

InfraRead

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Is this a meaningful start of a UK transport revolution?

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The Heathrow Decision – What does it mean for Infrastructure?

BY CLAIRE DUTCH, MARK ELSEY, NAOMI HORTON AND JONATHAN TURNER

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An overview of this issue

I am delighted to introduce this fourteenth issue of **InfraRead**, our biannual publication covering a range of legal and transactional issues relevant to the global transport and infrastructure space.



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Access to ports, and to port infrastructure – The key service industry

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Indonesia moves capital city: an illusion or an era of new opportunities?

Frédéric Draps and Suci Modjo provide insights into the underlying reasons for Indonesia plans to move its capital city as well as the current plans and opportunities which may arise from this herculean enterprise.

Waste-to-Wealth Initiatives – Part 1: Fuel and Feedstock Resource Recovery – Energy Carriers from Waste

This article, the sixth in our “Waste-to-Wealth” series exploring the global waste sector, focuses on fuel and feedstock. Michael Harrison and his co-authors address the importance of understanding composition and quantity of fuel and feedstock for the purposes of councils and municipalities contracting for, and increasingly, the private sector, developing, resource recovery projects.

The Heathrow Decision – What does it mean for Infrastructure?

On 27th February 2020 the Court of Appeal ruled that the Government's plan for Heathrow expansion was unlawful on the basis that it failed to take account of the Paris Agreement on climate change. Claire Dutch, Mark Elsey, Naomi Horton and Jon Turner look at the potential implications of the ruling.

This publication is not intended to be a comprehensive review of all developments in the law and practice, or to cover all aspects of those referred to. Readers should take legal advice before applying the information contained in this publication to specific issues or transactions. If you have any comments about this edition or suggestions for future editions, please contact us at infraread@ashurst.com. If you would like to contact Ashurst please visit Ashurst.com/contactus and one of our team will be happy to help you.

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Is this a meaningful start of a UK transport revolution?

by Will Tane and Ellen Blakeney

While these are undoubtedly “strange and unprecedented times” for all, public transport is likely to be one of the most transformed sectors in the post-Covid world. With the fundamental premise of mass-transportation suddenly considered unsafe, cities are prioritising walking and cycling (“active transport”) as alternative ways of getting around. But will this emergency shift constitute a longer lasting transport revolution?

Current Limitations of Public Transport

Due to events which seemed inconceivable a few months ago, the use of public transportation has declined significantly. Most trains in the UK are currently running at approximately 10 per cent of their normal passenger capacity.¹ This reduction is largely the result of governmental advice to only use public transport for “essential travel” and, for those required to travel, concerns regarding the safety of public transport during the Covid-19 pandemic.

In response to the Government’s partial lifting of lockdown in May 2020, mainline train operators have increased the number of services running. To allow for social distancing, they are restricting the flow of passengers by asking people to book in advance. Operators are able to afford to introduce such measures as a result of the Emergency Measures Agreement signed in March 2020 with the Department for Transport, which removed cost and revenue risk

from rail franchisees. Once this ends, however, the future for rail franchises and mainline operators is unclear.

The outlook is even starker for mass-transit systems such as inner-city buses, the London Underground and Manchester Metrolink which, pre Covid-19, were providing frequent services at high capacity. Indeed, the introduction of passenger flow restrictions and social distancing measures largely defeats their purpose and without continued financial assistance (as was recently granted to Transport for London),² or a change in attitude towards mass-transportation, such systems will be financially unviable.

As the UK lockdown eases and more members of the public are asked to return to work, it remains fundamentally unclear how they will commute and what role mass-transit systems will play.

¹ Financial Times, “Public transport struggles to cater for the few” (21 May 2020)

² .UK Government, “Government grants Transport for London funding package” (15 May 2020)

Are cars the answer?

Moving forward, will cars fill the void left by public transport?

City mayors have already expressed concerns over the impact of increased car journeys. Council figures warned of gridlock in Manchester,³ while the Congestion Charge has been reinstated in London, with a price increase and extended hours of operation, to prevent roads from becoming unusably blocked.⁴

City planners are also considering the impact of increased car usage on air pollution and the worsening of climate change. Although in some UK cities, implementation of “clean air zones” have been delayed until at least January 2021,⁵ our expectation is that the goal of reducing emissions will remain firmly on the national political agenda in the future.⁶ Research has also suggested that air pollution is linked to higher Covid-19 death rates.⁷ Widescale adoption of electric cars would mitigate air pollution concerns, but such a fundamental shift is unlikely to happen quickly and would not address concerns over the potential for gridlock across the UK’s cities.

Consequently, while cars may appear to provide the safest mode of transport for the individual in a post-Covid world, their mass adoption in the urban environment is unlikely to be supported by the UK’s urban infrastructure or the political agenda.

Emergency implementation of “Active Transport”

Across the UK, the Government and city mayors alike are promoting the use of “active transport” as a response to Covid-19.

Sadiq Khan has announced plans to pedestrianise large sections of London as lockdown eases,⁸ while Council leaders in Bristol and Greater Manchester plan to permanently pedestrianise parts of their city centres.⁹ The Scottish government have pledged £10 million to create “pop-up” walking and cycling routes,¹⁰ and the UK government have promised £2 billion to “create new era for cycling and walking”.¹¹

However, it may be naïve to assume that these announcements will inherently lead to widespread behavioural change. People still have concerns over safety; although cyclist injury and deaths across Europe are decreasing year upon year, they are doing so at a slower rate than other forms of transport.¹² While lockdown persists, “pop-up” facilities (which borrow space from roads by using

temporary road-marking-tape) provide all important separation for cyclists. But as lockdown eases and roads begin to repopulate, there are fears that the risk to cyclists will increase. Safety concerns would be somewhat alleviated by the construction of physically separate cycling paths, but with budget and time constraints, this might not be possible in the short term.

There are other more practical drawbacks to cycling and walking. For the everyday commute, it is likely to remain unrealistic for most people who do not live within a reasonable radius of their workplace. On top of the geographic constraints, cycling may not be practicable for the injured or elderly, nor as appealing in autumn and winter.

Ultimately, it remains to be seen whether the current political support for active transport will be enough to overcome these fundamental concerns and impracticalities, and result in its widescale adoption.

A Lasting Revolution?

Given the measures that city planners are taking across the UK to encourage active transport, our expectation is that there will be a significant increase in its adoption in the short term. Whether this leads to a long term “revolution” is likely to depend on whether the public’s psyche has been permanently changed with regards to the safety of mass transportation and the alternative use of active transport. The most important factors are likely to be (a) whether a vaccine for Covid-19 is discovered; (b) how deeply entrenched the so-called “new world” becomes before such discovery; (c) the likelihood of there being future pandemics; and (d) how successful/practical the public’s adoption of active transport turns out to be.

For the time being at least, the Government’s clear message is to “get on your bike”.



- 3 The Guardian, “Calls for more space for walking and cycling in UK during lockdown” (28 April 2020)
- 4 Mayor of London, “Car-free zones in London as Congestion Charge and ULEZ reinstated” (15 May 2020)
- 5 Birmingham City Council, “Birmingham’s Clean Air Zone and the impact of COVID-19” (24 March 2020)
- 6 Leeds City Council, “Council releases information on support available to those self-employed in the city along with an update on the Clean Air Zone plans” (27 March 2020)
- 7 UK Government, “Creating the transport decarbonisation plan” (25 March 2020)
- 8 Harvard University, “A national study on long-term exposure to air pollution and COVID-19 mortality in the United States” (24 April 2020)
- 9 Mayor of London, “Car-free zones in London as Congestion Charge and ULEZ reinstated” (15 May 2020)
- 10 Bristol City Council, “Getting Bristol moving safely and quickly” (13 May 2020)
- 11 Manchester City Council, “Deansgate set for part-pedestrianisation as part of city’s coronavirus recovery plan” (30 April 2020)
- 12 Transport Scotland, “£10 million to support pop-up active travel infrastructure” (28 April 2020)
- 13 UK Government, “£2 billion package to create new era for cycling and walking” (9 May 2020)
- 14 CIVITAS, “Smart choices for cities: Cycling in the City” (2016) p.10



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COVID-19 AND BEYOND:

Drafting for future pandemics and dealing with the fallout from this one

by Tom Duncan, Myfanwy Wood and Ed Davies

The outbreak of COVID-19 has seen the sharpest rise in contractual non-performance since the Second World War, following unprecedented measures taken by governments to contain the virus.

Much has already been written on the remedies available to contracting parties who find themselves unable to perform their contractual obligations – or are on the receiving end of a force majeure (FM) notice. In this article we look beyond COVID-19 to how the lessons learned might be applied in the future. First, we address how contracting parties should approach drafting relief mechanisms such as FM, variation and change in law clauses going forward. We then consider the pitfalls to avoid where contracting parties are trying to find a commercial solution to problems caused by COVID-19, and the potential for dispute avoidance to ensure a smooth working relationship going forward.

Force majeure – drafting to cover or exclude covid-19

General Terms

Boiler plate FM clauses typically contain lists of undefined and broad terms to cover a variety of unforeseen circumstances. Recently, we have seen parties attempt to stretch the meaning of these to cover the COVID-19 outbreak with varying prospects of success. Terms are of course construed according to their context

but on their natural meaning the following are unlikely to cover a future pandemic:

- a. **“Embargo”** – this would likely be limited to trade restrictions put in place between sovereign states rather than applying to the various social distancing measures introduced.
- b. **“Biological Contamination”** – would probably be construed as the presence of the virus on a worksite itself rather than infected workers. As the virus cannot survive for long without a human host, this would probably not apply.
- c. **“Act of God”** – has been held to mean an extraordinary natural event which could not have been anticipated or provided against. We consider it arguable that such a term could be invoked to cover the **present** outbreak of COVID-19. However, timing is all. There is a strong argument that a second wave of COVID-19 or another pandemic would have been in the parties’ contemplation when concluding contracts post-COVID. Parties should therefore not hope to rely on “Act of God” to cover future pandemics merely because there **may** be precedent from the current outbreak.



Pandemic/Epidemic sub-clause

For parties who do wish to put in place pandemic FM options, they should address these FM events in a detailed “Pandemic/Epidemic” sub-clause.

- a. It is useful to **define pandemic** as specifically as possible to provide certainty and limit scope for dispute regarding the starting point of the pandemic. Referencing an authoritative public body such as the WHO to determine whether a pandemic is in existence can help prevent abuse of the mechanism by a counterparty.
- b. In general, most difficulties have resulted from governments’ responses to COVID-19 rather than the direct effect of absence of staff due to illness. The drafting should therefore reference restrictions imposed as a result of pandemic. If parties are able to identify particular restrictions from the current outbreak likely to cause performance issues, the drafting could contain granular detail of these.
- c. Parties also need to consider the wording which determines the required impact on performance to trigger FM:
 - i. “prevention” – this is the highest threshold and means complying with obligations must be physically or legally impossible. It is not enough for parties to show that performance was made more difficult or economically unviable;
 - ii. “hindrance” – where performance would put the affected party in such a precarious position that it would endanger

the business or prevent them from performing contracts with other parties; or

- iii. “affect” or “delay” – this lower bar would be suitable for parties who want to build in flexibility if performance remains possible but uneconomic at the time required.
- iv. Some clients may favour more sophisticated impact triggers to take into account economic hardship. For example, many contractors might seek to rely on FM as they are unable to procure sub-contractors to complete works at an appropriate price. Such an FM clause could be drafted to take into account these market changes as a result of pandemic.

Other common FM wording

Other standard form FM wording could also affect future pandemic relief:

- a. “**Unforeseeable**” – there is no implied term under English law that an FM event must be unforeseeable if the clause is silent on this. As a future pandemic is now unfortunately foreseeable, those seeking to cover it should avoid this wording. Those hoping to exclude it should not assume FM will not apply to a listed pandemic event, such as a COVID-19 second wave, because it is foreseeable and should expressly exclude it.
- b. “**Beyond reasonable control**” – recent case law has held that an event will be within the party’s reasonable control if non-

performance was within the control of any party further up its supply chain. If a party does not wish to be exposed to the risk of a supplier voluntarily closing as a result of a pandemic, the FM clause should explicitly state that such an event constitutes FM.

- c. **“Including but not limited to”** – without this wording it is open to argument whether any list of events is exhaustive. In the interests of certainty it is best to state whether a list is limited or not. The choice depends on whether the parties want to build in the flexibility to argue an unlisted event constitutes FM.

Force majeure – Drafting pitfalls

The pandemic has resulted in increased scrutiny of FM clauses and parties need to be mindful of how to overcome some common pitfalls seen in some boilerplate FM provisions.

Notices and time frames

Notice requirements can act as pre-conditions to relief and failure to meet those requirements might preclude a party from relying on FM. It is, therefore, important to be aware of exactly what they provide for and ensure they are not overly onerous or impractical. Common notice requirements include:

- a. an obligation to provide notice within a particular time period;
- b. an obligation to report periodically;
- c. a requirement to provide full particulars of the event and its impact on performance of the contract, an estimate of likely duration, and steps taken to mitigate the impact of the event; or
- d. requirements as to service of the notice.

Before inserting these requirements into your clause, consider whether they are necessary and/or practical.

For example, the form of service might not be practicable in certain situations. The circumstances of COVID-19 have shown that hand delivery, or even postal delivery might not be possible. Parties should therefore consider agreeing to electronic delivery instead.

If time frames are required to be adhered to for the giving of notice, it is better to be clear on what the time frame is: avoid vague drafting, such as “prompt” notice, and instead agree a specified time limit (e.g. within three months of a specific event).

Termination rights

Typically, an FM clause will suspend the performance of the affected party’s obligations while the impact of the FM event continues. The aim is that, wherever possible, the contract will resume when the FM event ceases to impact the performance of the contract and both parties can then perform their obligations as they originally intended.

Some contracts provide for a right to terminate after a specified period of time. This might be advantageous in situations where the FM event is continuing to impact the performance of the contract indefinitely. Parties should, however, draft such termination rights with care. For example, ensure that there is a reasonable time period specified before the termination rights crystallise. Ensure also that the wording of such a right is clear as to whether the FM event must impact the performance of the contract for a particular period, or whether the FM event need only

exist for a certain period of time. Equally, it is advisable to specify whether the time period is cumulative and allows for periods in which performance is not impacted, or whether it is sequential and restarts if there is a pause.

Parties might also consider whether to allow for the right to source goods or services from elsewhere after a particular period of time.

Mitigation

Parties are usually explicitly required to mitigate against the impact of an FM event and the drafting here should reflect whether mitigation:

- a. is an ongoing obligation;
- b. needs to be evidenced;
- c. is required to a standard of reasonable or best endeavours.

Case law has shown that even a reasonable endeavours obligation imposes a heavy burden on the FM claimant to show for example that it could not have performed by seeking alternative supplies.

In the absence of express language there is authority that an obligation to mitigate can be implied if the clause defines FM as beyond the reasonable control of the party. The implied standard is the same as an explicit reasonable endeavours obligation.

Variation clauses

A well drafted variation clause could be used as an alternative mechanism to FM to build in flexibility in the event of a pandemic. For example, parties might consider inserting a variation clause which allows one or more parties to unilaterally amend their obligations so as to mitigate the impact of an event that affects performance of the contract in the future. This might be particularly useful in supply agreements. Also with respect to supply agreements, buyers (or suppliers depending on the circumstances) might consider inserting a clause that provides for no minimum volume with respect to supply in particular circumstances.



Change in law clauses

Although there may be scope for the English law doctrine of frustration to apply where performance of the contract has been made illegal by a change in law (CIL), the bar for this is high and would be of little assistance if it applied only to a few obligations rather than the contract as a whole. CIL clauses are designed to fill the gaps and allocate risk at the outset by allowing one party to claim relief if a CIL satisfying certain stipulated criteria occurs.

CIL clauses are common in construction contracts. They may overlap with an FM clause listing government restrictions as an FM event and the contractual consequences may be similar. However, while FM will typically allow for suspension from obligations to comply with a timetable, CIL usually allows for compensation for the need to comply with new unforeseeable standards. The key elements of the drafting of these clauses are as follows:

- a. The breadth of the definition of law. This can range from very narrow, including only acts of Parliament and statutory requirements, to all types of decisions, regulations or measures. Two particular aspects have been brought into focus by COVID-19.
 - i. Whether a law is required by the clause to have “force of law”. Although on its face, the government’s Coronavirus guidance, such as the “two metre rule”, is non-binding and so unlikely to be encompassed, the guidance’s legal status is highly ambiguous. The Health and Safety Executive has indicated it may prosecute employers who fail to comply with the guidance as a breach of the Health and Safety at Work Act 1974, leaving scope for argument that the guidance does in fact have “force of law”.
 - ii. The status of legislation in different parts of the UK given the disparities in the responses of the UK’s devolved bodies to COVID-19.

Future drafting therefore needs to specifically address whether “soft law” guidance is included in the definition and take into account whether the law of England, Scotland, Wales or Northern Ireland is relevant.

- b. The scope of CIL which qualifies as an employer-risk event. For example, the clause may stipulate that the law “specifically refer” to construction premises for the provision of certain services.

Moving forward with COVID-19 – finding a balance between commercial relations and reserving rights

Given the uncertainty of the current situation, most parties are adopting a “wait and see” approach to contentious issues arising from non-performance. Maintaining business relationships and reducing the risk of counterparty insolvencies through constructive negotiation should rightly be the priority to resolve any dispute. The fact that the root cause of any breach is likely to be COVID-19 rather than fault on the part of either party should encourage this.

Even if initial negotiations fail there is no need to immediately hit the contentious proceedings button. Other forms of ADR such as mediation, which can be conducted remotely, will likely be more conducive to long term business relationships and may be more readily available given the case overload of the courts and arbitral

institutions. Such an approach is consistent with the government’s and Construction Leadership Council’s guidance on responsible contractual behaviour, which encourages parties to act responsibly and fairly and protect jobs and the economy. Although non-binding, this guidance encourages maintaining contractual performance where possible, thereby avoiding disputes and insolvencies and generally ensuring that economic activity can continue once the outbreak ends.

However, at the same time, parties should ensure that they reserve all rights in case amicable relations break down. Inaction or informal undocumented negotiation can create uncertainty as to the parties’ positions and could inadvertently result in loss of rights:

- a. **Waiver:** If one party makes a representation that they will not insist on the enforcement of their rights and the other party acts on it, performance on those terms is waived. Unless there is a contractual exclusion clause, waiver can be inferred from conduct and in contrast to variation, there is no requirement for consideration. Failing to respond to FM notices could be construed as waiving the right to reject FM; even if the FM clause does not expressly require a response, where FM is not accepted a clear rejection should be sent, including a reservation of rights.
- b. **Estoppel:** Offering to accept reduced performance such as lower payments can give rise to promissory estoppel. This doctrine prevents the promisor reneging on their promise while the circumstances causing difficulties persist.

Documenting what has been agreed is the best approach to avoid any uncertainty. The drafting should cover some key elements:

- a. whether the modification of contractual rights is intended to be permanent;
- b. how long any temporary arrangements will last. This might be referenced to the end of pandemic related government restrictions or whenever one party gives notice;
- c. whether any contractual changes will be revived in the event of a second lockdown;
- d. whether the counterparty is required to make good any deficiency once the temporary arrangements end;
- e. whether the seller is free to sell the goods to others in the meantime, for example on the spot market;
- f. if payments are to continue without services what benefit will be received and will account be taken of the government’s furlough scheme.



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ACCESS TO PORTS, AND TO PORT INFRASTRUCTURE:

The key service industry

by Co-authors: Michael Harrison, Richard Guit, Justin Jones and Dan Reinbott

In previous Ports and World Trade articles, we provided an overview of various approaches to procuring the development of whole-of-port infrastructure and port infrastructure, and procuring the provision of port services at bulk ports. It is difficult to overstate the importance of ports to world trade: an estimated 85% to 88% of the international trade in goods is seaborne (and associated inland waterways), with seaports being an integral part of that trade.

Ports are key to the maritime logistics system as part of effective supply chain management (SCM). Ports and the port services provided at ports can affect the efficiency of supply chains. Increasingly the competitiveness of service providers in the supply chain is influencing how ports respond to the need for efficiency. Just as ports are critical to world trade, so world trade is critical to ports: ports benefit from increases in world trade, and are vulnerable to fluctuations in world trade. In this environment, it is less likely that ports will act as monopolists, even if, in theory, they are able to do so. The history of ports and seaborne trade is a story:

“... of the drivers for global commerce, of cultural interchange and [over time] of the rise and fall of states and political systems.”¹

In short, the existence of ports facilitates trade. Economic development² is, and ports are, dependent on trade. Economic decline impacts trade: in the aftermath of the global financial crisis of 2008/2009, aggregate world GDP fell by 1.9%, and world trade fell by 13%. As the world economy contracted in size, and trades fell, the participants in SCMs had leaner times, as demand contracted and the market in which the participants operated became more competitive.

¹ Empire of the Winds, The Global Role of Asia's Great Archipelago, by Philip Bowring.

² In addition, urbanisation of a city is achieved more quickly if it has a seaport, in comparison to cities without seaports.



1. Access to ports and ports infrastructure and services

This article considers access to ports and to ports infrastructure³ by users of ports (port users)⁴ that have access to both marine and land side infrastructure and services within the vicinity of ports. Access to the hinterland of ports (and beyond) is outside the scope of this article, but is something of which port users must be aware for the purposes of effective SCM.⁵

To access ports and ports infrastructure, and to be provided with services, port users need legal rights. Legal rights may be contractual or legislative, or both. Port users will have to pay

- 3 This article is concerned with ports and port infrastructure operated to serve third party port users. Additional third party access issues arise where ports or port infrastructure are operated as part of a vertically-integrated supply chain, such as private terminals serving hinterland mining operations.
- 4 For these purposes, shippers and shipping companies/shipping lines are the principal port users.
- 5 As a general statement, ports facilitate the initial settlement and subsequent growth of populations, and with increasing urbanisation the infrastructure within the hinterland of a port is likely to become constrained. Unless constraints are addressed, trade through the port may be constrained, and efficiency of the port affected. There is a number of ports around the world where constraints in the hinterland may be regarded as affecting the efficiency of the port and more broadly the SCM.

charges and fees in return for legal rights of access and service provision, some charges may be regulated, some not. In the context of trade, the cost of access and service provision within the precincts of each port (marine and land side) is key. In addition, any constraint on efficient access⁶ will be important: as in infrastructure generally, capacity and efficiency is determinative of effective access and service provision.⁷ These are not static concepts, they are dynamic: ports respond to the requirements of service providers in the supply chain and changes in SCM who in turn are responding to the needs of those shipping goods using the SCM.

A future InfraRead Ports and World Trade article will consider transportation to and from ports within the hinterland (and beyond), and the issues that arise, in particular in urban areas (including constraints), the best practices used to overcome those issues (including the use of intermodal terminals), the involvement of governments in the development of infrastructure in response to those issues and third party access to below rail infrastructure.⁸

2. Overview

Costs are key: The cost of access and services to port users, among other things, is a function of:

- the cost of developing, operating and maintaining the port and its infrastructure (marine and land side);
- whether the charges and fees payable by port users are regulated; and
- the costs that port users incur when access and services at port are not provided efficiently (critically, the visible demurrage costs and increased berthing and holding costs, but also the less visible inventory carry costs of the goods being at port for longer than anticipated).

In this context, in section 3 we consider activities undertaken within ports and using port infrastructure, and the key charges and fees levied, including channel charges, towage charges, berth/mooring/occupation charges, wharfage (harbour/port dues), stevedore charges and terminal handling charges, and storage and warehousing charges. To these charges, shippers need to add the cost of transport to the port of loading in the case of exports and from the port of discharge in the case of imports.

- 6 While access to, and service provision to ports (in the case of exports) and from ports (in the case of imports) from the hinterland of ports is beyond the scope of this article it is important that any constraints are understood by ports, port service providers and ports users, most importantly to understand how constraints may be best managed at the port, and, from the perspective of port users, the possible impact on costs of any constraint in the hinterland of ports. Also it is important to understand the impact on transportation if there is a bottleneck at the port itself. For example, if vessels are queued off-shore for prolonged periods of time this adds to the freight rate charged by shipping companies/lines to shippers of goods (including to address increased waiting times).
- 7 At a high level, the configuration of any port and port infrastructure is a function of the capital applied to develop the port and the port infrastructure, and the efficiency of the ports and port infrastructure is a function of waiting times, turnaround times, and time in port. To each port user efficiency is a function of productivity and service quality provided to each port user, and the cost to the port user of that productivity and service quality.
- 8 In the previous InfraRead Ports and World Trade article we anticipated that this article would cover third party access to below rail infrastructure, but to keep this article within manageable length we decided that this was more appropriately included in an article dedicated to the hinterland and beyond.

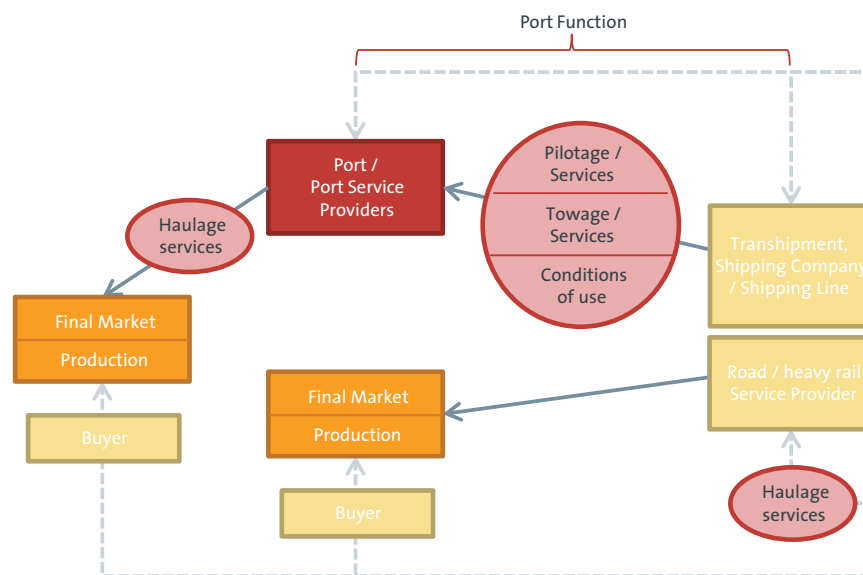
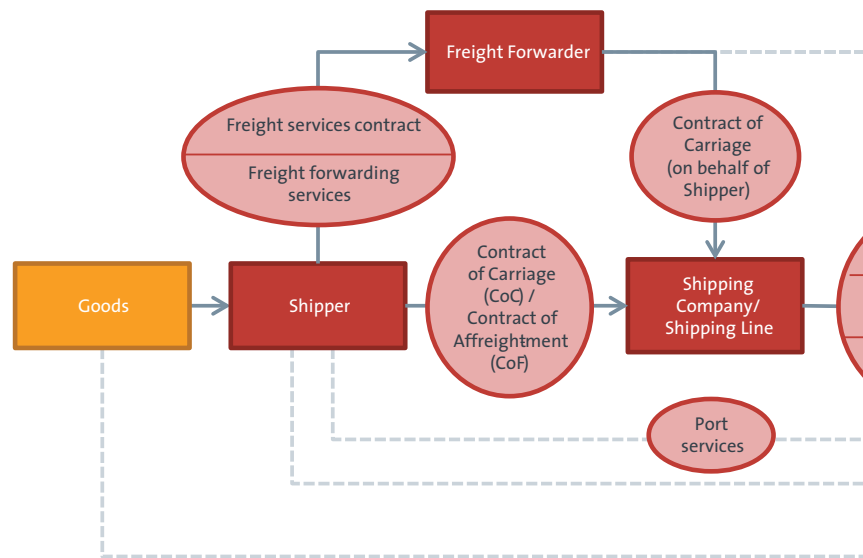
Functions within the maritime logistics system: It is important to understand the function of ports in the context of the maritime logistics system. As a general statement, the maritime logistics system (as part of the SCM) may be said to comprise three distinct key functions:

- the **freight forwarding function** which may include freight forwarders booking capacity on vessels on behalf of those wanting to have goods transported by vessel (shippers). More broadly, freight forwarder services include tracking goods, organising documentation to effect the transportation of goods (including documents of title) and payment on behalf of shippers for services provided by shipping companies/shipping lines and ports and port service providers, and arranging cargo insurance for and customs clearance of the goods. This said, some shippers contract-manage their own arrangements, including contracting directly with shipping companies/shipping lines and ports and port services providers;
- the **shipping function** involving the transportation of goods by shipping companies/shipping lines from the port of loading to the port of discharge and to ports for transshipment; and
- the **port function**, comprising access to port infrastructure and service provision from port service providers, allowing and managing access to and use of ports, unloading goods from and loading goods onto vessels, providing stevedoring and storage services, and allowing collection from the port and delivery of goods to the port to and from the hinterland of the port.⁹

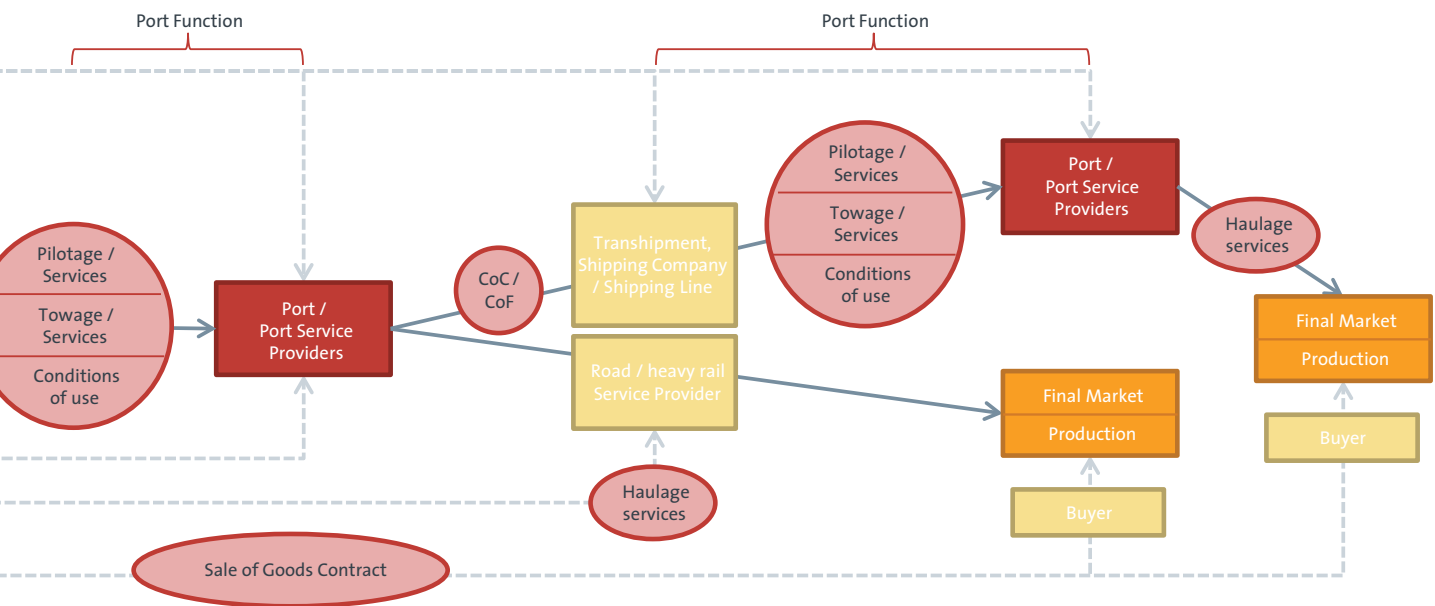
Across the SCM (of which the maritime logistics system is a part), there are said to be six key factors that can improve efficiency:

- capacity matching among participants in the SCM, to achieve or to improve efficiency;
- information provision in real time among participants, and integrated processes and systems;
- activity and asset specialisation through alliances and cooperative arrangements among participants;
- increased vertical integration at participant level to take advantage of scale;
- market conditions (noting that there is a number of markets within the SCM); and
- policy settings (including economic, and infrastructure and regulatory).

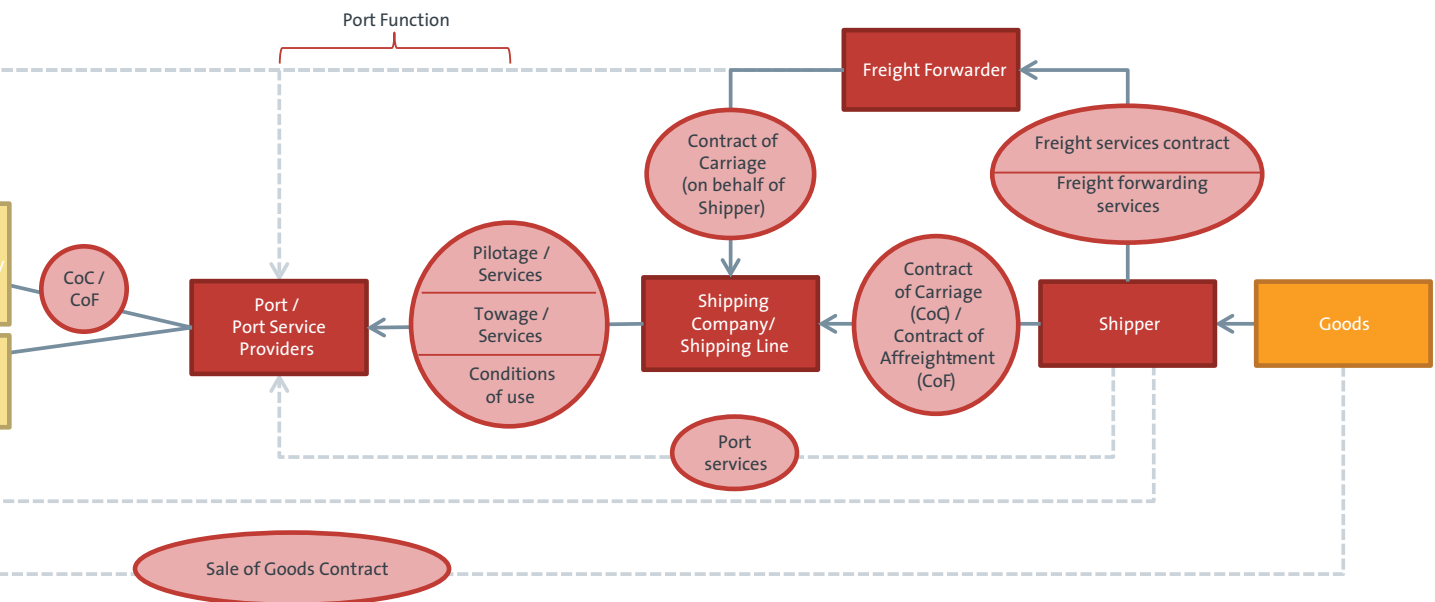
⁹ The collection of goods from the port and the delivery of goods to the port is not a port function, but the collection and delivery of goods forms part of the SCM. The collection and delivery of goods is likely to be undertaken using road or heavy rail transportation, and as such may be constrained by the infrastructure or regulation within the hinterland, including as a result of restrictions on the use of infrastructure at certain times, both in terms of curfews on traffic movements or restrictions on the number of movements.



EXPORT



Import



To a greater or lesser extent, some or all these factors apply to each function, and across functions. The first four factors go to a more integrated SCM, in particular capacity matching and information provision, which will reduce cycle times across the SCM and reduce inventory of shippers.

Port function: This article considers the **port function**. A future InfraRead Ports and World Trade article will consider the contracts and legal principles governing the activities undertaken as part of the freight forwarding and shipping functions (and the key matters in those functions), including Incoterms.

In the context of the port function, ports and the port service providers are concerned about utilisation and the unit costs of undertaking activities and functions at the port.¹⁰ In contrast, port users (being shipping companies/shipping lines and shippers) are concerned about the quality of services they receive, essentially, efficient and timely access to and services at the port, for known charges, and as far as possible at a known total cost,¹¹ including the “internal” costs (as opposed to the “external”¹² costs of contracting with ports and port service providers) of the port user.

As such, the level of port and service charges is not determinative of total cost:

- shipping companies/shipping lines are concerned about the level of utilisation of their vessels (the unit costs of providing transportation services), which can be affected by ports and port service providers, and the increased costs associated with inefficient operation; and
- shippers are concerned about the delivery of goods to market in a way that avoids inefficiency and, critically, are concerned to achieve the shortest period of time from production of goods or purchase of goods (i.e., from when they become inventory) to their sale,¹³ thereby managing the inventory levels, and as such working capital requirements, of shippers.

Functions of a port – the economics of ports: Section 4 considers, at a high level, the economics of ports, including the theoretical ability of ports and port service providers to charge monopoly rents, and, if theory is put into practice, whether, and, if so, how, port users may respond to monopoly rents, commercially and legally, including to achieve some form of price regulation. The capacity and efficiency

of a port is affected by capacity constraints (including bottlenecks), and inefficiency of land side access to ports from the hinterland (and beyond). Because of this, key to capacity and efficiency at many ports is the port working with municipalities and governments, communities and transport infrastructure owners and operators to address capacity constraints, and for ports and port service providers to respond to those constraints in a manner that minimises their impact on activities at port.¹⁴

Functions of a port – the regulation of ports: Section 5 considers, at a high level, the basis of port regulation, specifically price regulation. In this context we note that price regulation may be regarded as intended to allow the port or the owner of the port infrastructure used to provide a service, to achieve an appropriate rate of return on efficiently deployed capital¹⁵ and efficient operating costs. In addition, in some ports in some jurisdictions there may be a legislative policy overlay to promote trade (or to maximise trade) or a contractual incentive or obligation to act in a manner consistent with this outcome. As we note in section 5, these dynamics are at the core of the balance that most ports and port service providers seek to achieve, pricing on a cost reflective basis (with an appropriate rate of return), while maximising efficient use of the port and the port infrastructure so as to maximise profitable revenue while providing efficient services.

There are port services provided within ports (most obviously, towage and stevedoring) that are unlikely to be subject to price regulation, especially, if there are multiple port service providers within the port. If there are not multiple port service providers within the port, it is likely that port users will pay higher unit costs than if there were multiple port service providers: if there are multiple port service providers, the market for port services is more likely to benefit from competition. There are ways in which ports are able to guard against sole port service providers abusing market power, and they are considered at a high level in section 5. Some ports may be prepared to grant concessions and long term leases on the basis of these safeguards, other ports may prefer to provide benchmarking to efficient market port service providers. Increasingly, it may be regarded as less likely that ports will leave the market to respond by supply side substitution. As such, ports seek to guard against higher unit costs of sole port service providers at a contractual or regulatory level.

Port function – access rights as a practical matter: Section 6 considers how access rights manifest themselves at ports as a practical matter. While there may be price regulation in respect of access to port and port infrastructure, this does not mean that the terms on which access is provided will be subject to negotiation between ports and port service providers on one hand, and port users on the other, or that there will be a clear contractual commitment to a standard of access or services to be provided at the port or by any port service provider. As a matter of long-

10 Ports and port service providers will not invest in new, or upgrade existing, infrastructure unless they can see an appropriate rate of return on that investment. Many studies refer to the benefits to the wider economy of investment in infrastructure, including port infrastructure. The co-authors are sceptical of the benefit to the wider economy of investment in infrastructure, unless the investment unlocks value by servicing increased demand for port services for exports which would not be unlocked but for that investment. Investment in infrastructure to allow increased import of goods has an impact on the wider economy, but many factors will determine whether it is beneficial, critically if the goods being imported are to be used to produce goods for domestic consumption or export.

11 The charges of port service providers are part of the total costs of transporting goods, and each shipper will be concerned to ensure that the total costs are understood, including costs arising due to delay or loss of goods.

12 Which costs may include demurrage (payable to the applicable person responsible for organising the shipping when laytime exceeds allowed laytime) and port congestion charges.

13 Shippers operate in a “just-in-time” world. The cost of making delivery of goods is key, as is the reliability and predictability of the time taken to make delivery. The costs incurred by a shipper due to unreliable and unpredictable access and service provision may impact significantly working capital management costs (including currency hedging costs) if inventory is at higher levels as a result.

14 While consideration of bottlenecks and hinterland transportation constraints is beyond the scope of this article, for port users it is good to understand whether there are any bottlenecks and constraints on transportation in the hinterland, recognising however that there is little that a port user is able to do to address inefficiency.

15 At an appropriate benchmarked weighted average cost of capital over the period during which the appropriate rate of return is to be made.

standing practice, and for good reason,¹⁶ the terms on which port users access the port and port infrastructure and contract with port service providers are invariably on standard terms, and as such provide the basis for access by all port users (including as to liability of the port user and the port and the port infrastructure) and the provision of port services to all port users.

Port function – liability of ports, port service providers and port users: Section 7 considers the approach that ports, port infrastructure and port service providers take to their liability for not providing access and services as contracted. As a general statement, ports, ports infrastructure, and port service providers

16 The reasons are both legal and practical in most jurisdictions, including not preferring one port user over another port user on a discriminatory basis, and as a practical matter ports and port infrastructure owners/operators do not want to have to manage, at an operational level, contracts that are different for each port user.

will accept liability to port users only to the extent that they are required to do by law, and are most unlikely (knowingly at least) to take risk of quality and timing of the provision of access and services, other than possibly through abatement of any fixed charges and fees in limited circumstances.

The next InfraRead Ports and World Trade article will consider this in greater detail, including the terms imposed at major ports around the world, and their impact on contracts of carriage and contracts for the sale of goods.

Port function – sub-functions: As a general statement, the port function comprises the following sub-functions,¹⁷ with the principal sub-functions detailed in Table 1.

17 The activities detailed are all subject to what may be regarded as the regulatory function, including laws and regulations, which are informed by and give effect to policy (including environmental and labour/workforce).

Table 1: Port function – sub-functions

Each sub-functions:

- 1. Governance functions:** including Vessel Traffic Services (VTS); customs, immigration and quarantine; harbour master – vessel traffic management within the port, including to manage business as usual (and any business not as usual, including any allision or collision or grounding), and control of the port; Environment and Pollution Policy, Management and Response, and Security Management (including policing) of marine side;
- 2. Infrastructure (development and operation and maintenance) Functions:** including breakwaters, harbour walls and shore protection and bridges; port channels and dredging – capital dredging and maintenance dredging – channels and berth boxes/pockets; jetties, piers, quays and wharfs, and berths; terminals – container terminals, roll-on-roll off, passenger terminals; and ship loading facilities – dry bulk commodity storage and conveyors and loaders and liquid storage and loading; and
- 3. Operational functions:** Land side – storage and warehousing and transport (likely road and rail, within the port precinct) and transport and logistics (to and from the port precinct); Stevedoring services – loading and unloading, and handling, of cargo; Marine side services – pilotage, towage, mooring and unmooring and services; Infrastructure developed under Design, Build, Finance, Operate and Maintain procurement structures.

Who controls each sub-function?

It remains the case that port authorities (government or government owned entities) control governance functions at ports, and, depending on the Port Model (see Table 3) applicable at port, the port authority may undertake some or

all of the infrastructure and operational functions (and will ultimately have control of them). Many port authorities were established to achieve strategic economic policy outcomes of government, and many still have this role, including the promotion of trade (or possibly, the maximisation of trade). In seeking to achieve any strategic policy outcome, port authorities must have regard to the hinterland of its port (or ports), including addressing any actual or likely capacity constraints (including bottlenecks) within the hinterland. As such the role of port authorities extends beyond land side and marine side, to understanding and acting to address constraints ahead of time so as to avoid adverse impacts on efficiency land side or marine side, and to respond to growing trade over time by the expansion of capacity (and in time the development of new infrastructure or a new port). If the landlord Port Model is applicable to the port, the port authority is likely to ensure that it achieves its objectives and purpose through the contractual relationships, and legislative powers and rights, but it must still fulfil the role in respect of the hinterland.

While port authorities are particularly adept at ensuring that concessionaires/lessees of port infrastructure price appropriately so as to achieve the objectives and the purpose of the port authorities, concessionaires/lessees will not assume the risk of capacity constraints in the hinterland. If port service providers within the port are private sector port service providers (whichever the Port Model), the port and the port authority is able to provide similar principles to ensure that the right to provide the service at the port is subject to acting in a manner consistent with the objectives of the port and the port authority, including by regulating what activities are subject to charges and fees, and the amount of those charges and fees.



3. ACCESS IN THE FORM OF SERVICES

Background: Access to port and port infrastructure from marine side, involves vessels arriving at port, entering and exiting the port via the channels to and from the port, berthing/mooring to load (if an export port) or to discharge (if an import port) or both (if transshipment).

For a vessel to do this, the vessel must execute the standard terms of access to, and use of, the port, and must contract with the port and with port service providers undertaking activities for the provision of services. Whether the port user contracts with the port for these purposes, or contracts with port service providers, will depend on the Port Model (see Table 3) that applies at the particular port.

Access to port and port infrastructure from land side hinterland (and beyond) involves delivery of goods for export by road or heavy rail, or both, to port, and discharge of goods, possible stockpiling or storage (in the case of bulk commodities) or nesting/stacking (in the case of containers), and loading of goods onto vessels.

In the case of goods imported, access to port and port infrastructure from marine side to land side will be required, with the discharge and the movement of those goods to stockpile or to store, or to nesting/to stacking, and movement of them from stockpile, store, nesting or stacking, to load onto road or heavy rail for transportation into the hinterland.

In the context of SCM, the fundamental dynamics driving port service outcomes are set out in Table 2:

Table 2 – Fundamentals driving port service outcomes

shipping company/ shipping line	port/port infrastructure and port service providers	port users	landside carrier/ transporter
Asset utilisation – a function of capacity and scheduling	Asset utilisation – a function of capacity and scheduling based on correct information	Cash to cash cycle time: short lead times to matched capacity, on time delivery	Asset utilisation – a function of capacity and scheduling
Ideally longer lead times to allow matching of capacity and flexibility	Ideally cargoes arriving on schedule	Cargoes arriving, and handled, on schedule	Transport on time and on schedule
Exclude and limit liability	Exclude and limit liability	Firm/Fixed external and internal costs – a function of efficiency	Exclude and limit liability

Port Models: In the context of each port, it is helpful to understand the Port Model applied at that port, and as such which activities are undertaken by the port and which activities are undertaken by port service providers, and in this context any applicable laws and regulations (including as to price regulation).

While the Port Model is unlikely to change the basis on which port users are required to contract for access and for port service provision, understanding the model will allow a high level of assessment of price risk for access and service provision at the port.

Table 3: Port Models

In general terms, there are four port models:

1.Private Service Model: the whole port is owned and operated entirely by the private sector, with services provided by the port but likely with some specialist private sector operators.¹⁸ Some private service model ports developed by the private sector, do not allow access or use by any entity other than the owner or an affiliated party of the owner of the port;

2.Public Service Model (Public Service Port): the port is owned and operated entirely by the host government or a government entity, with the port possibly allowing private sector operators to provide some services.¹⁹ Public service model ports invariably allow access and use of the port by port users who are prepared to contract for access and service provision on the standard terms required by the port and port service providers;

3.Service Port Model or Labour Model (Tool Port): the port (equipment and land) is owned by the host Government or a Government entity, and is either operated by government, or the government contracts with the private sector to operate all or part of the port, including to provide port services. Service port model ports invariably allow access and use of the port and port infrastructure by port users prepared to contract for access and service provision on standard terms; and

4.Landlord Model: the port (whether publicly or privately owned) leases land within the land side precincts of the port to the private sector to undertake activities within the port, and the private sector invests capital to allow it to undertake those activities (effectively each private sector is granted a concession, which may or may not be exclusive), and within this model the private sector will provide services. Landlord model ports invariably allow access and use of the port and port infrastructure by port users prepared to contract for access and service provision on standard terms. The issue for the host Government or Government entity that grants the lease is regulating that pricing at the port to promote trade for the benefit of the country in which the port is located.

18 A Private Service Model places market risk (and actually or prospectively market power because of barriers to entry for competitors) with the private sector, but the host government will want to be assured that it is able to achieve the benefits of the multiplier effect within the broader economy. It is reasonable to assume that the private sector will be concerned to achieve improved efficiency across all activities, and that it is likely to contract to achieve this, including to develop port capacity.

19 It is fair to say that even in **Public Service Ports** and **Tool Ports** some activities will be undertaken by the private sector, as contractors of the host government. The Public Service Port and Toll Port models do not preclude the government from involving the private sector in the development of some infrastructure on a piecemeal basis, but may not allow the host government to achieve efficiency levels that in the case of transshipment ports will attract increased trades.

Port Activities and Services:

a. Port access and port services

As noted above, access to a port is a function of having the right to enter and to exit the port (for which the port will charge) and the provision of services at the port (which the port or the port and private sector participants, as port service providers, will charge, depending on the Port Model).

b. Categories of charges

In terms of entry to and exit from, and use of, the port, at the simplest level, it is possible to draw a distinction (and many ports draw a distinction) between charges and fees payable in respect of vessels (CoV), charges and fees payable in respect of cargoes (CoC) and charges and fees payable for storage²⁰ (CoS).

CoV may include charges and fees for docking/staying at anchorage and docking at berth/mooring (which will tend to be levied by reference gross registered tonnage of the vessel). In addition, CoVs may include charges and fees in respect of use of channels and navigation aids and services.

CoC may include wharfage for imported goods, exported goods and goods being transhipped (and will be levied by reference to the number of tonnes or units that cross the wharf). In addition, there will be customs charges and fees in respect of imported goods.

CoS may include rates based on whether goods are being imported, exported or transhipped.

c. Regulation of charges

At many ports, the amount of CoV, CoC and CoS is regulated, by law or by a regulator (the regulator having the power to approve or to settle charges and fees for a period of time). The amount of CoV, CoC and CoS is key, as is an understanding of the basis upon which each may change over time. For example, if the charge for an activity is not regulated, and the demand for the use of the port and port services is inelastic, the port user may be exposed to higher charges over time: if the port user has developed infrastructure to export commodities, any increased or new charge payable by that port user or any shipping company/shipping line will be an increased or new charge of that port user (directly or indirectly because it will be passed on by the shipping company/shipping line).

CoV, CoC and CoS may be regarded as the core charges and fees for use port use. In terms of the provision of port services, the position is likely more complex.

d. Activities subject to charges

In any event, for a port or port authority, it is important to understand what activities are (or may be subject) to charges and fees, and the amount of those charges and fees by port service providers not subject to formal price regulation. In this context, it is not unknown for port service providers to introduce new categories of charge or fee for what the port service provider may regard as a new service. In this context, ports and port authorities may contract with the port service provider (under the concession or lease) to prescribe the activities for which the port service provider may charge, and the amount the port service provider may charge). This is considered in detail in section 6(d).

20 Storage is a generic term that includes stockpiling, nesting and stacking.

e. Key activities

Table 4 details the key activities and services provided within the precincts of ports (marine side and land side),²¹ including in respect of CoV, CoC and CoS. Table 4 does not deal with activities undertaken in the hinterland to and from ports, which activities (and the cost of them) can affect the efficiency of the port (including the activities undertaken within the precincts of the port) – this is beyond the scope of this article.

Table 4: Key Activities and Port Services Provided at Ports

Harbour Master: among other things, the harbour master receives notification of estimated times of arrival (and priority) of vessels²² and manages vessel movements in channels leading to the port (from safe anchorage), movements to PBS, movements within the port to berthing/mooring, and movements from berthing/mooring on completion of discharge of cargo. Each vessel is required to comply with the directions of the harbour master.

Channel Charges: port users must pay for the use of channels in the vicinity of the port, and the provision of channel/navigation services. Channel Charges are levied on the basis of the gross tonnage of the vessel. The use of the channels will be regulated by terms of use, and the directions of the Harbour Master. These are COV charges.

Nautical and Navigation services: while port users will not contract for the provision of navigation services, the port or channel authority (or both) will construct and operate and maintain navigation aids, and will pass on the costs to port users²³ typically through the Channel Charges.

Customs, Immigration and Quarantine Clearance Charges: The government of the country in which the port is located will require customs, immigration and quarantine inspections and clearances to be undertaken and completed before the vessel may move to berth/mooring so as to discharge cargo.

Security Management and Charges: ports charge security charges enabling them to recover their costs of complying with duties and its obligations as a matter of law and

regulation. Port Security is a maritime and a land side issue. While the private sector may be used to provide security services, the port will retain responsibility for security.

Pilots and pilotage services: pilots provide pilotage services from the PBS within the port, to berth/mooring, and back to the PBS, and contract direct with the vessel for pilotage services.²⁴ As might be expected, these services are highly specialised and regulated, and costs will include the physical cost and time cost of the pilot getting to and from the PBS. These are CoV charges.

Towage providers and towage services: towage providers provide towage services (typically from the PBS)²⁵ within the port, to berth/mooring, and following discharge or loading back to the PBS. Towage providers contract direct with vessels for towage services. Towage is provided by private sector providers. The level of trade within the port will determine the number of towage providers and the towage charges.²⁶ These are CoV charges.

Dredging services: while vessels (as port users) will not contract for the provision of dredging services, the port or channel authority (or both) will do so, and the charges levied by the port (whatever name they are given), the port will pass on the costs of maintaining channels and berthing pockets to port users. The port will likely contract with the private sector for the provision of dredging services. Twhe Channel Charges will tend to cover the cost of dredging services, but this does not mean that Channel Charges will be limited to dredging only.

Marine side infrastructure services: while port users are unlikely to be charged for infrastructure services, the charges levied by the port will include an amount to cover the costs of common port infrastructure, being infrastructure that is not used to provide a particular service, but is used to provide an environment in which goods can be loaded and unloaded safely (including breakwaters, harbour walls and shore protection). Charges for these services do not naturally fall neatly into a category of CoV, CoC or CoS.

21 We have detailed the principal activities at port (marine side and land side), noting that there are other activities that may be undertaken (and for which charges will be levied). As will be apparent, it is important that the port and port authority maintain control in respect of which activities any charge or fee may be levied, and the amount of that charge or fee.

22 Most, if not all, ports have a vessel arrival system, which provides processes to be followed in respect of the notice of arrival, the basis on which order of arrival is determined, the basis for determination of priority in any queue, and the basis for maintaining priority in any queue (including giving notices as required, and arriving as notified) and loss of priority in queue. VASs (as part of the VTS) tend to follow a similar form, but all are different, and as such need to be understood, critically, in the context of the terms of carriage (including between buyers and sellers in respect of which delivery is effected at port of loading (FOB) or at the port of discharge (Ex-ship)) and the contracts of carriage (between buyer or seller and its carrier/transporter under which the buyer contracts with carrier / transporter to take delivery at the port of loading (FOB) or the seller contracts with carrier/transporter to make delivery at the port of discharge (Ex-ship)), so that any underlying sale and purchase contracts and their associated contracts of carriage are consistent with the applicable VAS.

23 In many instances as a navigation services charge.

24 In almost all instances, pilotage services are the subject of pilotage charges.

25 Pilot Boarding Station – being the location at which the pilot boards (on the inward leg) and disembarks (on the outward leg) the vessel to provide, or having provide, pilot services.

26 In some ports the amount of trade will support only one towage service provider and the quantity of trade and the number of tugs required to service that trade. Some trades may require the use of multiple vessels, and if the level of trade of trade is not sufficient, the cost of towage services per trade may be relatively higher than at comparable ports with a greater level of trade. Conversely, ports with trade levels that support multiple towage service providers, will benefit from competition among towage service providers, and level of trade means that the costs of towage services per trade may be relatively lower than a comparable ports with a lesser level of trade. While towage providers must be accredited and licensed, the charges levied by towage provides for the provision may not be regulated (by law or by contract). As such, there is a risk that towage charges may be set at a level consistent with a monopolist. In this context, the port should consider the basis upon which towage providers are granted rights to provide towage services, and the extent to which the port is able to ensure that the charges for towage services are consistent with achieving any legislative outcome required of the port (including maximising trade), and in the absence of any legislative outcome ensuring consistency with the objectives of the port.

Berth Charge/Jetty Charge/Occupation Charge: is a charge paid by the port user for being permitted to berth/moor, so as to load or unload goods onto and from a vessel, effectively it is a charge for use (sometimes an occupation charge or site charge), rather than a charge for service. The charges may be at full charge (typically applying while the vessel is at berth/mooring – from all fast, to last line cast-off) or lay-up charge (typically at the discretion of the port if at berth/mooring for before or after loading or discharge). In many ports there is a CoV in respect of use of anchorage (essentially on the basis of occupation).

Wharfage (Harbour or Port Dues): is a charge in respect of the applicable quantity of goods comprising a cargo (mass or volume, including dry and liquid bulk and motor vehicles) or per container (TEU) crossing the wharf on loading and discharge. Wharfage revenues may be regarded as indicator of trade, but as noted below, the number of tonnes and containers is the more effect measure of trade, the first measures revenue received, the second measures the “volume” of trade. This is a CoC charge.

Stevedore services (loading and unloading services): it is likely that a private sector stevedore service provider will provide stevedore services. The port user whose goods are being loaded or discharged will contract with the stevedore for the provision of these services. As with the ports standard terms, the stevedore will limit its liability to all who have any interest in the cargo or the vessel. This is a CoC charge.

Terminal handling services (may include loading and unloading services): stevedore services may be referred to as terminal handling services, but is more likely that terminal handling services will be used to describe services provided using infrastructure designed and constructed and operated and maintained to handle bulk goods, such as coal and iron ore. This is a CoC charge.

Storage and warehousing services: if a port user wants to store/warehouse goods at the port (land side) the port (that owns the storage and warehousing facilities) or the port service provider (that has leased storage and warehousing facilities from the port), that port user will be required to contract for those services and under that contract required to pay a storage charge/warehousing charge. This is a CoS charge.

Bunkering services:²⁷ if a vessel (as a port user) wants to refuel (or to take on water, although this is usually referred to as a utilities charge) at a port, the port or the applicable port service provider will provide the fuel (or water) and loading services, and will charge for those bunkering services.

27 Bunkering means the provision and loading of liquid fuel onto a vessel: the origin of bunkering goes back to days of steam ships with the loading of coal (solid fuel) into bunkers, being referred to as bunkering.

4. ACCESS AND ECONOMICS OF PORTS

Background: In this section 4 the economics of ports are considered at a high level, including the theoretical ability of ports and port service providers to charge monopoly rents, and, if theory is put into practice, whether, and, if so, how, port users may respond to monopoly rents, commercially and legally (including to achieve some form of price regulation). As importantly, economics and competition are considered from a practical perspective.

Economics in theory:

a. Ports as natural monopolies and acting as monopolists

Many ports are natural monopolies in the sense that they are the sole supplier of port services within a market, and are able to supply the entire market as a single supplier more efficiently than two or more ports. In theory, those ports may exploit their position to act as monopolists. Using a favoured phrase of economists and regulators, monopolists are able to extract monopoly rents: if a port is able to act as, and does in fact act as, a monopolist it can increase prices for access to, and, depending on the Port Model, for the provision of port services at, the port and ration access and reduce the supply of port services provided without affecting demand for access and use of the port or for those port services, because port users are not able to choose to go to alternative port.

While ports may have the ability to price as monopolists, most do not, and many are not permitted to do so.²⁸ From a macro-economic perspective, allowing a port to price as a monopolist is bad for trade, and as such as a matter of strategic economic policy, and depending on the Port Model, the pricing at ports is likely to be regulated. If the port is Government owned (i.e. Public Service Port Model or Tool Port Model), while it may price as a monopolist it is unlikely to do so, rather it is likely to price on the basis of promoting trade consistently with its public interest objectives.

It is possible to “book end” conceptually ports acting as a monopolist and a port seeking to maximise trade:

- i. ports able to price as monopolists will price to maximise profit (rather than to maximise trade, or even revenue), by balancing price with supply, and in so doing affect levels of trade over time; and
- ii. ports aiming to maximise trade (i.e. not to maximise profit) will price in an a way that will increase the trade that it is seeking to maximise.

In practice, most ports will be found somewhere between these book-ends, where will depend on the Port Model (and regulation) and the competition, actual and potential, for port services provided by any alternative port or ports.

28 Government owned (and operated) ports may be required by underlying legislation to promote or to maximise trade at port. This requires the port to set charges at a level that promotes or maximises trade, not to maximise profit or revenue. Private sector operators renting facilities from government owned ports are increasingly likely to be required (under contractual arrangements with the port) to maximise throughput through performance based contractual arrangements/performance based agreements (PBAs). For example, in the context of container terminals PBAs can range from the measurement metrics for efficiency of time alongside (the amount of time that the vessel spends adjacent to the quayside) versus time worked (the discharge of cargoes); crane rates (in effect the number of lifts in a given period of time); and dwell times (the period of time a container spends in the stacking yard before being discharged from the terminal). The terms of the PBAs all respond to the efficiency of the use of port capacity and are aligned to the port service providers providing services that are consistent with efficiency.

b. Economics of and competition among, ports and port service providers

The economics of ports need to be considered in the context of competition between ports, and the goods being exported from them (origination port), imported through them (final destination port), or both.²⁹ There is a difference of the economics of origination and final destination ports when compared to ports that are transshipment ports or predominantly transshipment ports.

While concepts of cross-elasticity³⁰ (substitutability) are not applied as readily to ports and ports services as they are to other services (and goods), they provide a useful frame to consider the economics of ports, and to help port users to consider the market or markets in which the port and the port service provider is carrying on business, including for the purposes of any action or claim based on misuse of market power³¹ or based on any regime that allows an access seeker to seek access to a port or port infrastructure. The remainder of this section 4(b) considers economics and competition from a number of perspectives.

i. The economics of ports at a micro level

The economics of ports need to be considered by reference to the markets that each port serves, which is essentially a function of the geography of each port, the goods exported from, and imported through, the port, and the cost of infrastructure deployed to provide port services.

- a. In the case of origination ports, it is reasonable to assume that demand cross-elasticity is negative, i.e. that origination ports are not substitutable by the port user with another port. This will be the case particularly at a port at which large amounts of capital have been invested in infrastructure by port users themselves, as is often the case at bulk ports.
- b. In the case of final destination ports, depending on the proximity of the nearest alternative port, and the transportation infrastructure from that nearest alternative port to the market for the applicable goods, the demand cross-elasticity may approach, or actually be, positive, allowing the port user to consider that alternative port as a possible substitute for the goods being imported.



- c. In the case of transshipment ports,³² depending on the proximity of the nearest alternative port, or the nearest country with the desire to develop a transshipment port (and the time period within which it will be able to do so, i.e. demonstrating supply cross-elasticity), the demand cross-elasticity may be positive, allowing the port user to consider the alternative port as a viable substitute port for the goods being transhipped.

ii. Theory and Practice

If there is a positive demand cross-elasticity, it may be said that the incumbent port and the alternative port or ports may compete with each other in the applicable market or markets for port services.

Whether an alternative port will compete in the market for the provision of services to port users, will be a function of many things, including whether it can compete and if so within what time frame, and whether there is a lead time, and the revenue it will earn from competing with the incumbent port (and any other alternative port), and the costs incurred to be able to compete with the incumbent port³³ (and any other alternative port).

29 Many ports are both origination and final destination ports. As such, the co-authors are drawing a distinction purely for the purpose of illustrating the different dynamics that affect the export and import functions of ports.

30 A port that is substitutable for an alternative port is said to have a positive cross-elasticity of demand. Conversely, a port that is not substitutable for another port is said to have a negative cross-elasticity of demand. Demand substitutability considers things from the perspective of the port user.

31 The theory and practice of defining markets in an anti-trust context is beyond the scope of this article, but at a high level it requires an assessment of both demand and supply substitutability, the distinctive ports service provided in a market (the market including the port services provided by the incumbent port or port service provider, and any product that may be substituted for it) and the temporal element of competition which, in the context of ports and port services, tends to foreclose on supply substitutability unless services are likely to be available immediately or imminently.

32 Many container ports and container terminals provide transshipment services. Some ports are predominantly transshipment container ports, with the majority of the goods passing through them being transhipped. Transshipment ports that are located within the same geographical area and from which shipping companies/shipping lines are able to service similar trades, are regarded as able to compete. The extent of this competition is subject to debate in practice, and tends to assume that the ports are not under the same ultimate common ownership.

33 Supply substitutability considers things from the perspective of the port (and the port service provider).



In theory, the threat of competition, will discourage the incumbent port from charging monopoly rents. In practice, the threat of competition will not discourage the incumbent port from pricing to the point of positive demand cross-elasticity.³⁴

iii. **Perspective of the private sector**

In the InfraRead Ports and World Trade – port developments in Asia Pacific article it was noted that unlocking capacity constraints and improving efficiency at ports can be achieved through increased capacity and associated land side logistics (through infrastructure enhancement or development) and increased efficiency or marine and land side operation.

This remains the case. But to achieve this outcome, owners and operators of ports and ports infrastructure need to be able to model an appropriate rate of return on the required investment, with any decision to invest underpinned by modelled growth in demand for port services, and an assessment of cross-elasticity.

³⁴ If ports compete, or port service providers within the precincts of a port compete (for example, in a container port there is more than container terminal and there is sufficient capacity in each to allow viable competition), in theory pricing will be based on efficient provision of port access and port services (although the extent of competition between the competing ports may vary). If a port does not have a competing port (invariably due to location and the cost of developing an alternative port and appropriate infrastructure to and from the port or the cost of developing new infrastructure at an existing port), in theory there is a greater risk of monopoly rents. As a monopoly, a port is able to charge monopoly rents to the point of substitution or to the point where trade is not economic. The co-authors stress that this may be regarded as a theoretical risk.

To the owners and operators of ports and port infrastructure, the benefits to the wider economy of investment are not relevant to any investment decision. The economics of ports at a macro-level is a matter to be considered by Governments and Government entities.³⁵

iv. **The economics of ports at a macro-level**

While competition among ports may be a function of the point of positive demand cross-elasticity (i.e. economic rationalism), competition among countries is not. In the context of being competitive in the international market for capital and investment, Governments and Government entities are investing in projects that facilitate economic activity within the host country.

In this context, infrastructure development on marine side and land side, and within the hinterland (to and from markets), allows Governments and Government entities to provide high performance integrated logistics solutions that deliver efficiency: high or higher logistics performance is measured by the cost, time, and complexity/simplicity of undertaking and completing import and export activities. In the context of nation building, investment by Governments and Government entities in transport infrastructure provides a positive investment environment generally as well as improving transport efficiency. Transport efficiency within the hinterland, and improved performance at port, promotes export growth and improved logistics performance (including at port), thereby reducing logistics unit costs. Again in the context of nation building, the development of a new port allows the development of the port as the hub, or as one of a number of nodes, of a transportation system in a strategic and systematic way. If developed effectively, ports can “bake-in” the benefits of transport efficiency for generations to come.

Assuming appropriate demand for services at a port, the combination of improved transport efficiency (including through hinterland accessibility), and improved logistics performance, allows a port to strengthen its competitive position. In the context of a supportive Government, a port is more likely to invest in port infrastructure and systems (including information technology), helping a port to maintain competitiveness.

In the context of supportive Governments and the use of the Public Service Port Model or the Tool Port Model, it is possible that for macro-economic reasons the Government or the Government entity that owns and operates the port will price access to the port, and the provision of port services at the port, to attract port users for broader economic reasons. The private sector will not act in this way.

³⁵ Conversely, private sector port owners and operators will regard it as the role of the Government/s to address capacity and efficiency constraints at the port arising from capacity constraints (including bottlenecks) and inefficiency within the hinterland (and beyond). For a port user it is helpful to understand if there are constraints in the hinterland, and, if so, the likely effect of them.

v. **The economics of port service providers**

The economics of port service providers at a port is more straightforward than those of ports. Among other things, the economics of port service providers will be a function of whether or not the port service provider is the sole port service provider or one of multiple port service providers within the precincts of the port.

If the port service provider is the sole port service provider, in theory it will have the ability to charge monopoly rents for its services. In practice, the port is unlikely to allow a private sector port service provider to contract with port users (critically, to price) on an open-ended basis, and to avoid this is likely to maintain the ability contractually to ensure that it can provide the service itself (self-source), to replace the port service provider with another port service provider, or to introduce another port service provider.

It is not possible to divorce the number of port service providers from the level of trade at a port, the former is responsive to the latter. There are many ports around the world with sole port service providers because the level of trade at the port is not sufficient to support competition among multiple port service providers. At these ports, there may be a stronger argument for price regulation. Furthermore, in jurisdictions with anti-trust legislation, there is the prospect that sole port service providers (or dominant port service providers where there are multiple port service providers) will be susceptible to actions and claims for abuse of dominance/misuse of market power (although abuse/misuse of market power claims can be challenging when based on monopoly pricing alone).³⁶

If the level of trade at the port is sufficient to support multiple service the competition within the port for the port services being provided, to the extent possible the port should seek to provide a level playing field for the port service providers to compete, recognising that over time, all things being equal, the more efficient port service provider will increase its market share. If the level of trade at a port is sufficient, the port may seek to have multiple towage providers and handling and stevedoring service providers. Providing a level playing field is easier said than done, and is easier at the end of concession or lease period, rather than introducing a new service provider to compete with an incumbent outside the competitive process of concession award or reletting of a terminal.

c. **Competition**

The benefit of competition among ports (and between port service providers within ports) is that at best it is likely to facilitate price competitiveness, and at worst it is likely to discourage pricing to the point of demand cross-elasticity.

While in theory competition drives efficiency by ports (and port service providers within ports), it would be a mistake to conclude that it will achieve efficiency.

Competition in the shipping industry has an impact on port

development: the shipping industry exerts pressure on ports to invest to enable the use of larger vessels. The response of ports to this pressure can affect decisions, including as to the choice of transshipment ports.

d. **Price regulation**

i. **Price regulation in theory**

The co-authors note that there is economics in theory and economics in practice, and that there is competition in theory and in practice. In this context, there can be no assurance that competition will achieve price competitiveness. This is the case even if the port services provided at one port are substitutable by services provided at an alternative port, or port services provided by another port service provider within the precincts of a port.

As noted above, competition may or may not arise, and may or may not result in pricing outcomes consistent with the promotion of trade (and competition is highly unlikely to result in maximisation of trade). As a result, it would be a mistake to conclude that it is all about competition, and it is likely that prices will need to be regulated to support the achievement of strategic economic policy objectives.

ii. **Price regulation in practice**

Price regulation tends to apply to the provision of specified services (often referred to as reference services). It is important that the reference service is defined, and that definition is demonstrated to describe a service that reflects the activities undertaken by the port or the port service provider and typically sought by port users.

The form of regulation varies, from simply requiring charges to be published or for the methodology to be made available to the port authority or regulator or other decision maker, to regimes that require negotiation followed by some form of price determination (such as arbitration, expert or regulatory determination), all the way to having specific charges for reference services approved or determined by the port authority, regulator or other decision maker or in legislation/regulation for a stated period.

It is not usual for price regulation to prohibit the provision of other services. It is not unknown for ports and port service providers to provide additional services or to augment services, and in so doing to take those additional or augmented services outside the framework provided by price regulation (i.e. not reference services). At a regulatory authority level, the regulator or other decision maker must anticipate this in respect of ports. At a port level, the port must anticipate this in respect of port service providers.

It is particularly important to be aware that over time, an additional or augmented port service, for which a different price is paid, may provide priority to port users prepared to contract on terms for those services, and as such encourage port users to contract for the higher priced additional or augmented services.

In jurisdictions (in respect of ports) or ports (in respect of port service providers) that prohibit discrimination, it is possible to structure these services to avoid any non-compliance with any prohibition on discrimination because

³⁶ Around the world, there are many cases that accept that there is a market within a port for any service provided within the precincts of that port.

those prohibitions often relate to port users being provided with the same reference service.

As a regulator, it is important to have in mind that the reason for price regulation is that competition cannot be left to provide appropriate pricing, but price regulation does not guarantee appropriate pricing unless it is appropriately framed.

5. ACCESS – REGULATED AND UNREGULATED

Background: As a general statement, ports and port service providers may be regulated by:

- price regulation ranging from light touch price publication or methodology rules through to specific prices being reviewed and determined on a periodic basis (every three to five years typically, but sometimes annually) in respect of reference tariffs for reference services, providing a certain price to port users for port services that they will require;³⁷
- approval of terms of access and port service provision in circumstances in which port users that are competitors³⁸ want to combine to cooperate in the development of port infrastructure, which cooperation might be regarded of itself as an unlawful combination under the anti-trust legislation of the

37 Price regulation implies that the port and the port service providers are required to provide services to port users. By implication, price regulation implies that the port and the port service providers will contract with port users, and will provide access and port services on the terms of that contract.

38 Typically producers and exporters of raw materials create an incorporated joint venture company to develop and to own port infrastructure to be used to provide the port services, and take an equity interest in that joint venture company).

applicable jurisdiction, and other arrangements comprising part of the combination that may be regarded as anti-competitive;³⁹

- general anti-trust laws, including abuse of dominance/misuse of market power, and non-discriminatory principles;
- third party access and specific anti-trust laws, including to allow a third party access seeker to seek to have a port or port infrastructure, land side or marine side, declared as infrastructure in respect of which access and the provision of ports services must be provided or else access is arbitrated or otherwise determined by a regulator or other decision maker.

Price Regulation

a. Basic principles

As a general statement, price regulation may be regarded as intended to allow the port or the owner of the port infrastructure used to provide a port service, to achieve an appropriate rate of return on efficiently deployed capital (by reference to an appropriate weighted average cost of capital) and efficient operating costs. The reference tariff either specifies or provides a ceiling to the amount that the port or the port service provider may charge for the reference service. The level of detail or sophistication in setting prices varies from regime to regime. As noted above, the setting of a reference tariff for a reference service should not be regarded as the extent of the role of the regulatory authority.

b. Overlay of market conditions and policy settings

The types of factors that a regulator has to take into account in

39 The approval of terms of access and port service provision by an anti-trust authority does not mean that third party access seekers are permitted to seek access on the same terms as the port users that have acted in combination to develop the port infrastructure, although those port users may determine to contract with third parties to allow third party access on this same terms as their arrangements approved by the anti-trust authority.

Table 6 – Countries with price regulation

country	price regulation
Australia	Price regulation of prescribed port services under statutory instruments (e.g. Port of Melbourne). The Australian Competition and Consumer Commission has an ongoing role in monitoring container stevedoring
European Union	EU Port Services Regulation, which sets out a frame work for common rules on financial transparency, port services and port infrastructure charges
Japan	Price regulation at Nagoya
China	Price regulation of prescribed port services (both fixed and capped). Other tariffs, including stevedoring and storage are set by private operators
Singapore	Price regulation of prescribed port services determined by size of vessel, length of stay and purpose of call. Other services provided by the private sector (e.g. towage) with prices set by statutory bodies
The Netherlands	The majority of ports have been privatised and are able to set their own tariffs and lease prices (subject to the EU Port Services Regulation). Some smaller ports are not privatised and are therefore subject to general pricing principles (Rotterdam)

determining pricing are reasonably consistent around the world, but the application may vary considerably.

The co-authors note that while for the most part those factors are sufficient, they usually allow for considerable discretion and argument in how they are to be applied to a particular case. There are circumstances in which the regulators should have greater regard to market conditions (or at least to be able to respond to changes in market conditions) and the policy settings (including economic, and infrastructure and regulatory) applicable to the port and the port service providers, and to other ports and port service providers, including under the Public Service Port Model and the Tool Port Model which may have a legislative policy overlay to promote trade (or to maximise trade).

c. Trust and verify — Not set and forget

While regulators may assume that most ports and port service providers seek to achieve pricing that is cost reflective (with an appropriate rate of return), at the same time as maximising efficient use of the port and the port infrastructure so as to maximise profitable revenue in providing efficient services, this is often not the case. In the absence of effective competition or price regulation, or both, the nature of the flows of trade are such that as trade ebbs and flows, ports and port service providers will seek to maintain net earnings.

Approval of terms of access where competitors are acting in combination:

As noted above, there are increasing instances in which competitors combine to develop and to own and operate infrastructure at a port so as to achieve the benefits of scale and to avoid duplication of infrastructure, for example, coal, iron ore and grain loading and unloading facilities, and liquefaction and re-gasification facilities.

In some jurisdictions, the combination of competitors in this way is prohibited, and requires authorisation. In the context of the need for authorisation, or to monetise capacity in the infrastructure that is not being used by the competitors, the competitors that are combining may put in place formal contractual arrangements to allow third party access seekers to seek access on standard terms, possibly at a stated price or more likely at a price to be agreed.

A future InfraRead Ports and World Trade article will consider these circumstances in more detail, including the standard terms of processing and treating the goods, typically contained in a terminal use agreement or a tolling services agreement, and outline the basis for asset finance and project finance of the vessels (off-shore) and facilities (on shore). Michael Harrison, Dan Reinbott, Peter Vaughan and Matt Wood will co-author this article.

General anti-trust laws: Australia, Europe, the USA and most jurisdictions across Asia have anti-trust laws. The laws most relevant to the provision of port services are the laws that regulate abuse of dominance/misuse of market power and, in some cases, price and other discrimination.

In broad terms, laws prohibiting abuse of dominance/misuse of market power apply to suppliers that have substantial market power or a dominant market position such that they are able to raise prices, or reduce the level of services, without losing customers. If that market power is used in a way that harms competition in a market, then it may be possible to bring a claim

against the supplier of the port services. In practice, these claims can be hard to prove, particularly in cases where the alleged harm to competition arises from monopoly pricing, as opposed to clearer cases where a port service provider (as a supplier) refuses to supply services to a port user in order to benefit its own associates (especially where the associates compete with that port user), or where the port service provider otherwise discriminates between its associates and a third party.

In some jurisdictions (particularly the European Union and the USA), abuse of dominance cases involving a refusal to deal have developed into an “essential facilities doctrine”. The essential facilities doctrine may apply to ports (and other natural monopoly infrastructure), and is essentially a series of principles used to identify circumstances in which a port or port service provider is a supplier of a service essential to competition in downstream markets. In these circumstances, the port or port service provider should be required to provide access in order to avoid or mitigate harm to competition in those downstream markets.

Some, but not all, anti-trust regimes include general⁴⁰ price and non-price discrimination laws. Non-discrimination laws are generally concerned with a supplier charging competing customers different prices for the same service in circumstances in which the discrimination harms competition. Competition may be harmed if there is clear discrimination over time, and the discrimination does not arise because of greater costs or risks in supplying one port user over another, or as a result of other competitive constraints (e.g. meeting a competitor’s pricing or because a particular port user has other options available to them).

Third Party Access

a. In the absence of regulation as to access, including pricing

In the absence of regulation, for a third party access seeker to be granted access and to be provided with the port services, that third party will have to contract by private treaty with the port or port service provider, or both. If the port and the port service provider are prepared to contract the terms will be determined by the port and the port service provider. This is unregulated third party access.

The basis of pricing is more likely than not to reflect the point of substitution (in the case of an alternative port to the incumbent port) or the point where trade is not economic (in the case of no alternative port to the incumbent port). The other terms on which access is granted and the port services provided are likely to be straightforward in principle, reflecting that the port and the port service providers will contract on terms favourable to them.

b. Impact of vertical integration

In theory, if the port and port service providers are able to contract on terms favourable to them, they are likely to do so. If however the port services sought by the third party access seeker are to be provided by a port service provider that is using the port infrastructure for its own purposes, the port service provider may not want to provide the port services to that third party, particularly if that third party is a competitor of it. In these circumstances, absent regulation as to mandate, or a process

⁴⁰ There are many instances of specific non-discrimination laws that apply to industries or facilities that have the features of a natural monopoly, or as part of third party access regimes.

to follow to achieve third party access, the third party access seeker will not be able to obtain access, and the economic and competitive benefits of access will not be realised for the host country, or the applicable market or markets.

There is a number of jurisdictions around the world that require the owner of the port or the port infrastructure to grant access and to provide port services, or that provide a regime under which the third party access seeker may have the port or the port infrastructure declared as essential infrastructure. A general description of these regimes are considered in the remainder of this section 5.

c. Regulated Third Party Access (RPTA)

i. Background

Regulated third party access is a phrase that covers a broad range of regulatory regimes and bases of third party access, including how pricing and other terms are agreed or determined. In the context of the majority of ports, if access to the port is regulated, then it tends to be regulated in accordance with the standard pricing and other terms of that port, and in some instances with a statute or a lease providing a statement as to the purpose of the port and the provision of port services, including a licence or lease condition to comply with the RPTA. It is not however always

the case in respect of a port that there is a RPTA. Further, if there is a RPTA it is often the case that the applicable the RPTA does not foreclose on the port or any port service provider requiring the payment of increased charges in respect of an area or piece of infrastructure not previously the subject of charges.

ii. Port or port infrastructure developed for own use

In some contexts, a port may have been developed or may be in the process of being developed by the private sector with the support of Government. In other contexts, it may be that a single private sector producer or group of private sector producers/users decide to combine to develop and to own and to operate port infrastructure. In the context of a single producer that is the owner and the operator of that infrastructure, that producer will control and regulate its access and use in accordance with its day-to-day requirements, and have flexibility within the capacity provided by the port or the port infrastructure. In the context of a group of producers, it is likely that they will seek control and to determine this basis of access of each producer, and in so doing agree the terms of access for each producer.

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Table 7 – Countries with Third Party Access Regimes applicable to Ports and Port Infrastructure⁴¹

country	type of third party access regime
Australia	National Access Regime may apply to port services (e.g., channel services at the Port of Newcastle were declared under the national access regime, but the declaration was revoked following a change in law) Queensland third party access regime Voluntary third party access undertakings ratified in State agreements (e.g. port terminals under agreements with the State to facilitate mining projects)
Europe	Essential facilities doctrine
USA	Essential facilities doctrine
China	National competition law includes restrictions on behaviour that denies access to essential facilities in an anti-competitive manner
Singapore	Prohibition on refusal to supply access to an essential facility where there is evidence of likely substantial harm to competition without justification
Japan	Prohibition against unreasonable refusal to deal, which may be applied as a form of essential facilities doctrine
The Netherlands (Rotterdam)	Essential facilities doctrine (EU regulation)

41 In some jurisdictions, principles for access to essential facilities is part of abuse of dominance, rather than a separate anti-trust regime.



As might be expected, if a private sector participant or private sector participants have developed a port or port infrastructure at their own risk and at their own cost they will be proprietary. It is likely that it or they will regard access to the port or port infrastructure by a third party that as unwelcome. This is particularly the case if access may or will impact the ability to operate the port in its or their best interests. In some instances it or they may regard access as a compromising production at the port, for example, a blending process of product by a single producer.

Nevertheless, in some jurisdictions legislation contemplates that a third party that does not own or operate, or has not contributed to the cost of the development, of that port or that port infrastructure, is able to seek access to the port and to seek to contract for the provision of port services, typically, under a negotiated third party access (NPTA) regime.

In some jurisdictions, it may be that legislation provides for access and the terms of access for all parties on the same terms or there is an established basis for access for all users – Open Third Party Access.⁴² This is not typical in the context of ports or port infrastructure, and is almost unheard of in the context of a port or port infrastructure developed by the private sector.⁴³

iii. **Distinction between Negotiated Third Party Access and Open Third Party Access**

- a. Negotiated Access includes regulated third party access regimes that contemplate negotiation by an access seeker and if the access seeker does not reach a negotiated outcome for access and service provision

that is satisfactory to it a right to refer matters not agreed to an arbitrator or other decision maker; and

- b. Open Access includes whole of industry third party access regimes under which the third party access seeker may contract for access to infrastructure and associated service provision on the same terms as each other access user (electricity, gas and below rail industries in many jurisdictions around the world follow this model).
- iv. **Declaration of port or port infrastructure**

As noted in section 4 (b), the fact that a port or port infrastructure is subject to price regulation in respect of some of the port services provided is a starting point for price regulation.

If a port is not subject to price regulation, or some but not all services are regulated, then, in countries that have a third party access regime, that regime may allow port users to seek to have the channel to the port declared as essential infrastructure⁴⁴.

⁴⁴ For example, in Australia, in May 2015 Glencore applied for the channel service at the Port of Newcastle to be declared under the national access regime. The primary reason for the declaration application was an increase in channel service fees implemented following the privatisation of the Port of Newcastle.

The responsible Minister initially determined not to declare the service, Glencore appealed this determination to the Australian Competition Tribunal (which, in turn, was upheld on appeal to the Full Federal Court), and its appeal was successful. Following declaration, Glencore and the Port of Newcastle did not agree on a port access agreement, so the matter was referred to arbitration before the Australian Competition and Consumer Commission (ACCC) to determine the price, and other terms, on which Glencore could access the port. After a prolonged arbitration process (including a judicial review application), the ACCC finalised its determination in September 2018. The ACCC's determination was appealed to the Australian Competition Tribunal, which subsequently ruled on it on 30 October 2019 and overruled aspects of the ACCC determination. The ACCC has appealed that decision.

In the interim, the national access regime was amended, so in July 2018 the Port of Newcastle successfully applied for the declaration decision to be revoked. However, the ACCC's access determination remains in force.

⁴² Being Regulated Third Party Open Access, in contrast to NPTA.

⁴³ For example, in some jurisdictions some private port infrastructure is subject to access obligations negotiated as part of agreements negotiated with the State when securing approvals to allow this port development to proceed.

6. How contractual rights manifest themselves

Overview: While there may be price regulation in respect of access to ports and port infrastructure, this does not mean that the terms on which access will be subject to negotiation between ports and port service providers on one hand, and port users on the other. Nor does it mean that there will be a clear contractual commitment to a standard of access or services to be provided at the port or by any port service provider. As a matter of long-standing practice, and for good reason, the terms on which port users access the port and port infrastructure and contract with port service providers are likely to be on standard terms, and as such provide the basis for access by all port users (including as to liability of the port user and the port and the port infrastructure) and the provision of port services to all port users.

Standard contractual terms

- a. In addition to contracting for services within the precincts of the port (marine and land side) (see section 3 and Table 4 above), a condition of access to, and use of the port, will be that each port user must contract with the port on the standard terms of the port.

As a rule, the standard terms ports are non-negotiable. The standard terms will include conditions of access and use, including a liability regime under which the port will exclude and limit its liability (and that of those for whom it may be vicariously liable) to the maximum extent possible (i.e. to the extent permitted by law) in respect of the entire supply chain by use of paramount clauses.⁴⁵

- b. In the same way that ports contract on their standard terms, all port service providers contract on their standard terms, which, in the ordinary course, are non-negotiable, and as such may be regarded as favouring the port service provider. As is the case with the port and port infrastructure, the port service providers will exclude and limit liability to the maximum extent possible.

⁴⁵ Paramount clauses are used in many contracts, and will invoke the terms of The Hague Convention as enacted in the applicable jurisdiction to as to enable each relevant party to get the benefit of a cap on liability against each entity that may incur loss as a result of any wrongful act or omission of the port or as the case may be the port service provider.

- c. In Table 8 we give a sense of the various contracts that will be executed, and the parties to those contracts.⁴⁶

In the next InfraRead Ports and World Trade article, **Michael Harrison, Richard Guit** and **Dan Reinbott** will consider the full range of liabilities that may arise between the port, port facilities and port users, including the interface between the law of the applicable jurisdiction and the expectations of ports and port service providers and port users (and cargo and vessel interests) and their insurers as to liability.⁴⁷

- d. **Performance Based Agreements**

In the **Ports and World Trade – Port developments in Asia Pacific** article we noted that in the case of ports using the Landlord Model it was possible for ports to ensure that the concessionaire/lessee of the port or port infrastructure is incentivised to provide services so as to achieve and to improve continuously efficiency at port, so as to ensure that no port user is disincentivised from using the port.

Also regulators (including at a port level, port authorities) are able to control the activities for which port service providers may charge, and the amount of those charges. As noted in section 4(d)(ii) some port service providers may circumvent price regulation by providing additional or augmented services. Whichever basis of regulation is chosen (legislative or contractual), it is possible to regulate both the activity for which a port service provider can charge and the amount of that charge. There are many ways of doing this, and the challenge for the regulator or port is to provide as light a touch regime as possible – it is likely that the last thing any port wants is to incur additional overheads to manage obligations of port service providers.

In a future InfraRead Ports and World Trade article, Michael Harrison and Richard Guit will consider Capacity Management and Performance Based Agreements in detail.

⁴⁶ Terms of carriage are addressed in any contract that exists for the sale and purchase of the goods transiting the port.

⁴⁷ This article will deal with content of conditions of use/omnibus and waiver (which ports will required to be executed) and excluding and limiting the liability of port to the extent permitted by law, and providing for the liability of port users and the insurances that they are required to effect and to maintain. Also, we will consider the typical exclusion and liability provisions in contracts between port users and ports and port service providers.

Table 8 – Port Access and Use and Service Provision – Contract and Parties

contract	port/service provider	port user	other interests
Port Standard Terms/ Conditions of Use	Port	All Port Users	All cargo and vessel interests
Pilotage	Pilot	Vessel as Port User	All cargo and vessel interests
Towage	Towage service provider	Vessel as Port User	All cargo and vessel interests
Stevedore/Handling Services	Stevedore/Handling Services provider	Owner of cargo as Port User	All cargo and vessel interests
Storage and Warehousing/ nesting/stacking reclamation	Storage and Warehousing Service Provider	Owner of product stored/ warehoused/ nested/stated	All cargo interests which will depend on any terms of carriage ⁴⁶
Haulage	Haulage service provider	Owner of product being hauled	All cargo interests which will depend on any terms of carriage

7. Liability and contracting in relation to it

Overview: In this section the approach taken by ports and port service providers to liability is considered. In most cases, ports and port service providers will accept liability to port users only to the extent that they are required to do by law. The next InfraRead Ports and World Trade article will consider this in greater detail, including the terms imposed at major ports around the world, and their impact on contracts of carriage and contracts for the sale of goods.

Bases of liability: For ports and port service providers, and for port users, it is important to understand how liability may arise within the context of use of the port and undertaking activities within the vicinity of the port and port infrastructure. The following bases of liability will need to be considered:

- a. breach of contract between a port user and a port services provider, for example, any pilotage or towage service agreement or stevedore agreement;
- b. breach of duty, including of any duty of care (negligence) or trespass which arise as a matter of law;
- c. operation of contractual terms, including in respect of a port user for booking capacity or service, but not using it;
- d. fault or no fault indemnities contained in contracts, these are distinct from other bases of liability based on breach of contract or breach of duty;

- e. knock for knock (or mutual hold harmless) indemnities may be contained in contracts of port users, and may give rise to liability irrespective of fault;
- f. statute; and
- g. conditions of use and port liability agreements.

For port users, it is likely that ports and port service providers will work on the basis of “all care, and no responsibility” such that there will be limited opportunities for the port user to be able to make a claim for which the port or the port user is liable.

Conditions of Use/Port Liability Agreements: It is usual for ports to require all port users to commit to compliance with its requirements within the port as a condition of being permitted to enter and exit the port and to undertake any activity within the port. This is achieved contractually, typically with each port user having to sign a document acknowledging the Conditions of Use and any Port Liability Agreement, and the terms of access to the port (COU). The port user signing the COU will do so as a contracting party itself, and often on behalf of entities that are directly or indirectly interested in the liability, and loss, of the port user, including entities that have any interest in the vessel or that have any interest in the cargo. Typically, COUs are signed by the master of the vessel on behalf of vessel and cargo interests.



The COU will address the obligations of port users on the basis of business as usual and business not as usual. Also the COU will address liability of each port user to the port and to each other port user (and to third parties).

The port will exclude and limit its liability to the extent that it is permitted to do so by law. The exclusion and limitation of liability provisions will be non-negotiable by the port. In addition, it is possible that underlying law (in the form of a port regulation) will allow contractual exclusion and limitation or provide for it.

The port will prescribe in the COU that each port user is responsible for contamination and pollution within the port (likely on a strict liability basis), and that in this context, each port user or particular port users must effect and maintain oil pollution insurance in respect of this liability.⁴⁸

The port will prescribe in the COU that each port user is responsible for damage to, or loss of, the property of other port users, and death and personal injury to individuals. In this context, each port user or particular port users will be required to effect protection and indemnity (P&I) insurance, including to cover liability for collision with vessels and damage caused by collision with fixed and floating objects, and include damage or loss of cargo/inventory, and comprehensive general liability insurance. Typically, the COU will include (or reflect) a cap on the amount of liability for damage.⁴⁹

Liability under leases and licences: Depending on the Port Model, if the port grants a lease (or licence) in respect of any area of the port to allow a port infrastructure owner to develop port infrastructure or a port service provider to provide port services, the port will exclude and limit liability under those arrangements. This said, there may be more scope for negotiation under a lease (or licence) than under COUs, not least because there may be regarded as a lower regulatory risk in doing so. However, many ports want to keep leases (and licences) in the same form so that the management of the duties and obligations of the lessee (or licensee) is easier.

Liability under port service provider contracts: As noted above, it is likely that port service providers will work on the basis of “all care, and no responsibility” such that there will be limited opportunities for a port user to be able to make a claim for which the port or any port service provider user is liable.

In addition to strict terms contained in pilotage and towage contracts, if a stevedore is providing stevedoring services, it will exclude and limit its liability to the extent permitted by law, and for these purposes will use a paramount clause⁵⁰ such that the exclusion and limitation provisions will be effective against any person that might seek to bring a claim against the stevedore (or any person for which it is vicariously liable).

⁴⁸ Michael Harrison, Richard Guit and Dan Reinbott will consider the full range of insurances relevant in the context of ports and port users in the next InfraRead Ports and World Trade article.

⁴⁹ Michael Harrison, Richard Guit and Dan Reinbott will deal with the form of the cap in a the next InfraRead, Ports and World Trade article.

⁵⁰ Paramount clauses are also used in contracts of carriage by sea, and will invoke the terms of The Hague Convention as enacted in the applicable jurisdictions to as to enable each relevant party to get the benefit of a cap on liability.

8. Conclusion

Ports have long been essential to world trade, and this will continue to be the case. Ports are a barometer of world trade. Each port is unique: while each port provides similar port services to other ports, the geographical location of that port, the history of its development (including investment in the port and port infrastructure), the capacity of the port and the basis of operation at the port, are the key factors that go to making it unique. Even though each port is unique and the classic paradigms of competition do not apply to ports, as they do to other undertakings, the level of activity at ports, reflects the level of trade at that port, and the competitive position of port users exporting from that port, and the demand for imported goods within the country in which that port is located or in the country or country to which goods are being transhipped.

For ports, there is a balance to be struck and to be maintained to ensure that they respond to the ebbs and flows of world trade, and as such the environment in which port users undertake their businesses. Regulation of access to and pricing of port services has a role in promoting pro-trade behaviours by ports. The extent of this role may be best regarded as a port by port consideration, recognising the need for regulation that does not tilt the playing field to favour one port over another. The perspective of the co-authors is that as a general statement regulation can assist in providing guiderails for ports and port service providers to operate within, but it is important that so far as practicable regulation is light touch, ideally incentivising pro-trade behaviours, including to encourage port infrastructure investment to increase capacity and to improve efficiency when trade projected trade flows support this.

In the course of preparing this article, the co-authors have had the opportunity to consider a broad range of regimes relating to access and pricing. In this context, Michael Harrison and Justin Jones are preparing a paper on the common and distinct features of port regulation. This will be published on the Ashurst website in due course, and may form the basis of a future InfraRead article.



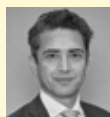
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SHIPPING EMISSIONS:

ON A COLLISION COURSE WITH THE EU'S EMISSIONS TRADING SYSTEM?

by JAMES NIERINCK AND ELEANOR REEVES



“We’ll never get anywhere if you want to convince the last climate change denier.”

This is the damning indictment by EU MEP¹ Jutta Paulus, who was commenting on the slow progress of the International Maritime Organization in tackling the shipping industry’s greenhouse gas emissions.² The trouble for the shipping industry is that Ms Paulus is the rapporteur for maritime emissions, and, by all accounts, she means business.

Under Ms Paulus’s direction, the ENVI Committee³ recently made a legislative proposal to include maritime emissions in the EU Emissions Trading System (ETS). The effect of this, if enacted, would be to put a price on greenhouse gases emitted from ships within the EU. While such a proposal is in line with the EU Commission’s 2019 “European Green Deal”, it has faced fierce criticism from the shipping industry.

1 Member of the European Union’s European Parliament.

2 The Lloyd’s List Podcast: Why the EU won’t wait for IMO on climate change, listened to 9 June 2020. <https://lloydslist.maritimeintelligence.informa.com/LL1131130/The-Lloyds-List-Podcast-Why-the-EU-wont-wait-for-IMO-on-climate-change>

3 The Committee on the Environment, Public Health and Food Safety (ENVI).

This article analyses the current EU landscape in relation to the regulation of greenhouse gas emissions from ships, current EU policy and the proposed legislative reforms, and comments on the potential impact on the shipping industry should the ETS be expanded.

If introduced, the inclusion of maritime emissions in the ETS would have a significant effect on the shipping sector. Therefore, if further developed, the proposal is likely to be subject to challenge, both in principle and in terms of its scope and application. Given the scale and importance of the shipping industry to the global economy, it would appear that the EU and the shipping industry are currently on a collision course.

Scene setting and data crunching: shipping emissions in a global context

For context, we have set out below the scale of emissions from shipping and the rate of growth. This is important to an understanding of the relevant policy and regulatory drivers.

The first key point relates to the **scale of greenhouse gas (GHG) emissions** from shipping:

- a. **Globally**, the most recent International Maritime Organization (IMO) GHG Study⁴ estimated that international shipping accounted for approximately 2.1 per cent of the total global anthropogenic GHG emissions. While 2.1 per cent is a relatively small contribution in percentage terms, the EU Commission has stated that ***"This is more than the emissions of any EU state. If the shipping sector were a country, it would rank sixth in emission[s] in the world"***.⁵
- b. **At EU level**, in 2019, shipping contributed approximately 13 per cent of the overall EU GHG emissions from the transport sector (the top three being 71.7 per cent road, 13.9 per cent aviation, 13.3 per cent maritime).⁶

The second key point relates to the rate of growth in GHG emissions from shipping. Unlike many modes of transport and industry, GHG emissions from shipping have not only grown significantly in recent years but are also projected to continue to grow significantly.

- a. **Globally**, the Third IMO GHG Study estimated that emissions from international shipping could grow by up to 250 per cent by 2050, mainly due to the global growth of maritime trade.⁷
- b. **At EU level**, CO₂ emissions from maritime transport increased by 48 per cent between 1990 and 2008, and are expected to increase by 86 per cent above 1990 levels by 2050, despite the adoption of minimum ship efficiency standards for new ships by the IMO in 2011.⁸

These statistics should be considered against the backdrop of significant momentum on climate change at an international level, coalescing around the Paris Agreement adopted at the UN climate conference⁹ (COP) in December 2015. The Paris Agreement aims to limit global temperature increase well below 2 °C compared to pre-industrial levels, and "pursue efforts" to limit the temperature increase to 1.5 °C based on ambitious GHG mitigation by all countries.

The EU submitted its Intended Nationally Determined Contribution

4 See further <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>. The IMO's third GHG study 2014 is the latest, with a final report of the Fourth IMO GHG Study being expected in Autumn 2020.

5 See further Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data COM(2019) 38 final.

6 See further the European Environment Agency's Greenhouse gas emissions from transport in Europe, published 17 December 2019 <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-12>

7 See further Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data COM(2019) 38 final.

8 See further Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data COM(2019) 38 final.

9 Conference of the Parties.

(NDC) under the Paris Agreement to the UNFCCC¹⁰ in March 2015, committing to a binding target of at least a 40 per cent domestic reduction in economy-wide GHG emissions below 1990 levels by 2030.¹¹ Since then, in December 2019, the EU has revealed its aim to be **climate-neutral by 2050**. An updated and more ambitious NDC target is expected in 2020.¹²

Since then, the EU has remained at the forefront of global climate diplomacy, calling for ambitious action on climate change both in terms of mitigation and adaptation. Further, the next COP will now take place in Glasgow in November 2021, having been rescheduled due to the coronavirus pandemic. Notwithstanding Brexit, this, alongside EU policy and legislative changes, will maintain momentum on action to reduce EU GHG emissions. EU policy developments in relation to maritime emissions are discussed below.

The EU's actions in a global context

The complexity of global developments and the range of stakeholders provide important context within which the EU regime sits. Before commencing a review of the EU regulatory landscape on shipping emissions, it should be acknowledged that the EU's proposals are only one part of a global shift towards green maritime transport, which is gathering significant momentum. Very briefly, key examples of other public and private measures adopted and developments currently under way include:

- a. A raft of measures adopted or under consideration by the IMO to address shipping emissions, include:
 - i. the Initial IMO Strategy on reduction of GHG emissions from ships¹³ which includes in particular an ambition "to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50 per cent by 2050 compared to 2008", while pursuing efforts towards phasing out GHG emissions as soon as possible this century;
 - ii. the IMO's focus on energy efficiency measures, including the Energy Efficiency Design Index, Ship Energy Efficiency Management Plans and the Energy Efficiency Operational Indicator;¹⁴
 - iii. a proposal to establish an IMO GHG reduction research and development (R&D) programme to accelerate the introduction of low-carbon and zero-carbon technologies and fuels. The sponsors propose that funding would be provided via a mandatory R&D contribution per tonne of fuel oil purchased for consumption.¹⁵

- d. National governments seeking to include emissions from

10 United Nations Framework Convention on Climate Change.

11 See further https://ec.europa.eu/clima/policies/international/negotiations/paris_en

12 <https://climateactiontracker.org/countries/eu/>

13 Adopted in April 2018 by the IMO's Marine Environment Protection Committee (MEPC) https://unfccc.int/sites/default/files/resource/250_IMO%20submission_Talanoa%20Dialogue_April%202018.pdf

14 <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-and-Operational-Measures.aspx>

15 See further Proposal to establish an International Maritime Research and Development Board (IMRB) dated 18 December 2019 <https://www.ics-shipping.org/docs/default-source/Submissions/IMO/final-imrb-submission-to-mepc-75.pdf?sfvrsn=6>

international shipping and aviation in carbon budgets and national net-zero targets (for example, the UK), where they have historically been excluded.¹⁶

- e. Shipping companies setting their own targets: for example, Maersk has announced a goal to reach carbon neutrality by 2050. Further, shipping companies are starting to differentiate themselves in the “low-carbon” market by offering low-carbon shipping solutions such as Maersk’s “ECO Delivery”.
- f. Significant growth in corporate net-zero emission strategies, some of which include “scope 3 emissions” (i.e. the indirect emissions of a company’s value chain). For example, the H&M Group in February 2020 sought to reduce its transport emissions by using Maersk vessels that run on sustainable biofuel.
- g. The “Getting to Zero Coalition”, a partnership between the Global Maritime Forum, the Friends of Ocean Action and the World Economic Forum, will focus on achieving the target set by the IMO to reduce greenhouse gas emissions from shipping by at least 50 per cent compared to 2008 levels by 2050.

The current EU legislative framework: MRV

EU law currently requires the monitoring, reporting and verification (MRV) of carbon dioxide emissions from maritime transport. It is, in essence, a data gathering regulation bolstered by the independent verification of emissions. Shipping does not presently have to participate in the ETS, the EU’s flagship GHG mitigation scheme.

Following extensive debate as to the most appropriate way to regulate shipping emissions, in April 2015 the EU enacted Regulation 2015/757 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport (the EU MRV Regulation). The EU MRV Regulation entered into force on 1 July 2015.

The overall effect of the EU MRV Regulation is that, from 1 January 2018, “large ships” (over 5,000 gross tonnage (GT)) which load or unload cargo or passengers at ports in the European Economic Area (EEA)¹⁷ have to monitor and report their related CO₂ emissions and other relevant information.

The EU’s aim is that the information collected informs future policy-making decisions and stimulates the uptake of new technologies and operational measures to make ships greener.

In summary, the main obligations for companies required to participate in the EU MRV Regulation are as follows:

- a. **Monitoring:** From 1 January 2018, companies shall – in line with their respective monitoring plans – monitor for each of their ships: CO₂ emissions, fuel consumption and other parameters (such as distance travelled, time at sea and cargo carried on a per voyage basis), so as to gather annual data for an emissions report to be submitted to an accredited MRV shipping verifier.
- b. **Emissions report:** From 2019, by 30 April of each year, companies shall, through THETIS MRV (the EU’s information system), submit to the EU Commission and to the states in which those ships are registered (flag states) a satisfactorily

verified emissions report for each ship that has performed maritime transport activities in the EEA in the previous reporting period (calendar year).

- c. **Document of compliance:** From 2019, by 30 June of each year, companies shall ensure that all their ships that have performed activities in the previous reporting period and are visiting ports in the EEA carry on board a document of compliance. This could be subject to inspection.

However, as with all laws with a significant technical component, the devil is in the detail. Set out below are several key points about the application, scope and design of the EU MRV Regulation. We highlight these points because similar principles are likely to arise when considering the potential inclusion of shipping in the ETS.

- a. The EU MRV Regulation **applies to ships above 5,000 GT regardless of their flag**. This aligns with the IMO’s principle of non-discrimination between flag States. There are a limited number of vessels exempted from the EU MRV Regulation, including warships, fish-catching or fish-processing ships, ships not propelled by mechanical means, and government ships used for non-commercial purposes.
- b. The EU MRV Regulation **applies to the emission of CO₂ only**. It does not apply to other GHGs from shipping.
- c. The EU MRV Regulation applies to **CO₂ released during a ship’s “voyage”**. Voyages are movements to or from EEA ports carried out after 1st January 2018 that **transport either passengers or cargo for commercial purposes**. Movements that do not serve either of these purposes are not subject to MRV requirements.
- d. **The exact geographical extent of the EU MRV Regulation is complex**. It applies to CO₂ released during voyages to or from a “port of call under the jurisdiction of a Member State”. The EU MRV Regulation therefore applies, for example, to voyages to and from Martinique (the Caribbean) and Réunion (the Indian Ocean).
- e. **Obligations are to be fulfilled on a “per ship” basis by the “MRV company”**, that is, by either the shipowner or any other organisation or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner. The EU MRV Regulation allows the parties involved in the operation of each ship subject to the regulation to determine who assumes the MRV monitoring and reporting obligations.

Overall, as its title suggests, the EU MRV Regulation imposes only MRV-related obligations on companies, and does not incorporate shipping into the EU ETS or establish any other form of market-based mechanism.

We note that, as is often the case with environmental data-collection regimes, once the data is collected, it drives awareness across the industry sector to investors, consumers and policy makers alike. The compiling and processing of such data creates a “policy problem” – here, rising shipping emissions – to which policy makers seek to find a “policy solution”. Returning to Jutta Paulus:

“I don’t see any sense in keeping on counting emissions but doing nothing to reduce them.”¹⁸

¹⁶ See e.g. Committee on Climate Change Letter on International aviation and shipping and net zero to the Secretary of State for Transport <https://www.theccc.org.uk/publication/letter-international-aviation-and-shipping/>

¹⁷ Note that the EU MRV Regulation also applies to the non-EU Member States in the EEA. In practice, this means that it also applies to some non-EU states including Iceland and Norway.

¹⁸ <https://www.euractiv.com/section/shipping/news/eu-starts-to-chart-shippings-new-green-course/>

IMO Data Collection System and overlapping compliance regimes

Following the adoption of the EU MRV Regulation, the IMO established an IMO Data Collection System (IMO DCS). The IMO DCS entered into force on 1 March 2018 through amendments to MARPOL¹⁹ Annex VI²⁰ on the Data collection system for fuel oil consumption of ships.²¹

The IMO DCS requires owners of large ships (above 5,000 GT) engaged in international shipping to report information on fuel consumption (and other proxies) of their ships to the flag States of those ships. The flag States then report aggregated data to the IMO, which produces an annual summary report to the IMO Marine Environment Protection Committee.

Under the IMO DCS, monitoring obligations started on 1 January 2019, with reporting in 2020. As a result, from January 2019 ships performing EEA-related maritime transport activities have to fulfil monitoring and reporting requirements under **both** the EU MRV Regulation and the global IMO DCS. However, the regimes are substantively different in a number of respects.

The EU's position is that it is not looking to create duplicative legislation and that the EU MRV Regulation envisaged global action via the IMO. Article 22 of the EU MRV Regulation provides that:

"In the event that an international agreement on a global monitoring, reporting and verification system for greenhouse gas emissions (...) is reached, the Commission shall review this Regulation and shall, if appropriate, propose amendments to this Regulation in order to ensure alignment with that international agreement."

To address this, the EU has sought to bring forward legislation amending the EU MRV Regulation.

Proposed EU amending regulation to EU MRV Regulation

The EU Commission's proposal for a regulation to amend the EU MRV Regulation in order to take account of the IMO DCS was published by the EU Commission in February 2019 (the Proposed MRV Amending Regulation).²²

The EU Commission has sought to streamline and reduce administrative effort for companies where possible, while preserving the objectives of the EU MRV Regulation. In bringing forward the Proposed MRV Amending Regulation, three policy options were assessed:

- Option 1: Do nothing
- Option 2: "Streamline"** – different alignment options were assessed, in terms of scope, definitions, monitoring parameters, monitoring plans and templates, verification and transparency
- Option 3: "High convergence"** – the EU MRV Regulation would be amended to harmonise all its technical aspects with the IMO DCS (i.e. the EU MRV Regulation would adopt the requirements of the IMO DCS)

Following consideration, the EU Commission proposed option 2, with a **limited alignment** of the EU MRV Regulation to the global IMO DCS in relation to definitions, monitoring parameters, monitoring plans and templates. The impact assessment recommended option 2, as it safeguards the expected environmental, social and economic benefits of the EU MRV Regulation, while reducing the administrative burden for shipowners.²³

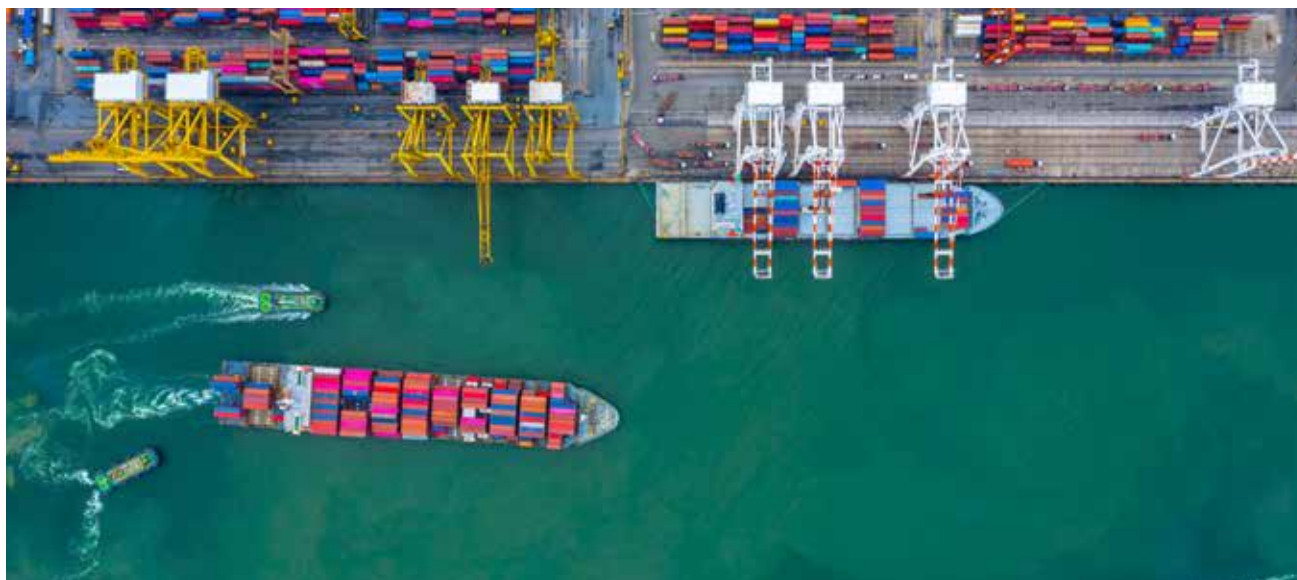
19 International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997.

20 Regulation for prevention of Air pollution from ships.

21 Adopted by resolution MEPC.278(70). See further <http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-%28MEPC%29/Documents/MEPC.278%2870%29.pdf>

22 See further Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data COM(2019) 38 final

23 A full analysis of the proposed limited alignment model is beyond the scope of this article. See further paragraph 1.4 of the Opinion of the European Economic and Social Committee on 'Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data dated 15 May 2019 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019AE1686&from=EN>





Intervening evolution of EU policy

Since the Commission's Proposed MRV Amending Regulation in February 2019, EU policy on climate change has developed significantly.

Specifically, on 28 November 2019, ahead of the most recent COP, the European Parliament approved a resolution declaring a **climate and environmental emergency** in Europe and globally.²⁴

Following this resolution, on 11 December 2019, the European Commission presented **the European Green Deal**. The European Green Deal sets out a road map of key policies and measures for the EU to become the first climate-neutral continent by 2050 at the latest.²⁵ The key point from the shipping industry's perspective is that the European Green Deal makes it EU policy to include shipping emissions in the ETS.

The relevant sections which suggest that broader tax reform can also be anticipated are set out below (our emphasis highlighted in bold):

"The price of transport must reflect the impact it has on the environment and on health. Fossil-fuel subsidies should end and, the Commission will look closely at the current tax exemptions including for aviation and maritime fuels and at how best to close any loopholes.

Similarly, the Commission will propose to extend European emissions trading to the maritime sector, and to reduce the EU Emissions Trading System allowances allocated for free to airlines. This will be coordinated with action at global level, notably at the

²⁴ <https://www.euractiv.com/section/climate-environment/news/european-parliament-declares-climate-emergency/>

²⁵ https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

International Civil Aviation Organization and International Maritime Organization."

"[The Commission] will take action in relation to maritime transport, including to regulate access of the most polluting ships to EU ports and to oblige docked ships to use shore-side electricity."

It is clear from these policy statements that the shipping sector is likely to be directly affected by EU legislative reforms. While, at present, the European Green Deal is policy and not law, shipowners and operators should be aware of significant changes on the horizon.

The declaration of a climate and environmental emergency and the European Green Deal have together driven the European Parliament's ENVI Committee to propose the inclusion of maritime GHG emissions in the ETS, which we explore in more detail in the next section.

The Draft report of the Committee on the Environment, Public Health and Food Safety

The European Parliament's ENVI Committee published its draft report on the Proposed MRV Amending Regulation on 24 January 2020²⁶ (the ENVI Committee Report). The ENVI Committee considers that the Commission's Proposed MRV Amending Regulation is not ambitious enough. In particular, the ENVI Committee considers that the Commission's policy has evolved since the Commission's publication of the Proposed MRV Amending Regulation in February 2019. As such, the ENVI Committee Report recommends that amendments should be made to the Proposed MRV Amending Regulation, including to incorporate maritime transport into the ETS.

The drafting amendments tabled by the ENVI Committee propose

²⁶ https://www.europarl.europa.eu/doceo/document/ENVI-PR-646870_EN.pdf



the inclusion of additional articles into the ETS Directive 2003/87 to include GHG emissions from the maritime sector in the ETS. Conceptually, this is quite a leap; the ENVI Committee Report seeks to include maritime emissions in the ETS through an instrument which seeks to make what are largely technical amendments to the EU MRV Regulation. In doing so, the ENVI Committee Report merges MRV with a market-based mechanism, which does not sit easily. As we set out in more detail below, it will be very challenging to simply “patch” maritime emissions into the ETS, because there are a number of complex considerations that will need careful consideration and drafting.

Putting to one side this conceptual issue, the explanatory memorandum sets out the proposed legislative changes in more detail. In relation to the ETS, it states:

“The European Parliament must take responsibility and transpose what Commission President Ursula von der Leyen has already proposed: the inclusion of maritime transport in the ETS system of the European Union.....The rapporteur warmly welcomes the Commission’s commitment in the Green Deal to broaden the scope of the EU Emissions trading scheme (ETS) to shipping.

Several attempts to regulate the shipping sector were already made over the past years, none of which was successful. The momentum to include shipping in the ETS is now. There will be no distortion of competition, as all flag states and all companies are treated in the same way. The scope of the regulation includes all intra-Union voyages, all incoming voyages from the last non-Union port to the first Union port of call and all outgoing voyages from an (sic) Union port to the next non-Union port of call.”

The explanatory memorandum also provides a real sense of the EU’s frustration with the IMO’s lack of action:

“The IMO has promised for more than 20 years that it will tackle shipping emissions and has only introduced its Data Collection System after the EU has implemented the MRV Regulation. No real progress has been seen, which is why EU action is a necessity to achieve the Paris objective to limit the temperature increase to 1.5C above pre-industrial levels.”

While this may be seen as mere rhetoric, the language used indicates the level of exasperation of the ENVI Committee with the perceived lack of tangible progress through the IMO.

In addition to the proposed inclusion of maritime emissions in the ETS, there are a series of other significant proposals, including:

- a. the establishment of a ***maritime transport decarbonisation fund*** to foster research and development in the energy efficiency of ships and support investments in innovative technologies and infrastructure to decarbonise maritime transport, and the deployment of sustainable fuels, with the fund financed from ETS revenues. The drafting proposed envisages that 30 per cent of the funds raised by the auctioning of EU allowances under the ETS would capitalise this fund;
- b. provisions in relation to “zero emission ports” including requiring the EU Commission to establish binding targets for Member States to ensure that there is an adequate supply of shoreside electricity in maritime and inland ports;
- c. the transposition into EU law of the ***IMO’s target to reduce CO2 emissions per transport work by at least 40 per cent by 2030;*** and
- d. an extension of the scope of the EU MRV Regulation ***to all GHGs***, in particular methane (not just carbon dioxide).

Dissenting views within Europe?

While the direction of travel from the ENVI Committee appears clear, it would be naïve to assume that all EU institutions and committees agree with these more ambitious proposals.

For example, the European Economic and Social Committee's (EESC) Opinion²⁷ on the Commission's Proposed MRV Amending Regulation advocates a complete alignment of the EU MRV Regulation with the IMO system, in order to ensure an international level playing field for the European fleet. It considers that the partial alignment proposed by the Commission would create ineffective double monitoring and reporting requirements that would increase the workload, administrative burden and costs.

While the EESC's opinion was prepared in May 2019 (ahead of the recent ENVI Committee Report and the European Green Deal), and so does not comment on the ETS expansion proposals, it shows that the EU is not advancing on a unified front in relation to the roles played by the EU and the IMO.

The most striking section of the EESC's Opinion is as follows – it clearly advocates that the IMO be allowed by the EU to take the lead on a coordinated global regulatory system:

²⁷ Opinion of the European Economic and Social Committee on 'Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data dated 15 May 2019 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019AE1686&from=EN>

“The EESC considers that the proposed partial alignment will lead to burdensome and ineffective double monitoring and reporting requirements...”

“...The aim of a complete alignment exercise of the EU MRV Regulation with the UN IMO DCS is to have global regulatory uniformity in order to minimise the additional burden that has a large impact...and avoid any dual reporting requirements under two different systems.”

In the light of this disparity in approach, further divisions can be expected.

The shipping industry's views on including emissions within the ETS

The shipping industry is, as one might expect, against the proposed inclusion of shipping in the ETS.

The shipping industry's main argument is that shipping is a global system which should not be distorted by regional regimes. The shipping industry generally supports progress through the IMO, the UN agency which sets rules for the industry more generally.

The shipping industry points towards the positive measures adopted by the IMO to date, in particular the Initial IMO Strategy on reduction of GHG emissions from ships, which contains the IMO's key target to cut total GHG emissions from international shipping



by at least 50 per cent by 2050.²⁸ It is noted that the IMO proposes to revise its initial strategy in 2023. Proponents of the IMO system are of the view that EU action before 2023 would prejudice multilateral efforts to find an effective global consensus.²⁹

It is further argued that regional regulation has the potential to distort competition. Concerns about carbon leakage have also been raised.

We can expect further, and more detailed, arguments to be put forward by the shipping industry as to why the IMO, and not the EU, should be entrusted to deliver ambitious GHG reductions.

Inclusion of maritime emissions in the ETS

As noted above, it seems unlikely that maritime emissions will be included in the ETS without a significant challenge from the shipping industry. However, if they are, the financial impact for the shipping industry will be that EU emissions allowances will have to be acquired and surrendered in respect of GHG emissions. This additional cost will no doubt have to be redistributed through supply chains.

²⁸ Compared to a 2008 baseline.

²⁹ See, for example, the European Community Shipowners' Association Position Paper 'A Green Deal for the shipping industry', February 2020 <https://www.ecsa.eu/sites/default/files/publications/2020%20ECSA%20Position%20Paper%20-%20A%20Green%20Deal%20for%20the%20European%20shipping%20industry.pdf>

A detailed proposal from the EU as to how shipping emissions would be included in the ETS has not yet been published. However, key considerations for the inclusion of maritime emissions into the ETS include the following:

- a. When would such a scheme commence?
- b. Would the 5,000 GT threshold used in the EU MRV Regulation for participants continue to apply?
- c. Which vessels would be excluded?
- d. Which parts of a participating ship's voyage would be captured? Would this be an EU or EEA measure?
- e. How would Member States' territories outside of the continent be treated?
- f. Are there concerns that the EU is legislating outside of its jurisdiction (as there have been with aviation)?
- g. Would all allowances be auctioned or would there be an introductory "grandfathering" phase?
- h. Would it be possible to use international-type offsetting credits to comply?
- i. Would there be specific provisions for small operators or new market entrants?
- j. Who would be liable for the costs of compliance – shipowners or ship operators?
- k. How viable is the idea of a maritime transport decarbonisation fund, where similar revenue-recycling funds have not been a significant feature of the ETS?
- l. How would those liable (shipowners/operators) pass costs down to other parties?
- m. Do contracts currently provide for this, noting that, as a matter of classification, the ETS is not usually viewed as a tax?
- n. As a significant maritime nation, would the UK participate in such a scheme, or design a similar domestic scheme?

In all, it is not a simple case of "patching" maritime emissions into the ETS, as each one of these issues requires detailed consideration.

Next steps

The next step in the legislative process is for the European Parliament to vote on the proposal at first reading, in order to adopt a position. The European Parliament will discuss and vote on the proposal. This proposal is due to be heard at a plenary sitting on 8 July 2020; however, the parliamentary timetable may be disrupted by the impact of COVID-19. As the position is rapidly evolving, we would recommend that all interested parties keep these legislative and policy developments under close review.



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INDONESIA MOVES CAPITAL CITY:

An illusion or an era of new opportunities?

by Frédéric Draps and Suci Modjo

The fourth most populous country in the world, Indonesia plans to move its capital city from Jakarta to a remote location on the island of Borneo. This article provides an insight into the underlying reasons for the move as well as the current plans and opportunities which may arise from this herculean enterprise.

“A capital city is not just a symbol of national identity, but also a representation of the progress of the nation. This is for the realisation of economic equality and justice. This is the vision of an advanced Indonesia.” – President Joko Widodo.

The largest economy in Southeast Asia and fourth most populous country in the world, Indonesia plans to move its capital city and seat of central government from Jakarta to a remote and undeveloped area in the province of East Kalimantan on the island of Borneo. The site earmarked for the new capital is said to be in the centre of the vast Indonesian archipelago which stretches from the northern tip of Sumatra to Papua.

This grand plan, floated from time to time since the country gained independence from the Dutch in 1945,¹ was formally

announced by President Joko Widodo (Jokowi) on 26 August 2019 in a State address at the presidential palace.² The main arguments for the move are two-fold: (i) to alleviate environmental and infrastructure issues affecting the current capital, Jakarta, which include pollution, congestion and gradual subsidence into the Java sea; and (ii) to reorient investment to other parts of the country and promote a more inclusive society and balanced distribution of wealth. This article provides insights into the underlying reasons for moving Indonesia’s capital as well as the current stated plans and opportunities which may arise from this herculean enterprise.

1 Soekarno, Indonesia’s first president, touted the city of Palangkaraya in Central Kalimantan, while Soeharto and Soesilo Bambang Yudhoyono (Indonesia’s second and fifth presidents, respectively) contemplated moving the capital to Jonggol, just 40km outside of Jakarta.

2 <https://nasional.kompas.com/read/2019/08/26/13351161/jokowi-ibu-kota-baru-di-sebagian-penajam-paser-utara-dan-kutai-kartanegara?page=all>. Prior to the announcement, Jokowi begged leave of the MPs and senators during an annual session on 16 August 2019, to move the capital to Kalimantan Island (without mentioning the specific regions) to improve economic equality across the archipelago. <https://nasional.kompas.com/jeo/naskah-lengkap-pidato-kenegaraan-2019-presiden-jokowi>.

Location, location, location sometimes a difficult choice

Choosing an optimum site to develop a city which is to become a national capital is no easy feat. History provides plenty of examples where internal rivalries among ethnic/economic groups, and the need to spread development more evenly, have prompted nations to reassess and change the location of their capital city. Precedents abound, from Brasilia (designated over Rio de Janeiro and São Paulo), Canberra (ending the quarrels between the states of New South Wales (Sydney) and Victoria (Melbourne)), Abuja (due to the overcrowding of Lagos and to serve as a bridge between the largely Christian south and the Muslim north of the country), Astana³ (more recently, to ensure the development of the vast Kazakh interior away from Almaty and its confinement in the south-eastern corner of the country) to Naypyidaw (closer to Indonesia and, allegedly, for astrologic reasons). This is particularly the case for countries where the potential options may be as plentiful as the number of groups and factions cohabitating within the realm of the relevant nation-state. Indonesia is a perfect example of such complexity: the largest archipelago in the world stretching for over 5,000 km from east to west and consisting of more than 17,000 islands, with a population of 270 million,⁴ a multi-ethnic and multilingual nation where five of the world's main religions are recognised in the Constitution and actively practised.

Jakarta's over-dominance

With the exception of the three years immediately following independence (1946-1949), Jakarta has been the capital of Indonesia⁵ from the first days of Dutch colonisation in the early seventeenth century until today. The city is located on the island of Java which is situated towards the west of the Indonesian

archipelago. Despite only representing 6.7 per cent of Indonesia's landmass, Java has a population of more than 147 million (or about 56 per cent of the Indonesian population).⁶ This makes Java by far the most populous island in the world with an average population density close to 1,100 inhabitants per square km.⁷ The dominance of Java in contemporary Indonesia is also reflected in the fact that this is where almost 60 per cent of Indonesia's GDP is produced. While Jakarta has a population of 10.5 million, the greater metropolitan area commonly referred to as Jabodetabek which includes the adjacent municipalities of Bogor, Depok, Tangerang and Bekasi has a population of approximately 32.5 million. This places Jakarta among the five most populous metropolitan areas in the world behind Tokyo and alongside Shanghai, Delhi and Mumbai.⁸

Environmental and infrastructure constraints

This concentration of the nation's population and productive capacity on Java, and especially in the greater Jakarta metropolitan area, comes at a price: the surrounding environment and infrastructure have borne the brunt of the load and are showing signs that they are on the brink of exhaustion.

Jakarta is regularly struck by floods. In 2007, during one of the worst episodes, 60 per cent of the city was under water resulting in 79 deaths, the displacement of 500,000 people, and damage amounting to in excess of US\$ 680 million.⁹ Today's Jakarta has not managed to set flooding issues behind it despite various plans to build a giant sea wall in the Jakarta bay. Based on the national Meteorological, Climatological and Geophysical Agency (BMKG), North Jakarta is sinking by about 7 to 10 cm per year, making Jakarta

3 Astana was renamed Nur-Sultan in early 2019.

4 <https://population.un.org/wpp/Download/Standard/Population/>;

5 Except for the three years (1946-1949) during the struggle to maintain its new independent status when Soekarno was forced to move the capital to Yogyakarta (in Central Java) and Bukittinggi (in West Sumatra).

6 <https://sp2010.bps.go.id/index.php/site?id=31&wilayah=DKI-Jakarta>; Badan Pusat Statistik (BPS), 2018; <https://databoks.katadata.co.id/datapublish/2019/05/14/berapa-jumlah-penduduk-di-pulau-jawa-2019>;

7 Ibid.

8 Depending on the sources and rankings consulted.

9 https://www.bappenas.go.id/files/8913/5441/6576/hasil-penilaian-kerusakan-dan-kerugian-pasca-bencana-banjir-awal-februari-2007-di-wilayah-jabodetabek_20081123211335_1300_0.pdf



one of the fastest-sinking large cities in the world.¹⁰ The causes of Jakarta's subsidence are mainly related to over-extraction of groundwater used by businesses, the growing population and rising sea levels.

Also of concern is the increasing level of pollution from coal-fired power generation and traffic, placing it for many days of the year as top in the ranks of cities with the highest level of air pollution in the world.¹¹ The same goes for water supply. Due to the lack of treatment facilities and unsupervised industrial waste dumping, the Jakarta metropolitan government is only able to supply 3 per cent of the population's clean water needs. In turn, the lack of access to potable water is one of the indirect causes of Jakarta's subsidence with residents digging groundwater wells thereby accelerating the rate of subsidence.¹²

Endless traffic jams have been plaguing Indonesia's capital, which is competing for the title of the most congested city in the world,¹³ with the daily commute of dwellers often in excess of four hours. Bappenas (the National Development Planning Agency) estimated in 2017 that traffic congestion in Jakarta caused economic losses of about IDR 67.5 trillion (US\$ 4.73 billion). Despite multiple measures to tackle traffic congestion over the past years, including the development of Jakarta's first metro line, express bus lanes and access restrictions on certain key road links, these efforts have so far had a limited impact on traffic due to an increasing population and economic growth. Although clearly positive, these recent improvements are perceived by some to be too little too late.

A combination of the factors as sketched out above have prompted the Indonesian Government to reconsider plans to move the national capital to a more auspicious site, which would also be a bridge towards the eastern confines of the archipelago and temper Java's over-dominance.

East Kalimantan – The site of the new capital

When considering the potential sites for the new capital, the Government of Indonesia (Gol) has primarily been driven by geographic considerations: What site would be most suitable to become the crossroads of this archipelago of 17,000 islands? Such site would ideally need to be geographically central and allow for easy access by air and sea, which are the two primary means of transportation connecting the Indonesian archipelago. The site for the new capital would also need to be virgin enough to allow for the "greenfield" development of a new city living up to size of the vast country it would service.

Borneo lies at the centre of the Indonesian archipelago and is its second largest island.¹⁴ The island is politically divided between Malaysia and Brunei which occupy the northern quarter, and Indonesia occupying the remaining three quarters to the south which is referred to as Kalimantan. Borneo's economy is centred

around palm oil production, forestry, mining, and oil and gas, in other words natural resources of which it is one of the largest producers in Southeast Asia.

Another vital factor considered by the Gol in its process to select the site for the new capital is the exposure to natural disasters. Located on the Pacific Ring of Fire, Indonesia is afflicted by frequent earthquakes and volcanic eruptions. Whereas Java is home to 45 active volcanoes, Kalimantan is considered safer since it is outside the range of the main areas of tectonic plates convergence and has no active volcano.

Based on a study commissioned by President Jokowi and the Gol, an area of 40,000 hectares of government-owned land located in the regencies of North Penajam Paser and Kutai Kertanegara in the province of East Kalimantan has been earmarked. The proposed site lies close to the coast and the cities of Samarinda (the capital and largest city of East Kalimantan) and Balikpapan (the centre of Kalimantan's oil and gas industry with an existing international airport).

Bridging economic inequalities

Besides the problems afflicting modern Jakarta, President Jokowi wants to ensure a more balanced development of the archipelago; to accelerate the development of the eastern provinces which have historically lagged behind; and to deliver a political message that Indonesia is not all about Java (and the Javanese) and that the nation needs to turn itself towards a more inclusive future.

Diagram 1: Economic Contribution of Region to National GDP¹⁵

Region	GDP Contribution
Java	58,48%
Sumatra	21,58%
Kalimantan	8,20%
Sulawesi	6,22%
Bali & Nusa Tenggara	3,05%
Maluku & Papua	2,47%

With Java and Sumatra having consistently contributed more than 80 per cent of the GDP for the past 35 years, it is clearly difficult to entice investment to other regions without real intervention and planning. Based on initial studies conducted by Bappenas for the Gol, the move of the capital to East Kalimantan is expected to increase investments in the province by 47.7%, and by 34.5% in Kalimantan generally.¹⁶ The Gol also expects that the move will trigger an immediate bump in investments across all other eastern regions (such as Sulawesi, the Maluku, Papua and East Nusa Tenggara) as they will be closer to the national capital and the centre of decision and policy making.

10 <https://www.bbc.com/news/world-asia-44636934> <https://www.surat kabar.id/80596/peristiwa/gawat-najwa-shihab-unggah-video-jakarta-tenggelam-di-tahun-2030-bmkg-itu-nyata>; <https://www.theguardian.com/cities/2016/nov/22/jakarta-great-garuda-seawall-sinking>

11 <https://jakartaglobe.id/context/jakarta-air-quality-among-worlds-worst>

12 <https://www.thejakartapost.com/news/2018/07/23/what-makes-jakartas-rivers-ugly-and-smelly.html>

13 According to the Inrix 2017 Traffic Scorecard, Jakarta was ranked second in the ranking of the worst congested cities in the world just below Bangkok.

14 And third largest in the world.

15 Presentation given by Bappenas on 16 September 2019 in the context of the National Dialog on the Move of the National Capital which is being organised by the Gol (Bappenas Presentation).

16 Bappenas Presentation.

What are the plans for the grand move?

Based on the current plans prepared by the GoI, the price tag for the development of the new capital is estimated to be around US\$ 33 billion, or, in a more modest scenario, about US\$ 23 billion.¹⁷ Out of these figures, the government is currently only planning to cover 19.2 per cent from the state budget, while the lion's share is slated to be allocated to public-private partnerships (PPPs) (54.4 per cent), and the remainder to pure private investments and state-owned enterprises (26.4 per cent). Other potential sources of funding contemplated by the GoI include the issuance of “municipal bonds” and the commercialisation of government assets (*Barang Milik Negara*) in Jakarta and East Kalimantan.¹⁸

Diagram 2: Budget allocation for the capital city move¹⁹

No	Infrastructure Needs	Scenario I (in US\$)	Scenario II (in US\$)
1	Main Functions: Palace, State Institution Offices (executive, legislative, judiciary), Strategic Buildings of Indonesian National Armed Forces (TNI) / Indonesian National Police Department (POLRI)	4.6 billion	2.7 billion
2	Supporting Functions: Residence for Civil Servants (ASN)/POLRI/TNI, Education & Health Facilities, Public Residence	17.2 billion	11.5 billion
3	Supporting Functions: Infrastructure facilities, Green open space	10.5 billion	8.1 billion
4	Land procurement	564 million	422 million
TOTAL		32.9 billion	22.8 billion

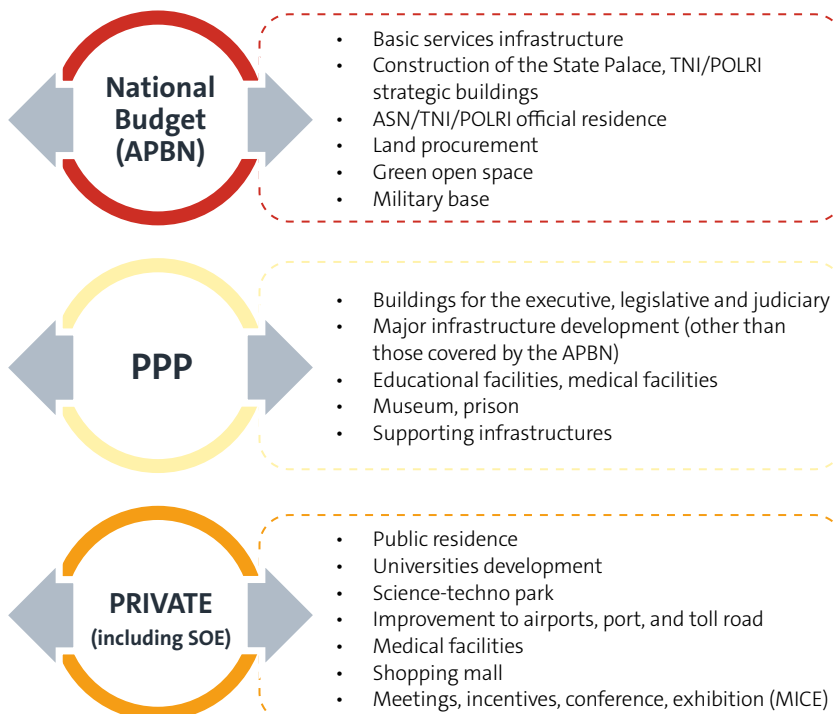
Not including other costs required for the capital move: GoI operational cost during construction; GoI operational cost during transition.

Diagram 3: Allocated projects per source of fund²⁰

SOURCE OF FUND

19.2%	6.3 B
54.4%	17.9 B
26.4%	8.7 B

PURPOSE



¹⁷ Bappenas Presentation.

¹⁸ Bappenas Presentation.

¹⁹ Bappenas Presentation.

²⁰ Bappenas Presentation.

PPP takes centre stage in the Gol's current planning due to its perceived appeal for delivering projects which are developed and financed by the private sector with the support of (but limited risk exposure for) the government.²¹ To attract private investors and facilitate financing solutions, the existing PPP regulatory framework includes various incentives which can be deployed by the Gol, such as direct monetary compensation in the forms of viability gap fund and availability payment, and a government guarantee provided through the Indonesia Infrastructure Guarantee Fund (IIGF) which is a state-owned enterprise tasked to provide payment guarantees for private participants to PPP projects.

So far, Bappenas has been taking the lead on the planning for the move, having conducted four formal market soundings and providing updates to businesses and the general public. The Ministry for Agrarian Affairs and National Land Board (BPN) is meanwhile busy with the land preparation at the new site, which mainly consists of "state-owned land" from repossessed plantation concessions.²² Other ministries and public offices are also contributing to the preparation of initial feasibility studies and planning efforts such as the Ministry of Finance and the Ministry of Environment and Forestry.²³

Based on the initial announcement of the move made by President Jokowi on 26 August 2019, Bappenas appears to be targeting the completion of the initial masterplan, urban design, and building design within 2020.²⁴ A bill to promulgate the new

site as the future capital is also expected to be submitted to Parliament before the end of 2019, with no meaningful opposition expected considering Jokowi's strong support in the current house of representatives. There are two scenarios currently on the table: either moving the entire existing national civil service workforce (involving the executive, legislative and judiciary as well as the armies and police general staff) in one go; or to re-size the civil service workforce before the move. Based on current estimates, the first scenario would involve the resettlement of approximately 1.1 million people with an initial population of the new capital estimated to be around 1.5 million, while 690,000 would take part in the move in the second scenario with a total city population just shy of 900,000. Based on these projections, the move being contemplated by the Gol appears to be on a much larger scale than similar enterprises undertaken by other countries in the past decades (such as the capital moves to Brasilia, Islamabad, Abuja, Astana and Naypyidaw).

What opportunities for this mega project?

Based on current plans, the Gol has identified specific types of infrastructure which need to be developed and funded by the private sector (see diagram 4). These include key government buildings, diplomatic quarters, education and healthcare facilities, power generation and transmission, roads and transportation infrastructure, water treatment and distribution, waste treatment facilities, etc.

The table below illustrates the different stages of the move (from planning to operation) and the relevant opportunities available for the private sector.

21 Bappenas Presentation.

22 <https://money.kompas.com/read/2019/09/19/155117526/lahan-ibu-kota-baru-disebut-tanah-sukanto-tanoto-ini-penjelasan-bappenas?page=all>

23 <https://www.bappenas.go.id/files/diskusi-ikn-2/PERSPEKTIF%20LINGKUNGAN%20HIDUP%20DLM%20RENCANA%20PEMINDAHAN%20IKN%20edit4%20share.pdf>

24 <https://www.voaindonesia.com/a/jokowi-resmi-putusan-ibu-kota-negara-pindah-ke-kalimantan-timur/5056949.html>

Diagram 4: Business/Investment Opportunities during the Stages of the Capital Move²⁵

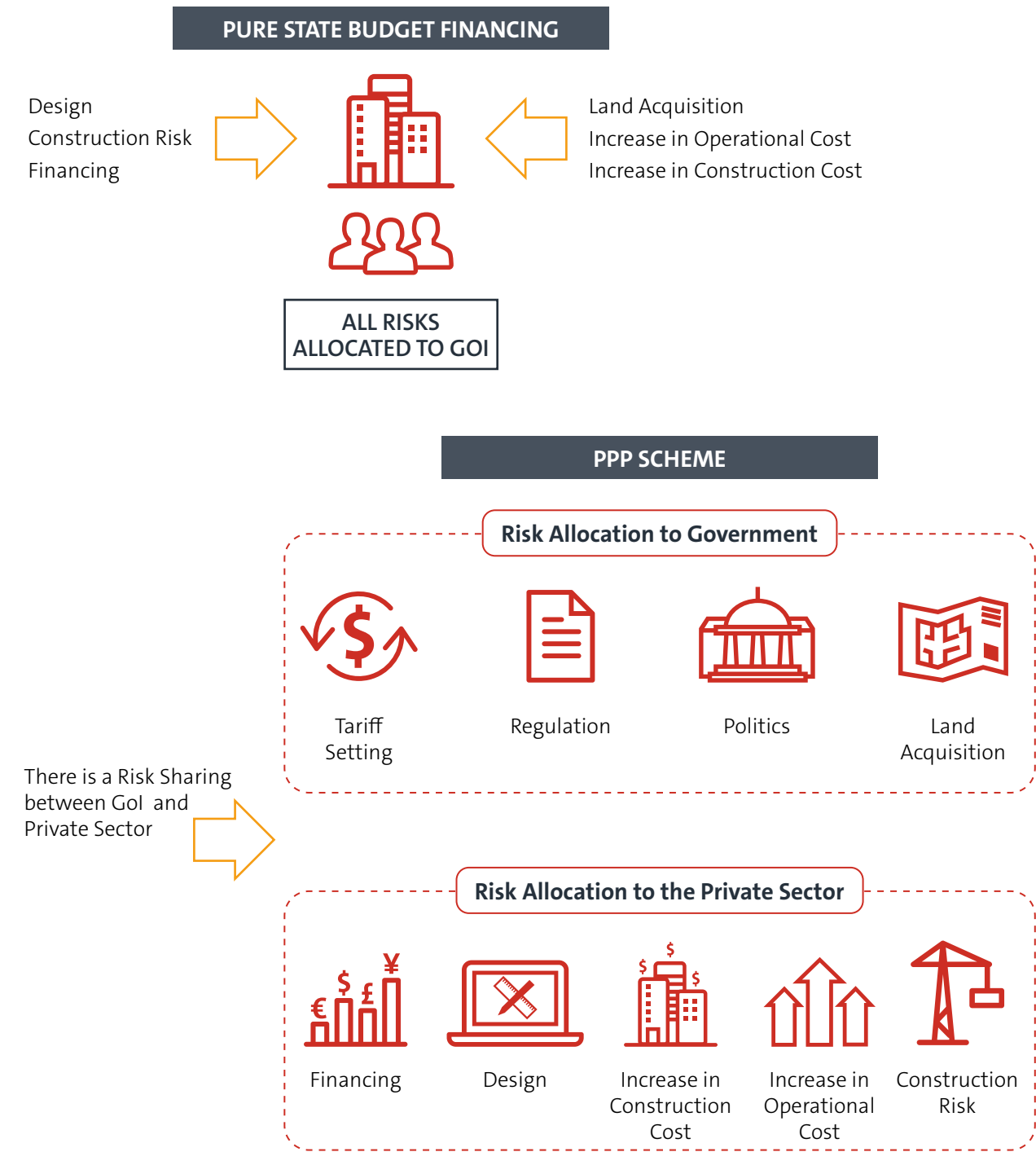
Planning Phase	Construction Phase	Operational Phase
<ul style="list-style-type: none"> Drafting of the Environment Impact Assessment Drafting of the DED (Outline business case, final business case and PPP tender documents) 	<ul style="list-style-type: none"> Central Government Building (legislative, executive, judiciary) Official residence for civil service & Armed Forces/Police Diplomatic Compound Education Facilities Health Facilities Museum Development of road network, power plant and electricity grid, telecommunications network Integrated waste management facilities Drinking water supply and treatment system, solid waste system, drainage system Green open space 	<ul style="list-style-type: none"> Public residence Cluster Universities Airport/port development Meetings, incentives, conference, exhibition (MICE) Science-techno park Shopping mall
Short Term: Planning and Construction Phase		Long Term: Operations of the new capital, Development of Local Economy and Hi-tech and Clean Industries

25 Bappenas Presentation.

The plans include the creation of Indonesia’s first consumer gas line, as well as the intention that the city will be largely powered by renewable sources of energy. To this effect, the Gol and PLN (the state utility company) are planning the development of a large scale hydro power project in the province of East Kalimantan to provide some of the base load required.

Based on Bappenas’ plans, it would seem that the Gol is conscious of the need for the relevant investment opportunities earmarked for the private sector to be suitable and offer a reasonable risk allocation and return on investment. In a detailed presentation given in September 2019 by Bappenas to other government stakeholders on the latest status of planning, Bappenas appears to map out the basic risk allocation between the public sector and the private sector as reflected below:

Diagram 5²⁶

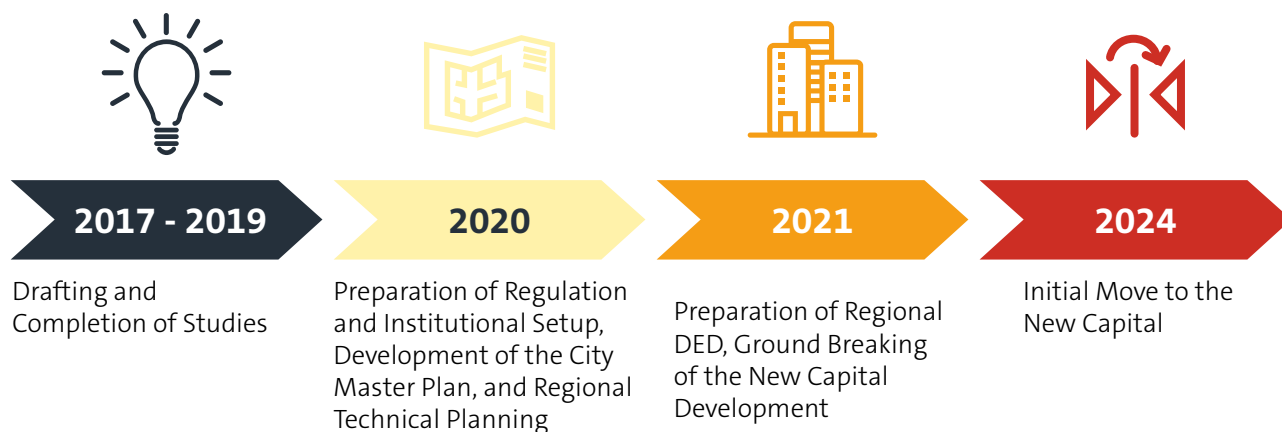


26 Bappenas Presentation.

Timeline

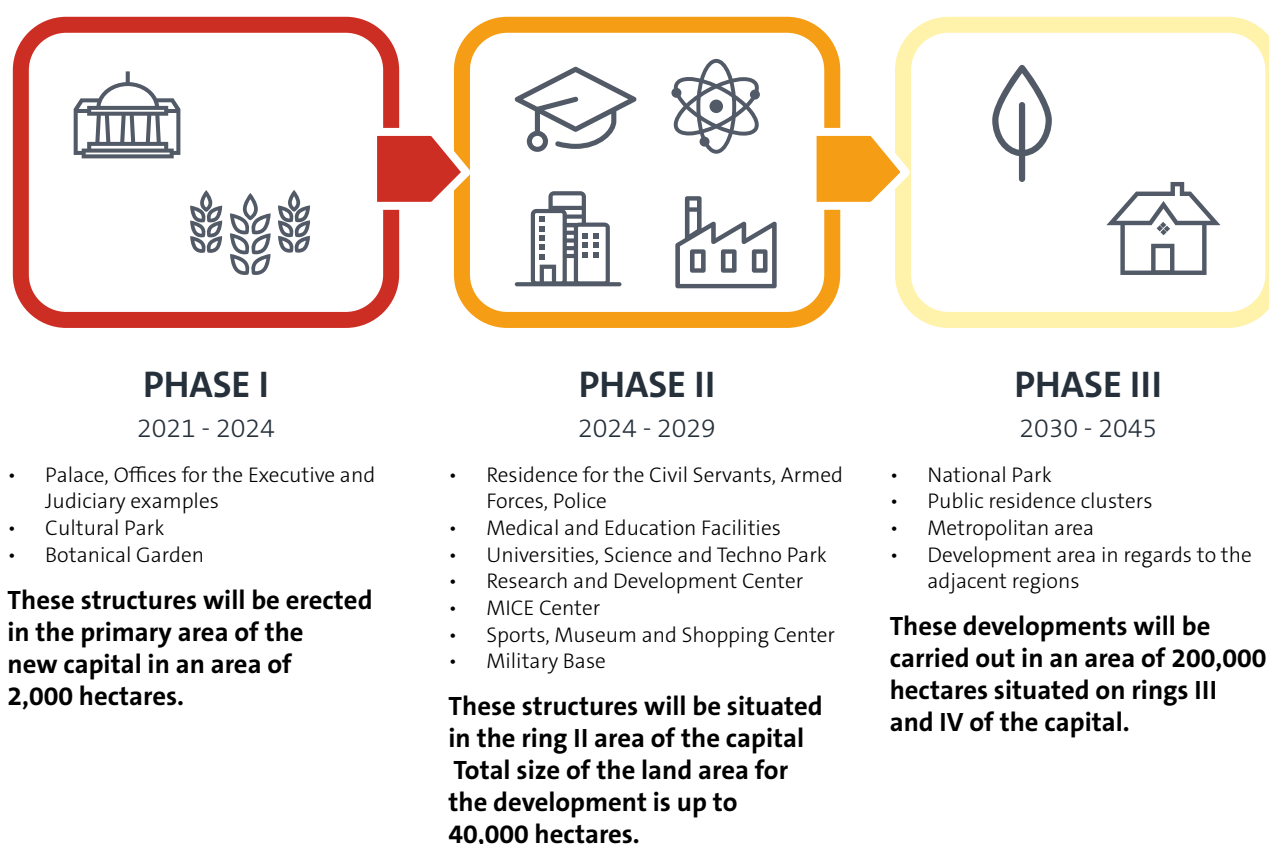
Bappenas has published a provisional timeline for the capital move by the end of President Jokowi's second term in office in 2024:²⁷ Based on this ambitious timeline, 2020 would be dedicated to detailed planning and to the issuing of the required regulatory framework for the move, while the period between 2021 and 2024 would involve construction at the site in East Kalimantan with the actual move being initiated in 2024.

Diagram 6: Timeline for implementing the capital move²⁸



Looking further into the future, certain sources have also identified additional potential work streams well beyond 2024, which is probably more realistic given the magnitude of the task lying ahead.

Diagram 7: Phases of the new capital development



²⁷ Bappenas Presentation.

²⁸ Bappenas Presentation.



Conclusion

The plan is certainly ambitious. But, in contrast to earlier plans to move away from Jakarta over the past decades which were not backed by any form of planning, relevant institutions within the Gol now appear to have engaged with concrete preparations to fast track such move. If the move of the capital does indeed go ahead, this should become one of the largest single infrastructure projects and resettlements ever undertaken. Given the Gol's fairly constrained resources and its stated intention to largely rely on private sources of funding and development, such a mega project should present investors (domestic and foreign) with a myriad of potential opportunities. From master planning to detailed engineering, power generation to water treatment, gas supply to social and transport infrastructure, all of these and more will

be needed to turn 40,000 hectares of largely peat swamp forests into a modern and well-functioning metropolis home to a million people or more. One of the keys to the success of this colossal enterprise will be to establish a visionary development plan which provides for a clear and realistic allocation of scope between the public and the private sectors. The viability and bankability of all investments designated for the private sector will also have to be targeted from the outset in order to be able to mobilise these sources which are primarily (and justifiably) driven by a return on investment.

If the Gol is indeed serious about this plan, it will have to put in place instruments and processes to ensure the smooth tendering and award of the various pieces of this gigantic puzzle to reputable contractors and services providers which are able to deliver quality infrastructure²⁹ for a city that the Indonesian people will be proud to call their capital. It would seem that such planning exercise could benefit from international ideas and best practices and that the Gol would be well inspired to consider running an international competition to develop the master plan for the new capital city.

Only the future will tell whether this grand vision can be fulfilled and the new capital city (yet to be named) will become a blueprint for future urban developments in the vast Indonesian archipelago and, maybe, beyond. A question though remains: is this real and will the move take shape within the term of the second Jokowi administration or is it just another illusion?

²⁹ The Bappenas Presentation includes references to the fact that the new capital 0 will require quality infrastructure and the private sector participants involved should be suitable and dispose of the relevant capacity and track record to develop similar infrastructure.

abbreviations	explanation
ASN	National Civil Servants (<i>Aparatur Sipil Negara</i>)
Bappenas	Ministry of National Development Planning/National Development Planning Agency (<i>Kementerian Negara Perencanaan Pembangunan Nasional/Kepala Badan Perencanaan Pembangunan Nasional</i>)
BPN	Ministry of Agrarian and Spatial Plan/ National Land Agency (<i>Kementerian Agraria dan Tata Ruang/Badan Pertanahan Nasional</i>)
DED	Detailed Engineering Design
Gol	Central Government of the Republic of Indonesia
IIGF	Indonesia Infrastructure Guarantee Fund (PT Penjaminan Infrastruktur Indonesia (Persero))
POLRI	Indonesian National Police Department (<i>Kepolisian Negara Republik Indonesia</i>)
TNI	Indonesian National Armed Forces (<i>Tentara Nasional Indonesia</i>)



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WASTE-TO-WEALTH INITIATIVES:

Part 1: Fuel and Feedstock Resource Recovery – Energy Carriers from Waste

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In our previous articles entitled **Waste-to-Wealth Initiatives – Aerobic and Anaerobic digestion waste projects** we stated that we would consider fuel and feedstock in the next article in the Waste-to-Wealth Initiatives Series, including to address the importance of understanding composition and quantity of fuel and feedstock for the purposes of councils and municipalities contracting for, and increasingly, the private sector, developing, resource recovery projects.

Since the publication of the articles on Aerobic and Anaerobic digestion, there has been a healthy increase in debate and engagement on waste policy, in particular on how to address certain plastics. The debate about plastics needs to be placed in the context of waste generally, and waste in the context of greenhouse gas (GHG) production. In doing so, we continue to illustrate that the macro issues in relation to resource recovery correlate directly with the micro issues for each resource recovery project, specifically projects that derive or produce fuel and feedstock. In this context, the United Nations estimates that through sustainable waste management practices, it should be possible to reduce 15% to 20% of anthropogenic GHG emissions. As with many facts and statistics, this estimate captures the attention. Placing plastics in this context, it is estimated that the life cycle of plastics accounts for 3.8% of anthropogenic GHG emissions. As such, responding to certain plastics as a part of sustainable waste management practices could make a material difference over time. Also, progress on plastics may be regarded as easier to achieve than progress on other waste management practices. It is important that plastics are viewed holistically as

plastics are part and parcel of our daily lives. Not all plastics are “at large” in oceans, waterways, or buried in landfills, many of them are to be found in our homes and workplaces.

In this article we consider fuel and feedstock that can be derived from waste, rather than waste that is used as a fuel or feedstock. As such, this article does not cover the use of fuel or feedstock to fire waste-to-energy/energy from waste projects. Until relatively recently, “waste-to-energy” and “energy from waste” have been used interchangeably to refer to projects that use waste delivered directly from collection (or possibly via a transfer station) as fuel or feedstock to generate electricity or to produce heat, or both. Increasingly, the phrase “energy from waste” (or EfW) is being used by policy makers to refer to and include the processing and treatment of waste to derive or to produce materials (energy carriers) that can themselves be used as fuel or feedstock. Energy carriers include gas (biogas⁷ and synthetic gas⁸), liquid fuel and feedstock (including from refining of dry organics) and solid fuel (for example, biomass and PEF, RDF and SRF). In the lexicon of some policy makers waste to energy has become a subset of energy from waste. For the purposes of this article, we do not conflate waste-



to-energy and energy from waste, rather we consider the derivation and production of energy carriers, which are themselves fuel or feedstock, in contrast to the use of waste as fuel or feedstock.⁹

Given the breadth of the current debate, particularly as it relates to plastics, the co-authors decided to make this a two-part article.

Part 1 of this article covers:

- a. in **section 3.2**, the continued importance (some may say the increased importance) of effective policy for deriving and producing energy carriers, and more broadly to increase resource recovery;
- b. in **sections 3.3 to 3.6**, the feedstock that may be used to derive or produce fuel and feedstock from waste (including the means of derivation and production to achieve a closed loop); and
- c. in **section 4**, the key commercial and legal issues in the derivation and production of energy carriers, including the **Four Cs**¹⁰

Part 2 of this article will cover the means of deriving and producing energy carriers (critically the technologies that are used), including the technologies used for each feedstock, and the commercial and legal issues that arise in respect of each feedstock. In doing so, we will consider Fuel Crops, which are crops grown specifically as fuel or feedstock. The co-authors will consider the convergence of technologies, including those to derive/produce hydrogen from waste and include comparison to the refining industry.

Also Part 2 of this article includes details of the means used to recycle plastics, typically shredding to create shredded plastics or granules, which are dried and then melted with the resulting

molten plastics separated, higher value to lower value.¹¹ We will also consider plastics in detail: certain plastics do more harm, have lower life cycles, release methane more readily than others and/or have little or no value; some plastic bags fit all of these characteristics and, perhaps surprisingly, so do “compostable plastics” arising in a region without access to the necessary industrial recycling facilities.¹² In addition, some plastics are difficult to recycle and have lower values. For example, rigid plastics including those containing calcite, which may add rigidity to the plastic but subtracts from value (because calcite affects recyclability). Part 2 of this article looks at these issues in more detail and, taking our theme of macro to micro, the types of technologies that need to be used in resource recovery projects to achieve the sought for policy outcomes.

While the “facts and stats” about plastics can be sobering, and, for some, resulting in a conclusion that it is all too hard, the awareness and debate about plastics is starting to have a positive effect: in 2019 Finland re-cycled plastics within two to three times the rate of 2018, and large consumer products corporations (such as Nestle) are acting to respond on plastics.

2. OUTLINE OF THIS ARTICLE

With the increased debate around waste policy, certain plastics have come to the fore in discussion.¹³ The frame within which resource recovery from waste is considered has consequentially become clearer and more concise: certain plastics pollute waterways and oceans¹⁴ and, depending on the environment in which they are disposed, release carbon dioxide and methane as they degrade.¹⁵ The production of plastics depletes hydrocarbons in an energy-intensive process¹⁶ which generates GHGs.



Disposing of plastics to landfill contributes over time to the release of landfill gas (LFG)¹⁷ emissions (although not to the same extent as putrescible waste because the degradation of plastics takes considerably longer): it is important to understand that landfilling plastics does not constitute the creation of a “carbon sink” for plastics as may be implied and as some have asserted. Furthermore, as plastics degrade, depending on the environment and their chemical composition, they can leach into groundwater and soil as a result of comprising part of the leachate from landfill.¹⁸ Part 2 of this article will consider plastics (including compostable plastics) and resulting micro-plastics.¹⁹ This said, while the increased awareness of plastics is good, we need to continue to increase awareness on climate change. Plastics contribute around 3.8% of anthropogenic GHGs, we need to continue to have regard to the other 96.2% of anthropogenic GHGs.

While the fuller narrative is more nuanced, this understanding frames how policy may (and should) develop. While market solutions may be preferred, they cannot be relied upon. In particular they cannot be relied upon to place value on the collection and recovery of waste (including plastics): our experience informs our perspective, which is that market solutions arise within a policy framework that places value on and maximises resource collection and recovery. This framework should consider how to reduce, and over time how to avoid, producing plastics that cannot be, or will not be, recycled, thereby maximising collection and recovery (and therefore processing and treating) of recyclable plastics. Importantly, any reduction or avoidance of plastics production must occur in the context of their being replaced by a sustainable alternative, being an alternative that is both sustainable environmentally and affordable.

This will allow more plastics to be recycled, processed and treated before or at the “end of life” to derive or produce products which will, in turn, reduce hydrocarbon depletion and encourage

movement towards alternatives to plastics with improved recyclability. Ultimately, though the move to any sustainable alternative is the likely policy outcome, this outcome must be balanced with the need to abate GHG production.²⁰ Similar policy issues arise with all waste streams, not just plastics. There is however a balance to be struck; the private sector is developing new uses for recycled plastics, including for use in structural building products (to displace steel and timber) and for use in the motor-vehicle industry. The investments made by the private sector to increase levels of recycling need to be encouraged, in particular if the net effect is a reduction in hydrocarbon use and GHG production.

Helpfully, the debate about waste policy is increasingly being framed in balanced terms across the resource recovery sector generally, including with regard to the need to achieve closed loops²¹ (within circular economies)²² and higher order waste management hierarchy outcomes, characterised by a movement towards “zero waste” policy outcomes.²³ It is important, however, to have in mind that no matter how efficient resource recovery becomes, there will always remain residual material from resource recovery, and as such there will always be a need to dispose of that residual material. Applying the logic of the waste management hierarchy, residual material should be treated using a waste-to-energy facility (WtE Facility), rather than being disposed of to landfill.

Increased granularity in this debate facilitates more informed decision-making, including to increase awareness of the need for balanced policy so as to achieve the policy trifecta: first, to reduce and to avoid waste over time; second, to achieve resource recovery and the derivation or production of products in a manner that avoids or minimises the production of GHGs; and third in all stages (production, collection, processing and treatment, and disposal) to maximise resource recovery and avoid or minimise adverse environmental and health and safety impacts.

3. OVERVIEW OF FUEL AND FEEDSTOCK FROM WASTE

3.1 Waste as fuel and waste as feedstock for the derivation/production of fuel and feedstock

Deriving and producing fuel and feedstock from waste continues to be an area in which progress is made, both in terms of increased activity and technology options.

Figure 1 summarises at a high level the key types of primary waste from which fuel and feedstock may be derived and produced. In this context we are considering the fuel and feedstock that can be produced *from* waste when it is processed (i.e. the products produced after processes in a facility). This is distinct from the use of waste as the primary fuel or feedstock used for the purposes of waste-to-energy projects.

It appears to us that progress has been accelerating and is likely to continue with increased understanding of the waste streams from which energy can be recovered and from which fuel and feedstock can be derived and produced, and the implications of doing so. One reason for this progress is the ever-increasing awareness of the actual and potential adverse impacts of waste

production, collection, processing and treatment. However, the key reason for this progress is the development and implementation of policy, including in the form of grants, subsidies and tax incentives, and landfill/waste levies (and other means of ensuring that the costs of disposal, rather than resource recovery, are imposed and calibrated), as well as policies that give value to different parts of the waste stream.

3.2 Facts and statistics: a starting point

How much plastic is out there?

Some information contains compelling facts and statistics. For example, it is estimated that more than 8 billion metric tonnes of plastics have been produced, and that more than 6.2 billion metric tonnes of plastics have been thrown away. These are estimates, and given current facts and statistics on the rates of current production of plastics, it may transpire that these are underestimates and the co-authors suspect this to be the case: the current best estimate appears to be that around 0.3 billion metric tonnes of plastic are produced each year, and that the rate of production is increasing. What should be clear however is that the best part of 2 billion metric tonnes of plastics remain in use,

Figure 1

Waste Stream	Aerobic Digestion: Derives/ Produces: Compost/RDF	Anaerobic Digestion: Derives/ Produces: Biogas/Bio-fertilizer	FOGO Compost/ RDF	MBT – Compost, Mixed Organics/ RDF	MT Compost, Mixed Organics/ RDF	Dry MRF: Devires / Produces: Recyclables	Dirty/ Wet MRF Derives/ Produces:	C&I Facility	C&D Facility
MSW	X	X	X	✓	✓	✓X	✓	X	X
C&I Waste	X	X	X	✓	✓	X	✓	✓	X
C&D Waste	X	X	X	X	X	X	X	X	✓
Events Waste	X	X	X	✓	✓	✓	✓	✓	X
E-Waste	X	X	X	X	X	X	X	X	X
Food Cycle Waste	✓	✓	✓	✓	✓	X	X	X	X
Food Organics	✓	✓	✓	✓	✓	X	X	X	X
Green Waste	✓	✓X	✓	✓	✓	✓X	X	X	X
Agri and Farming	✓X	✓X	✓X	✓	✓	X	X	X	X
Forestry	✓	✓X	✓	✓	✓	X	X	X	X

including in our homes and workplaces, motor vehicles, and so on. There is more certainty as to current plastic production. This is a good thing, because it is possible to capture these plastics.

The issue is how to capture and to control the life cycle of plastics (both existing and those to be produced), not the production of plastics as such. It is estimated by The World Economic Forum that around 30% of plastics “leak” from collection and recovery systems in the sense that they are unaccounted for, and as such may be assumed to be at large in the environment or landfilled. Given the level of resource recovery of plastics, we suspect this figure may be higher.

Some plastics are more likely to leak than others. It is estimated that 1 million plastic bottles are purchased every minute. Coca-Cola makes 200,000 bottles every minute.²⁴ A key issue is how many of these bottles are collected and recovered for recycling and having been recovered how many are made from recycled plastic (and in due course how many of the bottles made from recycled plastics, will themselves be recycled). An estimated 24.2 billion pairs of shoes were made in 2018, a fair proportion of them manufactured from plastics. An estimated 1 billion tooth brushes were thrown away in the United States in 2019.²⁵ These are examples of every day products made from plastic that are difficult to re-cycle, and in respect of which over time sustainable alternatives, and respect of which there is no current waste management system solution to re-cycle.

It is estimated that between 9% and 9.5% of all plastics produced have been recycled. This estimate appears to be reflected in some current statistics, with less than 10% of plastic bottles being currently recovered as a resource for recycling. In jurisdictions with developed waste collection and management systems, the levels for recovery of plastics for recycling can be within the 10% to 15% range.²⁶ Even in jurisdictions in continental Europe with the most

developed waste collection systems, the rate of collection/recovery of plastics hovers around the 30% mark.

Perspective is needed

Some compelling facts and statistics need further analysis to avoid overstatement, in particular the contribution of plastics producers to GHGs. This analysis is important to ensure that policy is calibrated appropriately. Critically, there is also a need to concentrate on “difficult” plastics, particularly those used in food packaging (and packaging generally), coloured plastics and hard plastics.

This is not a petrochemical industry issue it involves all industries.

Close to home, plastics is an issue for the food industry (agricultural farming, wholesale and retail), and consumer goods industry, specifically it is an issue that goes to the balance each industry seeks to achieve – to be environmentally responsible and to deliver food/consumer goods at a price and of a quality acceptable to consumers. Of particular focus in seeking to achieve this balance is the relevance of packaging to the plastics debate. While there is increased consumer awareness, ultimately the use of containers and packaging is a choice and cost issue, at its most basic, whether consumers will pay for alternatives. The introduction of and access to sustainable alternatives requires the support of policy to require or to incentivise payment for them. Furthermore, it is not a simple substitution in any instance. For example, replacing plastics with aluminium or glass for beverages and drinks is not as simple a solution as it may appear, because aluminium cans and glass bottles are both energy intensive, in production and transportation. As we note above, there is a need for balance, and over time this is a renewable and sustainable solution.



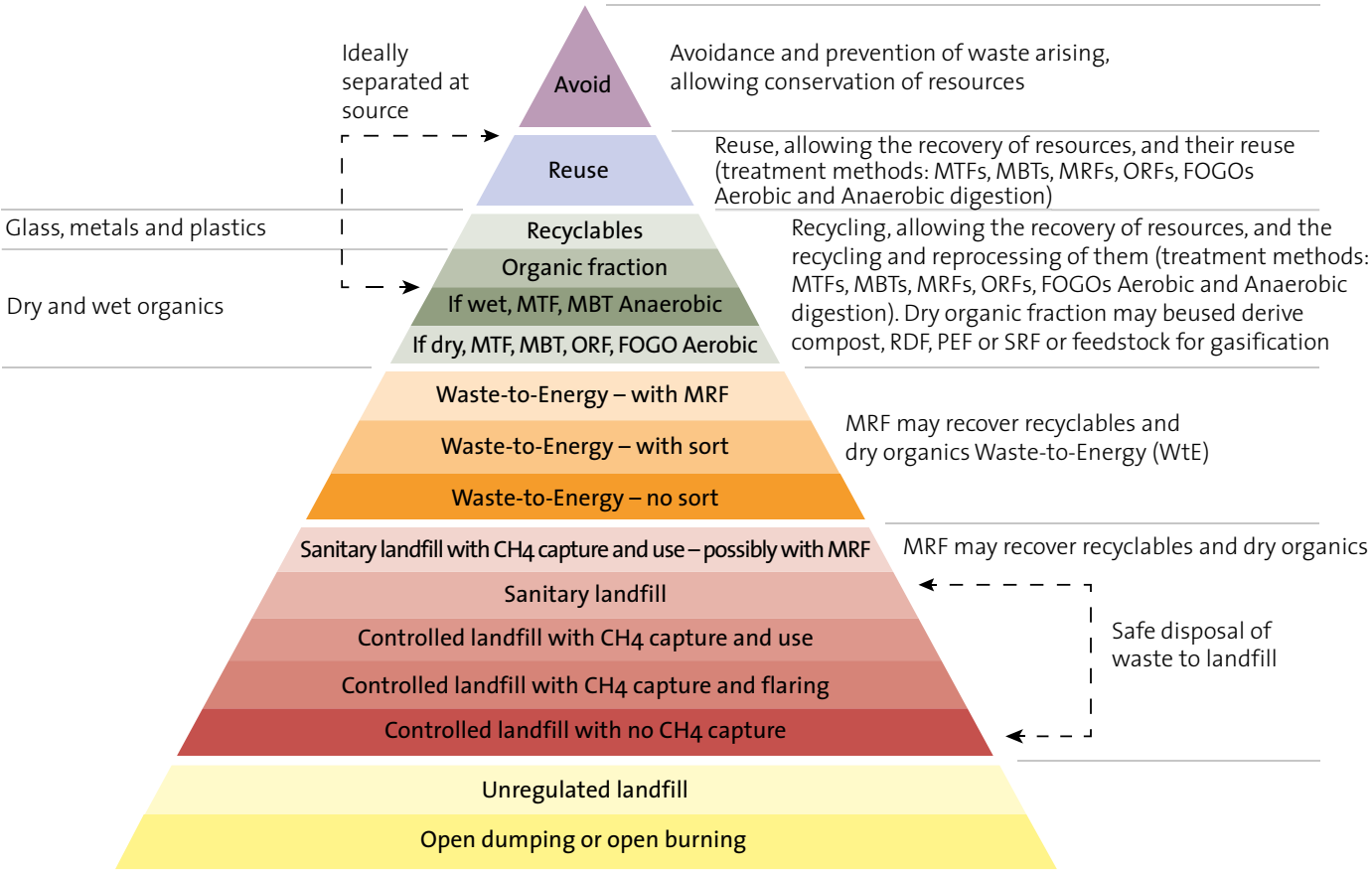
It is important to note that the building and construction, and the motor vehicle and IT industries as large users of plastics have a key role to play in the use of plastics that can be recycled, and in some ways the motor vehicle and IT industries may have a residual value role to play in the context of the recycling of vehicles and IT hardware produced by industry participants.

Policy and the Waste Management Hierarchy

The Waste Management Hierarchy suggests that we move toward avoiding the production of plastics. This requires time, although in some jurisdictions such a move is underpinned by law in respect of some plastics. For example, the phasing out of single use plastics (being plastics that are used once before disposal by the user).²⁷ Also, it is important that policy does not result in all plastics being used as feedstock to derive or to produce energy carriers: again applying the logic of the Waste Management Hierarchy, ideally, policy will result in the production of plastics being avoided, as sustainable (and as such affordable) alternatives to plastics are developed over time. Plastics will continue to be produced and ideally policy will promote maximisation of recycling and reuse prior to being used as feedstock to derive or to produce energy carriers.

Plastics at large in the environment

Figure 2 – Waste Management Hierarchy



While many facts are compelling, they do not of themselves allow us to understand the quantity of plastics that may be recovered from the environment (including oceans and waterways) and, following recovery, the quantity of that plastic that may be processed and treated.

For example, it is estimated that the mass of the “Great Pacific Garbage Patch”, being the mass of plastic floating in the Pacific Ocean (covering an area estimated to be twice the size of Texas), is around 87,000 metric tonnes. This mass is less than is required as feedstock each year for some energy carrier resource recovery projects to produce liquid fuel from plastic²⁸.

In contrast, Unilever²⁹ produces 700,000 metric tonnes of new plastics a year. If Unilever increases its use of plastics derived from recycled plastics and is able to create a closed loop of all its plastics, we move to a policy framework that may be described as “capturing the life cycle of plastics”.

This is not to say that the plastic constituting the Great Pacific Garbage Patch (and other plastic pollution) should not be recovered. It should be. Of the 300 million metric tonnes of plastic is produced each year, it is estimated that between 8 to 15 million metric tonnes of plastic finds its way into waterways (and some ultimately into oceans), with the majority of this comprising



plastic containers and packaging. But the recovery of plastics from waterways and the oceans, it a small (albeit important) part of the broader capture of plastics³⁰.

The role of policy and the market

It is logical to conclude from these facts that policies are needed to increase the collection and recovery rates for plastics so that this does not eventuate. The recovery of plastics from our oceans and waterways must be an effort driven by policy makers to limit further environmental harm, as the market is not well positioned to address this issue. By seeking to “capture the life cycle of plastics”, policy makers will also recapture the material value of plastics which is lost to the economy after their first use.

This framework will allow market solutions to develop in the form of recycling facilities and facilities to produce liquid fuels as captive plastics reach the optimal point in their life cycle. But this framework does not ensure that all plastics that are collected and recovered will be delivered for recycling or to produce liquid fuels. As yet, legal and policy frameworks are not sufficiently developed in any jurisdiction to ensure that all plastics collected and recovered are delivered for recycling or the production of liquid fuels³¹. Some jurisdictions have policies to increase collection and recovery rates. Policies of this kind need to be “bookended” with legal and policy frameworks that ensure that plastics that are collected and recovered remain captive, rather than being delivered into landfill.

If the challenges identified with plastics are to be addressed, it is apparent from the above that two distinct steps are required:

- first, the recovery and collection of plastics from our waterways and oceans to address environmental and public

health, safety and welfare concerns, and

- secondly, “capturing the life cycle of plastics” to ensure that plastics do not find their way into our waterways **and** oceans and are not delivered to landfill, so as to create a closed loop for plastics.

In addition to “capturing the life cycle of plastics” (and ensuring that plastics remain captive), ideally the policies to achieve this will give value (which is both an absolute and relative issue) that will be recognised by the market so as to encourage:

- the delivery of plastics to recycling facilities or liquid fuel producers (to realise the benefits of scale); and
- the derivation and production of products, including liquid fuel produced from plastics,

which will, in turn, increase the rate of collection and recovery of plastics by the market.

The increasing debate promotes discussion about a broad range of policies. In addition to policies that give value to encourage outcomes, policies are being suggested that require the manufacturers and the major users of plastics to be directly responsible for the life cycle of the plastics that they sell, or to be indirectly responsible through the payment of a levy to fund the collection and recovery of plastics and subsequent recycling of those plastics. Others have enlivened the idea of imposing fines and penalties on those that frustrate collection and recovery, from households to commercial and industrial enterprises.

Each jurisdiction has its own circumstances, but as a general statement, “giving value”³² will lead to market solutions, and the market will extract and maximise value. Over time and given the right signals, the market will develop alternatives to plastic.³³

3.3 Resource Recovery

It is possible to assess waste arising and resource recovery in a number of ways. We have chosen to assess these matters in the context of an urban environment (**section 3.4**) and non-urban environment (**section 3.5**).

In doing so, we seek to emphasize the importance of transportation, both for processing and treatment and then onto market. Transportation is both a cost issue and a GHG issue.

3.4 Waste arising in urban setting

(a) The urban ore body

As we stated in the first article in this series (entitled **Waste Projects**), “waste provides a resource that can be “mined”³⁴ and otherwise used to avoid or to reduce contamination and emissions – effectively “an urban ore body””. But what does this mean in practice? In the context of an increasing population and urbanisation (and increased disposable income and consumption), urban populations give rise to large amounts of waste of different kinds. In jurisdictions that have reached peak urbanisation and which possess more developed waste collection systems, the proportion of the waste arising that is collected and recovered is generally highest. Collection and recovery of waste allows it to be processed and treated.³⁵

The greater the level of collection and recovery of waste, the greater the opportunity to process and treat waste to achieve the desired policy outcomes, including Zero Waste outcomes. The quality of what is collected (and its level of contamination of it) is key. The segregation/separation at source is also key: experience has shown that the greater the value ascribed to plastics (and containers generally) the greater the level of collection, and the higher the quality of the plastics (and containers) collected. If the waste collected and recovered is disposed of to landfill, to the extent that the waste comprises organic material that material will decompose, and as it decomposes will give rise to fugitive LFG emissions (comprising predominately carbon dioxide and methane, the principal GHGs). These emissions will escape to the atmosphere and, depending on the engineering of the landfill and the geology on which it is located, leachate may contaminate soils and groundwater. To the extent that the waste delivered to landfill contains plastics, these plastics will break down over time and will release methane. While increasingly effective systems have been developed to capture LFG from landfill, even the most advanced systems do not recover the majority of LFG produced, and as such in most instances considerably more than half of the LFG is released as fugitive emissions contributing to GHG emissions.

There are many means to ensure collected and recovered waste is reused and recycled or, where this is not possible (including where plastics have reached the end of their life cycle), treated and processed to derive useful products. For example, if the waste collected is organic and therefore not capable of reuse or recycling, it can be treated to derive other products including gas³⁶ or mixed organic material. Other types of waste not capable of reuse or recycling can be treated, for example, thermally in a WtE Facility. The resulting bottom ash can be used as a base for road and construction materials and the fly ash can be used in construction materials, including to increase the performance of concrete.

(b) Categories of waste in urban environments

(i) What are the waste streams?

A number of waste streams arise in urban environments, principally municipal solid waste (MSW),³⁷ commercial and industrial waste (C&I Waste)³⁸ and construction and demolition waste (C&D Waste).³⁹ Each waste stream has a different composition and different fractions of waste within it.

Depending on the country in which the waste arises, typically MSW is often the smallest proportion of the waste arising, next C&I Waste, with C&D Waste making up to two thirds of waste (and in some countries more) arising (by mass) in some countries. It is estimated that globally between 7 to 10 billion metric tonnes of MSW, C&I Waste and C&D Waste arises each year, with by far the greatest percentage by mass being C&D Waste.⁴⁰ In Part 2 of this article, we will take a more detailed look at a number of jurisdictions to consider the fractions of waste arising, and how this correlates to the technologies used in that jurisdiction.

The processing and treatment of these three categories of waste is critical. Of the other categories of waste arising in urbanised areas, *Events Waste*⁴¹ and *Green Waste*⁴² can be processed and treated using technologies used to recover resources from MSW and C&I Waste.

*E-Waste*⁴³ is increasingly being addressed through prescribed processes and treatment. Of the jurisdictions collecting and recovering e-Waste, the quantities being collected and recovered are increasing. This said, only around 20% to 22% of e-waste is being collected and recovered. By 2021, a projected 52 million metric tonnes of e-waste will be generated globally each year.⁴⁴

Within MSW and C&I Waste, there will also be *Food Cycle Waste*,⁴⁵ principally from the preparation and consumption of food (giving rise to Food Organics).⁴⁶ Food Organics contains a wet/wetter organic fraction comprising organic matter that is predominantly derived from the preparation and consumption of food, which may be used as feedstock for production of biogas⁴⁷ (using anaerobic digestion (AD) technology), but given the risk of contamination it may be regarded as unlikely that MSW and C&I Waste that is not predominantly organic will be used as a source of feedstock for AD.

(ii) Energy from urban waste streams

The production of biogas is more likely from a single source of biomass,⁴⁸ although sometimes from multiple sources (called co-digestion)⁴⁹ that are not derived from MSW or C&I Waste. This said, C&I Waste comprising a separated wet organic waste stream may offer opportunities for the production of biogas. *Garden Waste*⁵⁰ (a sub-set of Green Waste) may be comprised in MSW or separated at source (in the “green bin”). Garden Organics comprise a dry/drier organic fraction which may be used as feedstock for production of compost or mixed organic material,⁵¹ which may be used as feedstock for compost⁵² or blended to produce solid fuel. MSW and C&I Waste will also contain recyclables⁵³ including card, paper, textiles and wood, and plastics.

Depending on the quality of the feedstock, solid fuel may be produced. Solid fuel includes refuse derived fuel (RDF),⁵⁴ process engineered fuel (PEF),⁵⁵ and solid recovered fuel or specific recovered fuel (SRF).⁵⁶ RDF tends to describe a lower calorific value solid fuel



(that is not processed) that may be used as a substitute for, or may be blended with, coal. PEF and SRF tend to be used to describe a higher calorific value solid fuel that have been processed to produce such calorific value and in some instances well defined specifications, including as to calorific value, chlorine content, ash and moisture content, and particle size, for use in cement kilns.

Within MSW, C&I Waste and C&D Waste there is likely to be a dry organic fraction comprising timber and wood. Increasingly, this organic fraction is being considered as a possible source of feedstock for the production of syngas from which liquid fuel may be derived, and projects are being developed for this purpose. At the moment there is a limited number of jurisdictions in which production of fuels and feedstock from timber and wood may be regarded as viable, being jurisdictions in which policy incentives reward this production, and allow the relatively high levels of capital investment to earn an appropriate rate of return. This said, we are aware of a number of corporates considering use of timber and wood residue to derive feedstock. Given that this dry organic fraction is within existing waste streams, depending on the waste stream, integration into a dirty/wet MRF or a dry MRF may be required to extract this fraction, C&D Plants may recover wood waste. While there are established technologies to derive syngas and liquid fuel from waste, those technologies are able to progress to full commercialisation in jurisdictions with appropriate policy settings.

There will also be a plastic fraction within MSW, C&I Waste and C&D Waste. In developed waste management systems, recyclables (including plastics) may be separated at source by households and individual businesses or otherwise at a sorting facility. If waste is separated at source, the plastics collected and recovered may be recycled mechanically to produce feedstock to derive recycled plastics, or may be treated chemically to derive liquid fuel or liquid feedstock, for example, synthetic crudes (syncrudes) that can be used for the production hydrocarbon products, including new plastics, and heavier hydrocarbon derived products. If there is no separation at source, plastics will be found in the MSW, C&I Waste, and C&D Waste. MTs and MBTs (with dirty/wet MRFs) are able to sort plastics. C&D Plants are able to recover the plastics (typically conduits and pipes, but also fittings).

(iii) Waste arising in urban environments and WtE Facilities

MSW and C&I Waste are the primary fuel source/feedstock for many thermal treatment WtE projects, and increasingly the dry organics from C&D Plants provide feedstock for wood waste projects, which we considered in detail in an earlier article in the series (entitled **Waste-to-energy Projects**).

WtE projects are able to process and to treat the broadest range of waste arising in an urban environment. In the context of the increasing global population and increasing urbanisation, WtE



projects may be regarded as offering a relatively cost-effective means of addressing adverse outcomes and avoiding uncontrolled GHG emissions.

In the context of the Waste Management Hierarchy, there is a balance to be struck between resource recovery and the use of WtE projects. This gives rise to a number of issues, including cost and affordability of other resource recovery projects when compared to WtE projects, which can be more cost-effective. In some jurisdictions, WtE projects may be preferred to landfill for the disposal of residual material discarded by other resource recovery technologies, or the disposal of materials from which it is not possible or cost-effective to recover resources.

(c) Municipal Solid Waste

By 2025, it is estimated that between 2.2 billion metric tonnes and 2.4 billion metric tonnes of MSW will arise globally each year (or between approximately 6 million metric tonnes and 6.6 million metric tonnes a day).⁵⁷

It is also helpful to understand and to reflect that it is estimated that the world will not reach the peak urbanisation and as such peak MSW arising until the twenty-second century. Given experience gained in developing waste collection systems, the ability to separate at source, and the ever increasing range of technologies available to recycle, process and treat MSW means that well before the twenty-second century, it is likely that we will be able to achieve

policy objectives such as Zero Waste on a consistent basis. Our assessment is that with increasing urbanisation globally, the most pressing need is for the increased and effective collection and recovery of MSW.

Effective collection and resource recovery requires effective, and ever improving, waste management systems. It is estimated (conservatively we suspect) that currently, in respect of 2 billion people worldwide, there is no waste management system at all and, in respect of 3 billion people, that there are no effective controlled waste facilities.

The absence of sufficient waste facilities is not an abstract concept. In Lebanon in 2015, the management of MSW reached crisis point, with waste collection being suspended and waste not collected (and piling up) around the Beirut and Mount Lebanon region because of the closure of the Naameh landfill. Although the Naameh landfill was established in 1997 as a temporary waste solution, it reached capacity prior to its closure in 2015 and a long term controlled waste facility or other solution was not developed in the interim. An ineffective waste management system continues to plague Lebanon, with a similar situation arising in northern Lebanon in 2019 with the closure of the unregulated Aadoueh dumping site and citizens resorting to burning waste to control overflows, despite the enactment of a national law in October 2018 prohibiting the practice.



(d) Commercial and Industrial Waste⁵⁸

In the context of the increased disposable income and consumption attendant on increased urbanisation, the quantities of C&I Waste arising are increasing. For the purposes of comparison with MSW, in many jurisdictions C&I Waste gives rise to a higher proportion of waste than MSW in the urban environment.

Commercial and industrial enterprises produce waste (often in environments in which it is possible to control the collection and recovery of waste) and consume directly and indirectly recycled products (and energy carriers). Given these factors, commercial and industrial enterprises have an increasingly critical role to play in the collection and recovery of waste, and deriving value from resources recovered from that waste.

From a policy (and practical) perspective, commercial and industrial enterprises are probably best placed to put in place and to implement best practice collection and recovery waste management systems to increase collection and recovery rates, and as importantly to pass on to consumers the costs of implementing those best practices. This will lead to the creation of closed loops (including through the use of recycled products). Commercial and industrial enterprises are well placed to impose contractual obligations on contractors that collect and deliver waste to ensure that the waste is not delivered to landfill, including by imposing obligations to trace and to verify the use to which the recovered resources are put. If these costs are passed on to all consumers, they will be negligible for each consumer.

In the context of the production of energy carriers, the dry organic and non-recyclable plastic fractions of C&I Waste (and possibly C&D Waste) may provide feedstock for the production of solid fuel (in the case of dry organics) and liquid fuel and feedstock (in the case of dry organics and plastics).

(e) Construction and Demolition Waste

With increased urbanisation the demand for extractive resources (from quarrying and mining) continues to grow. In some jurisdictions there are shortages of construction materials and the costs of transportation is high given the mass of these materials (and attendant GHG creation). In this context, the market has provided construction and demolition recycling plants, to allow recycling of C&D Waste.

In most instances, C&D recycling plants are located close to the demand for the recovered resources to address (at least in part) the transportation cost issue. From an environmental perspective, effective recycling of C&D Waste (in the urban setting) avoids or reduces the risk of run-off into natural water courses and waterways and into storm water systems. In countries prone to flooding, this is a public health, safety and welfare issue.

Given that C&D Waste is recoverable and is predominantly dry and has value, increased levels of recycling and reuse are both achievable and sustainable. The challenge is the cost of transportation to the point of recycling, and from the point of recycling to the point of reuse, in comparison to the cost of sourcing new extractive resources and the transportation of

them to the point of use. As with C&I Waste, the producers of C&D Waste are more often than not consumers of the recycled products. Policy makers are able to incentivise the use of recycled products in a number of ways and mandate use of recycled resources through building laws and regulations. When governments or government corporations and enterprises are procuring the construction of infrastructure including bridges, roads and tunnels, they are able directly to influence the development of the C&D Waste recycling industry, as they do with local and national content requirements on procurements.

In the context of the production of energy carriers, the organic fraction of C&D Waste (timber and wood) may be recovered to provide feedstock to produce liquid fuel (from the production of syngas) it may be combined with other higher calorific material to produce solid fuel. The plastic fraction of C&D Waste may be recovered to provide feedstock for chemical processing to derive liquid fuel or feedstock.

(f) Wastewater

Wastewater is a phrase describing water used in the home, business or in an industrial process, and, in an urban area, stormwater collection and management. In urban areas, the effective collection and management of Wastewater is a critical environmental and public health issue, with the need to treat used water and sewage. In respect of sewage, the effective treatment of bio-solids allows the capture of biogas (and avoid the release of methane and carbon dioxide), manage pollution, and avoid and manage the risk to public health, safety and welfare.

There is a number of similarities between Water Projects and Waste Projects. In future InfraRead articles, **Michael Harrison** and **Richard Guit** will explain the key commercial and legal issues arising from Water Projects, including Wastewater Projects.

3.5 Non-urban ore body

(a) Resources to be recovered

While there are towns and some cities in agricultural, farming and forestry areas, and each of MSW, C&I Waste and C&D Waste arises, these three categories of waste may not arise in quantities large enough to encourage the market and provide solutions as are available in urban areas. Depending on the size of these communities and distances between them, transportation costs may also be such that the unit costs consolidating the quantities of waste arising for processing and treatment is not affordable or sustainable without policy to provide the necessary funding or gap funding. In the context of C&D Waste, the level of construction and demolition activity in non-urban areas is substantially less, and the nature of that activity different, such that it is most unlikely that the market will provide a solution in the form of a C&D Waste recycling plant.

As with urban areas, Food Waste and Green Waste arises, although not on the same scale as in urban areas. It follows that a market solution in an urban area may not work in a non-urban area, and vice versa.

Non-urban areas in which agricultural, farming and forestry activities are undertaken grow biomass, and produce *biomass* as waste from those activities. *Biomass* is a word used in many contexts.⁵⁹ In the context of resource recovery, biomass refers to organic matter that has become waste, and on recovery may be used as feedstock for processing and treatment to produce compost using aerobic digestion technology, to produce biogas using anaerobic digestion technology to process biomass in its wetter form (and possibly to produce bio-fertiliser from the digestate), and for some forms of biomass in their dry (or drier form) to use it as feedstock for *biomass to energy projects (BtE)* (which feedstock includes residue from forestry and husbandry activities and from the production of certain crops, for example, bagasse from sugar cane production) and possibly in dry (or drier) form as feedstock for pyrolysis⁶⁰ to produce liquid fuel.

Figure 4 – Biomass in a non-urban environment

ACTIVITY/CATEGORY	SOURCE OF ORGANIC MATTER
Agricultural/Farming Waste	animal litter, manure and slurry from cattle, poultry and pigs, animal slaughter and meat preparation (abattoir waste ⁶⁴), <i>cultivated crop waste, including rice husk, bagasse/vinasse</i> , ⁶⁵ and <i>straw shavings/waste</i> , silage, dairy farming and milk production, fruit and vegetable production, and hay and straw with accompanying litter and manure
Forestry Residue	<i>branches and bark removed from trees and tree stumps</i>
Food Waste (possibly as a sub-set of C&I Waste)	from processing and production, sale and consumption of food, including food and drink and oil production (including from sugar and palm oil refineries), food consumed at point of sale, food consumed other than at the point of sale (including as a result of preparation at home) and food, drink and dairy products past use-by dates
Green Waste	organic material that has a manageable lignin content or <i>organic material with lignin content that affects microbial digestion</i>



As a general statement (and without wishing to oversimplify), for the purposes of recovering gas, liquid and solid fuels and feedstock from biomass, it is helpful to understand that biomass can be categorised as lignocellulosic⁶¹ organic material and non-lignocellulosic⁶² organic material.

In *Figure 4*, the *italicised* biomass comprises predominantly lignocellulosic organic material, the non-italicised biomass comprises predominantly non-lignocellulosic organic material.

Wet/wetter biomass is not suitable as the principal feedstock for BtE (to generate electricity). Dry biomass (that is lignocellulosic) is suitable for BtE and may provide feedstock for the production of syngas.

Certain non-lignocellulosic material provides some of the highest methane yielding feedstock for anaerobic digestion (AD), and as such is an ideal feedstock for the production of biogas. The feedstock⁶³, and the AD technology used to process that feedstock, will affect the quantity of biogas derived from the organic material used as the feedstock, and the methane content of the biogas. Although, generally, non-lignocellulosic material does not provide an appropriate feedstock for the production of syngas.

(b) Categories of waste arising

In non-urban areas, the principal categories of waste arising are Agricultural and Farming Waste, Forestry Residue, Food Waste and Green Waste

Agricultural and Farming Waste describes all biomass arising from agricultural and farming activities. *Figure 4* below describes

what may be regarded as the predominant sources of biomass: there are others and we will consider them in further detail in Part 2 of this article.

Agricultural and Farming Waste provides a “non-urban resource body” for the derivation of biogas and bio-fertiliser using wet/wetter organic material that is predominantly non-lignocellulosic material, and dry/drier material as a source of solid fuel for BtE projects. Using dry organic material that is predominantly lignocellulosic may provide feedstock for the production of liquid feedstock to be further refined to produce bio-diesel/bio-fuel.

Forestry Residue describes waste arising from forestry, typically comprising the organic material removed from trees as they are felled (including bark and branches, tree stumps, and in some instances, sawdust). Forestry Residue is a source of solid fuel for BtE projects and as a possible feedstock for the production of liquid feedstock for further refining to produce bio-diesel/bio-fuel.

(c) Fuel Crops

For the purposes of Part 1 of this article, we do not consider *Fuel Crops*, being crops that are grown for the purpose of the production of fuel or feedstock. For example, the production of *bio-fuel*, principally *bio-ethanol* (using such crops as cassava, corn, potato and sugarcane). Part 2 of this article will consider Fuel Crops, the technologies used to produce them and the associated commercial and legal issues.

3.6 Non-recyclable/Non-renewable waste

There are some organic and inorganic materials that cannot be recycled, and from which it is not possible to derive or to produce energy carriers from waste.

For the purposes of this article, we have not addressed *Chemical Waste*, *Medical Waste* (waste arising from medical and pharmaceutical activities), *Mega Waste* (waste arising from breaking of mega structures, including oil rigs and vessels), *Mining and Quarrying Waste* (waste arising from extractive industries, both from extraction and from processing) or *Nuclear (Radioactive) Waste* (waste arising from nuclear power plants and nuclear processing, and testing, facilities). This is because these waste streams are not suitable for the derivation or production of fuel or feedstock. The overriding policy outcome in respect of these waste streams is the safe collection, processing and treatment and disposal or storage of them so as to avoid environmental harm and any adverse impact on public health, safety and welfare. As such, the collection, processing and treatment and disposal or storage of these waste streams is heavily regulated in many jurisdictions.

4. Key Commercial and Legal issues

(a) Background

In this **section 4**, we introduce the key commercial and legal issues that need to be assessed and addressed in the context of recovery projects producing fuel and feedstock. We will address these in greater detail in Part 2 of this article.

As noted previously, assuming that collection and recovery has occurred, the key issues in the context of any resource recovery project are the *Four Cs*: *Compatibility*, *Contamination*, *Composition and Capacity*.⁶⁶ Before considering the development or developing any resource recovery project to derive/produce fuel or feedstock, *Collection* (and the resulting recovery) needs to be considered as does *Community Engagement* (and the resulting social license) – the Pre-Decision Considerations.

(b) Key Issues

- **Quality of waste as fuel/feedstock:** The Composition of the fuel/feedstock will be key to Compatibility for the resource recovery technology and, as such, the Capacity of the resource recovery facility to process and treat waste to derive/produce gaseous, liquid or solid fuel or feedstock. Also, the level of Contamination⁶⁷ contained or likely to be contained in the waste needs to be understood, as does its impact on the resource recovery technology, and on the quality of the fuel or feedstock derived or produced.
- **Quantity of waste collected/recovered:** The quantity of waste arising within the catchment area of resource recovery facility is critical, both to understanding the likely use of Capacity (if all waste arising within that catchment area is to be delivered) and also how much more waste may be available for collection and recovery. In the context of resource recovery projects to derive/produce fuel and feedstock, this is likely to be a risk that the resource recovery project takes.
- **Quality and Quantity of waste:** Quality and Quantity come together in the context of the Capacity of the resource recovery facility (including whether it achieves the required performance characteristics and tests) and the quantity of

fuel and feedstock that may be derived/produced (Output). Output is one half of the revenue equation, the other half is the price that the market is prepared to pay for the fuel or feedstock. The price of biogas and syngas (used a fuel, not feedstock) will be a function of the cost of substitute fuels, and may be priced to reflect fluctuations in substitute fuels. The price of syngas used as feedstock for further refining and the liquid fuel derived/produced will be a function of the world prices for those liquid fuels. The price of solid fuel/feedstock will be a function of its use: if the solid fuel is to fire a BtE facility or is blended to produce RDF, PEF or SRF, the price will tend to be fixed (by reference to an existing off-takers). If the solid feedstock is to be used as a feedstock to produce liquid fuel, the price will reflect the world prices for the fuel to be produced.

- **Cost Certainty – Delivery Solution:** This issue is not unique to resource recovery projects, nor is the criticality of the technology. Many technology providers are not comfortable with or suited to undertaking the role of EPC contractor: technology providers will not provide an EPC solution, and an EPC contractor will not provide a risk adjusted price that is workable on the basis that it will take technology risk. As such, both have to take responsibility for the design and build interfaces working. This is a critical area for the management of the capital cost and performance of each resource recovery facility, particularly in respect of resource recovery facilities that are using technologies sensitive to Composition and Contamination, and that are using established technologies but in a new or relatively new combination.
- **Cost of Collection/Recovery (including transportation costs):** This is both a front end issue (the cost of collection/recovery and delivery to the resource recovery facility) and a back end issue (the cost of delivery of derived fuel and feedstock to customer/market, and the cost of transportation and disposal of material that is not Compatible or that is Contaminated and of residue material following processing and treatment). There are variables in respect of all of these costs (including escalating collection and recovery costs and variable fuel costs).
- **Cost Certainty – Operation and Maintenance:** This issue is not unique to resource recovery projects. In the context of any resource recovery facility it is more likely than not that the risk of cost and performance will rest with the project sponsors (at least outside proven cost and performance parameters), unless the EPC contractor, or a related entity of it, is the O&M contractor. In addition to the project sponsors assuming cost and performance risk, if an O&M contractor is retained even within proven cost and performance parameters, the O&M contractor will not agree to be liable on an open-ended basis for escalating costs or for damages and losses incurred by the project sponsors for breach of contract.
- **Costs of off-takers from resource recovery facility:** Depending on the off-taker of the gaseous, liquid or solid fuel or feedstock derived or produced by a resource recovery facility, it is possible that the off-takers may incur costs (short, medium or long-term costs) as a result of the quality of the fuel or

feedstock. While resource recovery projects will seek to avoid or to limit liability for the consequences of delivering off-specification or out of specification fuel or feedstock, it is possible that it will not be possible to do so, and liquid feedstock refiners will deal specifically with the consequences of off-specification or out of specification fuel or feedstock, both by price adjustment and recovery of increased costs.

- **Change in law risk:** As will be apparent from all of the Ashurst Waste to Wealth articles, change in law is a key commercial and legal risk. A change in law is able to undermine a resource recovery project if some or all of the resource recovered cannot be marketed or, in order to be capable of being marketed, must be subject to further or new processing and treatment. If a resource recovery project is being paid for the acceptance and processing and treatment of waste, risk of change in law may be something that it is able to pass to its customer or customer through an increase in the gate fee/waste processing fee. If a resource recovery project, is a merchant project its ability to pass on the cost consequences of Change in Law is a function of the elasticity of price changes.
- **Market change/disruption risk:** The regulatory changes introduced by the Peoples' Republic of China in late 2017 have demonstrated that market change and disruption can occur

as a result of a regulatory change in another jurisdiction. Prior to late 2017, China provided value for recyclables not offered by any other jurisdiction. Many jurisdictions were therefore able to avoid the need to introduce policies to give value to recyclables. After late 2017 there has been disruption to the global market for recyclables, and dislocation of collection and recovery of recyclables as a result. In this context, the increasingly healthy debate around policy may be regarded as having been fuelled by that disruption.

- **Feedstock change and technology change/disruption risk:** Over time it is likely that changes in law and perspectives will result in the decreased production of plastics. This does not seem to be a short or medium term issue, but in the longer term there may be less plastic available as fuel or feedstock. The medium to long term future of energy businesses (including oil and gas companies) is likely to involve the production of hydrogen which, depending on the feedstock, is renewable. In this context, resource recovery projects that derive or produce fuel or feedstock from renewable resources (and in so doing serve an environmental and public health, safety and welfare function and GHG abatement function) may be regarded as less susceptible to risk of feedstock change and technology change.

China Sword– Quote taken from **Waste-to-Wealth Initiatives – Have we reached a tipping point?** (September 2018)

“Changes introduced in the People’s Republic of China (PRC) at the end of 2017 have caused knock-on effects on waste projects (and the waste industry more broadly) around the world. The changes introduced did not go so far as to ban the import of recyclables; instead they prescribe maximum permitted levels of contamination for certain imported recyclables. Globally, many waste projects were not designed to achieve these prescribed lower levels of contamination, or their economic models had not contemplated achieving those levels, or both.

The changes introduced in the PRC have therefore reduced significantly the import of recyclables (including plastics) into the PRC, which has had an impact on resource recovery projects around the world, and a material impact on resource recovery projects in many jurisdictions, including Australia, Belgium, France, Germany, Japan, Indonesia, Italy, Malaysia, Mexico, The Philippines, Poland, the Republic of Korea, Spain, the United Kingdom and the United States of America. At the most fundamental level, these resource recovery projects have been materially impacted, because the key consequence of the change introduced in the PRC has been to reset (at a materially lower level) the pricing for mixed plastic and paper derived from resource recovery projects.

Until the end of 2017, the PRC had been the world’s key export market for recyclables from many jurisdictions. This has now changed, and has forced many jurisdictions to review their policy settings. With increased awareness of environmental issues, we are reaching, or have reached, a tipping point at which policy makers may be required to make decisions reflective of the cost of sorting, processing and treating waste which had previously been exported to the PRC.

With this change to the world’s key market has come the stark realisation that, if recyclables (plastics in particular) are not recycled, they will be disposed of to landfill, or that their ultimate destination may be the world’s waterways and oceans. In some jurisdictions with more established waste collection systems, decisions have been made to send recyclables to landfill. While this may be regarded as a short term response, it is unlikely to be considered as a sustainable solution, particularly in jurisdictions with scarce landfill facilities.”

Post – script to our 2018 analysis: And so it has proved. The impact of China Sword resulted in displacement of recyclables in the world market, resulting in this initial export to countries neighbouring the PRC, but medium term increased retention of recyclables in the country in which they arose. This is underpinned by the increasing emphasis on the Basel Convention (which allows export of recycled plastic that is clean), and a realisation that countries in which recyclables arise need to process those recyclables such that they are a fuel or feedstock that can be used as such in the country of import, rather than being disposed to landfill in the country of import.



Conclusion

The healthy increase in debate around plastics has resulted in an invigorated policy debate about resource recovery (and GHGs), much of which is helpful and informed. To the public and resource recovery industry professionals alike, we appear to be at a point of inflection – the fulcrum of a tipping point if you will.

In the context of certain plastics, for policy makers there is an ever increasing range of solutions, and for councils and municipalities an apparently wide range of technologies on offer, and to choose from. In this context, a balance must be maintained between addressing plastics (by increasing levels of collection/ recovery (and recycling), encouraging avoidance and reducing production over time) while also ensuring the continued reduction and abatement of GHGs in the context of reduction over time of the production of plastics.

In the context of waste management practices generally, we see a golden opportunity for policy makers, councils and municipalities and the private sector to come together to maximise resource recovery by achieving the benefits of scale by combining and co-locating to develop facilities and plants that in combination offer multiple solutions. This is particularly the case in larger urban areas.

In Part 2 of this article we will consider the broad range of policies and technologies being used and considered, but also we will provide a sense of realism and responsibility that needs to prevail to collect and to process waste so as to maximise resource recovery, while seeking over time to reduce waste arising.



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(Endnotes)

- 1 The co-authors would like to thank Francesca Arciuli and Charlotte Britton for their keen editing skills.
- 2 One of these articles was general, the other article was Queensland specific. The aerobic and anaerobic articles were published in June and January 2019 respectively.
- 3 In the context of resource recovery, waste provides a feedstock for the derivation and production of fuel (in the case of fuel that can be used without further processing or treatment) or feedstock which following initial processing and treatment will require further refining to derive or to produce fuel. For example, the use of dry organics as feedstock to produce a crude liquid fuel that is then subject to refining to derive differing hydrocarbon fractions.
- 4 In the Ashurst article **Waste-to-Wealth Initiatives – Have We Reached a Tipping Point**, we stated that a tipping point had been reached in respect of certain plastics – specifically single use plastics. In this context, we noted that the onus rests on policy makers to formulate policies to avoid waste arising, and to **maximise** resource recovery from waste arising. Ideally, the increased debate will result in policy better suited to achieving these outcomes. Both parts of this article, continue this theme.
- 5 **Greenhouse gases (GHGs)** are those gases in the atmosphere that absorb thermal radiation emitted from the surface of the earth, and through absorption of that thermal radiation lead to an increase in the temperature of the atmosphere (not the earth), hence the use of the phrase “global warming”. The most prevalent GHG is water vapour (approximately 0.4% of the atmosphere). Water vapour is not increasing at a dramatic rate (as is the case with other GHGs, and as such does not have the same global warming impact as other GHGs.) Ozone is a potent GHG, but like water vapour, it is not increasing at a dramatic rate (rather the debate focuses on too little ozone). What may be regarded as the principal GHGs and their estimated contribution to global warming and global warming potential (based on the measurement of CO₂e, being one metric tonne of carbon dioxide equivalent), are set out below:


GHGs	Global warming potential (one metric tonne of CO ₂ equivalent)
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	21–36
Nitrous Oxide (N ₂ O)	280–310
Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs)	500–23,900 depending on the HFCs / HCFC
Perfluorocarbons (PFCs, including CF ₄ , C ₂ F ₆ , C ₃ F ₈ , C ₄ F ₁₀ , c-C ₄ F ₈ , C ₅ F ₁₂ and C ₆ F ₁₄)	4000–8,700 depending on the PFCs
Sulphur hexafluoride (SF ₆)w	Up to 34,900

- 6 The production of materials that become waste and the recycling of that waste (including to derive/produce fuel and feedstock), does not produce at many GHGs as transportation, but the production of GHGs is significant.
- 7 Biogas is a gas comprised predominantly methane and carbon dioxide, which is produced by the anaerobic digestion, or putrefaction, of organic matter.
- 8 Synthetic Gas or Syngas is a gas comprising of predominantly carbon monoxide and hydrogen produced from conversion from waste as a result of thermal processing.
- 9 In the Ashurst article **Waste-to-Wealth Initiatives – Waste-to-energy projects**, we covered waste-to-energy projects in detail, including the waste streams used as fuel.
- 10 The **Four Cs** is a term coined by Ashurst in 2018 in the context of key aspects of each resource recovery project: Compatibility, Contamination, Composition and Capacity. These concepts are considered in more detail in the **Waste-to-Wealth Initiatives articles, “Have we reached a tipping point?”** and the two **“Aerobic and Anaerobic digestion waste projects”** articles. In 2019, Ashurst coined the concept of two additional Considerations (or Two Additional Cs): **Collection** and **Community Engagement** to achieve social license.
- 11 Briefly, plastics can be: recycled mechanically following collection/recovery (involving cleaning, sorting, shredding and pelletising), with the pelletised plastics used to make recycled plastics or processed and treated chemically to derive a liquid fuel, or more likely a liquid feedstock (as an energy carrier), for refining and blending with other hydrocarbon derived products to produce fuel.
- 12 Many plastics badged as “compostable” break down only in industrial composters, that maintain the required conditions for decomposition (i.e. heat). Compostable plastics which are made from or include bio-plastic components, including polylactic acid (**PLA**), are often relegated to the “red” bin (general waste being MSW) in the absence of necessary industrial facilities and will be destined for landfill. If plastics containing PLA find their way into waterways and oceans, they will contribute to plastic pollution as PLA does not degrade in sea water. Compostable plastics will be considered further in Part 2 of this article.
- 13 This debate has included the quantity of plastics that remain in the environment, including in our oceans and waterways, and as such the quantity of plastics that are not collected or recovered for recycling, and whether the production of liquid fuel from plastics provides a means to address these issues.
- 14 In addition to what policy makers have had to say about plastics, key opinion formers in business are adding thought leadership and action to addressing the issue of plastics. For example, Andrew Forrest (Chair of Fortescue Metals Limited, one of the world’s largest producers of iron ore) has provided detailed thought leadership as to how policy may be introduced to give value to plastics. The result of giving value to plastic will be an increased level of collection and recovery, and increased levels of recycling and ultimately recovery of energy carriers from waste. The co-authors agree with the need to give value to plastics.

- 15 When exposed to heat including sunlight, plastics degrade and release methane, although the amount released and rate of production depends on the type and age of the plastic. For example, a study showed that virgin low-density polyethylene (LDPE) exposed to sunlight emits 500 nmol g⁻¹ over a 212-day incubation period with production rates increasing over time, while aged LDPE emits 700 nmol g⁻¹ over the same period at a relatively steady rate. While this amount of methane is relatively small, the scale of certain plastic production supports increased resource recovery and the environmental agenda to address marine plastic pollution.
- 16 The production of new plastics requires the production (extraction, processing and treatment) of hydrocarbons, transportation of hydrocarbons, and the production of the plastic from those hydrocarbons.
- 17 LFG is gas produced from the putrefaction of organic matter disposed of to landfill. LFG contains biogas, ammonia and sulphides (including H₂S).
- 18 As plastics degrade and react with material in landfill, carbon dioxide (in the presence of oxygen) and methane is released (albeit not in great quantities). The extent of this release depends on the environment in which the plastics are degrading. Plastics also leach chemicals contained within them as they degrade, including chlorine, phthalates and Bisphenol A (BPA), harmful to animal and human health and likely to pollute soil and groundwater. We note that the European Commission has recommended banning oxo-degradable plastics because of the concern of the degradation into micro-plastics.
- 19 Micro-plastics and nano-plastics arise from many sources (including unsuspected sources such as cosmetics and from washing clothing (otherwise known as microfibrils)) and the degradation of plastic materials over time. Micro-plastics are pieces of plastic less than 5mm long, and may be that size before entering the environment or otherwise break down to that size after entering the environment. Nano-plastics are plastics ranging from 1 to 100 nm and arise from the degradation of plastics in their manufacture and use, and as they age. These find their way into the environment in many ways. In the context of waste disposal and resource recovery, micro-plastics and nano-plastics arise from waste disposed of to landfill and also arise from the application of sludge (after treatment in a wastewater facility) to agricultural land as fertilizer.
- 20 Large producers of plastic bottles (such as Coca-Cola) are moving towards increased recycling of plastics as a step towards sustainable alternatives to plastics. This does not mean that there will be a switch to the production of aluminium cans or glass, because this is more GHG-intensive than the recycling of plastics.
- 21 In the context of closed loops, a progressive move towards the production of plastics that do not have adverse impacts on the environment and welfare, health and safety should be the policy objective. If this is not achievable on a sustainable basis, policy can appropriately encourage or prescribe avoidance of waste, in the context of promoting the production of sustainable alternatives to those plastics.
- 22 The concept of a circular economy (in contrast to a linear economy) is an economy in which waste that arises is collected and recovered and processed and treated to maximize resource recovery so that the collected and recovered resources can be recycled and reused for as long as possible. At the moment, we may be regarded as some distance from achieving circular economies. There is no “one size fits all” blue print for a circular economy, but the key is increasing the quantity of resources collected and recovered, and formulating policies that send the right messages and “give value” to resource collection and recovery so that they are collected and recovered: for example, container deposit schemes. As rates of collection and recovery increase, the quantity of waste available for processing and treatment at resource recovery projects increases, including the recovery of fuel and feedstock from waste. With this increase, the scale of resource recovery projects will increase and as such the unit costs of recovery will decrease.
- 23 While many jurisdictions have had Zero Waste objectives for a number of years, after the publication by the United Nations of the 17 Sustainable Development Goals in 2015 (as part of the 2030 Agenda for Sustainable Development), there has been a marked increase in the number of jurisdictions developing plans that allow implementation of Zero Waste. The term Zero Waste is used in two contexts: (1) principally, zero waste diverted to landfill (although this needs to be viewed by the percentage of waste collected and resources recovered from the waste collected); and (2) increasingly, moving to an economy that is circular. Others use the term as shorthand for avoiding the production of waste.
- 24 Coca-Cola (like other major users of plastics) is committed to increasing its use of recycled plastics to make plastic bottles.
- 25 It is said that the vast majority of the toothbrushes made since the 1930’s remain at large in the environment, principally in landfill.
- 26 In Australia it is estimated that between 12% and 15% of plastics are recycled. In Canada it is estimated that between 9% and 11% of plastics are recycled. By comparison, in 2016 the EU recycled 30% of its plastic waste (while 31% was landfilled and 39% subject to thermal treatment). As ever, one has to look beyond raw numbers in any jurisdiction to understand what percentage of the plastics are recyclable or can be used to derive and to produce energy carriers from waste, because if there is no market/value for the particular plastic, the market will not recover it. This returns to the central and continuing theme that policy is required to place value on the collection and recovery of plastic and the products that can be derived or produced from it.
- 27 The single use plastic which policy makers are taking action to phase out are lightweight plastic bags, which are often made from resource-intensive low-density polyethylene (LDPE) plastic. Countries which have banned or imposed taxes/charges on the sale of lightweight plastic bags in an effort to phase out use include Afghanistan, Bangladesh, Cambodia, Cameroon, Chile, Denmark, France, Italy and South Korea. Other countries including Australia, Argentina, Brazil and Indonesia have regional policies (some of which prohibit sales) in certain states and provinces. Enforcement remains an issue in many jurisdictions and the banning of the production and import of lightweight plastic bags is therefore important.
- 28 By some estimates, by 2050 we will have produced approximately 50 billion tonnes of plastic. Given the estimates of plastics produced so far, and the estimated plastic production each year, if this figure is correct we would appear to have been underestimating the mass of plastics produced so far, and predicting an acceleration in the rate of plastics production in the 30 years to 2050.

- 29 The United Kingdom's largest food producer and one of the largest consumer pharmaceutical products companies.
- 30 For those seeking to reconcile the estimated mass of plastics comprising the Great Pacific Garbage Patch, and the quantity of plastics entering the oceans each year, some of our plastics would appear to be "missing plastics": it is estimated that approximately 1% of plastics remain on the surface, rather they sink and decompose, and are likely to be ingested by marine life. This said, by some estimates, up to 90% of plastics remain within a 100 kilometre zone off shore, and in many instances is closer, and as such there is an opportunity to capture it.
- 31 In many jurisdictions, recyclables collected and recovered (including in jurisdictions in which container deposit schemes provide for payment for the collection and recovery of plastics (and other recyclables) to increase collection and recovery rates) are not delivered to recycling facilities or to facilities for the production of liquid fuels.
- 32 Value can be given by the introduction of policy, for example, a container deposit scheme giving value to containers that are collected, imposing a levy on the manufacturers/producers of containers that is recoupable on the collection and recycling of them, and imposing a levy on the retailers of containers which is recovered by the person that collects, recycles and tracks them.
- 33 Being options that use less non-renewable energy to produce plastics, and that are sourced from renewable resources.
- 34 In this context, we do not mean the mining of an established landfill for waste, rather we mean the collection of waste and resource recovery from it.
- 35 This does not mean that waste that is collected and recovered is processed and treated. As noted below, plastics may be delivered to landfill, including by the private sector seeking to maximise net revenue. In addition, there are examples of jurisdictions in which plastics are delivered to landfill because councils/municipalities have chosen to do this or have been forced to do so. For example, in the disarray that has affected the plastics market since late 2017 (and the broader recycling market), councils and municipalities in some jurisdictions have delivered recyclables to landfill. This is an interim measure while policy makers consider how best to create or to recalibrate policy.
- 36 And if the process is continued to produce fertiliser or compost conversion of nitrogen in its unstable form as ammonia into a stable form: chemically nitrogen in fertiliser or compost is stable and as such released slowly.
- 37 MSW or municipal solid waste, is waste arising from the general public and consists of reusable, recyclable, organic, incompatible, contaminated and other fractions. We discussed MSW in detail in the first article the Waste to Wealth series, entitled **Waste Projects**.
- 38 C&I Waste is used to describe waste arising from commercial and industrial activities. Depending on the composition of C&I Waste, the dry organic fraction may be used as feedstock for pyrolysis to produce syngas, to be combusted for the purposes of a waste-to-energy project or to be separated (by refining technology) to produce liquid fuel. C&I Waste may be used as feedstock for waste-to-energy projects, in particular mass combustion (in particular using moving grate technologies).
- 39 C&D Waste comprises a varied range of material (from organic and inorganic sources), including bricks and rubble (comprising stones for the most part, including granite, marble, and sandstone, cement (including in cement plaster), cinder blocks, concrete, gypsum, glass, metals (copper and steel predominantly), plastics, clay, rock, sand and soil (principally from excavation during construction), steel, conduits and pipes (including iron/steel and plastic) and electrical fittings (including plastics and non-ferrous metals).
- 40 From research that we have undertaken, it seems likely that the quantity is higher than this because of the quantity of C&D waste appears understated.
- 41 Events Waste is a phrase used to describe waste arising from entertainment and public events, including music concerts and festivals, demonstrations and parades, and sporting events. Events Waste comprises predominantly recyclables (which will be collected and sent to a dry MRF) and Food Organics (which can be collected and sent to an MT or MBT facility to produce mixed organic output, or to a waste to energy facility). The Food Organics fraction of Events Waste may provide a feedstock for the production of biogas using AD technology.
- 42 Green Waste is a phrase used to describe organic material collected from domestic green bins and by councils and municipalities in managing vegetation (including parks and gardens, topping and lopping trees, and management of vegetation in the vicinity of roads). Green Waste tends to be used as feedstock for the production of compost or possibly mixed organic output using aerobic technology (often as part of an MBT or MT resource recovery project or as a FOGO resource recovery project). Green Waste does not tend to be used as feedstock for the production of energy carriers from waste on the basis that separation at source allows the production of compost. This said, Green Waste may be in part for RDF production (a solid fuel).
- 43 E-Waste is a phrase used to describe waste arising from electronic products. An ever increasing number of jurisdictions around the world are developing specific E-Waste collection and processing systems. These systems recognise the importance of processing and treating E-Waste effectively to avoid any adverse impact on the environment and health and welfare: providing for the recovery of resources comprising the E-Waste. E-Waste is not used as feedstock for the production of energy carriers from waste. E-Waste contains precious metals (including copper and gold, palladium and platinum and silver), and ferrous (iron) and non-ferrous (cobalt and lithium) metals, and recyclable plastics. Each year, it is estimated that up to 330 metric tonnes of gold is recovered from E-Waste, approximating to around 10% of the total global production of gold.
- 44 In 2020, an E-Waste article will be published by Ashurst (on the Ashurst website). The recovery of E-Waste is of particular interest to one of the co-authors of this article.
- 45 Food Cycle Waste is a phrase used to describe waste arising from the growth, collecting and harvesting, production, and preparation and consumption of food. The dry organic fraction derived from collection and harvesting of crops may be used as feedstock for the production of compost or as feedstock for a biomass waste to energy project, and possibly as feedstock for the production of liquid fuel.

- 46 Food Organics is a phrase used to describe waste arising from the production and consumption of food. Food Organics can be used as feedstock for processing and treating using AD technologies to produce biogas, and bio-fertiliser.
- 47 Biogas (like LFG), comprises predominantly methane and carbon dioxide, and will have traces of other gases, including hydrogen sulphide (which is toxic) and nitrous oxide NOX (which is a fundamental measure of air quality). Depending on the composition of the feedstock, the biogas may comprise between 50% to 80% methane and between 20 to 50% carbon dioxide.
- 48 In the context of resource recovery, biomass refers to organic matter that has become a waste, and on recovery, and among other things, may be used as feedstock for processing and treatment to produce compost using aerobic digestion technology or to produce biogas (and possibly to produce bio-fertiliser from the digestate) using anaerobic technology.
- 49 Co-digestion refers to the use of more than one feedstock to achieve anaerobic co-digestion of differing feedstocks using the same anaerobic digestion technology.
- 50 Garden Organics describes a subset of Green Waste, in particular in the context of Food Organics and Garden Organics (FOGO) projects. Garden Organics are used as feedstock for the production of compost (using aerobic technology). Garden Organics do not provide feedstock for energy carriers from waste production.
- 51 The mixed organic output (effectively an organic product) derived from processing and treatment of the organic fraction of MSW (using mechanical treatment (MT) or mechanical biological treatment (MBT)) derived from an aerobic environment (typically, a composting and drying hall) can provide a feedstock (possibly blended with our resources) to produce solid fuel. Depending on the policy framework in the applicable jurisdiction, this mixed organic output can be used as compost medium (for some agricultural uses) or as rehabilitation medium (for use in the mining industry and for freeway/motorway central reservations or verges).
- 52 The production of compost requires taking the organic fraction (or more accurately part of the organic fraction) from the waste stream, processing to it produce organic matter in the (more) stable form of compost; the compost is derived from the process breaking down at a slower rate than the organic matter in the waste stream from which it is derived, and which may otherwise have been disposed of to landfill.
- 53 Recyclables are materials that may be recovered from the waste stream and recycled, for example, cardboard, paper (including newspapers and magazines), liquid paperboard (LPB), glass bottles, plastic bottles and containers, high density polyethylene (HDPE), mixed plastics, polyethylene terephthalate (PET), drink cans (aluminium), and food cans (comprising ferrous metals) and steel, the recycling of which will require the use of energy.
- 54 RDF or refuse derived fuel is solid fuel derived from waste used to fire industrial facilities, including cement kilns, being a fuel from waste.
- 55 PEF or process engineered fuel is fuel derived from waste used to fire industrial facilities, including cement kilns, being a fuel from waste.
- 56 SRF or solid/specific fuel recovery is solid fuel derived from waste used to fire industrial facilities, including cement kilns, being a fuel from waste, more often than not blended to produce a specific specification, i.e., a specific calorific value/heating value.
- 57 It is estimated that the highest rates of growth in MSW arising will occur in Africa and Asia, in particular South and South East Asia.
- 58 C&I Waste is sometimes separated (and analysed) into commercial waste (being waste arising from commercial activities, including commercial enterprises, such as restaurants and shops, and offices (private and public sector)) and industrial waste (being waste arising from industrial activities, including manufacturing and production processes). For the purposes of this article, and generally, we prefer to combine.
- 59 In the broadest (and most accurate) sense, biomass describes the total mass of living organisms on earth, comprising humans, animals (domesticated and non-domesticated), crops and forests and other vegetation (including estuaries and wetlands).
- 60 Pyrolysis involves deriving gas (and char and tar) from the sublimation of feedstock at high temperatures in the absence of oxygen with the gas to provide energy combusted or separated to derive liquid fuel.
- 61 Lignocellulosic material is organic material that has certain characteristics, critically in the context of anaerobic digestion, organic material that is resistant to enzymatic hydrolysis, tends to have limited water content and takes a fibrous form. Furthermore, lignin resists microbial digestion. Because of these characteristics, the use of lignocellulosic material feedstock for anaerobic digestion tends to result in higher levels of residual digestate. This does not mean that lignocellulosic material cannot be used as a feedstock to produce biogas, but its use does not result in optimal yields of biogas, and can impact operations.
- 62 Non-lignocellulosic material is organic material that is not resistance to microbial digestion.
- 63 The potential biogas yield of a feedstock is dependent on the total solids and volatile solids, each expressed as a percentage: a lower total solids percentage results in a lower biogas yield. Also the nature of the solids allows the prediction of methane yields, including fat and protein content. The presence of cellulose/lignocelluloses (ie from lignocellulosic material) will reduce the biogas production/ yield.
- 64 In addition, it is possible to derive fats from abattoir waste, and those fats can be blended with other feedstock to produce blended bio-fuel.
- 65 Vinasse is a by-product of sugar processing which can be processed, among other things, to produce ethanol.
- 66 These concepts are considered in more detail in the **Waste-to-Wealth Initiatives** articles **Have we reached a tipping point?** and the two **Aerobic and Anaerobic digestion waste project** articles.
- 67 In this article or context, Contamination does not mean that the waste is hazardous, rather that it is waste that if processed or treated will result in the fuel or feedstock being derived or produced not being within the required specification.



THE HEATHROW DECISION:

What does it mean for Infrastructure?

by Claire Dutch, Mark Elsey, Naomi Horton and Jonathan Turner

On 27 February the Court of Appeal gave its hotly anticipated judgment in the judicial review of the Airports National Policy Statement (ANPS). The Court declared the ANPS to be unlawful based on the failure of the government to have regard to (or to have indicated how it has had regard to) the Paris Agreement when designating the ANPS.

The judgment has direct implications for the development of a third runway at Heathrow Airport as the ANPS sets out the national policy support for that project. Indeed, an application for permission to appeal to the Supreme Court was submitted by the airport operator almost immediately after judgment was handed down.

But does the decision have wider implications for nationally significant infrastructure projects which do not yet have a Development Consent Order (DCO)?

The facts

The ANPS was designated as national policy by the UK government in June 2018. At that time, the Climate Change Act 2008 (CCA 2008) had set a target of achieving an 80% reduction in 1990 greenhouse gas levels by 2050.

Prior to the designation of the ANPS, the UK government had also committed to the Paris Agreement, which was ratified in November 2016. The Paris Agreement enshrined a stronger international commitment to mitigating climate change and a clear aspiration of achieving net zero greenhouse gas emissions from 2050.

The judicial review claim against the controversial ANPS was pursued by the Mayor of London, 5 local authorities and several

environmental groups. Having lost their case in the High Court last year, the claimants succeeded on appeal on one ground relating to climate change. On this point, the Court of Appeal held that the government had breached its duty under The Planning Act 2008 to give an explanation of how the ANPS took account of government policy in relation to the mitigation of climate change. Put simply, the Court held that the ANPS should have taken into account not just the government's targets under the CCA 2008 but also the government's commitment to the Paris Agreement.

The implications for other National Policy Statements (NPSs)

It is important to note that the judgment focussed on government policy and not DCO applications. Going forward, the government is likely to be keen to ensure that any new NPS has ticked the legal box and expressly states that it has taken into account the Paris Agreement in the reasons for its designation.

For existing NPSs that do not expressly take into account the Paris Agreement (and indeed there are many that were designated before the 2016 Paris Agreement for example, those NPSs relating to transport, energy and waste development) the Court's decision does not, and cannot in our view, mean that any such NPS is



retrospectively rendered unlawful. The 6 week judicial review challenge period will have expired against those NPSs in any case.

The big question is whether the government will in light of the judgment now see the Paris Agreement as a “significant change”, which under the 2008 Act could trigger a review of NPSs which do not expressly deal with the Paris Agreement. If an NPS is reviewed, any DCO application not yet granted which is reliant on the NPS is suspended. A review of some or all of the existing NPSs would undoubtedly lead to significant delay for DCO applications which have not yet been determined – and ultimately delay to the delivery of much needed nationally important infrastructure.

A number of legal challenges have been brought against existing NPSs on the basis that the Paris Agreement forces the government to review these. The government says it is currently considering whether its approach to review all or some of these NPSs. The Paris Agreement has been in place since 2016 and the judgment does not suddenly make it a new issue. In our view, a wholesale review of existing NPSs by the government would not be proportionate and the consequences of such action could be economically disastrous.

Where does this leave DCO applications?

Although the judgment related to national policy, it is directly relevant to DCO applications. This is because the 2008 Act requires all DCO applications to be determined in accordance with the relevant National Policy Statement (NPS) if there is one in place.

The judgment therefore raises concerns for DCO applications which are reliant on an NPS which does not take into account the Paris Agreement (whether the NPS predates the Paris Agreement

or otherwise). The 2008 Act allows the Secretary of State when determining a DCO application to take into account other “important and relevant” matters, which would include consistency with the Paris Agreement. It also expressly allows the Secretary of State to depart from the NPS where to follow the NPS would lead to the UK being in breach of its international obligations. This means that an individual project’s ability to conform with the Paris Agreement may be a material consideration in the determination of the DCO application notwithstanding that the project complies with the relevant NPS where such NPS is not consistent with the Paris Agreement.

Unless the judgment is overturned, it would appear prudent to ensure that a DCO application deals very clearly in its supporting evidence with the scheme’s impact on climate change and specifically addresses the issues in the Paris Agreement regardless of whether the relevant NPS takes the Paris Agreement into account.

In summary, the judgment weakens the previous ability for a project DCO to rely on an NPS for policy support where the NPS does not expressly take into account the Paris Agreement. However, the Court was keen to emphasise that just because a project is inconsistent with the commitments in the Paris Agreement, it does not automatically mean it cannot be permitted. Accordingly, for DCO applications relying on an NPS that does not take into account the Paris Agreement, the judgment is not fatal; but it is not helpful and promoters will need to consider the risks of non-compliance carefully.

The Supreme Court has given the airport operator leave to appeal and the Court of Appeal’s decision may be overturned by the Supreme Court. In the meantime, it is hoped that at the very least the government will issue guidance on how it intends to respond to the judgment in relation to NPSs which do not deal with the Paris Agreement. This would at the least give certainty to those promoting, or funding, nationally important infrastructure projects in reliance on those NPSs.



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Infrastructure kickstart?

Naomi Horton writes.....

At the time of writing the world is grappling with the COVID-19 pandemic, with many countries still in lockdown, as others take their first cautious steps towards opening up their societies and rebooting their economies. The question on everyone's lips is what the "new normal" will look like. Truisms abound and I have made a mental note to do my best not to use the word "unprecedented" in this short article. So what does this mean for infrastructure, one of the key backbones of the world economy? If COVID-19 impacts are coupled with the pressing demands of sustainability and decarbonisation, and the increasing gap between the pace of change in infrastructure and technology, this forced opportunity to "stop and think" must surely be grasped with both hands. Can the current crisis act as a catalyst for a more holistic approach to developing resilient and sustainable infrastructure that is designed for the needs of the next rather than the last century? Here are a few thoughts on what the infrastructure sector might take from our current situation.

- The continuing requirement for massive global infrastructure investment for the next 15-20 years (\$3.7 trillion a year until at least 2035, as estimated by McKinsey, has not disappeared overnight. If anything, COVID-19 has exposed chronic underinvestment in social infrastructure in many countries.
- Once lockdown requirements permit, governments will need to kick start economies, turning to the tried and tested Keynesian approach of economic infrastructure investment as that stimulus. Early indications are that the UK Government is no exception, with a clear desire for infrastructure projects to continue unabated, witness issuing the Notice to Proceed for the multi billion pound HS2 project at the height of UK lockdown. This of course leads to the question as to who will pay – will previous prudent fiscal rules be torn up or is this the time to focus on leveraging more of the "tidal wave" of private money into new infrastructure?
- Projects must continue safely on the ground. Site managers need to find ways of working so as to manage and mitigate the current challenges of the virus and comply with local COVID-19 regulations, particularly social distancing. Employers must provide the confidence of a safe work place for employees, to ensure their health and safety in the first instance, and reduce risks of poor attendance, employee claims and union action.
- The pandemic has highlighted the vulnerability of supply chains. Addressing this is likely to require both the continuation of public support measures and a more flexible and resilient

approach from the private sector. Critical supply chains must be secured, with contingency plans put in place. Alternative construction sequencing may help to mitigate both supply chain issues and virus related health and safety factors, and the latest technological developments may assist.

- The pandemic is likely to accelerate the move to remote working and virtual communication. This not only needs to be factored into thinking on future transport and other related infrastructure needs, but also emphasises the exponential reliance on data transmission and storage. Demand for increased capacity and resilience in this area is a one way bet.
- We now have an opportunity to accelerate the use of technology in infrastructure. This has lagged behind in recent years. The use of AI, advanced data analytics, 3D printing, new materials and maximising the planning and operation of infrastructure through initiatives such as digital twins can be used to manage health and safety risks, enhance resilience of project implementation as well as delivering more flexible and resilient infrastructure solutions.
- The environmental pressures to increase the proportion of sustainable power generation is not diminished by COVID-19; decarbonisation targets continue. If anything, the pressure may be increased as global populations see for themselves the environmental benefits of lower emissions during lockdowns. However, decarbonisation comes at a cost. The burning question is whether the economic adverse winds of COVID-19 will blow developing market appetite for decarbonisation off course or can industry offer governments increasingly efficient and sustainable solutions that can help close the funding gap.

Our infrastructure will need to adapt to a world that is unlikely to be quite the same as the one we have previously known, and appears increasingly likely to be a "living with COVID-19" rather than a "post COVID-19" world for some time. However, we have adapted before, and will no doubt do so again. Let us all hope that the current crisis can help kickstart both the public and private sector's approach to infrastructure to focus on designing and delivering more joined up, adaptable and resilient infrastructure solutions as the "new normal".



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