The Pearl Rating System for *Estidama*

Public Realm Rating System

Design & Construction

Version 1.0

The Pearl Rating System *for* Estidama
Emirate of Abu Dhabi

مجلس أبوظبي للتخطيط العمراني
ABU DHABI URBAN PLANNING COUNCIL

إستدامة
estidama

TEL +971 2 409 6000
FAX +971 2 443 2903
Abu Dhabi U.A.E.
www.upc.gov.ae

Table of Contents

Introduction

ESTIDAMA

Estidama, which means 'sustainability' in Arabic, is the initiative which will transform Abu Dhabi into a model of sustainable urbanisation. Its aim is to create more sustainable communities, cities and global enterprises and to balance the four pillars of Estidama: environmental, economic, cultural and social.

Figure 1: The Four Pillars of Estidama

The aspirations of Estidama are incorporated into Plan 2030 and other Urban Planning Council (UPC) policies such as the Development Code. Estidama began in 2008 and is the first program of its kind that is tailored to the Middle East region. In the immediate term, Estidama is focused on the rapidly changing built environment. It is in this area that the UPC is making significant strides to influence projects under design, development or construction within the Emirate of Abu Dhabi. One of Estidama's key initiatives is the **Pearl Rating System**.

THE PEARL RATING SYSTEM FOR ESTIDAMA

The Pearl Rating System for Estidama aims to address the sustainability of a given development throughout its lifecycle from design through construction to operation. The Pearl Rating System provides design guidance and detailed requirements for rating a project's potential performance in relation to the four pillars of Estidama.

The Pearl Rating System is organised into seven categories that are fundamental to more sustainable development. These form the heart of the Pearl Rating System:

- **Integrated Development Process**: Encouraging cross-disciplinary teamwork to deliver environmental and quality management throughout the life of the project.
- **Natural Systems**: Conserving, preserving and restoring the region's critical natural environments and habitats.
- **Liveable Spaces:** Improving the quality and connectivity of outdoor spaces.
- **Precious Water:** Reducing water demand and encouraging efficient distribution and the reuse and recycling of water.
- **Resourceful Energy:** Targeting energy conservation through energy efficiency, improved awareness, monitoring and reporting and renewable sources.
- **Stewarding Materials:** Ensuring consideration of the 'whole-of-life' cycle when selecting and specifying materials.
- **Innovating Practice:** encouraging innovation in building design and construction to facilitate market and industry transformation.

Pearl Rating Levels

There are three levels of rating within the Public Realm Rating System; Pearl Rated, Green Pearl Rated and Exemplar Pearl Rated.

Within each section there are both required and optional credits. To achieve a Pearl Rating, all required credit requirements must be met. To achieve a Green Pearl rating, all required credit requirements must be met along with a minimum of 50% of the optional credits.

Exemplar public realm projects are those that are of national significance, typically because of their outstanding natural, cultural or heritage values and draw the presence and attention of large numbers of people. In recognition of their special status, Estidama invites such projects to demonstrate innovative performance against eight unique exemplar visions. Refer to the Public Realm Design Manual (PRDM) for more illustrative guidance.

Applicant Exemplar Projects must meet the requirements of the Exemplar Public Realm Approval Process within the 'Exemplar Public Realm' section of this manual. To achieve an Exemplar Pearl Rating, all the required credit requirements must be met, along with a minimum of 75% of the optional credits.

Table 1: Public Realm Rating Levels

Requirement	Pearl Rating Achieved
All required credits	Pearl
All required credits + 50% of the optional credits	Green Pearl
All required credits + 75% of the optional credits + be a site of national significance + achieve Exemplar Pearl status	Exemplar Pearl

Section Credits

The number of optional credits available in each section are presented in Table 2.

Table 2: Optional Credits Available for each Section

Credit Section	Optional Credits
IDP – Integrated Development Process	3
NS – Natural Systems	4
LS - Liveable Spaces	2
PW – Precious Water	4
RE – Resourceful Energy	2
SM – Stewarding Materials	5
IP – Innovating Practice	2
TOTAL	**20***

* Total: Excludes Innovating Practice credit points which are offered as bonus credits.

The Pearl Rating System Documents

The Pearl Rating System currently comprises the following documents:

- Pearl Community Rating System: Planning
- Public Realm Rating System: Design & Construction
- Pearl Building Rating System: Design & Construction
- Pearl Villa Rating System: Design & Construction

This document focuses on the Public Realm Rating System. The Pearl Rating System documents are available to download from the UPC / Estidama website, which will also contain frequently asked questions, training information and any revisions to the documents. Please visit www.estidama.org.

The Pearl Rating Stages

The Pearl Rating System recognises the reality of ownership and responsibility transitions as a project evolves from a design team to a construction team to a facility management team. Accordingly, four rating stages have been established: Planning, Design, Construction and Operational.

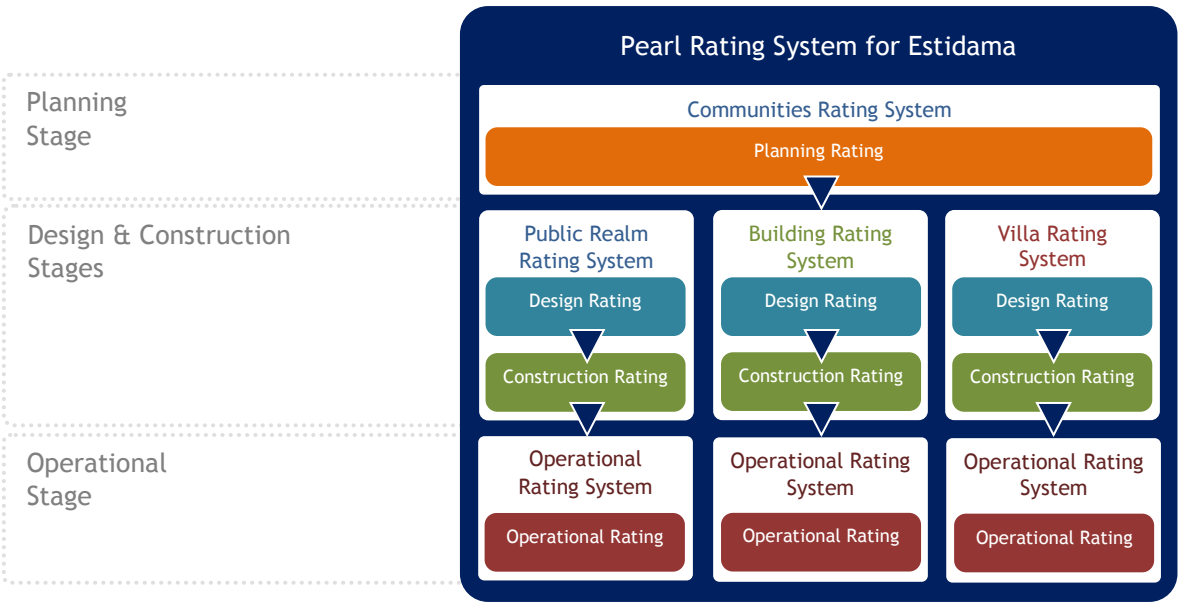
Pearl Planning Rating – The Planning Rating sets the overarching design standards for developments during the planning phase. The Planning Rating is aligned with the UPC Urban Development department's Development Review Stream and sets requirements for buildings and public realm within the wider context of a community. The Planning Rating requires that all collateral, branding and communication materials identify the project as a Pearl *Planning* Rated project.

Pearl Design Rating - The Design Rating rewards measures adopted during the design development of each project that meet the intent and requirements of each credit. The Design Rating recognises the additional marketing value and branding a Pearl Rating will afford a development. A Pearl Design Rating is valid only until construction is complete and requires that all collateral, branding and communication materials identify the project as a Pearl *Design* Rated project.

Pearl Construction Rating - The Construction Rating ensures that the commitments made for the Design Rating have been achieved. The Construction Rating requires that all collateral, branding and communication materials identify the project as a Pearl *Construction* Rated project.

Pearl Operational Rating (under development) - The Operational Rating assesses the built-in features and operational performance of existing development and ensures it is operating sustainably. The Operational Rating can only be achieved a minimum of two years after project completion.

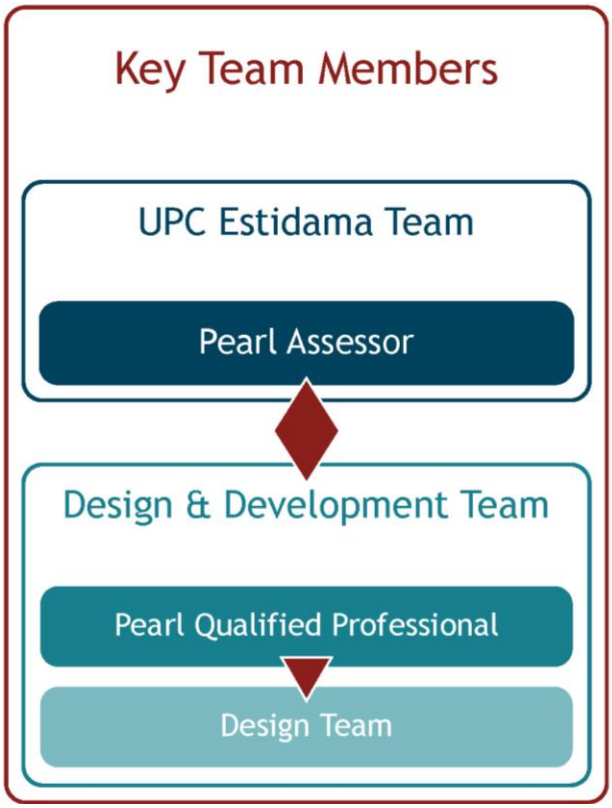
Figure 2: Links between the Pearl Rating Systems



KEY TEAM MEMBERS

The assessment process requires the following key team members:

Figure 3: Key Team Members



Pearl Assessor

The Pearl Assessor is an Estidama representative who assesses the Pearl submission documents.

Pearl Qualified Professional

The Pearl Qualified Professional (PQP) is a member of the design team who facilitates the Pearl Rating System for Planning, Design and Construction stages. To be a PQP, the individual must pass an exam which will test their administrative and technical knowledge of the Pearl Rating Systems.

The PQP's role will be as follows:

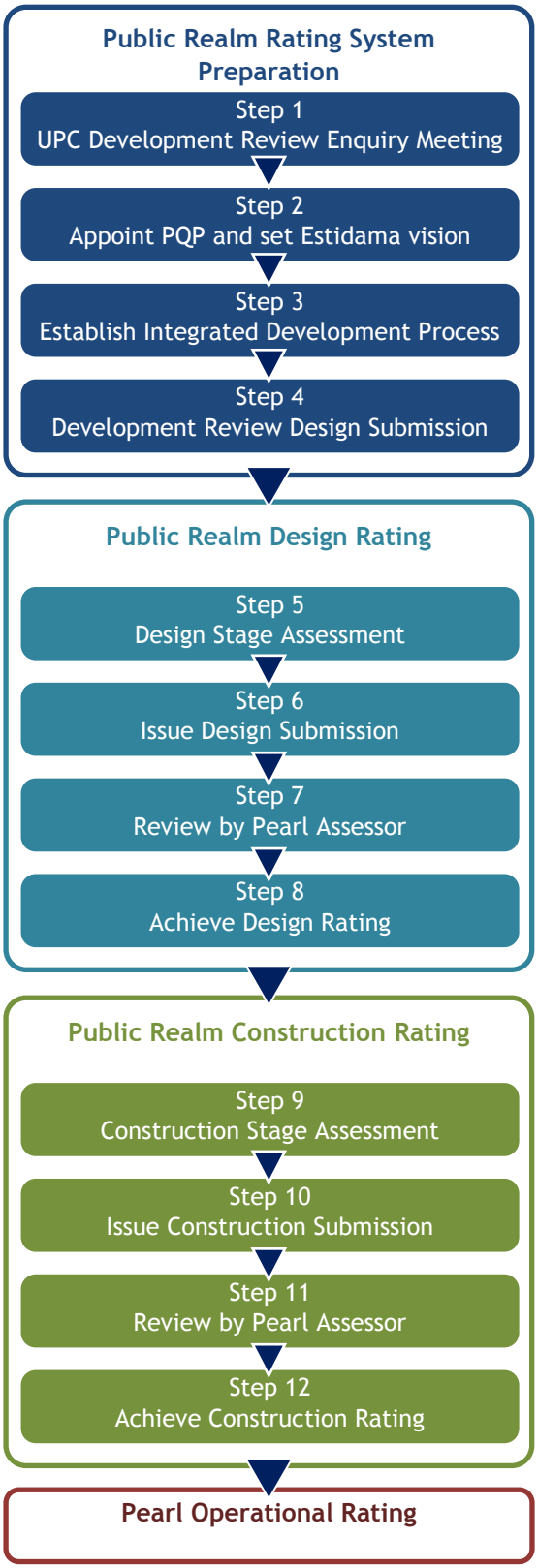
- Understand the requirements of the Pearl Rating Systems and associated Guides;
- Facilitate the rating process; and
- Provide quality assurance to documents prior to submission to Estidama.

Communication with Estidama and the Pearl Assessor will generally be via email, with frequently asked questions available on the Estidama website. The website will also provide information to help guide design teams through the Pearl Rating Systems and will contain schedules of training sessions, seminars and event notices.

The Pearl Rating Process

The Public Realm Rating System is designed to facilitate an effective way to assess the sustainability of a specific development. The general steps required to be undertaken by developers and their consultants in the process are summarised as follows:

Figure 4: Public Realm Rating System Process



Public Realm Rating System Preparation

Step 1: The UPC Development Review process begins when a public realm project is identified for development/ redevelopment. The landowner and/or his/her representative attends an Enquiry Meeting where UPC staff explain plans and policies that will determine the site's development potential and outline the upcoming Development Review and Estidama Integrated Development Processes.

Step 2: Appoint a PQP to facilitate the rating process and co-ordinate the submission. The PQP will assist the Client in establishing the target Estidama rating for the project and advise (with input from the Project Team) the credits to be targeted.

Step 3: Conduct workshops in compliance with the Integrated Development Process (IDP) with facilitation by the PQP.

Step 4: Provide detailed information as part of the UPC Urban Development Project Design Review submission, confirming that Estidama requirements will be incorporated into the development in preparation for applying for the Estidama Design Rating.

Public Realm Design Rating

Step 5: The Design PQP will review and update credit submissions on a regular basis throughout the design process.

Step 6: Issue the final design credit submissions to UPC Estidama at the end of the tender documentation stage.

Step 7: The submission will be reviewed by a Pearl Assessor, who may request clarifications or additional information from the Design PQP as necessary.

Step 8: The Pearl Assessor will award a Pearl Design Rating based on the credits achieved by the development.

Public Realm Construction Rating

Step 9: The Construction PQP will review and update credit submissions on a regular basis throughout the construction process. The Pearl Assessor will undertake construction audits.

Step 10: Issue the final construction credit submissions to UPC Estidama after construction is complete and prior to project handover.

Step 11: The submission will be reviewed by a Pearl Assessor, who may request clarifications or additional information from the Construction PQP.

Step 12: The Pearl Assessor will award a Pearl Construction Rating based on the credits achieved by the development.

Pearl Operational Rating

Two years following construction completion, submissions can be made for the Pearl Operational Rating. The process for achieving a Pearl Operational Rating is set out in the separate Pearl Operational Rating guide (currently under development).

APPLICATION OF THE PUBLIC REALM RATING SYSTEM

Public realm includes all external spaces and linkages that are physically accessible to the public. Public realm elements can include, but are not limited to: streetscapes, pedestrian and cyclist paths, transit hubs, gateways, parks, gardens, waterfronts, natural features, landmarks, squares, plazas and building interfaces.

The Public Realm Rating System is designed to address the following uses of public realm, their sites and associated facilities:

- **General:** this applies to all types of public realm and covers the common requirements. Within individual credits, exemptions or differing requirements may be specified for the following public realm uses:
- **Public Open Spaces:** this applies to all open areas within urban growth boundaries and/or the natural environment (whether it is free or fee paying access), and allocated for public recreation, gathering or assembly. These spaces may include areas designated as natural, semi-natural and environmental preservation areas; natural and developed waterfronts; developed parks and gardens; linear parks and green infrastructure elements; urban squares, plazas and civic spaces. These are further defined by size as:
  - **Local Public Open Space:** this applies to small public open spaces located within residential, commercial or mixed use areas, usually containing playgrounds, and smaller sports facilities, with a site area less than 1 ha.
  - **Neighbourhood Public Open Space**: this applies to public open spaces serving a collection of fareej units or a designated neighbourhood, adjacent to community facilities or Jame'e Mosques, usually containing playgrounds, some sports facilities, small kiosks and café facilities with a site area between 1 ha and 5 ha.
  - **District Public Open Space:** this applies to public open spaces within cities, towns or small settlements serving multiple neighbourhoods, often co-located with district retail centres, community facilities, schools and district Jame'e Mosques, and containing larger sports fields, space and facilities for community gatherings and religious celebrations with a site area between 5 ha and 50 ha.
  - **Municipality & Emirate Public Open Space:** this applies to large public open spaces of municipality or emirate-wide significance, containing facilities for major cultural and civic events and celebrations, natural features, historic landmarks or specialist sports facilities with a site area above 50 ha.
- **Streetscapes:** this applies to the elements of a street including the footpaths, medians, street lights, planting, irrigation systems, water features, street furniture, signage and all associated public landscaped areas. These are further defined as:
  - **Individual Streetscapes:** this applies to individual streets, less than 1km length, which are not part of a master plan project that has been granted approval through the UPC Master Plan Development Review Stream.
  - **Network of Streetscapes:** this applies to multiple streets, individual streets greater than 1km length, and streetscapes forming part of a master plan project that has been granted approval through the UPC Master Plan Development Review Stream.

Public Open Space and Streetscapes are further defined within the PRDM.

Submission Requirements

The submission requirements for each of the stages of the Public Realm Rating System are outlined in each credit. The Design Rating submission should be made at the end of the tender documentation stage and the Construction Rating submission should be made on completion of construction prior to project handover. Both the design and construction submissions should be made electronically from the PQP to the Pearl Assessor at Estidama.

Confidentiality

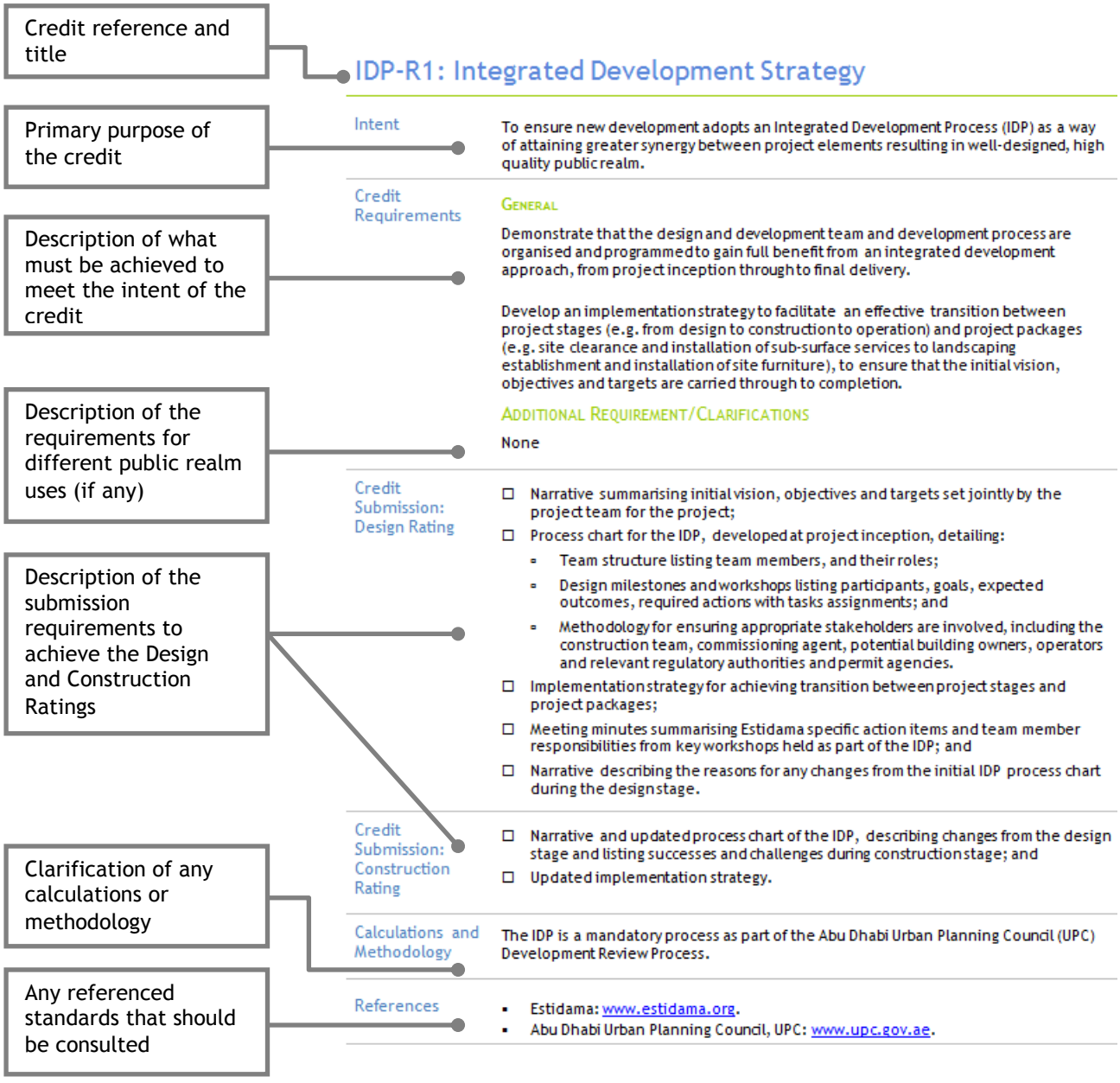
There will be no public disclosure of information provided or derived as part of the Submission Requirements. Information provided will remain confidential, except as required for identification of the project and its key participants for the purposes of Certification.

Understanding the Credits

The Public Realm Rating System comprises the following two types of credits:

Required Credits - these must be met by every project submitting for a Pearl Rating. These occur at the front of each section and are designated with an 'R', for example SM-R1. While limited in number, they are essential to achieving a Pearl Rating and reflect existing or emerging UPC and other Abu Dhabi Government Agency policies.
Optional Credits - these are the voluntary performance credits. Projects pursuing a Green Pearl or Exemplar Pearl rating will be required to achieve a number of these credits.

Figure 5: Example credit and description layout:



SUMMARY OF CREDITS FOR THE PUBLIC REALM RATING SYSTEM

IDP	Integrated Development Process	Credit Points
IDP-R1	Integrated Development Strategy	R
IDP-R2	Sustainable Buildings	R
IDP-R3	Commissioning	R
IDP-R4	Construction Environmental Management	R
IDP-1	Life Cycle Costing	1*
IDP-2	Guest Worker Accommodation	1
IDP-3	Sustainability Awareness	1*
	TOTAL	**3**

*IDP-1 – this credit is not available to Individual Streetscapes
IDP-3 – this credit is not available to Individual Streetscapes

NS	Natural Systems	Credit Points
NS-R1	Natural Systems Assessment	R
NS-R2	Natural Systems Protection	R
NS-R3	Natural Systems Design & Management Strategy	R
NS-1	Reuse of Land	1
NS-2	Remediation of Contaminated Land	1
NS-3	Landscape Enhancement	1
NS-4	Habitat Creation & Restoration	1
	TOTAL	**4**

LS	Liveable Spaces	Credit Points
LS-R1	Outdoor Thermal Comfort	R
LS-R2	Site & Context Assessment	R*
LS-R3	Transit Supportive Practices & Connectivity	R
LS-R4	Outdoor Light Pollution Mitigation	R
LS-R5	Smoking Control	R*
LS-R6	Legionella Management	R
LS-1	Active Urban Environments	1*
LS-2	Sustainable Food Practices	1*
	TOTAL	**2**

*LS-R2 – this credit is not applicable to Streetscapes
LS-R5 - this credit is not applicable to Streetscapes
LS-1 - this credit is not available to Local Public Open Space and Individual Streetscapes
LS-2 – this credit is not available to Streetscapes

PW	Precious Water	Credit Points
PW-R1	Water Efficiency	R
PW-R2	Water Monitoring & Leak Detection	R
PW-R3	Stormwater Management	R
PW-1	Improved Water Efficiency	1*
PW-2	Water Features	1
PW-3	Improved Stormwater Management	1
PW-4	Water – Educational Learning	1
	TOTAL	4

*PW-1 – this credit is not available to Streetscapes

RE	Resourceful Energy	Optional Credits
RE-R1	Lighting Compliance	R
RE-R2	Energy Monitoring & Reporting	R*
RE-1	Renewable Energy Technologies	1
RE-2	Energy – Educational Learning	1
	TOTAL	2

*RE-R2 – this credit is not applicable to Individual Streetscapes

SM	Stewarding Materials	Required / Green Pearl Credits
SM-R1	Hazardous Materials Elimination	R
SM-R2	Basic Construction Waste Management	R
SM-R3	Operational Waste Management	R
SM-R4	Landscape Waste Management	R
SM-R5	Durable Hardscape Materials	R
SM-R6	Legal, Reused & Certified Timber	R
SM-1	Improved Construction Waste Management	1
SM-2	Organic Waste Management	1*
SM-3	Regional Materials	1
SM-4	Recycled Materials	1
SM-5	Improved Reused & Certified Timber	1
	TOTAL	5

*SM-2 – this credit is not available to Local Public Open Space and Individual Streetscapes

IP	Innovating Practice	Maximum Credit Points
IP-1	Showcase of Regional & Cultural Practices	1
IP-2	Innovating Practice	1
	TOTAL	2

Credit Section	Maximum Credit Points
IDP - Integrated Development Process	3*
NS - Natural Systems	4
LS - Liveable Spaces	2*
PW - Precious Water	4*
RE - Resourceful Energy	2*
SM - Stewarding Materials	5*
IP - Innovating Practice	2
TOTAL Credit Points	**20***

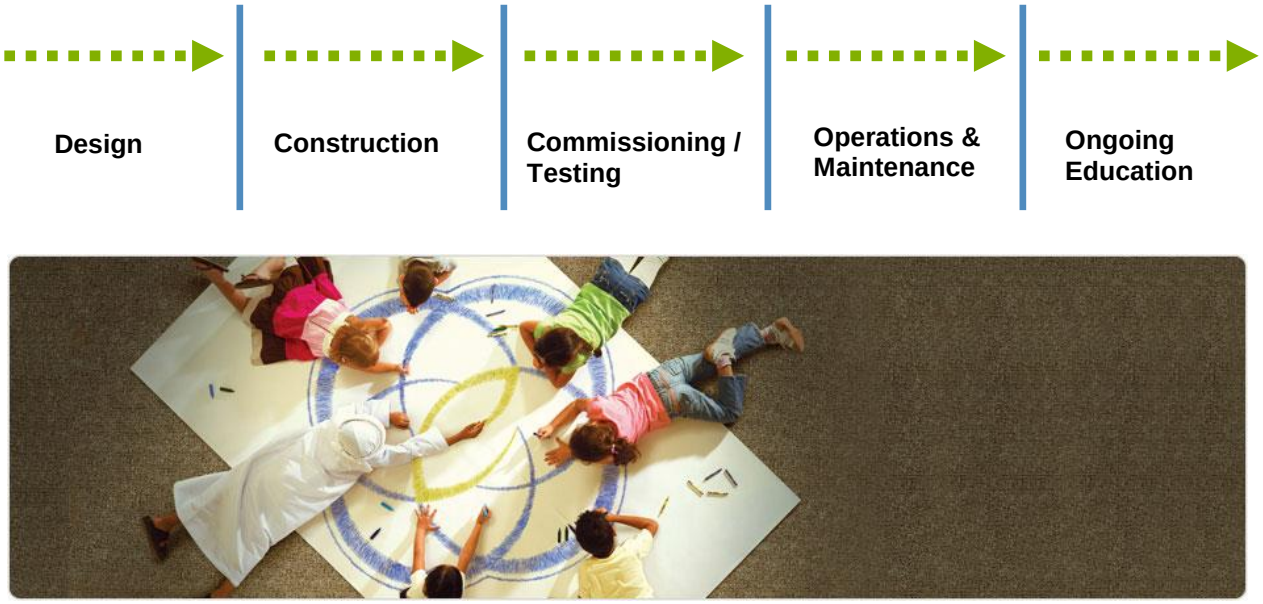
*IDP: Maximum of 1 credit point available to Individual Streetscapes.
LS: 0 credit points available to Individual Streetscapes, and maximum of 1 credit point available to Networks of Streetscapes and Local Public Open Space.
PW: Maximum of 3 credit points available to Streetscapes.
RE: Maximum of 1 credit point available to Individual Streetscapes.
SM: Maximum of 4 credit points available to Individual Streetscapes and Local Public Open Space.
Total: Excludes Innovating Practice credit points which are offered as bonus credits.

Credit Section
IDP: Integrated Development Process

An essential part of the strategy for achieving Estidama is to fundamentally change the way we approach design, construction and development. The Public Realm Rating System provides design and development teams with more than a checklist for green land development. It is part of the overarching Pearl Rating System, a transformative tool aiming to improve the design and development process and provide more cost-effective, higher performing developments.

IDP calls for cross-disciplinary teamwork and builds upon sound thinking, delivering quality and environmental management throughout the life of the project in order to achieve the successful integration of building, community, natural and economic systems. The process requires an integrated development approach from very early on in the design, a clear vision and sustainability targets and implementation strategy. The main objective is to achieve significant environmental, social, economic and cultural benefits while ensuring that the life cycle costs of development are minimised.

Integrated Development Process



Implementing the IDP Credits will:

- Establish a more collaborative and iterative design and development process;
- Encourage construction activities that value workers' welfare, quality and sound environmental management; and
- Prepare the ground for good operation and maintenance where the end user plays an informed, active role.

CREDITS COVERED IN THIS SECTION

IDP	Integrated Development Process							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
IDP-R1	Integrated Development Strategy	R	R	R	R	R	R	R
IDP-R2	Sustainable Buildings	R	R	R	R	R	R	R
IDP-R3	Commissioning	R	R	R	R	R	R	R
IDP-R4	Construction Environmental Management	R	R	R	R	R	R	R
IDP-1	Life Cycle Costing	1	1	1	1	1	n/a	1
IDP-2	Guest Worker Accommodation	1	1	1	1	1	1	1
IDP-3	Sustainability Awareness	1	1	1	1	1	n/a	1
	TOTAL	**3**	**3**	**3**	**3**	3	**1**	**3**

IDP-R1: Integrated Development Strategy

Intent	To ensure new development adopts an Integrated Development Process (IDP) as a way of attaining greater synergy between project elements resulting in well-designed, high quality public realm.
Credit Requirements	**GENERAL** Demonstrate that the design and development team and development process are organised and programmed to gain full benefit from an integrated development approach, from project inception through to final delivery. Develop an implementation strategy to facilitate an effective transition between project stages (e.g. from design to construction to operation) and project packages (e.g. site clearance and installation of sub-surface services to landscaping establishment and installation of site furniture), to ensure that the initial vision, objectives and targets are carried through to completion. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Narrative summarising initial vision, objectives and targets set jointly by the project team for the project; ☐ Process chart for the IDP, developed at project inception, detailing: ▫ Team structure listing team members, and their roles; ▫ Design milestones and workshops listing participants, goals, expected outcomes, required actions with tasks assignments; and ▫ Methodology for ensuring appropriate stakeholders are involved, including the construction team, commissioning agent, potential building owners, operators and relevant regulatory authorities and permit agencies; ☐ Implementation strategy for achieving transition between project stages and project packages; ☐ Meeting minutes summarising Estidama specific action items and team member responsibilities from key workshops held as part of the IDP; and ☐ Narrative describing the reasons for any changes from the initial IDP process chart during the design stage.
Credit Submission: Construction Rating	☐ Narrative and updated process chart of the IDP, describing changes from the design stage and listing successes and challenges during construction stage; and ☐ Updated implementation strategy.
Calculations and Methodology	The IDP is a mandatory process as part of the UPC Development Review Process.
References	▪ Estidama: www.estidama.org. ▪ UPC: www.upc.gov.ae.

IDP-R2: Sustainable Buildings

Intent

To ensure that the design and construction of buildings within the public realm will contribute to the overall sustainability objectives and targets.

Credit Requirements

GENERAL

All buildings, structures, or temporary structures not required to meet the Pearl Buildings Rating System (PBRS) requirements, must meet the following requirements:

Building Envelope

To ensure the installation of a high performance building envelope, where buildings are air conditioned, all building elements are to have an area weighted average U-value that is equal to or less than the following:

Table IDP-R2a: Maximum Building Envelope U-values

Construction Element	U-value (W/m²K)
Fenestration	2.20
Roof	0.14
Wall	0.32
Basement Wall	0.28
Floor	0.15

For the above construction elements, the following also needs to be implemented:

- Proposed glazing area to be less than 15% of the conditioned floor area;
- All glazed fenestration to have a maximum Solar Heat Gain Coefficient (SHGC) of 0.3; and
- Infiltration rates are a maximum of 0.35 ach.

Energy Efficient Equipment and Appliances

- All appliances are to have a minimum EU Energy Rating of B or equivalent on an alternative rating scheme;
- All lighting power densities must not exceed the figures as defined in ASHRAE 90.1-2013 Section 9 (space by space method);
- Lighting is to be provided with presence detection to control lighting of intermittently occupied spaces, e.g. employee lunch and break rooms, restrooms, and changing rooms;
- All fans must have a maximum fan power of 0.8 W/l/s; and
- The air conditioning system must have a minimum coefficient of performance (CoP) of 3.4 (tested at AHRI Standard 210/240 conditions or equivalent).

Water Efficient Fixtures, Fittings and Appliances

Flow rates/volumes for fixtures, fittings and appliances must not exceed the following:

Table IDP-R2b: Minimum Water Efficiency

Fixture, Fitting or Appliance	Flow Rates/Volumes
Bathroom Taps	6 litres/min at 413.7 kPa (reference pressure)
Shower Head	9.5 litres/min at 551.6 kPa (reference pressure)
Kitchen Sink Faucet	6 litres/min at 413.7 kPa (reference pressure)
Bidets	6 litres/min at 413.7 kPa (reference pressure)
Urinals	0.5 litres/flushing cycle

Toilets (Dual Flush)	6/4 litres/flushing cycle (full/low)
Ablution fixtures	6 litres/min at 413.7 kPa (reference pressure)
Dishwashers	1.3 litres/place setting
Washing Machines	8.5 litres/kg of dry load

Ozone Impacts of Refrigerants

Demonstrate that all refrigerants to be installed have an ozone depleting potential (ODP) of zero.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

All waste generated from buildings on the project site must be accounted for within the operational waste strategy within credit SW-R3.

Credit Submission: Design Rating

- ☐ Sections/details for each building façade element (including details on glazing type and areas) demonstrating how each element meets the requirements of the credit;
- ☐ PVRS U-value Calculator to demonstrate compliance with building envelope requirements;
- ☐ Manufacturer's data or extracts from specification for each proposed appliance, light fixture (internal and external) and control system, fan, and air conditioning unit, detailing the energy rating/unit efficiency/power rating and ODP;
- ☐ Extracts from specifications for all proposed water fixtures and fittings indicating flow rates and flow regulation systems;
- ☐ Extracts from specifications for all proposed appliances including information on their water use; and
- ☐ Extracts from specifications for all proposed refrigerant systems confirming ODP of each refrigerant is zero.

Credit Submission: Construction Rating

- ☐ As-built sections/details for each building façade element (including details on glazing type and areas) and detail how each of these elements meets the requirements of the credit;
- ☐ PVRS U-value Calculator (if changed from design submittal) to demonstrate compliance with building envelope requirements;
- ☐ Updated Manufacturer's data for each installed appliance, light fixture (internal and external) and control system, fan, and air conditioning unit, detailing the energy rating/unit efficiency/power rating;
- ☐ Manufacturer's data for all installed water fixtures and fittings indicating flow rates and flow regulation systems;
- ☐ Updated manufacturer's data for all installed appliances including information on their water use; and
- ☐ Updated manufacturer's data for all proposed refrigerant systems confirming ODP of each refrigerant is zero.

Calculations and Methodology

Estidama Pearl Rating System: Information Bulletin #3 provides a definition of buildings requiring compliance with the Pearl Building Rating System (PBRS).

The infiltration rates must be calculated in accordance with the 2013 ASHRAE Handbook-Fundamentals, Chapter 16.

Calculation of air conditioning system performance requirements must be based upon the standard test conditions and procedures outlined in AHRI standard 210/240, or equivalent. Certification should be obtained from the equipment manufacturer.

Recognised energy rating systems include but are not necessarily limited to:

- Energy Star

- EU Energy Efficiency Labelling Scheme

If other labelling schemes are used, evidence describing how the appliances meet or exceed the equivalent requirements under the Energy Star or EU labelling scheme must be submitted and may be accepted after formal verification from Estidama.

The following provides guidance on the typical appliances that are required to be covered by the energy rating scheme. This list is not exhaustive and all appliances purchased should be rated for energy efficiency where available:

- Refrigerators and freezers
- Ovens
- Ice Machines
- Cookers
- Fryers
- Televisions
- Washing Machines or washer/dryers
- Computers
- Monitors
- Printers, scanners and all-in-ones
- Water coolers/heaters

The ozone depleting potential (ODP) of various refrigerants is given below:

Chlorofluorocarbons	ODP	GWP	Common Building Applications
CFC-12	1.0	10,900	Refrigerators, chillers
Hydrochlorofluorocarbons			
HCFC-22	0.055	1,810	Air-conditioning, chillers
HCFC-123	0.02	77	CFC-11 replacement
Hydrofluorocarbons			
HFC-134a	0	1,430	CFC-12 or HCFC-22 replacement
HFC-245fa	0	1,030	Insulation agent, centrifugal chillers
HFC-407c	0	1,700	HCFC-22 replacement
HFC-410a	0	1,900	Air-conditioning
HFC-417a	0	1,950	HCFC-22 replacement
Natural Refrigerants			
Carbon Dioxide (CO_2)	0	1.0	
Ammonia (NH_4)	0	0	
Propane (C_3H_8)	0	3	
Isobutene	0	3	
Air	0	0	
Water	0	0	

References

- ANSI/ASHRAE/IES (2013) *ASHRAE Standard 90.1-2013 - Energy Standard for Buildings except Low-Rise Residential Buildings*. Atlanta, USA.
- *Addenda Supplement (2015) to ANSI/ASHRAE/IES Standard 90.1-2013. Energy Standard for Buildings except Low-Rise Residential Buildings.* Atlanta, USA.
- ANSI/AHRI (2008) *ANSI Standard 210/240 Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment*. Arlington, USA.
- Pearl Villa Rating System U-value Calculator. www.estidama.upc.gov.ae .
- UPC (2011) *Estidama Pearl Rating System: Information Bulleting #3 - Definition of Buildings requiring compliance with the PBRS*. Abu Dhabi, UAE.
- ASHRAE (2013) *ASHRAE Handbook-Fundamentals*. Atlanta, USA.
- Energy Star: www.energystar.gov.
- EU Energy Efficiency Labelling Scheme: http://ec.europa.eu.

IDP-R3: Commissioning

Intent

To ensure that public realm systems perform as designed, to provide amenity and ongoing efficiency.

Credit Requirements

General

Demonstrate that:

- An independent Commissioning Agent, reporting to the project owner, is engaged as part of the project design team throughout the design and construction stages;
- Comprehensive commissioning requirements are included in project specifications and construction contracts and a commissioning plan is developed;
- At completion, the systems have been commissioned by an independent commissioning specialist(s); and
- The commissioning plan has been reviewed and verified prior to project completion.

Additional Requirement/Clarifications

Individual Streetscapes, Local Public Open Space and **Neighbourhood Public Open Space**
The independent Commissioning Agent role can be carried out by an appropriate project team member.

Credit Submission: Design Rating

- ☐ CV of Commissioning Agent;
- ☐ Contract with the Commissioning Agent;
- ☐ Basis of Design (BoD) narrative;
- ☐ Design documentation review(s); and
- ☐ Commissioning plan developed in line with BSRIA BG 11/2010, including:
  - Project team members and their roles;
  - Systems to be commissioned; and
  - Commissioning programme.

Credit Submission: Construction Rating

- ☐ List of all meetings attended by the Commissioning Agent through commissioning period and project handover, including dates;
- ☐ Final commissioning report, including:
  - Construction documentation review(s); and
  - Verification of installation.
- ☐ Operations and Maintenance Manual (OMM) developed in line with BSRIA BG 1/2007.

Calculations and Methodology

Commissioning is a collaborative effort. Specific roles played by various project team members are as follows:

The **independent Commissioning Agent** must oversee and lead the commissioning process as follows:

- Review design documentation and make recommendations to the design team;
- Review construction documentation make recommendations to the project team;
- Prepare or review the commissioning plan in line with BSRIA BG 11/2010;
- Review and approve the results of commissioning and performance testing; and
- Provide design stage, construction stage and final commissioning reports.

The **Contractor** must perform the following prior to construction completion:

- Account for the commissioning, responsibilities and criteria within the project's

construction programme and ensure suitable budget is allocated for appointments;
- Employ an independent commissioning specialist to commission the installed systems; and
- Develop an operations and maintenance manual containing maintenance schedules, as-built drawings, commissioning documentation and descriptions on correct operation of the public realm systems in line with BSRIA BG 1/2007.

The **Design Team** must perform the following prior to project completion:
- Review and approve submittals from relevant subcontractors during construction;
- Visually inspect and confirm the results of selected commissioned systems; and
- Review final commissioning documents, including but not limited to the operations and maintenance manual and staff training materials.

The commissioning process must cover, at a minimum, the following systems:
- Lighting and lighting controls (LS-R4, RE-R1)*;
- Irrigation (PW-R1, PW-1)*;
- On-site energy generation (RE-1)*;
- Central monitoring system (PW-R2, RE-R2)*;
- Water features (PW-2)*;
- Stormwater drainage systems (PW-R3, PW-3)*; and
- On-site water treatment systems (PW-3)*.

*The commissioning process must validate performance in accordance with the credit evidence submitted.

The independent Commissioning Agent must have a minimum of 2 years' experience in commissioning of public realm systems and can be an employee of one of the companies involved in the project as long as this individual is not involved in the project design and/or construction.

An appropriate project team member can be a member of the design team such as an Engineer provided they are not involved in the general installation works for the relevant system(s).

References

- BSRIA (2010) *BG 11/2010 Commissioning Job Book, A framework for managing the commissioning process*. UK: BSRIA.
- BSRIA (2007) *BG 1/2007 Handover, O&M Manuals, and Project Feedback*. UK: BSRIA.

IDP-R4: Construction Environmental Management

Intent	To reduce the environmental impacts associated with construction practices.
Credit Requirements	**GENERAL** Demonstrate that a project Construction Environmental Management Plan (CEMP) has been prepared in accordance with Environment Agency Abu Dhabi's (EAD) Construction Environmental Management Plan Technical Guidance Document by an EAD-approved and registered consultant and that: ▪ Where the EAD require a CEMP to be produced – the CEMP has been approved by EAD; or ▪ Where the EAD does not require a CEMP to be produced - the CEMP has been peer reviewed by an EAD-approved and registered consultant, (for this option the CEMP is not required to be issued to the EAD). In addition to achieving the above, demonstrate that the project lead contractor is either ISO 14001 or AD EHSMS certified. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ CEMP, including: ▫ Statement from EAD or an EAD-approved and registered consultant, that the project's CEMP meets the Abu Dhabi CEMP standard; and ▫ CV and EAD registration of the peer reviewer. ☐ Certified Contractor's ISO 14001 or AD EHSMS certification.
Credit Submission: Construction Rating	☐ Signed off audit of the CEMP that verifies the project's performance was in compliance with the CEMP, including photographs and narrative describing construction practices; and ☐ Certified Contractor's ISO 14001 or AD EHSMS certification.
Calculations and Methodology	None
References	▪ EAD (2010) *Technical Guidance Document for Construction Environmental Management Plan*. Abu Dhabi, UAE. ▪ ISO (2004) *ISO 14001 Environmental Management Standard: 2004*. Geneva, Switzerland: International Organisation for Standardisation. ▪ Environment Agency Abu Dhabi, EAD: www.ead.ae. ▪ Abu Dhabi Environment, Health and Safety Management System, EHSMS: www.adehsms.ae.

IDP-1: Life Cycle Costing

Intent

To enable effective long-term decisions about design and construction in order to maximise efficiency over the whole life of the public realm space.

Credit Requirements

GENERAL

Demonstrate that a Life Cycle Costing (LCC) analysis was undertaken during concept design by a RICS Chartered Surveyor to inform the selection of materials or public realm furniture.

The LCC analysis must be carried out for a minimum of two of the following:

- Hardscape material
- Softscape material
- Public realm furniture
- Shading structures
- Walls, fences and screens
- Irrigation systems
- Lighting

The LCC model developed must be maintained and upgraded at each design stage (concept, detailed, tender) and updated at the end of construction to reflect final construction costs.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Individual Streetscapes
This credit is not available.

Credit Submission: Design Rating

- ☐ LCC report produced at the end of design, including the following:
  - Executive summary with summary history of the progressive decisions that benefited from LCC;
  - Purpose and scope (including what costs have been considered/excluded and the period of analysis);
  - Statement of objectives;
  - Materials considered, and justification for their selection;
  - Any assumptions made;
  - Any constraints and risks identified;
  - Alternatives considered in the analysis;
  - LCC Results including risk assumptions and exclusions;
  - Graphical representation of results;
  - Replacement and maintenance plan; and
  - Conclusions related to the objectives of the study and recommendations for materials selection.
- ☐ Specifications and Drawings identifying the selected materials which have been included within the design; and
- ☐ CV of the RICS Chartered Surveyor.

Credit Submission: Construction Rating

- ☐ Updated LCC report reflecting final construction costs; and
- ☐ Photographs confirming the installed materials in line with the final LCC report.

Calculations and Methodology

The LCC analysis must be conducted in accordance with BS ISO15686-5:2008 and PD 156865:2008, or equivalent international standards, and cover the following stages:

- Construction;
- Operation (e.g. utility costs);
- Maintenance (e.g. adaption or refurbishment of the material in use, repairs & replacement, cleaning and redecoration); and
- End of life (e.g. disposal, demolition and decommissioning).

The RICS Chartered Surveyor must have previous experience with LCC modelling on at least 2 similar projects, and be familiar with internationally recognised LCC standards and methodologies such as BS ISO 15686-5:2008 and BCIS/BSI PD 156865:2008, or similar.

References

- BSI (2008) *BS ISO 15686-5:2008 Building and Constructed Assets - Service Life Planning Part 5: Life Cycle Costing*. London, UK: British Standards Institute.
- BSI and BCIS (2008) *PD 156865:2008 Standardized Method of Life Cycle Costing for Construction Procurement - supplement to ISO 15686*. London, UK: Building Cost Information Service and the British Standards Institute.

IDP-2: Guest Worker Accommodation

Intent	To promote fair labour practices in construction.
Credit Requirements	**GENERAL** Develop and implement a Construction Guest Worker Accommodation Plan that at a minimum, addresses the following: ▪ The provision of accommodation facilities for all construction guest workers on the project. Facilities must be located within suitable walking distances. Appropriate shade must be provided to circulation areas, parks, play fields and waiting/gathering areas such as bus stops. The facilities must provide dedicated and adequate areas for: o Food preparation; o Personal hygiene; o Religious services; o Healthcare; o Recreation; and o Entertainment. ▪ An ongoing maintenance plan of guest worker housing facilities and total budget allocated to maintenance services; ▪ Inspection schedules and auditing mechanisms for the guest worker housing facilities with minimum annual inspections required; and ▪ A formal protocol for engaging with facility residents and other stakeholders to address their requests, concerns and petitions, including the formation of a Workers' Representative Committee and the development of a Workers' Social & Welfare Program to address the following issues at a minimum: o Health, safety and security; o House rules; o Drugs and alcohol awareness; o Education programs; o Recreation activities; and o Transport within, to and from the housing facilities outside working hours. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Guest Worker Accommodation Plan; ☐ Narrative describing how all requirements of Abu Dhabi Cabinet Decision No. (13) of 2009 are met or exceeded; ☐ For new facilities, a signed copy of tender agreements with housing contractors and subcontractors, stipulating the standards and requirements for the provision of guest worker housing, its ongoing maintenance and engagement with residents and stakeholders; and ☐ For existing facilities, photographs and other documentation as listed under 'Credit Submission: Construction Rating'.
Credit Submission: Construction Rating	☐ Photographs confirming how all requirements of Abu Dhabi Decision No. (13) of 2009 are met or exceeded; ☐ Record of all maintenance visits and inspections, including dates and actions taken and summary of invoices associated with maintenance expenditures; ☐ Narrative describing how the Contractor applied the stakeholder-engagement protocol; and ☐ Record of the formation of a Workers' Representative Committee and development of a Workers' Social & Welfare Program.

Calculations and Methodology	The provision of accommodation facilities for all construction guest workers on the project must meet or exceed the requirements of Abu Dhabi Cabinet Decision No. (13) of 2009.
References	▪ Abu Dhabi Cabinet Decision No. (13) of 2009: Approving the General Standards Manual for Group Labor Accommodation and Related Services.

IDP-3: Sustainability Awareness

Intent

To promote the efficient ongoing operation of the public realm by enabling visitors and workers to appreciate, understand and therefore contribute to responsible resource use in the public realm.

Credit Requirements

General

Demonstrate that a Sustainability Awareness Strategy was developed by the design team and updated at the end of construction.

The Strategy must address the education of site users on the following topics as a minimum:

- Ecological and cultural heritage features of the site, their value within the local, regional and global context and ways for site users to preserve/protect these features;
- Energy and water efficiency measures used on-site (including buildings), and how site users' behaviour affects performance;
- Information on materials used in the public realm, including environmental and social benefits, as appropriate;
- Waste and recycling policies and information such as location, sorting requirements and the use of organic and landscaping waste;
- Location of nearby amenities and community facilities, including sports and recreation, food growing/allotment areas; and
- Alternative transportation offered to site users including locations of nearby public transport, shuttle service and on-site bicycle facilities.

Demonstrate how each topic is communicated using:

- Static Communication – educational kiosks, interpretative signs, displays and information packs; and/or
- Ongoing Communication – continually updated information through digital display, internet and/or newsletter with information on performance measures such as ongoing energy and water consumption or generation of energy from renewable sources.

Additional Requirement/Clarifications

Individual Streetscapes

This credit is not available.

Credit Submission: Design Rating

- ☐ Narrative describing the Sustainability Awareness Strategy setting out the communication mechanisms to be used to raise sustainability awareness;
- ☐ Where Static Communication will be applied, provide a site plan, signage drawings and renderings illustrating the elements of the Sustainability Awareness Strategy and summary of the content of the information pack; and
- ☐ Where Ongoing Communication will be applied, provide samples of digitally displayed messages, website template and structure or template of Newsletter.

Credit Submission: Construction Rating

- ☐ Updated narrative describing the Sustainability Awareness Strategy setting out the communication mechanisms to be used to raise sustainability awareness;
- ☐ Where Static Communication will be applied, provide a site plan, photographs illustrating elements of the Sustainability Awareness Strategy and a copy of an information pack; and
- ☐ Where Ongoing Community Communication will be applied, provide a summary of messages displayed, website link/files or sample Newsletter.

Calculations and Methodology	None
References	None

Credit Section
NS: Natural Systems

One of the fundamental building blocks of Plan 2030 is the need to foster careful, sensitive growth that will conserve, preserve, and restore the region's critical natural environments and habitats. The ecosystem services provided by these unique marine and desert systems are invaluable and their ongoing viability is essential to maintain a high quality of life in the region.

Plan 2030 calls for the creation of a national park system to preserve key areas, but goes beyond that with the concept of a 'green gradient.' This gradient designates levels of conservation, preservation, restoration and development for each of five zones, ranging from the most intensely developed urban core to the natural areas that must be preserved. This concept and its policy objectives are more clearly defined in the Conservation Development Guidelines issued by UPC in January of 2009.

Plan 2030 also proposes an open space framework — a system of formal and informal spaces in communities that connect and augment a broader national park system and the resources it protects. This 'green infrastructure' strategy should be reflected not only in plan and form, but also in implementation, leading to healthier ecosystems, habitats and ultimately communities.

"The islands, sand dunes, sea, coast lines, and native wildlife all blend to create Abu Dhabi's incredibly intricate, sensitive and unique natural environment. This extraordinary mix has coexisted with the people living within it for thousands of years."

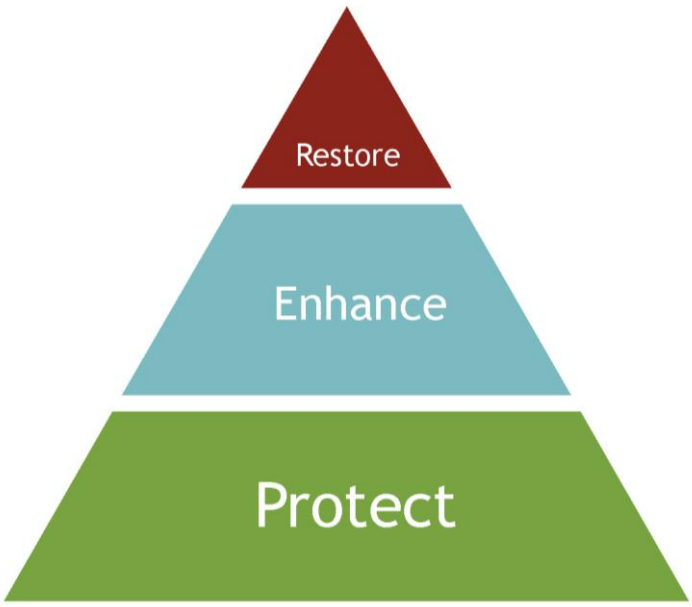
- Capital 2030, A Sustainable Foundation

The Natural Systems Credit Section is intended to encourage natural resource management and sustainable land use through:

- Thorough analysis and assessment of natural systems;
- Conservation of existing valuable features through protection or mitigation;
- encouraging reuse of land;
- Remediation of contaminated land;
- Enhancement in ecological value; and
- Habitat creation, restoration and provision of habitat connections.

In addition, the credits encourage landscape designs which minimise resource and management requirements.

The overarching hierarchy followed is illustrated below:



CREDITS COVERED IN THIS SECTION

NS	Natural Systems							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
NS-R1	Natural Systems Assessment	R	R	R	R	R	R	R
NS-R2	Natural Systems Protection	R	R	R	R	R	R	R
NS-R3	Natural Systems Design & Management Strategy	R	R	R	R	R	R	R
NS-1	Reuse of Land	1	1	1	1	1	1	1
NS-2	Remediation of Contaminated Land	1	1	1	1	1	1	1
NS-3	Landscape Enhancement	1	1	1	1	1	1	1
NS-4	Habitat Creation & Restoration	1	1	1	1	1	1	1
	TOTAL	**4**	**4**	**4**	**4**	**4**	**4**	**4**

NS-R1: Natural Systems Assessment

Intent

To ensure that before the design process begins, the environmental baseline conditions surrounding, connected to and on the site are considered and assessed.

Credit Requirements

GENERAL

Demonstrate that, before the start of the design process and site clearance, a field survey and desktop assessment of the existing site conditions have been carried out by a *suitably qualified environmental professional*.

Approvals

- Demonstrate Environmental NOC approval for the project works from the Abu Dhabi Environment Agency (EAD).
- Demonstrate approval for the project works from the Abu Dhabi Tourism & Culture Authority (ADTCA).

Desktop Survey

The desktop study survey is to be based on the sub-regional and regional scale and is required to:

- Demonstrate if the development is within 100m of areas designated sensitive or protected, as identified in the:
  - Regional Environmental Framework Plan contained in Plan Abu Dhabi 2030; and
  - Regional Urban Structure Framework Plan;
- Demonstrate that the Interim Coastal Development Guidelines have been addressed and an Environmental Context Statement prepared, if required;
- Demonstrate if the development is within 100m of environmental assets as defined in EAD's geo-portal; and
- Identify potential sources of contamination from previous land use.

Site Survey

A Phase I Habitat Survey* must be carried out for the project site to identify significant or valuable assets, which are defined as follows:

- Significant Assets which are of significant importance (internationally, nationally, regionally and/or locally). These include:
  - Priority Habitats;
  - Priority Species; and
  - Any other habitat identified as significant through the Development Review Process, the Coastal Development Guidelines, an Environmental Impact Assessment (EIA), a Preliminary Environmental Review (PER) or a Strategic Environmental Assessment (SEA).
- Valuable Assets - Any valuable assets, such as features of ecological value, including healthy native trees or shrubs; and
- Notable sources of current or historic contamination, including waste.

*Where significant or valuable assets are recorded identify a mechanism to ensure that further surveys are carried out and any resulting mitigation is implemented.

Natural Systems Assessment Report

Demonstrate that a Natural Systems Assessment Report has been prepared to capture the following elements:

- Living environment – flora, fauna and habitats;
- Physical environment – topography, geology, soils, hydrology, contamination and microclimate; and
- Human environment – archaeology and cultural heritage.

The report must cover the project site and area of probable impact surrounding the

project site.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Individual Streetscapes and **Local Public Open Space** and **Neighbourhood Public Open Space**

Where a *suitably qualified environmental professional* can demonstrate there are no significant or valuable assets or potential sources of contamination present, a site survey is not required.

Credit Submission: Design Rating

- ☐ Project programme confirming that the Natural Systems Assessment took place prior to the start of the design process and site clearance;
- ☐ Correspondence with EAD, including the following documents:
  - Environmental Permit Application (EPA);
  - EAD's response to the EPA;
  - Copy of the project team's response to EAD's requirements (e.g. SEA, EIA, PER, CEMP, as applicable); and
  - Environmental NOC from EAD.
- ☐ Correspondence with ADTCA, including the following documents:
  - Preliminary Cultural Review (PCR) Application;
  - ADTCA's response to the PCR;
  - Copy of the project team's response to ADTCA's requirements (e.g. PCR Report, EIA-Cultural Heritage Impact Assessment Study, as applicable); and
  - Correspondence granting approval from ADTCA.
- ☐ Natural Systems Assessment report including:
  - Review of the site against applicable national, regional and local Environmental Planning and Policy documents;
  - Summary of field survey findings;
  - Extended Phase 1 Habitat Map with associated Target Notes (where required); and
  - Site photographs.

Maps and site photographs must clearly identify the extent of different habitats and/or other significant natural system features.

- ☐ CV of the appointed *suitably qualified environmental professional*.

Credit Submission: Construction Rating

There is no required submission at this stage.

Calculations and Methodology

The Area of Probable Impact is defined by EAD as the extent of a physical area occupied by an environmental component that is likely to be impacted by at least one of the phases of the proposed project (i.e. construction, operation, and decommissioning activities). The boundary of the area of probable impact is determined by measurements, previous studies, models, or best professional judgment and may vary by environmental component.

Priority Habitats – Habitats identified in Abu Dhabi Emirate which are of exceptional value and are highly threatened, including Intertidal Mudflats, Mangrove, Vegetated Sandy Beaches, Marine (seagrass, coral), Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes, Alluvial Plains and Jebels. Reference is to be made to Brown and Boer, 2004 for detailed habitat types.

Priority Species – A protected species (flora or fauna) or species determined to be critically endangered, endangered, vulnerable, threatened, near threatened or sensitive (as defined by the Union for Conservation of Nature (IUCN) and the UAE Red

Data list.

A *suitably qualified environmental professional* is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience (for the ecological component of the assessment, where significant and/or valuable assets are present, this is to include experience of carrying out habitat surveys as well as providing advice on ecological protection, enhancement and mitigation measures); and
- Experience working on similar projects in the region.

The EAD holds a list of qualified consultants carrying out a range of environmental services within the Emirate of Abu Dhabi.

References

- Abu Dhabi Tourism and Culture Authority, ADTCA: www.tcaabudhabi.ae/en.
- UPC: www.upc.gov.ae.
- ASTM (2011) *ASTM E1527 – 13 Standard Practices for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. Pennsylvania, US: ASTM.
- Environment Agency Abu Dhabi, EAD: www.ead.ae.
- Union for Conservation of Nature, IUCN: www.iucn.org.
- Brown, G. and Boer, B. (2004) *Interpretation Manual of Major Terrestrial Natural and Semi-Natural Habitat Types of Abu Dhabi Emirate*. Abu Dhabi, UAE: Environmental Research and Wildlife Development Agency, ERWDA.
- ERWDA (2005) *Red List of Terrestrial Mammalian Species of the Abu Dhabi Emirate*. Abu Dhabi, UAE: Environmental Research and Wildlife Development Agency.
- ERWDA (2005) The *Terrestrial Mammals, Reptiles and Amphibians of the UAE - Species list and status report*. Abu Dhabi, UAE: Environmental Research and Wildlife Development Agency.
- JNCC (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit. London, UK: Joint Nature Conservation Society.
- EAD Geo-portal: http://enviroportal.ead.ae/geoportal/catalog/main/home.page.

NS-R2: Natural Systems Protection

Intent

To protect significant and valuable natural systems assets identified in NS-R1, Natural Systems Assessment.

Credit Requirements

GENERAL

Demonstrate that significant and valuable natural systems assets, as identified in NS-R1 Natural Systems Assessment, are adequately protected, or that impacts are either mitigated or compensated following steps 1 to 3.

Step 1 – Protection*:

- Demonstrate that all significant assets, and at least 80% of all valuable assets, are retained on-site and protected from damage and destruction sufficient to maintain their structure and function.

*natural systems assets located within a protected area, proposed protected area, national park, ecological hot-spot or coastal conservation zone must be protected.

Step 2 – On-site Mitigation:

Where it can be demonstrated, and agreed with the UPC and EAD, that on-site protection cannot be achieved:

- Demonstrate that at least 70% of all significant assets and at least 50% of all valuable assets are retained on-site and protected from damage and destruction sufficient to maintain their structure and function;
- Mitigate for the loss of assets through on-site creation of habitat, at a ratio of 2:1 (created: lost habitat); and
- Provide an ecological corridor between the protected habitat areas (significant assets) and the mitigation areas.

Step 3 – Off-site Compensation:

Where it can be demonstrated, and agreed with the UPC and EAD, that on-site mitigation cannot be achieved:

- Compensate for the loss of assets through off-site creation of habitat, at a ratio of 2:1 (created: lost habitat);
- The compensation area must have a similar hydrological function and soil type as the original area;
- The compensation site must be:
  - Located within the Emirate of Abu Dhabi;
  - A degraded habitat; and
  - Located outside an area allocated for development within a 2030 plan.
- The habitat to be created must be:
  - A similar type to the habitat lost at the project site;
  - Of a type appropriate to the compensation site location; and
  - Located in an area surrounded and connected to a similar habitat.

The Natural Systems Protection, Mitigation or Compensation plan and supporting studies must be prepared by a *suitably qualified ecological professional*.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Where any dredging, reclamation and/or shoreline modification is intended, the project must demonstrate compliance with all applicable legislation, regulations and guidelines

and be approved by relevant government agencies as necessary.

Credit Submission: Design Rating

- ☐ Protection, Mitigation and/or Compensation Strategy Report which includes:
  - Narrative and marked-up location maps describing the extent of natural system assets to be protected, destroyed, and to be created on the site post-development;
  - Calculations, summarising total site area, protection area and/or compensation area (in hectares), the % of significant and/or valuable assets to be retained and protected, and the area replacement ratio;
  - Consideration of set-back requirements;
  - Details of the off-site compensation area allocated for habitat creation, including site location;
  - Response to Natural Systems Assessment (NS-R1) identifying any site constraints and demonstrating site suitability for habitat creation; confirmation of approval from landowner to establish and maintain the habitat; and details of consultation with EAD; and
  - A strategy for habitat creation, including source of plant stock, temporary irrigation (if required), weed/pest control, and establishment of soil base.
- ☐ CV of the appointed *suitably qualified environmental professional*;
- ☐ UPC approval of the strategy;
- ☐ EAD approval of the strategy (where on-site mitigation and/or off-site compensation is proposed);
- ☐ Draft Construction Environmental Management Plan detailing the measures that will be put in place to protect significant and valuable assets from construction impacts:
  - Potential risks to the natural systems assets from project works, and the measures to be put in place to mitigate these risks; and
  - Limits of development, buffer areas and setbacks. Works areas shall be clearly identified on an aerial photograph of existing conditions.
- ☐ Copies of approvals from all relevant government agencies for projects involving dredging, reclamation and/or shoreline modification.

Credit Submission: Construction Rating

- ☐ Construction Environmental Management Plan, containing:
  - Evidence that on and off site features of ecological value have been protected during construction and that appropriate set-back requirements have been considered; and
  - Photographs of areas of protection, mitigation and/or compensation.
- ☐ Updated calculations summarising final total site area, protection, mitigation and/or compensation area (in hectares), the % of significant and valuable assets that were retained and protected, and the area replacement ratio achieved.

Calculations and Methodology

Protection setback requirements are to be determined by the *suitably qualified environmental professional* depending on the nature of the asset (in consultation with UPC). In the absence of any policy for a specific habitat type, or clear justification for setback, any component of the proposed project is to be:

- Setback at least 100 meters from identified coastal and marine priority habitats (intertidal, coral, seagrass);
- Setback at least 50 meters from mangrove and vegetated sandy beaches;
- Setback at least 10 meters from wadis, sand-sheets and low dunes, interdunal plains and high dunes, alluvial plains and jebels;
- Setback from trees to be protected through use of barriers located either at the outer edge of branch spread or half the height of the tree, whichever is the greater; and
- Setback from other habitat areas through use of barriers located minimum 1 meter from the outer edge.

Assets are to be protected from damage and destruction sufficient to maintain their structure and function.

For off-site compensation strategies, the following is required:

- A Natural Systems Assessment in line with the requirements of NS-R1 Natural Systems Assessment, to identify site constraints and suitability for habitat provision at the compensation site.
- Undertake consultation with EAD when identifying or proposing suitable site(s) for habitat establishment to ensure delivery of the most appropriate habitat.
- The compensation site must be:
  - Located within the Emirate of Abu Dhabi;
  - A degraded habitat; and
  - Located outside an area allocated for development within a 2030 plan.
- The habitat to be created must be:
  - A similar type to the habitat lost at the project site; and
  - Of a type appropriate to the compensation site location.
- Located in an area surrounded and connected to a similar habitat.

A *suitably qualified environmental professional* is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience (this is to include providing advice on ecological protection, enhancement and mitigation measures); and
- Experience working on similar projects in the region.

The EAD holds a list of consultants carrying out a range of environmental services within the Emirate of Abu Dhabi.

References

- NS-R1 Natural Systems Assessment. www.estidama.upc.gov.ae.
- Environment Agency Abu Dhabi, EAD: www.ead.ae.

NS-R3: Natural Systems Design & Management Strategy

Intent

To minimise demand for resources, promote soil protection and enhancement and ensure the long-term survival and management of landscaped/habitat areas.

Credit Requirements

GENERAL

Demonstrate that a Natural Systems Design and Management Strategy has been prepared that ensures the establishment, long term survival and management of the landscape and habitat areas within the site and promotes:

- Soil protection and enhancement;
- Low maintenance requirements; and
- Low demand for resources.

The Natural Systems Design and Management Strategy must cover all landscape areas, and include as a minimum the management of the following:

- Protected, mitigated or compensated assets;
- Areas of ecological enhancement; and
- Habitat creation and restoration.

The Natural Systems Design and Management Strategy must be prepared by a *suitably qualified environmental professional*.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Sites that demonstrate no existing or proposed landscaping comply with the requirements.

Credit Submission: Design Rating

☐ Natural Systems Design and Management Strategy that includes:

- Plans and drawings illustrating layout and design of landscaped and habitat areas;
- Details of soft and hard landscaped areas;
- Details and justification of plant selection (ensuring that only native and adaptive drought and saline tolerant species are specified for habitat areas);
- Soil Testing, Protection, Enhancement and Maintenance Plan;
- Landscape Maintenance Plan; and
- Specific establishment, maintenance and protection requirements (identifying timescales and performance criteria) for:
  - Assets identified under NS-R2 Natural Systems Protection;
  - Ecological enhancement identified under NS-3 Landscape Enhancement and habitat creation; and
  - Restoration identified under NS-4 Habitat Creation & Restoration.

☐ CV of the appointed *suitably qualified environmental professional*.

Credit Submission: Construction Rating

☐ Updated Natural Systems Design and Management Strategy including:

- As-built layout drawings clearly identifying landscaped and habitat areas;
- Details of plant palette for landscaped and habitat areas and sources of plant stock or seeds;
- Reporting of any landscape / habitat design alterations or procedures; and
- Reporting of any failures and rectification work undertaken.

☐ Confirmation of the appointment of a management and maintenance organisation (with a contract running for at least 5 years), or confirmation that management

will be undertaken by the local municipality. The confirmation must contain details of individuals responsible and their duties in line with the strategy.

Calculations and Methodology

The Soil Testing, Protection, Enhancement and Maintenance Plan must include the following, as a minimum:

- Appropriate nutrient and salinity levels;
- Soil testing to determine nutrient and salinity level;
- Protection of site soils from compaction, erosion, pollution and increases in salinity; and
- Soil enhancement including increasing water retention capacity, salinity management and nutrient management including proportion of low fertiliser requirements.

The Landscape Maintenance Plan must include the following, as a minimum:

- Minimisation of fertiliser application;
- Avoidance of pesticide and herbicide application; if required, identify potential environmental impacts and planned actions to mitigate these;
- Maintenance duties required to be carried out in the various landscaped areas considering species type, soil type, irrigation requirements and season;
- Monitoring requirements for the landscape / habitat areas and species for annual monitoring of health, species diversity and abundance and soil condition; and
- Identification of monitoring and maintenance organisation.

A *suitably qualified environmental professional* is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience (this is to include providing advice on landscape design, management and maintenance); and
- Experience working on similar projects in the region.

References

- NS-R1 Natural Systems Assessment. www.estidama.upc.gov.ae.
- NS-R2 Natural Systems Protection. www.estidama.upc.gov.ae.
- NS-4 Habitat Creation & Restoration. www.estidama.upc.gov.ae.

NS-1: Reuse of Land

Intent	To encourage new development to reuse land that has already been built on and infill existing urban areas.
Credit Requirements	**GENERAL** Demonstrate that at least 75% of the site area has been previously developed. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Narrative describing the previous uses on the site, or adjacent to the site outlining existing structures and hard landscaped areas; ☐ Plan drawing of the existing, or previous development, on the site (or an aerial photograph, including graphic scale) illustrating the proposed development boundary; and ☐ Calculations demonstrating that the previously developed area is at least 75% of the new site area.
Credit Submission: Construction Rating	☐ Plan drawing of the existing, or previous development, on the site (or an aerial photograph, including graphic scale) with the final development boundary outlined; and ☐ Calculations confirming that the previously developed area remains at least 75% of the site area.
Calculations and Methodology	Previously developed land is classified as any land that is or was occupied by a permanent structure, or impervious surfaces such as hardscape and/or parking areas, including the land up to the plot boundary of the permanent structure and any associated fixed surface infrastructure. It excludes any land previously occupied by agriculture or forestry and any parks or recreational grounds.
References	None

NS-2: Remediation of Contaminated Land

Intent

To encourage and reward the remediation of land for public realm provision.

Credit Requirements

GENERAL

Demonstrate the site has been identified as contaminated through the completion of ASTM Phase I and Phase II contamination assessments, or similar.

Demonstrate that adequate remedial steps will be taken to decontaminate, or safely encapsulate, the site prior to construction through a Phase III ASTM remediation strategy and implementation plan, or similar.

All assessments, analysis and reporting must be carried out by a *suitably qualified environmental professional*.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Phase I and Phase II site contamination assessment report(s) that:
  - Identify the contaminant sources/types pre-existing on site;
  - Estimate the degree of contamination;
  - Present the options for remediating the sources of pollution which present an unacceptable risk to the proposed site usage;
- ☐ Drawings, maps or photographs which clearly identify the contamination and areas to be remediated;
- ☐ Phase III remediation strategy and implementation plan including the following:
  - Contract and scope of engagement;
  - The person or organisation responsible for overseeing the decontamination operation (from commencement to completion);
  - The remedial steps to be taken to decontaminate, or safely encapsulate, the site prior to construction; and
  - Procedures to ensure that contaminated material (whether solid or liquid) is appropriately handled, stored, transported, treated and/or disposed of to protect human health and prevent environmental pollution.
- ☐ CV of the appointed *suitably qualified environmental professional*.

Credit Submission: Construction Rating

- ☐ Validation report of remediation from a *suitably qualified environmental professional*. The report is to state the individual or company responsible for overseeing the remediation operations (from commencement to completion) and confirm that the site has been correctly and appropriately remediated for the proposed land use; and
- ☐ CV of the appointed *suitably qualified environmental professional*.

Calculations and Methodology

A Phase I analysis includes the identification of the potential for contamination through former land uses and/or through preliminary site analysis, available environmental information, conceptual site model and risk assessment.

A Phase II analysis includes the completion of site surveys to determine the presence and extent of contamination on a site, assessment of testing and monitoring results, updated conceptual site model and risk assessment.

A Phase III remediation strategy and implementation plan demonstrates the remedial steps to be taken to decontaminate, or safely encapsulate, the site prior to

construction. The strategy should be site specific, and include procedures to ensure that contaminated material (whether solid or liquid) is appropriately handled, stored, transported, treated and/or disposed of to protect human health and prevent environmental pollution.

Asbestos qualifies as contamination where it occurs in the ground.

A *suitably qualified environmental professional* is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience (this is to include Phase I, II contamination assessments, and Phase III remediation strategies and implementation); and
- Experience working on similar projects in the region.

References

- ASTM (2013) *ASTM E1527 – 13 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment* Process. Pennsylvania, USA: ASTM.
- EA (2011) *CLR 11 Model Procedures for the Management of Land Contamination*, Bristol, UK: Environment Agency.
- *ASTM (2013) E2531-06e1 Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Non-aqueous-Phase Liquids Released to the Sub-surface*. Pennsylvania, US: ASTM.
- ASTM (2014) *E2531-06, Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous-Phase Liquids Released to the Subsurface.* Pennsylvania, US: ASTM.

NS-3: Landscape Enhancement

Intent

To enhance the ecological value of the site, and establish demand for planting appropriate to the context and climate of Abu Dhabi.

Credit Requirements

GENERAL

Demonstrate a minimum of 70% plants specified for planting on the site comprise drought and saline tolerant plant species where proposed in a coastal environment.

Demonstrate a minimum of 30% plants specified for planting on the site comprise native plant species.

Demonstrate that the project plant palette contains a biodiverse mix of species appropriate to the site context and scale.

Demonstrate no species known to be of an invasive nature are included in the plant palette.

The ecological enhancement recommendations must be prepared by a *suitably qualified* Ecologist and/or Landscape Architect.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Ecological/landscape report and plant palette highlighting the proposed species, identifying the native or adaptive species which are drought and/or saline tolerant;
- ☐ Drawings highlighting the location and area coverage of the proposed species;
- ☐ Calculations confirming the % plants specified which are native or adaptive and drought and/or saline tolerant; and
- ☐ CV of the *suitably qualified* Ecologist and/or Landscape Architect.

Credit Submission: Construction Rating

- ☐ Updated drawings highlighting the location and area coverage of the proposed species;
- ☐ Updated calculations confirming the % plants specified which are native or adaptive and drought and/or saline tolerant; and
- ☐ Photographs and as-built landscape drawings clearly indicating the planted species.

Calculations and Methodology

The PRDM plant list includes a variety of species suitable for the inland and coastal environments of the Abu Dhabi Emirate. Medium and high drought and/or salinity tolerance ratings comply with this definition.

A *suitably qualified* Ecologist and/or Landscape Architect is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience; and
- Experience working on similar projects in the region.

References

- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE: Abu Dhabi Urban Planning Council.

NS-4: Habitat Creation & Restoration

Intent

To restore or re-create a habitat that is connected to other similar habitats and is self-sustaining.

Credit Requirements

GENERAL

Demonstrate measurable strategies to increase the ecological value of the site by creating habitat or restoring pre-existing or degraded remnant natural areas on the site. The creation of habitat must use native species.

The habitat type to be created or restored must be a Priority Habitat of a type appropriate to the site location.

Land allocated for habitat creation or restoration must be in addition to land allocated for mitigation or compensation as required under NS-R2 Natural Systems Protection.

Demonstrate that habitat creation / restoration provides at least the minimum habitat size for effective habitat function, as defined by the *suitably qualified ecological professional*. The habitat type to be created is to be located in one area of the site and be connected to the same or similar habitat type either within the site or adjacent to the site.

Demonstrate opportunities to create or connect to existing functional ecological corridors have been explored.

The ecological restoration or creation recommendations must be prepared by a *suitably qualified ecological professional*.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Habitat Creation & Restoration Strategy, including:
  - Photographs and maps illustrating habitat creation areas or pre-existing natural resource areas requiring restoration;
  - Plant palette highlighting the proposed native species;
  - Calculations showing the minimum habitat size, and habitat size to be provided;
  - Methodology for habitat creation or restoration of functional habitat;
  - KPIs for assuring performance through monitoring and management; and
  - Maps illustrating any connections between habitats within the site and opportunities for ecological corridors between the site and neighbouring areas.
- ☐ CV of the suitably qualified ecological professional.

Credit Submission: Construction Rating

- ☐ Updated Habitat Creation & Restoration Strategy including:
  - As-built drawings and photographic evidence of implementation of habitat creation / restoration strategy.
- ☐ Documentation of any failures identified during construction and proposed rectification strategies of habitat creation / restoration.

Calculations and Methodology

Priority Habitats include: Intertidal Mudflats, Mangroves, Vegetated Sandy Beaches, Seagrass, Coral, Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes,

Alluvial Plains, Jebels, or other significant habitat types, to be agreed with UPC.

The habitat creation or restoration strategy is to include the following:

- Photographs, maps and a description of the existing condition of the habitat creation/restoration area and the impacts that have caused or are continuing to cause the degradation or loss of habitat on the site;
- The habitat to be created or restored, including justification for the habitat type;
- Plans illustrating the location of the habitat creation/restoration area in relation to other areas of the same or similar habitat type and a description of the existing or proposed connections between them (where applicable);
- A description of the structure and function of the habitat type, including inter-relationships between topography, soil, microclimate, light and shade, flora and fauna and minimum habitat size for effective habitat function;
- A strategy for re-creation of the structure and function of the habitat type identifying timescales and performance criteria; and
- The methodology for habitat creation or restoration, including grading, soil restoration and seeding or planting of the site and the proposed strategies to mitigate the existing degrading factors.

The PRDM plant list includes a variety of native species suitable for the inland and coastal environments of the Abu Dhabi Emirate.

A *suitably qualified ecological professional* is an individual with:

- A degree in a relevant subject;
- A minimum of three years relevant work experience (this is to include providing advice on habitat creation and restoration); and
- Experience working on similar projects in the region.

References

- NS-R2 Natural Systems Protection
- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE: Abu Dhabi Urban Planning Council.
- JNCC (2010) *Handbook for Phase 1 habitat survey - a technique for environmental audit*. London, UK: Joint Nature Conservation Society.

Credit Section
LS: Liveable Spaces

The design of outdoor space is fundamental to an individual's well-being and, as a direct consequence of this, the prosperity of a city.

"Our ultimate goal is to create a cohesive, contemporary and sustainable urban fabric for this new city and prosper as an attractive, liveable place that preserves the Emirate's unique culture and environment."

- H.E. Falah Mohamed Al Ahbabi – General Manager, Abu Dhabi Urban Planning Council.

In order to create sustainable cities, development must go beyond environmental aspects and address the other key pillars of Estidama - social, cultural and economic. This demands a human scale urban environment that provides community focused facilities within comfortable walking distances for people. It requires designs that respect the cultural identity of the region and reflect the importance of family structure and religion on built form. As the towns and cities of the Emirate grow there is a need to create an urban fabric that supports mass transit modes of movement. This involves a response to the climate of the region, recognising the role that design can have in reducing the worst effects of the arid climate, learning from traditional design responses so as to reduce the reliance upon technology.

The Liveable Spaces section is intended to encourage responsive design and sustainable land use through the following:

- Thorough analysis and assessment of the social, economic, design and policy context;
- Analysis and appreciation of the climatic conditions;
- Provision of appropriate public realm amenities and facilities, including sport and recreation;
- Creating a well-connected public realm that promotes pedestrian and cycling activity; and
- Facilitating community cohesion.

CREDITS COVERED IN THIS SECTION

LS	Liveable Spaces							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
LS-R1	Outdoor Thermal Comfort	R	R	R	R	R	R	R
LS-R2	Site & Context Assessment	R	R	R	R	R	n/a	n/a
LS-R3	Transit Supportive Practices & Connectivity	R	R	R	R	R	R	R
LS-R4	Light Pollution Mitigation	R	R	R	R	R	R	R
LS-R5	Smoking Control	R	R	R	R	R	n/a	n/a
LS-R6	Legionella Management	R	R	R	R	R	R	R
LS-1	Active Urban Environments	1	n/a	1	1	1	n/a	1
LS-2	Sustainable Food Practices	1	1	1	1	1	n/a	n/a
	TOTAL	**2**	**1**	**2**	**2**	**2**	**0**	**1**

LS-R1: Outdoor Thermal Comfort Strategy

Intent

To increase outdoor thermal comfort during transition months in public open/recreation spaces and streetscapes, and reduce thermal discomfort during summer months.

Credit Requirements

General

Demonstrate that an outdoor thermal comfort strategy has been developed to identify primary, secondary and tertiary pedestrian walkways, and priority areas for shading to improve the public realm's microclimate.

Shade measures (natural or structural) must be provided in all applicable spaces and achieve the following minimum % shading:

Table LS-R1a: Minimum shading requirements

Public Realm Space	Minimum % shading	
	Interim Shade Provision Shade measured at 5 years growth after planting (applies only to natural shading)	**Final Shade Provision** Shade measured at maturity (applies to both natural and structural shading)
Exterior Surface Car Parking with more than 10 spaces (including parking on roof surfaces)	40%	
Bicycle Parking Spaces	90%	
Seating areas	30%	70%
Playgrounds	90%	
Primary Pedestrian Walkways (based on 1.8m width within the through zone)	35%	75%
Secondary Pedestrian Walkways (based on 1.8m width) within the through zone)	25%	60%
Tertiary Pedestrian Walkways	0%	
Cycle Tracks (non-recreational)	50%	

Additional Requirement/Clarifications

Where shade is provided by structures such as canopies or other architectural elements, the outer surface of the shading element must have a minimum Solar Reflectance Index (SRI) of 29.

Public Open Spaces

This credit does not apply to recreational areas such as playing fields and ball courts.

Credit Submission: Design Rating

- ☐ Outdoor shading strategy report including:
  - Narrative describing shade provision;
  - Plan to show public realm spaces and priority areas for shading; and
  - Plan and tabulated results showing achievement of % of interim and final shading provision achieved for applicable spaces.
- ☐ Extracts from specifications relating to the SRI of all cover elements.

Credit Submission: Construction Rating

- ☐ Updated outdoor shading strategy report including:
  - Narrative describing shade provision;
  - As-built plan identifying public realm spaces and priority areas for shading;
  - As-built plan and tabulated results showing achievement of % of interim and final shading provision achieved for applicable spaces; and
  - Photographs confirming the installation of shade measures.
- ☐ Evidence that all purchased and installed covers have compliant outer surface SRIs.

Calculations and Methodology

Primary, secondary and tertiary pedestrian walkways should be established by the design team through the assessment of routes on the basis of their:

- Level of footfall (the number of pedestrians using the routes in question);
- Proximity to significant trip generators (such as buildings, car parks and mosques);
- Ability to encourage sustainable travel (including links to public transit services);
- Level of interaction with general traffic; and
- Walkway establishment must ensure that all buildings, car parks, mosques and transit stops within, or adjacent to the project site, are a maximum distance of 50m from a shaded primary pedestrian walkway.

Further definitions for specific spaces are given below:

Public Open Space

- Primary pedestrian walkways are those linking primary entrances to key features within the public open space.
- Secondary pedestrian walkways are those linking to secondary entrances and other features within the public open space.
- Tertiary pedestrian walkways are all other routes within the public open space.

Streetscapes

- Pedestrian walkways separated by a street or road with regular crossing points only need to achieve the minimum shading requirements on one of the two pedestrian walkways.
- Primary pedestrian walkways are defined as the main walking and cycling route(s) along streetscapes. They provide convenient direct access and connections between buildings, car parks, mosques and link to public transit stops. Primary routes have the highest predicted pedestrian and cyclist movement numbers.
- Secondary pedestrian walkways along streetscapes are walking and cycling route(s) connecting primary and tertiary routes into an overall network. They have lower predicted pedestrian and cyclist movement numbers than primary pedestrian walkways, and may include recreational routes within residential neighbourhoods.
- Tertiary pedestrian walkways along streetscapes are those unlikely to be used as a walking route, for example through heavy industrial or rural areas.

Shading Calculations

- The through zone is an obstacle-free space for pedestrian movement, as defined within the USDM.
- Shading calculations can assume that the sun will be directly overhead, to mimic the timing of the summer solstice.
- All trees included within the shading calculation must be planted between Southeast and Southwest of the area shaded, to ensure comfort during transition months.
- All shade structures must be designed to provide adequate shade during transition months, and must be offset between the Southeast and Southwest of the area shaded.
- Shade from adjacent buildings and/or structures can be included in calculations.
- Dappled shade of more than 60%, such as that created by a grid or lattice, may be considered fully shaded. Dappled shade less than 60% must be calculated based on

the actual shaded portion.

- The minimum % shading requirements should be applied to the total area to be shaded, including where this is formed of individual elements.
- Where natural shade is provided (e.g. trees), an Interim Shade Provision % must be met prior to the Final Shade Provision %.
- Plant shape and expected size at 5 years growth must be based upon a 4% growth rate. Maturity sizes must be based upon those given in the PRDM Plant List.
- All trees included within the shading calculation must be of a sufficient size when planted, with a minimum trunk circumference of 14cm (measured at 1.2m from the ground) when planted.

SRI values for the outer surface of structural shade elements can be calculated based on solar reflectance and emittance numbers as defined in ASTM E1980-01. Alternatively, manufacturer's data can be supplied where the testing is in accordance with the relevant ASTM Standard.

References

- UPC (2010*) Urban Street Design Manual (USDM)*. Abu Dhabi, UAE.
- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE.
- DOT (2012) *Walking and Cycling Master plan*. Abu Dhabi, UAE.
- ASTM (2001) *E1980-01 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-sloped Opaque Surfaces*. Pennsylvania, US: American Society for Testing and Materials.
- ASTM (2009) *C1549-09 Standard Test Method for Determination of Solar Reflectance near Ambient Temperature Using a Portable Solar Reflectometer*. Pennsylvania, US: American Society for Testing and Materials.
- ASTM (2013) *E 408-71 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques*. Pennsylvania, US: American Society for Testing and Materials.
- ASTM (2015) *C1371-15, Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers*. Pennsylvania, US.

LS-R2: Site & Context Assessment

Intent

To ensure that the proposed public open space provision responds to local characteristics and requirements.

Credit Requirements

General

Demonstrate that, before the start of the design process and site clearance, a Site & Context Assessment of the existing site and its surrounding area (a 700m offset minimum around the site) has been carried out by an *appropriate project team member*.

Demonstrate that the Open Space Framework has been reviewed, and specific local requirements for facilities and amenities identified within the assessment.

Identify the settlement classification of the sector (or zone) within which the site sits, and demonstrate that the provision of Public Open Space is consistent with the PRDM guidance percentages for the applicable settlement classification of the site.

Table LS-R2a: Guideline Percentages of Public Open Space for each Settlement Classification

	Urban Settlement Context	Suburban Settlement Context	Rural Settlement Context
Total Public Open Space	20%	15%	10%

Once the provision of Public Open Space has been determined, demonstrate that the proposed quantities of each Public Open Space type (programmed space, play facilities, sports & recreation) are consistent with the PRDM guidance percentages.

Table LS-R2a: Guideline Quantities of Public Open Space Types

Public Open Space Type:	Public Open Space Percentage
Programmed Space	55%
Play Facilities	20%
Sports & Recreation	25%

Additional Requirement/Clarifications

Streetscapes

This credit does not apply.

Credit Submission: Design Rating

- ☐ Site & Context Assessment report including:
  - Narrative describing the existing site and its surrounding area. This should include a section which summaries how this information is reflected in the final design solution, supported by graphics;
  - Maps and Diagrams; and
  - Photographs.
- ☐ A letter from the *appropriate project team member* stating and providing justification that the proposed development provides:
  - Facilities and amenities consistent with the Open Space Framework; and
  - Public Open Space types which meet the recommended PRDM percentages according to the settlement context.

- ☐ Confirmation from the UPC that the proposed percentages of Public Open Space are acceptable; and
- ☐ CV of the appointed *appropriate project team member*.

Credit Submission: Construction Rating

There is no required submission at this stage.

Calculations and Methodology

The *appropriate project team member* may be a member of the design team such as the Landscape Architect, Architect or Urban Planner.

The Site & Context Assessment must determine the local urban grain and character of the site and its context, existing public open space provision, including the type, size and quality of existing sport and play facilities, and the presence of community and transit facilities.

The site assessment must include:

- Existing features including existing vegetation, environmental and ecological features;
- Current access and movement network to the site including location of public transit network and stops, pedestrian and cycle routes;
- Topography;
- Views;
- Solar access;
- Utilities and infrastructure constraints; and
- Existing facilities relevant to site development.

The wider context assessment must include:

- An assessment of the land uses, urban grain and character of the context area;
- Identification of the size, quantity, type and features all public open space and streetscape within the surrounding area;
- Identification of the type, size and quality of all publicly accessible Sport and Play facilities in the area;
- Location and type of community facilities;
- Location of transit facilities and routes; and
- Location of pedestrian and cycle routes.

The project site's settlement classification must be determined in accordance with the methodology outlined in the Community Facility Planning Standards.

Examples and guidance for calculating the percentages of Public Open Space types for each settlement classification are provided within Section P3 of the PRDM.

References

- UPC (2014) *Open Space Framework*. Abu Dhabi, UAE.
- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE.
- UPC (Version 1.0) *Community Facility Planning Standards*. Abu Dhabi, UAE.

LS-R3: Transit Supportive Practices & Connectivity

Intent

To improve health, enhance mobility and encourage pedestrian movement and bicycle use.

Credit Requirements

GENERAL

Demonstrate that the public realm design connects to existing and planned public transit, pedestrian and bicycle networks, and key destinations and amenities through the following:

- Provide pedestrian walkways and entrance points which connect the site and its key amenities to:
  - Public transit stops located on and adjacent to the site;
  - Public transit stations located within a 350m catchment area; and
  - Key amenities and facilities located within a 350m catchment area.
- Provide safe crossing points where pedestrian walkways cross streetscapes within the site boundary.

Bicycle Parking

Demonstrate that accessible bicycle parking facilities in accordance with Table LS-R3a are provided within 30m walking distance of primary entrance points and key amenities on site. All bicycle parking spaces must comply with the following:

- The stands must be solid (and securely fixed to the ground) and allow both the wheel and the frame of the bicycle to be locked safely to the structure (ideally u-shaped structure type 'Sheffield' stands or similar);
- Each bicycle space must have a minimum width of 0.75m, length of 1.8m and vertical clearance of 2m;
- Have an aisle at least 1.5m wide behind all required bicycle parking to allow room for bicycle manoeuvring (where the parking is adjacent to a sidewalk, the manoeuvring area may extend into a right of way);
- Where bicycle parking is not visible from primary entrance points, clear directional signage must be provided; and
- The minimum cycle requirements should be shared appropriately between all primary entry points and key amenities, according to anticipated demand.

Table LS-R3a: Minimum Bicycle Parking Requirements

Public Open Space Hierarchy	Minimum Bicycle Parking Spaces
Local	6 spaces (3 racks) expansion space required for additional 6 spaces
Neighbourhood	10 spaces (5 racks) expansion space required for additional 10 spaces
District	20 spaces (10 racks) expansion space required for additional 20 spaces
Municipality	Based upon a Pedestrian and Cyclist Movement Analysis*
Emirate	Based upon a Pedestrian and Cyclist Movement Analysis*
Network of Streetscapes	Based upon a Pedestrian and Cyclist Movement Analysis*

*The Pedestrian and Cyclist Movement Analysis must be provided by an appropriate project team member such as a Transport Consultant or Urban Planner.

Where requested by the UPC, projects must provide a letter of commitment to participate in public bicycle sharing schemes to be implemented in the future.

Additional Requirement/Clarifications

Individual Streetscapes

Bicycle parking requirements do not apply.

Public Open Space

Demonstrate cycle paths:

- Connect to any cycle lanes outside of the project boundary and/or adjacent roads;
- Provide direct access between primary entrance points and bicycle parking facilities provided on the site; and
- Meet the following minimum dimensions:
  - Where pedestrian and cycle paths are shared the minimum total width of the combined path is 3m with signage to designate shared use area; and
  - Where the cycle lane is segregated from the pedestrian route (and carriageway), the minimum width of the cycle path is 2m.

Credit Submission: Design Rating

- ☐ Narrative and calculations, describing how the project meets the Credit Requirements, including numbers of bicycle parking spaces, location of bicycle parking, types of stands and security arrangements, description of walkways and cycle paths and their connectivity;
- ☐ Plans and/or drawings showing the location of bicycle parking, distance from entrance points and key amenities, locations of signage, cycle paths and walkways, and means of access to the external highway/cycle paths from the bicycle parking spaces;
- ☐ Signage Drawings and Specifications illustrating the information to be provided; and
- ☐ Pedestrian and Cyclist Movement Analysis confirming the following:
  - Estimation of predicted site visitors and travel distances;
  - Current pedestrian and cyclist movement routes;
  - Peak hour(s) pedestrian and cyclist counts (for existing sites);
  - Future pedestrian and movement route analysis and predicted movement numbers; and
  - Recommended number of bicycle parking spaces.

Credit Submission: Construction Rating

- ☐ Updated narrative with calculations describing how the project meets the Credit Requirements, including numbers of bicycle parking spaces, location of bicycle parking, types of stands and security arrangements, description of walkways and cycle paths and their connectivity;
- ☐ As-built plans and/or Drawings showing the location of bicycle parking, distance from entrance points and key amenities, locations of signage, cycle paths and walkways, and means of access to the external highway/cycle paths from the bicycle parking spaces;
- ☐ Photographs confirming bicycle parking spaces, walkways, cycle paths and signage as appropriate; and
- ☐ Letter of commitment to participate in public bicycle sharing schemes to be implemented in the future.

Calculations and Methodology

Bicycle parking must comply with all the minimum requirements as set out by the Department of Transport (DoT).

The Pedestrian and Cyclist Movement Analysis must be provided by an appropriate project team member such as a Transport Consultant or Urban Planner.

References

- DoT (2014) *Walking and Cycling Master plan*. Abu Dhabi, UAE.
- UPC (2010) *Urban Street Design Manual*. Abu Dhabi, UAE.
- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE.

LS-R4: Light Pollution Mitigation

Intent

To reduce night time light pollution and its associated impacts on human and ecological health.

Credit Requirements

GENERAL

Demonstrate that the following lighting requirements are met:

Exterior lighting:

- All non-safety and non-security public realm lighting must be automatically switched off between 23.00hrs and 07.00hrs and outside these hours if daylight levels are sufficient.
- If safety lighting is provided and will be used between 23.00hrs and 07.00hrs, this part of the lighting system must comply with the lower levels of lighting recommended during these hours by IESNA RP-33-99 and IES RP-8. For example by using an automatic switch to reduce the lighting levels at 23.00hrs or earlier.
- If security lighting is provided, it must be activated using motion sensors with threshold and time-off adjustment so that luminaires only activate when someone is in the immediate area and turn off a reasonable time after motion is no longer detected.

Lighting levels at the site boundary and beyond:

- All projects must be classified under one of the zones defined in the IECC 2009 Exterior Lighting Table 505.6.2(1). The exterior lighting must be designed to meet the following requirements:

Table LS-R4a: Lighting Design Requirements

Lighting Zone**	Max Initial Illuminance at site boundary (Lux)	Max Initial Illuminance at specified distance beyond site boundary (Lux)	Max % direct up-light	Max Light Trespass into windows (vertical Lux)		Max Luminaire Source Intensity (kcd)		Max Surface Luminance (cd/m^2)
				07.00 to 23.00 hrs.	23.00 to 07.00 hrs.	07.00 to 23.00 hrs.	23.00 to 07.00 hrs.	Average
LZ1	<1	n/a	0%	2	1*	2.5	0	2.5
LZ2	1.1	<1 at 3m	2%	5	1	7.5	0.5	5
LZ3	2.2	<1 at 4.5m	5%	10	2	10	1	10
LZ4	5	<1 at 7.5m	15%	25	5	15	2.5	15

* Allowed from public road lighting installations only.

** Where the site boundary lies adjacent to a Lighting Zone of a lower category, the requirements of the lower category must be met at and beyond that boundary.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

High structure aircraft hazard lights are excluded from the calculations.

Feature lighting may be excluded from these requirements where a specialist lighting consultant has recommended their inclusion in order to protect illuminated visual elements/character as part of artwork. Any exemption from the credit requirements is subject to UPC approval.

Sports and Recreational Public Open Spaces

Floodlighting for sports facilities, that is only activated during sporting events between 07.00hrs and 23.00hrs only need to comply with the Max Light Trespass into windows (vertical lux) requirements of Table LS-R4a for residential buildings in line of sight of the sports facility.

Credit Submission: Design Rating	☐ Narrative describing the type and location of all external lighting provided on the project, and lighting calculations demonstrating that the required illuminances and percentage up-light limits have been met; ☐ External lighting drawings and details of lighting controls and locations of daylight sensors; ☐ Specification and luminaire schedule confirming mounting heights and all information relating to the light output and aiming of each luminaire; ☐ Control Strategy confirming which luminaires will be turned off outside the recommended hours of operation and which luminaries will operate at the reduced levels; and ☐ Specification confirming that the safety or security lighting used between 23.00 and 07.00 complies with the lower levels of lighting recommended in IESNA RP-33-99 and IES RP-8; and Table LS-R4a.
Credit Submission: Construction Rating	☐ Revised Design submission to reflect any changes in the constructed project; ☐ As-built electrical specifications and drawings confirming external lighting (including safety and security lighting) and controls; and ☐ Photographs confirming: ▫ External lighting and controls; and ▫ Cut off luminaires, if provided, have been angled to limit spill light to potentially obtrusive directions.

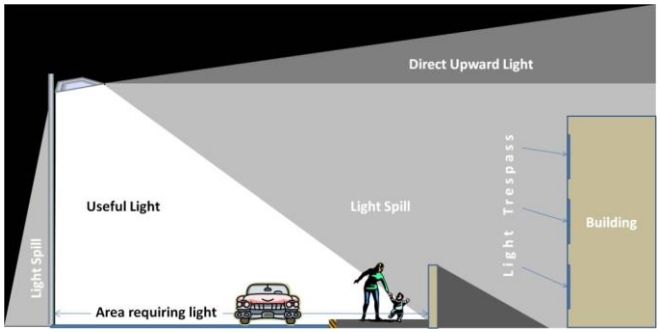
Calculations and Methodology

Calculations must include all public realm lighting, including safety, security, pedestrian circulation, landscape (functional/accent/feature), external car parking, and external signage and advertising.

Lighting schemes requiring the deliberate and careful use of upward light, for example ground recessed luminaires, ground mounted floodlights and decorative lighting may not achieve these limits. In these instances, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires, accurate aiming onto surfaces, minimal lamp-source wattage selection and light controlling attachments.

Proprietary lighting calculation software must be used to evaluate and demonstrate compliance. Luminaire data sheets must be used to select the correct fixtures and demonstrate appropriate light cut-off angles and visible light source intensities.

Figure LS-R4a - Light pollution from street lighting



Definitions

- **Lighting Zone, LZ1** – Dark (park and rural settings).
- **Lighting Zone, LZ2** – Low (residential areas).
- **Lighting Zone, LZ3** – Medium (commercial/industrial, high density residential).
- **Lighting Zone, LZ4** – High (major city centres, entertainment districts).
- **Percentage Direct Up-light** - The percentage of direct upward light (see figure LS-R4a) associated with the total initial designed fixture lumens emitted at an angle

of 90 degrees or higher from nadir (straight down). This percentage must be met at the public realm plot boundary.

- **Maximum Light Trespass (into windows)** - This is calculated in vertical illuminance (Lux) and is measured flat on the glazing at the centre of the window. These values are the maximum levels permitted excluding existing base light levels.
- **Maximum Luminaire Source Intensity** - This applies to each lighting source and/or luminaire directly visible outside of the area being lit which could be a source of glare or distraction. These values must be achieved however exceptions may be permitted for particular lighting applications, such as sports lighting.
- **Maximum Surface Luminance -** This is the measurement of actual visual brightness and must be limited to avoid over lighting of all or any of the external lighting elements. The area luminance is only applicable to surfaces directly illuminated as part of the night time external lighting scheme.
- **Motion sensors with threshold adjustment** - Threshold adjustments can be made to prevent nuisance activation by insects, birds and small animals.

Hours of operation should be followed, except where it can be demonstrated that the project's known 'hours of usage' vary from these.

References

- DMA (2016) *Abu Dhabi Lighting Manual Issue 1*. Abu Dhabi, UAE.
- DMA (2014) *Abu Dhabi Public Realm & Street Lighting Handbook First Edition*. Abu Dhabi, UAE.
- IESNA (1999) *IESNA RP-33-99 Lighting for Exterior Environments*. New York, USA: Illuminating Engineers Society of North America.
- IES RP-8 (2005) *Roadway Lighting*. New York, USA: Illuminating Engineers Society of North America.
- International Energy Conservation Code, IECC: www.energycodes.gov.
- ILP (2005) *Guidance Notes for the Reduction of Obtrusive Light*. Warwickshire, UK: Institution of lighting professionals.
- UPC (2013) *Abu Dhabi Safety and Security Planning Manual, P4 Lighting surveillance*. Abu Dhabi, UAE.

LS-R5: Smoking Control

Intent	To eliminate or minimise exposure of public open space users to the harmful effects of tobacco smoke.
Credit Requirements	**GENERAL** Demonstrate appropriate measures are incorporated into the public open space design to reduce exposure to tobacco smoke: ▪ Demonstrate that smoking is prohibited throughout the public open space including car parks; ▪ Train all security staff for smoking control within the public open space; and ▪ Install signage at key public open space entry points and amenities which communicates that smoking is prohibited. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** **Streetscapes** This credit does not apply.
Credit Submission: Design Rating	☐ Written commitment from the public open space owner/developer that there will be a no smoking policy operated within the public open space; and ☐ Extracts from specifications and/or drawings indicating the locations of posted signage stating that the entire public open space is a no smoking environment.
Credit Submission: Construction Rating	☐ Updated written commitment (if relevant) from the public open space owner/developer that there is a no smoking policy operated within the open space; ☐ Photographs confirming no smoking signage has been installed; and ☐ Copy of training material for security staff.
Calculations and Methodology	None
References	None

LS-R6: Legionella Prevention

Intent	To manage the risk of Legionella in water based public realm systems.
Credit Requirements	**GENERAL** Develop and implement a Legionella Management Plan for all relevant water based systems. Follow the requirements and guidance in Part 1 and 2 of 'Legionnaire's Disease – The Control of Legionella Bacteria in Water Systems', Approved Code of Practice and Guidance (L8), 4rd Edition 2013, UK Health and Safety Executive and EHSMS CoP 12.0. Implement the Legionnaire Management Plan for all at risk water based systems. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Narrative and drawings describing all water systems present in the project. The Narrative must explain the approach to Legionella Management, or confirm no water based systems are present; and ☐ Legionella Management Plan for the treatment of Legionella in the project's water-based systems.
Credit Submission: Construction Rating	☐ Operations and Maintenance Manual (OMM) containing the Legionella Management Plan; ☐ Narrative and as-built drawings of the project's water-based systems. The Narrative must explain the approach to Legionella Management and how it integrates into the OMM; ☐ Legionella Management Plan for the treatment of Legionella in the project's water-based systems; and ☐ All audit checklists associated with the Legionella Management Process including but not limited to plant installation and commissioning, testing, training and competency and record keeping.
Calculations and Methodology	The Legionella Management Plan must be set out in accordance with Part 1 of HSE ACoP L8 and EHSMS CoP 12.0. Relevant water based systems include but are not limited to: ▪ Water systems incorporating a cooling tower; ▪ Water systems incorporating an evaporative condenser; ▪ Hot and cold water systems; ▪ Other plant and systems containing water which is likely to exceed 20°C and which may release a spray or aerosol during operation OR when being maintained; ▪ Humidifiers; ▪ Air washers; ▪ Spa baths and pools; ▪ Car/bus washes; ▪ Wet scrubbers; ▪ Fountains and water feature; and ▪ Sprinkler and hose reel systems. The Legionella Management Plan must include: ▪ Risk Identification and Risk Assessment;

- Risk management Plan for management responsibilities, training and competence;
- An Exposure Risk Prevention or Control Plan;
- Record Keeping Plan; and
- Responsibility Plan for manufacturers, importers, suppliers and installers.

A 'water system' or 'water based system' includes all plant/equipment and components associated with that system e.g. All associated pipework, pumps, feed tanks, valves, showers, heat exchangers, quench tanks, chillers etc. The system must be considered as a whole and not as isolated parts/components. Dead legs and parts of the system used intermittently must be included as part of the system.

References

- HSE (2013) *Legionnaire's Disease - The Control of Legionella Bacteria in Water Systems, Approved Code of Practice and Guidance (ACoP), L8*. UK.
- HSE (2003) *Control of Legionella bacteria in water systems: Audit Checklists*. UK.
- EHSMS (2012) *EHS RI - CoP 12.0 - Prevention and Control of Legionnaires Disease*. Abu Dhabi, UAE.

LS-1: Active Urban Environments

Intent	To encourage active lifestyles by providing public spaces that allow sport and recreational activity.
Credit Requirements	**GENERAL** Demonstrate that public open spaces have been provided and programmed to encourage activity, including sport and recreation. The spaces must be specifically developed for any of, or any combination of, the following: ▪ Programmed space for recreation ▪ Sport facilities ▪ Play facilities Develop and implement an Active Urban Environment Program which details the programming of spaces for the following types of uses: ▪ Communal; ▪ Women and children only; and ▪ Families. If sports fields are provided, also demonstrate that accessible showers and change rooms are located within 350 meters walking distance. Management and maintenance for all facilities must be incorporated into the Operations and Maintenance Manual (OMM). **ADDITIONAL REQUIREMENT/CLARIFICATIONS** **Individual Streetscapes** This credit is not available. **Local Public Open Space** This credit is not available.
Credit Submission: Design Rating	☐ Narrative describing how the project meets the Credit Requirements including planned uses for the area, accessibility and maintenance arrangements; and ☐ Site plans, marked up to clearly demonstrate how the area meets the requirements highlighting the planned uses for the area, including highlighting communal areas, areas for woman and children only, families only, and accessible shower locations.
Credit Submission: Construction Rating	☐ As-built site plans marked up to clearly demonstrate how the area meets the use requirements highlighting the uses for the areas; ☐ Relevant section(s) of the Operations and Maintenance Manual; and ☐ Photographs confirming the installed facilities.
Calculations and Methodology	None
References	None

LS-2: Sustainable Food Practices

Intent

To improve access to locally grown food and facilitate education about sustainable food production.

Credit Requirements

GENERAL

Community Gardens and Small Scale Allotments

- Demonstrate that an area within the site, determined appropriate based on the Environmental Agency Abu Dhabi (EAD) Soil Survey or local hydrological, soil and microclimatic conditions, has been allocated for use as a community garden or small scale allotment.
- Demonstrate a strategy for the establishment and long-term management of the community garden or allotments has been prepared.

OR

Food Celebration

- Demonstrate that a public space has been allocated for local food sale, distribution or exchange and celebration. This is to be a permanent but flexible and/or multi-purpose space for a regular feature such as a weekly market.
- Demonstrate a strategy for the use of the public space has been developed identifying the following as a minimum:
  - The source of local food crops to be sold or used for celebration purposes at the public space. Locally grown crops are to be from either within the Emirate or at least grown within the Gulf Cooperation Council (GCC) region;
  - The ownership, management strategy and program for use of the public space; and
  - Strategy for educational awareness associated with local food production.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Sites within 100m of a saline body of water must include the impact of the saline environment within the community garden or small scale allotment establishment and long-term management strategy.

Streetscapes

This credit is not available.

Credit Submission: Design Rating

Community Garden or Small Scale Allotments

- ☐ Plans and drawings illustrating the layout and design of community garden or small scale allotment areas;
- ☐ Community garden or small scale allotment establishment and long-term management strategy including the following:
  - Community support;
  - Appropriate size;
  - Access requirements for service vehicles;
  - Proposed crop types, growing season, water consumption and pest/weed control;
  - Proposed amenities and facilities; and
  - Strategy for sustainability awareness associated with the use of local and culturally relevant planting, herbs or crops.

Food Celebration

- ☐ Plans and drawings illustrating location of public space for food celebration, and associated facilities; and

- ☐ Food Celebration Strategy including the following:
  - Location of the public space within the site and it's connection to the wider community;
  - Access provision for service vehicles;
  - Proposed amenities and facilities;
  - Programming and management strategy, including engagement of local food producers, distributors and/or retailers; and
  - Strategy for sustainability awareness associated with local food production.

Credit Submission: Construction Rating	**Community Gardens and Allotments** ☐ As-built drawings and photographs confirming the size, layout and design of community garden or allotment areas, associated facilities, connectivity and distance from roads and car parking areas; ☐ Confirmation of ownership, management and maintenance organisation (with a contract/agreement running for at least 5 years) and long-term management strategy; and ☐ Relevant section(s) of the Operations and Maintenance Manual (OMM). **Food Celebration** ☐ As-built drawings and/or photographs identifying the location of public space for food celebration, amenities, facilities and access provision; ☐ Relevant section(s) of the Operations and Maintenance Manual (OMM); and ☐ Confirmation that a long-term management and maintenance strategy is in place.
Calculations and Methodology	Food is to be defined as any food grown for human consumption. This can include fruit and vegetable crops in their raw form e.g. dates; or food products e.g. jams and preserves.
References	None

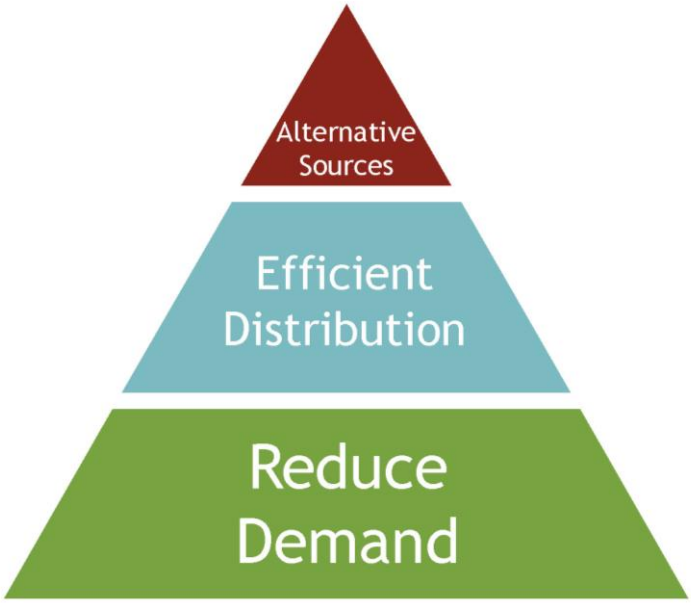
Credit Section
PW: Precious Water

Because of Abu Dhabi's limited annual rainfall, hot climate, and the significant energy embodied in potable water due to desalination, water conservation is a priority for Estidama. As discussed in the April 2006 UAE Initial National Communication to the United Nations on climate change, it is a distinct possibility that the UAE will become even drier due to the effects of global warming. Coupled with projected population increases, the importance of accelerating water conservation and reuse efforts is clear.

"One of the most important challenges for the Emirate is to balance water supply and demand as efficiently as possible given that the per capita consumption of fresh water is among the highest in the world and new water supplies are expensive."

- Abu Dhabi Water Resources Master Plan, EAD 2009

The Precious Water section of the Public Ream Rating System: Design & Construction includes the Public Realm Water Calculator that should be used throughout the entire design process. This calculator will help the development team to set targets and evaluate options for reducing irrigation water consumption, and assist in identifying how and where reductions in the use of water may be made.



CREDITS COVERED IN THIS SECTION

PW	Precious Water							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
PW-R1	Water Efficiency	R	R	R	R	R	R	R
PW-R2	Water Monitoring & Leak Detection	R	R	R	R	R	R	R
PW-R3	Stormwater Management	R	R	R	R	R	R	R
PW-1	Improved Water Efficiency	1	1	1	1	1	n/a	n/a
PW-2	Water Features	1	1	1	1	1	1	1
PW-3	Improved Stormwater Management	1	1	1	1	1	1	1
PW-4	Water – Educational Learning	1	1	1	1	1	1	1
	TOTAL	**4**	**4**	**4**	**4**	**4**	**3**	**3**

PW-R1: Water Efficiency

Intent

To develop and implement a comprehensive water strategy during the early stages of design to minimise the projects water consumption.

Credit Requirements

General

Demonstrate that the average landscape irrigation requirement for all public realm areas achieves the following:

- All public open spaces* in aggregate do not require more than 4.5 l/m^2/day;
- All urban public open spaces** in aggregate do not require more than 2.5 l/m^2/day; and
- All streetscapes in aggregate do not require more than 2.0 l/m^2/day.

* Public open spaces are programmed space, sports and recreation spaces and play facilities with <70% hardscape cover.

** Urban public open spaces are public open spaces with >70% hardscape cover.

Demonstrate that a water efficient irrigation system has been incorporated into all public realm landscaping, as follows:

- Eliminate all surface spray components (except in sports fields);
- Irrigate only during non-daylight hours (except if sub-surface);
- Provide irrigation zones, with independently controlled valves, segregated by plant water needs (hydrozones);
- Utilise mulch and/or soil amendment techniques to reduce evapotranspiration; and
- Use of TSE must be prioritised through coordination with the Department for Parks and Recreational Facilities (PRFD) and Abu Dhabi Sewerage Services Company (ADSSC).

Additional Requirement/Clarifications

Public Open Spaces

Sports playing fields are excluded from the average landscape irrigation requirement calculation.

Credit Submission: Design Rating

- ☐ Completed Public Realm Water Calculator;
- ☐ Map identifying site location and corresponding yearly average ETo value;
- ☐ Site plan illustrating landscape areas, highlighting areas of hardscape and softscape;
- ☐ Irrigation design plan(s), identifying each hydrozone and associated planting;
- ☐ Plant schedule for the development's landscape program that includes the following key data:
  - Plant names (common and botanic);
  - Plant irrigation classification(s); and
  - Annual water demand.
- ☐ Narrative describing the water efficient irrigation strategy, including:
  - The projects irrigation approach, technology to be used, timing and anticipated irrigation efficiency; and
  - The application of mulch and/or moisture retention approach for soil amendments including type, location, extent of application, and frequency of reapplication (if needed) to maintain effectiveness.

Credit Submission: Construction Rating

- ☐ Updated Public Realm Water Calculator;
- ☐ As-built site plan illustrating landscape areas, highlighting areas of hardscape and softscape;
- ☐ As-built irrigation design plan(s), identifying each hydrozone and associated

planting;

- ☐ As-built plant schedule for the development's landscape program that includes the following key data:
  - Plant names (common and botanic);
  - Plant irrigation classification(s); and
  - Annual water demand.
- ☐ Manufacturer's data clearly indicating the type and extent of all irrigation equipment; and
- ☐ Extracts from the Operations and Maintenance Manual (OMM) identifying the irrigation timing and frequency, and the proposed application of mulch and/or moisture retention approach for soil amendments including type, location, extent of application, and frequency of reapplication (if needed) to maintain effectiveness.

Calculations and Methodology

The average landscape irrigation demand is determined as follows:

$$Average\,Irrigation\,Demand = \frac{I_S}{A_L}$$

I_S = Total annual average irrigation demand of soft landscape area (litres/day)
A_L = Landscaped area (m^2)

Note: In cases where species with different water needs are planted in the same irrigation zone (hydrozone), then the species in the highest water-need category determines the mean irrigation rate applied to that particular hydrozone in the Public Realm Water Calculator.

Landscaped area refers to the entire site, excluding roadways, cycle paths where these do not form part of the pedestrian realm, car parking spaces, building footprints and water feature areas, but including frontage, furnishings, edge zones and centre medians, and is made up of all hardscape and softscape areas.

The Evapotranspiration ETo (mm/day) yearly average rate for the project site must be determined using the reference map within Part 22, Appendix A of the ADM Irrigation Manual. If your ETo location is 'other' and an ETo rate is manually entered into the Public Realm Water Calculator, supporting documentation confirming the rate is appropriate for the proposed site must be provided.

References

- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE.
- ADM (2014) *Irrigation Manual - Volume I - Design Manual, Volume II-Operation and Maintenance Manual, Volume III-Technical Specifications, Volume IV-Standard Drawings*. Abu Dhabi, UAE.

PW-R2: Water Monitoring & Leak Detection

Intent

To reduce loss of water associated with leaks, system degradation, or failure.

Credit Requirements

GENERAL

Monitoring

Demonstrate that easily accessible, clearly labelled water meters are provided and capable of monitoring the water consumption of, at a minimum, the following uses (where present):

- Irrigation;
- External hose bibs;
- Water Features; and
- Any other major public realm water requirements (e.g. swimming pools etc.).

Leak Detection

Demonstrate that a leak detection system has been installed that covers all main water distribution networks within the project.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Individual Streetscapes

The credit requirements can be achieved by demonstrating that the streetscape is monitored as part of a network of streetscapes.

Credit Submission: Design Rating

- ☐ Narrative describing the project's:
  - Water monitoring strategy relating to all major uses; and
  - Leak detection strategy.
- ☐ Design drawings identifying the location of all meters, leak detection equipment, and central monitoring system;
- ☐ Schematics illustrating the metering strategy, confirming that the required level of metering will be achieved; and
- ☐ Extracts from specifications clearly indicating:
  - The type and extent of all metering;
  - Leak detection equipment; and
  - Central monitoring system.

Credit Submission: Construction Rating

- ☐ Updated Narrative describing the project's:
  - Water monitoring strategy relating to all major uses; and
  - Leak detection strategy.
- ☐ As-built drawings identifying the location of all meters, leak detection equipment, and central monitoring system;
- ☐ Manufacturer's data clearly indicating:
  - The type and extent of all installed meters;
  - Leak detection equipment; and
  - Central monitoring systems;
- ☐ Photographs confirming the installation of specified meters, leak detection equipment and monitoring capabilities of the central monitoring system; and
- ☐ Written commitment from the site owner to submit all water monitoring data to Estidama (if requested).

Calculations and Methodology

All meters must have pulsed output and be connected to a central monitoring system so that information on the water network performance can be recorded. The monitoring

system shall have, at a minimum, the following capability:

- Provide hourly, daily, weekly, monthly and annual water consumption by each major use;
- Compare consumption to previous days, weeks, months and years for trend analysis;
- Detect leaks by determining 'out-of-range' values and alert facility operators to unusually high consumption; and
- Record peak water consumption for each major use.

The site owner must provide a written commitment to supply all water monitoring data to Estidama (if requested). All reported information will be treated as confidential.

Water consumption of the major end uses may be monitored through metering or subtraction. The design team should develop an appropriate metering strategy which can determine the consumption of each end use at the central monitoring system.

The leak detection system must be capable of:

- Sounding an alarm when the water flow rate exceeds a pre-set level;
- Able to identify constant and varying flow rates to determine continuous, high and low leakage rates measured over defined time periods; and
- Being programmed to fit the project's water consumption requirements.

References	None

PW-R3: Stormwater Management

Intent

To minimise peak stormwater discharge and protect the stormwater drainage system and receiving water bodies from pollutant loading during and after storm events.

Credit Requirements

GENERAL

Quantity Control

- Demonstrate that the project has developed a stormwater management system that prioritises infiltration, sustainable urban drainage systems, and utilises structural solutions when necessary; and
- Demonstrate that the post-development peak runoff rate and quantity from the 2-year 24-hour design storm does not exceed the pre-development peak runoff rate and quantity through either structural or non-structural methods, or a combination of both.

Operation & Maintenance Plan

Demonstrate that an Operation & Maintenance Plan (OMP) is in place that shows how all stormwater systems will be maintained throughout the life of the project. The plan should include at a minimum:

- Protocol for maintaining regular system checks and maintenance;
- Methods for ensuring neighbouring developments will not be adversely affected by the project's stormwater strategy; and
- Strategies to prevent on-site erosion.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Where the project site forms part of a phased master plan, each phase must provide self-sufficient stormwater retention, even if temporary.

Credit Submission: Design Rating

- ☐ Narrative describing the stormwater management system developed for the site including:
  - Drawings showing locations of components of the stormwater management system including catchment areas, gullies, open and underground drains, manholes, retention areas/structures and treatment system; and
  - Civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-development peak runoff rate and quantity.
- ☐ OMP for ongoing site best management practices to uphold system integrity. The plan shall include:
  - An inspection schedule for the stormwater management system to assure its continued operation as designed;
  - A protocol for cleaning & de-silting stormwater detention areas after storm events;
  - The proposed person(s), organisation, or entity responsible for the continued operation and maintenance of the stormwater management system;
  - Operating budgets and funding mechanism for the continued maintenance of the stormwater management system;
  - Methods for ensuring neighbouring developments will not be adversely affected by the project's stormwater strategy; and
  - Erosion plan to prevent excessive on-site erosion and to any receiving water courses.
- ☐ CV of qualified Civil Engineer.

Credit Submission:

- ☐ As-built drawings showing locations of the applied components of the stormwater management system;

Construction Rating	☐ Updated civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-development peak runoff rate and quantity; ☐ Updated OMP; and ☐ Photographs confirming the installation of the stormwater management strategy.
Calculations and Methodology	▪ Non-structural stormwater management solutions include sustainable urban drainage systems (SUDS) such as ponds, depressed landscapes etc.; ▪ Structural stormwater management solutions include engineered structures such as retention dams and tanks, as well as pipes, concrete channels that have been oversized in comparison to the downstream stormwater network; ▪ Design of stormwater management solutions is to avoid exacerbating shallow/rising groundwater impacts (where these exist), and allow for water reuse on site, where practical; and ▪ Calculations must be signed off by a qualified civil engineer. Design storm events for the different regions of Abu Dhabi are described within the DoT Road Drainage Manual. A qualified Civil Engineer is an individual with: ▪ A degree in a relevant subject; ▪ A minimum of five years relevant work experience; and ▪ Experience working on similar projects in the region.
References	▪ Environment Agency Abu Dhabi, EAD: www.ead.gov.ae. ▪ CSIRO (2006) *Urban Storm water Best Practice Environmental Management Guidelines*. Australia. ▪ DoT (2012) *Road Drainage Manual - Volume I - Standards and Criteria*. Abu Dhabi, UAE.

PW-1: Improved Water Efficiency

Intent

To promote further reductions in the project's water consumption.

Credit Requirements

General

Demonstrate that the average landscape irrigation requirement for all public realm areas achieves the following:

- All public open spaces* in aggregate do not require more than 4 l/m^2/day; and
- All urban public open spaces** in aggregate do not require more than 2 l/m^2/day.

* Public open spaces are programmed space, sports and recreation spaces and play facilities with <70% hardscape cover.

** Urban public open spaces are public open spaces with >70% hardscape cover.

Demonstrate that a water efficient irrigation system has been incorporated into all public realm landscaping, as follows:

- Eliminate all surface spray components (except in sports fields);
- Irrigate only during non-daylight hours (except if sub-surface);
- Provide irrigation zones, with independently controlled valves, segregated by plant water needs (hydrozones); and
- Utilise mulch and/or soil amendment techniques to reduce evapotranspiration.

Additional Requirement/Clarifications

Public Open Spaces

Sports playing fields are excluded from the average landscape irrigation requirement calculation.

Streetscapes

This credit is not available.

Credit Submission: Design Rating

- ☐ Completed Public Realm Water Calculator;
- ☐ Map identifying site location and corresponding yearly average ETo value;
- ☐ Site plan illustrating landscape areas, highlighting areas of hardscape and softscape;
- ☐ Irrigation design plan(s), identifying each hydrozone and associated planting;
- ☐ Plant schedule for the development's landscape program that includes the following key data:
  - ▫ Plant names (common and scientific);
  - ▫ Plant irrigation classification(s); and
  - ▫ Annual water demand;
- ☐ Narrative describing the water efficient irrigation strategy, including:
  - ▫ The projects irrigation approach, technology to be used, timing and anticipated irrigation efficiency.
- ☐ The application of mulch and/or moisture retention approach for soil amendments including type, location, extent of application, and frequency of reapplication (if needed) to maintain effectiveness.

Credit Submission: Construction Rating

- ☐ Updated Public Realm Water Calculator;
- ☐ As-built site plan illustrating landscape areas, highlighting areas of hardscape and softscape;
- ☐ As-built irrigation design plan(s), identifying each hydrozone and associated planting;
- ☐ As-built plant schedule for the development's landscape program that includes the

following key data:

- Plant names (common and scientific);
- Plant irrigation classification(s); and
- Annual water demand.

☐ Manufacturer's data clearly indicating the type and extent of all irrigation equipment; and

☐ Extracts from the Operations and Maintenance Manual (OMM) identifying the irrigation timing and frequency, and the proposed application of mulch and/or moisture retention approach for soil amendments including type, location, extent of application, and frequency of reapplication (if needed) to maintain effectiveness.

Calculations and Methodology

The methodology is the same as PW-R1 Water Efficiency.

References

- UPC (2016) *Public Realm Design Manual (PRDM)*. Abu Dhabi, UAE.
- ADM (2014) *Irrigation Manual – Volume I-Design Manual, Volume II-Operation and Maintenance Manual, Volume III-Technical Specifications, Volume IV-Standard Drawings*. Abu Dhabi, UAE.
- Pearl Public Realm Rating System Water Calculator.

PW-2: Water Features

Intent	To reduce water use in exterior water features, by minimising evaporative loss.
Credit Requirements	**GENERAL** Demonstrate that water features: ▪ Avoid the use of sprays; ▪ Incorporate an automatic pump down system for out of use hours, and times when evaporative losses will be high; ▪ Avoid water features that have high evapotranspiration potential (e.g. avoid creating cascades of shallow water over wide areas); ▪ Use gravity for water movement or recirculation, or use electricity supplied from a renewable energy source; and ▪ Are located in accessible areas. OR Where there are no external water features installed, the credit can be achieved. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** Water features that provide an educational benefit are exempt from these requirements.
Credit Submission: Design Rating	☐ Narrative describing proposed water features, and water efficiency measures which will reduce evaporative losses; ☐ Design drawings identifying the proposed features; and ☐ Specifications detailing the proposed features. OR ☐ Site plans confirming that there will be no exterior water features.
Credit Submission: Construction Rating	☐ Updated narrative describing proposed water features, and water efficiency measures which will reduce evaporative losses; ☐ As-built drawings identifying the proposed features; and ☐ Photographs confirming the installed features. OR ☐ As-built site plans confirming that there are no exterior water features.
Calculations and Methodology	External water features include any open surface water associated with man-made fountains, ponds, lakes, streams etc.
References	None

PW-3: Improved Stormwater Management

Intent

To protect receiving water bodies from pollutant loading during and after storm events.

Credit Requirements

GENERAL

Quantity Control

- Demonstrate that the post-development peak runoff rate and quantity from the 10-year 24-hour design storm does not exceed the pre-development peak runoff rate and quantity through either structural or non-structural methods, or a combination of both.

Quality Control

- Demonstrate that a study of the site and its surrounding area has been undertaken by a *suitably qualified professional*, such as a Civil Engineer, which identifies areas of run-off, potential sources and levels of pollutants, and potential structural or non-structural pollutant removal solutions.
- Demonstrate that the proposed stormwater management system is capable of collecting and treating a minimum of 90% of stormwater and that the treatment process is capable of achieving the following minimum standards for quality control:
  - 80% removal of Total Suspended Solids (TSS);
  - Minimum 95% removal of litter (gross pollutants, >1mm);
  - Minimum 90% removal of hydrocarbons; and
  - Use of petrol interceptors or suitable permeable paving for car parks of more than 4 bays.

Operation & Maintenance Plan

- Demonstrate that the Operation and Maintenance Plan (OMP) incorporates appropriate maintenance procedures and schedules to ensure ongoing pollutant removal.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Narrative describing the stormwater management system developed for the site including:
  - Drawings showing locations of components of the stormwater management system including catchment areas, gullies, open and underground drains, manholes, retention areas/structures and treatment system; and
  - Civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-development peak runoff rate and quantity;
- ☐ Drawings identifying run-off and drainage systems, and the proposed quality control measures;
- ☐ Extracts from specifications and product data sheets describing the components specified, confirming that the system is capable of collecting 90% of stormwater and is able to treat to the required quality standards;
- ☐ OMP containing maintenance procedures and schedules; and
- ☐ CV of *suitably qualified professional*.

Credit Submission: Construction Rating

- ☐ As-built drawings showing locations of the applied components of the stormwater management system;
- ☐ Updated civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-

development peak runoff rate and quantity;

- ☐ Manufacturer's data for the purchased components, confirming that the system is capable of collecting 90% of stormwater and is able to treat to the required quality standards;
- ☐ Updated OMP containing maintenance procedures and schedules; and
- ☐ Photographs confirming the installation of the stormwater management strategy and quality control measures.

Calculations and Methodology

All water infiltrated through SUDS is considered to be 100% treated, achieving all the required quality control standards

Design storm events for the different regions of Abu Dhabi are described within the DoT Road Drainage Manual.

Calculations must be signed off by a qualified civil engineer.

A qualified Civil Engineer is an individual with:

- A degree in a relevant subject;
- A minimum of five years relevant work experience ; and
- Experience working on similar projects in the region.

References

- Environment Agency Abu Dhabi, EAD: www.ead.gov.ae.
- CSIRO (2006) *Urban Storm water Best Practice Environmental Management Guidelines*. Australia.
- DoT (2012) *Road Drainage Manual – Volume I – Standards and Criteria*. Abu Dhabi, UAE.

PW-4: Water – Educational Learning

Intent	To educate visitors on water conservation in relation to the cultural and climatic context of Abu Dhabi.
Credit Requirements	**GENERAL** Demonstrate that the project incorporates educational or interpretive elements that are interactive, and provide on-site examples of water conservation in relation to the cultural and climatic context of Abu Dhabi. This may include education on topics such as traditional and contemporary water scarcity, water sources, irrigation and water conservation techniques. Demonstrate that the design features promote the connection to responsible behaviour, and help users and visitors understand how sustainability can be applied to off-site situations (e.g. homes, schools and workplaces). Provide activities and educational programs that welcome, encourage and expand sustainability learning on the site, and promote these by creating partnerships with local community groups and schools. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Narrative describing the proposed educational design features, documenting: ▫ Educational objectives; ▫ Location, design and (if applicable) operation of the features; ▫ Proposed activities and educational programs; and ▫ Strategy for forming connections to local community groups and schools. ☐ Site plans, and drawings indicating the location, arrangement and form of educational features.
Credit Submission: Construction Rating	☐ Updated narrative (where the proposed features have changed from the design stage documentation) describing how the intent is still achieved; and ☐ As-built site plans, drawings and photographs confirming the installation and programming of educational features.
Calculations and Methodology	Appropriate on-site examples of water conservation, could include: ▪ Water efficient features installed in buildings on the site; ▪ Reduction in water use on the site; ▪ Plant selection including details of selected native, draught tolerant and saline tolerant planting; ▪ Water efficient irrigation system; ▪ Water monitoring results and recorded reductions in water use, including comparisons to similar sites; ▪ Stormwater management features, how these have been incorporated into the design of landscape spaces, and their benefits; and ▪ Water efficient water features.
References	None

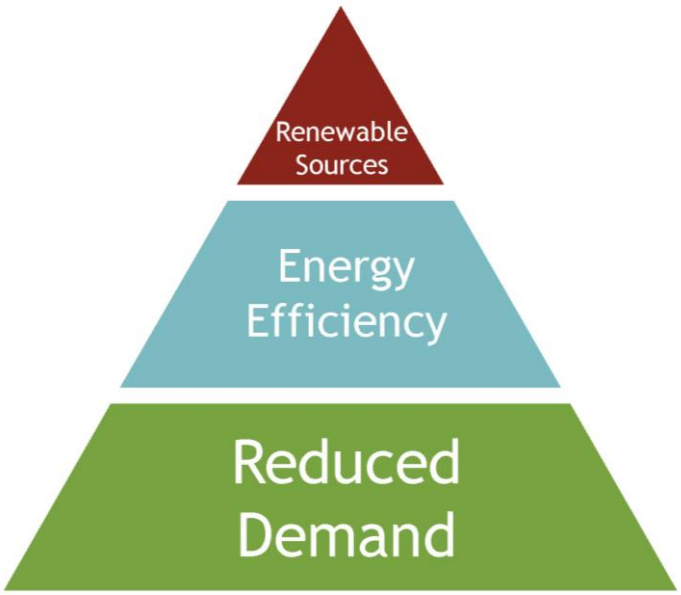
Credit Section
RE: Resourceful Energy

Abu Dhabi's ambitious growth targets translate into increased energy consumption. Energy conservation is imperative to sustain a competitive economy. Through the Pearl Rating System, Estidama seeks to target energy conservation within the public realm through efficiency, control and education.

"The UAE has almost the highest rate of energy consumption per person in the world. If we continue at the current rate, the demand for energy will simply exceed the supply. At the same time, our consumption of energy adds to the worldwide problem of global warming. Clearly, we need to do something to prevent this"

- Heroes of the UAE, EAD

Techniques to conserve energy at the design and construction stages can have significant impacts on reducing overall energy consumption during operation. The Resourceful Energy section requires provision of energy efficient lighting, a major source of energy consumption in the public realm, and energy metering, with opportunities to develop renewable energy sources and educate visitors on energy conservation techniques.



CREDITS COVERED IN THIS SECTION

RE	Resourceful Energy							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
RE-R1	Lighting Compliance	R	R	R	R	R	R	R
RE-R2	Energy Monitoring & Reporting	R	R	R	R	R	n/a	R
RE-1	Renewable Energy Technologies	1	1	1	1	1	1	1
RE-2	Energy – Educational Learning	1	1	1	1	1	1	1
	TOTAL	**2**	**2**	**2**	**2**	**2**	**2**	**2**

RE-R1: Lighting Compliance

Intent

To reduce the energy consumption and carbon emissions associated with public realm lighting.

Credit Requirements

GENERAL

Efficient Lighting

Demonstrate that all public realm lighting has been designed and installed in accordance with the following standard:

- DMA Abu Dhabi Lighting Manual, Issue 1

Lighting Controls

Demonstrate that all of the following have been achieved:

- All lighting designated for dusk-to-dawn operation must be controlled by an astronomical time switch or photocell;
- All lighting not designated for dusk-to-dawn operation must be controlled by either a combination of a photocell and a time switch, or an astronomical time switch;
- All time switches, including astronomical types, must be capable of retaining programming and time settings during loss of power for a minimum period of 72 hours;
- Essential and non-essential lighting must be controlled separately. This includes lighting for sports areas and other amenity areas where operating times may vary; and
- Pathway/transitional lighting circuits must be controlled separately from accent/landscaping lighting circuits on different time settings and specific to the area and project requirements.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Carriageway lighting and traffic lights are excluded from the requirements of this credit.

Credit Submission: Design Rating

Efficient Lighting:

☐ Narrative describing the lighting design strategy, including written confirmation of compliance with the DMA Lighting Manual; and

☐ External lighting Drawings, Specifications and Calculations confirming the lighting power densities of all roadway, pathway and amenity lighting.

Lighting Controls:

☐ Narrative describing the lighting control strategy and demonstrating that all external lighting shall be controlled as required, detailing the method to retain programming for 72 hours during periods of loss of power; and

☐ Specifications of all control measures: photocell, time switch or astronomical time switch as required.

Credit Submission: Construction Rating

Efficient Lighting:

☐ Updated narrative describing the installed lighting design strategy, including written confirmation of compliance with the DMA Lighting Manual; and

☐ As-built external lighting drawings, photographs and manufacturer's data confirming the lighting power densities of all roadway, pathway and amenity lighting.

Lighting Controls:

☐ Updated Narrative describing the lighting control strategy and demonstrating that all external lighting shall be controlled as required, and detailing the method to retain programming for 72 hours during periods of loss of power;

- ☐ Photographs and manufacturer's data confirming the installed control measures: photocell, time switch or astronomical time switch as specified; and
- ☐ Installation evidence confirming the method to retain programming for 72 hours during periods of loss of power is installed and operational.

Calculations and Methodology	None
References	▪ DMA (2016) *Abu Dhabi Lighting Manual Issue 1*. Abu Dhabi, UAE.

RE-R2: Energy Monitoring & Reporting

Intent

To ensure the provision of metering facilities to monitor the performance of infrastructure systems, enabling future improvements and understanding of energy use within the public realm.

Credit Requirements

GENERAL

Demonstrate that the total site energy consumption is metered and that easily accessible, clearly labelled energy sub-meters are provided which are capable of monitoring the energy consumption of, at a minimum, the following uses (where present):

- External lighting;
- Irrigation;
- Buildings, or groups of buildings;
- On-site energy generating systems; and
- Final electrical distribution boards rated over 10kW.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Projects with a total connected load of less than 25kW only require a single energy sub-meter.

Buildings that are provided with their own utility connection are excluded.

Individual Streetscapes
This credit does not apply.

Credit Submission: Design Rating

- ☐ Narrative describing the project's energy monitoring strategy relating to all major uses;
- ☐ Design drawings identifying the location of all meters and their connection to a central monitoring system;
- ☐ Schematics illustrating the metering strategy, confirming that the required level of metering will be achieved; and
- ☐ Extracts from specifications clearly indicating the type and extent of all metering and monitoring equipment.

Credit Submission: Construction Rating

- ☐ Updated narrative describing the project's energy monitoring strategy relating to all major uses;
- ☐ As-built drawings identifying the location of all meters and central monitoring equipment;
- ☐ Manufacturer's data clearly indicating the type and extent of all metering, and central monitoring equipment;
- ☐ Photographs confirming installation of specified meters and monitoring capabilities of the central monitoring system; and
- ☐ Written commitment from the site owner to submit all energy monitoring data to Estidama (if requested).

Calculations and Methodology

All sub-meters must have a pulsed output and be connected to a central monitoring system so that information on the project's energy consumption can be recorded. The monitoring system shall have, at a minimum, the following capability:

- Provide hourly, daily, weekly, monthly and annual energy totals for each use;
- Compare consumption to previous days, weeks, months and years for trend analysis;
- Determine 'out-of-range' values and alert facility operator to unusually high

consumption; and
- Record peak energy consumption for each use.

The developer/site owner must provide a written commitment to supply energy monitoring data to Estidama (if requested). All reported information will be treated as confidential.

Energy consumption of the major end uses may be monitored through metering or subtraction. The design team should develop an appropriate metering strategy which can determine the consumption of each end use at the central monitoring system.

References	None

RE-1: Renewable Energy

Intent

To reward projects for the use of renewable technologies, therefore reducing the carbon emissions associated with public realm operation and the reliance on fossil fuel based energy generation.

Credit Requirements

General

Demonstrate that a study has been undertaken at the concept design stage to assess the feasibility of photovoltaic (PV) and solar thermal system(s).

Demonstrate that 50% of the total annual outdoor lighting energy consumption (kWh) is to be generated from PV system(s).

Demonstrate that 50% of the total annual hot water energy consumption (kWh) is to be generated from solar thermal system(s).

Additional Requirement/Clarifications

Other forms of renewable technology may be proposed and will be subject to approval from Estidama.

Credit Submission: Design Rating

- ☐ PV and solar thermal system(s) feasibility study;
- ☐ Calculations of the annual energy generation of the proposed PV system(s) and resultant percentage reduction in total annual outdoor lighting energy consumption;
- ☐ Calculations of the annual energy generation of the proposed solar thermal system(s) and resultant percentage reduction in total annual hot water energy consumption; and
- ☐ Drawings and specifications detailing the proposed PV and solar thermal system(s).

Credit Submission: Construction Rating

- ☐ Updated calculations of the annual energy generation of the proposed PV system(s) and resultant percentage reduction in total annual outdoor lighting energy consumption;
- ☐ Updated calculations of the annual energy generation of the proposed solar thermal system(s) and resultant percentage reduction in total annual hot water energy consumption; and
- ☐ Photographs confirming that the proposed PV and solar thermal system(s) have been installed.

Calculations and Methodology

The feasibility study must cover the following:

- Calculations demonstrating the total annual outdoor lighting energy consumption and total annual hot water energy consumption;
- Annual energy generated from PV and solar thermal system(s);
- Life cycle cost of each technology, and payback;
- Suitable locations for siting each technology;
- Visual issues; and
- Maintenance (including cleaning requirements).

The percentage of total annual outdoor lighting energy consumption supplied through PV system(s) is determined by calculating the annual energy generation of the PV system(s), and dividing their sum by the annual outdoor lighting energy consumption.

$$\text{\% total annual outdoor lighting energy generation from PV} = \frac{\Sigma \text{ Annual energy generated from PV (kWh)}}{\Sigma \text{ (Installed lighting load (Wattage) x hours of operation) (kWh)}}$$

All outdoor lighting that will be operated between the hours of 6pm to 11pm must be considered within the calculation.

The percentage of total annual hot water energy consumption supplied through solar thermal system(s) is determined by calculating the annual energy generation of the solar thermal system(s), and dividing their sum by the annual hot water energy consumption.

$$\text{\% total annual hot water energy generated from solar thermal} = \frac{\Sigma \text{ Annual energy generated from solar thermal (kWh)}}{\text{Annual hot water energy consumption (kWh)}}$$

The annual hot water energy consumption must be calculated using an internationally recognised methodology such as those defined by CIBSE, ASHRAE or CIPHE.

References

- CIBSE (2014) *CIBSE Guide G Public Health and Plumbing Engineering*. London, UK.
- ANSI/ASHRAE/IES (2013) *ASHRAE Standard 90.1-2013 - Energy Standard for Buildings except Low-Rise Residential Buildings*. Atlanta, USA.
- *Addenda Supplement (2015) to ANSI/ASHRAE/IES Standard 90.1-2013. Energy Standard for Buildings except Low-Rise Residential Buildings.* Atlanta, USA.
- CIPHE (2002) *Plumbing engineering services design guide*. Essex, UK: The Institute of Plumbing.
- DMA (2016) *Abu Dhabi Lighting Manual Issue 1*. Abu Dhabi, UAE.

RE-2: Energy – Educational Learning

Intent	To educate visitors on energy efficiency in relation to the cultural and climatic context of Abu Dhabi.
Credit Requirements	**GENERAL** Demonstrate that the project incorporates educational or interpretive elements that are interactive, and provide on-site examples of energy efficiency and conservation in relation to the cultural and climatic context of Abu Dhabi. These may include traditional and contemporary urban design and architectural strategies for outdoor and indoor thermal comfort, energy sources and energy conservation techniques. Demonstrate that the design features promote the connection to responsible behaviour, and help users and visitors understand how sustainability can be applied to off-site situations (e.g. homes, schools and workplaces). Provide activities and educational programs that welcome, encourage and expand sustainability learning on the site, and promote these by creating partnerships with local community groups and schools. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Narrative describing the proposed educational design features, documenting: ▫ Educational objectives; ▫ Location, design and (if applicable) operation of the features; ▫ Proposed activities and educational programs; and ▫ Strategy for forming connections to local community groups and schools. ☐ Site plans, and drawings indicating the location, arrangement and form of educational features.
Credit Submission: Construction Rating	☐ Updated narrative (where the proposed features have changed from the design stage documentation) describing how the intent is still achieved; and ☐ As-built site plans, drawings and photographs confirming the installation and programming of educational features.
Calculations and Methodology	Appropriate on-site examples of energy efficiency and conservation, could include: ▪ Energy efficient building design on the site; ▪ Energy monitoring results and recorded reductions in energy use, including comparisons to similar sites; ▪ Lighting design to minimise energy consumption and details on control systems; ▪ Details on materials selected, and the benefits that sustainable sourcing has on the environment, including regional materials, durable materials, and recycled materials; ▪ Renewable energy systems, including their benefits and metered energy generated; and ▪ Details on how the sites shading design contributes to reducing the urban heat island effect, and contributes to a more pleasant, usable environment.
References	None

Credit Section
SM: Stewarding Materials

The act of using materials such as timber, concrete and asphalt generates a number of direct and indirect consequences, beginning with the way raw content is extracted, through to how that material is prepared and installed. The consequences can be far-reaching including:

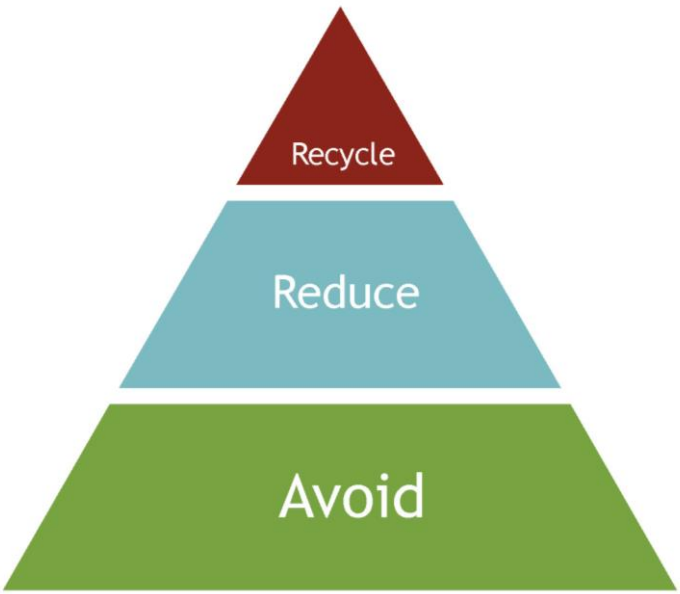
- The loss of biodiversity in a tropical rainforest half a world away;
- Consumption of energy required to ship materials to the UAE by boat, plane or truck;
- Substantial energy and water inputs required for the manufacturing process; and
- Impacts as the material ages, degrades and finally must be disposed of or recycled back into useful life.

In a sustainable development, the materials chosen and the process by which associated waste is disposed should be viewed as a complete cycle, not two disconnected constructs. Transportation of waste uses large amounts of fossil fuel and decaying landfill trash generates methane, a major greenhouse gas.

"The fact that people produce waste cannot change. However, by changing our behaviour and our attitudes to waste, we can tackle this problem in a way that meets the needs of the present without affecting future generations. Optimising recycling and reuse, as well as limiting production, forms a core part of protecting the environment."

- *Abu Dhabi Water Resources Master Plan, EAD 2009*

The Stewarding Materials section of the Public Realm Rating System encourages design and development teams to consider this entire continuum – or 'whole-of-life' cycle- when selecting and specifying materials, with an overall objective to improve the social and environmental outcomes associated with their manufacture, transport, installation and disposal.



CREDITS COVERED IN THIS SECTION

SM	Stewarding Materials							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
SM-R1	Hazardous Materials Elimination	R	R	R	R	R	R	R
SM-R2	Basic Construction Waste Management	R	R	R	R	R	R	R
SM-R3	Operational Waste Management	R	R	R	R	R	R	R
SM-R4	Landscape Waste Management	R	R	R	R	R	R	R
SM-R5	Durable Hardscape Materials	R	R	R	R	R	R	R
SM-R6	Legal, Reused & Certified Timber	R	R	R	R	R	R	R
SM-1	Improved Construction Waste Management	1	1	1	1	1	1	1
SM-2	Organic Waste Management	1	n/a	1	1	1	n/a	1
SM-3	Regional Materials	1	1	1	1	1	1	1
SM-4	Recycled Materials	1	1	1	1	1	1	1
SM-5	Improved Reused & Certified Timber	1	1	1	1	1	1	1
	TOTAL	**5**	**4**	**5**	**5**	**5**	**4**	**5**

SM-R1: Hazardous Materials Elimination

Intent	To minimise toxic effects of asbestos, chromated copper arsenate (CCA) treated timber and lead based paints on people and the environment.
Credit Requirements	**GENERAL** Demonstrate that no Asbestos Containing Materials (ACMs) are used within the project. This Credit Requirement builds *on Cabinet Resolution No. 39 of 2006 Concerning Prohibiting Import, Production and Utilisation of Asbestos Boards* and extends the prohibition to all ACMs. Demonstrate that where treated timber is specified for external structures where there is frequent and human contact, including but not limited to, shading devices, public realm furniture, playground equipment and handrails that no chromated copper arsenate (CCA)-treated timber is used. Demonstrate that no lead based paints are used within the project. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Extracts from specifications indicating that none of the following are to be used in the project as per the Credit Requirements: ▫ ACMs; ▫ CCA-treated timber; and ▫ Lead based paints.
Credit Submission: Construction Rating	☐ Evidence of products purchased, indicating that no ACMs, CCA-treated timber or lead based paints were used in the project as per the Credit Requirements.
Calculations and Methodology	None
References	▪ Cabinet Resolution No. 39 of 2006 Concerning Prohibiting Import, Production and Utilisation of Asbestos Boards.

SM-R2: Basic Construction Waste Management

Intent

To reduce the long-term environmental impacts associated with construction, demolition and site clearance waste collection, transport and disposal.

Credit Requirements

General

Demonstrate that prior to the start of site clearance and demolition activities, a Construction and Demolition Waste Management Plan (CDWMP) has been developed by the general contractor, working collaboratively with all sub-contractors and specialty contractors (e.g. site clearance or demolition).

The CDWMP must identify all site clearance, demolition and construction materials and demonstrate that waste materials will be separated into the following key waste groups:

- Landscaping/organic matter (trees, shrubs, groundcover etc.);
- Inert waste: Soil (sand, clay, gravel etc.), asphalt and tar (bitumen, asphalt, etc.), mixed rubble/excavation material, glass, concrete (kerbs, concrete rubble, paving slabs, concrete shuttering etc.);
- Timber & Packaging (timber, pallets, cardboard, wrapping ties, etc.) or alternately, these can be separated according to material type;
- Metals (building materials, cables, wires, lighting posts etc.);
- Plastics (irrigation pipes, building cladding, plastic sheets etc.); and
- Electrical & electronic equipment (lighting fittings, cables, appliances etc.).

Demonstrate that the contractor implemented monthly monitoring of the CDWMP, and achieved a minimum final recycling/salvage rate of 50% of construction and demolition waste (by weight or volume). This figure excludes all hazardous waste that must undergo specialised treatment and all excavated soil and land clearing debris.

Additional Requirement/Clarifications

None

Credit Submission: Design Rating

- ☐ Extracts from Specifications or draft CDWMP containing:
  - Schedule of predicted site clearance, demolition and construction waste materials generated by the project (by type or material), and each estimated weight or volume;
  - Measures to be adopted to mitigate possible pollution from waste containers, including fly away waste and odour;
  - Schedule of materials to be recycled/salvaged, their source within the project, and their estimated weight or volume;
  - Targeted recycling/salvage rate;
  - The name and location of potential reclaim/recycling haulers and licensed treatment/recovery site(s); and
  - The name and title of the person(s) responsible for implementing and monitoring the CDWMP and the monitoring procedures.
- ☐ Completed Public Realm Waste Calculator.

Credit Submission: Construction Rating

- ☐ Calculations, supported with detailed receipts, summarising final results of the CDWMP activities, listing:
  - Items recycled/salvaged, their source within the project, and their total weight or volume;
- ☐ The name and location of the reclaim/recycling haulers; and
- ☐ Updated Public Realm Waste Calculator.

Calculations and Methodology	Calculations can be done by weight or volume but must be consistent throughout. Applicable recycling/salvage practices include: ▪ Re-using the material on site (in-situ or for new applications); ▪ Re-using the material on other sites; ▪ Returning the material to the supplier via a 'take back' scheme; and/or ▪ Recovery of the material from site by an appropriately licensed waste management contractor and recycled, or sent for energy recovery. A full list of registered environmental service providers, including construction and demolition waste reclaim/recycling haulers can be found on the Center for Waste Management (Tadweer) website.
References	▪ Center of Waste Management (Tadweer), CWM: www.cwm.ae.

SM-R3: Operational Waste Management

Intent

To reduce the long-term environmental impacts associated with operational waste collection, transport and disposal.

Credit Requirements

GENERAL

Demonstrate that an Operational Waste Strategy has been developed from the concept stage. As a minimum, the following must be addressed by the design and development team:

- Annual estimates of operational waste (by waste type);
- Summary review of existing and planned waste management infrastructure and programs available from the appropriate authority, including management during peak events;
- Proposed options for diverting waste from landfill and incineration, with a minimum targeted diversion rate of 40% by weight or volume of the total operational waste generated at full occupancy;
- Provision of adequately sized and accessible facilities and clearly labelled containers for the storage and collection of source-segregated waste as recommended by the Center of Waste Management (Tadweer). At a minimum, allow for separation as follows:
  - Container for recyclable plastics, glass and metals;
  - Container for recyclable paper and cardboard;
  - Container for non-recyclable and non-compostable waste; and
  - An optional container may be provided for compostable organic waste.
- Measures to be adopted to mitigate possible pollution from waste containers, including fly away waste and odour;
- Provision of signage at bin locations, and at waste source encouraging recycling and avoidance of litter; and
- Adequate vehicular access for waste handling vehicles must also be ensured.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Operational Waste Strategy, including:
  - Narrative describing options researched and selected to meet the diversion targets. The strategy must address waste minimisation, storage, collection, measures to be adopted to mitigate possible pollution from waste containers, including fly away waste and odour, signage, and treatment and links to private or municipal and regional infrastructure and programs;
  - Plan(s) indicating location of the storage/disposal facilities and vehicle access areas, designed to ensure adequate space for manoeuvring delivery and waste removal vehicles; and
  - A waste transfer inventory (CWM waste manifest) outlining the intended receiver of waste. This should include information indicating that the carrier, recycling and disposal facilities are licensed.
- ☐ Completed Public Realm Waste Calculator, detailing the estimated operational waste from the development on an annual basis.

Credit Submission: Construction Rating

- ☐ Updated Public Realm Waste Calculator, detailing the estimated operational waste from the development on an annual basis;
- ☐ As-built plan(s) and photographs confirming the location of the storage/disposal facilities (including signage etc.) and vehicle access areas designed to ensure adequate space for manoeuvring delivery and waste removal vehicles;

- ☐ Updated waste transfer inventory (CWM waste manifest) outlining the contracted receiver of waste and indicating that the carrier, recycling and disposal facilities are licensed; and
- ☐ Confirmation that a maintenance contract is in place.

Calculations and Methodology	All calculations must be undertaken using the Public Realm Waste Calculator detailing the output of operational waste from the development. Waste benchmarks may be obtained from the Center of Waste Management (Tadweer), waste audits of similar public realm spaces or literature research. References must be clearly listed. A full list of registered environmental service providers, including waste reclaim/recycling haulers can be found on the Center for Waste Management (Tadweer) website.
References	▪ Center of Waste Management (Tadweer), Abu Dhabi: www.cwm.ae.

SM-R4: Landscape Waste Management

Intent

To ensure the recovery and reuse of organic landscaping waste generated through operation and maintenance of the public realm.

Credit Requirements

General

Demonstrate that a Landscape Waste Strategy has been developed, and that all landscape waste will be collected for treatment at either an on-site or off-site facility. As a minimum, the following must be addressed by the design team:

- Annual estimates of landscape waste generated on site (including frequency and volume);
- A review of existing and planned landscape waste management infrastructure and programs available from the appropriate authority;
- Options for reducing, storing, treating and re-using landscape waste on-site; and
- The proposed strategy for recovery and reuse of landscape waste.

Storage area(s) must be suitably sized for the projected amount of waste to be collected and located with ready access to adequate collection vehicle manoeuvring areas.

Additional Requirement/Clarifications

None

Credit Submission: Design Rating

- ☐ Landscape Waste Strategy, including:
  - Narrative describing waste minimisation, storage, collection and treatment, and proposed links to private or municipal and regional infrastructure and programs;
  - Plan(s) indicating location and size of the storage/treatment facilities and that vehicle access areas have been designed to ensure adequate space for manoeuvring delivery and waste removal vehicles; and
  - A waste transfer inventory (CWM waste manifest) outlining the intended receiver of waste. This should include information indicating that the carrier, recycling and disposal facilities are registered with the Centre for Waste Management.
- ☐ Completed Public Realm Waste Calculator, detailing the estimated landscape waste generated from the site on an annual basis, and confirming that any on-site storage areas are sufficiently sized.

Credit Submission: Construction Rating

- ☐ Updated Public Realm Waste Calculator, detailing the estimated landscape waste from the site on an annual basis;
- ☐ As-built plan(s) and photographs confirming the location and size of the storage/treatment facilities (if provided on-site) and that vehicle access areas have been constructed to ensure adequate space for manoeuvring delivery and waste removal vehicles;
- ☐ Updated waste transfer inventory (CWM waste manifest) outlining the contracted receiver of landscape waste and indicating that the carrier, recycling and treatment facilities are registered with the Centre for Waste Management; and
- ☐ Confirmation that a maintenance contract is in place.

Calculations and Methodology

All calculations must be undertaken using the Public Realm Waste Calculator detailing the output of landscape waste from the project site.

Suitable on-site treatment could include composting, chipping or shredding landscaping waste for reuse as compost, ground cover or mulch.

References

- Center of Waste Management (Tadweer), Abu Dhabi: www.cwm.ae.

SM-R5: Durable Hardscape Materials

Intent

To minimise waste associated with upgrades or maintenance of public realm through the use of durable materials and modular pavement and hardscape cover.

Credit Requirements

GENERAL

Develop and implement a Site Durability Plan to optimise the integrity of site materials.

Demonstrate that at least 70% (by surface area) of pedestrian areas use modular pavement and/or modular hardscape cover.

Demonstrate that 100% (by surface area) of areas which may require access for maintenance (e.g. above utility corridors) use modular pavement and/or modular hardscape cover.

Demonstrate that all proposed pedestrian pavement and hardscape products have a minimum SRI of 29.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Sports and Play Facilities

Specialist surfaces are not required to meet the % modular pavement and/or modular hardscape cover requirement.

Credit Submission: Design Rating

- ☐ Narrative describing the hardscape strategy and how the credit requirements will be met;
- ☐ Plans to illustrate the location of each surface type and protection measures;
- ☐ Schedule of materials used for pavement and hardscape cover, identifying relevant durability standards to be met (weight tolerance, impact resistance, slip resistance, water resistance, fade resistance, temperature resistance, salt tolerance) and their SRI;
- ☐ Calculations demonstrating the percentage hardscape comprising modular pavement and hardscape cover for pedestrian areas, and areas where access may be required; and
- ☐ Extracts from specifications showing that pavement and hardscape cover systems meet the required durability standards and SRI requirements.

Credit Submission: Construction Rating

- ☐ As-built plans identifying the location of hardscape materials;
- ☐ Schedule of materials used for pavement and hardscape cover, durability standards met, and their SRI;
- ☐ Updated calculations demonstrating the percentage hardscape comprising modular pavement and hardscape cover; and
- ☐ Evidence of purchase and installation of these materials in the project in the form of invoices from suppliers and installers.

Calculations and Methodology

This credit applies to all hardscape in the public realm, excluding routes utilised by public transit and motor vehicles, as defined in the Abu Dhabi Urban Street Design Manual, Chapter 5.

The Site Durability Plan must include:

- Estimated life span of hardscape, shading structures, play equipment, lighting, irrigation equipment, and site furniture;
- Description that the following design measures have been implemented:
  - Hardscape material in areas where vehicle access is permitted must have

suitable weight tolerance;

- Surfaces surrounding play structures and sports equipment must be hard wearing and impact resistant;
- Ability to withstand the country's climatic conditions, including solar radiation, temperature variation, salinity where the site is within 100m of a coastal area, and dust;
- Slip resistant, water resistant materials with suitable drainage gradients in locations where regular water usage or ingress is anticipated (e.g. where the surface is shared with water features, drinking fountains, shower facilities, or adjacent to irrigation outlets, etc.); and
- Any structures within 1m of vehicle manoeuvring areas (e.g. roads and car parks) must be provided with protection measures such as bollards, barriers, raised kerbs or tyre restraints.

References

- UPC (2010*) Urban Street Design Manual*. Abu Dhabi, UAE: Abu Dhabi Urban Planning Council.
- ADM (2010) *Updated Specifications for Interlocking Concrete Paving Blocks*. Abu Dhabi, UAE: Municipal Roads and Infrastructure Division.

SM-R6: Legal, Reused & Certified Timber

Intent

To avoid the use of timber derived from endangered species and encourage the use of sustainably sourced timber.

Credit Requirements

GENERAL

Demonstrate that all timber is legally sourced and not on the CITES (Convention on International Trade in Endangered Species) list of endangered species (Appendix I, II and III).

Demonstrate that 30% (by cost) of the timber and composite wood products used on the project, including temporary construction timber, is reused OR certified (with Chain of Custody Certification: CoC) under any one or any combination of the following certification schemes:

- Forest Stewardship Council (FSC); or
- Program for the Endorsement of Forest Certification scheme (PEFC) or the following national schemes endorsed by PEFC: the Canadian Standards Association, CSA, the Sustainable Forestry Initiative SFI and the Malaysian Timber Certification Scheme MTCS.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ List of specified timber products (including temporary construction timber) highlighting intended use, proposed certification schemes and/or if the timber product is reused; and
- ☐ Extracts from specifications highlighting which timber product will come from certified sources (clearly indicating intended certification scheme) and/or be reused. The specification (or equivalent legally binding document) must also confirm that all timber and timber products will not include species on the CITES list of endangered species.

Credit Submission: Construction Rating

- ☐ Updated list of installed timber products (including temporary construction timber) highlighting certification schemes used and/or if the timber product was reused;
- ☐ Chain of custody (CoC) certificates associated with each timber product; and
- ☐ Evidence of purchase and installation of the certified timber products from suppliers and installers.

Calculations and Methodology

$$\text{PercentageCertifiedTimber} = \frac{\text{Cost of certifiedtimber}}{\text{Total cost of timber products}} \times 100$$

References

- Forest Stewardship Council, FSC: www.pefc.org.
- Program for the Endorsement of Forest Certification scheme, PEFC: www.fsc.org.
- Canadian Standards Association, CSA: www.csagroup.org.
- Sustainable Forestry Initiative, SFI: www.sfiprogam.org.
- Malaysian Timber Certification Scheme, MTCS: www.mtcc.com.my.
- Convention on International Trade in Endangered Species (CITES) list of endangered species, Appendix I, II and III: http://www.cites.org/eng/app/index.shtml.

SM-1: Improved Construction Waste Management

Intent	To further reduce the long-term environmental impacts associated with construction waste collection, transport and disposal.
Credit Requirements	**GENERAL** Demonstrate that the Contractor implemented monthly monitoring of the CDWMP, and achieved a minimum final recycling/salvage rate of 70% of construction and demolition waste (by weight or volume). This figure excludes all hazardous waste that must undergo specialised treatment and excavated soil and land clearance debris. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Extracts from Specifications or draft CDWMP containing: ▫ Schedule of predicted site clearance, demolition and construction waste materials generated by the project (by type or material), and each estimated weight or volume; ▫ Schedule of materials to be recycled/salvaged, their source within the project, and their estimated weight or volume; ▫ Targeted recycling/salvage rate; ▫ The name and location of potential reclaim/recycling haulers and licensed treatment/recovery site(s); and ▫ The name and title of the person(s) responsible for implementing and monitoring the CDWMP and the monitoring procedures. ☐ Completed Public Realm Waste Calculator.
Credit Submission: Construction Rating	☐ Calculations, supported with detailed receipts, summarising final results of the CDWMP activities listing: ▫ Items recycled/salvaged, their source within the project, and their total weight or volume; ▫ The name and location of the reclaim/recycling haulers; and ▫ Markets for the recyclable materials. ☐ Updated Public Realm Waste Calculator.
Calculations and Methodology	Calculations can be done by weight or volume but must be consistent throughout. Applicable recycling/salvage practices include: ▪ Re-using the material on site (in-situ or for new applications); ▪ Re-using the material on other sites; ▪ Returning the material to the supplier via a 'take back' scheme; and/or ▪ Recovery of the material from site by an appropriately licensed waste management contractor and recycled, or sent for energy recovery. A full list of registered environmental service providers, including construction and demolition waste reclaim/recycling haulers can be found on the Center for Waste Management (Tadweer) website.
References	▪ Center of Waste Management (Tadweer), CWM: www.cwm.ae.

SM-2: Organic Waste Management

Intent

To encourage the recovery and reuse of organic food waste from the public realm.

Credit Requirements

GENERAL

Demonstrate the provision of on-site treatment facilities (e.g. composting, anaerobic digestion energy from waste) for organic food waste generated on-site and from the surrounding community, and provide the following:

- Annual estimates of organic food waste generated on-site and from the surrounding community;
- An analysis of treatment, including:
  - A review of existing and planned organic waste management support programs available from the appropriate authority; and
  - Appropriateness of the site context for short-term on-site storage and treatment addressing visual impact, avoidance of odour, avoidance of litter, and generation of good quality compost for on-site use.

Demonstrate that on-site storage and treatment area(s) are suitably sized for the projected amount of organic waste to be collected, and located with ready access to adequate collection vehicle manoeuvring areas.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

Individual Streetscapes
This credit is not available.

Local Public Open Space
This credit is not available.

Credit Submission: Design Rating

- ☐ Narrative describing how the project intends to meet the Credit Requirements, including details on the size and location of the storage area and the estimated amount of waste to be generated;
- ☐ Drawings clearly indicating the proposed location and size of waste collection, storage and (where provided on-site) treatment area(s); and
- ☐ A waste transfer inventory (CWM waste manifest) outlining the intended receiver of organic waste and indicating that the carrier and treatment facilities are licensed.

Credit Submission: Construction Rating

- ☐ Updated narrative describing how the project meets the Credit Requirements, including details on the size and location of the storage area and the amount of waste to be generated;
- ☐ Updated waste transfer inventory (CWM waste manifest) outlining the contracted receiver of waste and indicating that the carrier, recycling and treatment facilities are licensed; and
- ☐ As-built drawings clearly indicating the location and size of waste collection, storage and (where provided) on-site treatment area(s).

Calculations and Methodology

Waste benchmarks may be obtained from the Center of Waste Management (Tadweer), waste audits of similar public realm spaces or literature research. References must be clearly listed.

A full list of registered environmental service providers, including waste reclaim/recycling haulers can be found on the Center for Waste Management (Tadweer) website.

References

- Center of Waste Management (Tadweer), CWM: www.cwm.ae.

SM-3: Regional Materials

Intent

To encourage the selection of materials that has reduced transport impacts and promote regional economies.

Credit Requirements

GENERAL

Demonstrate that the transport distance travelled by materials, representing 20% of the total material cost, is not greater than 500 km from the furthest point of origin to the project site.

Any materials sent by airfreight at any point during their transport do not qualify for this credit.

This credit applies to all materials used in the construction of infrastructure and public realm (including urban furniture).

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Report listing all materials proposed to demonstrate compliance with the Credit Requirements, including:
  - Their material cost;
  - Location(s) of extraction/harvest/recovery or manufacture;
  - Distance travelled and means of transport; and
  - Calculations demonstrating the total amount of the qualifying materials as a percentage of the total material cost;
- ☐ For each nominated material, proof of manufacture detailing country of origin and port of entry, if applicable; and
- ☐ Extracts from specifications indicating the requirement for materials to meet this credit.

Credit Submission: Construction Rating

- ☐ Updated report listing all nominated materials demonstrating compliance with the Credit Requirements, including:
  - Final cost;
  - Location(s) of extract/harvest/recovery/manufacture; and
  - Proof of manufacture detailing country of origin and port of entry, if applicable.
- ☐ For each nominated material, proof of manufacture detailing country of origin and port of entry, if applicable; and
- ☐ Evidence of purchase and installation of these materials in the project in the form of invoices from suppliers and installers.

Calculations and Methodology

- The 'furthest point of origin' is measured as either the furthest distance to the project site from (1) the point of extraction, harvest or recovery or (2) the point of manufacture. Products manufactured within the United Arab Emirates will automatically comply with the credit requirements.
- "Manufacture" means, "to process or fabricate a raw material into a finished product." Simple assembly of pre-fabricated components does not qualify.
- The distance travelled is calculated as ('Distance travelled by road or rail' + 0.1 x 'Distance travelled by sea')
- For composite materials, a weighted average by weight (mass) must be applied to the distance. This calculation is not necessary for materials where one major constituent represents at least 90% of the final material by weight.

$$\text{Percentage Regional Materials} = \frac{\text{Cost of the regional materials}}{\text{Total Cost of Materials}} \times 100$$

- Where materials or primary constituent elements are quarried, extracted, or harvested, the calculation begins at this point and includes the distance travelled to the manufacturing/processing facility.
- Where products are primarily comprised of recycled materials (i.e. 90% by weight or more), then the calculation begins at the point of manufacture.
- Calculations to include distance to site but not returns.
- Total Material Cost: exclude labour and equipment costs and include the following divisions from the Construction Specifications Institute (CSI) MasterFormatTM or equivalent: Division 03 Concrete, Division 04 Masonry, Division 05 Metals, Division 06 Wood, Plastics, and Composites, Division 07 Thermal and Moisture Protection, Division 10 Specialties, Division 31 Earthwork, Division 32 Exterior Improvements, 33 Utilities, 34 Transportation, 35 Waterway and Marine Construction.

References

- Construction Specifications Institute, CSI: www.csinet.org.
- Information Bulletin 11: Point of Origin Required for Regional Materials. www.etidama.upc.gov.ae.

SM-4: Recycled Materials

Intent

To increase the demand for recycled materials and therefore reduce the amount of waste going to disposal.

Credit Requirements

GENERAL

Demonstrate that recycled materials are used as follows.

Recycled Steel

Demonstrate that at least 80% (by weight) of all steel used has a minimum of 90% post-consumer recycled content.

Recycled Aggregates

Demonstrate that:

- At least 30% (by volume) of all aggregate used is recycled;
- A minimum of 50% (by number) of block pavers comprise recycled aggregate (each have a minimum recycled aggregate content of 20%); and
- Only recycled aggregates, and/or aggregates from industrial waste by-products are used as base, sub-base or backfill.

Cement Replacement

Demonstrate that the use of Portland cement is reduced by 50% (by volume) through the use of supplementary cementing materials (SCMs) (including fly ash, ground granulated blast furnace slag (GGBFS) and silica fumes) or the increased use of aggregates or admixtures.

Other Materials

Demonstrate that any combination of materials with the following characteristics constitute at least 10% of the Total Material Cost:

- Minimum 30% post-consumer recycled content;
- Minimum of 80% post-industrial content; and/or
- 50% agricultural waste by-product.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Credit Submission: Design Rating

- ☐ Narrative describing all materials proposed for compliance with the Credit Requirements;
- ☐ Calculations by weight (Recycled Steel) volume (Recycled Aggregates, Cement Replacement) or cost (Other materials) demonstrating compliance with the Credit Requirements; and
- ☐ Extracts from specifications detailing the use of compliant nominated materials.

Credit Submission: Construction Rating

- ☐ Updated narrative describing all materials used to meet the Credit Requirements;
- ☐ Updated calculations by weight (Recycled Steel), volume (Recycled Aggregates, Cement Replacement) or cost (Other materials) demonstrating compliance with the Credit Requirements;
- ☐ Proof of manufacture for all nominated materials; and
- ☐ Proof of purchase for all nominated materials. For nominated 'Other Materials' the proof of purchase should indicate the material cost (excluding labour and equipment).

Calculations and Methodology

Recycled Steel

Products from companies certified under CARES Sustainable Reinforcing Steel Appendix 01 "Production of continuously cast steel billets" and "Production of hot rolled steel bar and coil for the reinforcement of concrete" will count as recycled.

$$\text{Percentage Recycled Steel} = \frac{\text{Weight of recycled or reused steel}}{\text{Total weight of steel}} \times 100$$

Recycled Aggregates

$$\text{Percentage Recycled Aggregates} = \frac{\text{Volume of recycled aggregates}}{\text{Total volume of aggregates}} \times 100$$

Cement Replacement

There are a number of potential supplementary cementitious materials SCMs that have been used in concrete (including volcanic ask, metakolin, and risk husk ash), the three most common are fly ask, silica fume, and ground granulated blast furnace slag (GGBFS) cement.

$$\text{Percentage Cement Replacement} = \frac{\text{Volume of SCMs}}{\text{Total volume of cement}} \times 100$$

Other Materials

$$\text{Percentage Recycled Materials} = \frac{\text{Cost of recycled-content materials}}{\text{Total Materials Cost}} \times 100$$

Total Material Cost: exclude labour and equipment costs and include the relevant divisions from the Construction Specifications Institute (CSI) MasterFormat™ or equivalent.

References

Construction Specifications Institute (CSI) MasterFormat™ (2004) Division 03 Concrete, Division 04 Masonry, Division 05 Metals, Division 06 Wood, Plastics, and Composites, Division 07 Thermal and Moisture Protection, Division 10 Specialties, Division 31 Earthwork, Division 32 Exterior Improvements, 33 Utilities, 34 Transportation, 35 Waterway and Marine Construction.

SM-5: Improved Reused & Certified Timber

Intent	To further encourage the use of sustainably sourced timber.
Credit Requirements	**GENERAL** Demonstrate that 70% (by cost) of the timber and composite wood products used on the project in relation to public realm and right-of-way works, including temporary construction timber, is reused OR certified (with Chain of Custody Certification: CoC) under any one or any combination of the following certification schemes as per the Requirement Achievement table: ▪ Forest Stewardship Council (FSC); or ▪ Program for the Endorsement of Forest Certification scheme (PEFC) or the following national schemes endorsed by PEFC: the Canadian Standards Association, CSA, the Sustainable Forestry Initiative SFI and the Malaysian Timber Certification Scheme MTCS. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ List of specified timber products (including temporary construction timber) highlighting intended use, proposed certification schemes and/or if the timber product is reused; and ☐ Extracts from specifications highlighting which timber product will come from certified sources (clearly indicating intended certification scheme) and/or be reused. The specification (or equivalent legally binding document) must also confirm that all timber and timber products will not include species on the CITES list of endangered species.
Credit Submission: Construction Rating	☐ Updated list of installed timber products (including temporary construction timber) highlighting certification schemes used and/or if the timber product was reused; ☐ Chain of custody (CoC) certificates associated with each timber product; and ☐ Evidence of purchase and installation of the certified timber products from suppliers and installers.
Calculations and Methodology	$\text{PercentageCertifiedTimber} = \frac{\text{Cost of certifiedtimber}}{\text{Total cost of timber products}} \times 100$ All timber must be legally sourced and not on the CITES (Convention on International Trade in Endangered Species) list of endangered species (Appendix I, II and III), as per the Credit Requirements of SM-R5 Legal, Reused & Certified Timber.
References	▪ Forest Stewardship Council (FSC): www.pefc.org. ▪ Program for the Endorsement of Forest Certification scheme (PEFC): www.fsc.org. ▪ Canadian Standards Association (CSA): www.csa.ca. ▪ Sustainable Forestry Initiative (SFI): www.sfiprogam.org. ▪ Malaysian Timber Certification Scheme (MTCS): www.mtcc.com.my. ▪ Convention on International Trade in Endangered Species (CITES) list of endangered species, Appendix I, II and III: http://www.cites.org/eng/app/index.shtml.

Credit Section
IP: Innovating Practice

Innovative practice builds on the essential elements of Plan 2030 and the pillars of Estidama - environment, social, cultural and economic - to deliver developments that incorporate design outcomes that go beyond the established benchmarks and deliver genuinely innovative features to further the sustainability of the community. This requires a design process that embraces innovation and creativity whilst respecting and responding to the cultural identity of the region.

The Innovative Practice section is intended to encourage responsive design that achieves pioneering solutions which will enhance the development's success and contribute to sustainability in the UAE through;

- Addressing the pillars of sustainability through innovative design solutions which are able to be replicated;
- Providing for cost benefit and feasibility analysis; and
- Developing designs that showcase cultural and regional practices, while contributing to the environmental performance of the community.

CREDITS COVERED IN THIS SECTION

IP	Innovating Practice							
Credit Code	Credit Title	General	Public Open Space				Streetscapes	
			Local	Neighbourhood	District	Municipality & Emirate	Individual Streetscapes	Network of Streetscapes
IP-1	Innovative Cultural & Regional Practices	1	1	1	1	1	1	1
IP-2	Innovating Practice	1	1	1	1	1	1	1
	TOTAL	**2**	**2**	**2**	**2**	**2**	**2**	**2**

IP-1: Innovative Cultural & Regional Practices

Intent	Develop designs that showcase cultural and regional practices, while contributing to the environmental performance of the public realm.
Credit Requirements	GENERAL Develop a strategy for incorporating architectural and/or technical solutions that are inspired by cultural and regional precedents and demonstrate their contribution to energy efficiency, water conservation or improved outdoor comfort.
Credit Submission: Design Rating	☐ Narrative describing the proposed strategy, documenting: ▫ Precedents for the proposed solutions; ▫ Numerical or physical performance modelling/testing describing the performance of the proposed initiative(s) within the project setting; and ▫ Rationale of how the proposed solutions will be incorporated into the project.
Credit Submission: Construction Rating	☐ Updated narrative describing the nominated solutions; and ☐ Photographs confirming the proposed built-in solutions.
Calculations and Methodology	Awarding innovative credit points are subject to Estidama approval.
References	None

IP-2: Innovating Practice

Intent	To promote designs that result in a significant positive impact in relation to any of the four pillars of Estidama.
Credit Requirements	**GENERAL** Develop, document and implement an innovative design and/or construction solution that addresses one or more of the four pillars of Estidama. AND Develop a guideline document that enables the innovative design solution to be repeated. **ADDITIONAL REQUIREMENT/CLARIFICATIONS** None
Credit Submission: Design Rating	☐ Evidence of IDP related to the innovative design and/or construction solution, developed through engaging all relevant team members; and ☐ Innovative solution report.
Credit Submission: Construction Rating	☐ Updated Innovative solution report; and ☐ Guideline document.
Calculations and Methodology	The four pillars that make up the Estidama concept are : ▪ Environmental ▪ Cultural ▪ Social ▪ Economic The innovative solution must be developed in conjunction with the IDP-R1 Integrated Development Strategy and be developed into a workable final solution. An Innovative Solution Report must be prepared that demonstrates the process by which the final innovative solution has evolved from early concepts and addresses the following subjects where relevant: ▪ Narrative of final design solution that must: o Fully describe the design innovation so that it may be repeated; o Be fully supported by concept proofs from studies, experiments or other research; o document key parameters relied upon in the context of the project; and o Be fully supported by design drawings, graphs and specifications. ▪ Predicted impact in relation to the four pillars of Estidama: The final design solution should be contextualized in terms of tangible impacts against one or more of the four pillars; ▪ Feasibility studies: This must address documented design evolution decisions toward the final design solution and address all considerations that led to the final solution; ▪ Cost Benefit Analysis: A detailed cost benefit analysis of the design measure(s) including, at a minimum, capital cost, operational and maintenance cost, cost as a percentage of total project cost and revenue where appropriate. The benefit analysis must include performance targets/levels attained or anticipated to be attained as a direct result of the measures; ▪ Risk: The risk analysis must detail the framework within which the design solution is intended to work and highlight any and all weaknesses that would impede

performance. The analysis must anticipate the impact of such weaknesses on the performance of the design solution;

- Integration and Implementation: This section must clearly demonstrate how the design solution has been integrated with any and all related elements associated with the development as well as a detailed plan of how the design solution is implemented;
- Measurability: This section must address how the performance of the design solution will be measured in-use and include all metrics and associated technologies relied upon; and
- Maintainability and Durability: This section must address all maintenance and durability aspects related to the design solution.

Awarding innovative credit points are subject to Estidama approval.

References	None

Exemplar Public Realm

Exemplar public realm projects are those that are of national significance, typically because of their outstanding natural, cultural or heritage values and draw the presence and attention of large numbers of people. In recognition of their special status, Estidama invites such projects to demonstrate innovative performance against eight unique exemplar visions.

The eight exemplar visions comprise inspirational statements that project teams must respond to through a process of consultation, strategy and design innovation. Each project's response to the vision statements is expected to be unique and tailored to the specific attributes that make the project a place of significance. The vision statements are not intended to be prescriptive, instead they are intended to pull together the most progressive thinking from landscape architecture and design, architecture, engineering, planning and policy and serve as a model for others to follow.

Examples and opportunities to achieve the vision statements are presented in the PRDM, and cover the following objectives:

- Showcasing outstanding natural features;
- Showcasing features of cultural heritage and cultural and regional practices;
- Providing a unique educational experience for site users;
- Supporting a 'car free' lifestyle;
- Modelling a dynamic and diverse economy;
- Demonstrating future technologies and practices towards net zero resources;
- Providing knowledge and opportunity for health and well-being; and
- Creating a global community.

Exemplar Public Realm Approval Process

Identification of Suitable Projects

Suitable sites should be identified as having "National Significance" and may also contain features of "natural heritage" or "cultural heritage", or a combination of these. The following definitions should be referred to when establishing whether a site can be classed as 'exemplar public realm' and an application for exemplar status made:

- Sites of "national significance" are those which do not necessarily have physical features of cultural or natural heritage, but nevertheless will bear a unique or exceptional testimony, or contribution, to Emirati culture, and will draw the presence and attention of large numbers of people. These may be:
  - **Intangible heritage**: directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding national significance.
- The following shall be considered as "natural heritage":
  - **Natural features** consisting of physical and biological formations which represent areas of remaining and intact significant biodiversity, which have conservation value or are of natural beauty;
  - **Natural habitats** for species of animals and plants of national value;
  - **Natural sites**, natural areas of national value from the point of view of science, conservation, social, cultural or natural beauty.
- The following shall be considered as "cultural heritage":
  - **Buildings** which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding value to Abu Dhabi's historic environment;
  - **Monuments**: architectural works, elements or structures of an archaeological nature, inscriptions or a combinations of these features;
  - **Sites**: works of man or the combined works of nature and man, and areas including archaeological sites which have historical, aesthetic, ethnological or anthropological value.

THE EXEMPLAR APPLICATION PROCESS

Exemplar projects may be nominated by the UPC during the Development Review Enquiry Meeting; alternately projects may follow the Exemplar Application Process:

Figure 6: The Exemplar Application Process

Step 1: Identification

The landowner or his/her representative is required to apply for exemplar status. The application should be supported by the relevant Municipality (ADM, AAM or WRM) and Government Agencies as follows:

- EAD for sites with Natural Heritage
- TCA Abu Dhabi for sites with Cultural Heritage
- UPC for sites with National Significance

Step 2: Application

An application must be made by the landowner or his/her representative, substantiating and justifying how the project meets the assessment criteria including the following documentation:

- Letters of Support from the relevant Municipality (ADM, AAM or WRM) and Government Agencies identified in Step 1;
- Narrative justifying the status of "national significance", "natural heritage" and/or "cultural heritage" as applicable.
- Narrative describing the project's commitment to achieving the exemplar visions;
- Location map and affection plan, clearly identifying the site's location, and existing cultural or natural heritage features;
- Photographs of existing cultural or natural heritage features;
- Visualisations, plans and drawings.

Step 3: Assessment of Nomination

The UPC will review the application documentation and confirm to the application whether all of the required documentation has been provided, and is of sufficient quality. As part of this process, the project will be assessed against the exemplar public realm "site of national significance" selection criteria. Where both of these steps are satisfied, the UPC will invite the applicant team to an interview with a review panel, where they will be required to present the project and application material for consideration.

The landowner will be notified if the project has been accepted as an Exemplar Public Realm Project.

EXEMPLAR PUBLIC REALM VISION STATEMENTS

Public Realm Projects are required to demonstrate that their design, construction and management proposals fully integrate all of the applicable exemplar visions.

E-1: Natural Heritage Features

"To showcase outstanding natural heritage features through world class design and management practices. To reveal the inherent diversity, fragility and importance of Abu Dhabi's natural environment through education, conservation and presentation of natural flora, fauna and ecological systems, for the enjoyment of current and future generations."

E-2: Culture and Cultural Heritage Features

"To showcase culture and regional practices, and cultural heritage through world class design and management practices. Increase understanding of culture and cultural heritage through education, conservation and presentation of cultural heritage features and incorporation of events, activities and features which showcase regional culture."

E-3: Education

"To inspire a passion for learning by providing opportunities to teach, learn and share knowledge in an inclusive, pleasant, formal or informal setting to fulfil society's need for knowledge and expertise."

E-4: Sustainable Transport

"To encourage the use of more sustainable means of transport, by creating a car free site and providing the necessary infrastructure for an integrated transport system across the Emirate supported by connected open spaces and streetscapes."

E-5: Diverse Economy

"To develop a dynamic and diverse economy, with increased localisation and self-sufficiency within the community. To contribute to a more sustainable world by helping local users and visitors to process locally occurring natural resources and recycled materials into valuable products."

E-6: Towards net zero resources

"To showcase future technologies and practices that contribute to net zero resources and waste. Contribute to a more sustainable world by developing, testing and presenting to local users and visitors innovative ways to balance consumption and production of natural resources."

E-7: Health and Well-being

"To provide knowledge and opportunity for increased health and well-being, contributing to creating a healthy and vibrant community."

E-8: Global Connection

"Create a global shift towards sustainability by contributing to creating a global community that is aware of the sustainability aspect of their actions and the effect that can be achieved if people work together."

Acronyms

AD EHSMS	Abu Dhabi Environment, Health and Safety Management System
ADM	Abu Dhabi Municipality
ADTCA	Abu Dhabi Tourism & Culture Authority
AHRI	Air Conditioning, Heating and Refrigeration Institute
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
BCIS	Building Cost Information Service
BS	British Standard
BSI	British Standards Institute
BSRIA	Building Services Research and Information Association
CCA	Chromated Copper Arsenate
CDWMP	Construction & Demolition Waste Management Plan
CEMP	Construction Environmental Management Plan
CFD	Computational Fluid Dynamics
CITES	Convention on International Trade in Endangered Species
DOT	Department of Transport
DMA	Department of Municipal Affairs
EAD	Environment Agency Abu Dhabi
EHSMS	Environmental Health and Safety Management System
EIA	Environmental Impact Assessment
EPA	Environmental Permit Application
EU	European Union
EWS-WWF	Emirates Wildlife Society in association with WWF
FSC	Forest Stewardship Council
GCC	Gulf Co-operation Council
GFA	Gross Floor Area
GHG	Greenhouse Gas
GIS	Geographical Information System
GWP	Global Warming Potential
HVAC	Heating, Ventilating and Air Conditioning
IDP	Integrated Development Process
IECC	International Energy Conservation Code
IP	Innovating Practice
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LCC	Life Cycle Costing
LS	Liveable Spaces
NOC	No Objection Certificate
NS	Natural Systems
ODP	Ozone Depleting Potential
PCR	Preliminary Cultural Review
PEFC	Program for the Endorsement of Forest Certification
PER	Preliminary Environmental Review
PRDM	Public Realm Design Manual
PQP	Pearl Qualified Professional
PW	Precious Water
RE	Resourceful Energy

REC	Renewable Energy Certificate
RICS	Royal Institute of Chartered Surveyors
SCM	Supplementary Cementing Material
SEA	Strategic Environmental Assessment
SFI	Sustainable Forestry Initiative
SHGC	Solar Heat Gain Coefficient
SM	Stewarding Materials
SRI	Solar Reflectance Index
SUDS	Sustainable Urban Drainage System
TSS	Total Suspended Solids
UAE	United Arab Emirates
UPC	Abu Dhabi Urban Planning Council
USDM	Urban Street Design Manual
WWF	World Wildlife Fund

Units

h	hour
ha	hectares
K	Kelvin
kg	kilograms
km	kilometres
kW	kilowatt
kWh	kilowatt hour
l	litre
m	metre
MW	megawatt
MWh	megawatt hour
Pa	Pascals
s	second
W	Watt
yr	year

Glossary

The glossary for the Pearl Rating System is available on the Estidama website (www.upc.gov.ae).

Adaptive species	A plant species which has adapted to the local climate that is drought and/or saline tolerant.
Admixture	A material other than water, aggregates, lime, or cement, used as an ingredient of concrete or mortar, and added immediately before or during the mixing process.
Aggregate	The particulate material used in construction including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates.
Albedo	The amount of solar energy reflected by a surface.
Area of probable impact	The extent of a physical area occupied by an environmental component that is likely to be impacted by at least one of the phases of the proposed project. The boundary of the area of probable impact is determined by measurements, previous studies, models or best professional judgment and may vary by environmental component. In simple terms the extent of the area outside of the project area that is likely to be directly or indirectly impacted by the proposed project.
As-built drawings	Final drawings produced by the contractor upon completion of the project. They reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the work completed under the contract.
Asbestos	A fibrous mineral formerly used for making incombustible or fireproof articles. The inhalation of asbestos fibres can cause serious illnesses, including malignant lung cancer, mesothelioma, asbestosis and gastro-intestinal cancer.
Audit	A systematic process of objectively obtaining and assessing evidence, including physical inspections and verification.
Benchmark	A standard against which something can be measured or judged.
Building envelope	The elements of a building that separate conditioned spaces from the exterior.
Carbon emissions	The release of carbon (or carbon dioxide) into the atmosphere.
Carrying capacity	The maximum number of organisms or amount of biomass that can be supported in a given area.
Central monitoring system	A central point for the storage and monitoring of information.
Chromated Copper Arsenate (CCA)	A chemical wood preservative containing chromium, copper and arsenic.
Climate change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.
Clock time	The artificial time used in everyday life to standardise time measurements. It allows people in difference locations to use the same time or to easily convert time from one location to another.
Coastal environment	A coastal environment is defined as the area lying at the interface between land and sea). It includes both the zone of shallow water within which waves are able to move sediment and the area landward of this zone, including beaches, cliffs

	and coastal dunes up to a distance of 100m.
Coefficient of performance (COP) - cooling	The ratio of the net cooling energy exported from the system to the total electric power used by the system.
Commissioning	The process of ensuring that newly constructed/installed systems (HVAC, plumbing, electrical, fire/life safety, building security etc.) operate as designed and meet the performance requirements of the building occupant.
Commissioning agent	An individual with responsibility for co-ordinating and monitoring the commissioning process.
Compensation	The measures taken to make up for the loss of, or permanent damage to, biological resources through the provision of replacement areas. Any replacement area should be similar to or, with appropriate management, have the ability to reproduce the ecological functions and conditions of those biological resources that have been lost or damaged.
Compost	A mixture of decomposed organic matter used to improve soil structure and provide nutrients.
Connectivity	A measure of the functional availability of the habitats needed for a particular species to move through a given area.
Construction waste	The unwanted material generated during construction, including demolition waste.
Desalinization	The removal of salt from water.
Development Review Process	The Urban Planning Council's process for reviewing development proposals.
District cooling	The centralized production and distribution of cooling energy.
Environmental component	An attribute or constituent of the environment (i.e. air quality, marine waters, waste management, geology, seismicity, soil, groundwater, marine ecology, terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project.
Environmental design	The process of addressing surrounding environmental parameters when devising plans, programmes, policies, buildings or products. Environmental design in the traditional sense develops physical environments to meet one or more aesthetic or day-to-day functional needs, or to create a specific sort of experience.
Environmental impact	The positive or negative impact that occurs to an environmental component as a result of the proposed project. This impact can be directly or indirectly caused by the project's different phases (i.e. construction, operation and decommissioning).
Environmental Impact Assessment (EIA)	The assessment of the possible impacts (both positive and negative) that a proposed development may have on the environment, covering natural, social and economic aspects.
Equinox	Either of the two times of the year when the sun crosses the plane of the earth's equator and day and night are of equal length.
Evapotranspiration	The transport of water into the atmosphere from surfaces, including soil and vegetation.
Fareej	A Fareej (plural Firjan) is an urban system, based on a social structure resulting from the interaction between families, through which the community, particularly women and children can safely roam. Associated with a fareej are sikkak, barahaat and meydeen.
Fossil fuel	A fuel manufactured from a hydrocarbon deposit such as petroleum, coal or

	natural gas derived from living matter of a previous geologic time.
General contractor	The contractor with the main responsibility for performing/supervising the construction of a project. The general contractor hires all the subcontractors and suppliers for the project.
Geothermal	The heating and/or cooling potential of the ground.
Global Warming Potential (GWP)	An indicator that reflects the relative effect of a greenhouse gas in terms of climate change considering a fixed time period, such as 100 years (GWP100). The GWPs for different emissions can then be added together to give one single indicator that expresses the overall contribution to climate change of these emissions.
Green infrastructure	A strategically planned and managed network of wilderness, parks, greenways, conservation easements and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for communities and people.
Greenhouse gas (GHG)	A gas which absorb infrared radiation (heat) and contributes to the greenhouse effect (examples include water vapour, carbon dioxide, methane etc.).
Gross Floor Area (GFA)	The sum of the floor areas of the spaces within a building, including basements, mezzanines and intermediate floors, and penthouses with an internal height of 2.3m or greater. It is measured from the exterior faces of the exterior walls or from the centreline of walls separating buildings. It excludes covered walkways, porches, pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.
Groundwater	The water that occurs below the surface of the earth where it occupies spaces in soils or geological strata.
Habitat	A place in which a particular plant or animal lives. Often used in the wider sense referring to major assemblages of plants and animals found together.
Habitat creation	The establishment of an ecosystem on land that did not previously support that ecosystem, or on severely altered sites.
Heat rejection	The removal of heat from a system, commonly water based.
Hydrozones	Grouping plants into hydrozones is an approach to irrigation and planting design where plants with similar water needs are grouped together in an effort to conserve water.
Key Performance Indicator (KPI)	An indicator set in a key area to measure performance.
Landscaping	The planting, configuration and maintenance of trees, ground cover, shrubbery, decorative natural and structural features (walls, fences, hedges, trellises, fountains, and sculptures), earth patterning and bedding materials, and other similar site improvements that serve an aesthetic or functional purpose.
Life Cycle Cost (LCC) analysis	An analysis of building impacts covering the consecutive and interlinked stages of a constructed building, from raw material acquisition to the final disposal.
Living system	An open self-organizing system that has the special characteristics of life and interacts with its environment. This takes place by means of information and material-energy exchanges.
Meydaan	A Meydaan (plural Meydeen) is a plaza area used for community use and activity such as for religious, cultural, commercial and/or recreational purposes.
Microclimate	The localised climate conditions within an urban area or neighbourhood.

Mitigation	The measures taken to avoid or reduce negative impacts.
Native species	Indigenous species living naturally within a given area.
Non-renewable energy	The energy derived from a fossil fuel source.
Open area	The area of opening through which air exchange occurs between indoors and outdoors. It is not the same as the whole window area (glass and frame) and is typically much smaller and depends on the opening style of the window.
Operational waste	The waste produced as a result of operating/running a building e.g. office waste, landscaping waste, food waste.
Organic waste	The carbon-containing waste derived from animal and plant materials.
Ozone Depletion Potential (ODP)	The relative amount of degradation to the ozone layer a chemical compound can cause. The ODP of CFC-11 is 1 and the ODPs of other compounds are calculated relative to this.
Permeable paving	Paving designed to allow water to pass through its surface using porous asphalt or concrete or using interlocking concrete permeable pavers or open grid pavers.
Phase I habitat survey	A field survey technique which provides a relatively rapid method to record semi-natural and natural vegetation and other wildlife habitats, designed to cover large areas relatively rapidly.
Photovoltaics	Cells that produce a voltage when exposed to radiant energy (especially light). The main application is the conversion of solar radiation to usable energy.
Plan 2030	The plan which has been designed to help Abu Dhabi filter all planning decisions through environmental, social and economic development criteria. The full title is the Abu Dhabi 2030 Urban Structure Framework Plan.
Preliminary Environmental Review (PER)	A review to identify, at the earliest possible stage, the potential environmental impacts associated with a proposed development.
Previously developed land	Any land that is, or was, occupied by a permanent structure including the land up to the plot boundary of the permanent structure and any associated fixed surface infrastructure. It excludes any land occupied by agriculture or forestry and any parks or recreational grounds.
Priority habitats	The habitats identified in Abu Dhabi Emirate which are of exceptional value and are highly threatened, including Intertidal Mudflats, Mangroves, Vegetated Sandy Beaches, Marine (seagrass, coral), Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes, Alluvial Plains and Jebels. Refer to Brown and Boer, 2004 for detailed habitat types.
Priority species	A protected species (flora or fauna) or species determined to be critically endangered, endangered, vulnerable, threatened, near threatened or sensitive (as defined by the International Union for Conservation of Nature, IUCN, UAE Red Data list and/or EHSMS).
Project site area	The physical area within which activities of the proposed project will take place (the boundary of the project area is defined by the titled property boundary).
Public Realm	Publicly used land or right of way.
Public Open Space	Parks, plazas and similar open space areas that are reserved and dedicated for public access and use. This includes publicly accessible open space that is located on privately owned land.
Receptacle and	All miscellaneous and plug loads within a building e.g. office equipment, kitchen

process loads	equipment, elevators etc.
Recyclable material	Any raw or processed material than can be recycled.
Recycled water	The water discharged from a wastewater treatment system, treated to reduce the concentration of any substance or organism that may be detrimental to public health or the environment and made suitable for reuse.
Recycling	The processing of previously used materials to create new products.
Remediation	In the context of contaminated land, remediation prevents contaminated land from harming the environment and restores the land to safe and usable conditions.
Renewable energy	The energy derived from a renewable source e.g. solar, wind, tidal.
Renewable Energy Certificate (REC)	A tradable energy commodity that represents proof that a unit of energy was generated from an eligible renewable source.
Restoration	The altering of an area in such a way as to re-establish an ecosystem's structure and function, usually bringing it back to its original (pre-disturbance) functioning.
Roof	The upper portion of the building envelope that is horizontal or tilted at an angle of less than 60° from horizontal.
Run-off	The water that is not absorbed by the soil or landscape to which it is applied and therefore flows from the area. For example, run-off may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or where there is a severe slope.
Salvage	To save discarded or damaged material for further use.
Security lighting	The lighting provided to deter intruders and protect property.
Service water heating	The heating of water for domestic or commercial purposes other than space heating and process requirements.
Significant asset	An asset which is of significant importance (internationally, nationally, regionally and/or locally), including: ▪ Priority Habitats; ▪ Any other habitat identified as significant through a Development Review Process, the Coastal Development Guidelines, an Environmental Impact Assessment, a Preliminary Environmental Review or a Strategic Environmental Assessment; and ▪ Priority species.
Sikka	A Sikka (plural Sikkak) is a pathway which is the smallest denomination of street that permeates a fareej. They are narrow, irregular and shaded, taking residents to and from community facility destinations. Sikkak correspond to key pedestrian routes.
Small Stand-alone Streetscape Projects	Individual streetscapes, not forming part of a wider network, less than 1km length, and not part of a master plan project that has previously gone through UPC Development Review.
Smart meter	An advanced meter that identifies consumption in more detail than a conventional meter. Smart metering is designed to provide utility customers with information on a real time basis about their domestic energy consumption. This may include data on how much gas and electricity they are consuming, the cost and the impact of their consumption on greenhouse gas emissions.
Solar radiation	The thermal energy from the sun, including the infrared, visible and ultraviolet wavelengths.

Solar Reflectance Index (SRI)	The measure of a material's ability to reflect solar heat on a scale of 0 to 100. A standard black material has an SRI of 0 and a standard white material has an SRI of 100.
Solar time	The time according to the position of the sun in the sky relative to one specific location on the ground. In solar time, the sun is always due south in Abu Dhabi at exactly noon. This means that someone a few miles east or west of you will realise a slightly different solar time than you, although clock time would be the same. Also known as local solar time.
Stormwater	The excess water created during precipitation events.
Street	A public or private right-of-way, other than a major or secondary highway or alley, whose function is to carry vehicular traffic or provide vehicular access to abutting property.
Sub-meter	A utility meter that allows for the monitoring of usage on a portion of a distribution system past a main meter.
Suitably qualified professional	An individual with: ▪ a degree in a relevant subject; ▪ a minimum of five years directly relevant work experience; and ▪ a proven track record on working on similar projects in the region. The Environment Agency Abu Dhabi (www.ead.ae) holds a list of consultants carrying out a range of environmental services within the Emirate of Abu Dhabi. For other consultants, appropriate evidence must be submitted to demonstrate meeting the criteria above.
Summer solstice	The time at which the sun is at its northernmost point in the sky (southernmost point in the southern hemisphere), appearing at noon at its highest altitude above the horizon. It occurs on 21st June (22nd December in the southern hemisphere).
Transit Shed	The 350 m catchment radius from the centre of a transit station (light rapid transit, bus rapid transit or metro).
Transit station	A public transport station such as a railway station or metro station.
Transit stop	A dedicated public bus or tram stop.
Transition Months	The shoulder months to the summer period, which include March, April, October and November.
Valuable asset	A feature of ecological value, including healthy, native trees or shrubs.
Vegetated wall	A wall that is partially or completely covered with plants and a growing medium.
Walkway	A path/route intended for pedestrian use such as a concrete or asphalt surface or continuous blocks of pavers.
Wastewater	Water that has been adversely affected in quality by human activity. Wastewater is a source of a potentially valuable resource including biosolids, nutrients and water.
Water feature	An artificial body of water such as a pool or fountain.
Water model	An analytical tool for understanding how much potable water is used in a building and to determine volumes of all demands and sources including potable and other potential sources of water, including greywater, recycled water and stormwater harvesting.

Appendix A: Relationship between Public Realm, Building & Villa Rating Systems

The Pearl Rating Systems address common regionally relevant sustainability measures and challenges. The Public Realm, Building and Villa Rating Systems have been developed concurrently to ensure a strong relationship between the three systems. The following table provides a summary of the commonality between the systems.

Public Realm	Building	Villa
Integrated Development Process		
IDP-R1 Integrated Development Strategy	IDP-R1 Integrated Development Strategy	IDP-R1 Integrated Development Strategy
IDP-2 Guest Worker Accommodation	IDP-R3 Guest Worker Accommodation	IDP-R2 Guest Worker Accommodation
IDP-R3 Commissioning	IDP-R4 Basic Commissioning	IDP-R3 System & Envelope Performance Verification
IDP-1 Life Cycle Costing	IDP-1 Life Cycle Costing	IDP-1 Life Cycle Costing
IDP-R4 Construction Environmental Management	IDP-2 Construction Environmental Management	IDP-2 Construction Environmental Management
IDP-3 Sustainability Awareness	IDP-5 Sustainability Communication	IDP-3 Sustainability Communication
Natural Systems		
NS-R1 Natural Systems Assessment	NS-R1 Natural Systems Assessment	NS-R1 Natural Systems Assessment & Protection
NS-R2 Natural Systems Protection	NS-R2 Natural Systems Protection	NS-R1 Natural Systems Assessment & Protection
NS-R3 Natural Systems Design & Management Strategy	NS-R3 Natural Systems Design & Management Strategy	NS-1 Landscape Design & Management Plan
NS-1 Reuse of Land	NS-1 Reuse of Land	
NS-2 Remediation of Contaminated Land	NS-2 Remediation of Contaminated Land	
NS-3 Landscape Enhancement	NS-3 Ecological Enhancement	NS-2 Landscape Enhancement
NS-4 Habitat Creation & Restoration	NS-4 Habitat Creation & Restoration	
Liveable Spaces, Liveable Buildings and Liveable Villas		
LS-R2 Site & Context Assessment	LBo-R2 Urban Systems Assessment	LV-R1 Urban Systems Assessment
LS-R1 Outdoor Thermal Comfort	LBo-R3 Outdoor Thermal Comfort Strategy	LV-R2 Outdoor Thermal Comfort
LS-R3 Transit Supportive Practices & Connectivity	LBo-6 Public Transport	LV-4 Public Transport

LS-1 Active Urban Environments	LBo-4 Active Urban Environments	LV-3 Community Facilities & Active Urban Environments
IDP-R2 Sustainable Buildings	LBo-2 Pearl Rated Communities	LV-1 Pearl Rated Community
Precious Water		
PW-R2 Water Monitoring & Leak Detection	PW-3 Water Monitoring & Leak Detection	PW-R2 Water Monitoring
PW-R1 Water Efficiency	PW-2.1 Exterior Water Use Reduction: Landscaping	PW-2.1 Exterior Water Use Reduction: Landscaping
PW-2 Water Features	PW-2.3 Exterior Water Use Reduction: Water Features	PW-2.2 Exterior Water Use Reduction: Water Features
PW-R3 Stormwater Management	PW-4 Stormwater Management	PW-3 Stormwater Management
Resourceful Energy		
RE-R2 Energy Monitoring & Reporting	RE-R2 Energy Monitoring & Reporting	RE-R2 Energy Monitoring
RE-1 Renewable Energy	RE-6 Renewable Energy	RE-3 Renewable Energy
Stewarding Materials		
SM-R1 Hazardous Materials Elimination	SM-R1 Hazardous Materials Elimination	SM-R1 Hazardous Materials Elimination
SM-R2 Basic Construction Waste Management	SM-R2 Basic Construction Waste Management	SM-R2 Basic Construction Waste Management
SM-R3 Operational Waste Management	SM-R3 Basic Operational Waste Management	
SM-3 Regional Materials	SM-9 Regional Materials	SM-4 Regional Materials
SM-4 Recycled Materials	SM-10 Recycled Materials	SM-5 Recycled Materials
SM-R6 Legal, Reused & Certified Timber	SM-12 Reused or Certified Timber	SM-6 Reused or Certified Timber
SM-1 Improved Construction Waste Management	SM-13 Improved Construction Waste Management	SM-7 Improved Construction Waste Management
SM-2 Organic Waste Management	SM-15 Organic Waste Management	
Innovating Practice		
IP-1 Showcase of Regional & Cultural Practices	IP-1 Innovative Cultural & Regional Practices	IP-1 Innovative Cultural & Regional Practices
IP-2 Innovating Practice	IP-2 Innovating Practice	IP-2 Innovating Practice

Acknowledgements

Abu Dhabi Urban Planning Council (UPC)

UPC Project Reviewers

External TAC Stakeholders

- Western Region Municipality
- Al Ain City Municipality
- Abu Dhabi City Municipality
- Abu Dhabi Civil Defence
- Abu Dhabi Police
- Abu Dhabi Tourism and Culture Authority
- Musanada
- Environment Agency Abu Dhabi

Other Contributors

The UPC would like to thank all other organisations, universities and individuals who have participated in the development of the Public Realm Rating System.