SUNREF Mauritius, the lending programme that promotes green and inclusive growth

27 October 2021

Caudan Arts Center,

Port-Louis

Developed by

With the financial participation of

In partnership with

Implemented by

Programme

09h00 : Welcome

09h30 : Context and objective of the workshop

09h35 : Welcome address by Mr. Ram Bahadoor, Executive Director of CIDB

09h40 : Philippe Beutin, General Coordinator of SUNREF Technical Assistance

Vulnerability and adaptation levels of the Construction sector in Mauritius to Climate Change

09h55 : Annelidé Sherratt, Head of Department of Green Building Certification, Solid Green Consulting

Ratings tools options for Mauritius and related fees to achieve certification, Pathways to Net Zero Building

10h35 : Avinash Ramessur, Local Coordinator of SUNREF Technical Assistance

Business case for Green Buildings

10h55 : Vimal Motee, Project Manager of SUNREF Technical Assistance

SUNREF: eligible investments, criteria and process

11h10 : Q&A

12h00 : End of workshop

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- **09h35 :** Welcome address, Ram Bahadoor (CIDB)
- **09h40 :** Philippe Beutin
  Vulnerability of the construction sector
- **09h55 :** Annelidé Sherratt
  Pathways to net-zero buildings
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  SUNREF: eligible investments and criteria
- **11h10 :** Q&A
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09h30

Context and objective of the workshop

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Mickaël Apaya

Head of SUNREF Technical Assistance

Head of Sustainability & Inclusive Growth, Business Mauritius

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Welcome address

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Ram Bahadoor

Executive Director,

Construction Industry Development Board (CIDB)

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Vulnerability and adaptation levels of the Construction sector in Mauritius to Climate Change

Vulnerability and adaptation levels of the Construction sector in Mauritius to Climate Change

Philippe Beutin

General Coordinator of SUNREF Technical Assistance

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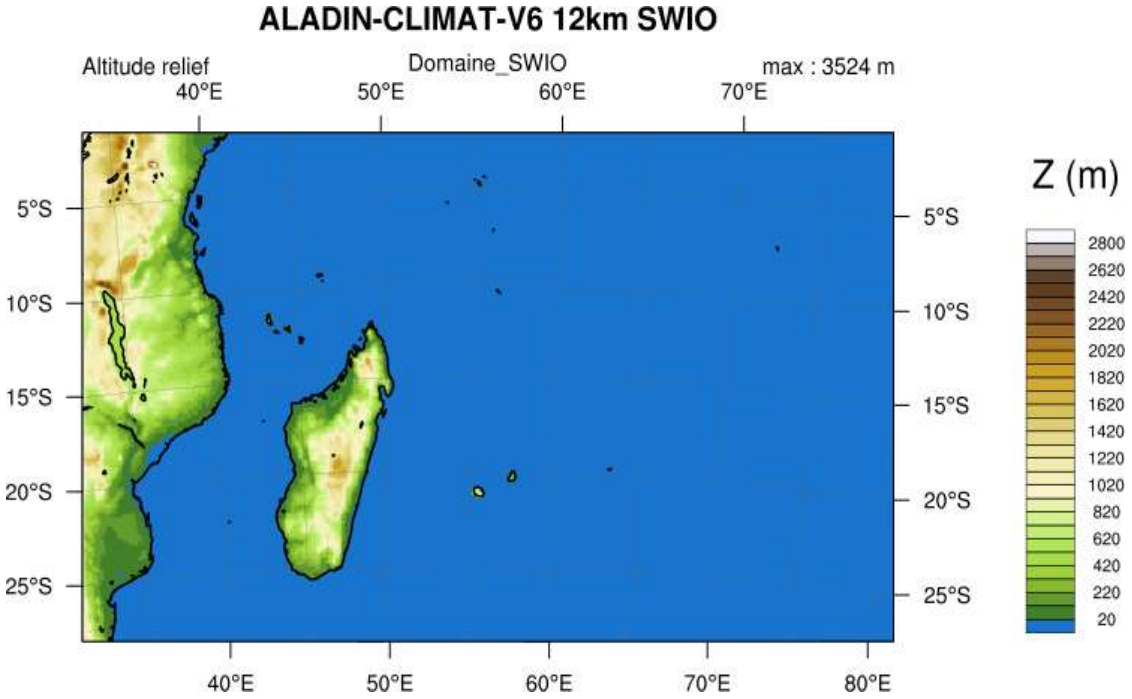
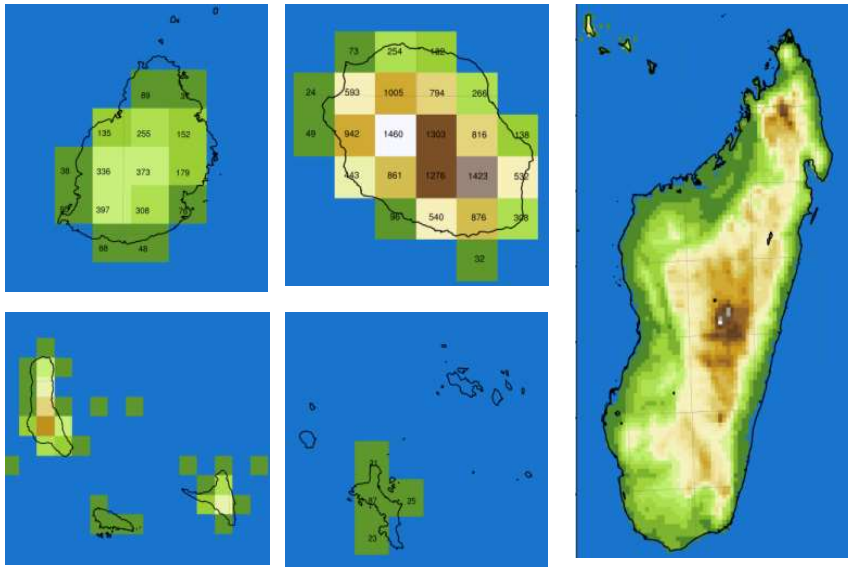
- Contexte climatique à Maurice et vulnérabilité du secteur de la construction
  - Quels enjeux en lien avec les impacts du Changement Climatique ?
- Des outils au service de l'analyse environnementale : « Carbon Footprint Assessment »

1- Contexte climatique: l'outil BRIO / Modèle climatique sous la Coordination COI/Météo-France

- ✓ Mise en œuvre d'un modèle climatique régional : ALADIN-climat (résolution 12 km)
- ✓ Enjeux : préciser les impacts attendus à l'échelle des territoires de la région SWIO (ressource en eau, habitat, énergie, agriculture…). Développement d'applications orientées utilisateur (projet de portail régional)





Le projet BRIO (Building Resilience in Indian Ocean) sur la période 2018-2021 vise à développer des projections climatiques haute résolution qui décriront le climat de la région jusqu'à l'horizon 2100

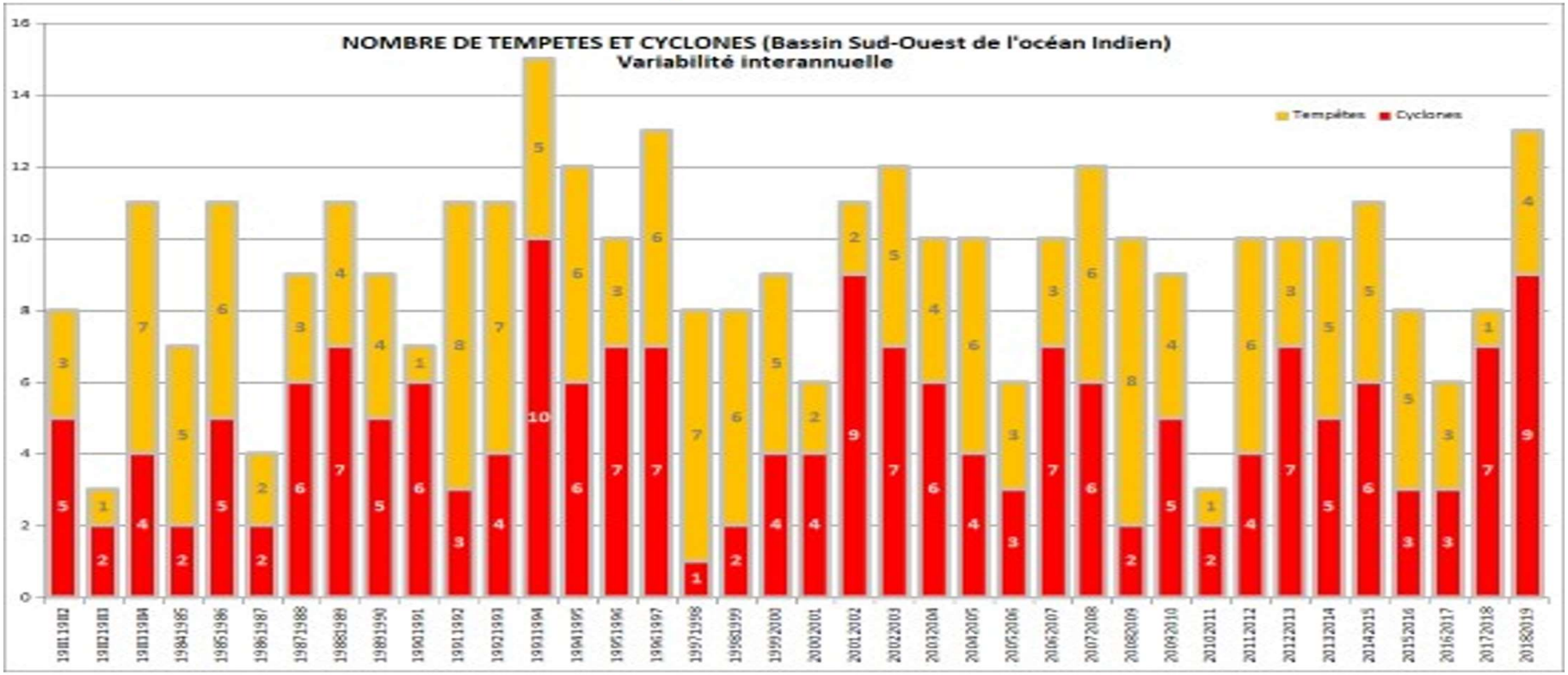
Un projet d'intérêt collectif majeur

□ Production d'un ensemble de jeux de données du climat futur à partir des simulations climatiques globales et/ou régionales disponibles, permettant une meilleure estimation des impacts attendus sur les secteurs d'activités climato-sensibles comme:

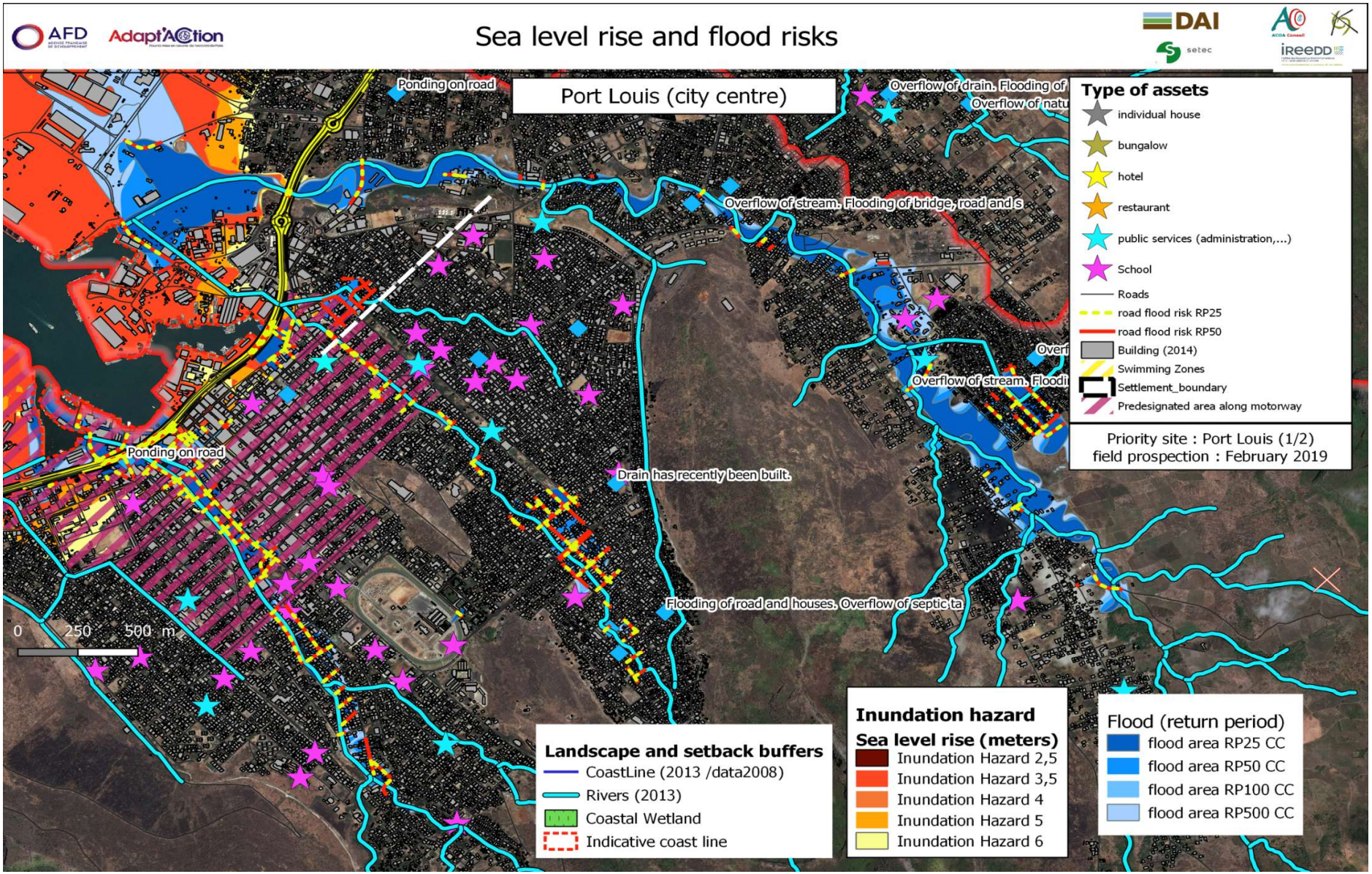
- Agriculture: conséquences du stress hydrique (saison sèche), gestion des ravageurs
- **Construction: patrimoine existant et nouvelles constructions**
- Transport: infrastructures en particulier ouvrages …
- Systèmes de production électrique et infrastructures…

□ Accent porté sur les principales vulnérabilités au changement climatique: formation d'un public d'utilisateurs…dans les secteurs les plus impactés par les effets induits

L'activité cyclonique



L'activité cyclonique sur le bassin sud-ouest de l'océan Indien présente une forte variabilité interannuelle et inter décennale Aucune tendance n'est, dans l'état actuel des connaissances, décelable sur le nombre de systèmes tropicaux affectant notre région durant les 40 dernières années


Sea level rise and flood risks
AFD
AdaptA©tion
DAI
setec
iReedd
Port Louis (city centre)
Ponding on road
Overflow of drain. Flooding of
Overflow of natu
Overflow of stream. Flooding of bridge, road and s
Overf
Overflow of stream. Floodi
Ponding on road
Drain has recently been built.
Flooding of road and houses. Overflow of septic ta
0 250 500 m
Type of assets
individual house
bungalow
hotel
restaurant
public services (administration,...)
School
Roads
road flood risk RP25
road flood risk RP50
Building (2014)
Swimming Zones
Settlement_boundary
Predesignated area along motorway
Priority site : Port Louis (1/2)
field prospection : February 2019
Landscape and setback buffers
CoastLine (2013 /data2008)
Rivers (2013)
Coastal Wetland
Indicative coast line
Inundation hazard
Sea level rise (meters)
Inundation Hazard 2,5
Inundation Hazard 3,5
Inundation Hazard 4
Inundation Hazard 5
Inundation Hazard 6
Flood (return period)
flood area RP25 CC
flood area RP50 CC
flood area RP100 CC
flood area RP500 CC

2 - La vulnérabilité climatique du secteur de la construction

Une vulnérabilité climatique qui se décline comme suit, impliquant des réponses en matière d'adaptation:

❶ Dégradation du confort thermique en relation avec les vagues de chaleur plus fréquentes et intenses qui nécessitent d'adapter la conception des bâtiments tant dans l'existant que dans la construction neuve (vers la conception bioclimatique)

❷ Impacts sur les ouvrages bâtis face aux évènements intenses :

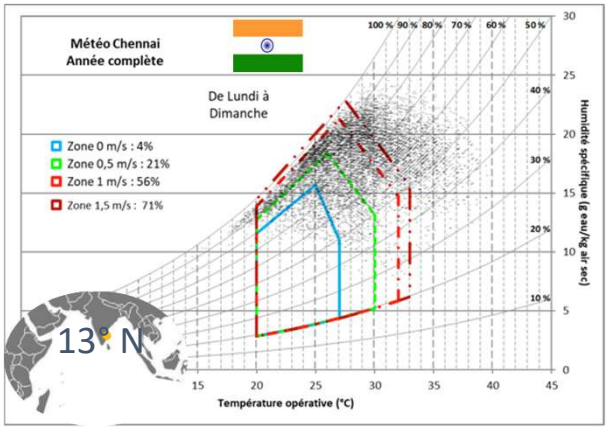
i) pluviométrie intense localisée,

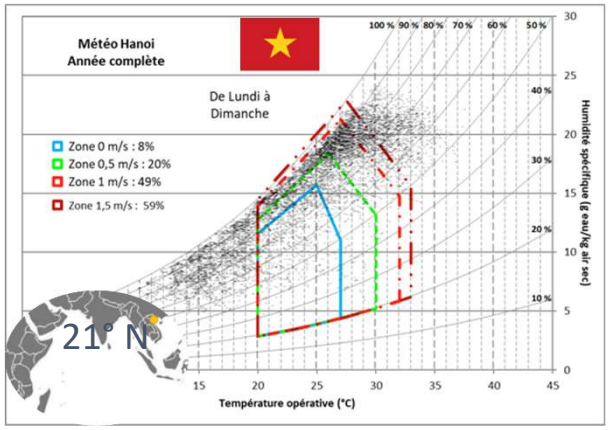
ii) cyclones réguliers: Maurice / Rodrigue sur une trajectoire plus impactante,

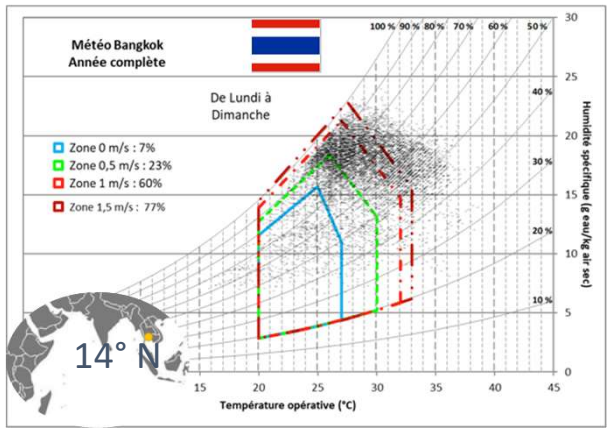
iii) risques de phénomènes de submersion, en zone côtière, où se situent des activités économiques importantes (ex : zones hôtelières et résidentielles)

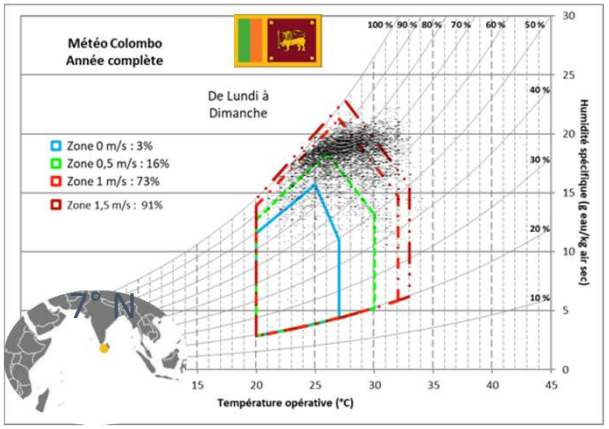
Collaborations internationales dans le cadre 'COP 21

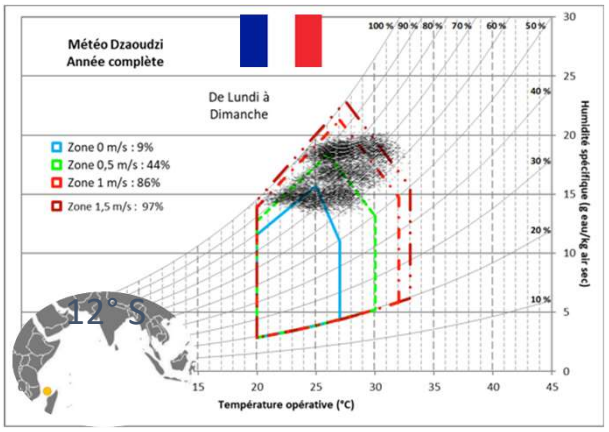
Dégradation du confort thermique en relation avec les vagues de chaleur plus fréquentes (couple: température/hygrométrie)

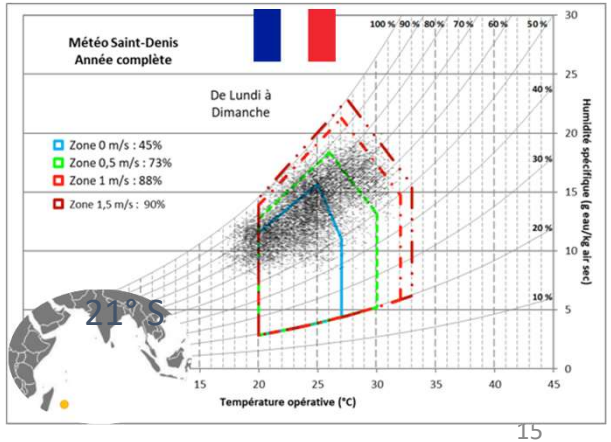












3- Quels enjeux en lien avec les impacts du changement climatique: identifier les solutions

Impact du changement Climatique

i) Montée du niveau marin, et atteinte des zones à forte sensibilité environnementale avec impact sur la biodiversité en zone tropical (patrimoine UICN)

ii) Risques de submersion **en zone côtière** : phénomènes d'érosion dus à la houle, atteintes majeures sur des zones urbanisées ou touristiques proches du rivage

iii) Régime cyclonique : conjonction de phénomènes intenses y compris vents violents, risques sur les ouvrages bâtis (ponts par exemple)

iv) Tempêtes tropicales plus fréquents avec des conséquences sur la gestion des eaux pluviales dans des zones sensibles (risques d'inondtions)

v) Vague de chaleur ayant un impact sur le confort thermique au sein des bâtiments résidentiels et tertiaires avec effets d'îlots de chaleur localisés

Solutions apportées

i) Mesurer l'impact sur la biodiversité et mise sur pied de plans de protection côtiers (infrastructures)

ii) Systèmes de protection en mer ou sur les côtes et ouvrages de protection à proximité des zones aménagées pour éviter les risques de submersion marine

iii) Structures constructives pouvant faire face aux vents violents, ou venue d'eau soudaine avec renforcement des fondations des ouvrages construits (ouvrages, infrastructures, bâtiments en zones sensibles …

iv) Renforcement des infrastructures de collecte avec drains adaptés au flux et gestion des eaux pluviales (avec bassins de rétention, et alimentation de réseaux d'irrigation…) à une échelle spatiale adaptée

iv) Améliorer l'isolation thermique des bâtiments en fonction de l'aérologie (régime des vents) au niveau des parois des bâtiments, végétalisation au contact des bâtiments et gestion bioclimatique avec solutions passives (ventilation traversante, isolation optimale, protection solaire, climatisation intelligente…)

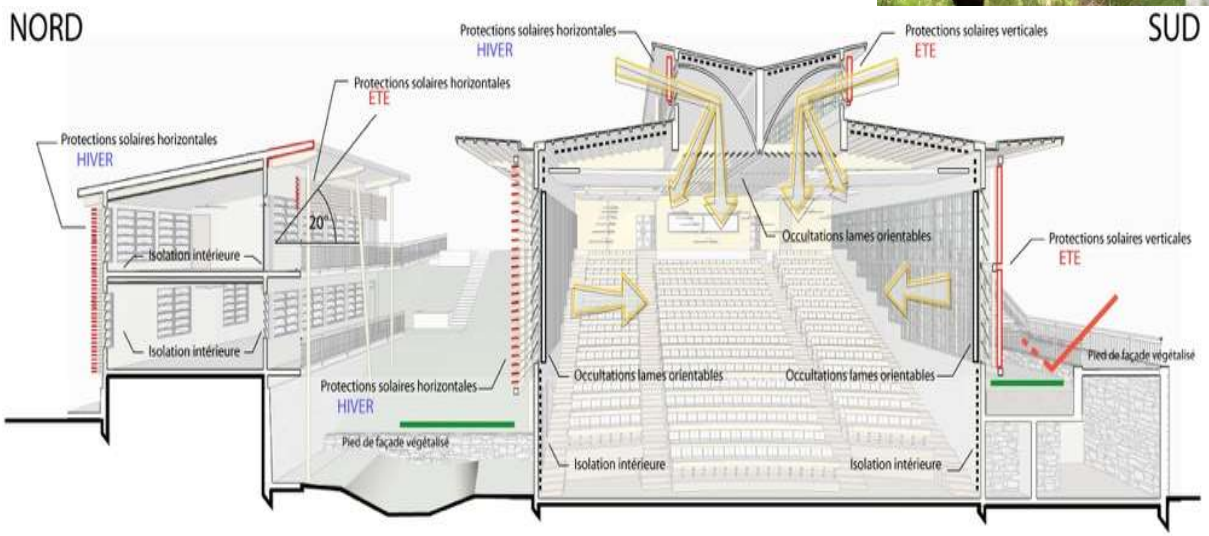
Partage d'expériences dans un cadre partenarial construit lors de la COP 21: solutions mises en œuvre

Global Alliance for Buildings and Construction


MAERSK

Green Campus avec conception optimale avec ventilation traversante sans climatisation

Facteur 4: réduction des consommations d'énergie



4- Des outils au service de l'analyse environnementale : ''Carbon Footprint Assessment''

Un cadre ''normative'' en évolution pour traiter l'analyse environnementale des projets

● **ISO 14 000** (Gestion environmentale): MSB bien impliqué dans la mise en oeuvre des normes ''ISO 14064 and ISO 14065'' pour prendre en compte les emissions de gaz à effet de serre, les principes de verification et les aspects de trading (http://msb.intnet.mu/)

● **ISO 16745**, ''Sustainability in buildings and civil engineering works – Carbon metric of an existing building during use stage, Parts 1 and 2'', constitue une série de méthodes de calculs, reporting, communication et de verification des emissions de CO2 pendant la vie d'un projet de bâtiment.

● **Certification schemes for Greenfield buildings:** vers la conception bioclimatique ou vers l'approche ''Net Zero Energy Buildings'' avec les Manuels complets pour aborder la phase de conception des constructions..avec toutes les solutions possibles

Principes et périmètres de l'analyse

Principe

- Addition de toutes les émissions de gaz à effet de serre que le projet entraîne (par rapport à son inexistence)
- Utilisation de données réelle ou estimées, et de « facteurs d'émission »
- Unité : la « tonne équivalent CO2 » (avec ratios par m², par logement, etc.)

Périmètre :

- Conception (maîtrise d'ouvrage, ingénierie, etc.)
- Construction (élaboration des matériaux primaires, mise en œuvre, fabrication et livraison des équipements)
- Utilisation (confort thermique, éclairage artificiel, etc.)
- Activités associées (déplacements contraints, restauration, etc.)
- Réhabilitation en cours de vie
- Démolition du bâtiment et recyclage des matériaux

Projet TEC-TEC: bâtiments tertiaires

Objectif général :

- Développer une méthode d'évaluation des bâtiments tertiaires à énergie positive et à faible impact carbone pour les îles françaises (Outremer)

Objectifs spécifiques :

- Réduire l'impact général du bâtiment : en conception, mise en œuvre, activité et fin de vie
- Faire évoluer les filières du bâtiment vers moins d'impact
- Faire émerger des filières nouvelles locales vertueuses (Maurice)
- Impulser de nouvelles pratiques par le biais d'un outil d'aide à la décision
- Développer des bâtiments à faible empreinte carbone

Cadre d'analyse en faveur de l'empreinte carbone des projets

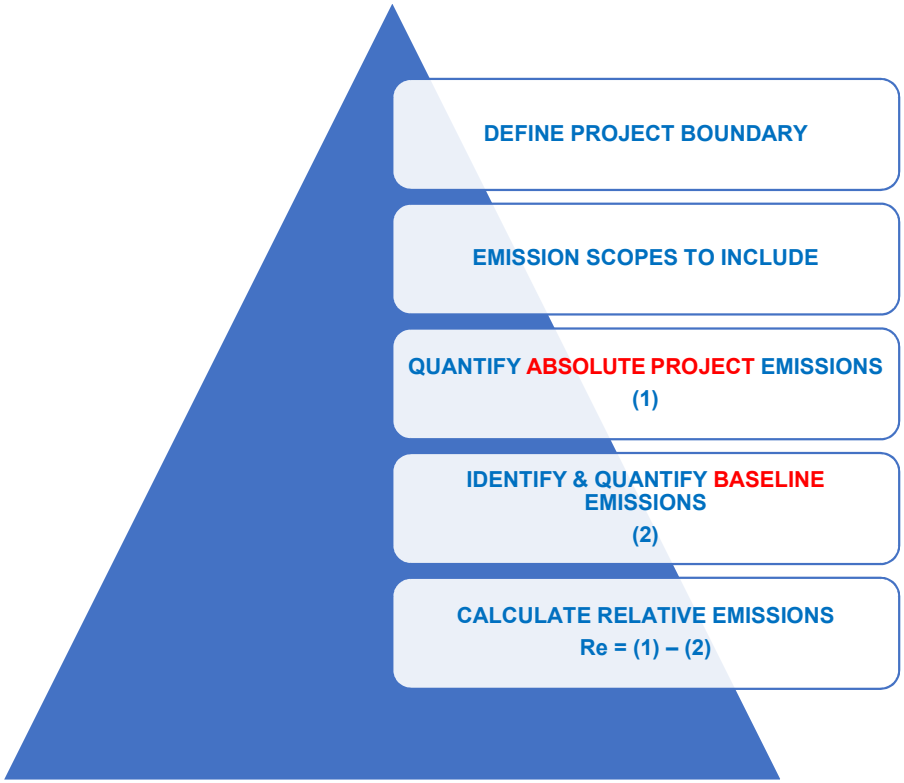
AETS - CIBOLA Partners

Carbon Footprint Assessment rules

i. CO2 eq Emissions by sources and sectors: general overview
ii. What are the key sectors in Mauritius to consider ?
i) Main GHG: priorities
ii) Carbon Footprint Analysis: Direct and indirect emissions
iii) Project boundaries: absolute and relative emissions
iv) Project analysis: Scope 1 and 2 as a first step
v) Activities /Project calculation methodology with major steps
vi) Case studies

Cadre d’analyse en faveur de l’empreinte carbone des projets

AETS - CIBOLA Partners



Source et documentation de reference

- EIB Project Carbon Footprint Methodologies (July 2020)
  - Methodologies for the Assessment of Project GHG Emissions and Emission Variations

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Ratings tools options for Mauritius and Pathways to Net Zero Building

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Annelide Sherratt,

Head of Department of Green Building Certification,

Solid Green Consulting

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RATING TOOL OPTIONS FOR MAURITIUS

CERTIFICATION OPTIONS

Excellence In Design
For Greater Efficiencies

Edge

greenstar

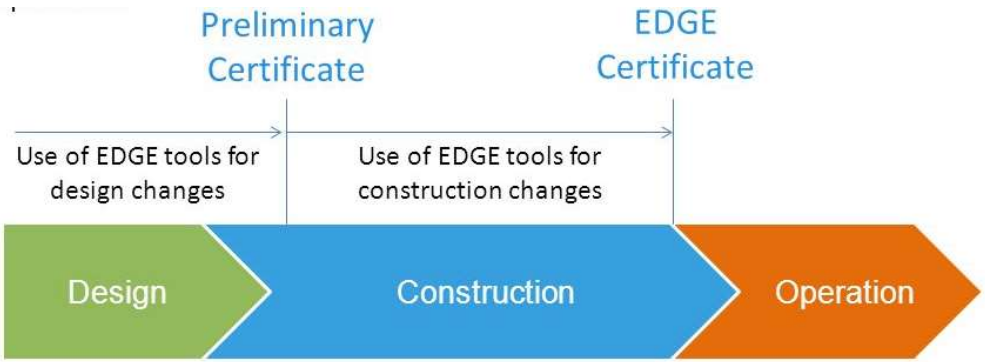
CODE FOR A SUSTAINABLE BUILT ENVIRONMENT
BREEAM

Certification System Options

Endorsement labels provide no information and purely serve as a 'seal of approval'

Excellence In Design
For Greater Efficiencies

Edge



EDGE Certified - 20% Less Energy: choose from efficient HVAC system, superior glass low-energy lighting, solar solutions, and more

EDGE Advance - 40% Less Energy
EDGE Zero Carbon - 100% Less Energy

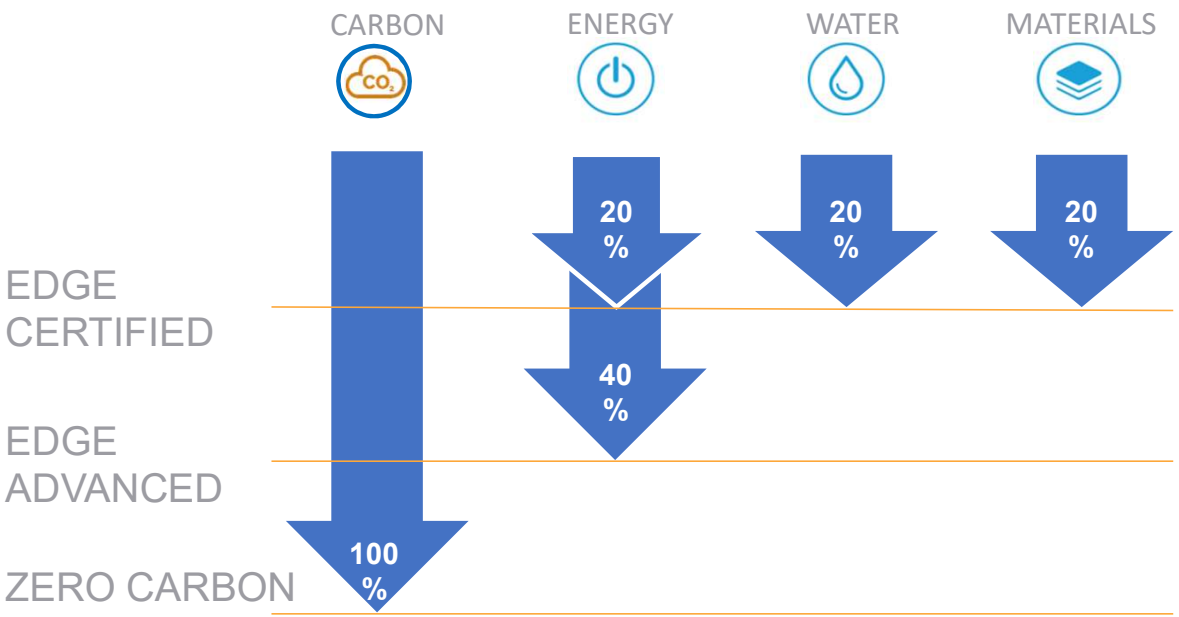
20% Less Water: choose from low-flow faucets, efficient water closets, recycled water systems, and more.

20% Less Embodied Energy in Materials: choose from floor, roof, wall and window construction with low embodied energy.

Excellence In Design For Greater Efficiencies

Edge

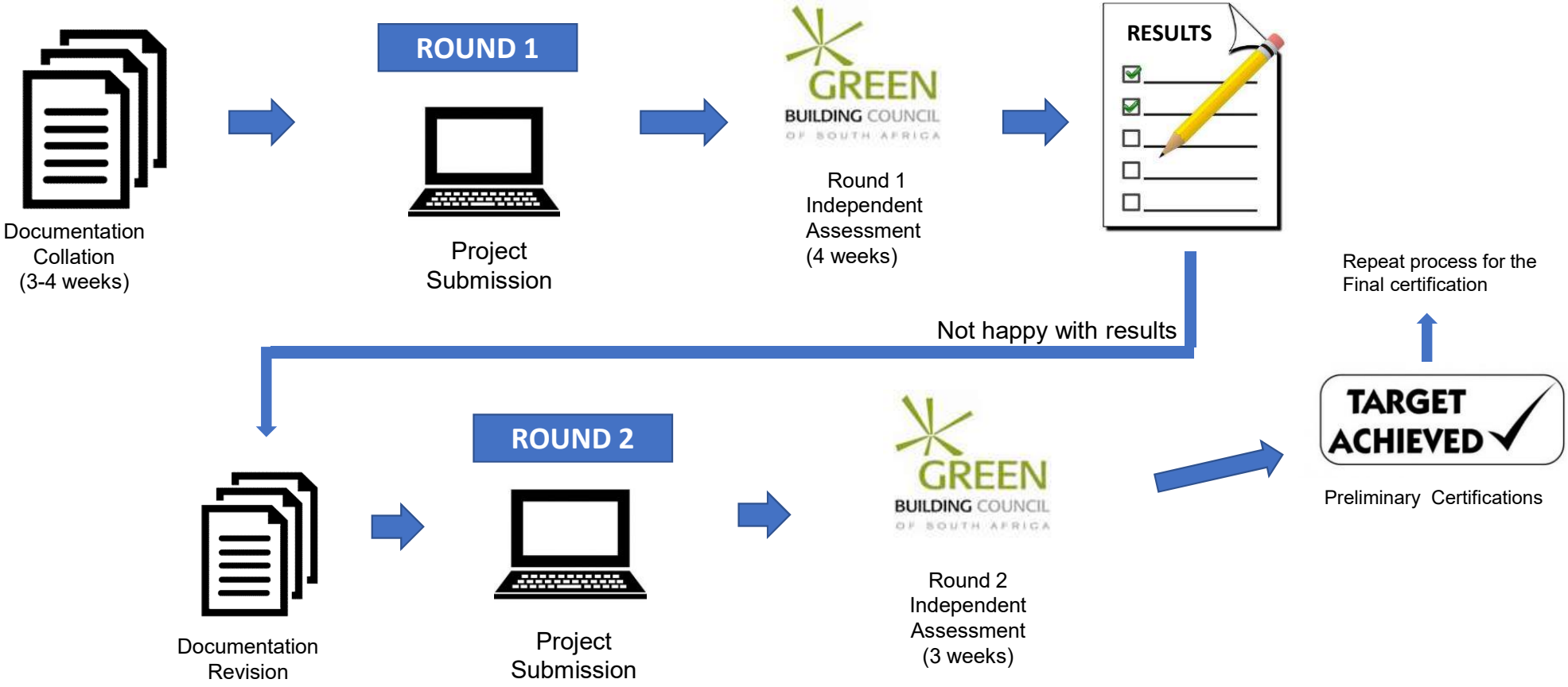
CHOOSE YOUR LEVEL OF SAVINGS DEPENDING ON YOUR ASPIRATIONS



IFC International Finance Corporation WORLD BANK GROUP

Creating Markets, Creating Opportunities

Certification Process



GBCSA Certification

Range (number of units in project)	Member Cost		Non-Member	
	Exclusive VAT	Inclusive VAT	Exclusive VAT	Inclusive VAT
Base fee and prelim certification fee for 1 unit	R 15 695,65	R 18 050,00	R 19 565,22	R 22 500,00
Post Construction fee per submission for 1 unit	R 15 695,65	R 18 050,00	R 19 565,22	R 22 500,00
Base fee and prelim certification fee for 2-50 units	R 20 565,22	R 23 650,00	R 25 695,65	R 29 550,00
Post Construction fee per submission for 2-50 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 51-100 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Post Construction fee per submission for 51-100 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 101-200 units	R 67 434,78	R 77 550,00	R 84 304,35	R 96 950,00
Post Construction fee per submission for 101-200 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 201-300 units	R 97 739,13	R 112 400,00	R 122 130,43	R 140 450,00
Post Construction fee per submission for 201-300 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 301-500 units	R 144 652,17	R 166 350,00	R 180 782,61	R 207 900,00
Post Construction fee per submission for 301-500 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 501-1000 units	R 191 565,22	R 220 300,00	R 239 391,30	R 275 300,00
Post Construction fee per submission for 501-1000 units	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00
Base fee and prelim certification fee for 1000 Units and Greater	R 285 347,83	R 328 150,00	R 356 652,17	R 410 150,00
Post Construction fee per submission for 1000 Units and Greater	R 36 217,39	R 41 650,00	R 45 217,39	R 52 000,00

The consortium of Sintali - SGS and GBCI (Green Business Certification Inc.) Certification Fees

Item	Sintali SGS	GBCI	
Registration	$ 300.00		$ 300.00
Certification	$ 2 400.00	0-25'000 SQM	$0.27 per sqm, min $2.250
		25'000-50'000 SQM	$0.22 per sqm, min $6.750
		>50'000 SQM	$ 11 000.00
https://edgebuildings.com/certify/certifiers/			

greenstar

For every phase of a project

Neighbourhoods & Precincts

New Build & Major Refurbs Interior Fitouts

Existing Building Performance

GREEN BUILDING COUNCIL SOUTH AFRICA

greenstar

NEW BUILDING & MAJOR REFURBISHMENT

+ CUSTOM TOOLS

ASSESSES DESIGN & AS BUILT/OPERATIONS, ONCE OFF

+

SEC

INTERIORS

ASSESSES AS BUILT, ONCE OFF

EXISTING BUILDING PERFORMANCE

EWP ENERGY WATER PERFORMANCE V1

ENERGY WATER PERFORMANCE

ASSESSES OPERATIONS, ON-GOING

PRECINCT

ASSESSES INITIAL, ONGOING AND AS BUILT

NET ZERO

ASSESSES DESIGN & AS BUILT /OPERATIONS, ONGOING

EDGE RESIDENTIAL

Excellence In Design For Greater Efficiencies

Edge

ONCE OFF

Certification System Options

Better performance is denoted by number of stars (Green Star)

★★★★ greenstar
4 Star Green SA Certified Rating
Weighted Score: 45-59
Recognises: Best Practice

★★★★★ greenstar
5 Star Green SA Certified Rating
Weighted Score: 60-74
Recognises: South African Excellence

★★★★★★ greenstar
6 Star Green SA Certified Rating
Weighted Score: 75-100
Recognises: World Leadership

GREEN BUILDING COUNCIL SOUTH AFRICA

greenstar

GREEN STAR CATEGORIES

MANAGEMENT
INDOOR ENVIRONMENTAL QUALITY
ENERGY
WATER
TRANSPORT
MATERIALS
LAND USE AND ECOLOGY
EMISSIONS
INNOVATION

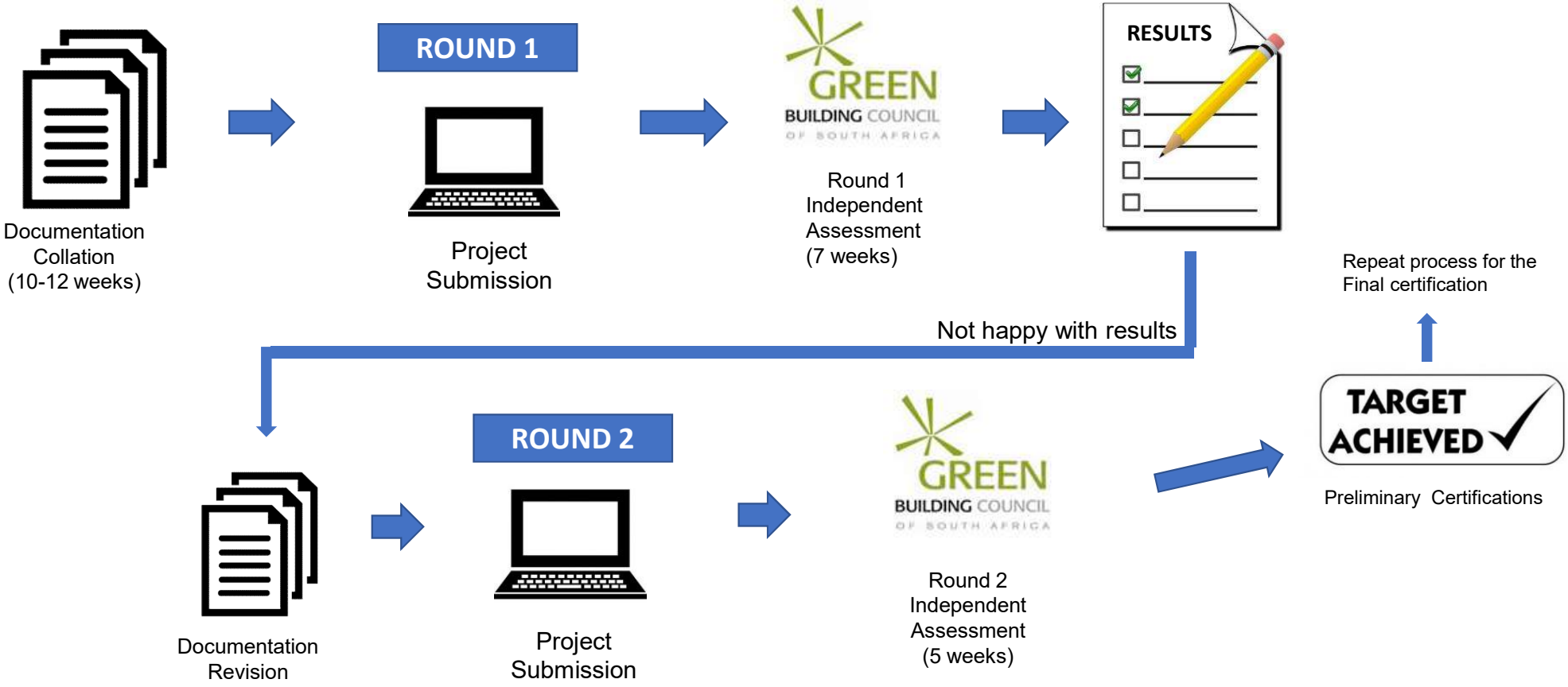
GREEN STAR SA –Rating tool

- Commissioning is ***optional***
- Energy Requirements are related to IEQ-09 Thermal Comfort within the units
- Water requirements are structured differently from LEED – not necessarily easier to target
- Innovation points can be targeted up to 10 points
- Industry (consultants and contractors) very familiar with the system
- Certification at tender stage is possible

GREEN STAR SA- Pre-Requisites

- ENE-00 Minimum Energy Performance
- ECO-00 Ecological Value
  - Not located on prime agricultural land
  - Is not located on vegetation of high ecological value or within a 100 meter buffer of vegetation of high ecological value
  - Is not located on land with confirmed presence or high probability of threatened red listed species, or within a defined buffer relevant to the specific threatened red listed species or habitat found
  - Is not located within the required buffer zones of watercourses:
    - Not within 100 year floodplain
    - Not within 100m of high ecological watercourse
    - If within 100m of not high ecological water course, mandatory requirements for Watercourse protection and Light Pollution apply

Certification Process



Project area GFA	AFRICA			
	Member Cost		Non-Member	
	Ghana, Kenya, Mauritius, Namibia	Other	Ghana, Kenya, Mauritius, Namibia	Other
< 1 500 m^2	R 64 486,96	R 53 739,13	R 80 921,74	R 67 434,78
1 500 - 2 499 m^2	R 86 817,39	R 72 347,83	R 120 834,78	R 100 695,65
2 500 - 4 999 m^2	R 114 939,13	R 95 782,61	R 157 147,83	R 130 956,52
5 000 - 9 999 m^2	R 133 721,74	R 111 434,78	R 180 573,91	R 150 478,26
10 000 - 19 999 m^2	R 171 234,78	R 142 695,65	R 220 486,96	R 183 739,13
20 000 - 39 999 m^2	R 201 704,35	R 168 086,96	R 257 947,83	R 214 956,52
40 000 - 69 999 m^2	R 229 878,26	R 191 565,22	R 293 113,04	R 244 260,87
> 70 000 m^2	R 257 947,83	R 214 956,52	R 340 017,39	R 283 347,83

Note Certification Fees for Projects in Africa

The GBC project certification fees will be equal to the fees quoted, plus, where relevant, an additional fee paid to the relevant country GBC to cover their operational expenses related to project certification.

***Comparative labels** allow* consumers to compare performance among similar products

Better performance is denoted by rarer metal (LEED)

LEED New Construction v4

- Commissioning is ***mandatory***
- Energy targets are quite stringent, but not linked to Thermal Comfort
- Material credits are challenging in Version 4
- Certification can only be achieved after practical completion
- Easy Regional Priority Credits (4 points)
- 5 Exemplary Performance (Innovation) points
- International Recognition

LEED - Pre-Requisites

- Construction Activity Pollution Prevention
- Outdoor Water use Reduction
- Indoor Water Use Reduction
- Building-Level Water Metering
- Fundamental Commissioning and Verification
- Minimum Energy Performance
- Building-Level Energy Metering
- Fundamental Refrigerant Management
- Storage and Collection of Recyclables
- C&D Waste Management
- Minimum Indoor Air Quality Performance
- Environmental Tobacco Smoke Control

LEED CATEGORIES

LOCATION AND TRANSPORTATION
SUSTAINABLE SITES
WATER EFFICIENCY
ENERGY AND ATMOSPHERE
MATERIALS AND RESOURCES
INDOOR ENVIRONMENTAL QUALITY
INNOVATION
REGIONAL PRIORITY

https://www.usgbc.org/tools/leed-certification/pricing-tool

Price Estimate

Estimate On: 26 Oct 2021, 12:41:43 pm

Product	LEED
Country	Mauritius
Currency	USD - United States Dollar

Project Type: Individual Project **Rating System:** LEED v4 BD+C: New Construction Request: 1

Item	Timeline							
	Precert + Combined		Combined		Precert + Split		Split	
	Member*	Non Member	Member*	Non Member	Member*	Non Member	Member*	Non Member
Registration	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00
Precertification Preliminary Review	$ 4,000.00	$ 5,000.00	--	--	$ 4,000.00	$ 5,000.00	--	--
A - 2,500 sq m								
|--- Design and Construction Preliminary Review	$ 2,850.00	$ 3,420.00	$ 2,850.00	$ 3,420.00	--	--	--	--
|--- Design Preliminary Review	--	--	--	--	$ 2,325.00	$ 2,740.00	$ 2,325.00	$ 2,740.00
|--- Construction Preliminary Review	--	--	--	--	$ 775.00	$ 910.00	$ 775.00	$ 910.00
Total	**$ 8,050.00**	**$ 9,920.00**	**$ 4,050.00**	**$ 4,920.00**	**$ 8,300.00**	**$ 10,150.00**	**$ 4,300.00**	**$ 5,150.00**

*USGBC Silver level and higher. For additional information on USGBC membership please visit www.usgbc.org.

Estimate On: 26 Oct 2021, 01:21:41 pm

Product	LEED
Country	Mauritius
Currency	USD - United States Dollar

Project Type: Individual Project **Rating System:** LEED v4 BD+C: New Construction Request: 1

Item	Timeline							
	Precert + Combined		Combined		Precert + Split		Split	
	Member*	Non Member	Member*	Non Member	Member*	Non Member	Member*	Non Member
Registration	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00	$ 1,200.00	$ 1,500.00
Precertification Preliminary Review	$ 4,000.00	$ 5,000.00	--	--	$ 4,000.00	$ 5,000.00	--	--
A - 30,000 sq m								
|--- Design and Construction Preliminary Review	$ 17,760.45	$ 21,312.54	$ 17,760.45	$ 21,312.54	--	--	--	--
|--- Design Preliminary Review	--	--	--	--	$ 14,531.28	$ 17,114.62	$ 14,531.28	$ 17,114.62
|--- Construction Preliminary Review	--	--	--	--	$ 4,843.76	$ 5,812.51	$ 4,843.76	$ 5,812.51
Total	**$ 22,960.45**	**$ 27,812.54**	**$ 18,960.45**	**$ 22,812.54**	**$ 24,575.04**	**$ 29,427.13**	**$ 20,575.04**	**$ 24,427.13**

*USGBC Silver level and higher. For additional information on USGBC membership please visit www.usgbc.org.

NOTE:

- All estimates are based on the Gross Floor Area (visit https://www.usgbc.org/help/what-gross-floor-area) provided. As these inputs change, the price will vary accordingly. Please note that prices are subject to change.
- To register, please visit LEED Online at www.leedonline.com.
- LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class strategies and practices. The Green Business Certification Inc. (GBCI) administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED system.

TOTAL POINTS:

55

CATEGORY SCORES:

- MANAGEMENT
- INDOOR ENVIRONMENTAL QUALITY
- ENERGY
- TRANSPORT
- WATER
- MATERIALS
- LAND USE AND ECOLOGY
- EMISSIONS
- INNOVATIONS

FLOOR AREAS:

TOTAL GROSS FLOOR AREA (GFA):	13,493 m²
TOTAL COMMERCIAL OFFICE AREA:	11,629 m²
CAR PARKING AREA:	10,472 m²

CASE STUDY PROJECT IN MAURITIUS

MON TRESOR BUSINESS GATEWAY

Plaine Magnien, District of Grand Port, Mauritius

4 Star Green Star – Office Design v1.1

greenstar AFRICA South Africa — Office Design v1.1 — 4 Star Rating Best Practice CERTIFIED JULY 2018 — GREEN BUILDING COUNCIL SOUTH AFRICA

PROJECT TEAM:

OWNER
MAREF Mon Tresor Investments 1 Ltd

ACCREDITED PROFFESSIONAL
Enerxis Solutions Ltd and Solid Green Ltd

ARCHITECT
Architects' Studio Ltd and Boogertman & Partners Ltd

ELECTRICAL ENGINEER
GMF Ltd

FIRE ENGINEER
GMF Ltd

LIFT SPECIALIST
GMF Ltd

MECHANICAL ENGINEER
GMF Ltd

QUANTITY SURVEYORS
MLC Ltd

STRUCTURAL ENGINEERS
Lux Consult Ltd

SUSTAINABLE DESIGN REVIEW
Enerxis Solutions Ltd

SUSTAINABLE BUILDING CONSULTANT
Enerxis Solutions Ltd

WET SERVICES
GMF Ltd

MAIN CONTRACTOR
Building Construction Engineering Ltd

PROJECT MANAGER
Etwaro & Associates Ltd

ENVIRONMENTAL CONSULTANT
Enerxis Solutions Ltd

INTERIOR DESIGNER
Architects' Studio Ltd

WASTE CONTRACTOR
Green Ltd

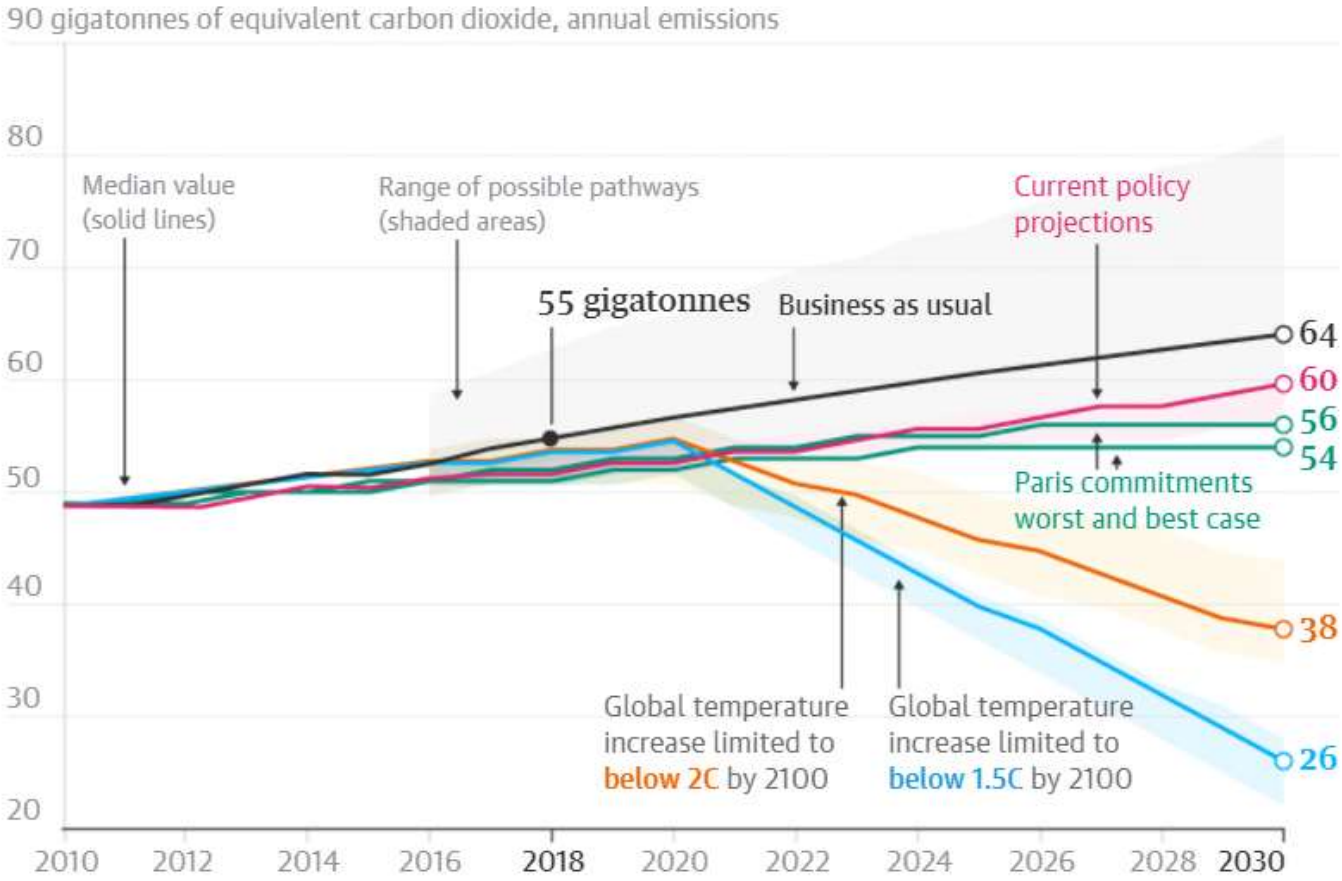
ACOUSTIC CONSULTANT
GMF Ltd

CLEANING CONTRACTOR
Green Ltd

LANDSCAPE MANAGEMENT COMPANY
Bidvest TopTurf Mauritius

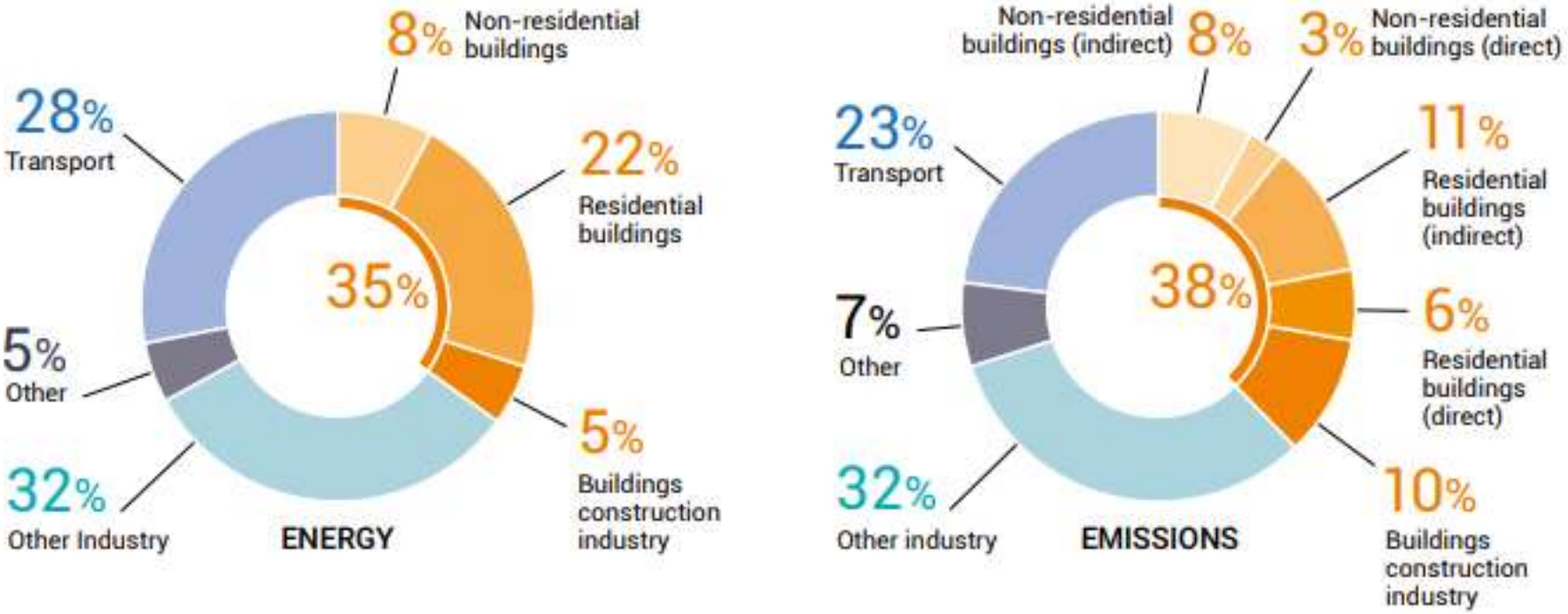
NET ZERO

Today's carbon emissions must be halved to restrain global temperature increases to 1.5C



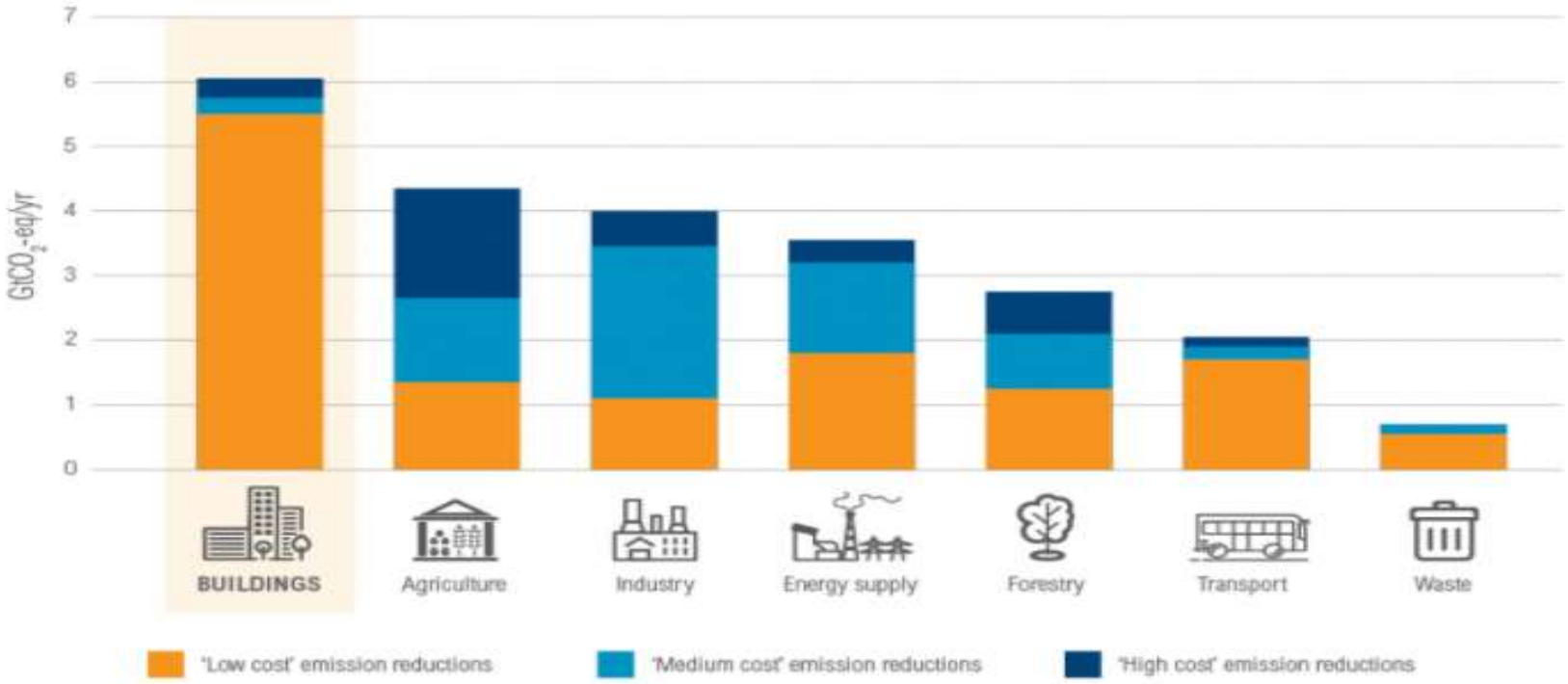
Guardian graphic. Source: Unep Emissions Gap Report

Global share of buildings and construction final energy and emissions, 2019



Notes: Buildings construction industry is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

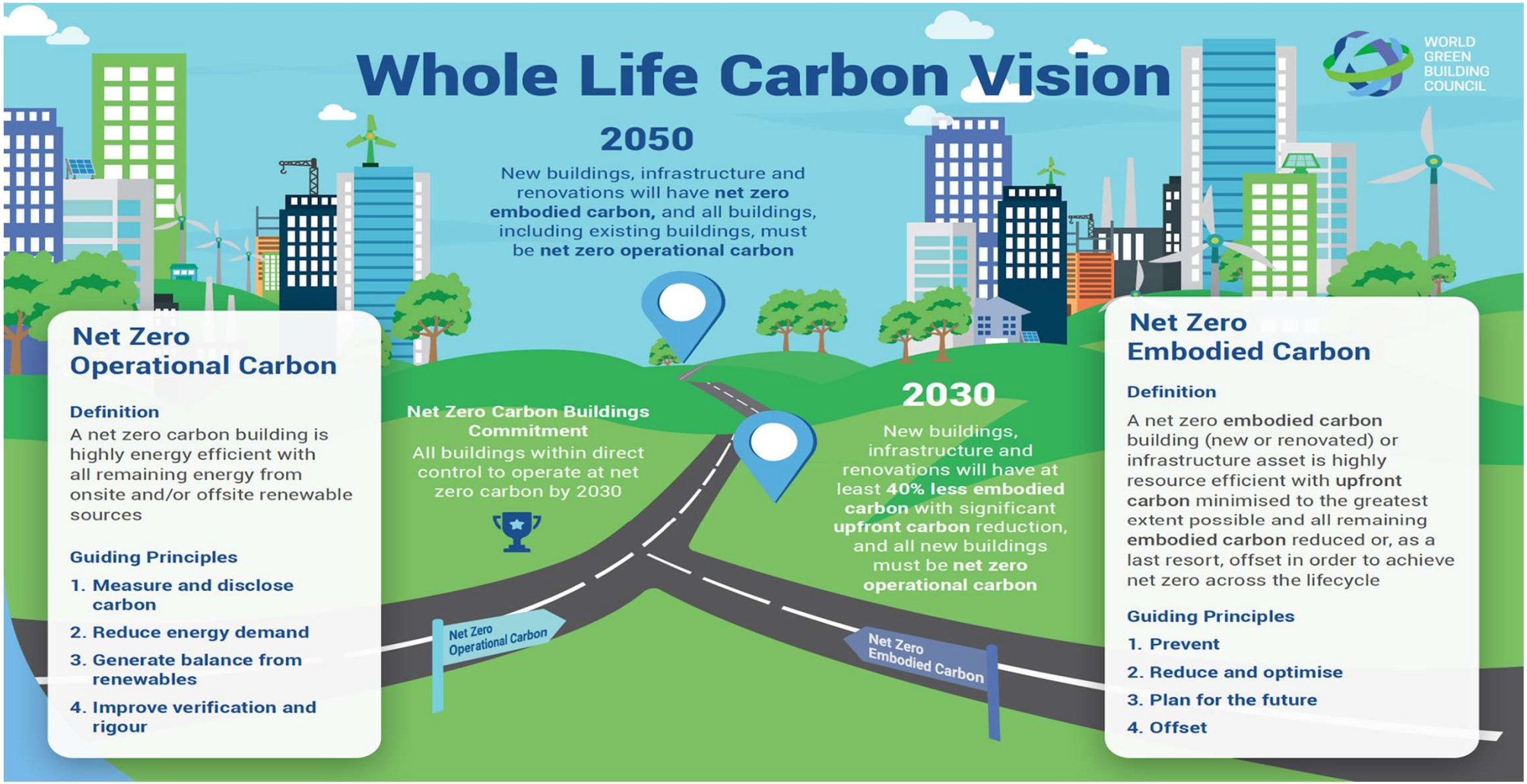
Building Efficiency Is One of the Most Affordable Ways to Cut Emissions



Note: 'Low cost' emission reductions = carbon price <20 US$/tCO$_2$-eq. 'Medium cost' emission reductions = carbon price <50 US$/tCO^2-eq.
'High cost' emission reductions = carbon price <100 US$/tCO$_2$-eq.
Source: IPCC. 2007. IPCC Fourth Assessment Report: Climate Change 2007: Synthesis Report. "4.3 Mitigation options." https://www.ipcc.ch/publications_and_data/ar4/syr/en/mains4-3.html

wri.org/buildingefficiency

WORLD RESOURCES INSTITUTE


Whole Life Carbon Vision
WORLD GREEN BUILDING COUNCIL
2050
New buildings, infrastructure and renovations will have net zero embodied carbon, and all buildings, including existing buildings, must be net zero operational carbon
Net Zero Operational Carbon
Definition
A net zero carbon building is highly energy efficient with all remaining energy from onsite and/or offsite renewable sources
Guiding Principles
1. Measure and disclose carbon
2. Reduce energy demand
3. Generate balance from renewables
4. Improve verification and rigour
Net Zero Carbon Buildings Commitment
All buildings within direct control to operate at net zero carbon by 2030
2030
New buildings, infrastructure and renovations will have at least 40% less embodied carbon with significant upfront carbon reduction, and all new buildings must be net zero operational carbon
Net Zero Operational Carbon
Net Zero Embodied Carbon
Net Zero Embodied Carbon
Definition
A net zero embodied carbon building (new or renovated) or infrastructure asset is highly resource efficient with upfront carbon minimised to the greatest extent possible and all remaining embodied carbon reduced or, as a last resort, offset in order to achieve net zero across the lifecycle
Guiding Principles
1. Prevent
2. Reduce and optimise
3. Plan for the future
4. Offset

Advancing Net Zero in numbers

May 2020

ADVANCING NET ZERO

27

Green Building Councils participating in the Advancing Net Zero project, actively working to advance net zero carbon buildings

17

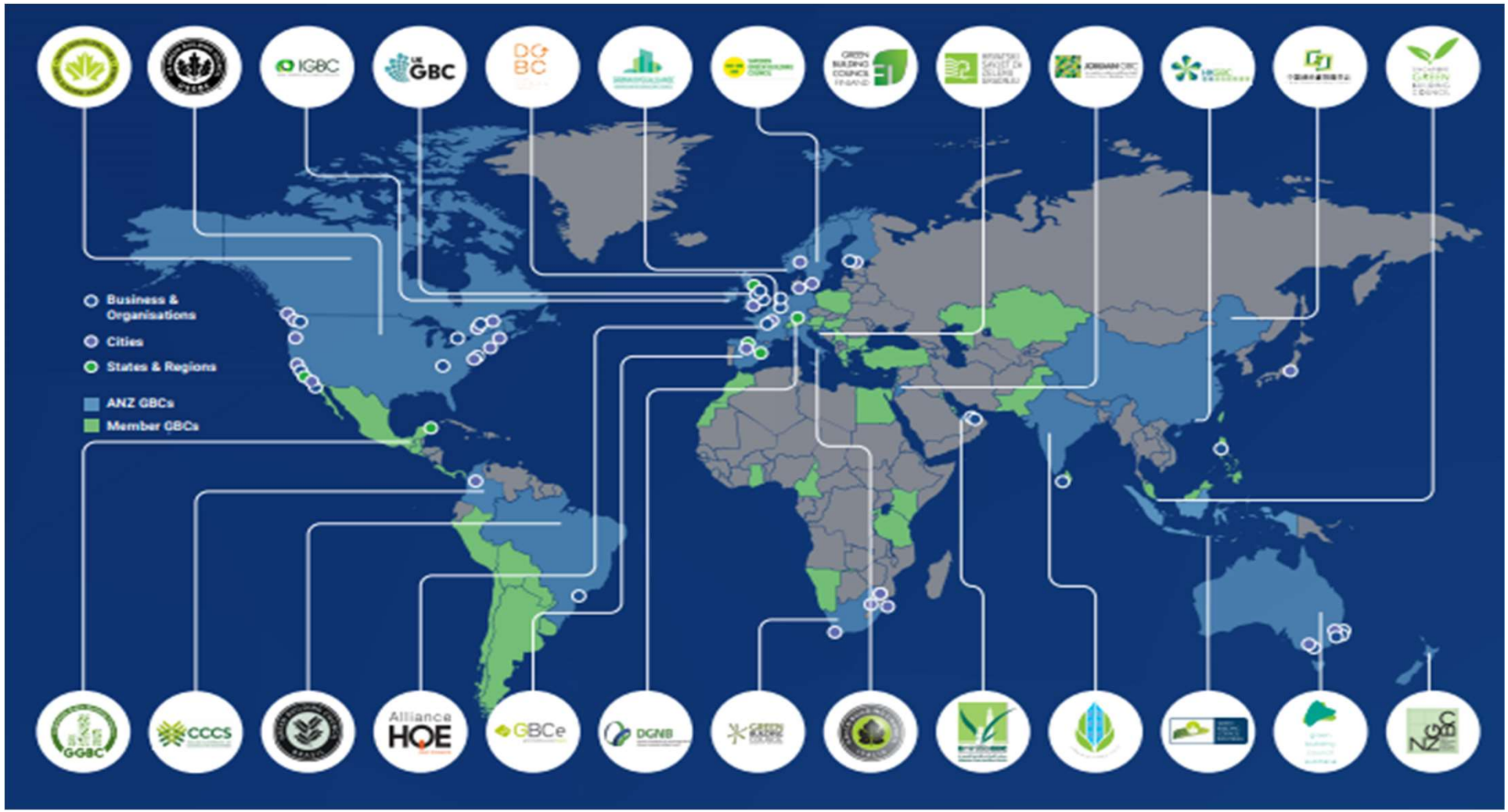
Green Building Councils with adopted or adapted certification schemes and programmes launched

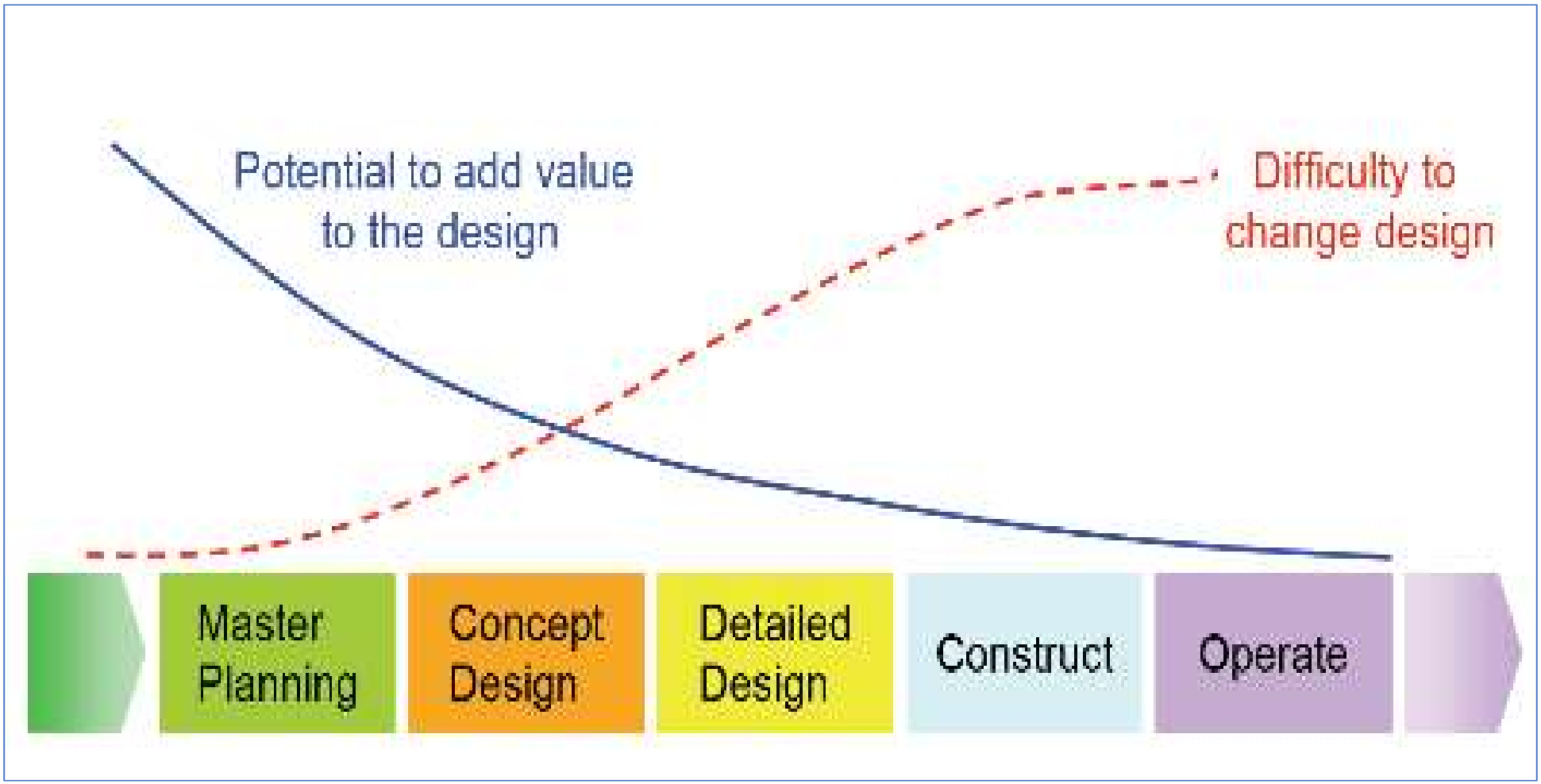
418

Buildings certified net zero through GBC schemes

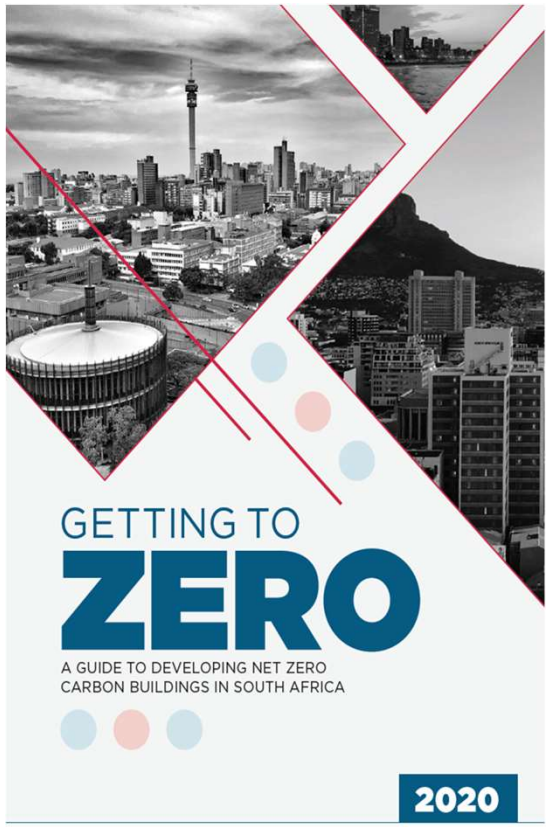
95

Net Zero Carbon Buildings Commitment signatories (full list on page 33)


Business & Organisations
Cities
States & Regions
ANZ GBCs
Member GBCs
IGBC
UK GBC
DGBC
GREEN BUILDING COUNCIL FINLAND
JORDAN GBC
GGBC
CCCS
Alliance HQE
GBCe
DGNB


Potential to add value to the design
Difficulty to change design
Master Planning
Concept Design
Detailed Design
Construct
Operate

Getting to Zero…



*"a building that is **highly energy-efficient**, with the **remaining energy requirement generated from renewable energy**, preferably on-site or off-site where absolutely necessary".*
- GBCSA

I.e. Zero net carbon emissions on an annual basis

ETHEKWINI MUNICIPALITY
C40 CITIES
ASHRAE South Africa Chapter
SEA SUSTAINABLE ENERGY AFRICA
GREEN BUILDING COUNCIL SOUTH AFRICA

CERTIFICATION OPTIONS

Excellence In Design
For Greater Efficiencies

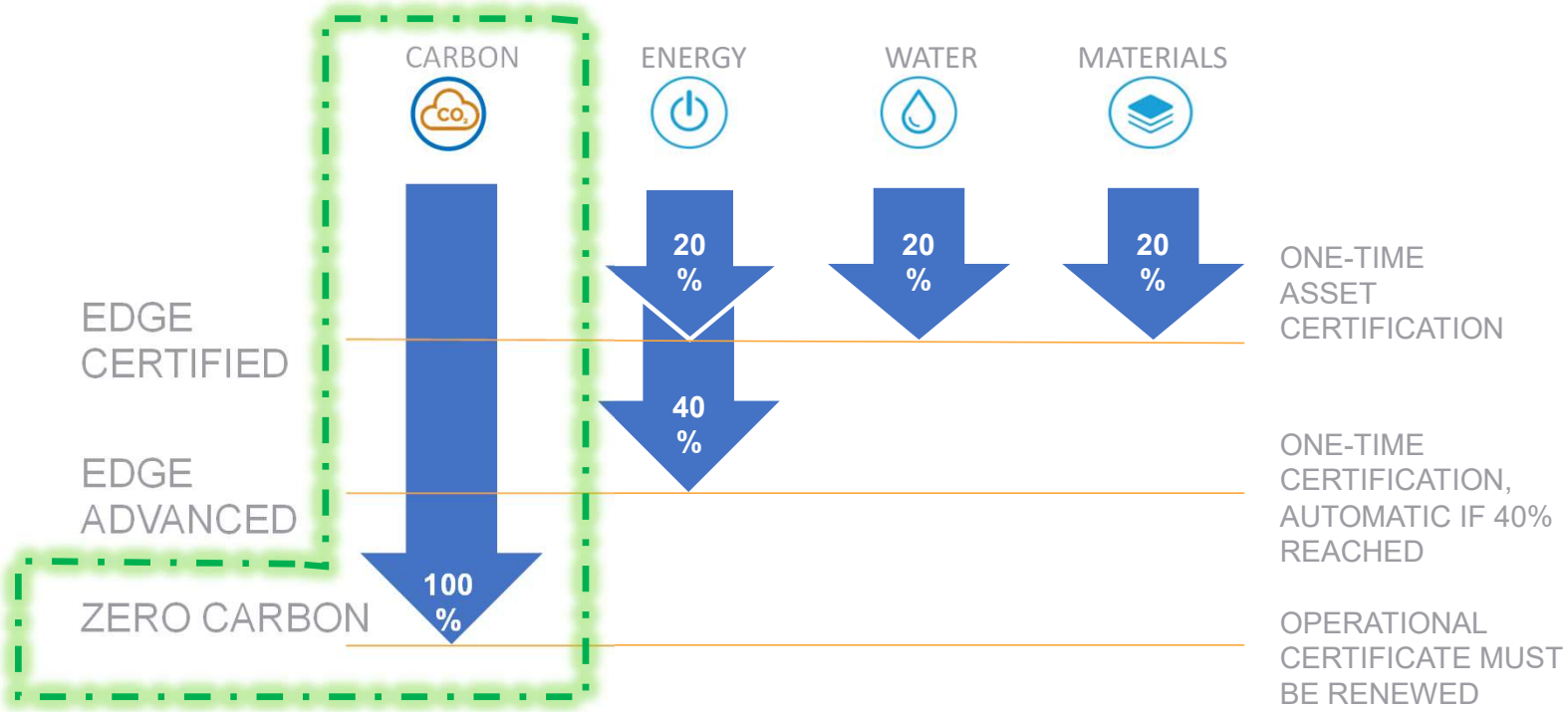
Edge

greenstar

CODE FOR A SUSTAINABLE BUILT ENVIRONMENT
BREEAM

Excellence In Design For Greater Efficiencies

Edge



IFC International Finance Corporation WORLD BANK GROUP

Creating Markets, Creating Opportunities

CERTIFICATION OPTIONS

NET ZERO carbon

- Different resources
- Different scopes of a building's lifecycle
- Different scales of development
- Net Zero & Net Positive certifications -valid for 3 y from the date of certification
- Based on principle of efficiency first

Preferred Pathway 1
Energy Efficiency

Preferred Pathway 2
On-site Renewables

Preferred Pathway 3
Off-site Renewables

Preferred Pathway 4
Carbon Offsets

NET ZERO carbon | NET ZERO water | NET ZERO waste | NET ZERO ecology

CERTIFICATION OPTIONS

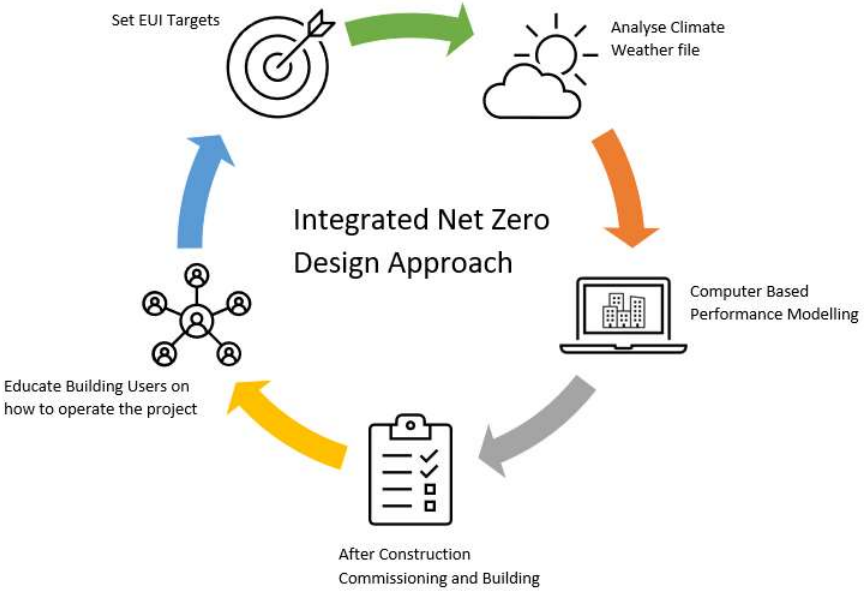
NET ZERO carbon

Net Zero / Net Positive Standard Levels:

- Level 1: Base Building
- Level 2: + Occupant Operations
- Level 3: + Embodied Carbon
- Level 4: + Renovation Carbon
- Level 5: + Deconstruction

NET ZERO carbon | NET ZERO water | NET ZERO waste | NET ZERO ecology

PROCESS DRIVEN DESIGN

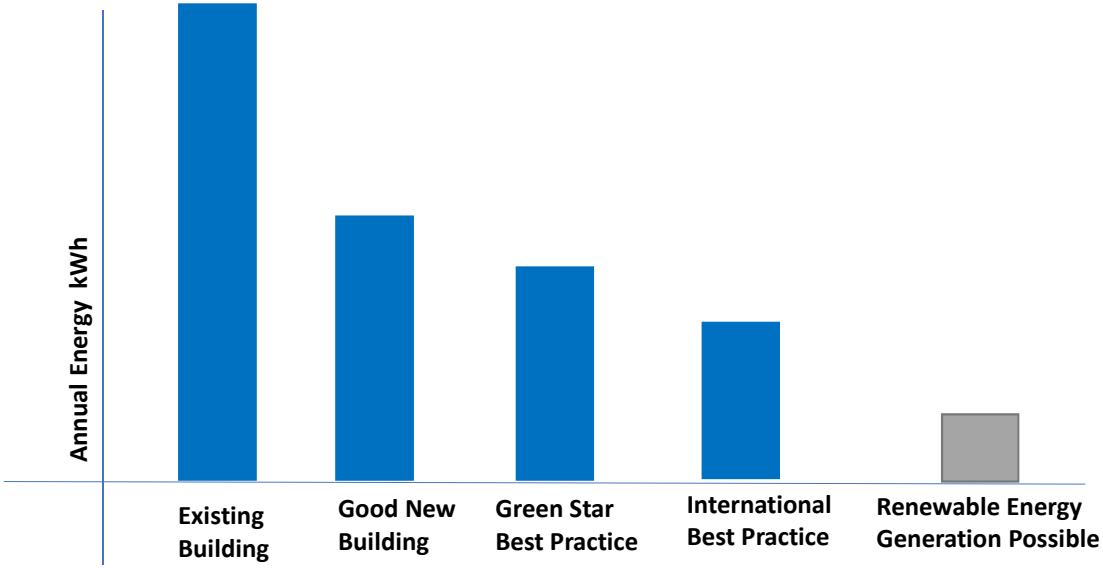


INDICATIVE* EUI TARGETS FOR OFFICE BUILDINGS IN SA

City	Target Office EUI* for net-zero performance (kWh/m²/yr)	'Draft' legislative SANS 10400-XA:2020 benchmarks for offices, (with plugloads added)** (kWh/m²/yr)	Current 'Standard Practice'
Tshwane	67.5	114	150-210
Johannesburg	67.5	96	
eThekwini	70	114	
Cape Town	50.5	90	

**Derived from Table 3-1, ASHRAE 'Advanced Energy Design Guide for Small to Medium Office Buildings - Achieving Net Zero' **The proposed SANS 10400-XA:2020 benchmarks exclude plugloads, thus 20% has been added to the proposed benchmarks for the illustrative purpose of comparison.*

SET TARGETS FOR BUILDING



ENERGY

ENERGY & NET ZERO

Carbon is released into the atmosphere during energy production using fossil fuels.

Reducing energy use reduces carbon emissions.

Renewable energy removes the carbon associated with operating a

solidGREEN

ENERGY USE INTENSITY (EUI)

There are a lot of tables

NZC pathway

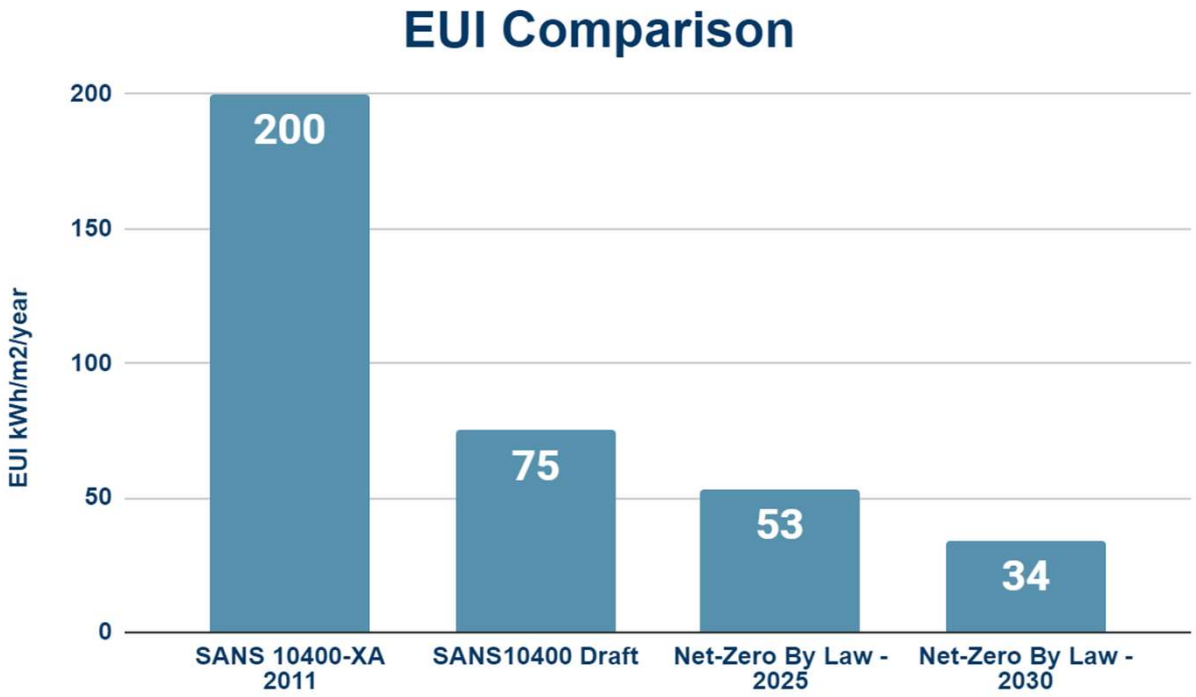
Energy Use Intensities for different building types

Occupancy	Class of occupancy or building	Occupancy description	Energy Use Intensity (EUI) kWh/m2/annum				
			2020	2025	2030	2040	2050
			SANS 10400 XA V2	SANS 10400 XA + 30% EE	SANS 10400 XA + 55% EE	SANS 10400 XA + 65% EE	SANS 10400 XA + 75% EE
						To be reviewed before 2040	
Public gathering / entertainment	A1	Venues for sedentary behaviour	80	56	36	28	20
	A1	Venues for non-sedentary behaviour	120	84	54	42	30
Theatrical	A2	Theatres and cinemas	95	67	43	33	24
	A2	Sport performance	120	84	54	42	30
Places of instruction	A3	Conference halls, auditoria, lecture halls, laboratories, etc	95	67	43	33	24
Schools	A3	Urban, suburban, rural	55	39	25	19	14
Worship	A4	Large venues	50	35	23	18	13
	A4	Small venues	45	32	20	16	11
Detention	E1	Place of detention	55	39	25	19	14
Hospitals	E2	Large and medium hospital	175	123	79	61	44
	E2	Day hospitals, clinics	90	63	41	32	23
	E3	Institutional (residential)	120	84	54	42	30
	E4	Health care	85	60	38	30	21
Retail	F1	Large shop >250m2	145	102	65	51	36
	F2	Small shop <250m2	80	56	36	28	20
Offices	G1	Large multi-storey office	95	67	43	33	24
	G1	Standalone blgs in office parks	80	56	36	28	20
	G1	Call centres	145	102	65	51	36
Hotel	H1	Hotel	145	102	65	51	36
	H2	Dormitory	70	49	32	25	18
	H3	Domestic residence	70	49	32	25	18
Dwelling houses	H4	Low income houses < R450k	70	49	49	49	49
	H4	Middle income/luxury houses >R450k	70	49	32	25	18
	H5	Hospitality	70	49	32	25	18

Table 1: Energy Use Intensities for different building types

Source: CSIR summary report on net zero pathway table for cities Nov 2020

ENERGY USE INTENSITY (EUI)

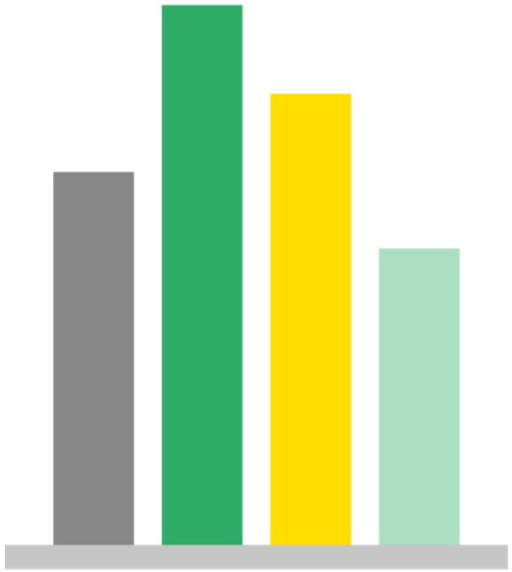


CAPE TOWN EXAMPLE

What does 2030 look like

Quantifiably low energy

Measurable
Ability to track real world performance

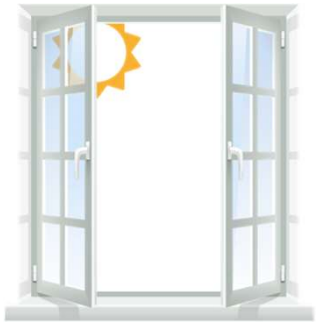


What does 2030 look like

Maximise use of nature

Powered by nature

Daylight



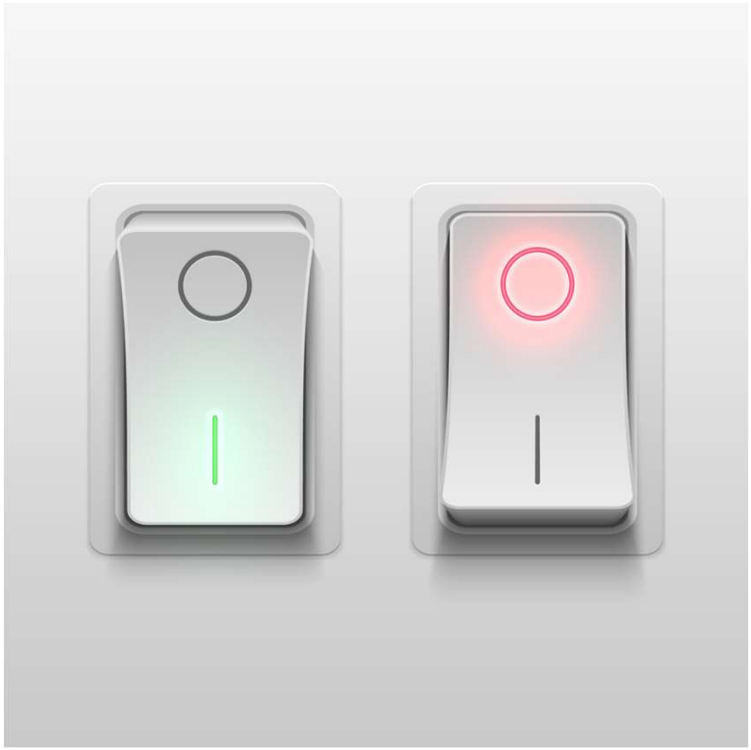
Outdoor air temperature

Sunlight

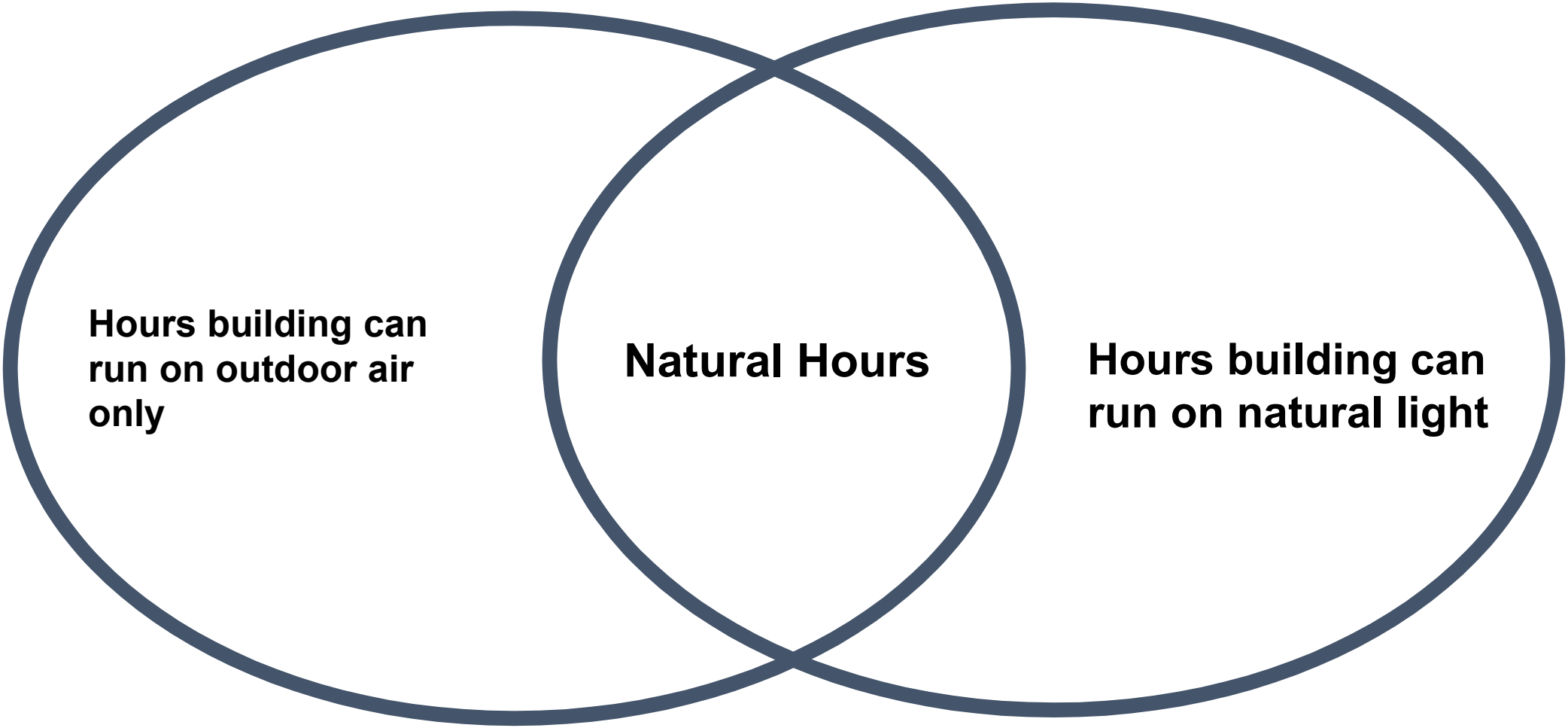
What does 2030 look like

Simplicity

Being energy efficient doesn’t always have to be a complex solution

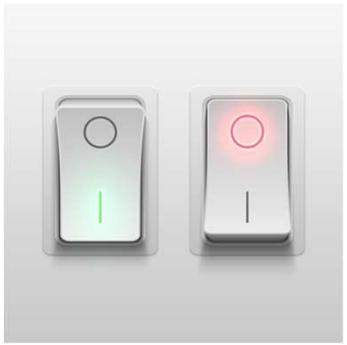


POWERED BY NATURE



LIGHTING IN BUILDINGS

Industry
Progression

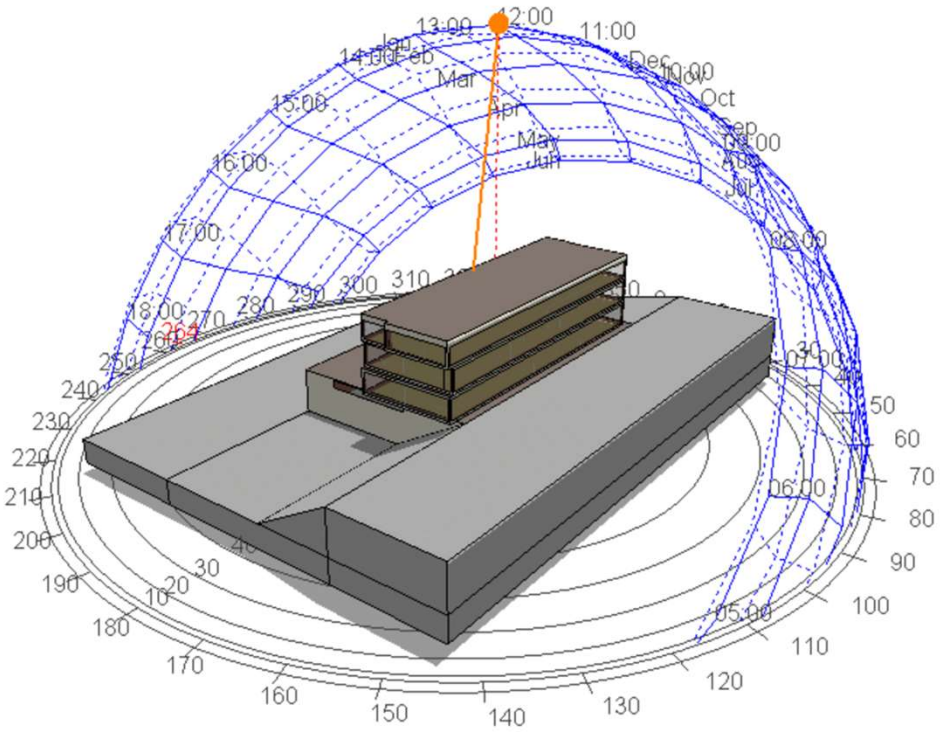


Focus moving
forward

COMPUTER AND SERVERS

Outsource efficiency of server equipment

CASE STUDY DISCUSSION

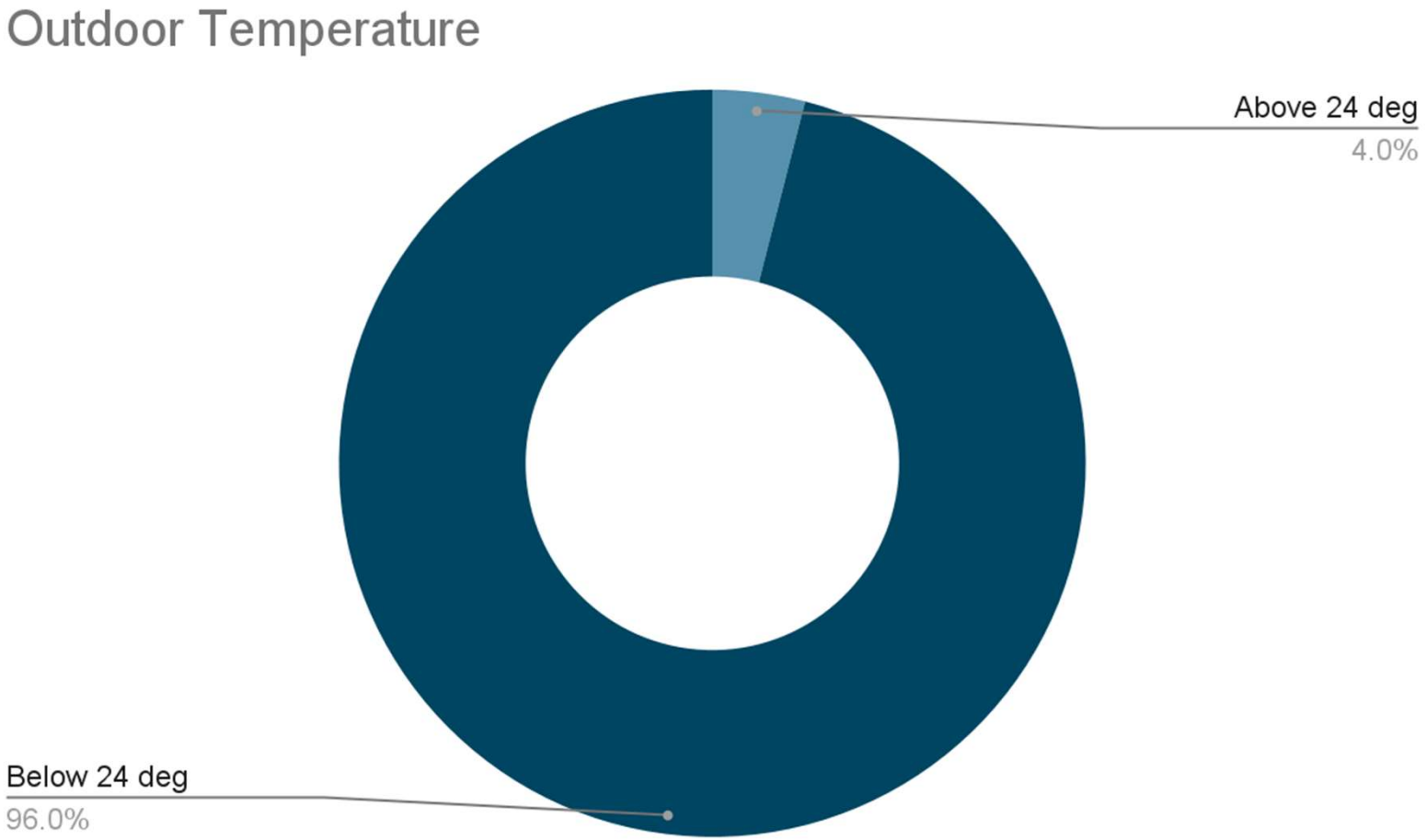


Cape Town Example

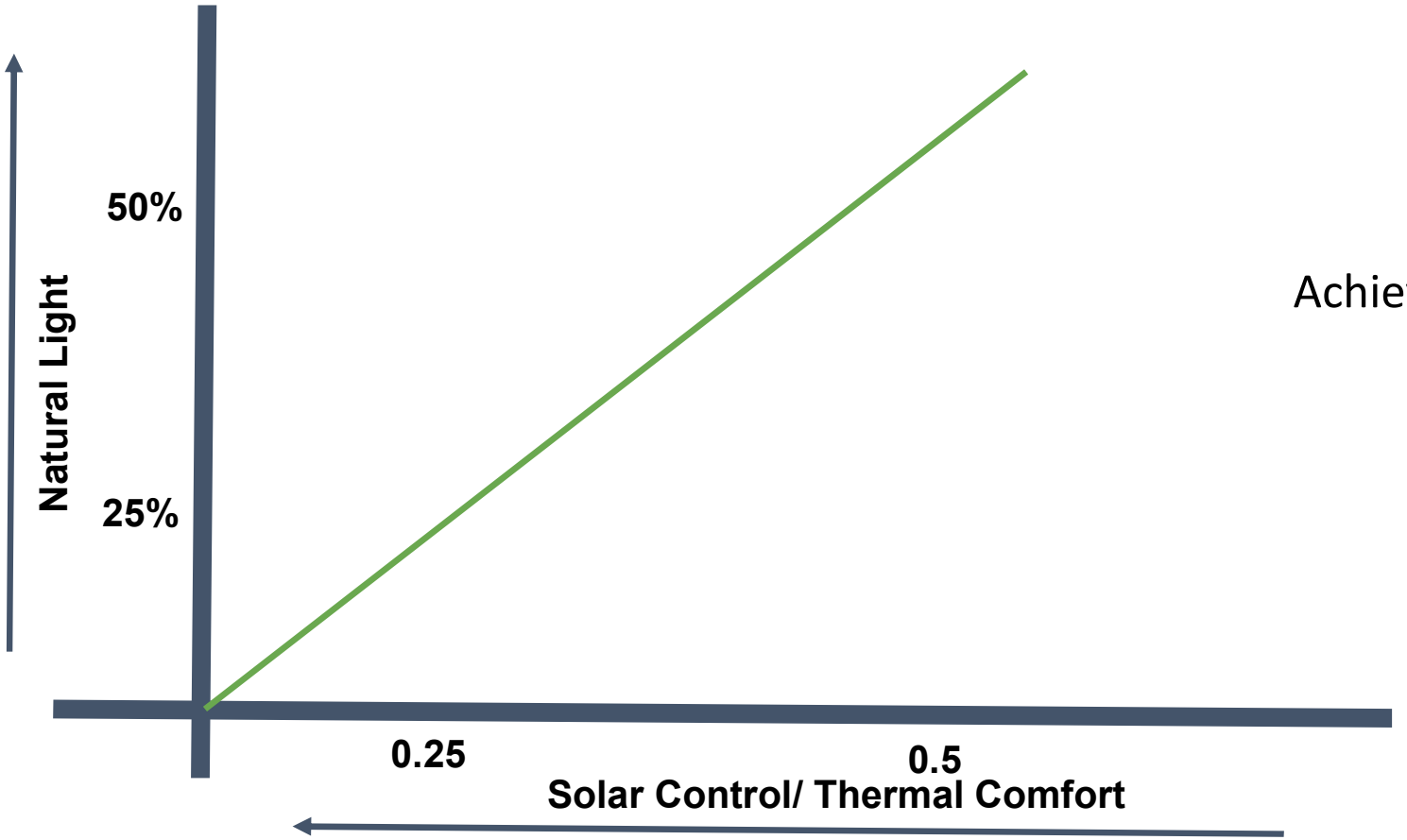
Why do new buildings look like this?

- Daylight
- Better environment
- Commercial appeal

POWERED BY NATURE POTENTIAL

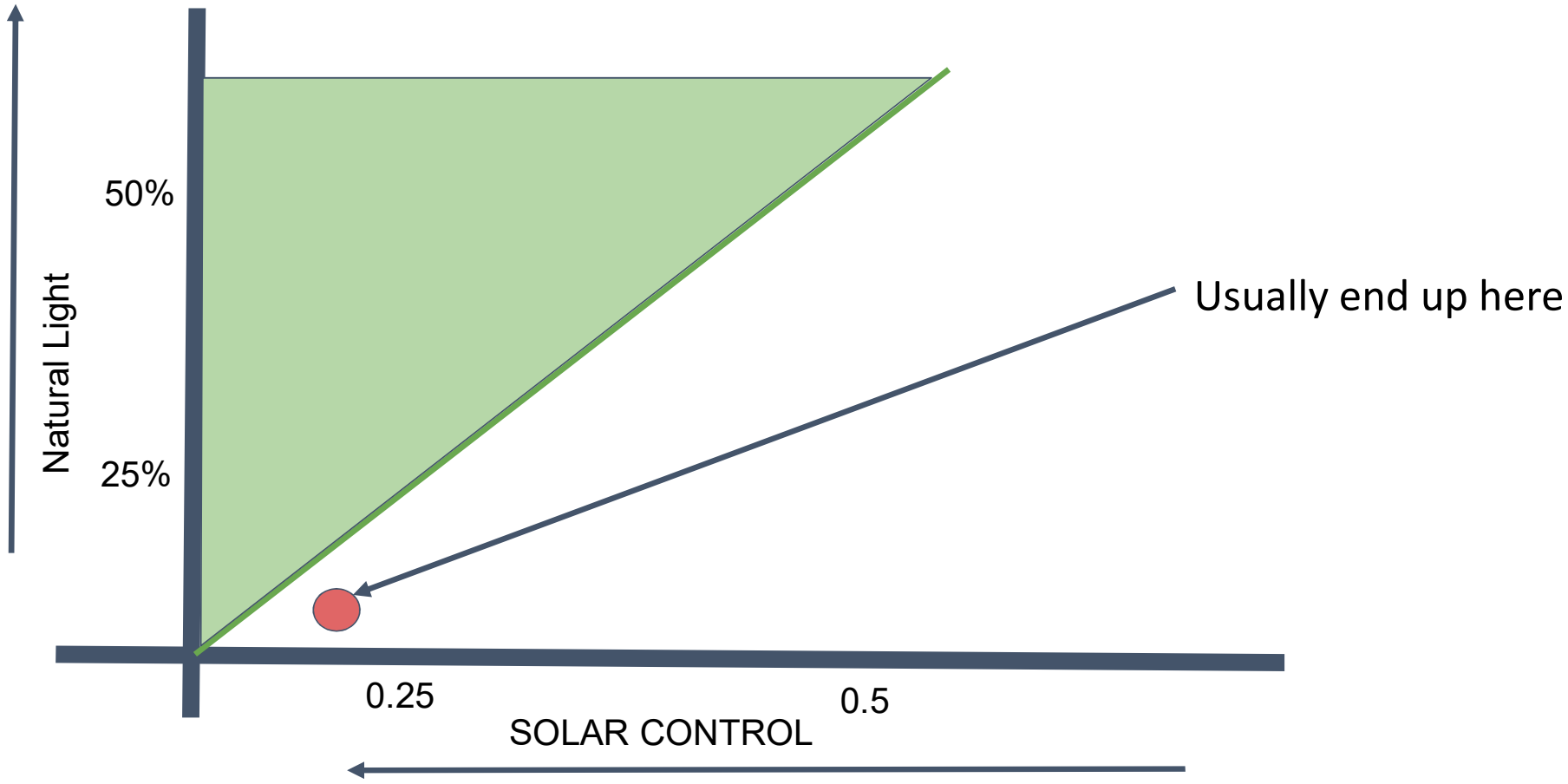


GLASS SELECTION

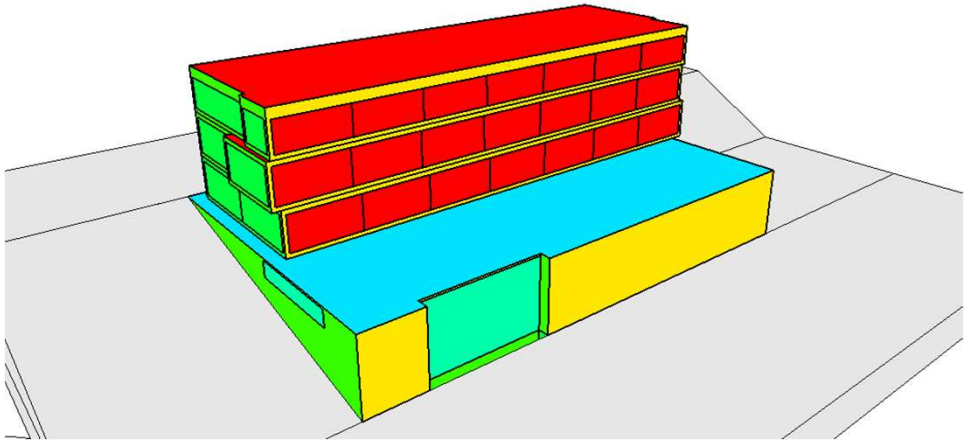


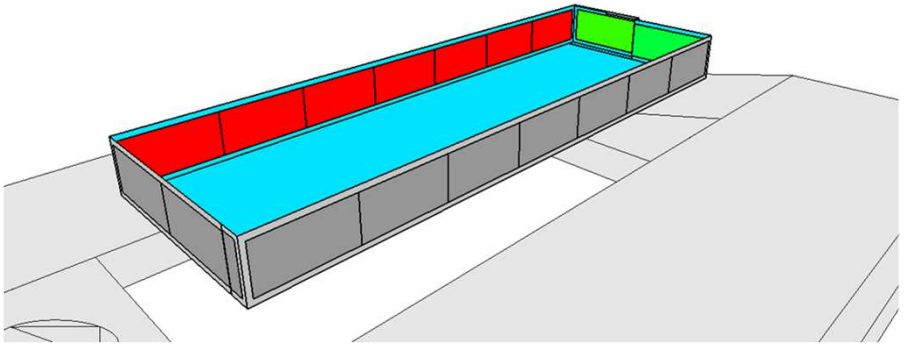
Achieving balance

GLASS SELECTION:

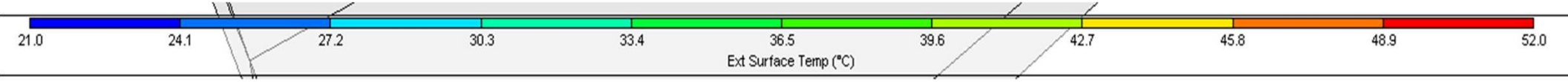


GLASS SELECTION

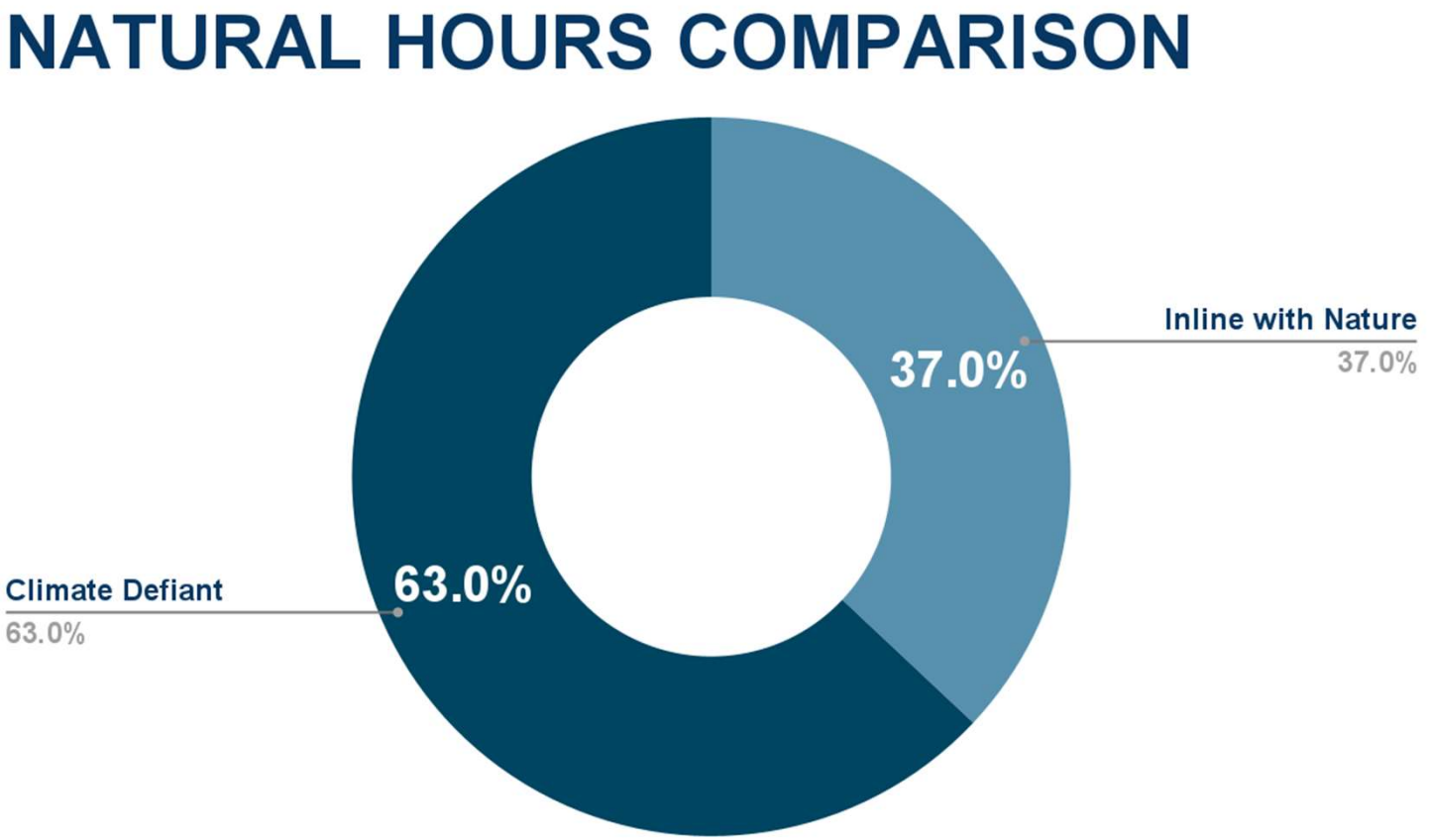




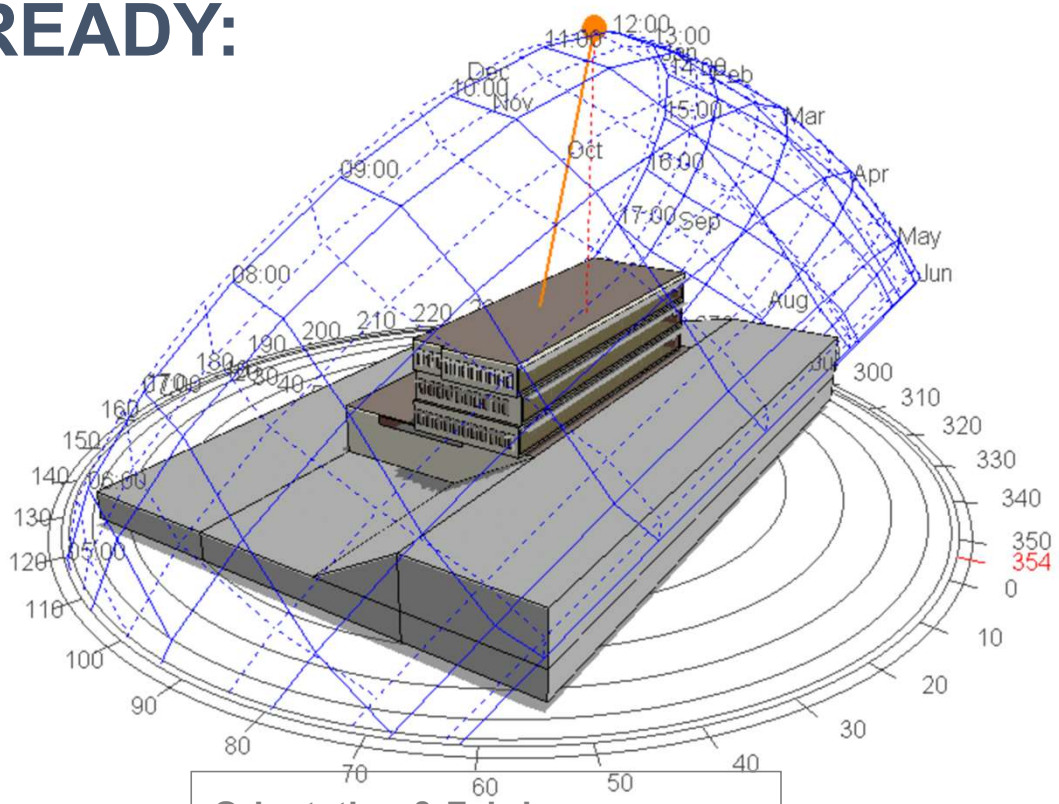
Outside temp - 26 Deg C



BASE CASE:


NATURAL HOURS COMPARISON
Inline with Nature
37.0%
37.0%
Climate Defiant
63.0%
63.0%

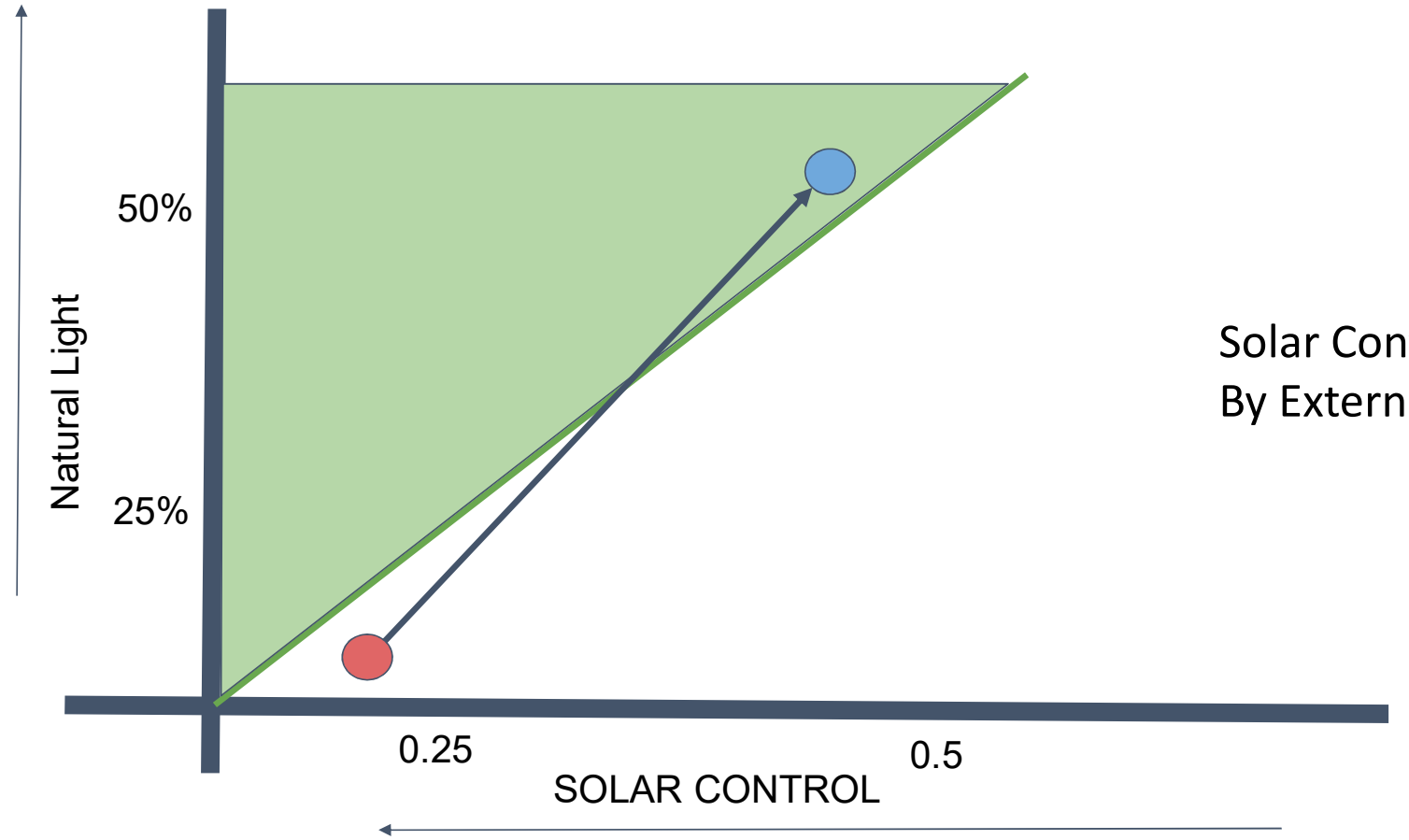
NET ZERO READY:



Orientation & Fabric:

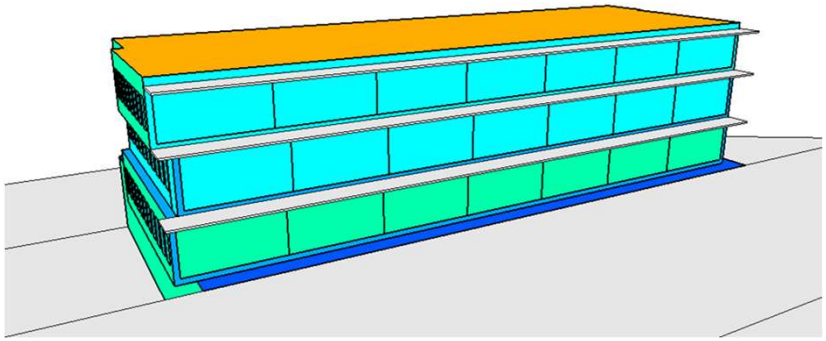
- North facing
- Shading, Glazed 80% North, 30% E&W, 50% South
- Double glazing
- Improved roof insulation

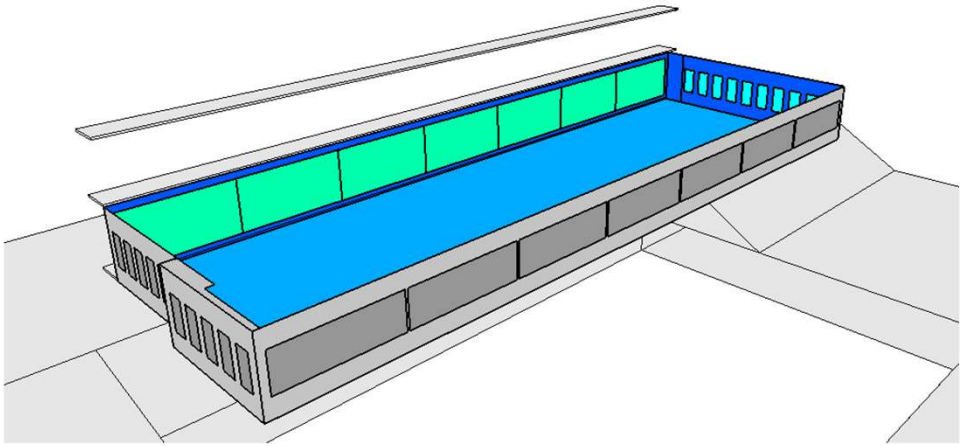
GLASS SELECTION:

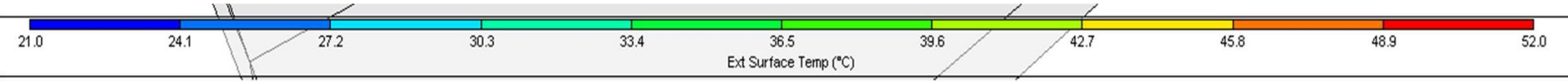


Solar Control Provided
By External Shading

GLASS SELECTION:

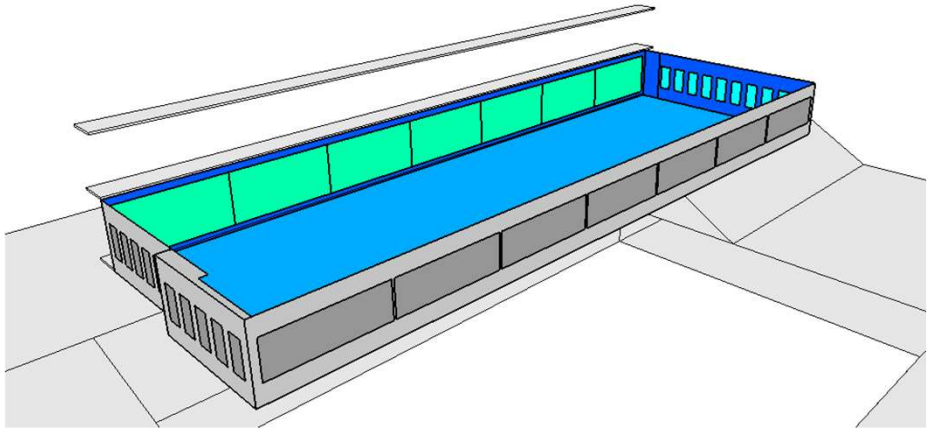




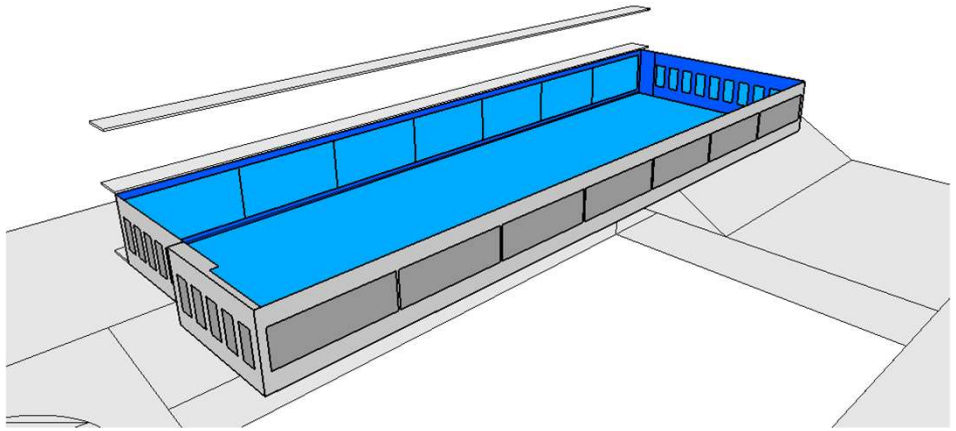


GLASS SELECTION:
SINGLE VS DOUBLE GLAZING

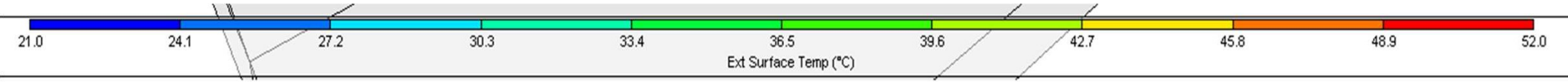
GOOD TO GREAT



SINGLE GLAZING



DOUBLE GLAZING

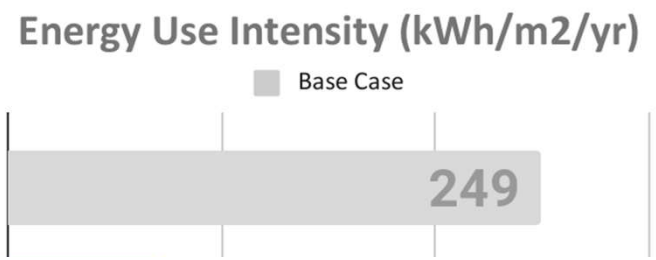


CASE STUDY:

Energy:

Comfort:

Before:



37%

After:

94%

CASE STUDY:

Monthly Electricity:

Before: R37/m2

70% Reduction

After: R10/m2

CASE STUDY:

PEAK DEMAND:

Before: 80VA/m2

75% Reduction

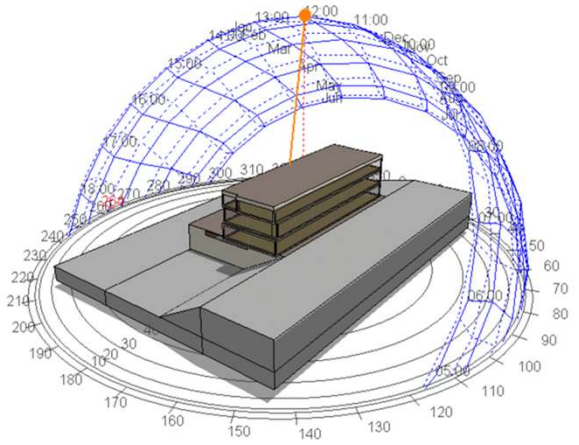
After: 20VA/m2

CASE STUDY:

Orientation & Fabric:

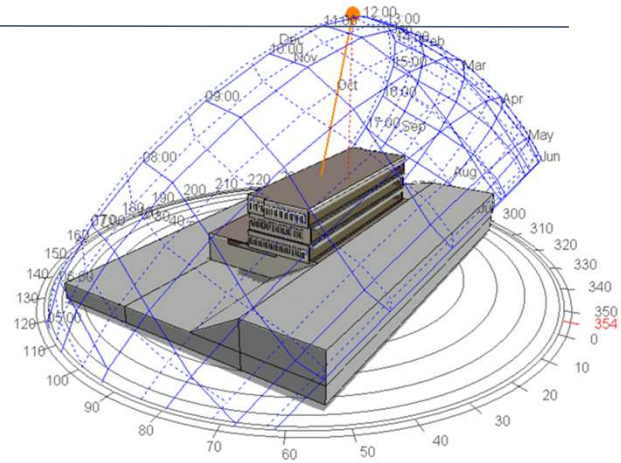
Before:

- East / West Orientation
- 80% Glazing Ratio
- Single Glazing



After:

- **North Orientation**
- **50% Glazing Ratio**
- **Double Glazing**



CASE STUDY:

Heating, Cooling, Ventilation:

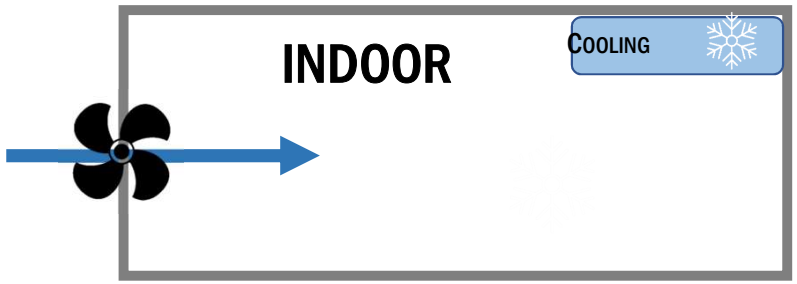
Before:

- Central air conditioning (VRV)
- Constant fresh air fans
- Constant basement ventilation

After:

OUTDOOR

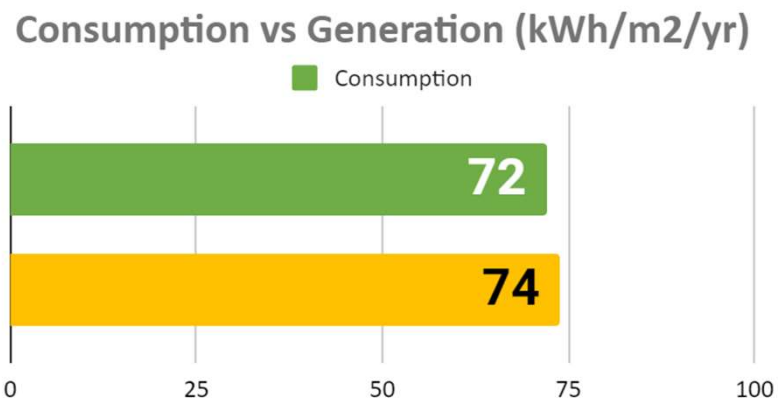
- Little /no central heating / cooling
- Natural Ventilation
- CO2 control of fresh air fans
- CO control of basement fans



CASE STUDY:

	Lighting:	Tenant:
Before:	• Efficient LED • Manual controls	• Standard tenant loads • Server rooms
After:	• **Efficient LED** • **Occupancy Control** • **Some daylight control**	• **Efficient tenant loads** • **No server rooms**

ON-SITE GENERATION:



- For this building, net zero ENERGY is a possibility…
- If more storeys were added, on-site generation would not meet demand. In which case, off-site / offsets would need to be explored to reach net zero CARBON.

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Business case for Green Buildings

Business case for Green Buildings

Avinash Ramessur

Local Coordinator, SUNREF Technical Assistance

Developed by

With the financial participation of

In partnership with

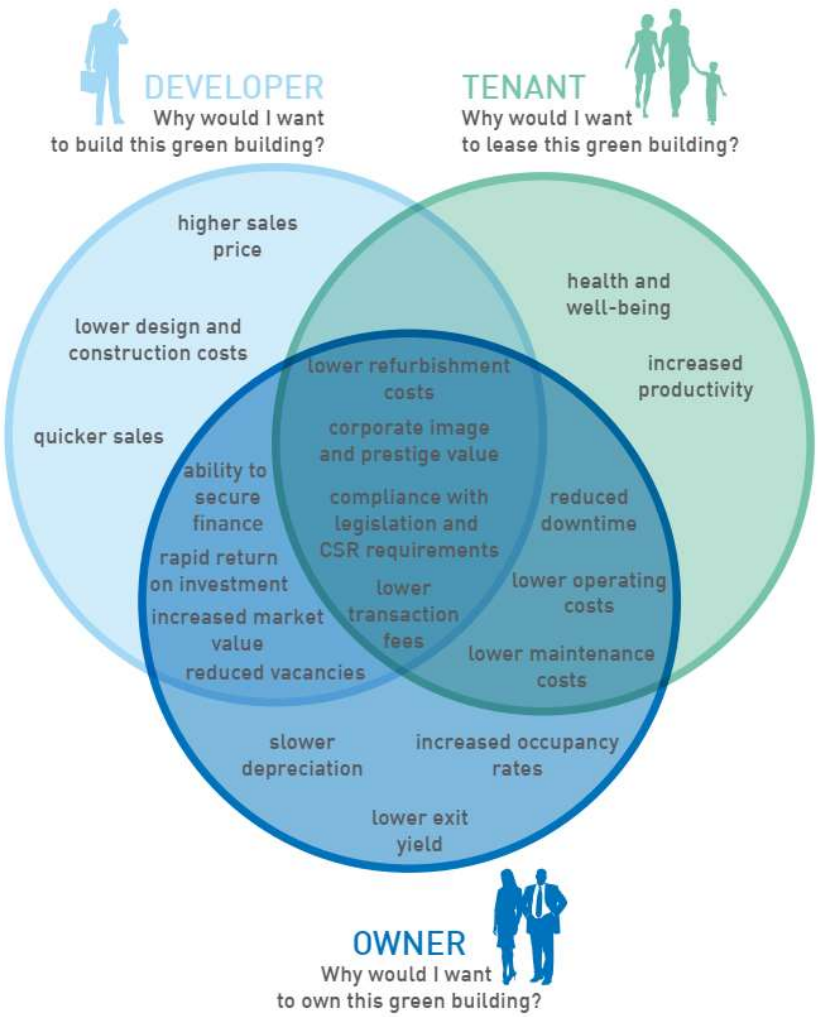
Implemented by

Business case for Green Buildings

2 main sources

Business Case For Green Building Report (2013) (World Green Building Council)

The price of innovation: An analysis of the marginal cost of green buildings (2019)



Key Considerations and Parameters

Triple dividends

1. Return on investment
2. Risk Mitigation
3. Employee Productivity & Health

Source : Business_Case_For_Green_Building_Report

The study

- The general perception in the construction and real estate development industry is that green construction is expensive, especially if it involves the refurbishment of existing buildings

- There is very limited rigorous empirical evidence regarding the cost and cost-effectiveness of investments to achieve green building certification. The existing research on input costs is limited to a handful of case studies, typically comparing a small number of green buildings to conventional counterfactuals, without properly controlling for other building characteristics and features of the construction process.

- *The price of innovation: An analysis of the marginal cost of green buildings (2019 uses a unique dataset from the Royal Institution of Chartered Surveyors' elemental construction cost database The Building Cost Information Services (BCIS) - UK to identify the marginal cost of green construction for the largest commercial property market in Europe, the UK. BCIS is the only large-scale, non-proprietary dataset that has project cost, project duration and contract data for individual construction projects.*
- *Assessment of the marginal construction cost for a set of 336 BREEAM certified buildings, matching projects on location and construction period with some 2000 non-certified construction projects built between 2003 and 2014.*

- *Two key parameters for developers : the profitability of a project hinges not just **on overall costs**, but also on the **development time***

Main findings

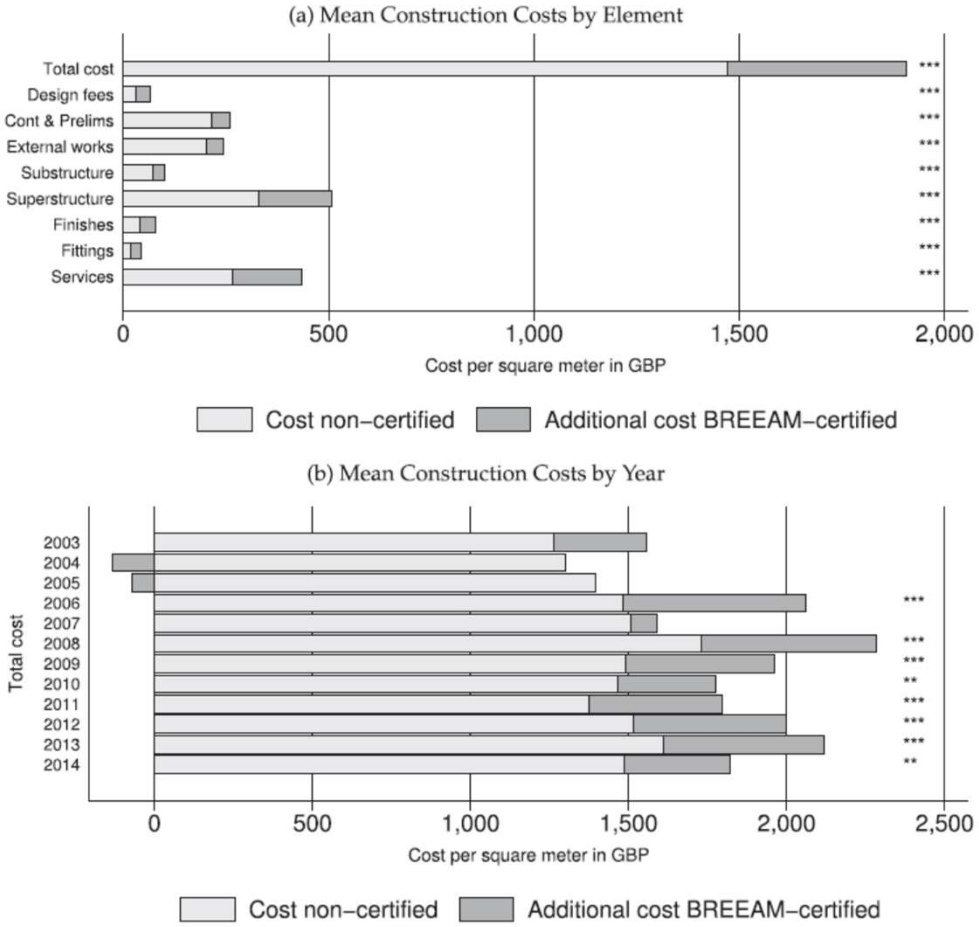
- There is a statistically significant difference in total construction cost between green, BREEAM-certified buildings, and conventional, non-certified buildings. The average difference in total costs for the sample as a whole is **6.5 percent**.

- There is a strong positive relationship between the level of environmental certification in construction projects and the corresponding construction costs. The highest rated green buildings - those labelled BREEAM Very Good, Excellent and Outstanding - are up to **31 percent costlier** to construct as compared to non-certified projects,

- Green building projects take about **11 percent longer** to complete as compared to conventional buildings, and that difference is higher for the most energy efficient buildings.

- Commercial buildings certified as green have been documented to command economically significant premiums in rents and sales prices where transaction premiums range from **13.3 percent to 36.5 percent**

Construction costs



Market failure:

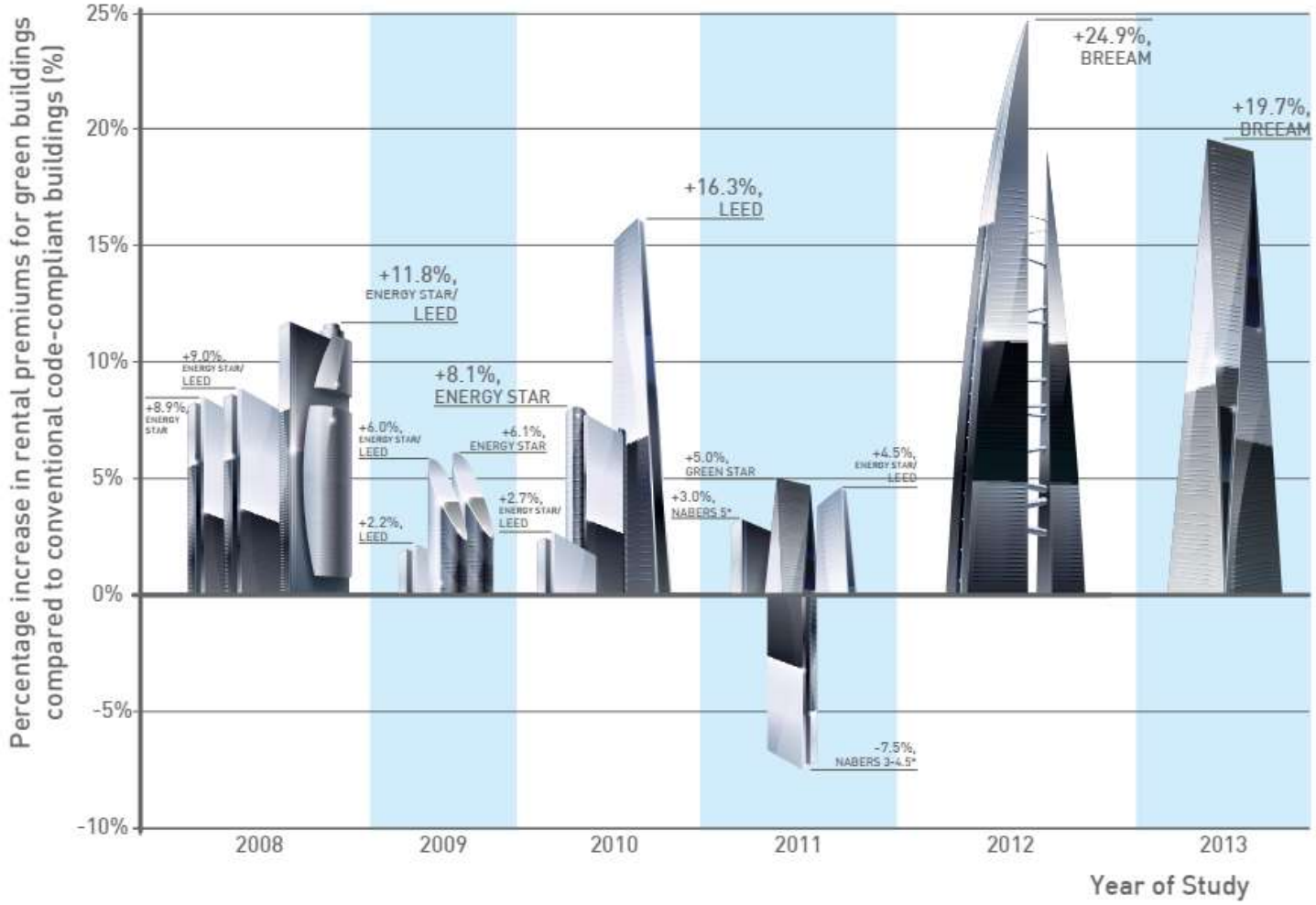
- ❑ Construction cost elements (design, fittings, and finishes) are more expensive.
- ❑ Even though these cost elements on aggregate represent a small proportion of total costs and are presumably capitalized into the price at which the developer can sell an asset, they accrue to a group of stakeholders making decisions that impact the lifecycle value of the entire building.
- ❑ Design fees are largely paid before construction has been started, and are mostly paid from the developer's equity.
- ❑ Importantly, even though design fees are only **3%** (average) of overall costs, these fees are investments with a significant risk, since fees are paid during a phase when developers still face fundamental uncertainty regarding the success of their project.
- ❑ Design fees are more than **150%** higher for the most advanced green buildings (as compared to non-certified building) reduces the likelihood that developers engage in the option to develop such projects.
- ❑ These fees can thus be regarded as the premium a developer has to incur for the option to develop a building.

Project Duration

Market barrier:

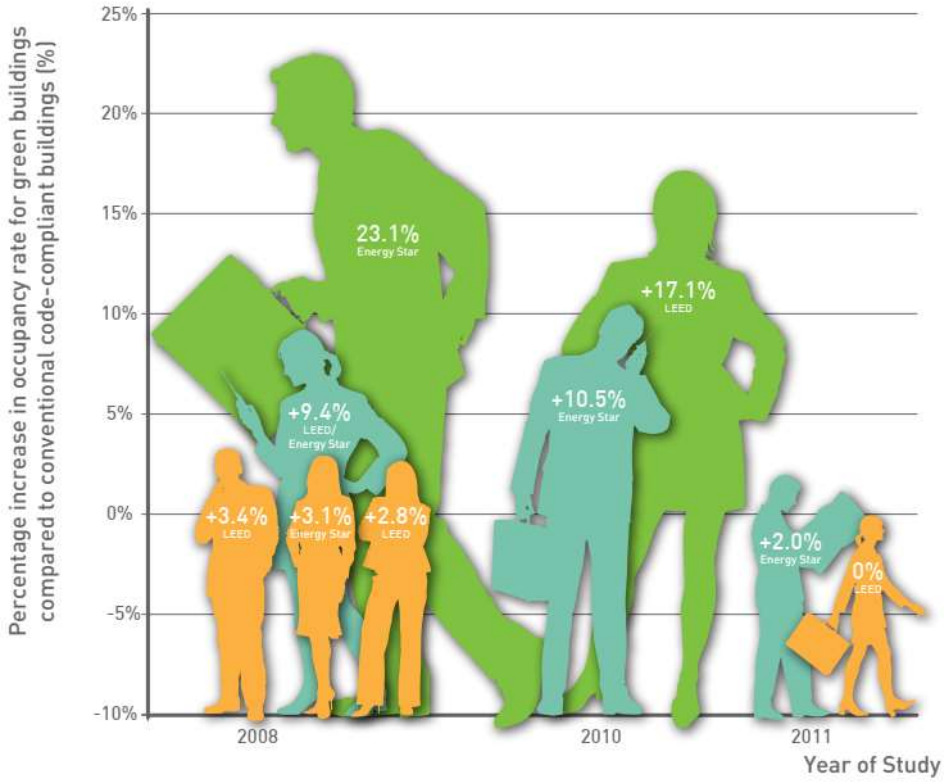
- The project length increases the uncertainty of total project costs and in turn uncertainty around the developer's expected return on equity.
- Presumably, as developers and construction companies become more experienced in green building, the additional time required to developed green rather than conventional buildings will decrease.
- Longer project duration implies longer need to burn cash without inflows and therefore longer financing needs.
- Implies a reduced internal rate of return (IRR) for the developer of **2.6%** based on financial scenario used which may in turn make the investment be below the return hurdle of the developer.

Rental rate increases of certified green buildings
as compared to conventional office buildings



Source : Business Case - For Green Building Report

Reported occupancy rate increases of green certified office buildings as compared to conventional code-compliant office buildings



Source : Business_Case_For_Green_Building_Report

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SUNREF: eligible investments, criteria and process

SUNREF: eligible investments, criteria and process

Vimal Motee

Project Manager, Business Mauritius

Developed by

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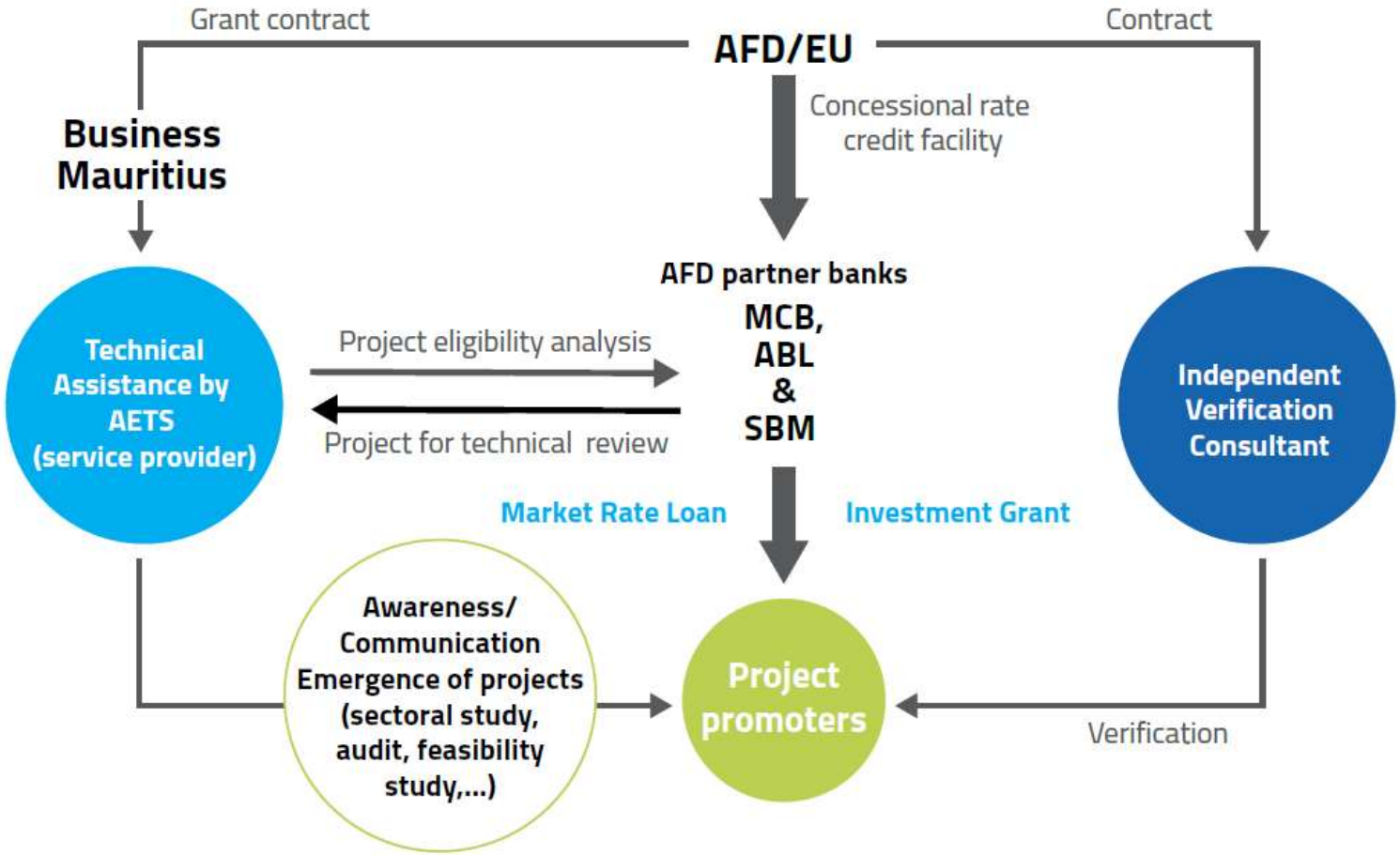
What is SUNREF Mauritius?

- EUR 85 million provided by AFD through partner banks to finance green projects
- Investment grants between 5% à 16% of the eligible loan amount
- Free technical assistance for investors and banks

Business Mauritius has upskilled its capability to foster the development/emergence of green projects within the private sector.

The Technical Assistance expertise is financed by the European Union

Stakeholders



AETS/ARTELIA Consortium

- The consortium provides technical support to Business Mauritius, for the execution and delivery of the Technical Assistance mandate.
- Main contacts: Project Manager, General Coordinator and Local Coordinator.
- Internal pool of experts:
  - Energy Efficiency
  - Adaptation – Water/Liquid Effluents
  - Adaptation – Coastal zone protection and rehabilitation
  - Adaptation – Climate Change
  - Gender
  - E&S Risk Management
  - Communication
  - Marketing
- Short term expertise can be mobilised depending on project specificities and where the expertise is not readily available in the core team of experts.

ELIGIBLE THEMATICS

Sunref UN LABEL AFD GROUPE

Mitigation

Adaptation

Gender

Who can benefit from SUNREF Mauritius

Any existing or new client of the MCB, SBM and ABL applying for a loan to finance a green project in Mauritius.

Any company* or individual who will benefit directly from the implementation of a project promoting climate change mitigation or adaptation or gender equality

* company which is compliant to AFD's exclusion list

Investment grants (applicable for small & large scale investment projects) and which will be paid after verification of installation of the equipment.

Mitigation Projects	**5%** of the eligible loan amount	**+**	**1%**	additional investment bonus granted to companies willing to assess and promote women's employment and professional equality (via a self-assessment questionnaire and the development of a gender action plan).
Adaptation Projects	**5%** of the eligible loan amount	**+**	**1%**	additional investment bonus granted to companies willing to assess and promote women's employment and professional equality (via a self-assessment questionnaire and the development of a gender action plan).

Additional grants*

Adaptation Projects	**10%**	extra grant for eligible climate change adaptation projects.
Gender Projects	**10%**	grant on new investments resulting from the gender action plan. The overall grant for a "gender-related" project stemming from the gender action plan will then be of 10% (5%+5%).

** Please note that projects financed by AfrAsia Bank are not eligible for these additional grants.*

Financial conditions and attractiveness of the offer are at the discretion of the banks.

Climate Change Mitigation

Eligible investments

- ❑Investments in **renewable energies** (for example: Solar PV, wind, hydro, biomass)
- ❑Investments in **energy efficiency** projects.
- ❑Investments in **electric mobility**.
- ❑Financing of **eco-businesses** (for example: producers/installers of solar water heaters or Energy Saving Companies (ESCOs))
- ❑Investments in **green buildings** with technologies/solutions to reduce energy consumption.

Climate Change Mitigation

Eligible investments – Construction sector

- "Active" solutions covering energy needs of residential or tertiary buildings. These solutions promote energy efficiency and help achieve SUNREF's eligibility criteria of 20% energy savings compared to a baseline (brownfield investments).
  - Office buildings with multi-split or variable flow air conditioning systems,
  - Ventilation systems controlled by CO2 sensors,
  - Elevators with energy recovery,
  - New generation LED lighting,
  - Real-time performance monitoring (BMS or Building Management System),
  - Drinking water supply pumps,
  - Solar water heater

Adaptation to Climate Change

Eligible sectors

- ❑ Agriculture
- ❑ Tourism and hospitality
- ❑ Manufacturing
- ❑ **Construction**

Adaptation to Climate Change

Eligible investments

- Investments in **water resource management** (irrigation, recycling, rainwater harvesting, desalination plant)
- Investments in **smart agriculture** projects (for example: sheltered farming, resilient varieties, use of technology, etc…)
- Investments geared towards **coastal zone protection & rehabilitation**
- Investments related to **thermal insulation** (using bio/plant based materials, green roofs, etc…)
- Investments related to **treatment of wastewater & effluents**
- Investments in **green buildings with resilient solutions** (with regards to treatment on water management, resilience against strong winds, risk of flooding, extreme temperatures, etc…).

Adaptation to Climate Change

Eligible investments – Construction sector

- "Passive" solutions targeting the building envelope, for example insulation and protection of exposed walls
- Improvement of the thermal comfort of buildings by reducing external thermal inputs and allowing a gain of 3 to 4°C
- Example: Roof insulation, green roof, reflective paints, sun screen panels to protect exposed walls

Adaptation to Climate Change

Eligible investments – Construction sector

- Cross ventilation
- “Architecture bioclimatique” to adapt to heat wave and cyclonic wind
- Rainwater collection networks (drain, retention ponds, etc..) to cope with heavy rainfall/flash floods
- Reinforcement of foundations and elevation of structures in case of sea level rise for buildings projects near coastal zones.

Gender

Eligible investments

On a **case-by-case** basis and after validation by the designated expert of the technical team before the launch of the project.

Investments having a positive impact in terms of reduction of gender inequalities, such as:

- ❑ Construction of sex-separated facilities (bathrooms, changing rooms…),
- ❑ Child care facilities (on-site day care centers),
- ❑ Work transportation services, which are adapted for safe travel with babies
- ❑ Breastfeeding rooms
- ❑ Dedicated resting areas for pregnant women
- ❑ Machines which are adapted to the female physique, in sectors such as agriculture, construction, hotels.

A tailor-made approach

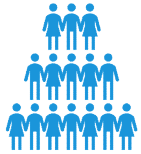
Small-scale investment projects up to MUR 10 million

- Up to 100% of the investment amount.
- Loan of up to EUR 250,000 (approx. MUR 10 million) for the purchase and installation of any equipment and technologies contained in a List of Eligible Materials and Equipment (LEME) established by the Technical Assistance and available online on Business Mauritius' website.

  https://www.businessmauritius.org/sunref/

- The partner banks are entitled to directly approve the project through a **simplified process**.

A tailor-made approach



Large-scale investment projects up to MUR 200 million

- Up to 100% of the investment amount.
- Maximum eligible loan amount of EUR 5 million (approx. MUR 200 million), even though the project cost and overall loan amounts from the partner bank may exceed EUR 5 million.
- Each project will be subject to a **comprehensive technical assessment** by dedicated expert(s) to assess and ascertain its eligibility against a pre-determined set of criteria for each of the investment categories covered by SUNREF (Mitigation, Adaptation, Gender).

Financial indicators

- **Maximum SUNREF eligible loan amount per project:** EUR 5 million, even though the project cost and the overall loan amounts subscribed with the partner bank might be greater than EUR 5 million.
- **Loan Currency:** EUR/MUR or any other currency.
- **Loan tenor:** minimum 4 years.
- **Interest rate cap** (ceiling): none (at the discretion of the partner bank)

Dedicated support mechanism

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1

Initiating contact through one of the available channels (partner banks or technical assistance) to have preliminary discussions on the proposed project, evaluate its feasibility and determine its potential technical and financial outcomes.

2

Formal loan application request by the project bearer to the partner bank (MCB, SBM & ABL).

3

Decision by the partner bank to finance the investment and to request SUNREF financing as well as expertise from the technical assistance.

4

Issuance by the technical assistance of the SUNREF Technical Eligibility Opinion with a project appraisal report and submission to AFD and to the partner bank, for large scale investments only.

5

Non-objection opinion from AFD to finance the project under SUNREF.

6

Signature of the loan agreement between the project bearer and the partner bank.

7

Validation, disbursement and implementation of the project following terms and conditions listed in the loan agreement.

8

In operational phase, monitoring and impact assessment of the project with recourse to a verification consultant mandated by AFD, at no cost for the project bearer.

9

Payment of the applicable investment grants upon completion of the project.

Contacts

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SBM Bank (Mauritius) Ltd

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(230) 207 0111

AfrAsia Bank Ltd

afrasia@afrasiabank.com

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Q&A

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Merci

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