

DOCUMENT TITLE:

UNDP Amman Corporate Environmental Management - A Summary -

This summary provides a concise overview of the short visit to the premises of the United Nations Development Programme (UNDP) office in Amman, Jordan. The visit was combined with the more substantial peer reviews of the WFP and UNRWA headquarters and field offices. The purpose of this summary is to convey the lessons learned and possible areas for future collaboration by other UN agencies.

For more detailed information on the report please contact the EMG Secretariat at emg@un.org

SUBTITLE 1: *The Peer Review Process*

The Peer Review Process was initiated in 2012 by the UN Environment Management Group (EMG). The Project aims to review the environmental sustainability profile and performance of UN and related agencies: peer reviewing refers to one or more agencies reviewing the environmental performance of fellow agencies' facilities and internal operations.

The Peer Reviews are undertaken by Peer Review Teams comprising technical experts and representatives of UN entities, international organizations and local government authorities, with support and coordination provided by the EMG Secretariat. The Peer Review Team analyses data and information provided by the reviewed agency based on site visits to the reviewed facility(ies). Achievements, challenges, good practices and lessons learned in approaches to corporate environmental management are then identified and compiled into a Peer Review Report, along with proposed recommendations. These recommendations focus on how the environmental performance of the reviewed entity could be improved, whilst enhancing their resource efficiency and economic and social sustainability.

SUBTITLE 2: *Overview*

Although a fairly large photovoltaic system had already been installed on the roof throughout the UNDP offices, several opportunities were identified to further reduce actual energy consumption. The visit found that the easiest and most financially feasible option to reduce energy consumption in these premises is to improve the lighting system. It was calculated that an efficient lighting system and an accompanying good management could easily reduce lighting energy consumption by 50%. It is likely that such a reduction in energy consumption would lead to a minimum 10%- 30% drop in total building energy use.

Good opportunities were also identified to improve the building air-conditioning system, which was found to be poorly installed. For example, the refrigerant coil component was found to have no insulation and very poor air-tightness, leading to a release in energy. Further recommendations were made, such as improving the 'phantom load' management of all plug loads, including for printers and water dispensers. It was also highlighted that better energy management of the server room was required.

Returning to the photovoltaic system, it was found that a more in-depth study is warranted on the installed roof system, as the energy bill seemed to not properly reflect the contribution of the photovoltaics to the building. During the visit, the system was found to be generating 14Kw on a sunny day, yet better performance can be extracted from the photovoltaic panels if there is less dust on their surface. Regular sweeping of the panels was recommended in order to keep them performing at an optimal output.

At the site visit, it was not possible to trace the photovoltaic output to the external grid, and the system was therefore assumed to be internally connected. Ideally, this situation should reduce the building's need for grid-fed power, thereby reducing the energy bill substantially. However, if the utility company is not aware of the photovoltaic installation, they will assume a faulty meter is in place and continue to charge the standard rate.

SUBTITLE 1: *Good Practices*

Daylight Use

The use of natural daylight as lighting for the meeting room was noticed. At the same time, the reflective foil installed above the roof light was identified as a good strategy for controlling the level of daylight entering the meeting room whilst also reducing any excess heat gain into the building. In addition to good practice daylight capture, there were energy efficient LED compound flood lights in use.

It was observed that this measure could be improved further, simply by placing an extra layer of thin aluminium foil just below the glazing. The current configuration above the roof light glazing will reduce heat transfer, but still not as efficiently as foil being placed below the glazing. Due to the low emissivity properties of aluminium foil to stop radiation, the roof light glazing will still heat up and transfer this heat inside. Furthermore, above the roof, an air gap must exist between the foil and the glazing to hinder any heat transfer.

Air-tight window frames

Window frames throughout the UNDP building were found to have proper seals for infiltration control. In order to maximize the benefits of this feature, it is worth ensuring that all windows are properly closed whenever air-conditioning and heating is being used. Installing a fresh air supply with CO₂ sensors is worthwhile, to ensure that adequate fresh air is supplied when the building is made air-tight.

SUBTITLE 4: *Potential Improvements*

The site visit found that if all the following suggested energy efficiency improvements are made across the premises, a minimum 50% reduction in energy use could be achieved.

Lighting efficiency

In one bathroom a total of 9 lamps were identified, with a combined total of 162 Watts. Yet, it would be very feasible to light the same bathroom with only 1 LED panel totalling 14 Watts or lower. This would lead to a reduction of 90% in wattage. At the same time, it was also found that halogen lights were being used in the main entrance lobby, and they were left switched on despite the availability of adequate daylight and the same can be said for the kitchen lights. Furthermore, inefficient compound lighting was noticed in the yard, along with inefficient lighting in the corridors and the car park. As a rule of thumb, typical maximum lighting power densities for each type of space are as follows:

Spaces	Max Allowable Lighting Power Densities (Watts/m ²)	Possible Max Allowable Lighting Density (Watts/m ²) with a Top Lighting Design	Recommended Lux Levels
Office with T5 fluorescent lights (tube lighting)	10	7	300 – 500
Office with LED lighting	6	3.5	300 – 500
Corridors	5	2.5	100 – 200
Bathroom	5	2.5	100 – 200

The following recommendations on lighting are provided:

- Install LED lamps with a minimum of 100 Lux to a maximum 200 Lux, which can even be achieved using lamps that distribute less than 3 Watts/m² of floor area.
- Replace any halogen lighting across the building, compound and car park, with more energy efficient LED lights immediately. Typically, a 4 Watts LED will replace an 18 Watts halogen bulb.
- Install daylight sensors in the lobby to ensure that lights turn off when daylight is available, and switch off lights elsewhere where daylight levels are adequate.
- Retire any compound lighting in use, that does not include the LED flood lights currently efficient enough alone.
- In narrow corridors use low LED panel wattages and have more units to ensure even light distribution.
- Install a motion sensor for corridor lighting and a small energy efficient plug-in for nighttime safety and security.

Plug and load efficiency

The plug load comes from any device that is plugged into a building's electrical system, including computers, monitors and office electronics. The following recommendations on plug and load efficiency are provided:

- Develop a purchasing guide to support the purchase of only EnergyStar rated IT equipment, including the data server.
- Enable more stringent power management settings, as screensavers can keep your monitor in active mode and stop your computer from entering an energy-saving mode. EnergyStar recommends setting monitors to sleep after 5 – 20 minutes of inactivity.
- Face screens away from sunlight and reflections to improve performance and glare reduction. The brighter the ambient room lighting, the brighter the screen needs to be and more energy is used.
- Install low-power digital timers to turn off equipment during non-business hours. EnergyStar recommends setting equipment to sleep after 30 – 60 minutes of inactivity.

Air conditioning

The air conditioners at UNDP, Amman, are split-unit types in the form of older non-inverter split air conditioning units. Many of these units are of reversible air conditioning, producing both cooling and heating. However, inverter-type units are beneficial for controlling and continuously regulating the temperature, and generally have increased efficiency compared to traditional air conditioners. The following *recommendation* on air conditioning is provided:

- Replace the older, traditional split units that have reached (or near) their lifespan with inverter-type units, by implementing a policy to improve the coefficient of performance of building-wide air conditioning.

Heating

It was identified that the hot water piping was not insulated and that boiler efficiency could be improved. The following *recommendations* on heating are provided:

- Undertake a retro-commissioning of the boiler heating system in the building to rebalance the entire hot water flowrate and to tune the boiler system for optimum efficiency.
- Install a thermostat control on all radiators to regulate their use in line with the room temperature.
- Apply insulation to all hot water piping to reduce heat loss.

- Install new condensing boilers, which have efficiencies of up to 90%. However, ensure that the supplier/contractor takes measures to reduce rust exposure during use, as condensing boilers are at greater risk of rust from the high Sulphur content of diesel used in Jordan.

Indoor air quality

Indoor air quality is represented by concentrations of pollutants and thermal conditions such as temperature and relative humidity, that may or may not affect health, comfort and performance. At UNDP, the measured CO² level was above 1,000 ppm after a meeting lasting 45 minutes. This indicates that there is a lack of fresh air being provided. The following *recommendation* on indoor air quality is provided:

- Provide a fresh air supply fan or an exhaust fan in all windowless meeting rooms. Ideally, the fan should be coupled with a CO² sensor to provide just the right amount of fresh air to the space.

Photovoltaic system

The photovoltaic (PV) solar panels installed on the roof top were found to be producing 14Kw of power during the site visit, at noon, with overcast skies. A thick layer of dust was found on the panels, after roughly 6 months of use; whilst no connection was found between the PV system and the electricity grid. It is likely that the generated solar power is used internally by the building rather than being exported. If this is the case, the electricity bill should decrease significantly after the installation of this system. The following *recommendation* regarding the PV system is provided:

- It is recommended to sweep the PV system once a month to maintain optimal output from these panels.

Data centre

The server room temperature was found to be operating at 16⁰C during the site visit, which is below the recommended minimum temperature. The latest ASHRAE Guide (2011), recommends that a data centre should operate at a temperature of 18⁰C to 27⁰C. The following *recommendations* regarding the data centre are provided:

- The data centre (server room) is recommended to be operated at no lower than 25⁰C to reduce energy consumption whilst maintaining a good buffer from the allowable maximum 27⁰C.
- It is also recommended to use the most efficient inverter type split unit air conditioning system for this location.