
BLENDED
FINANCE
TASKFORCE
SYSTEMIQ
INFRA 3.0
BETTER FINANCE
BETTER INFRASTRUCTURE

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Discussion Paper

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BETTER FINANCE, BETTER INFRASTRUCTURE

We have just lived through the second hottest year on record – a year characterised by extreme weather events including droughts, fires, floods, tropical cyclones and typhoons. In 2018 alone, this caused hundreds of billions of dollars in damage, disrupted energy and transport services, destroyed crops and wreaked havoc on food supply chains, displacing millions of people and taking thousands of lives. If we have any hope of reversing these trends, then we will need to urgently rethink the global infrastructure investment model which is central to delivering climate action under the Paris Agreement and achieving the UN Sustainable Development Goals (SDGs).

Estimates suggest that the required annual infrastructure spend is around $6 trillion per year[1] with most investment needed in emerging markets. We are falling short by around $2.5 trillion every year; half of which is expected to come from the private sector. Blended finance solutions which use development capital to mitigate investor risks will play a crucial role in attracting more private capital for this agenda (see *Better Finance, Better World* for more).

While we urgently need to scale infrastructure investment around the world, we also need to invest "smarter" by increasing the productivity of new infrastructure or reducing the cost through an infra-light model. This will be possible through what we call "Infra 3.0" – an approach to infrastructure delivery which is highly distributed, digitised and "service" based, and which captures the benefits of new technologies, economic clusters and natural solutions to increase asset resilience and connectivity.

By taking a "lifecycle" approach we can also better understand the costs and benefits of an asset over its lifetime, including the impact of operation and maintenance (O&M) and the cost of negative externalities on human health and the environment, especially from high-carbon assets.

Together, this could deliver huge savings by increasing infrastructure productivity and cutting investment needs by up to $1 trillion a year. This will require a wave of financial innovation from sophisticated financial players – shifting investment structures and developing new business models, partnerships and tech platforms to make it work.

1. NCE (2014), "*Better Climate, Better Growth*" - link
   UNCTAD (2014) "*World Investment Report*" - link

INCREASING INFRASTRUCTURE PRODUCTIVITY

We have laid out three different models of infrastructure to analyse where there is room to drive efficiencies and cost savings.

Fig 1: *Infrastructure framework*

Model of infrastructure	Action for SDGs
Infra 1.0 Traditional infrastructure	**Improve efficiency and maintenance;** increase private finance
Infra 2.0 Sustainable infrastructure	**Accelerate investment;** especially through blended finance
Infra 3.0 Infrastructure as a service	**Catalyse innovation;** develop finance and digital solutions

1. **Infra 1.0: Traditional infrastructure. Continue to scale investment into roads, airports, bridges, waste treatment plants and hospitals, with a focus on improving efficiency and maintenance.**

There are huge costs associated with poor infrastructure maintenance, including lower performance, poor safety record and unpredictable service delivery. Poor maintenance can also dramatically reduce the life of the asset, creating faster and more expensive replacement cycles. For types of infrastructure like transport, water and sanitation, failure to perform routine maintenance can accelerate replacement timeframes and increase capital replacement costs by at least 60%. There are, however, major savings if we get it right. Boosting asset utilisation, optimising maintenance planning, and expanding the use of demand-management measures for Infra 1.0 assets (including through energy efficiency measures) can generate savings of up to $400 billion a year,[2] while well-planned maintenance can reduce the total cost of core infrastructure by more than 50%. Optimising O&M can therefore become a key source of savings – not only to improve efficiency of the asset but also to avoid early or unnecessary construction of new Infra 1.0 assets.

3. McKinsey (2013), "*Infrastructure productivity: How to save $1 trillion a year*" - link

2. **Infra 2.0: Sustainable infrastructure. Rapidly accelerate investment into low carbon, climate resilient infrastructure like wind and solar and e-vehicle charging stations, especially from the private sector.**

We need to shift from a high-carbon energy system where around 80% of the world economy runs on fossil fuels, to a zero-carbon energy system by mid-century. This will mean renewing our energy-related infrastructure to the tune of $200 trillion and decarbonising at least $50 trillion of existing infrastructure over the next 30 years. Given the current size of the world economy (around $80 trillion in 2017) and its projected growth to around $145 trillion in 2035, this should be entirely achievable. Indeed, redirecting capital investments into resilience measures and low-carbon technologies will be a key driver of higher-quality, lower risk economic growth as shown by a recent study[3] which found that Latin America could save around $15 billion a year by adopting a transformative approach to electricity infrastructure that favoured demand-side management, energy efficiency and renewable energy instead of a high-carbon pathway.

3. World Bank Group (2017), "*Rethinking infrastructure in Latin America and the Caribbean*" - link

In spite of this, investors are often deterred by the high capital (upfront) costs of renewable energy infrastructure. In contrast to a wind farm for example, thermal coal power plants have typically lower upfront costs, but higher and more uncertain O&M costs compounded by volatile fossil fuel prices and significant negative externalities (e.g. air pollution and global warming). This should start to change as we see a rapid decline in the cost of renewable energy assets[4] and investors take advantage of cheaper energy production – including copper mines like Los Pelambres in Chile which is using off-grid solar and wind to power its operations. Using renewables in mining could deliver savings of over 30%[5] and create a pathway for the mine to become a hub for the supply of clean energy in the region. In order to capture all the benefits, we need to create the right incentives to accelerate and scale investment into sustainable infrastructure, especially in emerging markets. We also need to ensure that, where possible, Infra 2.0 assets replace Infra 1.0 assets as they come to the end of their life. For more on mobilising private capital for infrastructure, see Annex 2.

3. **Infra 3.0: Infrastructure as a service. Catalyse investment for non-traditional infrastructure which captures the benefits of new technologies, financial innovation or natural solutions to lower costs.**

If we are truly going to reduce infrastructure costs, then we need to see a proliferation of infrastructure delivery models which do one or more of the following:

a. **Utilise a distributed approach** to reduce the amount of infrastructure needed and avoid the costs and inflexibility of largescale, centralised networks e.g. off-grid solar "pay-as-you-go" via mobile (rapidly increasing energy access); solar-powered desalination and water purification (game changer in remote / disconnected areas); off-grid wind power for corporate offtakers like Google or Amazon (saves high costs of on-grid power).

b. **Integrate digitisation** and "smart" technology to increase productivity, use resources more efficiently and potentially swap "intelligence" for scale e.g. building control algorithms to optimise energy efficiency and space utilisation; "smart highways" which can charge electric vehicles and use sensors to optimise travel times and traffic flow; telehealth services which deliver medicine by drones and provide virtual advice (reducing pressure on hospitals and travel time from remote areas).

c. **Share assets through a "services" model** to turn fixed costs into variable ones, making them more affordable and to reduce the total amount of infrastructure capacity needed

4. Carbon Tracker (2018), "*Powering down coal: Navigating the economic and financial risks in the last years of coal power*". 42% of global coal capacity is currently unprofitable. The US could save $78 billion by closing coal-fired power plants. The price to build new wind & solar has fallen below the cost of running existing coal-fired power plants.
5. Saving due to project design, operation and maintenance optimisation, lower travel costs to transport fuel to distant locations and lower counter-party risk as the PPA is directly with the company.

e.g. subscription or "pay-per-use" for farm machinery e.g. HelloTractor in Africa or EM3 Agriservices in India; community toilet blocks and sanitation infrastructure (e.g. through FeelWell Ceramics to reduce stunting from open defecation in Indonesia); UberEats and package delivery by drone; shared autonomous vehicles with better connectivity (meaning we only need half the cars and much less road capacity).

d. **Optimise economic clusters** to embed circular economy principles into economic zones and growth corridors and ensure cities are more connected and compact. This will reduce the overall amount of infrastructure required and to avoid negative externalities like air pollution (which kills around 7 million people every year and costs the top 15 emitters more than 4% of GDP)[6] and save costs by leapfrogging using innovation e.g. "pay as you-save" models for electric buses; urban farming; and LADOL: the world's first Sustainable Special Economic Zone, located in Nigeria and designed with circular principles across all core facilities (including energy and waste) with companies who are mandated by SDG policies to unlock maximum value.

e. **Incorporate natural solutions** to provide a range of ecosystem services including resilience, which may reduce the cost of climate-related damages (prolonging the life of the asset while potentially improving its value) and mitigate negative externalities e.g. green roofs increase energy efficiency and manage stormwater and flooding; coral reef rejuvenation absorbs the impact of cyclones, reducing damage to coastal infrastructure; a $1.5 billion investment over 10 years in watershed protection saved NYC $6-8 billion for a new water filtration facility plus $300 million a year in O&M.[7]

These five categories of Infra 3.0 make it clear that smarter delivery could provide an extra source of infrastructure productivity – a distributed approach can reduce scale and accelerate delivery, digitisation can improve efficiency of assets (whether brown or green), asset sharing makes traditional infrastructure more affordable. More compact cities and circular economic clusters should reduce the overall need for infrastructure capacity and avoid major health costs, while natural solutions can lower the bill for climate-related damage and often provide services more cheaply than traditional infrastructure. This is where Infra 3.0 or infrastructure as a service arguably creates a capex benefit, since it is more likely to be right-sized, tailored to the end user and resilient. As a major driver of disruption, Infra 3.0 should not be at risk of producing stranded assets unlike more traditional infrastructure assets in Infra 1.0 (e.g. thermal coal power plants). You can find further examples in Annex 1.

6. WHO (2018), "*Air pollution and child health: prescribing clean air*" - link

7. World Bank Group (2019), "*World Resources Institute: Integrating Green and Gray*" - Link

Fig 2: Infra 3.0 uses a new approach to increase infrastructure productivity and reduce costs in five key categories

Model	Cost saving
 **Distributed**	Reduce amount of infrastructure needed; avoid costs of largescale, centralised networks; more flexibility, higher penetration, accelerated delivery
 **Digitised**	Increase productivity; more efficient use of resources; potentially reduce scale or amount of infrastructure needed
 **Shared services**	Turns fixed costs into variable ones to make them more affordable; reduce the total amount of infrastructure needed
 **Economic clusters**	Embed circular principles to reduce costs; reduce the amount of infrastructure needed through more connected and compact cities
 **Natural solutions**	Ecosystem services at a lower cost; avoid potential costs of climate-related damage; improve asset value; mitigate negative externalities

INFRA 3.0 ENABLERS

Despite these benefits, investment in some Infra 3.0 solutions remains relatively niche and is likely to be perceived as more risky, especially by traditional infrastructure investors.[8] Three cross-cutting enablers will be key to scaling investment in Infra 3.0.

1. **Technology and innovation:** Infra 3.0 will continue to evolve through advances in science, artificial intelligence, machine learning, the "Internet of Things", 3D printing, low orbit satellites, and cheaper and longer lasting batteries. Supporting local entrepreneurs and tech platforms will ensure that the breeding ground for Infra 3.0 remains fertile and can penetrate the market quickly in order to realise lower costs of infrastructure delivery. Integrating automation, big data analytics and new design programmes into more traditional infrastructure can also increase efficiency and precision (as well as optimise the timing and cost of capital investments). For example, thanks to digital construction modelling, the UK government has reported a reduction in construction costs in public sector projects by 20%.[9]

2. **Policy and planning:** In many cases, maximising the benefits of Infra 3.0 will require strong reinforcing policies at the national level (e.g. a price on carbon or Nationally Determined Contributions to reduce emissions under the Paris Agreement) and local planning capacity at the state or city level (e.g. on public transport, electric vehicles, energy efficiency and residential housing, especially in low lying coastal communities or flood prone areas). China shows how tax incentives, subsidies and other government policies (e.g. to build charging infrastructure and restrict the sale and use of petrol cars) has driven rapid growth in the electric vehicle industry. About 35% of all electric cars sold globally come from China, and it is home to the only city in the world – Shenzhen – to have 100% electric buses. China is now looking to capitalise on the rise of automated vehicles, exploring smart highways and roads. An example at the local level is public transport: we know that future demand for mobility could be supplied at relatively low infrastructure investments costs and low CO2 emissions with a shift towards more rail and urban public transport. However, as might expected, this can only be realised if accompanied by policies that incentivise high rail occupancy and incorporate integrated land-use planning to densify cities (e.g. designing cities in a way which reduces the need to drive). This integrated approach will be systematically less costly, but may require more strategic coordination and political capital. For more on the importance of cities in delivering climate action and global infrastructure needs, see the excellent work of the New Climate Economy in "Better Growth, Better Climate".

8. PEI (2018), "*Is 'infra-like' alike enough to be the future?*" - link

9. A 20% reduction in construction costs would be the equivalent of at least tripling private investments in infrastructure from their current level.

3. **Finance:** Many of these newer infrastructure models have the potential for different financing solutions which will make it possible to pay for the service on a more commercial and/or bundled basis. Mobilising capital for Infra 3.0 will therefore require a wave of financial innovation from sophisticated players – with new investment structures, business models, enabling platforms and cross-sector partnerships to make it work. "Pay-as-you-go" platforms, leasing models, crowdfunding, corporate PPAs, resilience and green bonds are all currently in the mix. But taking this model of infrastructure delivery to scale will require additional financial innovation. Infra 3.0 will often involve less liquid, small-scale assets (e.g. off-grid solar panels), low credit ratings (e.g. a key challenge for cities in emerging markets), smaller balance sheets or lack of track record (entrepreneurs will be the typical early pioneers of Infra 3.0), technology risk (especially where benefits of digitisation are too new to be proven at scale) or have unpriced benefits (e.g. lack of carbon market or payments for ecosystem services in many countries). However, the good news is that much of Infra 3.0 has clearly identified beneficiaries and this may – at least in principle – make more innovative forms of financing (through a "service" based model) more feasible.

Philanthropy has a particularly catalytic role to play to seed Infra 3.0 entrepreneurs and scale innovation, especially in more difficult geographies or sectors. The MacArthur Foundation is demonstrating real leadership in this space, launching the Catalytic Capital Consortium in early 2019 which dedicates $150 million to help address financing gaps for high impact issues. MacArthur is joined by other pioneers – the Rockefeller Foundation and the Omidyar Network. Rockefeller's focus on innovative finance for resilient cities has seen it launch The Urban Resilience Fund which could be a game changer for Infra 3.0. Omidyar is forging a new breed of "venture philanthropy" which may take higher risk positions to ensure disruptive market-level impact, making it ideal for early stage tech-enabled Infra 3.0 solutions.

Development banks can also leverage their high-quality concessional capital to invest in seed and venture capital funds, business incubators and accelerator vehicles that are Infra 3.0 aligned. These vehicles will go on to support start-ups, SMEs and entrepreneurs that can accelerate delivery of Infra 3.0. By capitalising and empowering financial intermediaries at the forefront of driving innovation, development banks can increase access to finance for Infra 3.0 which are currently underfinanced. One example is the IFC Venture Capital Group's "Startup Catalyst" programme which invests in ventures and growth stage companies that offer innovative technologies or business models geared at emerging markets to support accelerated launch through seed capital. It also facilitates access to global investors for companies in underserved markets and development of local venture capital ecosystems that will result in sustained entrepreneurship, improved products and services, and increased support of technology.[10] Finally, development banks will play a key role in helping to aggregate projects so that largescale capital can still access smaller scale investments. For example, the Inter-American Development Bank (IDB) has been structuring a blended finance warehousing solution for up to $50 million to accumulate a portfolio of standardised energy efficiency receivables from Mexican energy service companies. The investments will be securitised through the issuance of green bonds in the local debt capital markets and benefit from $56 million from the IDB in the form of guarantees for the portfolio of projects.[11]

10. Investment amounts range between $1-2 million into target investees with demonstrable track records, reputable managers, and sustainable structures.

11. The transaction is also mobilising $19 million in resources from the Clean Technology Fund and $20 million from GCF.

GETTING TO THE TRILLION

There is a lot to be gained from increasing productivity across the three models of infrastructure. First, it will be critical to improve the delivery of Infra 1.0 – with a focus on efficiency and optimising O&M. Second, we urgently need to accelerate investment for Infra 2.0; where possible, this should involve replacing Infra 1.0 assets at the end of their life with low carbon and climate resilient Infra 2.0 assets. Finally, catalysing investment for Infra 3.0 should capture a range of cost reductions across five core models of delivery (distributed, digitised, shared services, economic clusters and natural solutions) to accelerate delivery of the SDGs and meet essential infrastructure needs. Infra 3.0 could also potentially lower the total cost of the infrastructure investment required in Infra 1.0 and Infra 2.0 by providing an efficient alternative in certain contexts.

Using the following analysis, we were able to estimate that reimagining infrastructure according to this integrated approach could reduce the annual investment need by $1 trillion a year (narrowing the $2.5 trillion a year funding gap by almost half).

Analysis

Conservative high-level estimates for savings across Infra 1.0, Infra 2.0 and the five categories of Infra 3.0 are set out in Fig 3 below. In particular, we found very little analysis quantifying the real cost reduction potential of natural solutions on infrastructure requirements. We welcome all feedback and research inputs which could improve these estimates, noting that we expect the real savings – especially from Infra 3.0 – could be much higher.

Fig 3: Estimated savings across Infra 1.0, 2.0 and 3.0 could be at least $1 trillion every year[12]

Model	Estimated cost saving	
 **Better O&M**	**$400 billion** [incl. demand management]	Infra 1.0
 **Sustainable infra**	**-$270 billion** [cost declining]	Infra 2.0
 **Distributed**	**$78 billion** [electricity only]	Infra 3.0
 **Digitised**	**$415 billion** [energy, water, buildings, comms]	Infra 3.0
 **Shared services**	**$80 billion** [transport only]	Infra 3.0
 **Economic Clusters**	**$200 billion** [sprawling vs. smarter urban development]	Infra 3.0
 **Natural solutions**	**$100 billion** [based on natural disasters; $50 billion from insurance losses from floods alone]	Infra 3.0
	Total saving: $1 trillion a year	

12. Conservative estimate using the following proxies: O&M –Boosting asset utilisation, optimising maintenance planning, and expanding the use of demand-management measures for Infra 1.0 assets (including through energy efficiency measures) can generate savings of up to $400 billion a year: McKinsey (2013) "*Infrastructure productivity: How to save $1 trillion a year*" - link; **Sustainable Infrastructure:** NCE estimate that low carbon transition will cost an additional $270 bn a year to total infrastructure spend but note costs rapidly declining for renewables. **Distributed:** $78bn a year [savings calculated by difference in cost of connecting 950bn without access on-grid or off-grid. Costs of on-grid and off-grid taken from IEA Energy for All Case investment needs IEA (2017) "*Energy Access Outlook*" - link; **Digitised:** $415 bn a year (Based on smart cities cost savings for governments and enterprises for energy, water, buildings, communication: ABI Research, Chordant, CA Technologies (2017) "*Smart Cities and Cost Savings*" - link. Have excluded transport from here as used it below; **Shared services:** $80 bn for transport only, government savings based on ride-sharing economy and driverless cars (*ibid.*); **Natural solutions:** ~100bn from avoided natural disasters (Protecting coastal wetlands, for example, could save the insurance industry $52 billion annually through reduced flood damage losses Beck (2017) "*Financing natural infrastructure for coastal flood damage reduction*"; **Planning:** $200bn a year NCE (2014) "*Better Climate, Better Growth*" - link.

We then analysed a number of recent research papers to see if the trillion dollar saving was a reasonable estimate. In particular, we looked the World Bank's 2019 "Beyond the Gap" report and found that the saving was of a similar order of magnitude to our own estimate (up to $1.2 trillion).

The World Bank report explored thousands of different scenarios to identify what proportion of GDP countries should be spending on infrastructure. They found that developing countries could spend 4.5% of GDP on new infrastructure to deliver a **high ambition** and **efficient** strategy which would achieve universal access to water, sanitation, and electricity; greater mobility; improved food security; better protection from floods; and eventual full decarbonisation.[13] We compared the high-ambition, highly efficient spending strategy against a high-ambition strategy which was deployed with low efficiency. "Low efficiency" involved the inappropriate use of costly technology (e.g. for irrigation), a lack of enabling policies to densify cities, failure to invest in energy efficiency and investment in fossil fuel infrastructure which has to be retired early. Infrastructure spend could be cut by $1.2 trillion each year by moving from the inefficient to efficient scenario.[14] The World Bank report also reinforces that integrating green infrastructure (we describe this as "natural solutions") with grey infrastructure (i.e. Infra 1.0), could *further* reduce the total infrastructure spend by lowering overall project costs and by avoiding future costs associated with climate change and health issues.[15]

To be clear, the potential to reduce the total infrastructure investment requirement should, in no way, dampen the urgency or ambition with which we need to mobilise capital for the SDGs or hit climate finance targets under the Paris Agreement. Rather, it should remind us that we can use scarce public resources much more effectively and that technological disruption, innovative new business models (including distributed / service-based models), natural solutions and effective O&M can deliver infrastructure needs faster, safer, cleaner and at a lower cost.

13. How much countries spend in the range depends on their goals and ability to implement supporting policy. In other words, investment needs are largely impacted by the (i) investment strategy (e.g. focusing on reducing energy demand as well as increasing capacity and implementation of relevant policy shifts); and (ii) the technology selected (e.g. natural solutions may prove effective in some cases, while in others it is worth investing in the more expensive technology immediately rather than having to upgrade in a second stage).

14. World Bank (2018), "*Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet*" - link

15. World Bank and World Resources Institute (2019), "*Integrating Green and Gray: Creating Next Generation Infrastructure*"

CALL TO ACTION

Driving the Infra 3.0 agenda to reduce costs, increase infrastructure productivity and accelerate delivery of Paris climate targets and the SDGs will require bold leadership from country governments, development finance, philanthropy, entrepreneurs and investors.

Fig 4: *Leadership for the new infrastructure approach*

a. **Government:** National governments will be powerful agents to deliver the new Infra 3.0 approach to infrastructure investment. As they set policy and regulation, governments should systematically consider Infra 3.0 options in the local context (including the potential for disruption and improved efficiency) in key sectors such as energy, building, transport, water, and sanitation – with a focus on creating compact and connected cities. As they develop and implement Nationally Determined Contributions to reduce greenhouse gas emissions under the Paris Agreement, governments should also factor in the cost savings from potential Infra 3.0 opportunities. Governments should prioritise strong institutional mechanisms – especially national infra finance institutions – which can link policy to sectoral strategies, investment plans, sustainability standards and innovation. Indonesia's PT SMI is one good example having launched a blended finance platform called "SDG Indonesia One" in October 2018 which will help to mobilise institutional investment for sustainable infrastructure in the country. $2.34 billion had already been committed to this platform when it was launched, with a target of $4 billion.

b. **Development finance:** The development finance community will be central to the Infra 3.0 agenda. They can support governments to implement efficient and ambitious policies and build institutional capacity. Most importantly, they can drive the financial innovation required to deliver the five core models of Infra 3.0, knowing that infrastructure which is

distributed, digitised, using shared services, focused on city planning or integrating natural solutions will have unique structuring requirements which will need to be standardised in order to mainstream and scale with commercial investors.

c. **Philanthropy:** Foundations and other mission-aligned investors can be particularly catalytic in seeding Infra 3.0 entrepreneurs and scale new technologies, especially in more difficult geographies. Philanthropy should also support new and existing platforms which can act as hotspots for Infra 3.0 innovation. One good example will be the THK "Blended Finance and Innovation Institute" which will include a workstream around incubating new projects or initiatives which involve "better business" to deliver the SDGs. The Institute will be launched in Bali in late 2019.

d. **Entrepreneurs and investors:** Businesses and entrepreneurs must be leading the charge on Infra 3.0 – testing innovation and creating new revenue models with the aim to scale. They should seek out new partnerships with the development finance and philanthropic community to mitigate some of this early stage risk. Investors should do the same, especially when testing digital innovation and untraditional financial mechanisms for Infra 3.0. We look forward to seeing new types of investors playing in the infrastructure space, especially as technology disruption drives a shift away from largescale, capital intensive assets to more distributed service models.

Clearly, reimagining infrastructure investment via the Infra 3.0 approach will not be business as usual. But the cost savings and corresponding new opportunities will be worth it. We urge everyone to go after the prize.

ABOUT THE BLENDED FINANCE TASKFORCE

The Blended Finance Taskforce was launched in 2017 by the Business & Sustainable Development Commission. The Taskforce was established to help address systemic challenges to mobilising private capital for the SDGs, with a focus on sustainable infrastructure. The Taskforce published its flagship consultation paper "Better Finance, Better World" in January 2018. At the 2018 Spring Meetings, the Taskforce launched its ambitious 18 month Action Programme with eight core workstreams to implement the recommendations of "Better Finance, Better World". The Taskforce has helped mobilise billions of dollars for the SDGs including through its support for the "Tri Hita Karana Forum for Sustainable Development".

We are also grateful to the work of so many who are driving the SDG infrastructure agenda, without which we could not have developed this concept. This includes the New Climate Economy, the UID, the One Planet Summit, the OECD, the MDB Blended Finance Steering Group, the IDB's Framework for Sustainable Infrastructure, the G20 Task Force on Long-term Investment, the WEF's SDIP and many others. We are also deeply grateful to the organisations who fund the Taskforce and to the members and friends who generously offer their time and insights. This is simply a concept paper so we have not asked members of the Blended Finance Taskforce or their organisations to endorse this work and they should not be taken to have done so.

ANNEX 1: EXAMPLES OF INFRA 1.0, 2.0 AND 3.0

Category	Type Of Infra	Features	Action	Example
 Infra 1.0	**Traditional infrastructure**	Typically lower capex and higher opex; typically not climate resilient or energy efficient	Increase private finance, ensure that design of new infrastructure and upgrades of existing infrastructure integrate sustainability and efficiency	Roads, bridges, ports, airports, power and waste treatment plants, hospitals, schools (e.g. retrofit buildings to increase energy efficiency and the life of utilities including through IoT solutions; sensors in smart roads to minimise crash costs, reduce construction costs in public sector projects through digital construction modelling)
 Infra 2.0	**Sustainable infrastructure (low-carbon and climate resilient)**	Often higher capex (though costs are coming down), lower opex; fewer negative externalities on health and environment; lower climate-related costs / damage	Scale up investment, increase private finance (including through blended finance)	Wind farms, electric vehicle charging infrastructure
 Infra 3.0	**Infrastructure as a service**	Distributed, smallscale, captures benefits of natural infrastructure and technology, lower cost (both capex and opex), accelerated delivery and access but can be harder to scale	Develop innovative digital solutions for local circumstances including pay-per-use, leases, pay for performance (results-based finance); scale up private capital especially through blended finance for entrepreneurs, private intermediaries and through corporate value chains or tech platforms; aggregate smallscale projects to mobilise largescale capital	Off-grid solar through mobile phone-enabled pay-as-you-go solutions, pay-as-you-save electric buses, green roofs in "smart" buildings and other natural infrastructure

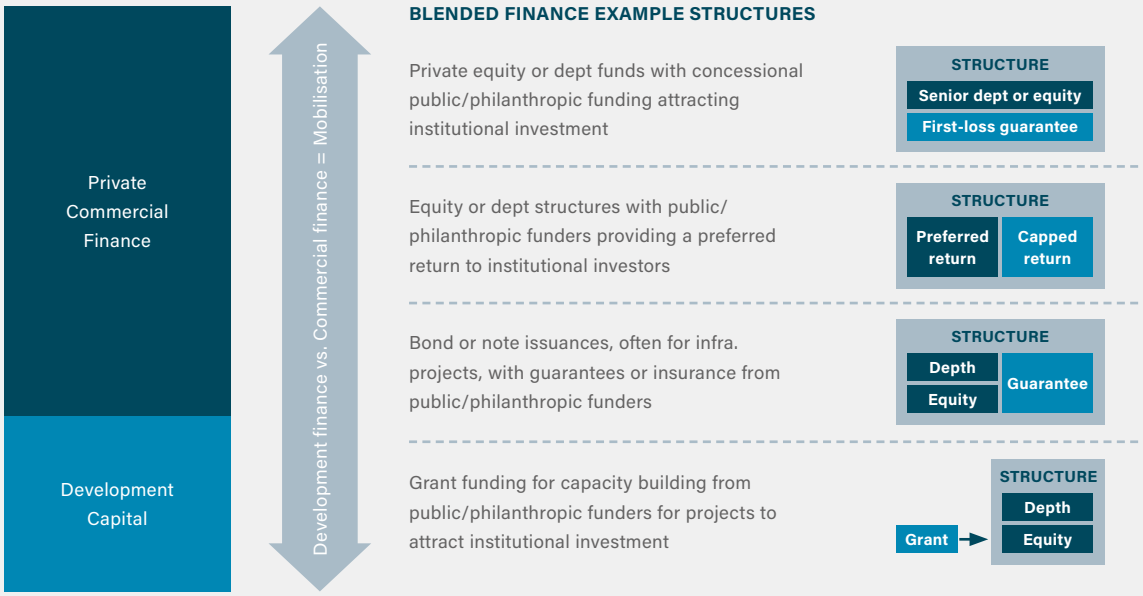
ANNEX 2: MOBILISING PRIVATE CAPITAL FOR INFRASTRUCTURE WITH BLENDED FINANCE

Despite attributes which make infrastructure an attractive asset class,[16] many investors still do not have a meaningful portfolio allocation to even the more traditional Infra 1.0 or 2.0 assets (whether through unlisted private equity, vehicles like increasingly popular infra debt funds etc.) This is especially true in developing countries where investors may have no track record or limited resources on ground. Investors also point to a lack of stable project pipeline, currency exposure and political, governance and counterparty risk as barriers to investing in emerging markets infrastructure. The perception of higher risk is often driven by the lack of data about the historical performance of these assets so we commend the ongoing work to make the development banks' Global Emerging Markets (GEMs) Risk Database publicly available to address this data gap.

All this compounds to keep mainstream capital largely on the sidelines – especially for Infra 2.0 assets which will typically have higher upfront costs. This is where "blended finance" can help, using development capital (public or philanthropic) to drive project development, mitigate country and counterparty risk, and incentivise higher capex projects which are lower cost in the long term when taking O&M into account.

Blended instruments (like insurance or guarantees) and blended vehicle structures (like layered funds with first loss or technical assistance side car facilities) can be especially catalytic to crowd in private capital for sustainable infrastructure assets in the Infra 2.0 category and innovative "service-based" assets in Infra 3.0, which may also have a higher perception of technology risk. Other examples of blended finance structures are set out in Fig 5 **below:**

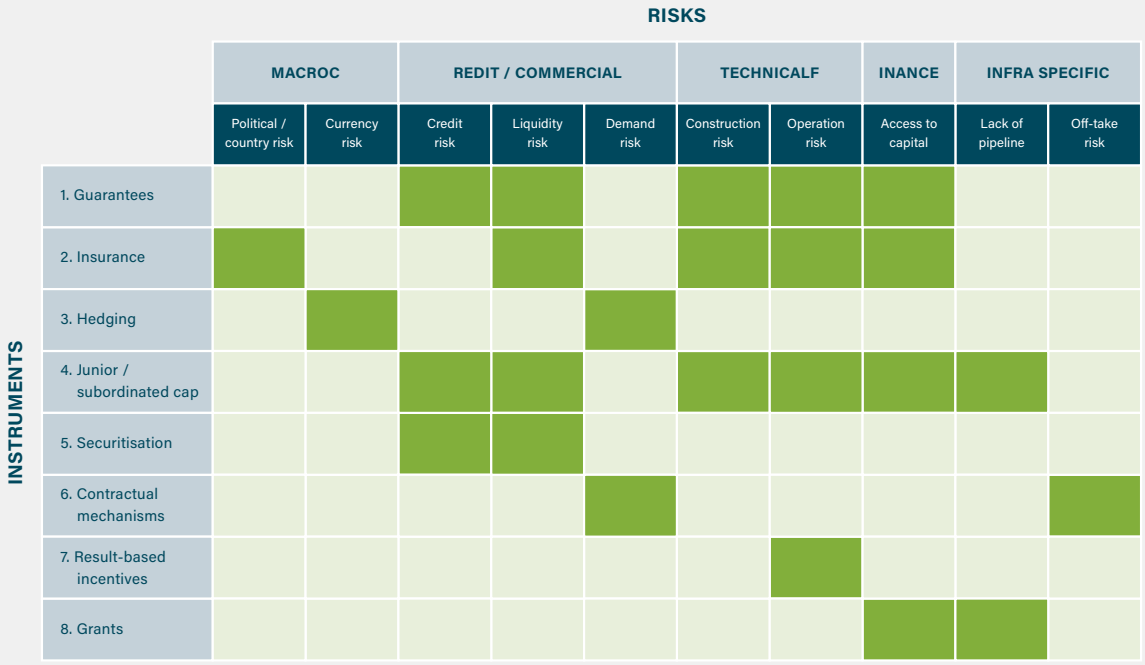
Fig 5: *Example blended finance structures*[17]



16. Including stable, predictable cash flows, typically long dated assets, natural hedge against inflation, uncorrelated returns with listed equities and other liquid assets, historically lower default rates than comparable corporate issuers, higher yields in emerging markets during periods of low interest rates. For excellent work on defining sustainable infrastructure as an asset class see the Inter-American Development Bank: - link
17. Blended Finance Taskforce, "*Better Finance, Better World*" (2018)

A relatively small amount of development capital can be used to mitigate against a range of risks – both real and perceived. This may be enough to "tip the scales" for new investment and enable financial and technological innovation to accelerate investment across the three categories of infrastructure.

Fig 6: *Blended finance structures and instruments can help mitigate investor risks and mobilise private capital for infrastructure*[19]



The proliferation of SDG-related financial instruments (including sustainability linked bonds and loans) should also help mobilise capital for the three categories of infrastructure. Green bonds will play a pivotal role in mainstreaming Infra 2.0 by connecting investors to financial instruments that have a comparable risk-return profile to a traditional bond but with positive environmental impacts. The Climate Bonds Initiative estimates that almost $158 billion in green bonds were issued in 2018 and we are seeing growing number of countries who are issuing sovereign green bonds (including the first green sukuk from Indonesia for $1.2 billion in 2018).

Municipal finance may also be a useful source of capital, especially where a city wants to finance Infra 1.0 and Infra 2.0 as part of a package. For example, Mexico City's MXP1 billion ($50 million) green bond was used to finance its new metro and refurbish existing transport infrastructure. The bond was oversubscribed 2.5x and attracted domestic private retirement fund investors. Bonds have long been an instrument for financing transport, however, note that they can be issued by very few cities in developing countries.

19. Blended Finance Taskforce, "*Better Finance, Better World*" (2018)

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