Photo Credit

?Sector-Specific Content on Climate-Smart

Download Chatbot

View the quick snapshots of the sections below or find more sector-specific resources on Climate-Smart PPPs in these sections:

Energy

Renewable Energy

For more information, visit the section on Toolkits, see Renewable Energy Projects by Resource (Solar Power, Wind Power, Hydropower, Biomass and Geothermal) or see Water Projects Using Renewable Energy .

Renewable Energy Policies, Laws and Regulations

The recent growth of the renewable energy market has been driven to a large extent by policies, laws and regulations that encourage private investment in RE. Often these approaches are combined in order to optimize the benefits of several mechanisms.

Key regulatory and pricing mechanisms to promote the uptake of RE include:

- **National RE targets** - Legal requirement to produce a certain portion of energy from RE sources together with a timeline by which the target has to be reached.
- **Feed-in tariffs (FiT)/feed-in premiums (FiP)** - FiT and FiP guarantee the purchase of generated RE at a fixed price or premium for a defined period in time.
- **Quota Obligations or Renewable Portfolio Standards (RPS)** - Requirements for utilities to source specific percentages from RE sources.
- **Grid Access Provisions** - Provisions that give RE producers facilitated access to the grid, e.g. through mandated grid access or reduced transmission fees.
- **Auction Schemes** - Public competitive bidding for procuring new RE capacity at the lowest possible price.

Global

Reference: IEA/IRENA Global Renewable Energy Policies and Measures Database - International Renewable Energy Agency (IRENA) maintains a joint database with the International Energy Agency (IEA) for policies and measures pertaining to renewable energy from around the world. The database is searchable by country and sector.

Regional

European Union

Reference: EBRD - Renewable Development Initiative for EBRD: Funded by USAID, this website tracks the latest developments of 29 countries located throughout Central and Eastern Europe and the Former Soviet Union and serves as an information resource to project developers, policymakers and researchers.

Reference: European Commission – Renewable Energy: This site on renewable energy by the European Commission contains links to the policy framework of the European Union as well as the Renewable Energy Directive.

Reference: European Union Renewable Energy Legislation: Overview of the secondary EU legislation that falls under the legislative competence of The Directorate-General for Energy (DG ENER) and that is currently in force (split by policy areas).

Reference: RES Legal Europe – Legal Sources on Renewable Energy - RES LEGAL Europe is a professionally edited and free of charge online database on support schemes, grid issues and policies regarding renewable energy sources in the EU 28 Member States, the EFTA Countries and some EU Accession Countries. The database covers all three energy sectors: electricity, heating & cooling and transport. It provides a quick overview of the different national regulations regarding renewable energy sources in a clear, concise and convenient way and links to the original legal sources in their original language as well as link to a translation of the law if available.

National

Australia

In line with its more market-oriented approach to power sector regulation generally (see Energy Laws and Regulations), Australia operates a market-based renewable energy target scheme under the Renewable Energy (Electricity) Act 2000 (Cth). The scheme aims to incentivize electricity generation from renewable sources.

Under the scheme, large renewable power stations and the owners of small-scale systems can generate renewable energy certificates for every megawatt of electricity they produce. The certificates can then be sold to electricity buyers on the wholesale market, who are required to surrender a certain number of these renewable energy certificates every year (expressed as a percentage of the volume of electricity they purchase in that year) to meet their surrender obligations under the scheme. The sale of renewable energy certificates provides an additional source of revenue for renewable energy projects, which acts as an incentive for investment into this sector. The scheme is regulated by the Australian Clean Energy Regulator.

The Australian Financial Market Association publishes template documents for the trading of renewable energy certificates under the scheme.

Brazil

Brazil introduced an auction system to procure electricity in 2004 (Law no. 10.848/2004, and Decree no 5163/2004) for the market regulated by ANEEL, the Brazilian Electricity Regulatory Agency.

In the same year EPE – Empresa de Pesquisa Energética was created (Law no. 10.847). The EPE Web Page on Energy Auctions provides information and updates on the Brazilian energy auctions organized by ANEEL as well as links to Laws and Regulations in the Brazilian Energy Sector.

Alternative Energy Auction of July 2011 – Regulation Portaria MME 113 of Feb 1, 2011 - Authorizes ANEEL to organize alternative energy auctions and provides pre-qualification criteria for

developers/investors interested in participating in the auction. The capacity to be awarded and the types of energy sources to be promoted at the auctions are defined by MME - Ministerio de Minas e Energia. All types of auctions are conducted by CCEE – Camara de Comercialização de Energía Elétrica, a regulated non-profit entity formed by agents from the power market, on behalf of ANEEL.

Further to the auction-based scheme, a new FIT-scheme has been introduced by the Brazilian government in December 2015 to promote distributed power generation from renewable sources by consumers (Executive Order 538/2015).

A draft Bill is currently under discussion in the Brazilian Congress, following two public hearings in July 2017 aimed at reformulating and improving the Brazilian power sector's legal framework. One of the topics discussed in the hearing was specific measures that could positively affect the market. Specifically, the hearings discussed the possibility for the establishment of public auctions specifically for capacity sale (unlike existing auctions, which sell energy produced by power plants).

For more details see The Brazilian Power Market: An Interesting Investment Regime for Onshore Wind and Solar Power? Fieldfisher LLP, April 2016 and Energy 2020 / Brazil, Global Legal Insights.

Chile

Chile's RE incentive scheme is based on several different laws, including Law 20257 (Ley de Energías Renovables No Convencionales) as amended by Law 20701 (Procedimiento para Otogar Concesiones Eléctricas) and Law 20018 (Modifica el Marco Normativo del Sector Electrico), as amended by Law 20805 (Perfecciona el Sistema de Licitaciones de Suministro Eléctrico para Clientes Sujetos a Regulaciones de Precios). For more details see Renewable Energy in Latin America: Chile, Norton Rose Fulbright, 2017.

Germany

The Renewable Energy Sources Act, also referred to as Renewable Energy Law (Erneuerbare Energien Gesetz – EEG) of 2000 as amended through 2017 and 2023 sets out the main support scheme for electricity generation from wind, hydro, solar, biomass and sewage gas combustion, as well as geothermal energy. It used to be based on a FiT scheme and has recently introduced an auction model for utility-scale projects.

Lao PDR

Lao PDR has implemented a number of policies to reduce greenhouse gas emissions and increase the use of renewable resources in its energy make up. The key policies include:

- National Strategy on Climate Change – the strategy includes among its priorities: accelerating the development of renewable energy sources such as wind, solar and hydropower, and development of cleaner technology for the use of the Laos' coal resources; and
- Renewable Energy Development Strategy, which among other things:
    1. sets a target to increase the share of the renewable energy to 30% of the aggregate energy consumption by 2025;
    2. sets a target to increase the share of biofuel to 10% of aggregate transportation energy consumption;
    3. outlines a range of financial incentive schemes to encourage investment in the renewable sector; and
    4. provides for the set-up of a Renewable Energy Fund to finance various development and research activities in the renewable sector.

See Sample Energy Laws and Regulations for an overview of Laos' regulatory framework.

Philippines

The Electric Power Industry Reform Act of 2001 ("EPIRA") mandates, among other things, that the Department of Energy ("DOE") shall encourage private sector investment in renewable energy sources (see Sample Energy Laws and Regulations for a more detailed summary of the EPIRA).

Consequently, the government of the Philippines has enacted a number of laws and policies including:

- the Renewable Energy Act of 2008. Among other things, the Act establishes:
    1. the National Renewable Energy Board ("**NREB**") to set minimum targets of generation from renewable energy sources;
    2. a Feed-in Tariff ("FiT") system designed to incentivize the development of generation projects from renewable sources;
    3. a Renewable Energy Market ("**REM**") for the trading of renewable energy certificates to facilitate meeting the minimum renewable generation targets set by the NREB; and
    4. the Green Energy Option program, which provides end-users with the option to choose renewable energy resources as their sources of energy; and
- the National Renewable Energy Program, which seeks to increase the renewable-energy based power capacity of the country by:
    1. implementing a comprehensive approach to address the challenges and gaps that prevent or delay the application of renewable energy technologies; and
    2. outlining action plans necessary to facilitate and encourage greater private sector investments in renewable energy development.

Feed-in Tariffs

The Philippine Feed-in Tariff ("**FiT**") scheme is an example of how a largely market-oriented approach to incentivizing the development of renewable energy sources can be adopted in less mature electricity markets. The Renewable Energy Act of 2008 established a scheme, which provides emerging independent power producers ("**IPPs**") with a guaranteed Php per kWh price for electricity generated through renewable energy sources for a period of 20 years. This provides a degree of cushioning for renewable projects against pricing volatilities in the Philippine electricity market (thereby facilitating their finance and development). The government's role is broadly analogous to that of a private hedge provider for the project's revenue stream, while the economic and commercial structures of the project are largely left to the private sponsors.

The FiT rates are set by the Energy Regulatory Commission ("ERC") with recommendations from the National Renewable Energy Board ("**NREB**"). The FiT rates are also subject to a degression mechanism, to account for the reduced cost of deploying renewable generation technology over time. The degression rate depends on the year in which the relevant renewable energy plant started commercial operation and the type of renewable energy involved.

The FiT system is largely funded through the Fit-Allowance ("FiT-All"), a levy paid by all consumers who are supplied with electricity through the distribution or transmission network. The levy is set annually by the ERC, collected by utility and electricity suppliers, then distributed to renewable energy generators by the National Transmission Corporation ("TransCo"), a government owned and controlled agency. The Guidelines on the collection of the FiT-All and disbursement of the FiT-All Fund were adopted by the ERC in 2013.

Spain

Article 2 of European Directive 2009/28/EC (repealed by European Directive (EU) 2018/2001) defines "electric energy from renewable sources" as electric energy coming from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill

gas, sewage treatment plant gas and biogasses. This definition is further developed in Spain through article 2 of Royal Decree 413/2014.

Licensing

As per Royal Decree 1955/2000 the building, operation, modification, temporary or definitive closure and transfer of renewable-electricity generating assets are subject to prior administrative authorizations. They must be granted by the relevant Spanish autonomous community or by the Ministry for Ecological Transition and Demographic Challenge when such actions affect more than one Spanish Autonomous Community or have an installed capacity which exceeds 50 MW, and can be summarized as follows:

- administrative authorization, if appropriate, in conjunction with the environmental impact study;
- approval of the execution project; and
- start-up certificate – the relevant authorities issue the start-up once the project is completed and after having completed the necessary technical inspections and verifications of the project.

Remuneration Regime

The Spanish incentive scheme for renewable generation provides an example of a partially market-oriented policy solution to incentivizing renewable energy developments. In general terms, under the Spanish scheme (mainly regulated in Law 24/2013, Royal Decree 2019/1997 and Royal Decree 413/2014) renewable power generators sell the electricity they generate:

1. into the Spanish wholesale market ("OMIE") and receive market price for such sales; or
2. to specific customers by means of bilateral agreements (Power Purchase Agreements or "PPAs") which can be either:
    a. physical (long-term PPA) with a specific amount of power sold at a fixed price per MWh; or
    b. synthetic (financial PPAs) which, in general are structured as a hedging agreement through a contract for differences, with no physical delivery of electricity, consisting of the financial coverage of the price of energy, adjusting the differences between the wholesale market price and the agreed price.

In addition, they may also receive additional state regulated payments during their respective regulatory lives, as an incentive to encourage the use of renewable generation sources.

As set out in Royal Decree 413/2014, the specific remuneration additional to market revenues consists of:

1. a capacity supplement in €/MW to cover investments not recovered in the market; and
2. if applicable, an operation supplement in €/MWh when operating costs cannot be recovered in the market. This specific remuneration is calculated taking into account standard installations throughout the regulatory life of the power plant, and assuming an efficient and well-managed company.

The granting of this specific remuneration scheme will be determined on a competitive basis through state auctions. The result of the auctions will determine the value of the supplement in €/MW.

United States

Reference: United States: Incentives and Policies for Renewable Energy and Energy Efficiency - The Database of State Incentives for Renewables & Efficiency ("DSIRE") is a comprehensive source of information on state, federal, local, and utility incentives and policies that support renewable energy and energy efficiency. Established in 1995 and funded by the U.S. Department of Energy, DSIRE is managed by the North Carolina Clean Energy Technology Center.

Vietnam

The Vietnamese Government has implemented a number of incentives to promote the development of renewable energy, which are primarily in the form of tax relief or government grants. The key policies include:

- Decision No. 2068/QD-TTg dated 25 November 2015 provides the following incentives:
  - zero import duty for assets to form the fixed assets of a renewable energy project, and for materials and semi products which are unavailable in the domestic markets;
  - corporate income tax exemption or reduction;
  - land rental exemption or reduction; and
  - government funding for research and technology of pilot projects.
- Decision No. 11/2017/QD-TTg dated 4 November 2017, as amended by Decision No. 02/2019/QD-TTg dated 8 January 2019, also provides incentives for solar energy projects, which are entitled to an import duty exemption for:
  - goods imported to form the fixed assets of the projects; and
  - materials, semi-products and fuel that are not available locally.
- Circular No. 02/2019/TT-BCT introduces notable changes to the regulations on wind power projects and the mandatory terms of wind power purchase agreements.

Renewable Energy Sample Project Documents and Contracts

Renewable energy projects rely on a number of legal contracts. One central contract is the power purchase agreement (PPA), which governs the sale and purchase of power:

See also Key Features of Power Purchase Agreements.

Other important contracts include land use agreements, supply agreements, installation agreements, O&M agreements and implementation agreements.

Below are links to sample project documents that were developed for multiple renewable energy sources. For sample documents that relate to specific resources see the sample project documents under Solar Power, Wind Power, Hydropower, Biomass and Geothermal.

Regional

Regional Center for Renewable Energy and Energy Efficiency (RCREEE)

The following are sample contracts published by the Regional Center for Renewable Energy and Energy Efficiency (RCREEE), an independent non-profit regional organization which aims to enable and increase the adoption of renewable energy and energy efficiency practices in the Arab region. RCREEE teams with regional governments and global organizations to initiate and lead clean energy policy dialogues, strategies, technologies and capacity development in order to increase Arab states' share of tomorrow's energy.

National

Kenya

Model PPAs for wind, biomass, small hydro, geothermal, biogas and solar projects.

Reference: Standardized PPA for Large Scale Generators More than 10MW

Reference: Standardized PPA for Small Scale Generators less than 10MW

Malawi

Reference: Draft Standard PPA of December 2010 published by the Malawi Energy Regulatory Authority for [hydro/geothermal/gas fired] power generation between IPP ("Seller") and Purchaser, a company entitled to purchase electricity and to transmit and distribute electricity in the Republic of Malawi; Seller proposes to develop, design, finance, insure, construct and complete, own, operate and maintain a [hydro/geothermal/gas fired] power generation facility and Purchaser wishes to purchase from the Seller he capacity of such power generation facility and all of the net electrical output pursuant to the terms and conditions of the PPA.

See also Independent Power Producer (IPP) Framework for Malawi of 8 March, 2017.

Philippines

Reference: Sample PPAs - The Energy Regulatory Commission ("ERC") has published standard documentation for the offtake of electricity from Renewable Energy ("**RE**") Plants eligible for the Philippine Feed-in Tariff ("**FiT**") system. The principal agreement is the Renewable Energy Payment Agreement ("**REPA**") under which TransCo (the FiT Allowance Administrator) pays the owner of the eligible RE Plant (RE Developer) the FiT rate for the plant's metered energy output. The economic function of the REPA is broadly analogous to a synthetic PPA with private hedge counterparties, which are used in more established electricity markets, to provide revenue stability for the project (see Synthetic PPAs). Separately, where a RE Plant does not operate in the Philippine Wholesale Electricity Spot Market ("**WESM**"), the RE Developer and local host distribution utility ("**DU**") must enter into a Renewable Energy Supply Agreement ("**RESA**") for the offtake of electricity generated by the plant. For key features of sample PPAs, read more...

Serbia

Reference: Model Privileged Producer Electric Power Purchase Agreement pursuant to Article 65 of the Law on Energy Republic of Serbia (applicable for wind, solar, small hydro biomass). The Energy Agency of the Republic of Serbia has published more information on Privileged Power Producers.

Uganda

Reference: Model Implementation Agreement and Standardized PPA published by the Global Energy Transfer Feed in Tariff (GETFiT) Programme. The main objective of the GET FiT Program is to assist East African nations in pursuing a climate resilient low-carbon development path resulting in growth, poverty reduction and climate change mitigation. Through the roll-out of phase one of the program, a portfolio of up to 15 small-scale Renewable Energy generation projects promoted by private developers with a total installed capacity of about 125 MW and approximately 780 GWh production / year will be fast tracked. The GETFiT Programm has also published a License Certificate and License Conditions.

Zambia

Reference: Zambia Renewable Energy Feed-in Tariff (REFIT) Program: REFIT Power Purchase Agreement - Model PPA between state-owned utility and the Seller (draft of February 2016) developed by the United States Agency for International Development (USAID) with the Ministry of Energy and the regulator. The 20-year agreement is applicable for solar, hydro, biomass, geothermal and wind plants and outlines the provisions commonly found in PPAs for private power projects internationally. The PPA is based on the assumption that the developer will finance the project through project finance arrangements. The Seller will also enter into an implementation agreement with the government of Zambia and will obtain a Generation

License from the energy regulator in Zambia. The standardized agreement is based on a REFIT policy to stimulate renewable energy production and to promote private sector participation in energy sector. See also Model Grid Connection Agreement, REFIT Guidelines: Support Mechanisms and Draft Regulations and REFIT Rules.

Other relevant contracts relate to the financing, building and operation of the power plant, e.g. land use agreements, construction and operating contracts, as well as implementation agreements. See Energy and Power PPPs

Further Reading and Resources: Renewable Energy

Climate Toolkits: Renewables, The renewables toolkit helps government agencies in emerging markets and developing economies (EMDEs) incorporate climate-related risks in the early stages of renewable energy infrastructure projects procured through public-private partnerships (PPPs). See other Sector Specific Climate Toolkits for Infrastructure PPPs here.

Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers, Technical Report of the Energy Sector Management Assistance Program (ESMAP), World Bank 2019

Mini Grids and the Arrival of the Main Grid: Lessons from Cambodia, Sri Lanka and Indonesia, Technical Report of the ESMAP Program, World Bank 2018

Renewable Energy Policies in a Time of Transition, International Renewable Energy Agency (IRENA), International Energy Agency (IEA), and the Renewable Energy Policy Network for the 21st Century (REN21), 2018

Understanding Power Project Procurement, Commercial Law Development Program (CLP) in partnership with the African Legal Support Facility - Fourth handbook in Power Africa's "Understanding" series, Understanding Power Project Financing This handbook is intended to provide the reader with an overview of the mechanisms and strategy behind successful Power Project Procurements. It explores the complexity of procuring privately-owned power projects and describes the approaches that public procuring entities can use to establish and sustain power projects, including the advantages and disadvantages of the alternatives. It also describes how these entities can implement these alternatives. Refers specifically to renewable energy projects and includes a chapter on feed-in tariffs.

Renewable Infrastructure Investment Handbook: A Guide for Institutional Investors, World Economic Forum, December 2016 – Guide for institutional investors interested in climate finance. The Roadmap for Renewable Infrastructure deals with risk allocation.

South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons by Anton Eberhard, Joel Kolker and James Leigland, Public-Private Infrastructure Advisory Facility (PPIAF), May 2014.

From the Bottom Up : How Small Power Producers and Mini-Grids Can Deliver Electrification and Renewable Energy in Africa. Directions in Development--Energy and Mining; Tenenbaum, Bernard; Greacen, Chris; Siyambalapitiya, Tilak; Knuckles, James. 2014. Washington, DC: World Bank.

Renewable Energy Auctions in Developing Countries, IRENA 2013

Revisiting Public-Private Partnerships in the Power Sector by Maria Vagliasindi, World Bank 2013.

Power PPPs, Handshake, International Finance Corporation's (IFC's) quarterly journal on public-private partnerships, Issue # 13, October 2012.

Recommendations for the Design of Successful Renewable Energy Auctions or Competitive Tenders in Africa, Lessons from South Africa by Anton Eberhard and Raine Naude. Part B contains recommendations for tender documentation and contracts.

A Policymaker's Guide to Feed-In-Tariff Policy Design, NREL 2010

Important Features of Bankable Power Purchase Agreements for Renewable Energy Power Projects, OPIC, USAID, International Trade Agency, US Trade and Development Agency- Summarizes 10 Important Features to Include or Consider for a Bankable PPA.

See also Power Projects: Further Reading and Resources

Useful Links

- ESMAP – Renewable Energy
- European Commission – Renewable Energy
- Inter-American Development Bank: Resources related to renewable energy
- Renewable Energy Policy Network (REN21)

Energy-Efficient Street Lighting PPPs

Sample Contracts, Clauses and Bidding Documents

Brazil:

Belo Horizonte - Concessão administrativa para a prestação dos serviços de iluminação pública no Município de Belo Horizonte incluídos o desenvolvimento, modernização, ampliação, eficientização energética, operação e manutenção da Rede Municipal de Iluminação Pública – Concession for the development, modernization, expansion, energy-efficiency, operation and maintenance of the municipal lighting network. See also: Impact Story: SNTA supports street lighting PPPs in Belo Horizonte and Rio de Janeiro, PPIAF April 2016.

Canada:

Request for Proposal – LED Streetlight Luminaire Supply of August 2014. Local Authorities Services (LAS) and RealTerm Energy developed a streetlight replacement program which resulted in 150 municipalities jointly procuring LED public lighting on a turnkey basis. This lowered transaction costs, enabled competitive procurement for the small and medium sized municipalities, and transformed the LED market in Canada.

Germany:

Package of tender documents for PPP street lighting projects *(Verdingungsunterlagen Beleuchtung)* developed by Partnerschaften Deutschland ÖPP Deutschland AG.

India:

Odisha, Greenfield Street Lighting Project – Request for Proposal (RFP) of May 2018 for the implementation of the Odisha Greenfield Street Lighting PPP Project for 113 Urban Local Bodies (ULBs) on a PPP Basis. Given the early success of the first phase of street lighting energy efficiency project at Bhubaneshwar followed by the Odisha multicity street light project which is currently under implementation, the Government of Odisha has decided to extend the rollout of such projects to all ULBs within Odisha. With

this the Government of Odisha also aims to cut the energy bills for ULBs and to provide roads with brighter and more even illumination with increased safety for pedestrians and vehicle drivers. The Project is envisaged to be implemented under a Public Private Partnership (PPP) model under a seven (7) year annuity based arrangement.

See also PPP Stories - India: Bhubaneswar – Street Lighting, India: Rajasthan Public Street Lighting, Street Lighting Project, Nasik, Maharashtra, India, Smart Poles and Streetlights, Bhopal, Madhya Pradesh, and Energy-efficient Street Lighting, Bhubaneswar, Odisha, India

Mexico:

Guadalajara – Leasing contract *(Contrato de Arrendamiento)* - Leasing contract of 15 April 2015 between the municipality and a partnership between the installer, Electricidad y Tecnología S.A. de C.V. (Electrotec) and the financial institution, Solucash S.A. de C.V. Sofom E.N.R. (Solucash), regarding the replacement of luminaires and the strengthening of the light network infrastructure in Guadalajara. Private partner is responsible for the installation of the luminaires. Municipality leases retrofitted lights from private partner and makes monthly payments over the 10-year lease term to be financed through cost savings. After expiry of the contract ownership of the luminaires will be transferred to the municipality.

United Kingdom:

Street Lighting Procurement Pack - Model Documentation by the Local Partnerships – Model documentation aims to provide assistance to local authorities in the procurement of street lighting projects through a public private partnership or through the Private Finance Initiative. It is not intended to be a word-for-word template.

Birmingham Highways Maintenance and Management Service PFI - Project Agreement & Schedules - Contract between Birmingham City Council (Authority) and Amey Birmingham Highways Ltd (Service Provider) relating to the rehabilitation, maintenance, management and operation of the roads and street lighting network in the City of Birmingham pursuant to the Government's Private Finance Initiative (PFI). The contract was signed in May 2010. The street light component is only one part of the 25-year contract and covers the modernization and maintenance of 97,000 street lights and the upgrade of associated street infrastructure.

United States:

Michigan, Detroit Metro Region - Metro Region Freeway Lighting Public-Private Partnership - Delivery of Freeway Lighting as a Design-Build-Finance-Operate-Maintain (DBFOM) Project - Project Agreement with Schedules between the Michigan Department of Transportation (MDOT) and Freeway Lighting Partners, LLC (Project Company) of 24 August 2015. Contract term 15 years. Project Company to design, build and finance the improvements on existing freeway and tunnel lighting systems during a two year construction period and to operate and maintain the existing and improved lighting system for the remaining operating and maintenance period of 13 years. Private partner to hand back the lighting system to MDOT at the end of the contract term. MDOT to make Milestone Payments to the Project Company during the design and construction period and Service Payments to Project Company for performance of services during the operating and maintenance period. The Service Payment takes account of energy savings achieved by the Project Company.

Policies and Legislation

France:

The Code général des collectivités territoriales (French law for regional and local authorities) provides that municipalities have the responsibility for lighting. PPPs (or délégations de service public) are common in this field and Reconstruction, Management, and Maintenance of Street Lighting and Other Public Facilities, Juvignac, France

Mexico:

Relevant legislation on street lighting *(Normatividad aplicable al alumbrado público)* (Spanish).

Further Reading and Resources

Street Lighting PPPs: Improving Energy Efficiency and Public Safety in India's Cities, IFC 2021 - Street lighting PPPs help provide better services, improve business and public safety, and increase energy efficiency by up to 70%. This IFC sector note provides lessons and examples on scaling up innovative PPP solutions in public street lighting infrastructure across India.

Proven Delivery Models for LED Public Lighting, ESMAP 2017 - This synthesis report summarizes the cross-cutting findings from six case studies, which document real-life experiences, challenges, and solutions encountered in implementing different LED lighting delivery models—ESCO, super-ESCO, joint procurement, public-private partnership, lease-to-own, and municipal financing. Crosscutting findings include various key roles played by governments, ranging from setting policies that support LED lighting programs to establishing an ESCO with a mandate to implement energy efficient programs while transforming the market.

Handbook on Quality Control for Street Lighting Projects for EESL (Energy Efficiency Service Limited) , PricewaterhouseCoopers Pvt. Ltd August 2017 - The objective of this handbook is to act as a comprehensive guide in designing and implementing quality control plan for energy efficiency (EE) projects in India involving LED lamps. Performance based contracting is an integral part of EE projects. Under this form of contracting, the revenue generated by a project of an ESCO is directly related to the energy savings achieved.

Lighting Brazilian Cities: Business Models for Energy-Efficient Street Lighting *(Modelos de Negócio para Eficiência Energética em Iluminação Pública),* World Bank, June 2016 (English and Portuguese) - Based on city studies and surveys in more than 300 municipalities, the report identifies business models and innovative financial structures that match the needs and capabilities of different sized cities. It also provides recommendations to governmental institutions on developing effective new policies and mechanisms to help Brazilian cities take ownership of their public lighting.

Prefeasibility Study Municipal Energy-efficient Public Street Lighting Project in the City of Rio de Janeiro, World Bank Group August 2014 - The objective of this study is to provide city officials in Rio de Janeiro with (a) a brief overview of the global trends in EE public street lighting; (b) a review of the relevant regulatory, institutional and legal frameworks that would have an impact on an investment in energy-efficient public street lighting; and (c) recommendations for financing structures that achieve scale by bundling/aggregation. See also: Impact Story: SNTA supports street lighting PPPs in Belo Horizonte and Rio de Janeiro, PPIAF April 2016 and Improving Energy Efficiency in Street Lighting in Brazilian Cities.

Les bonnes pratiques en éclairage public, l'association des maires de France et des présidents d'intercommunalité (AMF) and Syndicat de l'éclairage May 2016.

Republic of India, Energy-Efficient Street Lighting - Implementation and Financing Solutions, World Bank, June 2015 - This reports serves as a manual for the implementation of LED lighting programs based on the experiences from India. Among other things it provides templates for investment grade audits, procurement

and contracting, tools and matrices. The manual has been designed according to the requirements and constraints specific to India. However, many of its recommendations may be applicable across urban local bodies (ULBs) and municipalities in other countries.

Street Lighting Toolkit – How to assess the impact of an energy efficiency investment in the street lighting asset, Scottish Futures Trust, March 2013 - The toolkit and the two accompanying business cases aim to assist local authorities to assess the impact of investing in energy efficiency measures within their street lighting asset. It draws on best practice and learnings from local authorities who have already implemented successful energy efficient street lighting schemes and provides clear guidelines and a structured approach and process for councils to work through to deliver energy efficient street lighting initiatives.

EESL Toolkit for Street Light Energy Efficiency, Energy Efficiency Services Limited (EESL) December 2013. The toolkit is based on analysis of the practical situation in Indian municipalities, and experience gained through the implementation of its ongoing street lighting projects.

Proyecto Nacional de Eficiencia Energética en Alumbrado Público Municipal *(PNEEAPM – National Project for Energy Efficiency and Public Municipal Lighting)* This program was established by Mexico's national government. It aims to provide technical assistance and financing to municipalities intending to implement better and more efficient street lighting systems.

PPP in Germany: street-lighting and other sustainability projects, Partnerschaften Deutschland ÖPP Deutschland AG December 2010 explains key elements of the PPP street lighting model.

Carbon Capture and Storage

Policies, Laws and Regulations: Carbon Capture and Storage (CCS)

Reference: Carbon Capture & Storage Database - The International Energy Agency (IEA) International CCS Law and Regulation Database (CCS Database) catalogues how global CCS legal instruments address key regulatory issues associated with CO2 storage. The aim is to support ongoing efforts by governments to implement CCS permitting frameworks – legal or regulatory provisions that enable CCS, aim to ensure safe and effective capture, transportation and storage of CO2, and manage interaction with other uses of the subsurface – by consolidating and making more accessible information on existing instruments.

Reference: Carbon Capture and Storage: Legal and Regulatory Review, International Energy Agency 2015 - The CCS Legal and Regulatory Review gathers contributions by national, regional, state and provincial governments, at all stages of CCS regulatory development. The Review provides an overview of CCS advances since the last edition and those expected to occur in the following 6 to 12 months and an overview of CCS legal and regulatory developments to date is also provided.

Reference: Global CCS (Carbon Capture and Storage) Institute, Legal and Regulatory Indicator (the CCS-LRI), Global CCS (Carbon Capture and Storage) Institute, CCS 2018 – Offers a detailed examination and assessment of national legal and regulatory frameworks in 55 countries and examines a range of legal and regulatory factors likely to be critical for the regulation of the technology.

Reference: Global Carbon Capture Storage Institute (CCS): Carbon Capture Legal Programme Legal Resources, The project analyses the implementation of Directive 2009/31/EC on the geological storage of carbon dioxide ('CCS Directive') in selected European jurisdictions.

Further Reading and Resources

Through the establishment of an Emission Reduction Program (ERP), the World Bank aims to help developing countries to engage strategically with evolving global ERC markets, establish efforts to generate ERCs to sell into these global markets, and mobilize finance for such transactions. Check the sections below or click the link to find out more.

Unlocking Blue Carbon Development: Investment Readiness Framework for Governments, The World Bank's practical framework to guide governments in catalyzing and scaling up public and private investment in Blue Carbon as part of their blue economy development.

Global CCS Institute - The Global CCS Institute is an international member-led organization whose mission is to accelerate the deployment of carbon capture and storage (CCS) as an imperative technology in tackling climate change and providing energy security.

International Energy Agency (Topics Page) -The IEA works to ensure reliable, affordable and clean energy for its 29 member countries and beyond. Its mission is guided by four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide.

Carbon Capture and Storage in Developing Countries: A Perspective on Barriers to Deployment, Natalia Kulichenko and Eleanor Ereira World Bank, June 2012 - This report aims to assist developing countries to better understand issues related to CCS within the economic and legal context of developing countries and countries in transition. It is the first effort of the World Bank Group to contribute to a deeper understanding of (a) the integration of power generation with CCS technologies, as well as their costs; (b) regulatory barriers to the deployment of CCS; and (c) global financing requirements for CCS and applicable project finance structures involving instruments of multilateral development institutions.

Water

Desalination Plant for Victoria, Australia

Go to Desalination Plant for Victoria, Australia - Project Financed Structure to view full description and find links to resources

PPP Desalination Project - Project deed and ancillary documents with summaries for the design, construction finance and operation of a seawater desalination plant, 85 km transfer pipeline, delivery of power supply for the project, operations and maintenance, and the purchase of renewable energy credits. The state has contracted with the consortium AquaSure to deliver all aspects of the project. AquaSure has engaged other contractors to design, construct, operate and maintain the plant and the associated infrastructure. The capital cost is $3.5 billion fully funded by the private sector. For a portion of the funds the state government was the lender of last resort. The project provides for desalinated water to be delivered from the private sector to the state-owned water authorities, who will in turn deliver this water to households.The seawater desalination plant will supply up to 150 gigalitres (GL) of water with the capacity to upgrade to supply up to 200 GL in the future. A key feature of the project is that all power usage during the operating phase of the project will be fully offset by power generated by renewable energy sources. A project description is available on the site of the Victorian Department of Treasury and Finance.

For more information about public-private partnerships (PPP) in this sector visit PPP Water & Sanitation PPPs.

Transport

Urban Passenger Transport

Urban Passenger Rail

Australia

- Melbourne – Franchise Agreements for Urban Rail - Second generation of agreements. Dated 2009 (amended 2012). Franchise is for an initial period of eight years, renewable for a further maximum of three years. Franchisee to operate railway passenger services on rail infrastructure and using rolling stock leased to it by the Melbourne Public Transportation Authority (PTV), and PTV and the Franchisee have agreed to the payment of Franchise Payments and other payments on the terms of the Agreement.
- RailCorp Rolling Stock Public Private Partnership - RailCorp entered into a rolling stock public-private partnership (PPP) with Reliance Rail in December 2006. The Reliance Rail consortium comprises equity partners Downer EDI, AMP Capital Investors, Royal Bank of Scotland Group and International Public Partnerships (formerly Babcock and Brown Partnerships). Reliance Rail is supported by a team of industry specialists, including engineering and service organisations such as Downer EDI Rail and Hitachi. See the Updated summary of contracts and Schedule of Agreements.
- Metro Tunnel Project – Project Agreement (executed in late 2017) between a private consortium (which includes Lendlease, a major Australian infrastructure and property developer, and John Holland, a leading Australian engineering contractor) and the State of Victoria, for the design, construction and maintenance of 9km of underground railway tunnel running through the Melbourne central business district. The term of the contract is over 30 years (including design and construction), ending in September 2048. It is structured on a BOT model and provides an example where the host government retains greater demand / revenue risk under a “availability payment” model. For the key features of the Project Agreement, read more...

United Kingdom

- London Overground Rail Concession 2016 - paper considering draft concession and summarizing key features of the concession agreement that was then entered into with Arriva in 2016

United States

- Denver FasTrack. Eagle Project Concession Agreement - Agreement between the Regional Transportation District (RTD) and Denver Transit Partners (DTP). Summary together with attachments and amendments. The RTD FasTracks Program is a multi-billion dollar comprehensive transit expansion plan to build 122 miles of new commuter rail and light rail, 18 miles of bus rapid transit, 21,000 new parking spaces at light rail and bus stations, and enhance bus service for easy, convenient bus/rail connections across the eight-county district. Eagle P3 is a public-private partnership comprised of RTD's East Rail Line, Gold Line, Commuter Rail Maintenance Facility and Northwest Rail Line Westminster segment. The entire Eagle P3 Project is scheduled for completion in 2016. The Eagle P3 is a $2.2 billion capital project comprised of federal funds, RTD sales tax bonds and private equity from the concessionaire team, Denver Transit Partners. Eagle P3 received a $1.03 billion Full Funding Grant Agreement (FFGA) from the Federal Transit Administration on Aug. 31, 2011. The Eagle P3 Project is being delivered and operated under a concession agreement that RTD has entered into with a "concessionaire" that has been selected through a competitive proposal process “Denver Transit Partners (DTP)”. The concession agreement requires DTP to design-build-finance-operate-maintain (DBFOM) the lines under a single contract. RTD will retain all assets while shifting much of the risk of designing and building the project to DTP.

Metro

Europe

- Metro Concession Agreement - Concession agreement developed for metro in European city. Drafted by international law firm. Sanitized document together with a summary of the project.

Trams

Australia

- Melbourne Metropolitan Tram Franchise Agreement - Agreement of 2009 as amended 2014. Franchisee has agreed to operate tramway passenger services on tram infrastructure and using rolling stock leased to it by Melbourne Public Transportation Authority (PTV), and PTV and the Franchisee have agreed to the payment of Franchise Payments and other payments, on the terms of this Agreement. The contract is for a duration of eight years from 2009 and may be extended for a further 3 years on mutual agreement.

Light Rail

Australia

- GoldLinQ - Gold Coast Rapid Transport Project. PPP project for the construction and operation of a 13 km light rail system. The primary contract is the Gold Coast Rapid Transit Project Deed (Project Deed), dated 5 May 2011, between the State of Queensland (the State) and the GoldLinQ Pty Ltd (GoldLinQ "Operator Franchisee"). Under the Project Deed, the Operator Franchisee has agreed to design, construct, manufacture, install and commission the light rail system for the State during a period of approximately three years. This includes the manufacture and supply of the trams and rail systems, track laying, station and structures, and the assembly of the overhead power supply. The operator is paid construction payments against the completion of construction milestones. The following operations and maintenance phase is for 15 years, which includes running tram services to the timetable, cleanliness and maintenance of the trams, and maintenance of the system infrastructure in return for monthly service payments.
- **North West Rail Link** – principal project deed (executed in late 2014) between Transport for NSW (a government agency responsible for regulating and managing Sydney's transportation networks) and a private consortium (which includes the MTR Corporation, Leighton, Plenary Group and Marubeni) for the design, construction, operation and maintenance of a new rapid transit railway line running through Sydney's north-western suburbs. The agreement runs for a term of 15 years from the target date for completion (in 2019) and is structured on a BOT model. The project usefully illustrates how the private sector can bring in innovative financing structures (the securitized license model) to fund the development of important public infrastructure. It is also a useful example of how larger infrastructure projects may be partitioned between severally different private participants, with the host government playing the central coordination role. For the key features of the agreement, read more...

Canada

- Canada Line Rapid Transit Airport Link (TransLink) - The Canada Line project is the construction and operation of a rapid transport link from Richmond City Center to Vancouver Airport in Ottowa, Canada. The Government of Canada, the Province of British Columbia, Greater Vancouver Transportation Authority (TransLink), the Vancouver Airport Authority (VAA) and the City of Vancouver are funding the Canada Line, which is supported by the City of Richmond. The project also involves a private sector partner, InTransitBC, who was selected through a competitive bidding process and there is a link to the concession agreement. The total projected cost of the project was Canadian $1.9 billion (2003). InTransitBC commits to design, build, partially finance, maintain and operate the

Canada Line. InTransitBC is to assume most construction and operations risks.

Bus Rapid Transit Systems

A cost-effective alternative to urban rail investments are bus-rapid transit (BRT) systems. A BRT system is a bus-based urban passenger transport system that enables fast, comfortable and high-quality passenger transit. Typical features are the use of dedicated bus lanes and traffic signal priority, technology of intelligent transportation systems (ITS), and rapid and convenient fare collection. In a PPP model the cities build and maintain the infrastructure including stations and a fare collection system, while private operators own and manage the buses, hire staff and provide services on a long-term contract. Existing bus and taxi operators can be integrated into the BRT system and enter into long-term contracts with the relevant municipality.

Senegal

- Inauguration of the Senegal BRT - The development objective of Dakar Bus Rapid Transit Pilot (BRT) Project for Senegal is to enhance urban mobility between Dakar and Guédiawaye through the development of a Bus Rapid Transit (BRT) corridor connecting 23 stations and 14 of the city's most densely populated communes. The project launched in December, 2023.

Colombia

- Bogotá - TransMilenio - The TransMilenio Bus Rapid Transit (BRT) system opened to the public in December 2000 and replaced a system of many small competing enterprises. It is considered as a model case for a mass urban transit system and was replicated by various cities. The TransMilenio operates like a rail-based system by providing dedicated lanes for the exclusive use of the system’s buses, with boarding stations along the length of the lanes. It is a registered Clean Development Mechanism (CDM) project under the UN Framework Convention on Climate Change (UNFCCC). The sample contracts below relate to Phase I of the TransMilenio system. The concession contract related to Phase II of the project is part of the additional materials provided with the Bus Rapid Transit Planning Guide (2017).
- Contrato de Concesión (Concession Contract) document in Spanish with annotations in Spanish and English.
- Contrato de Operación (Operation Contract) document in Spanish with annotations in Spanish and in English

South Africa

- Cape Town, South Africa BRT - The PPP in Bus Rapid Transit (BRT) operations involved transfers of buses from government entities to private operators for specified contractual periods, during which the operators were required to operate and maintain the BRT fleet. Fleet expansion and replacement to be undertaken depended on future demand were defined in the contract accordingly. Fare collection is not part of the operator's scope of work. Payments are made to the operator on the basis of per kilometer availability payments paid out in pre-defined time intervals, with a minimum revenue guarantee in terms of fixed annual kilometers. The contract sets out mechanisms for paying additional kms, for revising payment terms and penalties/bonuses. Click on the RFP (with the draft agreement). **NOTE**: This may have been amended during the bidding process: IRT Vehicle Operator Contract between the City of Capetown and the Vehicle Operator Company.

Toolkits

Light Rail

- Private Sector Participation in Light Rail - Light Metro Transit Initiatives by Cledan Mandri-Perrott (with Iain Menzies), Public-Private Advisory Facility (PPIAF) 2010 – Toolkit on PPP arrangements for the establishment of effective light-rail metro transit (LRMT) systems. Presents options and discusses practical issues related to preparing and implementing new LRMT PPP schemes. The toolkit is intended as a practical guide to developing LRMT PPPs in both developed and developing countries. It aims to help government and public authorities to make informed decisions, adapted to local policy and objectives.

Bus Rapid Transit

- Urban Bus Toolkit, World Bank and Public-Private Infrastructure Advisory Facility (PPIAF) 2011 - This toolkit is designed to help government officials and policy makers evaluate existing and alternative urban bus systems in developing and transitional countries. It offers practical advice to enact fundamental system reforms (available in English, French and Chinese).
- Toolkit for Public-Private Partnerships in Urban Transport - Maharashtra, India, Asian Development Bank (ADB) 2011 - This toolkit was prepared to assist public entities in the state of Maharashtra in India in developing public-private partnership (PPP) urban bus transport projects. It includes case studies and detailed term sheets for the different PPP options that aim to facilitate the drafting of contracts. Terms sheets are provided for (a) cost-plus contracts and net-cost contracts (typically lease contracts) where the private sector owns, operates and maintains the buses while the public authority collects the revenue, (b) licensing contracts (typically operation & maintenance contracts) where the buses are owned by the public authority and the private party operates and maintains the buses and collect the revenue, and (c) a bus depot contract (design-build-operate contract) as well as (d) a monorail operation and maintenance contract.
- Bus Rapid Transit (BRT): Toolkit for Feasibility Studies - This Toolkit is Module 2 of the Guidelines and Toolkits for Urban Transport Development prepared by the Asian Development Bank (ADB) and the Ministry of Urban Development of India in 2008. The documents in this toolkit are designed to help decision makers and practitioners in states and municipal governments who are concerned with urban transport development in medium-sized cities in India.

Fare Collection and Intelligent Transport Systems (ITS)

- World Bank Toolkit for Intelligent Transport Systems (ITS) for Urban Passenger Transport - Online tool providing guidance in the planning, design, implementation and evaluation of an ITS program. The online resource includes sections on fare collection and case studies as well as a downloadable Handbook and Companion Guide.
- European ITS Toolkit - Decision-support toolkit for Intelligent Transport Solutions (ITS) - The toolkit was developed by the European project 2DECIDE. It covers ITS solutions for road and public transport in Europe. The toolkit is available to the public for free upon registration. It is available in English, French, Spanish and other European languages.
- A Toolkit for Self-Service, Barrier-Free Fare Collection, Transport Research Board (TRB) of the United States, Transit Cooperative Research Program (TRCP) Report 80, 2002. The report addresses the full range of issues and parameters - including policy and enforcement issues, operational issues, and capital and equipment issues - that an agency must consider in determining the applicability of self-service fare collection systems. In 2012, TRB released TCRP Synthesis 96: Off-Board Fare Payment Using Proof-of-Payment Verification, as an update to TCRP Report 80.

Further Reading and Resources

- Urban Transport - Can Public-Private Partnerships Work? By Eduardo Engel Alexander Galetovic, The World Bank, Sustainable Development Network, Urban and Disaster Risk Management Department, Policy Research Working Paper No. 687 May 2014.

- Incentive Structure in Transit Concession Contracts: The Case of Santiago, Chile, and London, England by Andrés Gómez-Lobo E. and Julio Briones, Clean Air Institute, January 2013. The objective of this report is to analyze the principal clauses of bus concession contracts to allow them to be adapted to other cities, and their concrete impact on the behavior of bus operators, the quality of the service provided, and transit systems finances, based mainly on the experience of Transantiago in Santiago, Chile, and in London, England. The ultimate aim is to derive lessons learned and provide recommendations for other cities that plan to embark on a contracting exercise or are faced with contract renegotiations with bus operators.
- Valuation of the Minimum Revenue Guarantee in the Urban Railway PPP Project by Kang-Soo Kim, December 2013 (Korean with English summary).
- Private Sector Participation in Urban Rail - Getting the structure right by Iain Menzies and Cledan Mandri-Perrott, Gridlines, Note No. 54, Public-Private Infrastructure Advisory Facility (PPIAF) April 2010.
- Guide de Bonnes Pratiques: Qui Paie Quoi en Matière de Transports Urbains -- Handbook of Good Practice: Who Pays What for Urban Transport (English and French). L'Agence Française de Développement (AFD) et ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer (MEEDDM) 2009.
- The Bus Rapid Transit Planning Guide - Institute for Transportation & Development Policy, 3rd edition, June 2007 (English, Portuguese, Spanish, Chinese, Russian). This guide is a comprehensive resource for planning a BRT system, beginning with project preparation all the way through to implementation. It contains a template for a concession contract which is based upon the Phase II contract for trunk services in the Bogotá TransMilenio system and provides an outline of the original contract. The complete contract is available as an additional resource. See also The BRT Standard and Best Practices 2013.
- Land Value Capture Mechanism : The Case of the Hong Kong MTR - The Case of the Hong Kong MTR.
- Traffic Demand Risk : The case of Bangkok’s Skytrain (BTS)
- Accelerating Infrastructure Delivery - New Evidence from International Financial Institutions, 2014.

Railway PPPs

Efficient rail transport can be an important catalyst for economic growth and development. Rail transport can stimulate trade, link production sites to regional and international markets, promote national and cross-border integration of regions and facilitate access to labor markets, education and health services.

Rail transport potentially provides a more energy efficient alternative to road or air transport. Investment in rail transport is therefore an important element of a low carbon transport strategy. Rail transport is also an energy efficient means to move high volumes of bulk commodities from centers of production, such as mining and agricultural areas, to ports and airports.

PPPs in railways can bring opportunities for investment, operating efficiency and modern and clean technology. PPP railway projects providing for shared use of rail tracks may lead to efficiency gains and an increased revenue basis (or reduced cost basis) for states and private investors, which would make investment in PPP schemes more attractive.

Competition and access are often key issues for railway projects, particularly those developed in remote regions (e.g. a railway line that connects a remote mining area to a port). The private railway operator may be in a very strong monopoly position as it may not be economically feasible to develop alternative transportation infrastructure to service the same region. To balance this, the private railway operator may be subject to an access regime which is designed to provide third party users with access to the railway infrastructure on non-discriminatory terms. This is discussed further in the “Track Access Laws and Regulations” section under Shared Use of Railway Tracks.

In large rail projects, it is relatively common to see the project partitioned, with different components being procured through different private partners (rather than for a single private party or consortium to assume responsibility for the development and operation of the entire project). For example, the operator of the rolling stock may be different to the manager of the rail tracks. This is driven by a number of different factors:

- given the size of the project and the range of expertise required, it may not be practical or economic for a single private partner (or consortium) to provide a one-stop-shop solution;
- partitioning may also give the contracting public authority more flexibility (e.g. different components of the project can be contracted for different terms);
- the contracting public authority may wish to retain certain functions on the public side; and
- competition considerations (e.g. to promote competition and mitigate the build-up of monopolistic power in a single entity).

See below for documents and links relating to PPPs in the railway sector:

Related Content

- **Climate-Smart PPPs**
- **Climate-Smart PPP Legal and Regulatory Framework**
- **Preparing, Procuring and Implementing Climate-Smart PPPs**
- **Renewable Energy**
- **Climate-Smart PPPs: Further Reading and Resources**

Partner Resources

Renewable Energy Project Resource Centre (REPRC)

hosted by Energypedia

Wiki-based library of energy project resources. Includes sample terms of references, procurement documents, economic analyses and case studies (success factors and lessons learned).

Subsections

Image not found or type unknown

climate smart renewable energy

Renewable Energy

Image not found or type unknown

Energy-Efficient Street Lighting PPPs: Lighted street/lamp light,town

Energy-Efficient Street Lighting PPPs

Image not found or type unknown

Carbon Capture and Storage

Carbon Capture and Storage

Image not found or type unknown

Nice lake with hills

Desalination Plant for Victoria, Australia

Image not found or type unknown

Train

Urban Passenger Transport

Image not found or type unknown

Blurred railway car

Railway PPPs