FINAL REPORT

European Water Stewardship
Pilot Study Airports

September 2012

❖ PAGE LEFT BLANK ON PURPOSE ❖

European Water Stewardship (EWS)
End Report Pilot Study Airports

Content

I. Introduction

With its partners from business, agriculture, and civil society, along with support from public authorities, the European Partnership (EWP) established the European Water Stewardship (EWS) in 2008. EWS strives to create positive incentives to improve behavior and practices regarding water management. It concretely supports the flagship activities of the European Commission to achieve "Resource Efficiency" and awards water users for sustainable management. As part of a wide stakeholder process, EWSP and EWP have developed a standard to provide guidance to water users and a basis for the evaluation, certification and communication of the sustainability of water management at an operational level within the watershed at hand.

The implementation of EWS standard by a broad range of water users will only succeed if it is implementable under diverse site- and sector-specific conditions. Therefore, EWS has established pilot studies at different locations in Europe and within the different sectors which report on the implementation of the scheme directly to the EWS. As part of this framework, EWS launched a pilot study on the implementation of its standard in airports in December 2011. The study of water management in regards to airports is interesting in regards to the manner in which it integrates distinct water quantity and quality issues, from storm water management to human consumption. EWS selected three airports for the pilot study including: Göteborg Landvetter airport, Malaga airport and Brussels airport.

The objectives of the pilot study were to:

- Further develop the implementation of the EWS standard with focus on its applicability to airports:
    - Update the EWS guideline documents with the necessary information and annexes to facilitate the implementation of the EWS standard in airports.
    - Include new terms in the EWS Glossary applicable to airports.
    - Define the components and scope of the airport assessment.
    - Define key performance indicators (KPI) for airports and define a benchmark for general airport assessment.
    - Gain internal knowledge on the main issues regarding water management in airports in different climatic conditions.
- Evaluate the on-site water management performance of the airports according to the following evaluation scheme:
    - Detect strong and weak points/risks of the water management in each airport.
    - Assess the implementation of the EWS's standard principles.
    - Elaborate a response strategy with the highest positive impact on the referring watershed.
    - Perform an audit on the compliance with the EWS standard at each airport (simulate as close as possible a real scenario of a third party certification).

II. Pilot characteristics

i. Pilot Timeline

The pilot studies began in early 2012 with an on-site training for airport staff directly targeting the issues of the specific site. Following reporting by EWS, the airports submitted a System Plan to prepare for the final pilot audit by the third party certification body. EWS presented the combined results and data exchanged between the three parties: EWS, Airports, and Certification Bodies via the End Reports delivered in July/August 2012.

This document seeks to combine the results from those three pilot studies in order to provide general conclusions and recommendations for the sector as a whole.

ii. Pilot study sites

EWS aimed to have a cohesive study of airports which represented situations with distinct geographic and climatic factors. The following airports intended to give a depiction of not only the individual's problems affecting each site but also overall, common challenges facing the industry.

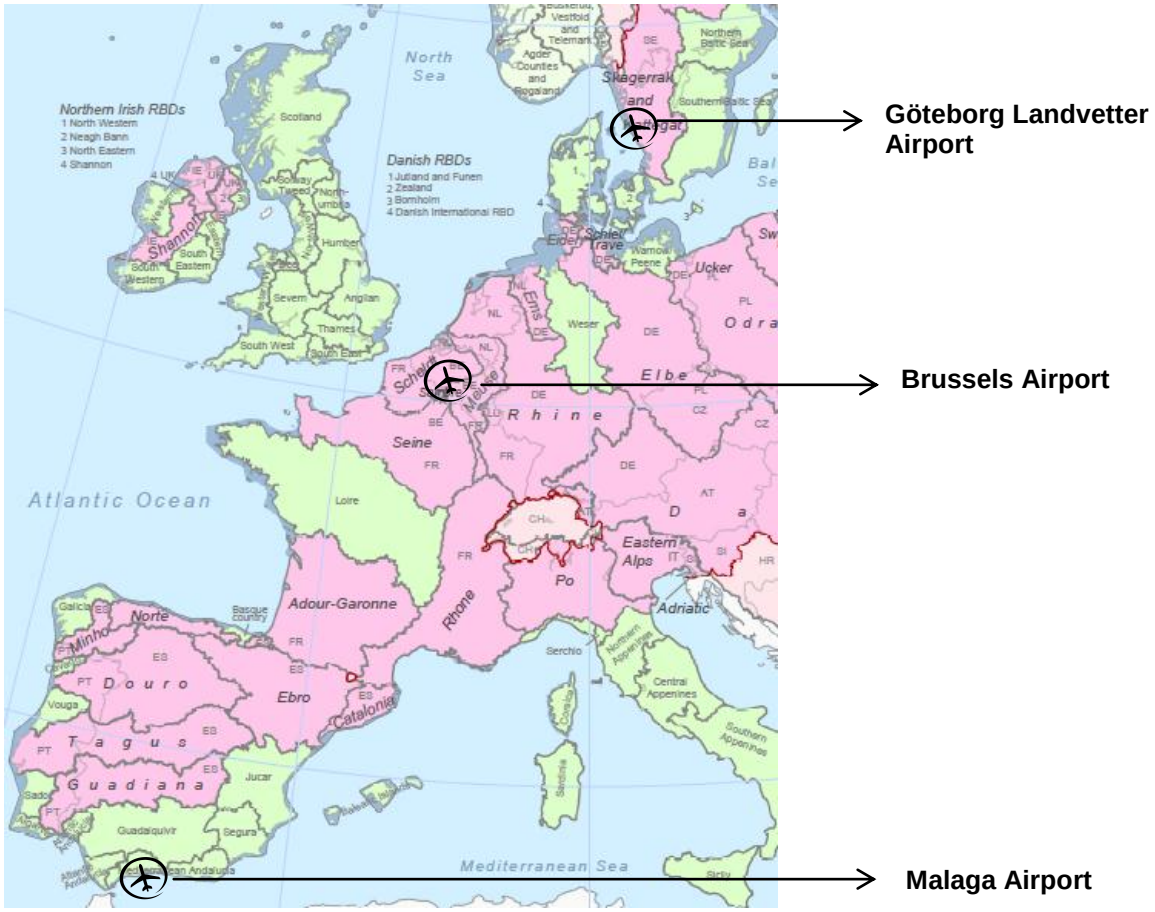

Figure 1: Pilot Partners

iii. Site water status

The pilot sites have been chosen to reflect diverse climates, local water situation (both qualitative and quantitative), and spatial differences. As depicted in Table 1, Malaga Airport, located in a water stressed region, will face very different management issues than Brussels Airport or the Göteborg Landvetter Airport. Likewise, the surrounding land uses will also impact the water quality which exists in the local waterbodies. In larger urban areas, cumulative impacts aside those stemming from airports, may have a large impact on local waterbodies leading to stressed or poor quality conditions. Finally the natural environment also affects the existing groundwater table and its qualitative or chemical state and may require different strategies for management.

Table 1: River Basins' Status

	GÖTEBORG LANDVETTER	MALAGA	BRUSSELS
River basin District	Skagerrak and Kattegat (Västerhavet)	Cuencas Mediterraneas Andaluzas	Scheldt

	GÖTEBORG LANDVETTER	MALAGA	BRUSSELS
Water stress status[1]	Non water stressed region	Water stressed region	Non water stressed region
Surface water Quality[2]	Failed to achieve good	Good[3]	Failed to achieve good
Ecological status[2]	Good/moderate	Bad[3]	Bad
Groundwater chemical condition[4]	Good	Poor[3]	Poor
Groundwater quantitative status[4]	Good	Poor[3]	Good

III. Water Management at airports

i. Definition of the Scope

Due to the complexity of activities and the variety of companies under the umbrella of airport management, it is very important to define the scope for implementing the EWS standard. The scope refers to the areas which are under direct control of the airport company. Airports must be able to provide concrete data and documents regarding the activities related to water taking place in this scope. Other activities not under direct control of the airport are services providers and are part of the supply chain.

The following list is the result of the pilot study. For further implementation of EWS standard in airports, a first step will be to define which of the following areas are within the scope of the airport:

- Airfield (including runways, taxiways, platforms and green areas in between).
- Tower.
- Fire station.
- Hangars and airplane maintenance.
- Surface vehicles maintenance.
- Freight / cargo.
- Fuel depot.
- Terminals and piers.
- General Aviation.
- Parking lots.
- Railway station.
- Bus station.
- Taxi stands.
- Airport staff buildings and services (offices, cantina, parking, etc.).
- HVAC (heating, ventilation, and air conditioning) systems for buildings.
- Gardens.
- Waste water treatment plants (if owned by the airport)
- Water supply infrastructures systems (including drinking water treatment facilities if used).
- Others (specify)

[1] Source: www.eea.europa.eu/data-and-maps/figures/water-exploitation-index-2014-towards

[2] Source: www.eea.europa.eu/themes/water/interactive/soe-wfd/wfd-surface-water-viewer

[3] *Plan Hidrológico de la Demarcación Hidrográfica de las Cuencas Mediterráneas Andaluzas.*

[4] Source: www.eea.europa.eu/themes/water/interactive/soe-wfd/wfd-ground-water-viewer

ii. Definition of the Area of influence

The "Area of Influence" of an airport incorporates aspects of its geography and activities. It refers to the area where the airport potentially produces effects or impacts on the environment (both social and ecological), ranging from the sub-catchment level to the River Basin level. Although this area might evolve in time, it must be clearly identified for the audit process to insure that the information available covers the whole area of influence (e.g. impacts due to the airports water management, both use and discharges, will be related to this area).

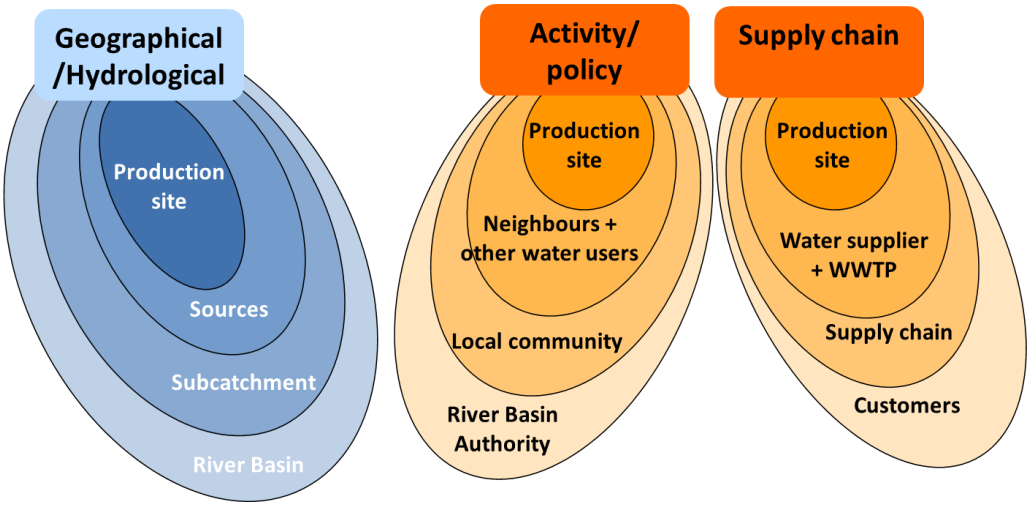

Figure 2: Area of influence

iii. Water Balance

One of the main challenges in addressing water management within airports is the sheer number of inputs and possible outputs within the water cycle. Considering the diversity of activities at airports the inputs to the water cycle are numerable from wastewater, storm water and other runoff, as well other wastewater stemming both directly from airport facilities as well as the airplanes themselves.

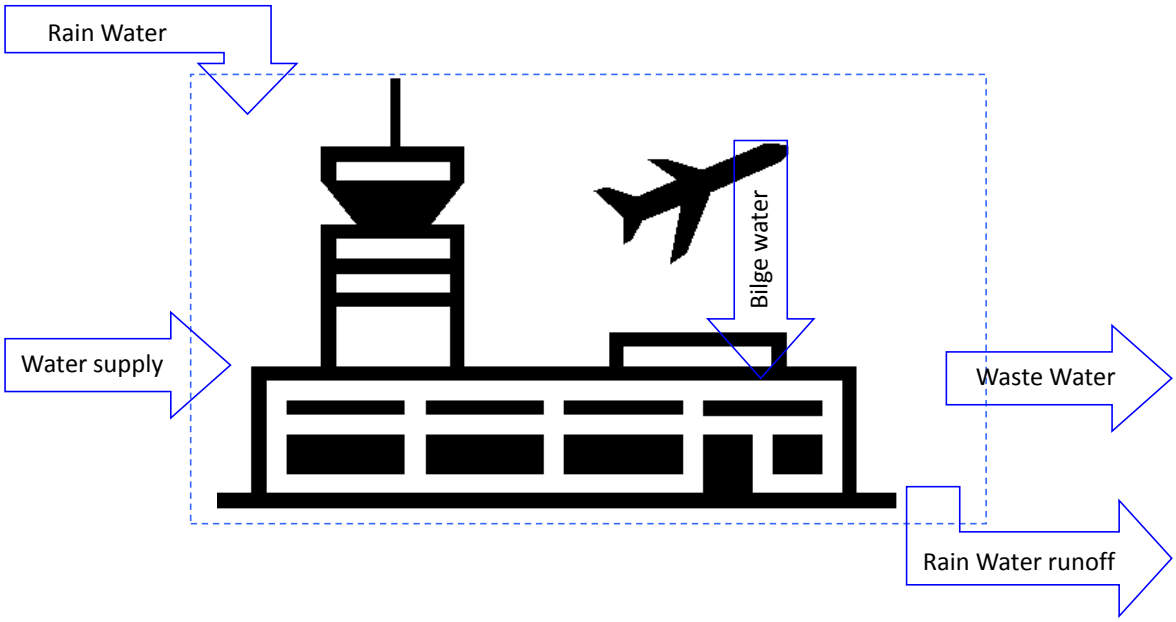

Figure 3: Airport water Balance

- **Water Supply**: Airports require a dependable supply of water in order to support diverse activities and needs, from drinking water to cleaning or irrigation. Water may come from groundwater or surface water and can be managed directly by the airport of by an external water supplier. The quality requirements of the water will vary depending on its use. Issues which may arise from the numerous and various uses of the water supply arise from the fact that the demand for water fluctuates in response to the operation peaks at the airports. Regions associated with tourist destinations have more passengers during high season increasing the demand of water. Furthermore, these high demand peaks in demand coincide, particularly in southern Europe, with summer or high water stress periods.
- **Rain water and runoff**: Due to the high percentage of impermeable surface at the airport, storm runoff management is one of the hot topics concerning water management at airports. Due to security reasons, rainwater must be promptly removed from runways and platforms through the discharge grid where water becomes runoff. In some areas, high volumes of water are collected and then discharged into local streams close to the airport. If this effluent is not properly managed, it can cause severe problems downstream in the natural environment. The most common potential impacts from rainwater runoff include the following:
    - Given the large areas of impermeable surfaces on airports, there is a high risk related to the accumulation of large quantities of water in short periods of time. Flooding due to the sudden discharge of all rainwater collected in the surface can result in serious environmental and economic damages.
    - Additionally, accidental oil and fuel spills on impermeable surfaces can pollute nearby water sources if not managed properly. As rainwater washes substances from the surface, if not treated, runoff will carry these pollutants to nearby streams and other waterbodies and are extremely detrimental to the local environment. It is useful to consider that in case of oil and fuels, the cost of recovery is often significantly greater than the initial costs required to install preventative measures.
    - De-icing products sprayed on impermeable surfaces (such as runways) and airplanes to prevent ice during winter seasons can also cause water quality problems. Common chemicals used for this purpose are Ethylene and propylene glycol. When they enter untreated into the natural environment, they can have harmful effects on aquatic life due to their high biological oxygen demand (BOD). These depleted oxygen levels in turn may cause fish kills, and undesirable bacterial growth in receiving waters.
- **Aircraft Sanitary Water**: Water from the bilges of airplanes arriving from all corners of the world, are often treated at the airport signifying an input of highly concentrated organic pollution. However, as this flow mixes with the effluent from terminals and other buildings the resulting effluent is diluted and does not necessarily pose a risk for WWTP.
- **Wastewater**: Final effluent from airports is similar to that stemming from urban area. The discharge flow from the airport is a mixture of different types of effluents from multiple activities including: car maintenance, toilets from the terminals and discharge from the restaurants and catering installations. Notwithstanding, studies showed that the final discharge is relatively homogenous, with average stable concentrations.

IV. EWS Assessment

This final assessment of the EWS principles has taken into consideration the information gathered at the three airports throughout the pilot study and the outcomes from the pilot audits. This assessment analyzes the strong and weak points or risks of water management in the airport sector for each principle.

i. Principle 1: Achieve and maintain sustainable water abstraction in terms of water quantity

As reflected in the spider web benchmarking (Figure 4), airports have a generally good performance concerning principle 1 on water quantity. Management has clearly identified sources of water along with their sensitivity. Airports regularly monitor these sources and register information on water

volumes and quality at minimum on a monthly basis. In cases where an external service provider supplies water, airports also assess the water management performance of this external service.

The EWS pilot study has identified the following as major areas for improvement:

- **Diversification of water sources**. When an airport is dependent on one source of water, risk arises from a potential drop in the source level or flow, particularly true in water scarce areas. Moreover, this dependence on source of water (usually treated municipal water) often implies that airports use high quality water for activities that management could sustain with recycled or alternative sources of lesser quality.
- **A clear water efficiency strategy**. In regions prone to droughts, airports might suffer from water abstraction restrictions that could compromise the services provided. This strategy should cover, not only direct water consumption reduction measures (at terminals, cooling processes, etc.) but also indirect measures (raise awareness of other companies on the topic, alternative water sources, recycling and re-using, etc.). For airports located in areas were water is abundant, reducing water consumption and increasing water efficiency should still be top priorities. In this way, airports will be taking the initiative on reducing the amount of waste water treated, decreasing energy consumption and increasing the resilience of the airport to any future changes in water availability.

Exemplary Management Strategy: Principle 1

Malaga Airport is located in a River Basin classified by the European Environment Agency (EEA) as a water stressed region according to the water exploitation index. The River Basin plan for the district (from the 28th of June 2012) states that "*Periods of drought is one of the hallmarks of the rainfall pattern of this territory, where almost total absence of rain in the summer is a common feature. Adding multiannual episodes of low rainfall has generated in the recent past critical situations where even the supply of high priority demands has been jeopardized*". Moreover, the River Basin Authority has classified the only source of water, the Guadalhorce Aquifer, as over-exploited. The risks (physical, reputational and regulatory) arising from this classification is very high. The airport is currently projecting the connection to the municipal water supply. Moreover, in order to diversify sources and decrease pressure on the local aquifer, they are under negotiations with the municipal Waste Water Treatment Plant to assess the possibility of reusing waste water for activities that do not require the highest quality of water (e.g. irrigation).

- **Accurate metering**. Though airports implement water use monitoring, assessment detected some faults in the metering system. The implementation of a water management strategy requires accurate metering of that use and, therefore, in some cases airports will need to expand their metering.
- **Water balance as a tool**. As a general point for improvement under principle 1, recommendations to the airports include the generation of an airport water balance. The balance reports can initially be defined to include the activities which are under direct control of the airport (refer to the scope defined) with the aim to extend the scope with time. This global water balance will provide important information on water management at the airport to assist in decision making and prioritization of activities. Moreover, this basic information is necessary to reduce reputational risk and assist airports in formulating preventative measures in case this general water balance shows areas where water consumption is too high and creates information readily available for the external community.

ii. Principle 2: Achieve and maintain good water status in terms of quality

Regarding Principle 2 on water quality, auditing reported good performance at all airports for measures regarding the clear disclosure of substances used on-site.

Due to the high percentage of impermeable surfaces at the airport, storm runoff management is one of the hotspots topics under Principle 2. The need to properly manage this runoff becomes more evident when environmentally detrimental chemicals spill or airports have spray them on airport surfaces and airplanes to avoid ice during winter seasons.

Airports have developed site-specific measures to ensure that there are no flooding episodes in the nearby communities and that rainwater discharges do not have an impact on the destinations. A general practice observed in the three airports is the installation of oil traps at all the discharge points from platforms to parking lots to avoid that spills reach the environment.

Exemplary Management Strategy: Principle 2

Göteborg Landvetter Airport installed a glycol recovering facility and purification unit as well as glycol detection systems and sensors in the platform where de-icing takes place. In the event that glycol concentrations are over 5%, the platform automatically diverts flow to the glycol recovering facility. If glycol concentration is under 5% the flow is directed to a system of ponds that clean the water in several phases, including oil separation, sedimentation, aeration, and sand and peat filtering.

Brussels Airport transports the fluid collected from the areas where de-icing takes place to the waste water treatment plant (WWTP) where waste water from the airport is treated. Management designed the WWTP to utilize the glycol effluent as organic input during warm seasons.

Generally, a high percentage of rainwater is collected and treated (including the rainwater from platforms where de-icing takes place) although in all airports there is still a minor percentage of rainwater runoff which flows to neighboring waterbodies potentially seeping into the groundwater without treatment. This “untreated” flow might pose an impact to the environment during the winter period where airports use chemicals such as formiate on runways, taxiways and aprons for security reasons to avoid ice. During summer time, minor risks also stem from oil and/or fuel spills. Airports should ensure that all discharge points are monitored and potential impacts assessed.

The improvement points are:

- **Risk assessment for diffuse pollution**. In the event that seepage to groundwater is identified a potential risk, there should be a risk assessment of diffuse pollution from platform runoff into the ground water or from the use of herbicides on the green areas of airports.
- **Storm water discharge monitoring**. Monitor all points of storm water discharge to be aware of any potential impacts and risks and be prepared to mitigate them. Furthermore, if there are no legally established limits for storm water, it is highly recommended to define internal limits to set targets and mitigate potential impacts. These measures will also decrease reputational risk associated with any accidental or accumulative damages caused by storm water.

Info box: de-icing and airports

Airports clear and manage snow and ice from runways, taxiways, roadways, and gate areas using a combination of mechanical methods (e.g., plows and brushes) and chemical deicing agents. Pavement is cleared with mechanical equipment, and then chemically treated to prevent snow and ice accumulation. Chemicals commonly used for deicing/anti-icing include ethylene or propylene glycol, potassium acetate, sodium acetate, sodium formate, calcium magnesium acetate (CMA), or an ethylene glycol-based fluid known as UCAR (containing ethylene glycol, and water). Sand and salt (sodium or potassium chloride) may also be used.

iii. Principle 3: Restore and preserve water-cycle related High Conservation Value (HCV) areas

As reflected in Figure 4, the results related to Principle 3 had more varied results and thus has the highest opportunity for improvement. Airports have a good base for compliance with this principle as most have an Environmental Impact Assessment which includes in an assessment of the potential impact of the airport activity on protected areas. However, Principle 2 normally goes beyond this assessment as it asks for protected areas (or High Conservation Value areas) within a radius of 25 km around the airport (as well as water sources and points of discharge if not located in the same area).

The pilot study shows that information from the EIA is a good start point but requires consultation with additional sources to verify the location of HCV areas and assess the potential impact. This information is readily available in the River Basin Plans.

Some points of improvement within this principle are:

- **Integrate HCV in strategy**. Airports have prepared maps of HCV areas around the airports including important biodiversity and locally important areas. The next step is the integration of these areas in strategic decisions, including how the given protection targets have been considered in the operational water management decisions.
- **Proactive measures to protect HCV**. A proactive water steward measure to protect the ecological status of protected habitats around the airport (wetlands, lakes, etc.)

iv. Principle 4: Achieve equitable and transparent water governance

Airports involved in the pilot study are well aware and have placed a great importance on environmental protection in their management activities and are ISO 14001 certified. Airports also implement Best Available Techniques (BAT) as part of the continuous improvement system. In general, the airports companies and corporates have developed a variety of internal and external communication initiatives on environmental and water challenges, water saving campaigns and education on sustainable water management.

Improvement points for this principle include the following:

- **Water management strategy**. Despite the existence of multiple documents and measures that support water management at airports, airports still require a specific water management strategy. The EWS standard considers the water management strategy as indispensable since it represents a crucial tool to integrate all water linked activities within a production site and the entire company. It works to initiates and supports management decisions on water management performance and facilitates the public and internal transparency. If airports develop strategies at the corporate level, recommendations refer within the corporate environmental strategy to the four EWS principles and to provide guidelines and targets for its implementation at the airport level.
- **Involvement with River Basin stakeholders**. Since public participation represent one key requirement of the Water Framework Directive, airports with leadership on Water Stewardship have to be actively involved in their river basin management activities (River Basin Authorities) or in local or technical platforms.
- **Engage Supply Chain**. Another complex issue in water management for airports is the supply chain concept. Though this concept might not be so straight forward for this sector (as it is, for instance, in the beverage sector or the paper industry) the EWS standard requires companies to address the water risk coming from the supply chain. Participants in the supply chain include not only suppliers of material but also of services. As such, when implementing the concept of supply chain on airports, companies that provide services sustaining the activity developed at the airport, should be included. Therefore, companies in charge of handling, food and beverage for aircrafts, logistics (cargo zone), maintenance of aircrafts or provision of fuel, should be included for consideration. It is suggested to develop an overall list of the suppliers needed for the airport's activity, select the most relevant (taking into account criteria such as quantities, economic impact but also water related issues) and start by raising the importance of sustainable water management in that first selection. Next steps will be to promote water stewardship certification within the suppliers to finally to demand such a certification (or similar) as requirement for contract.
- **Alternative sources of water**. As mentioned earlier, management should not ignore the importance of exploring alternative sources of water, particularly in water-stressed areas. The option to potentially use rainwater as an alternative water source could be a particularly viable option given the large spaces of impermeable surfaces associated with the airports. Given the variety of water uses, there is also the possibility of using greywater or other recycled water (from cooling towers) sources for uses such as irrigation.

Exemplary Management Strategy: Principle 4

In considering new developments to take place on airport ground, airports should consider state of the art techniques for water efficient buildings in new construction projects. These techniques can range from small adjustments like low flush toilets or include larger scale adjustments such as rainwater storage facilities. Brussels Airport will design new projected building (to connect terminal and pier) to harvest rainwater from the roof of the building for flushing.

- **Promote water stewardship**. It is highly recommended to promote the stewardship principles in any new projects that are developed at the airport (for example new buildings, new irrigation schemes, improvement of the waste water treatment plant facilities, etc.).

v. Visual Representation of Compliance with EWS Standard

For each indicator the airport was rated between 0 to 5 (where 0 means that no information has been provided or is available to prove compliance up to 5 that means all measures have been taken). ***The following diagram is an objective visual representation of airports compliance with the standard on each principle*****.** The closer the shape to the outer limits of the diagram, the greater compliance the airport obtained. The diagram serves to provide a general overview on the performance level throughout the sector with the EWS standard.

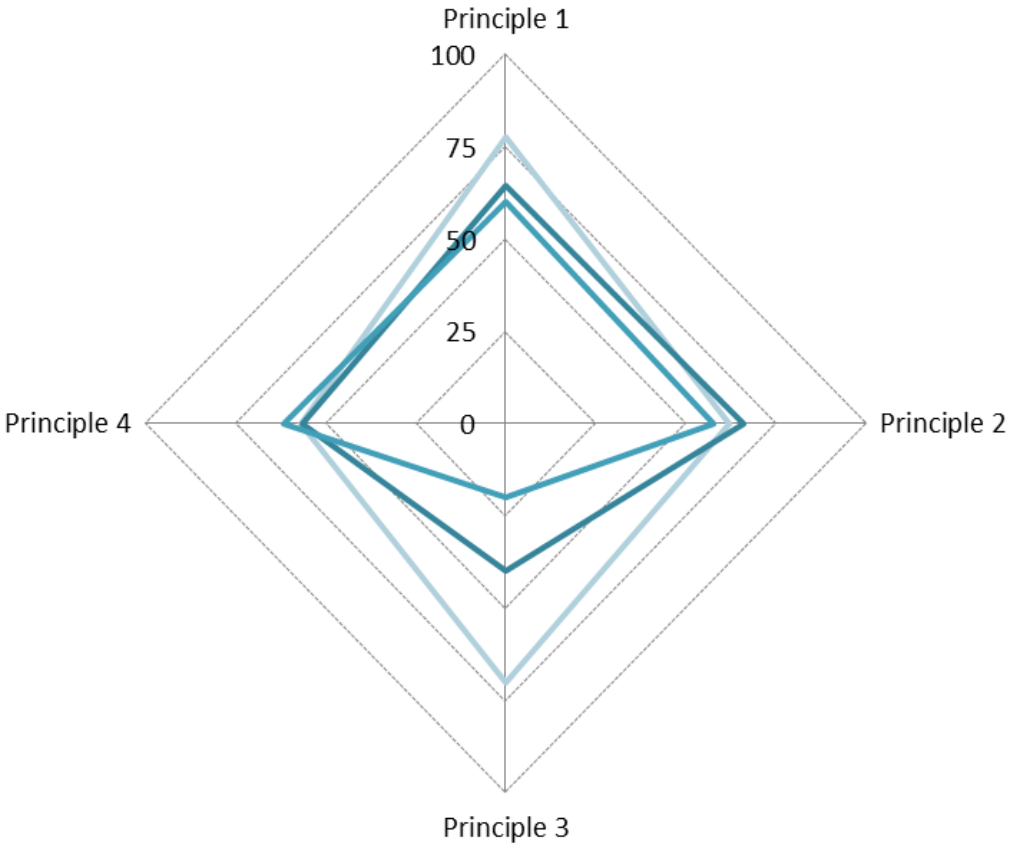

Figure 4: Benchmarking spider-web diagram.
Percentage of compliance for the three pilot airports

V. Conclusions

The results of the EWS Airport Pilot Study on Malaga Airport, Brussels Airport, and Göteborg Landvetter Airport are an exemplary opportunity to demonstrate how to address sustainable water management across an entire sector and provided an excellent comparison of the standard implementation on sites with unique site-specific challenges. The process of the pilot study from training to data collection and audits demonstrated not only the common challenges shared by airport water management by also unique ones which require individualized solutions.

Results from the airport assessment showed that one of the principle challenges that airports face in water management is in regards to their location in population nuclei. This creates collective water quality issues and requires careful management of storm water over the large areas of impermeable surfaces to prevent flooding from affecting surrounding areas. Additionally, communication with airports revealed that fluctuations in discharge associated to seasonal patterns are another complicated challenge for management. The quality of runoff depends largely on the use of various substances to de-ice aircrafts and runways for safety reasons as well as potential fuel spills. This fluctuation requires careful and extensive monitoring grid to manage effluents properly and prevent contamination of nearby water bodies.

In regards to site specific challenges, results showed the manner in which these challenges stem from shaped by their various climatic and environmental differences. For example, airports located in naturally drier climates, which experience with demand peaks attributed to tourism during water stressed summer months creates risks associated to water supply, incremented by dependence on a sole water supply source. Alternatively, managers of airports located in northern countries deal with large quantities of storm water and de-icing needs during winter months, deal with a different set of management responsibilities. Table 2 below depicts the overarching strengths in airport performance in relation to the EWS standard principles as well as the principal improvement points for each principle.

Table 2: Evaluation of On-site Performance

EWS Principle	Major Strengths	Improvement points
1 Efficiency of Water Abstraction	• Clear knowledge of the source(s) and its sensitivity. • Water accountancy performed at least on a weekly basis.	• Expand water supply to alternative water sources (use or recycled water from the WWTP, rainwater harvesting, etc.). • Define clear efficiency targets. • Guarantee sound data from metering.
2 Achievement of Good Water Quality Status	• Concrete measures for de-icing pollution control adapted to the unique character of each airport. • Extensive oil pollution control by the installing oil traps at all the discharge point from platforms to parking lots.	• Assess the risk of diffuse pollution from platform runoff into the ground water or from the use of herbicides on the green areas of airports. • Unify monitoring parameters of rainwater runoff monitoring and establish self-determined limits if legal permits do not disclose them. • Assess the impact of punctual discharges of untreated rainwater. Related to indicator GRI AO4[5]

[5] Global Reporting Initiative (GRI) Airports Operators Sector Supplement https://www.globalreporting.org/resourcelibrary/AOSS-Complete.pdf

EWS Principle	Major Strengths	Improvement points
3 High Conservation Value (HCV) Areas	• Availability of Environmental Impact Assessment in all airports regarding the impacts on protected areas in a radius around the airport. • Maps indicating high conservation value areas are available at regional level.	• Integrate HCV areas into planning and decision making. • Establish pro-active measures to protect the ecological status of protected habitats around the airport (wetlands, lakes, etc.).
4 Equitable Governance	• Involvement in other types of environmental certification (like ISO 14001). • High levels of internal and external transparency in water management. • Fluent communication with local stakeholders. • Periodical environmental awareness campaigns centred on water topics.	• Establish a concrete operational water management strategy (including compilation of objectives, targets and responsibilities both short and long term). • Increase participation in the activities of the River Basin District. • Improve supply chain management (all companies located at the airport whose services are indispensable for the activity of the airport but not under direct control of airport management). • Assess the implications of the four EWS principles in all new development projects.

One of the principle outcomes of the Airport Pilot Study was the finalization of all documentation as it applies to the Airport sector. In this regards, EWS is ready to implement the EWS standard for certification having addressed any potential issues during the pilot study process. Additionally, results from the study showed the principal improvement points as visible in Table 2, the most underlying of which was the need for having exhaustive management strategy in place. In turn, a more thorough management strategy points to the investment needed to improve water efficiency (i.e. staff training or a water-recycling scheme) and can facilitate internal and external communication on water management topics.

As airports have a relatively large economic and water user responsibility, a cohesive management strategy is an important first step in engaging with local river basin authorities in order to address regional problems with tangible solutions. Additionally, this strategy could preclude measures to improve water management along the supply chain as well as internally, the potential for which is notable although not always straightforward. The transparency brought on by a unified management strategy is exemplary of excellent water stewardship and serves as an excellent tool for future actions.