

# ENVIRONMENTAL SUSTAINABILITY FOR RIVER CRUISING

A guide to best practice



Photo courtesy of Uniworld Boutique River Cruise Collection

## **Environmental Sustainability for River Cruising**

### **A Guide to Best Practice**

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This best practice guide was written by The Travel Foundation, with support from the TreadRight Foundation and in close collaboration with Uniworld Boutique River Cruises.

It is designed to support the river cruise tourism industry around the world as it works towards a sustainable future.

The best practices examples come from investigations on environmental performance and management carried out together with river cruise companies in Europe and Egypt. However, it is relevant to all river cruise operators, large and small, to help them start playing their part.

#### About the Travel Foundation

The Travel Foundation is an independent charity that works with the travel and tourism industry towards a sustainable future, both for the industry and holiday destinations.

It enables travel companies to protect the environment and create opportunities for local people in tourism destinations, while also providing unique and memorable visitor experiences.

*www.thetravelfoundation.org.uk*

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#### About the TreadRight Foundation

The TreadRight Foundation is a not-for-profit foundation established by The Travel Corporation in 2008 to support sustainable tourism worldwide and safeguard the destinations in which the company operates.

TreadRight supports both existing conservation initiatives with other organisations, as well as in-house efforts within their own family of brands, encouraging responsible business practices and spreading the message of sustainable tourism to both partners and guests.

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#### Acknowledgements

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# 1. Introduction

## 1.1 Trends

River cruising has become an increasingly popular way of experiencing a multitude of international destinations and is rapidly expanding. This trend has been forecast to continue, making cruising one of the boom areas of modern tourism.

From the UK market alone, passenger numbers on European river cruises reached 90,000 in 2012, up 12% on the previous year. Similarly, UK passenger numbers to non-European destinations rose by 19% over the same period to 40,000.<sup>1</sup>

To cope with increasing demand, 13 new river ships were launched in 2011, 16 in 2012 with 22 planned for launch in 2013 and 25 on order for 2014. In 2013 there are 822 river cruise ships worldwide<sup>2</sup> with over 30% of them operating within the European Union.<sup>3</sup>

Guests and tour operators are increasingly seeking responsible suppliers that adopt environmental best practices. Investors or financiers are more often seeking to understand how environmental risks are managed in companies.

## 1.2 Purpose of the guide

Sustainability is a broad subject area which encompasses environmental, social and economic factors, The environment is the aspect of sustainability which this guide concentrates on and it is aimed at commercial river cruising operations. We believe it is the first of its kind in the public domain.

While individual environmental footprints, such as that of a single river cruise, may seem small, it is the sum all of all environmental impacts that can cause serious problems. This is particularly relevant where the river passes through a densely populated area, such as the Rhine, with some 60 million people in its catchment area. All stakeholders that use rivers therefore share the responsibility of protecting river environments.

This guide is designed to support the adoption of better environmental practices for river cruising. Seven main topics associated with operational management and resource efficiency are covered, including:

1. monitoring;
2. energy;
3. water;
4. wastewater;
5. solid waste;
6. communications; and,
7. environmental management systems (EMS).

For each topic a brief summary is offered of the potential environmental impacts, the rationale for best practice and suggestions on how to reduce these impacts.

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<sup>1</sup> IRN Research, *UK River Cruise Market Summary 2012*

<sup>2</sup> <http://www.river-cruise-fleet.com/3.html>

<sup>3</sup> Hader & Hader, *The River Cruise Fleet Handbook 2013*

The technical aspect of the guide is aimed to give the reader a grounding in the basics of environmental sustainability and to cover, in more detail, aspects of environmental sustainability that are unique to river cruising.

For more comprehensive detail of generic hotel sustainability the Travel Foundation's free-to-use Green Business Tools<sup>4</sup> cover the basics more thoroughly. Guides such the International Tourism Partnership's (ITP) 350 page *Environmental Management for Hotels* publication covers the same topic in great detail.

This guide goes further than the technical aspects, however. Section 4 covers the wider and long-term aspects of the river cruise industry by encouraging river cruise companies to work in collaboration with suppliers, port authorities, local government, booking agents and, critically, other river cruise ship operators.

### 1.3 Business benefits

The business benefits for improving the sustainability of your operations are clear:

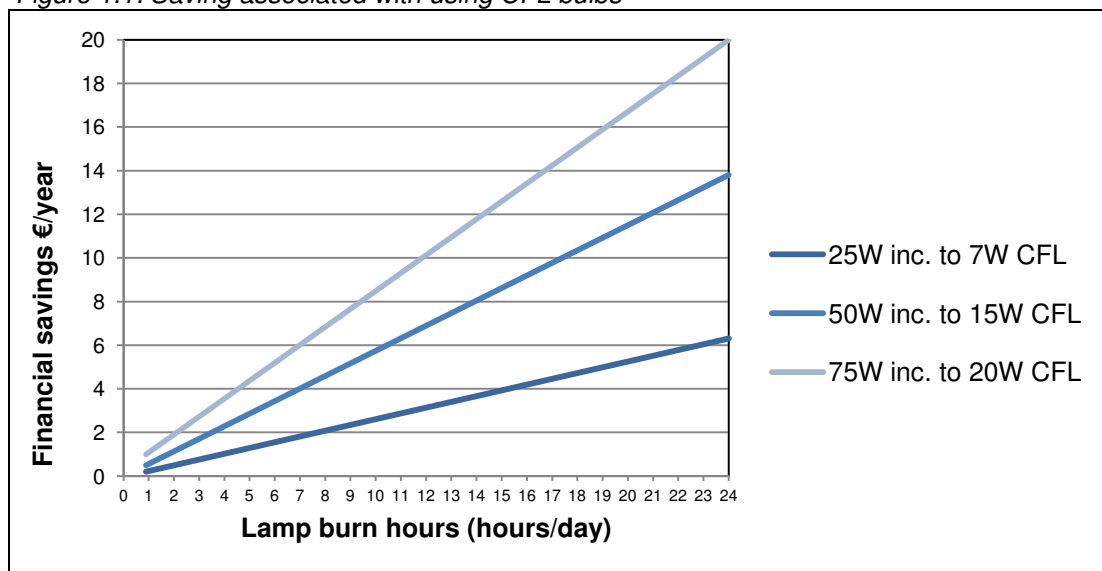
#### 1. Reducing costs and improving efficiency:

*Utility costs are rising and predicted to grow further. Sustainable practices result in cost savings.*

The implementation of environmental performance improvements is linked to financial performance. It is positive for profits by creating significant cost-savings in terms of operating budgets.

In Figure 1.1, financial savings per year are shown when replacing a single incandescent lamp with a compact fluorescent lamp (CFL). It is just one example of how the use of up-to-date technology can contribute to significant energy and monetary savings.

Figure 1.1: Saving associated with using CFL bulbs



Data source: Guidelines for Environmental Sustainability in Hotels, TUI Travel PLC, March 2011

#### 2. Managing risks and meeting legislative requirements:

*Government regulators are implementing ever-stricter controls on the travel and tourism industry – a*

<sup>4</sup> [http://www.thetravelfoundation.org.uk/green\\_business\\_tools](http://www.thetravelfoundation.org.uk/green_business_tools)

*trend which is likely to continue given the urgent need to tackle climate change impacts and resource scarcity issues.*

As international and national legal frameworks change, so too must river cruise companies to comply with new and future regulatory requirements.

### 3. Engaging staff:

*Corporate Social Responsibility (CSR) is a key driver in staff satisfaction - on average 50% higher in companies with a strong CSR culture, improving staff recruitment and retention, as well as creativity and productivity.*

The global tourism industry has become increasingly aware of sustainability concerns. This has partly been in response to stricter environmental regulations, but also due to a growing interest in CSR. The concept is now applied beyond individual companies, for example, at the destination level for planning and management and across entire value chains, for example port authorities providing adequate recycling facilities.

### 4. Gaining competitive advantage:

*Sustainable tourism is being increasingly linked to product differentiation and a better holiday experience for customers and can lead to earlier booking curves, higher customer satisfaction and retention and superior margins.*

When mass tourism began in the late sixties and early seventies, high concentrations of tourists in certain destinations have generated considerable positive economic and social changes, or impacts. However, if not managed well, tourism and also bring negative environmental and social impacts.

Since the 1980s, companies have realised the benefits of offering more sustainable forms of tourism. At first this was often small-scale *niche* tourism focused on conservation issues in biodiversity-rich areas, or income-creating opportunities in developing countries but it quickly became evident that any kind of tourism can be more sustainable if managed properly.

### 5. Meeting emerging consumer trends:

*Today's consumers expect travel companies to build sustainability into their product offer. A majority (70%) believes that companies should be committed to preserving the natural environment, while three quarters want a more responsible holiday and 66% would like to be able to easily identify a greener holiday.*

Sustainability can be a profitable strategy - Nielsen's Global Corporate Citizenship Survey of more than 28,000 consumers in 56 countries shows that 46% were willing to pay extra for products and services from companies that have implemented programmes to give back to society. An entire market segment, the Lifestyle of Health and Sustainability (LOHAS), has been identified and is associated with above average income and a more conscientious and selective life- and consumption style.





*Photographs courtesy of Uniworld Boutique River Cruise Collection*

A well-managed tourism business should take into account and adjust to market trends, going beyond individual, fragmented actions and setting up a company philosophy, management structures and practices according to sustainability principles. Today's consumers know how to differentiate between isolated actions and an authentic company culture committed to sustainability.

**6. Protecting the tourism product:**

*A resilient and functioning environment is critical to having a healthy tourism industry. Protecting investments by saving water, planning for climate change impacts and ensuring a warm welcome from destination populations are all key parts of the business case for sustainability.*

The unpolluted, vibrant and attractive natural surroundings of the river and the river itself is part of the tourism product. It is therefore in the business interests of all river cruise companies, their suppliers and the port companies to look after the environment in which they operate.



*Photographs courtesy of TUI FlussGenuss / TUI UK & Ireland*

## 2. Ten principles of environmentally sustainable river cruising

River cruising is a complex business, and so is ensuring environmental sustainability on river cruises. To make sure that all those involved understand the essentials, the ten most important principles are summarised here:

<b>1</b>	<b>Improve monitoring</b>
	What you don't measure, you can't manage. Following this simple rule means establishing easy-to-follow monitoring systems and continuously providing feedback on performance, in order to improve environmental sustainability.
<b>2</b>	<b>Reduce energy use</b>
	Generation of energy from non-renewable fuel impacts on the both the global environment and the company's bottom line. Ensure that your company makes use of efficient up-to-date technology and procedures to reduce impacts and save costs.
<b>3</b>	<b>Save water</b>
	Every cubic meter of freshwater use results in another cubic meter of wastewater. Both water and wastewater have costs to the environment and the company. Reduce water consumption by using the best technology available and creating awareness among both guests and staff about water saving practices.
<b>4</b>	<b>Limit waste production</b>
	Solid waste is one of the largest environmental impacts a river cruise produces. Work on the "3 R's": reduce, reuse and recycle. By systematically analysing waste sources and flows, cruise companies can avoid producing waste in the first place, reduce the volume of waste produced, and improve waste management and recycling.
<b>5</b>	<b>Foster a sustainability culture</b>
	Sustainability efforts cannot be effective in the long-term if they are not genuinely rooted in the company's philosophy. Management should not only strive to set an example but set up the structures and procedures to facilitate a company culture committed to sustainability. Every employee should be aware of the underlying "why" and want to be a part of it. It is an inside-out approach.
<b>6</b>	<b>Define operating procedures</b>
	Don't leave sustainability to chance. Environmental considerations and criteria should be systematically integrated into standard operating procedures and clear responsibilities assigned to staff. In addition, an environmental management system can specify indicators, procedures and practices.
<b>7</b>	<b>Increase cooperation</b>
	No single river cruise company can address all the complex issues linked to the move towards a more sustainable cruise industry sector. Cooperation with other river cruise companies, both formal and informal, can lead to an exchange of experiences, lobbying for better port facilities, negotiating with common suppliers, and making progress in other areas of shared interest.
<b>8</b>	<b>Bring your supply chain in line</b>
	Work with the entire supply chain to minimise impact on the environment. Maintain a constructive dialogue with suppliers. Create awareness among guests and staff to make sure that environmental impacts are reduced throughout the whole supply chain. Prepare materials so that marketing partners can market your product with sustainability in mind. Coordinating efforts with the supply chain will make your sustainability approach more consistent and effective.
<b>9</b>	<b>Incorporate innovation</b>
	Always incorporate state-of-the-art technology in your fleet. Not only will it benefit the environment and lower your operational costs but it will also give you a competitive edge in the market by providing an additional selling point and improving your brand. Anticipate opportunities ahead of refitting and construction of new ships.
<b>10</b>	<b>Minimise absolute impact</b>
	Focus on efficiency when considering sustainability indicators, for example in terms of "waste produced per guest night" or "fuel spent per voyage". With a finite market it is better for the environment for passengers to travel on more resource efficient ships. However, for a more challenging target, especially in a growing market, also consider the absolute indicators - total waste produced, total fuel combusted - because the environment doesn't recognise efficiency.



## 3. Operational management of river cruise ships

### 3.1 Overview

Often referred to as 'floating hotels', river cruise ships can apply many best practices from the hotel industry to its guest cabins, restaurants and housekeeping. National and international regulations prescribe mandatory health and safety, security and environmental actions, and the cruise industry itself is working on voluntary sustainability certifications (such as Green Globe).

River cruise ships share many of the same characteristics as their land-based equivalents - they contain features to accommodate and entertain and relax guests, serve food and drink, all in comfort. Gym and spa facilities are not uncommon on modern vessels. To achieve this ships require, kitchens, bars, restaurants, food and beverage storage and staff accommodation. The whole ship will be supplied by heating, cooling, lighting, potable water, solid and liquid waste facilities.

In contrast to land-based accommodation, river cruise ships have several unique characteristics. Unless the ship is docked, it is not connected to mains electricity, potable water and sewerage which therefore requires that these are stocked onboard within its limited confines or it has the means to produce or treat them itself.

In addition, unless utilising electricity from solar panels or using sails, the ship must store enough energy in the form of fuel, for propulsion.

Another unique factor of a river cruise ship is that it operates in relatively sensitive environment. Contamination in rivers migrates very quickly and, in contrast to a cruise ship in the middle of the ocean, contaminants could quickly impact on riverbank side receptors such as plants, terrestrial fauna and humans.

The design, operation and maintenance of the ship as a transport vessel adds additional layers of complexity. During the course of a cruise these will alter with the national regulations of each country the ship passes through, in addition to international and European Union (EU) regulations that govern all vessels.

In this section of the best practice guide, seven main topics associated with resource efficiency in river cruising operational management are covered:

1. Monitoring
2. Energy
3. Water
4. Wastewater
5. Waste
6. Communications
7. Environmental Management System.

For each topic a brief summary is offered of the potential impacts, the rationale for best practice and suggestions on how to reduce these impacts.

Before starting to plan how to improve particular sustainability aspects of river cruise operations it would be well worth researching the current situation, if not already done. The checklist provided in appendix 1, though not exhaustive, will help with that task.

### 3.2 Monitoring

In order to achieve improved resource efficiency and sustainability on river cruise ships, a monitoring system should be established, together with a preventive maintenance system. This is usually the responsibility of the Chief Engineer onboard. The aim is to allow the company to;

- establish a performance baseline of water, energy use and waste production;
- determine long-term trends;
- set targets for improvements;
- asses performance against those targets; and,
- identify problems as soon as they occur.

Monitoring involves gathering and analysis of key information on a regular basis. This starts with a 'baseline' - the initial measurement or calculation used as a basis for comparison with future data. There are many potential measurement points and data sources for water, waste and energy that can be used to set up, or improve an existing, monitoring system, (see appendix 2). Existing documentation and logs can often be used as a source for this type of data. This type of data can be automated and communicated between ships and the company head office using specialised marine management software, for example, MXSuite software produced by Mastex ([www.mastex.nl](http://www.mastex.nl)).

Indices of water or energy use should be used to set targets and track progress. Total consumption indicators can be used, or divided by a relevant denominator (such as monthly guest night occupancy). The self-assessment checklist (see Appendix I) can serve as starting point. More guidelines, videos and tools are available on the Travel Foundation's website; [www.thetravelfoundation.org](http://www.thetravelfoundation.org).

Monitoring engine performance

ENGINEER ROOM REPORT S.S. ANTOINETTE												
Ship: S.S. ANTOINETTE												
Voyage No: 1010												
Date: 10/10/2010												
Date	Time	Oil pressure	Temp	Water			Air in engine			Exhaust		Temperature
				Inlet	Outlet	Flow	Inlet	Outlet	Temp	Temp	Temp	
Monday	10:00											
Tuesday	10:00											
Wednesday	10:00											
Thursday	10:00											
Friday	10:00											

Temperature log

Temperature control log for blast chiller					
Ship: S.S. ANTOINETTE					
Voyage No: 1010					
Date: 10/10/2010					
Date	Item Description	Time in	Time out	Internal food temperature	Signature
10/10/2010	Fish stock	10:00	11:00	4	Capt
10/10/2010	Chicken food	10:00	11:00	5	Capt
10/10/2010	Half chicken	10:00	11:00	5	Capt
10/10/2010	Salmon	10:00	11:00	4	Capt
10/10/2010	Shrimp	10:00	11:00	5	Capt
10/10/2010	Shrimp	10:00	11:00	4	Capt
10/10/2010	Shrimp	10:00	11:00	5	Capt
10/10/2010	Shrimp	10:00	11:00	4	Capt
10/10/2010	Bread	10:00	11:00	5	Capt
10/10/2010	Bread	10:00	11:00	4	Capt
10/10/2010	Bread	10:00	11:00	5	Capt
10/10/2010	Bread	10:00	11:00	4	Capt
10/10/2010	Bread	10:00	11:00	5	Capt
10/10/2010	Bread	10:00	11:00	4	Capt
10/10/2010	Bread	10:00	11:00	5	Capt
10/10/2010	Bread	10:00	11:00	4	Capt

A preventive maintenance programme should be in place to ensure that all equipment is working properly and efficiently at all times, including the following key elements:

- servicing of equipment to manufacturer's recommendations;
- leak detection and repair;

- checking the conditions of seals, e.g. refrigerator door seals;
- cleaning, e.g. condenser coils;
- proper operation of thermostats;
- checking regularly for wear and tear on valves and pumps;
- carrying out pressure testing of pipelines and tanks, as appropriate, using approved testing procedures and contractors;
- calibration of metering and dosing systems regularly to avoid overuse of cleaning chemicals;
- application of appropriate corrosion protection metal tanks, vessels and pipe work; and,
- checking and, where necessary, replacing critical items as they approach the end of their predicted life expectancy to avoid failure and leaks.

These elements are covered in more detail in each of the following sections on energy, water, wastewater and solid waste.

### 3.3 Energy

In this section, energy use is discussed, including the potential impacts, the rationale for best practice and suggestions on how to reduce these impacts.

#### 3.3.1 *What are the issues?*

Greenhouse gases produced by fossil fuel combustion are a significant contributor to climate change, therefore a business that minimises the use of energy is acting responsibly in this regard. Other by products of combustion have the potential to impact on local and regional air quality.

Fuel is a major cost for river cruise companies, fuel prices have risen significantly in recent years and continuity of supply is not guaranteed.

Putting in place environmental performance measures can lower greenhouse emissions and other emissions to air, all whilst reducing costs and reducing risk.

Electrical energy on river ships is generally provided by two sources that are often used in combination: onboard generators and shoreside electrical power.

Shoreside power is used when a ship is at berth and its main and auxiliary engines are turned off. Using the onboard generators will be more expensive than using shoreside power when it is available (depending on the rates in the port) ) and produces more emissions to air and noise locally.

Fuel for propulsion is the other major contributor to energy consumption on a ship. Whilst many factors influence fuel consumption (such as river water flow, going upstream or downstream, traffic at locks and itinerary requirements), an inefficient cruising style, poorly-planned itineraries, lack of maintenance and not utilising modern engines and other aspects of ship design will contribute to high fuel use.

Energy costs can be significantly reduced by monitoring energy consumption, investing in the most up-to-date technology, establishing energy-saving procedures, training staff, raising awareness of guests, and making good use of existing port facilities.

### 3.3.2 What should be done?

During the periodic refitting of a ship, modern technology should be installed to ensure optimal energy consumption. Staff should be trained to follow energy-saving procedures in all areas. Guests should be made aware of opportunities for saving energy on a voluntary basis, as part of welcome sessions or through signs in the appropriate places.

Careful planning will help make optimum use of port facilities and establish efficient itineraries to reduce fuel consumption. Captains should also be trained to employ a fuel-saving cruising style, taking into account relevant factors, such as the current river water level or locks times.

The following measures will help reduce energy consumption onboard:

- ☑ Install and monitor of sub-meters in key areas of the ship to allow for monitoring of energy consumption by individual ship area, such as kitchens, and thus give a greater understanding of ship performance and more precise location of problems should they occur.
- ☑ Install low-wattage, energy-saving LED lamps. Typically, LED bulbs use less energy and need to be replaced much less often than an equivalent incandescent or CFL bulb, saving cost and environmental impact over its lifetime. Use the lowest wattage feasible for each environment (restaurant, bar, aisles, guest cabins, guest bathrooms). Figures 3.1 and 3.2 show typical energy consumption and service life of different types of lamps, making evident the benefits of LED lamps.

Figure 3.1: Typical amount of light produced by watt of power

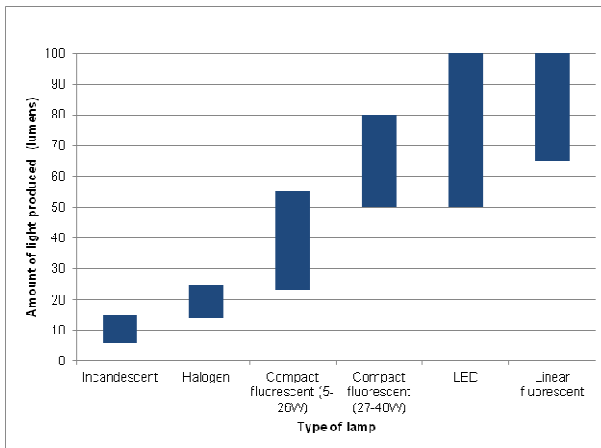
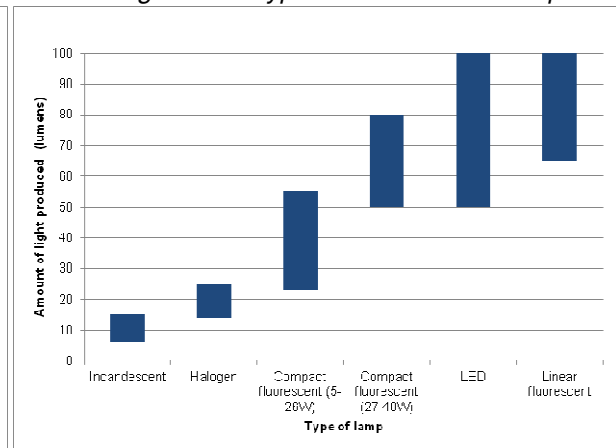


Figure 3.2: Typical service life of lamps



Data Source: Guidelines for Environmental Sustainability in Hotels, TUI Travel PLC, March 2011

- ☑ Use differentiated management of lighting through switchboards that allow for partial dimming or switching off of lights in public areas, such as the restaurant or bars.

*LED lighting in onboard restaurant*



*Sliding door sensor regulating A/C*



- Install pipes (hot water and air conditioning) to reduce heat loss.
- Check that rubber seals are in good repair for all refrigerated rooms, refrigerators and freezers.
- Implement room key card systems and movement sensors to control heating, ventilation, and air conditioning (HVAC) energy consumption and lighting in guest cabins and other areas while guests are absent.
- Install sensors at sliding window doors that will turn off the air conditioning (AC) when opened.
- Use modern energy-efficient appliances such as laundry machines, dishwashers, cooking heaters. Take into account reliability
- Take into account reliability and environmental considerations in purchasing decisions when replacing equipment. A good opportunity for this is during and routine refurbishments.
- During winter storage, mooring or refitting of ships, use shorepower where possible or share generators between ships from the same company.
- Maintain digital records of planned maintenance and monitoring records of all equipment onboard to allow long-term performance reviews and more fuel-efficient operation of the ship.
- Use shorepower wherever available. Contrary to the ship's generator that provides power at a certain level independently from the electrical devices that are in operation on the ship, shorepower is always provided in accordance with the actual power requirements at any given time. Additionally, shorepower helps reduce greenhouse gas emissions as it is generally more efficiently produced.
- Encourage those ports that do not yet offer hook-up to shorepower to do so, possibly in conjunction with other river cruise companies.
- Use laundry machines, dishwashers and appliances at full capacity/load.



*Onboard washing machine at full capacity*



*Typical shoreside power connection*



- ☑ Where possible use small pop-up toasters, rather than conveyer toasters.
- ☑ Establish clear procedures and train staff to reduce energy consumption of the HVAC systems, lighting in guest cabins and public areas, and other electrical devices, by providing guidelines on when they should be turned off, e.g. when guests are not occupying the cabin, or when public areas during the night should be dimmed.
- ☑ Within large rooms install a lighting system that allow for dimming in the unused areas.
- ☑ Create awareness amongst guests about the ways they can reduce energy consumption when not in their room, such as;
  - switching off lights, TV and other electrical devices;
  - turning off the air conditioning and suggesting a reasonable thermostat temperature,
  - drawing curtains to avoid sunlight heating-up the room.

### **3.3.3 Fuel consumption for propulsion**

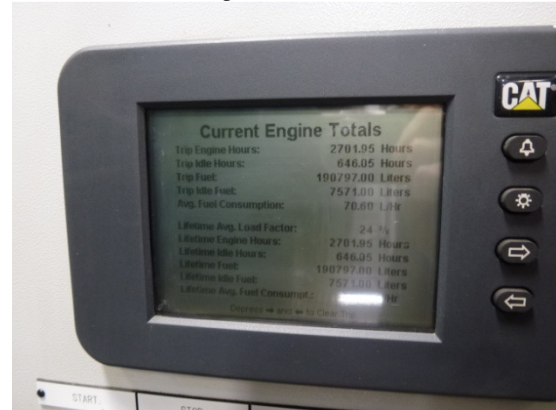
Fuel for propulsion is a very important aspect of energy consumption of a river cruise ship and so represents a significant opportunity for making efficiency gains. The following measures for reducing fuel use should be considered:

- ☑ Set up fuel meters in the wheelhouse that allow captains to optimise their cruising style, for example by avoiding high cruising speeds that are not required to meet the planned itinerary.
- ☑ Establish indicators to monitor cruising styles, benchmarking fuel consumption for comparable journeys to measure and manage fuel consumption patterns.
- ☑ Establish a preventive monitoring and maintenance system for engines and generators according the to the manufacturer's service schedule to help prevent, and quickly resolve, mechanical performance issues that could increase fuel consumption.
- ☑ Train captains to adopt a fuel-efficient cruising style.

Fuel meter in wheelhouse



Fuel meter in engine room



- Design itineraries in such a way that travelling at maximum speed is unnecessary
- Establish a minimum fuel use per kilometre specification when commissioning new ship designs.
- Install up-to-date fuel-efficient engines and generators.
- Use engine and generators with a generating capacity matched to the needs of the ship.

### 3.3.4 Emissions to air

Emissions to air are usually not measured directly but instead calculated as a function of fuel consumption, multiplying the total diesel consumed (kg) by published emission factors (such as greenhouse gases) or by data provided by the engine manufacturer.

Strategies to reduce emissions are the same as those to conserve fuel, but with the addition of:

- Compliance with all applicable legal regulations concerning emissions.
- Installation of state of the art particulate filter technology.

## 3.4 Water

In this section, water use is discussed, including the potential impacts, the rationale for best practice and suggestions on how to reduce these impacts.

### 3.4.1 What are the issues?

Clean water is a precious resource and it is important to use it sparingly. The energy used to pump, clean and heat water also contributes to greenhouse gas emissions. Contaminated water has the potential to pollute the environment if released.

Minimising its use helps to;

- ensure continuity of future supply, protect natural river and groundwater sources;

- reduces the need to build new dams;
- care for fresh water habitats for local wildlife and migrating waterfowl;
- cut down on associated greenhouse gas emissions; and,
- create less wastewater.

Cruise ships commonly stock potable water from shore to be used for all requirements. The requirement to store both fresh and wastewater takes up considerable space.

Significant amounts of water are used for a wide range of purposes onboard a river cruise ship - from housekeeping, laundry, and kitchens to guest and staff showers, taps and toilets, to exterior deck and window cleaning. In some cases, river cruise ships can have a swimming pool, increasing water consumption.

By understanding water use onboard, monitoring its use and working towards reduction targets the river cruise company will both save costs (in its purchase and treatment) and its impact on the environment.

### **3.4.2 What should be done?**

The total volume of water stocked for each journey should be measured and recorded in litres. Over time baseline water consumption can be established and future use tracked against it.

The following is a list of some of the most important water-saving techniques that should be applied in guest and crew cabins and public area, as appropriate:

- Install water sub meters in various strategic points, such as the supply for the kitchen, so that a more detailed picture of water consumption onboard can be built up and problems detected at an early stage.
- Fit low-flush (vacuum) toilets with low capacity cisterns.
- Fit taps with flow controllers such as aerators, restrictors or percussion (push) taps.
- Fit showers with flow restrictors or special low-flow showerheads.

*Inefficient high-volume toilet cisterns*



*Trigger nozzle to minimise water wastage*



*Photograph courtesy of Daniel Oines*

- ☑ Train staff members to report leaks and drips to the engineering department. The housekeepers are ideal people to do this on a daily basis so that problems can be rectified quickly.
- ☑ Put in place a towel and bed linen reuse programme with staff training and instructions to guests.
- ☑ Separate and pre-treat soiled laundry items to avoid re-washing.
- ☑ Load washing machines and dishwashers to capacity before use. Where frequent small loads occur (such as guest's self-service laundry) make smaller machines available.
- ☑ Review the efficiency of installed washing machines and dishwashers and replace with modern and more water efficient models during refitting.
- ☑ Fit hoses with trigger nozzles so that they cannot be left running unintended (both those on-deck as well as for pre-washing dishes).
- ☑ Where possible, use of river (instead of potable) water for deck cleaning.
- ☑ Backwash pool sand filters based on need with visual windows or back pressure, rather than a fixed daily schedule.

**Guest bathrooms** are one of the most water-intensive areas on river cruise ships, so if the fittings aren't already efficient, it is an area with great potential to make cost-savings and improve environmental performance.

The water section of the Travel Foundation's Greener Accommodations Guide explains how to calculate water flow rates in more detail, as well as the impact and payback periods. Simple flow tests can be carried out with buckets of a known volume and a stopwatch and then compared to best practice standards for hotel accommodation<sup>5</sup>. See the webpage at the link for more details: [http://www.thetravelfoundation.org.uk/green\\_business\\_tools/greener\\_accommodations/water](http://www.thetravelfoundation.org.uk/green_business_tools/greener_accommodations/water) [Alternatively: <http://tinyurl.com/cermrhq> ]

<sup>5</sup> Travelife [www.travelife.org](http://www.travelife.org) is one of several international certification schemes. It was designed by the Association of British Tour Operators (ABTA) for the travel industry with the aim of helping to improve the management of hotel social and environmental issues, by complying with the requirements of 99 sustainability criteria (criteria currently under review).



**Showerheads** - Showerheads that use a high flow rate of water not only use unnecessary amounts of water but also unnecessary amounts of energy in heating that water. They should either be replaced with low-flow showerheads or fitted with effective water conservation devices, such as flow restrictors. Low-flow showerheads are specifically designed to generate a satisfying shower flow while using only 8 to 10 litres/min.

**Taps** - Where high flow rates are not required, taps should be limited to a maximum output of 6 litres/min in cabins, public and employee bathrooms and 10 litres/min in bar, kitchen and laundry sinks. The flow output of inefficient taps can be reduced by:

- ☑ Installing aerators that generate the desired maximum flow output (this includes replacing aerators that produce excessively high flow).
- ☑ Installing a flow restrictor in the connection between the aerator and the tap or in the pipes that supply water to the tap.
- ☑ Partially closing the shut-off valves that are generally installed on the pipes that convey water to the tap. This measure however is generally less effective and yields lower savings than the other measures described above.

*Automatic tap in guest cabin*



*Low-flow showerhead in guest cabin*



**Toilet cisterns** - Toilet flush water volume should be limited to maximum of six litres, with the following in mind. This can be achieved by

- ☑ Having a vacuum system (commonly aboard ships). Vacuum systems, if set-up correctly tend to be more water-efficient than siphon or dual-flush systems.
- ☑ The size of the cistern should be six litres or contain a displacement device.
- ☑ Toilets should be dual-flush models, which use a partial flush for liquid wastes and a full flush of six litres or less.

Housekeeping staff often flush the toilet several times during the course of cleaning rooms. The supervisor may even flush once more on checking, simply out of habit. Implementing a “one flush policy” to the room cleaning procedure will save significant amounts of water every day.

### 3.5 Wastewater

In this section the focus is on wastewater, with a brief summary provided on the potential impacts, the rationale for best practice and suggestions on how to reduce these impacts.



### 3.5.1 What are the issues?

Wastewater management is important for three main reasons:

1. Discharges of wastewater into waterways, depending on the nature of the discharge, the sensitivity of the location and the frequency of discharges, can have serious negative environmental and public health impacts and damage the responsible party's reputation
2. River cruise ships, just as with any inland waterway vessel, must comply with legislation on inland waterways. National and/or regional legislation may mandate the segregation of wastewater streams, use of holding tanks, disposal via port facilities and parameters for wastewater discharge into waterways (see section 3.10 legal frameworks). Additionally, compliance with EU regulations is required, such as those that stipulate that ships must be equipped with treatment devices to prevent the discharge of untreated or inadequately treated wastewater.
3. Producing and treating wastewater has a financial cost. A given volume of wastewater represents the various costs that have gone into making it, e.g. purchasing metered potable water, use of cleaning chemicals and water heating. Wastewater treatment systems are not cost-free to purchase and maintain and greater volumes of wastewater will require larger and possibly more complex equipment.

Three terms are commonly used to distinguish the main types of wastewater streams created on cruise ships: 'blackwater', 'greywater', and 'bilge water'. These streams must be strictly segregated onboard in order to ensure proper and efficient treatment and disposal:

- **Blackwater** is sewage (toilet waste which contains harmful bacteria and viruses). An estimated 20-40 litres per person is produced per day (Butt 2007). Cruise ships use treatment devices with physical, chemical and/or biological processes to allow effluent to be treated and discharged with characteristics that are similar to effluents from wastewater treatment plants on land (Sweeting & Wayne 2006).
- **Greywater** is wastewater from sinks, showers and washing machines (which contains a variety of substances including detergents, oils and greases, and food waste) and typically the greatest source of liquid waste generated by cruise ships
- **Bilge water** is any water spilt in the interior, or ship wash water on the exterior, that collects in a tank in lowest part of the ship and is often contaminated with oil.

### 3.5.2 What should be done?

Any comprehensive strategy should first focus on reducing the volume of wastewater produced in the first place. Minimising water use (see section 3.4) will reduce the amount of wastewater generated onboard, thereby lowering both the costs of wastewater handling and treatment and minimising environment risk.

River cruise ships should have the most up-to-date treatment technology and measures in place to ensure that wastewater discharge meets or exceeds acceptable quality limits within the law. This includes related management such as handling sludge and backwash from filtration, separated water from oil/water separator, and preventive maintenance such as replacing filters. In terms of best practice, considerable advances have been made in shipboard technology sector for wastewater purification over the last decade and the most effective and efficient equipment should be sought.

Four main strategies to reduce wastewater costs and risks are outline below.

### 1. Reduce the quantity of wastewater

- Reduce the use of water to reduce the volume of wastewater produced, as outlined in section 3.4.

### 2. Reduce the concentration of contaminants in the wastewater before discharge into the river or sewerage system

- Use state-of-the art on-bard treatment systems.

*Enzymes used to break down bacteria in for an onboard treatment system*



*Automatic dosing system for cleaning chemicals*



- Reduce the concentration of contaminants in the wastewater by reducing the use of cleaning chemicals. If using concentrated cleaning products an automatic electronic dosing system will lower the volumes used (as humans typically pour more than the minimum requirement).
- Clean the bilge water using "passive" methods such as bioremediation, which uses bacteria to break down the hydrocarbons in the water into harmless by-products.

### 3. Improve the treatability of water

- Procure more readily biodegradable products certified by independent organisations such as Green Seal, Environmental Choice, GreenGuard, EU Flower and Nordic Swan.

### 4. Assure secure containment and handling of wastewater

- Ensure that wastewater is securely stored (no leaks), clearly labelled (to avoid accidental mixing of incompatible chemicals in the water), has secondary containment where applicable.
- Include all waste water storage, transfer and treatment equipment are included in the maintenance programme.
- Make sure that staff are trained in the handling and correct handling and disposal of liquid waste.

- ☑ Check that wastewater transfer equipment is suitably designed and sized for the job.
- ☑ Put in place emergency procedures and spill containment equipment and that they are well-understood and practiced.
- ☑ Collect bilge water in suitable oil/water separators and dispose at ports or through specialised oil separator vessels with disposal facilities for this type of waste.

*Electronic dosage system*



*Sign advising about onboard water-saving technology*



Any strategy to reduce wastewater should always focus first and foremost on the reduction of water consumption. Once all possibilities have been exhausted in this regard, wastewater minimisation is essentially a technological issue, not one determined primarily by staff or guest behaviour, and should be optimised using the most advanced equipment and bio-chemicals available for treatment.

## 3.6 Solid waste

This section explains the hidden costs of solid waste, how minimisation of solid waste is less about technology and treatment and more about avoiding becoming waste in the first place and their subsequent handling, plus actions river cruise companies should take to achieve this.

### 3.6.1 What are the issues?

The production of materials and their processing once onboard the ship all use finite natural resources in the form of raw materials, energy supplies and fresh water. If poorly managed, waste has the potential to pollute the natural environment.

Producing and handling solid waste also has a financial cost. Taking the example of food waste, the cost of that waste is much more than the obvious cost of disposal charges. The hidden costs are the costs of the ingredients, packaging, transportation, refrigeration, labour for preparation, energy and water for cooking and cleaning, plus the labour cost of handling it once it is waste.

In addition, if a river cruising company has to factor in large quantities of extra stock and space to store it, plus space to hold waste before disposal, all because of excess waste production, this represents additional storage space onboard; space that might otherwise be more profitably used for additional or larger rooms for other purposes.

An average cruise ship will generate an estimated minimum of 1 kg of solid waste per day per passenger (Sweeting and Wayne 2003). A large proportion of that waste will be inert but other fractions of the waste will not be. For example, food waste is putrescible which can create leachates (liquid waste) harmful to aquatic life and nuisance odours. Certain solid wastes, such as fluorescent light bulbs, contain hazardous substances which need to be handled accordingly.

With limited storage space onboard, river cruise ship operations depend on frequent access to adequate waste reception facilities on shore and, where port companies do not provide a disposal service themselves, contracts with specialised waste companies to dispose of hazardous waste. Variance in waste management facilities at ports, and different regulations in each country can pose challenges in terms of waste management.

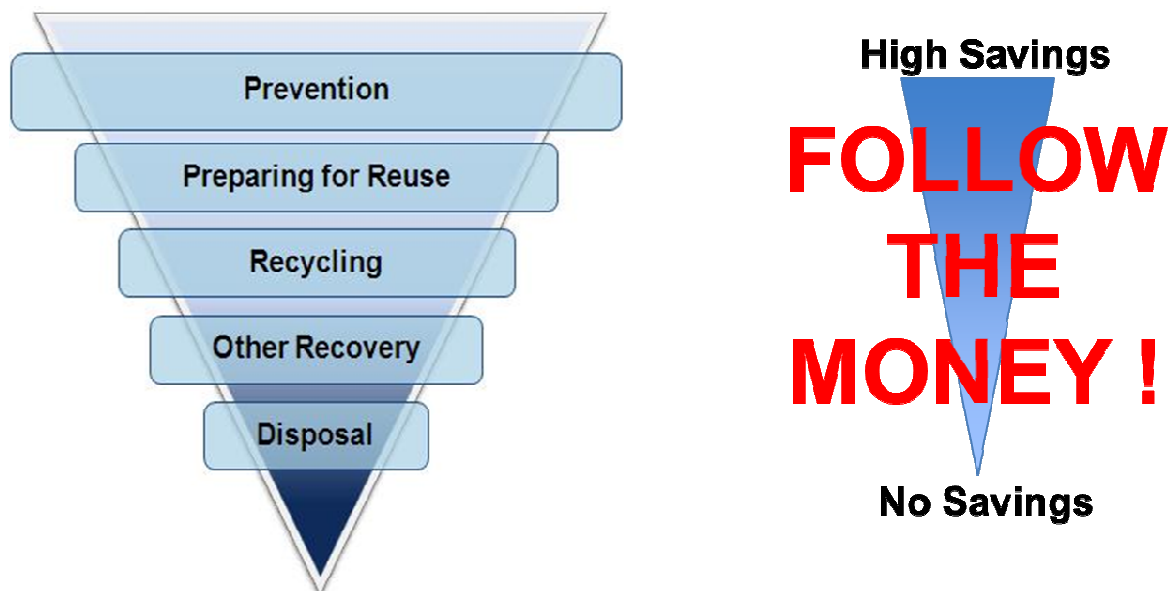
It is not only important not only manage waste for the safety and comfort of passengers and to protect fragile river habitats, but equally to dispose of waste onshore properly.

The disposal of hazardous chemicals and solid waste contaminated with oil, such as oily rags and used oil filters, is subject to strict legal national and international regulations and needs to be monitored and logged in detail, for example by means of the oil record book that is obligatory in many countries in Europe.

### 3.6.2 What should be done?

Strategies to optimise waste management include the “three Rs”, Reduce - Reuse - Recycle, as well as other options, specified in the waste hierarchy (Figure 3.3 below). The most preferable option – at the top - is prevention, avoiding solid waste altogether; while the least preferable option is disposal – at the bottom – that if necessary, should be done properly employing adequate facilities. All other options appear in between, in decreasing order of preference.

Figure 3.3: The waste hierarchy



In general, the measures taken towards the top of the waste hierarchy will realise the greatest cost savings and reduce negative environmental impacts and those towards its base, the least.

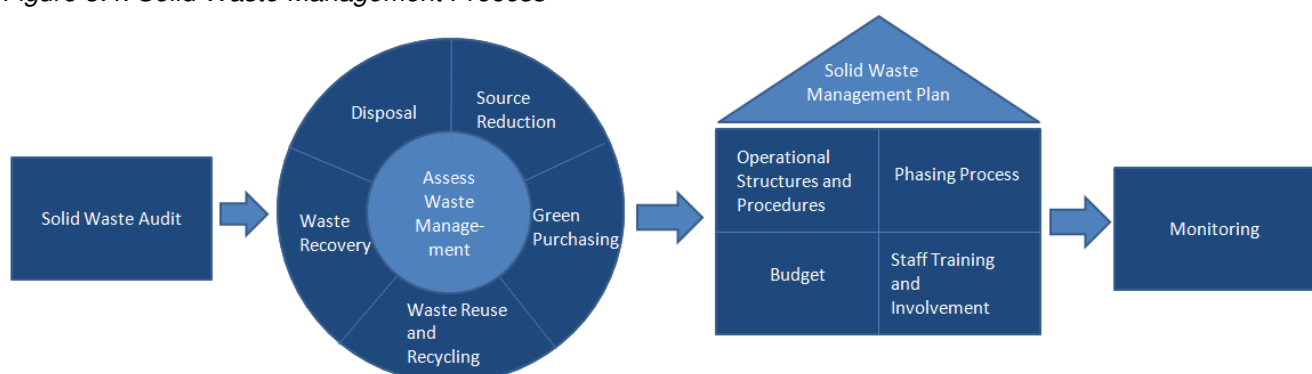
- ☑ **Prevention** – This is preventing waste from being created in the first place. Reduce the generation of waste that could not be prevented by ordering the minimum amounts of goods required, come in minimal packaging and goods that last longer.
- ☑ **Reuse** – Use materials repeatedly. For example, use suppliers who can deliver food in crates that can be returned and used over and over again, use refillable soap containers rather than individually wrapped bars. Cleaning, repairing and refurbishing also falls into this category.
- ☑ **Recycling** – Recycling is turning waste into new materials and products. To aid this, ensure proper separation of recyclable materials onboard and offload ports that can adequately forward them to recycling facilities.
- ☑ **Recovery** – Recovery refers to the recovering of energy embodied in the waste by incineration or anaerobic digestion to produce energy or fuels. This is preferable to disposal at a landfill that does not use energy/fuel recovery techniques.
- ☑ **Disposal** – This is disposing to landfill without energy/fuel recovery. Even with this least preferred option, there are possibilities of minimisation prior to disposal, for example reducing the volume by compacting solid waste, e.g. glass crushers for wine bottles. This increases the opportunity to hold on to recyclable waste until a port with proper recycling facilities is reached.

Solid waste storage onboard requires adequate space, such as rooms for food waste with sealed doors that prevent the escape of any odours or occurrence of pest, or even cooled waste storage rooms in hotter climates, to ensure the comfort of guests. Typically, different types of waste are stored in a number of locations on the river cruise ship before being disposed of at a port.

Waste disposal should make optimum use of port facilities through: a) separation of different types of waste, and b) keeping hold of recyclable waste until a port that is able to send the waste off for recycling is reached.

Creating and implementing a Waste Management Plan (WMP) will be an aid to ships in better managing their waste minimisation, handling and removal in line with the waste hierarchy. A WMP sets out your priorities and actions for tackling waste in your business. The diagram in Figure 3.4 outlines some example steps and process to do so.

Figure 3.4: Solid Waste Management Process



Source: A Manual for Waste and Water Management, UNEP, 2003

The main steps in developing the WMP are:



- ☑ Complete a solid waste audit: Walk around your ships and ports you use to understand waste streams onboard and define how they can be measured (see appendix 2 for measurement point options).
- ☑ Assess the waste management options for each type of waste in relation to the waste hierarchy.
- ☑ Develop the management plan, considering;
  - operational structures, procedures and key responsibilities.
  - financial costs, benefits and payback time.
  - how the different elements will be phased when implemented; and,
  - staff training and guest awareness.
- ☑ Monitor results and review procedures, continuously aiming to improve the process.

More detailed guidance is available from other sources, but below are some examples of the types of measures that should be implemented in line with the waste hierarchy. Also included and also include aspects referring to management and communication:

### Prevention

- ☑ Control stock and purchasing policies carefully to avoid over-ordering.
- ☑ Discuss ways of reducing packages and waste with your main suppliers, making an analysis of all products regularly purchased. For example, your supplier may be able to make utilise of reusable plastic boxes for fresh vegetables.
- ☑ Go paperless wherever possible. Electronic ordering and invoicing systems are commonplace.
- ☑ Reduce waste by limiting disposable items such as small packages for food such as jam, butter, milk etc. where bulk dispensers or containers could be used instead.
- ☑ Place glass refillable filtered water bottles in guest bedrooms rather than plastic disposable ones.

### Reuse

- ☑ Use refillable bottles and containers for, shampoo and soap.
- ☑ Worn out or permanently stained bed linen can be reused to carry laundry instead of disposable plastic sacks.
- ☑ Donate obsolete furniture to non-profit organisations that can still make use of it.

*Refillable soap containers*



*In-room recycling bin arrangement*



## Recycling

- Improve waste separation through the systematic use of colour-coded packs and bins for different kinds of waste, following a unified system throughout the ship that is explained in the operations manual and guest welcome pack.
- Use garbage bins in guest cabins and other locations with inserts that allow pre-sorting different types of waste such as food waste, plastic or paper.
- List waste reception facilities at each port to support optimal waste disposal management. This may mean storing a certain type of waste onboard until a port with appropriate facilities for separation and recycling is reached.
- Set-up special bins for receiving used batteries either from guests or staff and set up a system to dispose at the appropriate shore facilities for hazardous waste from commercial sources.
- Guest and staff bathrooms can be supplied with high-quality recycled toilet paper.

## Disposal

- Use readily biodegradable soaps and other chemicals where possible.
- Separate oil and fat in the kitchen and dispose of separately to wastewater.
- Crush cans and bottles to save space.
- Use a reputable disposal company – check their credentials.

Staff should be trained to comply with the WMP, assigning specific tasks and responsibilities for each member. Staff should have knowledge of waste reception and recycling facilities in each port so that each staff member can cooperate in storing and disposing solid waste accordingly. Training should also be given so that queries from guests about waste policies will be handled well.

Management and communication:

- Train staff to comply with the WMP and how to communicate the policies with guests, should a situation require it.
- Monitor and benchmark solid waste production and disposal route by type of waste (landfill, recycling, organic, hazardous).

- Create awareness among guests, sensitising them to the waste policies and the reasons for them.

### 3.6.3 Case study: Sustainable Cruise

**Sustainable Cruise** ([www.sustainablecruise.eu](http://www.sustainablecruise.eu)) is a project financed by the European programme LIFE+ aimed at improving waste management efficiency. Currently focused on ocean-going cruise ships, the lessons learned will still be relevant for river cruises in terms of reducing and recycling solid waste onboard ships and the re-use or total disposal of residual waste.

The project is experimenting with management models and innovative technologies which meet the objectives established by the European Directive on waste (Dir. 2008/98/EC), including the so-called '3Rs': Reduce, Re-use and Recycle.

Starting with a pilot project on the *Costa Pacifica*, a detailed analysis of the waste flows is being carried out with a focus on three waste categories: biodegradable, packaging and paper. At the end of the project, innovative solutions for each of these three categories will be proposed. These solutions will be aimed at the reduction of packaging, transformation of food and paper into merchandisable by-products, and at increasing the percentage of waste destined for recycling.

The project also aims to develop a new monitoring methodology capable of quantifying the reduction of emissions (in terms of CO<sub>2</sub>) derived from sustainable management of shipboard waste. This can contribute to defining and applying the Kyoto climate change objectives to the cruise sector, and provide the basis for a plan to define new type of certification that can guide future European regulation in the sector.

## 3.7 Communications

Once specific steps are being taken towards implementing the best practices outlined in this guide, a parallel communication strategy should make sure that staff are aware of the changes and underlying policies, and understand the short, medium and long-term benefits that environmentally sustainable river cruising will bring.

Beyond staff, communication should also be aimed at guests, so that they also understand they role that they can play in helping to reduce any negative impact on the environment from tourism.

The Travel Foundation website offers a free range of guides that help businesses to communicate best practices to both consumers and staff. Visit the communications tool at:

[http://www.thetravelfoundation.org.uk/green\\_business\\_tools/communications\\_tool](http://www.thetravelfoundation.org.uk/green_business_tools/communications_tool)

or: <http://tinyurl.com/kyhhhq6>

### 3.7.1 Staff communications and training

If a sustainability policy is to be effective, it has to be credible in a consistent way. For staff to take ownership of sustainability issues it is important that management is equally committed, setting an example wherever possible, and that the overriding purpose of the sustainability policy is clear, as well as the procedures that help reach that goal. Credibility is also very important from a guest's point of view. Inconsistency will affect the opinion of guests and lower the morale of staff.

The whitepaper “*Survival of the Fittest*” (2012) published by the Travel Foundation highlights a number of examples showing the strong correlation between a business’ sustainable practices and staff engagement. According to Business in the Community (a UK-based sustainability charity), 75% of employees who believe their organisation is focused on sustainable development exhibit high levels of commitment. CSR is a key driver in staff satisfaction – on average 50% higher in companies with a strong CSR culture. Greater staff engagement also pays dividends in terms of improved customer satisfaction and loyalty.

Here are some essential tips for making sure that staff are committed to making a difference:

- ☑ Sustainability is not about isolated actions but rather a basic philosophy underlying every decision and the entire company. Management plays an important role in setting an example and establishing clear guidelines for sustainability policies in a river cruise operation. This can be accomplished by setting up an Environmental Management System (EMS) (see section 3.8) and having a set of indicators to measure and monitor environmental performance in an objective manner.
- ☑ The existence and essence of the EMS should be communicated clearly to all staff through handbooks, operation manuals and announcements that are posted visibly in key locations on the ship.

*Guest communication*



*Photograph courtesy of Uniworld Boutique River Cruise Collection*

*Communicating commitment*



- ☑ Annual training events before the main season should cover environmental practices, with refresher courses offered during the year.
- ☑ Train staff how to deal with guests when questions arise about environmental policies.
- ☑ Ask for and take into account ideas and suggestions from staff at all stages when planning and designing new procedures - they’re the ones at the ‘coal face’, so will have good ideas and instinctively know what will work and what will not.

As more sustainable solutions sometimes imply higher costs, if only in the short-term, clear guidelines should be established for any decision involving financial obligations (for example, when purchasing energy-saving equipment or environmentally friendly cleaning chemicals) vs. the longer-term financial, risk reduction and brand reputation benefits.

Tip: The **Travel Foundation** has developed a range of **training materials** that can be integrated into existing staff training plans. The training toolkit will also help integrate sustainability in to key business areas – retail, overseas, purchasing, quality, new product development and marketing – visit

[http://www.thetravelfoundation.org.uk/green\\_business\\_tools/staff\\_training\\_development](http://www.thetravelfoundation.org.uk/green_business_tools/staff_training_development)

or: <http://tinyurl.com/kfzmt8o>

Consistency is important for staff trained to separate different types of waste. If waste is observed to be mixed during port disposal despite staff having previously separated it onboard, staff will be demotivated to continue with waste separation procedures. Simultaneous efforts with port authorities to maintain the separation of waste should be pursued and communicated to staff.

Monitoring is another important aspect for communicating any progress to staff. Key performance Indicators (KPIs) should be clearly communicated to relevant staff. For example, fuel consumption patterns to captains, household chemical use to hotel managers or energy consumption patterns to engineers create an enhanced awareness of current environmental performance and trends.

By openly communicating performance data, or making it easily available, the process of implementing environmentally friendly practices gains transparency and credibility and staff will be motivated to contribute to improvements.

Positive competition can also help improve sustainability indicators. Reward systems should be set up to recognise staff contributions to sustainability requirements and procedures, e.g. “employee of the month”. Staff repeatedly failing to comply with company sustainability policies should face disciplinary action.

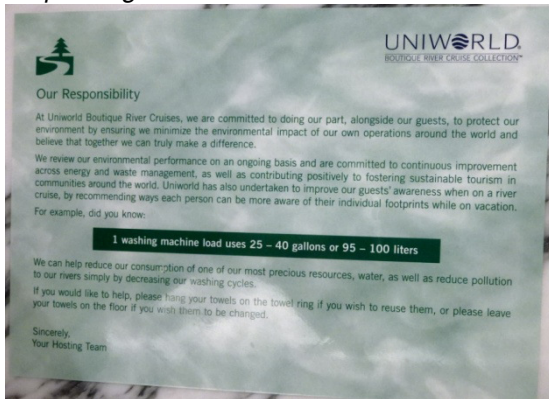
### **3.7.2 Guest communications**

In order to maximise the results of environmental best practice, the active participation of guests is helpful. Explain to guests how they can make a difference. The focus of the message should be on the ecological benefits to the local area, rather than the financial benefits of the environmental programme to the company.

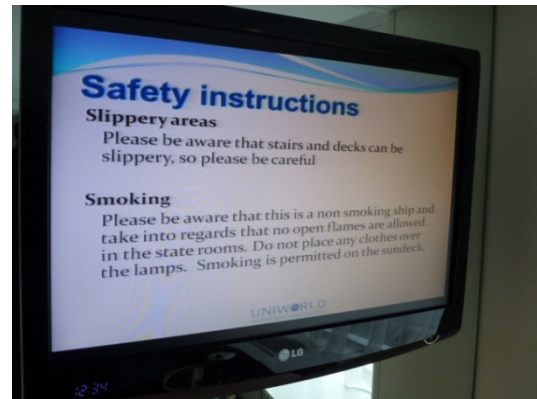
Supplying polite tips to guests on reducing energy use is now routine in hotels across the world – encouragement to turn off appliances when not in use and to switch off lights and air conditioning when they vacate their room or cabin. Towel and bed linen reuse programmes, will not only save water but also energy and cleaning products too. This should be simply explained to clients using a tent card in the bathroom or electronic display systems. Guests can then decide whether they want to participate, rather than staff automatically changing towels and linens every day.



### Explaining environmental measures



### In-room TV, another possible communication channel



Specific measures to create guest awareness include:

- Explaining the company philosophy and provide recommendations during orientation sessions.
- Providing recommendations for environmentally friendly behaviour in orientation booklets available each cabin, as well as through the company TV channel in cabins.
- Provide explanatory signs in guest cabins and other areas.

In terms of environmental and cost impacts, it is important to monitor the programme to make sure it is working properly. For example, the number of towels washed over a given period can easily be tracked by the housekeeping department. This data can then be used to calculate the average number of towels used, which should be around 0.7 bath towels per guest night. If it is more than this, check whether guests have been adequately informed and that housekeeping staff are complying with the programme.

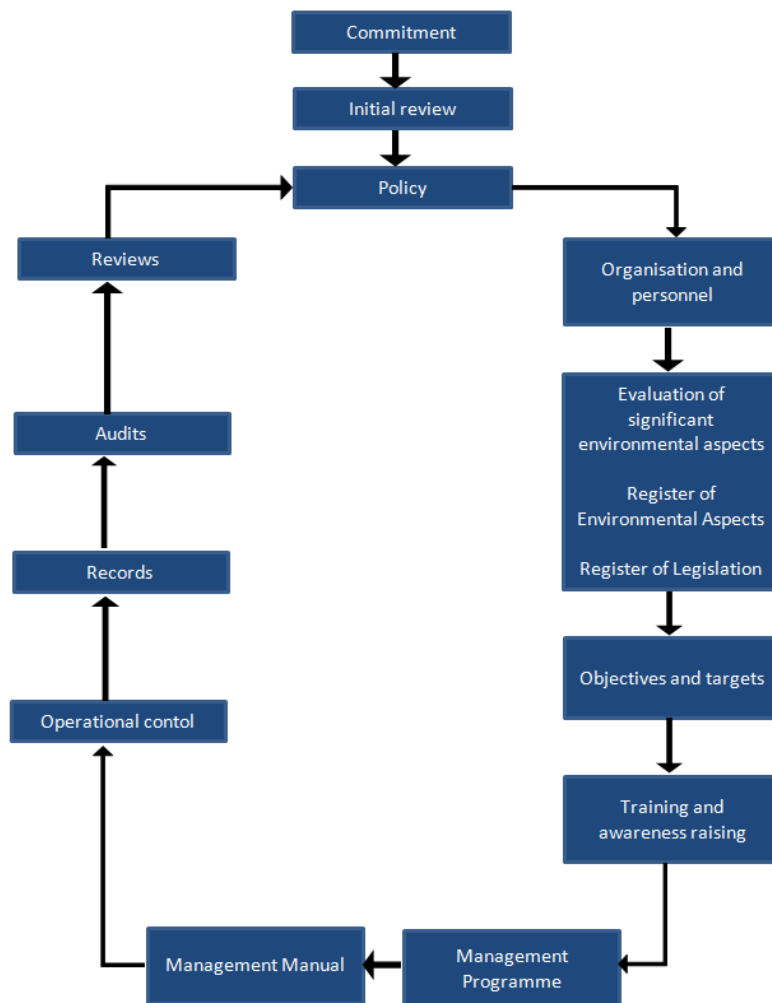
The Travel Foundation provides advice through its consumer-facing Make Holidays Greener website that can be shared with guests for creating general awareness and a sense of shared responsibility ( <http://www.makeholidaysgreener.org.uk/download-guides> or <http://tinyurl.com/lgv2zrl> ).

## 3.8 Environmental Management Systems

A common and well-established way for companies to address and minimise its environmental impacts, manage legal compliance and continuously improve performance, is through an 'environmental management system' (EMS).

The Travel Foundation and the waste recycling organisation, WRAP UK, suggest the following key elements of a typical EMS (and shown in Figure 3.5):

Figure 3.5 – Elements of a typical EMS



Source: *Your Guide to Environmental Management Systems, WRAP*

The following steps lead to the establishment of an EMS:

1. an assessment of how company activities, products, processes and services might affect the environment,
2. the development of an environmental policy that shows the commitment to environmental excellence by top management,
3. procedures and environmental improvement programme or action plan,
4. defined roles and responsibilities for all employees with environmental responsibility onboard - create a staff 'green team',
5. a training and awareness programme,
6. written procedures to control activities with a significant environmental impact,
7. a controlled system of records,
8. periodic auditing to ensure effective operation; and,
9. a formal review by senior management to analyse the objectives achieved and define new activities for the next year.

Performance against the Management Programme can be measured in a variety of way, such as;

- performance against resource efficiency targets.

- ☑ legal compliance,
- ☑ policy awareness levels amongst staff,
- ☑ non-conformance issues,
- ☑ complaints from authorities or other stakeholders, and,
- ☑ tests of emergency preparedness.

An effective system also ensures good administrative control and provides evidence that internal procedures are well-managed.

### 3.9 Itinerary planning

Various aspects of river cruise itineraries influence its environmental impact. This represents another opportunity for river cruising companies to minimise their environmental impact - by careful planning of itineraries.

Taking the example of fuel use, and related greenhouse gas emissions, the distance between two ports and the required journey times between determines the speed at which the river cruise ship has to travel. If the ship has to travel at a high or full speed, fuel consumption increases disproportionately to the increase in velocity. A well-balanced itinerary does not require the cruise to operate at full speed but rather allows for a fuel efficient pace.

Although the main criteria for selecting ports will likely be based on the tourism attractions in their surroundings, this choice also affects how waste will be managed and separated, depending on the facilities available in each port. This should be taken into consideration when planning itineraries and priority given to ports with proper waste management facilities, as well as shoreside electricity, whenever possible. Excursions offered in each port should also be analysed to give preference to tours that have more limited impact on the environment, e.g., walking tours preferred over those that require motorised transportation.

### 3.10 Innovation and fleet improvement

There should be a clear mandate from management to take into account sustainability criteria in the conceptualisation, planning and implementation phase of new river cruise ships and major refurbishment programmes.

Initially, this implies a systematic scanning of available technologies, materials and designs that reduce environmental impacts. Communication and an exchange of ideas among different departments should be encouraged, bringing together management, designers, nautical directors, engineers, captains, and hotel managers to discuss the implication of each change or innovation for their area of responsibility before final decisions are made. When large investments are identified, thorough cost scenarios should be developed to study short, medium and long-term savings resulting from the employment of environmentally friendly technology.

Sustainability considerations should not only refer to the environmental impact caused by a particular technological device, but also include aspects such as quality, reliability, serviceability and user-friendliness. The company should also monitor all ships and benchmark performance and sustainability indicators to get actual data to inform future investment decisions. The company should continuously monitor new technological developments to remain aware of the best solutions on the market.

### 3.11 Legal frameworks

There are many aspects to compliance with the legal frameworks that river cruise industry faces: the operation of vessels, health and safety regulations, waterways, ports, coordination amongst countries, as well as environmental and commercial aspects. Some of these legal aspects affect river cruise companies directly, while others are more indirectly linked to the overall conditions under which river cruise companies operate.

Legal frameworks exist on different levels: the port, for specific rivers or even certain sections, national and international levels. This complex web of overlapping regulations, as abstract as it may seem, clearly does contribute to the overall sustainability of rivers and the commercial entities which operate on them.

As previously mentioned, one important aspect of an EMS (section 3.8), is to assure compliance with environmental laws and regulations.

#### Ports

Each port has its own specific regulation and fees. This might concern, for example, regulations where a cruise ship can moor (in some cases, in the city centre; in other cases, in an industrial area on the outskirts of town), the fees to be paid (for example, for shorepower, if available) and the availability of waste management facilities, such as different containers for different types of waste. Finally, some port areas do not allow the discharge of treated wastewater into the port basin.

#### **River-specific regulatory frameworks: the example of Europe**

River cruising in Europe is concentrated on a few main waterways (for example the Danube, the Rhine and the Moselle) and is governed by ordinances issued by river commissions. The European rivers are discussed here as an example of river-specific regulatory frameworks.

By way of example, an overview of the environmental legal framework on three European rivers are given on the next page.

## Rhine

The *International Commission for the Protection of the Rhine* seeks to environmentally protect the Rhine and all of its tributaries. Even though significant advances in the protection of the river have been made, the commission is still working on reducing the impact of inland vessels in various areas, such as;

- reducing the danger of intentional or non-intentional contamination;
- waves disturbing fragile ecological systems along the shore; and,
- turbidity of water through ship propellers, along with swirling up of sediment which contributes to spreading of foreign animal and plant species.

The *Central Commission for the Navigation of the Rhine* has a regulatory framework spanning four areas

1. traffic regulations;
2. technical requirements;
3. personnel executing nautical functions; and,
4. transportation of dangerous goods.

The regulations covering these four areas are applicable for all countries that the Rhine flows through.

Additionally, as is the case with other rivers, certain sections of the river require captains to hold specific patents to ensure safe navigation.

## Moselle

The *Moselle Commission* founded by France, Germany and Luxembourg establishes a regulatory framework with a special emphasis on safety regulations. This includes the Moselle Waterway Policy Ordinance for navigation on the Moselle River. The commission also deals with construction projects such as the lifting of bridges or the doubling of locks.

The *Moselle Commission* cooperates with the *International Commissions for the Protection of the Moselle and the Saar (IKSMS)*, which aim, among other aspects, to safeguard water quality and prevent accidents.

## Danube

The *International Commission for the Protection of the Danube River* has been established by the Danube River Protection Convention, the overall legal instrument for co-operation on transboundary water management in the Danube River Basin.

It is an international body dealing with river basin management which focuses on sustainable water management including the reduction of contamination and surface / ground water conservation

Another body, the *Danube Commission* has the following areas of intervention:

- establishment of a uniform system of traffic regulations;
- creating a regulatory framework concerning the river customs and sanitary inspection; and,
- publishing sailing directions, nautical charts and atlases for navigation.



## **National**

Each country has national legislation that affects river cruising in a number of aspects. While national legislation is often aligned with river-specific or international regulatory frameworks, some differences exist, for example, between the ten EU countries and non-EU countries that border the Danube River. Each river cruise company must be familiar with the current and evolving national legislation in each country to be able to comply with these standards.

## **International**

A number of international agreements exist, such as the EU Water Framework Directive, which aim to protect the biological quality of water bodies and monitor chemical contamination. Other examples of EU legislation include the Council regulation 1356/96/EC on common rules applicable to the transport of goods or passengers by inland waterway between member states; directive 2008/68/EC on the inland transport of dangerous goods; or directive 2000/59/EC on port reception facilities for ship generated waste and cargo residues.

The vast number of laws and regulations affecting the international business of river cruising is not within the remit of this guide. It is clear that constant monitoring of the relevant legislation is needed, ideally by a designated person or department in charge of assuring compliance.

Another important area of legislation concerns food safety. The internationally known and accepted hazard analysis and critical control points (HACCP), which represents a preventive approach to food safety from EU legislation since 2004 (EC regulation 853/2004) and also provide guidelines for dealing with food waste. Complying with this legislation represents standard procedure among river cruise companies today.

## 4. Sustainable river cruising - the wider view

This guide has highlighted the complexity of managing cruise ships in terms of their environmental performance. But in addition to the floating hotel operation, there are broader factors related to the operation of the river cruise boat, including suppliers, ports, municipal governments, booking agents and colleagues in competitor river cruise companies.

### 4.1 Cooperation with suppliers

Suppliers play an important role in the operation of a river cruise and should be part of any comprehensive sustainability strategy. This should include a thorough analysis of the supply chain - the products purchased, the logistics required to get these products onboard, as well as the packaging. Aim to establish long-term relationships with suppliers in order to better influence their environmental impacts. Food should be provided from areas close to where the cruise operates to reduce transportation distances and emissions. Food should be purchased with sustainability criteria in mind; many foods such as produce, meat, fish, coffee and tea now have a label or certification that should be given preference. Packaging should be kept to a minimum to reduce waste onboard the river cruise ship.

*Purchasing regional specialities*



*Photograph courtesy of Uniworld Boutique River Cruise Collection*

*Food delivery to ship with reusable crate*



There are many areas where working closely with suppliers can contribute to reducing impacts on the environment:

- ☑ An important line of supplies is cleaning chemicals. Many providers offer a 'green' line of products that should be sourced. Staff should be thoroughly trained in the adequate selection and use of cleaning chemicals, taking budget considerations into account.
- ☑ Similarly, products used for personal hygiene of guests (such as soaps, shampoos, cleaning lotions) should be purchased according to sustainability criteria, avoiding unnecessary packaging and using refillable containers in the guest bathroom. Certified products are available on the market.
- ☑ Going a step further beyond consumables, the cruise company should also work with suppliers of furniture and machinery to ensure that their production takes into account environmental criteria. For example, concerning the wood used for the furniture in guest cabins and panelling of walls should come from sustainably managed forests.

- ☑ Another important area to consider is paper products such as those used in the administration of the ship or to facilitate information to customers about services or tour options. The type of paper used should be recyclable or certified, for example by the Forest Stewardship Council (FSC).

## 4.2 Cooperation with ports

One key area of cooperation with ports is the adequate establishment of waste management facilities. Ports should have facilities for receiving food waste, glass, metal cans, plastic, paper and cardboard, batteries, general waste and hazardous waste. In practice, ports are often only prepared to receive some of these types of solid waste, implying that recyclable materials end up in the general waste, or that the cruise company has to dispose of these in another port. This can be challenging given the space restrictions on a river cruise ship.

The areas where the waste containers are located should be easily accessible from the mooring cruise ships and should be well lit at night. Special care should be taken on both sides that cruise companies respect the designation of each waste container so that different types of solid waste are not mixed together.

Rates for shorepower can differ substantially from one port to another and joint efforts should be made by river cruise companies to establish a price range applicable for all ports. Some ports are only prepared to provide shorepower to a few ships at a time, so river cruise companies should collectively negotiate an appropriate number of connection points for grid electricity.

*Recycling containers in port*



*Shoreline power supply*



## 4.3 Cooperation with the destinations visited

Port cities and smaller destinations may be more interested in cooperation with river cruise companies if there are economic benefits beyond port fees. Here are some key points to take into consideration:

- ☑ Using local services as much as possible is one way to achieve this, such as transportation from the port area to the city centre, local restaurants, handicraft markets, guides, museums and other cultural facilities. If it is not feasible to include such services in cruise itineraries due to financial considerations, cruise guests should be given information about options in a

destination so that they can make their choices. Another good practice is to make guests aware of local customs and sensitive social norms through orientation sessions or leaflets.

- ☑ Another way to improve cooperation with a port destination is to facilitate overnight stays, especially in arrival ports at the starting point, or those at the end of a cruise. In this way guests have the opportunity to familiarise themselves further with the region before or after the cruise, and are better prepared to understand and appreciate the host country.
- ☑ Items offered onboard for sale in the souvenir shop should reflect the character of the destinations visited, with those produced with environmental considerations in mind given priority.
- ☑ Group size should be in accordance with local conditions. Where possible, groups can be split up if certain sites cannot handle large numbers of visitors at a given time. Environmentally friendly ways of exploring destinations along the river should be especially encouraged, such as walking and cycling tours. Information material handed out to passengers should be designed to facilitate these eco-friendly excursions with corresponding tips, maps or local guides. If possible cruise companies should select mooring sites close to the city centre and attractions, in order encourage passengers to walk or cycle.

## 4.4 Destination partnerships

Many of the improvements to environmental performance that can be made onboard are dependent on the availability of efficiently run and affordable shore facilities and services. Making improvements is a challenge, given the wide range of actors that need to be communicated with - from municipal governments and river police, to sub-contractors and suppliers. Individual river cruise companies are in difficult position to lobby for better port facilities. Collaborate with other river cruise companies or associations to establish destination partnerships for improvements related to environmental performance (such as shorepower or recycling facilities).

Centralised procurement brings costs savings from economies of scale and leverage within the company supply chain. This could also be applied to environmental performance, for example the purchasing of Marine Stewardship Council certified fish. Leverage buying power and work with suppliers to minimise their environmental impacts.

### **Ocean Conservation and Tourism Alliance – an example that can help make a difference**

A good example is the Ocean Conservation and Tourism Alliance founded in 2003 by the International Council of Cruise Lines and Conservation International to protect biodiversity in top cruise destinations and promote industry practices that minimise the cruise industry's environmental impact, focusing on four areas:

**Best Practices for Wastewater Management:** improved shipboard technology, specifically accelerating and adopting Advanced Wastewater Purification (AWP) systems.

**Establishing Destination Partnerships:** working with local governments and communities to maintain high-quality travel experiences by protecting the natural and cultural assets of cruise destinations.

**Promoting Environmental Education:** raising guest and crew awareness of and support for critical conservation issues.

**Promoting Vendor Environmental Education:** lessening the environmental impacts of suppliers

Destination partnerships can be extended to collaborate on projects to protect natural and cultural assets, as well as small communities affected by cruise ships.

## 4.5 Cooperation within the river cruise industry

Moving towards reducing the environmental impacts of any tourism operation requires cooperation with many stakeholders. In the river cruise industry, companies depend on good cooperation with ports to dispose of waste, to obtain shorepower, to bunker freshwater and fuel. Some of the more frequented ports have heavily invested to provide an improved infrastructure, such as the port of Nuremberg with €10 million in 2012, thus cooperating with the requirements of the river cruise company and preparing for further growth. But not all ports are prepared to make investments in infrastructure investments that can help reduce environmental impacts.

River cruise companies could address specific sustainability concerns by jointly defining needs for the industry and negotiating collectively with port authorities. This could include aspects like reasonable rates for shorepower or provision of adequate waste management facilities with separation of the different waste types.

Another level of cooperation among river cruise companies concerns the regular exchange of best practices and sustainability and the establishment of minimum criteria for sustainable river cruising operations. This includes what should be implemented by a river cruise company and what could be part of a communication strategy aimed at guests and potential clients.

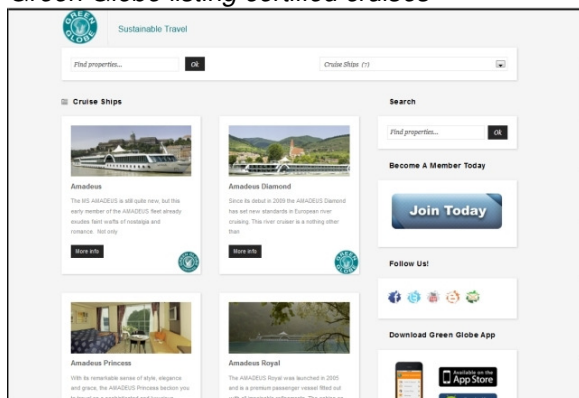
An open and frank discussion on the best technologies required for sustainable river cruising should also allow for feedback to providers so that they can improve their technology, for example concerning the monitoring of fuel consumption or sub-metering energy consumption in key areas of the ship. Given the complexity of the wiring in any cruise ship it is not easy to install sub-meters in a later phase. However, if this aspect would be contemplated from start it would be easier for cruise companies to monitor and adjust their energy consumption patterns.

## 4.6 Cooperation with booking agents

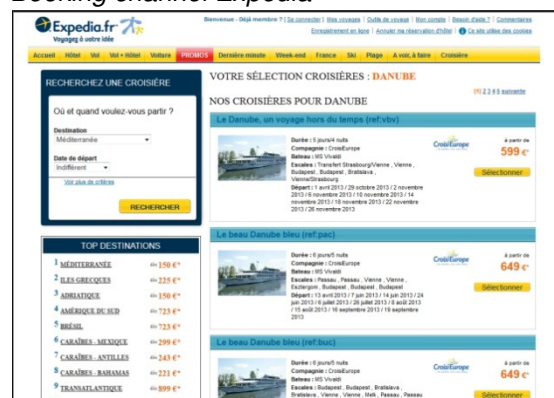
Another option is to collaborate with tourism authorities to develop tour packages that benefit both the river cruise company and the visited destination. Booking agents, such as travel agencies and tour operators, should be made aware of the environmental efforts of the river cruise company so that they can market to clients when selling a river cruise.



## Green Globe listing certified cruises



## Booking channel Expedia



The promotional materials of the cruise company should contain a section where sustainability efforts are explained. Booking agents should also make clients aware of environmentally friendly travel options to the port of departure and from the port of arrival at the end of the cruise, especially train travel, whenever available and applicable. Additionally, clients should be offered possibilities to compensate emissions for their travel to and from the port as well as the cruise itself.

## 4.7 Certification systems / labels

One trend in sustainable tourism is the certification of services that allows for greater transparency, comparability and credibility, providing the consumer with reliable choices. While certification is quite common in the accommodation sector, it has not yet reached the river cruise industry to a significant degree.

Currently Green Globe ([www.greenglobe.com](http://www.greenglobe.com)) is the only organisation to have developed a certification programme specifically for cruise companies, and the number of certified river cruise ships is still very limited.

As river cruise companies increasingly implement environmental policies and communicate these to the public (through annual sustainability reports, for example) certification is likely to become more common. This in turn will help consumers to make better decisions when considering which river cruise company to book with. However, certification is not a prerequisite to implementing environmental performance measures and communicating this directly.

## 5. Conclusions

By safeguarding destinations, companies have the opportunity to protect the natural assets they rely on to be able to offer an enjoyable holiday, enhance brand value, increase profits, save costs and improve competitive positioning, both for attracting and retaining cruise guests and recruiting the best staff talent

This guide seeks to support river cruise companies to better understand and adopt environmental performance measures. It shows how implementing these measures can prevent serious environmental impacts and improve business.

The guide covers the main potential environmental impacts of river cruising, the rationale for best practice and suggestions on how to reduce these impacts. The seven main topics include monitoring, energy, water, wastewater, waste, communications with guests and staff, and setting up an EMS.

The ten key principles of sustainable river cruising in this guide summarise the main lessons based on best practice for the operation of cruise ships themselves. Suggestions are also made for how to address sustainability through cooperation with suppliers, ports and destinations, as well as within the river cruise industry and booking agents.

Moving towards improved environmental performance is a dynamic and on-going process. Ships within accepted norms still have opportunities for further cost-savings and sustainability actions, allowing each company to define their own improvement plan, priorities and indicators for individual ships and the company fleet. Best practice examples, sources of further information, and the self-assessment checklist in this guide support river cruise companies in their efforts of continuous improvements towards a more sustainable future.

# Appendices

## Appendix 1 - Self-assessment checklist

This is a basic checklist for use when planning preliminary environmental audits of river cruising ships / floating hotels. Items should be added or deleted to suit your particular circumstances.

### 1. Useful documentation

- Environmental log register.
- Environmental risk register.
- Environmental policy.
- Environmental Management System (EMS).
- Existing certifications.
- Fuel/water consumption logs.
- Logs of other inputs chemicals (ex. cleaning, laundry, other).
- Logs of input foodstuff.
- Solid waste/hazardous waste logs, emission and treated wastewater monitoring results, etc..
- Contracts with solid/hazardous waste collection contractors.
- Compliance with applicable national or EU laws.
- Health and safety regulations.

### 2. General background information

- Ship history.
- Ship components.
- Description of activities from guest welcome, meal service and support
- Environmental responsibility onboard the ship (organisation, periodic/non-conformance reporting).
- Average trips/year and average trip distance.
- Labour force and shifts per day and no of hours /roster.
- Number of guest cabins and average rate of occupancy.
- Number of crew cabins.

### 3. Energy utilisation

- Description of the power generated on the ship (no. of generators and capacity and fuel used and its consumption).
- Sub-metering of energy use by area.
- Energy source during mooring.
- Other types of energy used, e.g. wind, solar.
- Heating, ventilation and air conditioning (HVAC):
  - Temperature setting for air conditioners / heaters.
  - Is that consistent throughout the ship?

- Who is responsible for setting the temperature?
- Who is able to override it?
- Does the air-conditioning have a heat-recovery system?
- How are frozen foodstuff thawed?
- Energy efficiency measures (energy management system) adopted:
  - Occupancy sensors / key cards for lighting and HVAC in cabins, deck areas and fans in walk-in refrigerators and freezers.
  - Timer switches.
  - Type of light bulbs, e.g. incandescent, CFLs, LEDs.
  - Operation of dish washers and washing machines only when fully loaded?
  - Periodic checks on refrigerator/freezer seals.
  - Periodic cleaning of heating / cooling coils.
  - Towel and linen reuse programs, communication of program to guests/crew.

#### **4. Emissions to air**

- Utilised fuel and its quantities for:
  - engines
  - generators
  - kitchens (gas bottles)
- Odours from kitchens and waste storage.
- Equipment maintenance programs and reporting.
- Whether monitoring is undertaken and its frequency – check monitoring results in environmental register.
- Abatement equipment used.

#### **5. Water supply and use**

- Water sources, quantities, and uses, including bottled water.
- Toilet flush capacity.
- Shower and tap flow rates.
- Water efficiency technologies in use.
  - Trigger nozzles on hoses.
  - Flow controllers or aerators on taps and showers.
  - Grey water reuse.
- Methods for cleaning floors and decks.
- Treatment of water before use.
- Source of fire fighting water and storage methods.
- Pool water and backwashing method.
- Leak detection and management.

#### **6. Hazardous substances**

- What are the types of hazardous substances used onboard the ships, e.g. chemicals for laundry, refrigeration?
- Are Material Safety Data Sheets (MSDS) available for all chemicals at the location where they are used stored?



- Is there a register for hazardous substances.
- Where are the substances stored?
- Are incompatible substances stored separately from each other?
- Are the fire risks understood?
- Is the store is well ventilated? Are drip trays or secondary containment measures in place? Who has access to the store?
- Do the containers have a label with required information and in a language that the crew are familiar with?
- Are emergency spill procedures in place, understood by the crew, tested and regularly practiced?
- Are spill kits available for containing a spill?
- Are tributyltin (TBT) or tin-based chemicals utilised as antifouling paint?
- Are there any ozone depleting substances used on site, for example, R22 for chillers, hydrochlorofluorocarbon (HCFC) for fire extinguishers? Is there a plan for phasing out their use?

## **7. Wastewater**

- Are wastewater types segregated (grey, black and bilge)?
- Description of treatment methodology for each wastewater type
- Description of disposal methodology for each wastewater type.
- Adequacy of containment tanks, pipes and pumps to protect against accidental discharge.
- Measures to ensure that wastewater discharges to the river meets acceptable discharge limits.
- Disposal method of sludges.
- Methods used for water recycling/reuse or reduction
- Water analysis protocols.

## **8. Solid waste management**

- Types and quantities of generated solid waste including, but not limited to food, packaging, paper, plastic, glass, metal, cardboard, electronic, furniture and maintenance wastes.
- Use of disposables, such as toiletries, napkins, straws, laundry bags, menus.
- What wastes are segregated?
- Waste handling methods.
- Storage facilities and locations.
- Collection methods onboard and at port.
- Adequacy of storage facilities at port – is the waste properly controlled and contained?
- Disposal methods.

## **9. Hazardous waste management**

- Sources and types including, but not limited to, waste oil, oily water, contaminated containers, paints, varnishes, cleaning and servicing chemicals, waste electrical equipment, medical wastes.
- Handling -identification, segregation, storage, labelling.
- Staff training records and staff awareness of procedures.
- Adequacy of hazardous waste storage. Are wastes contained properly, are secondary containment and spill kits in place and are procedures for their use understood and practiced?
- Are transfer procedures to shore facilities adequate to minimise the risk of spills? Are emergency procedures established, understood and practiced?
- Final disposal route, related contracts and consignment records.

## **10. Housekeeping**

- What is the structure of the housekeeping department?
- Are staff trained to report and repair leaks
- Are bin liners used in guest cabins? How often are they changed?
- What is the policy for replacing partially used toiletries?
- Use of chemicals and water when cleaning cabins.
- Use of disposables (e.g. laundry bags, envelopes, toilet covers).

## **11. Food and beverage**

- Food procurement procedures & criteria.
- How is buffet food kept warm?
- What foods and condiments are served in individually wrapped portions?
- Are toasters continuously on, even when not being used?
- Are disposable items used, e.g. straws, coasters, napkins.
- What proportion of food is cooked to order?
- Do suppliers use returnable crates?
- Are drinks bottles returned to the supplier?
- Are wastage / spoilage rates measured and recorded?
- Are there measures undertaken to avoid or reduce waste food

## **12. Communications**

- If the company has an environmental policy, is signed and dated by a senior director. Does it have a commitment to continual improvement? Is it on public display? Are staff members aware of it, its content and its significance?
- Are staff aware of environmental procedures?
- Are environmental procedures adhered to?
- Does the company publish environmental targets and performance against them, either to its own staff or publically?

- Are guests informed
- Are staff trained to deal with customer enquiries about the company's environmental policies?
- Are the company's environmental policies clearly communicated to the customers, e.g. how the towel reuse policy works or the location of the battery recycling bin?
- Does the company comply with and hold any environmental certifications. Are those certifications within their expiry date? Are they communicated to interested stakeholders?

## Appendix 2 - Potential measurement points and data sources

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
<b>Energy</b>	Energy (stored in the form of fuel) for propulsion.	Supplier invoices.	Ship's engineering department	If information is supplied to the ship at port then acquiring the data will be relatively quick.	Relies on contact with each individual ship.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.
			Head office accounts department.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.
		Engine management system.	Ship's engineering department.	Should be a quick and reliable source of data.	SS Antoinette is only ship with fuel meter. Relies on contact with each individual ship.	Flexible. Could be per cruise or at each filling of the tanks,

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
		Comparison of contents of fuel tank at start of cruise and at end of cruise, as logged in sailing report.	Ship's engineering department.	Quick to obtain the information. Not reliant on third parties.	Less accurate if a poor quality gauge fitted or a 'tank dipping' method used. Relies on contact with each individual ship.	Per cruise.
	Electricity from onboard, diesel-powered generators.	Supplier invoices.	Ship's engineering department.	If information is supplied to the ship at port then acquiring the data will be relatively quick.	Potentially slow for data to arrive and relies on supplier invoices being accurate. Relies on contact with each individual ship.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.
			Head office accounts department.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.



Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
		Meter reading.	Ship's engineering department.	Likely to be accurate. Quick to obtain.	Generators do not have meters, with exception of SS Antoinette.	Per cruise.
		Comparison of contents of fuel tank at start of cruise and at end of cruise	Ship's engineering department.	Depends on measurement method.	No differentiation between generators. Relies on contact with each individual ship.	Per cruise.
		Known generator fuel use – engineering data multiplied by running.	Ship's engineering department.	As generators are frequently monitored and maintained, probability of unexpected changes in fuel consumption is low.	Not precise. Relies on contact with each individual ship.	Per cruise.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
		Onboard electricity meter.	Ship's engineering department.	Quick and accurate measurement.	No sub-meters exist. Relies on contact with each individual ship.	Per cruise.
	Shorepower	Invoices.	Ship's engineering department	Quick to obtain if documentation received at the port.	Potentially slow for data to arrive and relies on supplier invoices being accurate. Relies on contact with each individual ship.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.
			Head office.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
		Shorepower meter.	Head office accounts department.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate. Relies on contact with each individual ship.	Per stop, but would be useful to know the total for the cruise.
			Ship's engineering department.	Accurate and quick to obtain.	Relies on contact with each individual ship.	Measured per stop, but would be useful to know the total for the cruise.
		Ship-board electricity meter.	Ship's engineering department.	Accurate and quick to obtain.	Relies on contact with each individual ship.	Per cruise.
<b>Water</b>	Potable mains water.	Supplier invoices, e.g. water company, port company.	Ship's engineering department	If information is supplied to the ship at port then acquiring the data will be relatively quick.	Relies on suppliers invoices being accurate. Relies on contact with each individual ship.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
			Head office accounts department.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate.	Depends of frequency of invoices, e.g. per cruise, weekly or monthly.
		Shore-side water meter.	Ship's engineering department.	Accurate and quick to obtain.	Relies on contact with each individual ship.	Measured per stop, but would be useful to know the total for the cruise.
		Ship-board water meter.	Ship's engineering department.	Accurate and quick to obtain.	Relies on contact with each individual ship.	Per cruise.
		Comparison of contents of water tank, as reported in sailing report.	Ship's engineering department.	Quick to obtain.	Accuracy depends on method of tank contents measurement.	Per cruise.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
Wastewater	Liquid waste discharged to river.	No measurement, estimated similar to bunkered potable water.	Could be estimated from a water mass balance.	Does not require additional metering.	More complex to calculate than a direct measure. Relies on accuracy of other measurements.	Per cruise.
	Liquid waste discharged to care of port company.	No liquid waste delivered to port authorities; sludge delivered to specialised companies.	Ship's engineering department records.	Quick to obtain.	Accuracy depends on method of volume measurement. Relies on contact with each individual ship.	Depends on how frequently the waste is discharged, but would be useful to be able to report on a per cruise basis.
			Service supplier invoices to head office.	Could supply along with other data.	Potentially slow for data to arrive and relies on supplier invoices being accurate.	Depends on how frequently the waste is discharged, but would be useful to be able to report on a per cruise basis.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
<b>Waste</b>	Solid waste discharged to river.	No measurement. Glass through glass crusher on Antoinette.	If all glass on Antoinette disposed of via the crusher then an estimate could be made from the known volume of sales of bottled drinks.	Easier than estimating the number of bottles in the waste storage area.	Would require some work developing a user-friendly methodology – possibly from computerized sales records.	Depends on which estimation methodology is used.
	Solid waste discharged to care of port company for landfill.	Sailing report, measured bag size / weight, estimated volume.	Ship's engineering department.	Weighing gives a precise idea of produced waste.	Waste amount currently estimated; weighing of each bag can be cumbersome. Handled differently in each port. Only limited number of ports charge per volume or mass of weight.	Almost daily, but would be useful to be able to aggregate on a per cruise basis.



Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
	Solid waste discharged to care of port company for recycling.	Currently not measured separately by bag size / weight.	Ship's engineering department.	Quick to count bags.	Many ports do not (fully) support waste separation and recycling. Handled differently in each port. Only limited number of ports charge per volume or mass of weight.	Almost daily, but would be useful to be able to aggregate on a per cruise basis.
	Organic (food) waste discharged to river.	Depends on how food waste is stored prior to disposal. An estimate could be made of the number of full containers (bins emptied).	Ship's catering department.	More accurate if weighed.	Less accurate if not weighed. Even if a legal disposal route, not good for company's brand reputation.	Depends on frequency of disposal.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
	Organic (food) waste discharged to care of port company for landfill.	Depends on how food waste is stored prior to disposal. An estimate could be made of the number of full containers (bins) emptied).	Ship's catering department.	More accurate if weighed.	Less accurate if not weighed. Handled differently in each port. Only limited number of ports charge per volume or mass of weight.	Depends on frequency of disposal.
	Organic (food) waste discharged to care of port company for composting.	Does not currently apply as ports do not currently offer composting as a final waste disposal option.	None, unless separated in the future.	More accurate if weighed.	Handled differently in each port or not offered. Only limited number of ports charge per volume or mass of weight.	Depends on frequency of disposal.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
	Hazardous waste.	Hazardous waste documentation.	Ship's engineering department.	Hazardous waste is registered in a very detailed manner.	Difficult to account for hazardous waste produced per cruise if the waste is disposed of less frequently than at the end of each cruise.	Depends on how frequently hazardous waste is off-loaded from the ship.
		Invoices from specialised waste company.	Ship's engineering department.	Quick to obtain, if invoices are issued at the port.	Difficult to account for hazardous waste produced per cruise if the waste is disposed of less frequently than at the end of each cruise.	Depends on how frequency of invoices.

Parameter	Source	Potential measurements points	Potential data source	Advantages	Disadvantages	Frequency
		Invoices from specialised waste company.	Head office.	Could supply along with other data.	Difficult to account for hazardous waste produced per cruise if the waste is disposed of less frequently than at the end of each cruise.	Depends on how frequency of invoices.

## Appendix 3 - Sources of further information

The Travel Foundation website ([www.thetravelfoundation.org](http://www.thetravelfoundation.org)) offers to free-to-use greener business tools. The Travel Foundation's Forum provides a gateway to sustainable tourism information.

### Documents and reports:

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Waste & Resources Action Programme (WRAP) (June 2012) – *Your Guide to Environmental Management Systems – Business Resource Efficiency Guide*, Banbury UK.

**Websites:**

[www.cruising.org](http://www.cruising.org)

[www.cruisejunkie.com](http://www.cruisejunkie.com)

[http://europa.eu/legislation\\_summaries/transport/waterborne\\_transport](http://europa.eu/legislation_summaries/transport/waterborne_transport)

[www.europeancruisecouncil.com](http://www.europeancruisecouncil.com)

[European Directive on Waste \(Dir. 2008/98/EC\)](#)

[http://www.environment-agency.gov.uk/static/documents/Leisure/EWC\\_31-03-09\\_CH.pdf](http://www.environment-agency.gov.uk/static/documents/Leisure/EWC_31-03-09_CH.pdf)

[www.greenglobe.com/cruise](http://www.greenglobe.com/cruise)

<http://www.fao.org/DOCREP/005/Y1579E/y1579e03.htm>

[www.mastex.nl](http://www.mastex.nl)

<http://www.responsibletourismpartnership.org/ICRTCruisingConf2010.html>

[www.sustainablecruise.eu](http://www.sustainablecruise.eu)

[www.thetravelfoundation.org](http://www.thetravelfoundation.org)

[www.travelife.org](http://www.travelife.org)

[www.treadright.org](http://www.treadright.org)

[www.wrap.org.uk](http://www.wrap.org.uk)