

The first ORRC called OPARK1 has been operational since July 2018 with the capacity to treat 200 tbd of food waste. As of May 2019, ORRC2 is in procurement

and will be able to treat up to 300 tbd, the feasibility of ORRC3 is being assessed and the remaining ORRC's are under review.



Source: Organic Resources Recovery Centre Phase 1 (OPARK1, previously known as ORRC1)
Image courtesy of Environmental Protection Department

WATER & WASTE CASE STUDY: HONG KONG

Hong Kong Organic Resources Recovery Centre

Location

OPARK1: Siu Ho Wan in North Lantau, Hong Kong

ORRC2: Sha Ling in North District, Hong Kong (pending funding approval from the Legislative Council)

ORRC3: Shek Kong in New Territories, Hong Kong (planning and feasibility study stage)

Owner

Environmental Protection Department (EPD)

Private Partner

OPARK1: OSCAR Bioenergy (Suez Environment, ATAL Engineering Limited, SITA Waste Services Limited, RosRoca)

ORRC2: Currently in procurement

PPP Model

Design-build-operate-maintain (DBOM)

Operating Term

15 years

Contract Value

Phase 1 – HKD 1.53 billion/USD 195 million¹

Phase 2 – Estimated HKD 2.45 billion/USD 312 billion

Asset Class

Waste and Water (Solid Waste Management)

In 2009, Hong Kong disposed of about 3,700 tonnes of organic waste to landfill every day, of which 1,000 tonnes originated from commercial and industrial sources. The damaging long-term environmental effects and depletion of the limited landfill void space meant that the development of a sustainable solution was urgently required.

Building on the success of a pilot composting facility commissioned in 2008, Hong Kong's Environmental Protection Department (EPD) sought to develop Organic Resources Recovery Centres (ORRCs) in several phases. The first two phases use anaerobic digestion technologies, followed by composting, to transform the organic waste into useful compost products and biogas for energy recovery.

The project was developed by EPD to treat source-separated organic waste (mainly food waste) arising in Hong Kong, thereby reducing the reliance on landfills and producing renewable heat/power and compost. The Government of Hong Kong is developing a network of around five to six ORRCs with a total recycling capacity of about 1,300 – 1,500 tonnes per day (tpd), over a number of years, using a similar approach each time, for achieving waste reduction targets. The phased development should allow for increasing treatment of separated food waste, as awareness and uptake of waste separation grows.

Output Specifications Development Approach Used

The output specification is based on the standards and publications of the Government of Hong Kong's Civil Engineering and Development Department, the Development Bureau and relevant statutory requirements. A detailed specification was developed, listing the type of technology and processes required, and covering both the outputs required and some of the input specifications more typically found in other types of contracting structures. The Private Partner is responsible for design, construction, operation and maintenance, as well as handback. The specification used was bespoke for the contract, although the output specification produced for OPARK1 has been mainly reused for ORRC2 with some flexibility in the surplus renewable energy export (electricity or biogas). Future ORRCs may follow a similar approach, with the potential for refinement from lessons learned. The level of prescriptiveness was considerably higher than other solid waste management PPP projects in Europe and the Middle East. This was intentional as the client had undertaken work prior to procurement to select their preferred technology, and used the contract to deliver the specified technology, with specific performance requirements typically seen in input specifications. There is a balance between the level of prescriptiveness and the requirement for the private sector to offer value for money, and in the case of Hong Kong, the contracts are more prescriptive than seen in other countries for waste PPP contracts.

Market comparison

Typical waste PPP projects, such as Edinburgh Energy from Waste in the United Kingdom (UK), Mexico Energy from Waste, United Arab Emirates (UAE) Energy from Waste, and North London Waste Authority in the UK have a high-level output specification, where the amount of waste to be treated, and a few performance targets are set, but the Private Partner is free to determine the specific technology and the method for achieving the performance standards. Examples of performance requirements would be percentage (by mass) of incoming material which is recycled, percentage which is diverted from landfill and recovery. Recovery can typically be in the form of material or energy (such as compost in an organic treatment plant and electricity and heat production in the thermal treatment plant). The quality of outputs may also be stipulated, but the method for reaching that quality standard has not been seen to be specified in PPPs other than the Hong Kong one.

For this Hong Kong project, an initial environmental permit was applied for before procurement commenced, so technology was relatively fixed for all bidders. The Private Partner was able to suggest changes, but it took the risk of applying for a permit variation. Specifications on the amount of material to be treated, the products to be produced, hours of operation, how air quality requirements are to be met, staff qualifications and further details were included.

It is unusual that a PPP contract targets commercial waste; more typically municipal waste streams are targeted, as this is what local authorities are responsible for managing (e.g. Cardiff and Edinburgh in the UK). There is not a single approach to the classification and regulation of commercial solid waste. For example, in some countries such as Bahrain commercial waste is included in the municipality's responsibility. However, in other countries, particularly in Europe, because of the way the European Union regulations are set up, commercial waste falls under separate regulations. Commercial waste may be treated at facilities which are developed as part of a PPP project, but this waste would be through separate contracts, (such as Cardiff, West Sussex, Hampshire and Kent in the UK).

In Hong Kong the Owner took the decision that the largest source of food waste would be targeted first. This makes sense, as more people regularly eat at restaurants/food markets in Hong Kong than in other parts of the world. It is also important to take into consideration the responsibility of waste management in each country. In some places, such as the UAE, almost all waste is the responsibility of the government, whereas in much of Europe, only municipal waste (i.e. not commercial and industrial waste) is the responsibility of the government.

No guarantee was provided regarding input waste quality/composition. This is a key issue for waste contracts, with a number of approaches taken. The most typical approaches are to either guarantee composition or characteristics within bands (such as bands of organics, recyclables and inert materials), such as in Serres in Greece, or to guarantee the collection method and material targeted will not change, such as in Wakefield in the UK, with the Private Partner taking the risk on changes due to lifestyle/new materials entering the waste streams.

¹ Assumed conversion rate of HKD/USD = 7.8 as at May 15, 2019.

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset</p> <p>Ability of the asset to address the needs and meet the expectations of end users</p> <p>By specifying design life, and remaining service life, the Owner promoted long-term decision-making even though the operating term is short compared to other PPP projects. The Owner has the option to appoint the same (or a different) contractor at the end of the term, which also incentivises the Private Partner to provide a quality service.</p> <p>The performance indicators are intended to measure the Private Sector's performance against the priorities and expectations of the end users and the Owner. Examples of performance indicators from ORRC2 include:</p> <ul style="list-style-type: none"> • "To operate the facilities of the ORRC2 24 hours a day and operate the waste reception facilities between 0800 to 2200 daily to treat up to 300 tonnes food waste; • To ensure the compost produced shall comply with the relevant quality standards; • To produce, in compliance with the above requirements, sufficient energy to meet the internal need for the facilities of the ORRC2 and export any surplus energy as electricity or biogas; • To prohibit flaring of biogas produced under normal operation; • To comply with the relevant occupational safety and health legislations and practices so as to avoid related accidents; • To comply with the conditions of the environmental permit, the requirements on effluent and air emission quality, and environmental monitoring, etc.; • To comply with other operational requirements in the specifications, such as site cleanliness and housekeeping, relevant legislations, life saving and fire fighting equipment, maintenance and inventory record, etc." 	<p>Performance Reviews: For ORRC2, the Owner intends to engage consultants to undertake contract administration, site supervision of the works, and carry out operational performance reviews upon completion of the construction. Independent operational performance reviews are one way to validate the accuracy of the Private Partner's self-reporting.</p> <p>Financial Deductions: The following are examples of mechanisms and penalties that have been included in the contract to address the unsatisfactory performance of the Private Partner during operation. The financial deductions align with the end user and Owner priorities:</p> <ul style="list-style-type: none"> • <i>Suspension of operation: If ORRC2 fails to operate on any days, the Government will deduct the corresponding operational fees for that period;</i> • <i>Operational requirements: If the contractor fails to comply with any or all of the operational requirements in the contract for any month, the Government will deduct the relevant fees from the operational fees of the month on a pro rata basis;</i> • <i>Environmental requirements: If the contractor fails to comply with any or all of the environmental requirements in the contract for any month, the Government will deduct the relevant fees from the operational fees of the month on a pro rata basis;</i> • <i>The Government can terminate the contract according to the contractual procedures if necessary.</i> 	<p>A 15-year contract is shorter than typical solid waste management PPP projects (terms in the range of 25 years are more common) but operations are likely to continue after handback. This may give the client more flexibility over the management of the facility once the operating term of the contract is complete.</p> <p>The ORRC has a higher level of external checking than for many waste management PPP projects, including those developed in the UK and France.</p> <p>Handback is typically required if the site belongs to the authority, such as in Hong Kong, and not if it is owned by the contractor (which is less common but seen in West Sussex in the UK). The benefit of the authority owning the site is that it encourages as many bidders as possible, as they are not required to find and purchase a suitable site themselves.</p> <p>Compared to the solid waste sector, the water and wastewater sectors typically show leadership in the field of asset management. Although output specifications do not always require compliance with the international standard for asset management (ISO 55000), there is a level of maturity in the market that means Private Partners sometimes offer an ISO 55000 compliant solution on their own accord. For example, the Private Partner (Samra Plant Co) on the As-Samra wastewater treatment plant project in Jordan recently obtained ISO 55000 certification.</p>
<p>Health and safety considerations during both construction and operation of the asset</p> <p>As for any industrial site, the output specification requires a health and safety plan to be followed. This plan is to include identification, control and mitigation for hazards during construction, operation and maintenance of the plant. Emergency procedures are also identified.</p> <p>This contract had the input of multiple departments within the government, so specifications from different departments were included. A more typical approach is to specify national legislation along with a small number of additional requirements.</p> <p>Accidents and incidents reportable to the Hong Kong Government Labour Department shall be counted as non-compliances with the environmental and safety performance requirements. Such non-compliances will be measured monthly, based on frequency and severity.</p>	<p>Payment linked to safety performance: The Owner had existing technical guidance that informed the requirements for construction safety management². The payments on safety cover both the task-tied payment items for the implementation of stipulated safety measures, such as provision and updating of safety plan, attending safety meetings and safety walks, provision of safety officers and safety training, etc., and the performance-tied payment items, which are measured according to the Private Partner's achievements in the performance indicators, such as no reportable accidents in a month, accident frequency rate, no notice of safety and environmental prosecution, etc.</p>	<p>Some contracts (predominantly in countries with well-developed health and safety regulations such as in the UK and Singapore) limit health and safety requirements to meeting national legislation, but many have specific requirements (for example, in Brazil), particularly around vehicle deliveries to a site, where staff from potentially multiple organisations are entering the facility.</p>
<p>Ability of the asset to withstand natural and other disasters, including climate change</p> <p>The Owner transfers geotechnical risk to the Private Partner, who shall carry out all the necessary geotechnical investigations. Design submissions, construction and maintenance of man-made geotechnical features, and natural terrain hazard study and mitigation works shall be in accordance with the Government of Hong Kong's Civil Engineering and Development Department Project Administration Handbook for Civil Engineering Works, Appendix 4.8³.</p> <p>The output specification also addresses site specific risks. For example, during inclement weather events such as strong winds, heavy rains or typhoons, the Private Partner shall take all reasonable measures necessary to ensure that all facilities within the site, including but not limited to skips loaded on mobile plants and skips stored at the waste reception area, are safely secured in order to prevent the facilities from causing damage to any plant, mobile plant and all persons on the Site.</p>	<p>There are no specific mechanisms to achieve this, rather it is stated in the contract requirements so would be the Private Partner's risk of non-compliance.</p>	<p>Increasingly, particularly in the UK and USA, risks, such as flood risk, are specified (no longer an unforeseen risk) so it is possible to allocate the risk to the Private Partner. To do so, the risk needs to be quantifiable and the basis for measuring it clearly defined.</p>

² Further information available at: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/19/1/C-2005-19-0-1.pdf>
³ Further information available at: https://www.cedd.gov.hk/filemanager/eng/content_80/PAH-2018-Chapter-4-Rev-00-Clean-181026.pdf

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Job creation, capacity building and transfer of knowledge</p> <p>Operation and maintenance of the facility requires local staff, both skilled and unskilled. When the asset is transferred back to the Owner at the end of the term, there is a benefit to the Owner if the operations and maintenance staff are retained to improve the transfer of knowledge. A Handover Plan is the formal document required to transfer knowledge from the Private Partner to the Owner and is required to provide details on employee retention and training.</p> <p>The output specification includes requirements for building information modelling (BIM) to mitigate construction risks and improve asset management and transfer of knowledge. At an organisation level, the Owner has defined their requirements for BIM⁴, which in turn inform the project requirements. The Private Partner shall adopt BIM during the design, construction, and operations stages of the Facility.</p> <p>The output specification provides estimates of the number of technicians and apprentices that may be employed based on the capital cost of the project. Available, skilled labour is a key component to successfully delivering the services. Providing an indication of the number of staff means all proponents are bidding on the same basis, although this can stifle innovation, such as process automation. However, if the Owner's objective is to create jobs, it provides a level of certainty that the outcome will be achieved. It is estimated that the proposed works will create about 465 jobs (400 for labourers and 65 for professional/ technical staff) providing a total employment of 12,400 person-months for ORRC2. The experience level of specific staff is prescribed, including degree type and number of years' experience. This is not just for senior management but a range of posts.</p>	<p>There are no specific mechanisms such as KPIs or measurable targets for the job creation requirements, however there is a requirement for the Owner to approve all resumés.</p>	<p>It is typical that expertise is included in the handback plan. In some contracts, more typically in the early waste management PPP contracts in the UK, (e.g. Isle of Wight and West Sussex), a community liaison officer was a requirement in the contract. This is less common in more recent contracts, with community liaison under the control of the Owner.</p> <p>Waste management facilities require operational staff, and there are often specifications about the number of staff who must be recruited from within the local area. Typically, only senior roles will be specified, as it may limit scope for job creation if specifications are prescriptive.</p> <p>Some European contracts specify the number of staff who must be employed from within a certain radius of the facility, with the aim of encouraging local labour. Alternatively, there are other projects that do not have the same prescriptive requirements for qualifications and length of experience. In countries where there is age discrimination legislation, specifying the number of years' experience may not be possible or appropriate.</p>
<p>Environmental impacts</p> <p>The Owner was responsible for obtaining environmental permits, but the responsibility for meeting the requirements in the permits was then transferred to the Private Partner.</p> <p>An Environmental Impact Assessment (EIA) was undertaken by the Owner prior to procurement and included expected technology, performance, emissions and output management. The Private Partner had to perform as well or better than the performance stated in the EIA, or apply for a variation to the Environmental Permit.</p> <p>The Private Partner will be required to ensure compliance with the requirements of the Environmental Permit including Environmental Monitoring and Audit (EM&A) requirements.</p> <p>For ORRC2, the requirements also consider ways to mitigate environmental impacts at each stage of the project development. For example:</p> <ul style="list-style-type: none"> • Planning and design stages: Consider ways to minimise the generation of construction waste; reuse inert construction waste (e.g. excavated soil) on site or in other suitable construction sites as far as possible to minimise the disposal of inert construction waste at public fill reception facilities (PFRF); maximise the use of recycled/recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste. • Construction stage: At the construction stage, the Private Partner is required to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation means to avoid, reduce, reuse and recycle inert construction waste. Day-to-day operations on-site will need to comply with the approved plan, and the contractor will be required to separate the inert portion from non-inert construction waste on-site for disposal at appropriate facilities. The disposal of inert and non-inert construction waste at PFRF and landfills respectively will be controlled through a trip-ticket system. • Operations: There is strict control over odour nuisance which may arise during the operation stage from both the facility and food waste collection vehicles (FWCVs). Waste water generated during the operation will first be treated by on-site sewage treatment facilities to meet relevant discharge standards before being discharged through public sewers to public sewage treatment facilities for final treatment and discharge. <p>The plant is predominantly electrically self-sufficient, with power being produced using biogas generated at the facility. For OPARK1, surplus electricity is exported. For ORRC2, either (1) surplus electricity is exported to the grid, or (2) surplus biogas is exported.</p>	<p>Financial deductions: If the Private Partner fails to comply with any or all of the environmental requirements in the contract for any month, the Owner will deduct the relevant fees from the operational fees according to the contract provisions.</p>	<p>The requirements in the output specification go beyond simply meeting local legislation. This has been seen, on a lesser scale, in other facilities in the UK (such as for odour treatment technologies), but varies depending on the country. In newer projects in countries with less developed legislation, including additional requirements beyond the existing legislation to meet good practice, such as meeting World Bank standards, depends on the recommendations provided by the Owner's advisers. This may also be a funding requirement from some development banks.</p> <p>The bidders, and subsequently the Private Partner, in this project were limited in the changes to the design which could be made to the specification detailed design and materials, etc. This is not typical for a waste PPP project, where usually the bidders are invited to come up with the most environmentally beneficial design possible, within affordability limits, and this is part of the evaluation scoring, such as Cardiff Organic Waste Treatment Project in the UK.</p>

⁴ Further information available at: <https://www.devb.gov.hk/filemanager/technicalcirculars/en/upload/366/1/C-2018-18-01.pdf>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Ability of the asset to respond to changes in resource availability, population levels, demographics and disruptive technology</p> <p>Proven technology was required, which is typical for waste PPP projects. However, food waste composition is different in Hong Kong to other countries, due to different eating habits and food eaten. The design of internationally proven technology had to take this into consideration to develop a facility that could optimise biogas yield based on the expect food waste composition. In addition, the site areas were small, so innovations were required to meet the capacity specifications (200tpd for OPARK1 and 300tpd for ORRC2).</p> <p>The Owner defined the required capacity, which is a small proportion of the total estimated food waste arising in Hong Kong, so waste availability is unlikely to impact the project. The government is taking an innovative approach to procurement by letting a number of contracts over a period of time, so that capacity is developed as source-segregated organic waste collections are introduced.</p>	<p>Non-compliance event: The Private Partner would be exposed to potential financial deductions if the specified capacity is not achieved.</p>	<p>The ORRC projects are unusual in not guaranteeing exclusivity, waste composition or waste tonnages.</p> <p>The two risks (composition and tonnage of waste) are the key issues when developing a PPP project. For a food waste contract, the risk of change of composition is lower than for residual waste, as foods do not change as quickly as packaging and consumer preferences for items such as clothes and electronic goods.</p> <p>There is no single model used but typical approaches include having a guaranteed minimum tonnage (take or pay) (Cardiff Organic Waste Treatment Contract), exclusivity of waste provision to the PPP facility (Wakefield residual waste treatment project) or no guarantee but the inclusion of the responsibility for collection (Hong Kong Waste Electronic and Electrical Equipment PPP project).</p>