how relatively unique QIC is, especially compared with U.S. public pension funds. QIC is one of the largest pension funds in Australia, with over A$79 billion of assets in its portfolio, including A$9.5 billion of infrastructure investments. Like IFM Investors, CPPIB, and OMERS, QIC "built a team of investment professionals and developed the in-house capability to assess and manage infrastructure assets directly." Among its other infrastructure assets are the privatized Brisbane Airport and the Port of Brisbane.

The case study authors add that "The operational improvements at QML were possible only due to the rare capability at QIC as a state-level pension fund manager to directly invest in and manage infrastructure assets. This internal capability is rare in public pensions. . . . Without QIC's dedicated infrastructure team, QML would also likely not have realized the same level of operational turnaround." Referring directly to advocates of AIK transfers to ordinary pension funds, the authors write that "It is unclear whether a similar transaction could be replicated in which the public pension uses some kind of external management contract with a service provider to assess and operate the in-kind asset without losing the competitive advantages that QIC's internal team enjoyed."

The alternative to AIK transfers is asset recycling of the traditional sort, in which the state or local government contracts with professional legal and financial advisors to structure a competitive bidding process for a sale or (usually in the U.S. context) a long-term PPP lease of the revenue-producing asset. Such a proposal was made by Jeff Schoenberg, former assistant majority leader of the Illinois Senate, in March 2019: a long-term PPP lease of the Illinois tollway system with the net proceeds used to shore up that state's grossly underfunded public pension systems.[47] Schoenberg cited the large net asset values received by the city of Chicago for the PPP lease of the Chicago Skyway and by Indiana for the PPP lease of the Indiana Toll Road. And he cited a study from last decade that he co-chaired, under which Credit Suisse estimated that a 75-year lease of the Illinois Tollway could generate as much as $23.8 billion. This would be far more effective than simply giving the Tollway to the state's beleaguered pension funds.

ABOUT THE AUTHOR

Robert W. Poole, Jr. is director of transportation policy and the Searle Freedom Trust Transportation Fellow at Reason Foundation, a national public policy think tank based in Los Angeles.

His 1988 policy paper proposing supplemental privately financed toll lanes as congestion relievers directly inspired California's landmark private tollway law (AB 680), which authorized four pilot projects including the highly successful 91 Express Lanes in Orange County. Over two dozen other states have enacted similar public-private partnership legislation. In 1993 Poole oversaw a study that introduced the term HOT (high-occupancy/toll) Lane, a concept which has become widely accepted since then.

Poole has advised the Federal Highway Administration, the Federal Transit Administration, the White House Office of Policy Development and National Economic Council, the Government Accountability Office (GAO), and the California, Florida, Georgia, Indiana, Texas, Utah, Virginia, and Washington State Departments of Transportation. He served 18 months on the Caltrans Privatization Advisory Steering Committee, helping oversee the implementation of AB 680. He was appointed by Gov. Pete Wilson as a member of California's Commission on Transportation Investment in 1995-96. He has also served on transportation advisory bodies to the California Air Resources Board and the Southern California Association of Governments, including SCAG's REACH task force on highway pricing measures.

Poole is a member of the board of the Public-Private Partnerships (P3) division of ARTBA and a member of the Transportation Research Board's Managed Lanes Committee. From 2003 to 2005, he was a member of the TRB's special committee on the long-term viability of the fuel tax for highway funding. In 2008 he was a member of the Study Committee on Private Participation in Toll Roads, appointed by Texas Gov. Rick Perry. In 2010 he was a member of the Washington State DOT's Expert Review Panel on the proposed Eastside Managed Lanes Corridor. Also in 2010, he served as a transportation policy advisor on the transition team of Florida Gov. Rick Scott.

Poole is the author of dozens of policy studies and journal articles on transportation issues. His book, *Rethinking America's Highways*, was published by the University of Chicago Press in 2018. Poole's popular writings have appeared in national newspapers, including *The New York Times* and *The Wall Street Journal*; he has also been a guest on such programs as "Crossfire," "Good Morning America," and "The O'Reilly Factor," as well as ABC, CBS and NBC News, NPR and PBS. He writes a monthly column on transportation policy issues for *Public Works Financing*, and produces the monthly e-newsletter *Surface Transportation Innovations*. *The New York Times* has called him "the chief theorist for private solutions to gridlock."

Poole received his B.S. and M.S. in mechanical engineering at MIT and did graduate work in operations research at NYU.

ENDNOTES

1 Alves, Bruno and Daniel Humphrey Rodriguez. "Fundraising Report 2018." *Infrastructure Investor*. January 2019.

2 Alves, Bruno. "For the Few, Not the Many: The Infrastructure Investor 50." *Infrastructure Investor*. November 2018.

3 Alves and Rodriguez. "Fundraising Report 2018."

4 Probitas Partners. "Infrastructure Investor Trends: 2018 Survey Results." 2018.

5 "Transactions: Transport, Global." *Inframation News* online database accessed March 7, 2019. <https://www.inframationnews.com/deals/>

6 "FY18 League Tables US and Canada: Modest Growth Seen in PPP Activity." *Inframation News*. Jan. 14, 2019.

7 Probitas Partners. "Infrastructure Investor Trends: 2018 Survey Results." Note 4, Chart IX.

8 Matthews, Andy. "Private Capital's Part to Play in Infrastructure Investment." *2019 Preqin Global Infrastructure Report*. 8.

9 Alves, Bruno. "Year in Review: Fundraising's Big Bang." *Infrastructure Investor*. Dec. 25, 2018.

10 Reinhardt, William. "Fengate Readies for Push into US." *Public Works Financing*. May 2018.

11 Reinhardt, William. "International Major Projects Report 2018." *Public Works Financing*. November-December 2018. 11.

12 Rivera, Fernando Moncada. "Sale of Spain's Abertis Completed in 16.5 Billion Deal." *Inspiratia Infrastructure*. Oct. 30, 2018.

13 Landini, Francesca. "Atlantia Open to Asset Sales After Abertis Deal." *Reuters*. March 7, 2019.

14 Reinhardt, William. "Gruppo Gavia and Ardian Plan International Joint Venture." *Public Works Financing*. May 2018.

[15] Rivera, Fernando Moncada. "Globalvia Acquires 40% of Toll Operator as Fight for Control Continues." *Inspiratia Infrastructure*. Oct. 22, 2018.

[16] Reinhardt, William. "World's Largest Transportation Developers." *Public Works Financing*. November-December 2018. 10.

[17] Reinhardt, William. "Transportation Developers Ranked by Invested Capital (1985-2018)." *Public Works Financing*. November-December 2018. 19.

[18] Reinhardt, William. "Top Transport Developers U.S. PPP Market." *Public Works Financing*. November-December 2018. 13-14.

[19] Preqin survey. 38.

[20] Rivera, Fernando Moncada. "Consortium Buys Gdansk Port." *Inspiratia Infrastructure*. March 20, 2018.

[21] Tan, Gillian. "Investors Keep Flocking to US Infrastructure, Even Without a Trump Plan." *Bloomberg News*. Aug. 29, 2018.

[22] Milhench, Claire. "Australian Toll Road Stake Leads Third-Quarter Sovereign Fund Deals." *Reuters*. Oct. 5, 2018.

[23] Balakrishnan, Reghu and Indulal PM. "CPPIB, Allianz-led InvIT in talks to acquire Sadbhav Infra's 12 road assets." *The Economic Times*. March 11, 2019.

[24] "CPPIB: In Five years, Infra Will Be North of $30Bn." *Infrastructure Investor.com*. June 27, 2018.

[25] Hernandez, Eduard Fernandez. "Korea's POBA Seeks Infra Partnership with Global Pension Funds." *Infrastructure Investor.com*. Sept. 28, 2018.

[26] Stutts, Jordan. "CalPERS Fiscal Year Performance Led by 20% Infrastructure Returns." *Infrastructure Investor.com*. July 12, 2018.

[27] Stutts, Jordan. "Foreign Assets Boost CalPERS' Transport-Heavy Portfolio." *Infrastructure Investor.com*. Oct. 3, 2018.

[28] Navedo-Perez, Steffan. "CalSTRS to Reconsider Infrastructure Investment Policy." *Inframation News*. Oct. 31, 2018.

[29] Carmody, Jonathan. "New York Pension Fund Plans Increased Infrastructure Investment." *Inframation News*. Jan. 10, 2018.

[30] Tilt, Paul. "Virginia Pension Fund Makes GIP IV Commitment." *Inframation News*. Jan. 22, 2019.

[31] Navedo-Perez, Stefan. "News Analysis: U.S. Pension Funds Eyeing Direct Infra Investing." *Inframation News*. June 18, 2018.

[32] "Moose in the Market: the Canada Pension Plan Investment Board." *The Economist*. Jan. 19, 2019. 74.

[33] Andonov, Aleksander, Roman Kraussl and Joshua Rauh. "The Subsidy to Infrastructure as an Asset Class." NBER working paper. September 2018. <https://www.nber.org/papers/w25045>

[34] Ibid.

[35] The White House. "Legislative Outline for Rebuilding Infrastructure in America." February 10, 2018.

[36] Office of the Secretary. "The President's Initiative for Rebuilding Infrastructure in America." U.S. Department of Transportation. February 2018.

[37] Poole, Jr., Robert W. "Asset Recycling to Rebuild America's Infrastructure." Reason Foundation. October 2018.

[38] Kanellakopoulou, Maritina. "Q&A: HRADF Primed for Extensive Greek Privatizations." *Inspiratia Infrastructure*. Oct. 31, 2018.

[39] Farmer, Liz. "Should Pensions Own Utilities? Congress Has Considered It Before." *Governing*. Dec. 21, 2018.

[40] Pugliese, Nicholas. "New Toll Lanes on NJ Turnpike? Gov. Phil Murphy Eyes State Assets to Fix Pension System." *NorthJersey.com*. Feb. 15, 2019.

[41] Kljajic, Ray. "New American Infrastructure Model." privately circulated presentation, no date (received by the author Feb. 11, 2019).

[42] Poole, Jr., Robert W. "Availability Payment or Revenue-Risk PPP Concessions? Pros and Cons for Highway Infrastructure." Reason Foundation. November 2017.

[43] Takash, Daniel. "Moody's: Lottery Transfer No Solution to NJ Pension Crisis." *Reason.org*. Sept. 12, 2017.

[44] Tauzer, Todd N. et al. "Pension Brief: Are Asset Transfers a Gimmick or a Sound Fiscal Strategy?" S&P Global Ratings. Feb. 19, 2019.

[45] Randazzo, Anthony. "Shifting New Jersey Lottery to Pensions Is a Gamble." *Reason.org*. May 31, 2017.

[46] Bennon, Michael, Ashby H.B. Monk, and Young-Joon Cho. "In-Kind Infrastructure Investments by Public Pensions: The Queensland Motorways Case Study." Stanford Global Projects Center. June 5, 2017.

[47] Schoenberg, Jeff. "The Road to Solvent Illinois Pensions Requires a Tollway Lease." *Crain's Chicago Business*. March 5, 2019.