Guide for sustainable construction and renovation

of metro stations

SUMMARY OF ACTIONS

AED- DITP
STIB

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INTRODUCTION

In 2010, STIB launched the "Ticket to Kyoto" European project, funded in 50% by the European Interreg IVB North West Europe. This project aims to reduce the CO_2 emissions of public transport and is carried out in collaboration with public transport operators of four other cities (Bielefeld, Manchester, Paris and Rotterdam).

Three categories of investments have been developed during the T2K project: energy production, braking energy recovery and energy efficiency improvement in infrastructure. For the energy efficiency category, STIB has launched an investment for eco-renovation of the De Brouckère metro station managed by Brussels Mobility.

As part of this renovation, STIB and Brussels Mobility decided to follow the BREEAM methodology. During this process, the general principles of eco-renovation have been defined with the support of the consulting firm IBAM. These principles are at the heart of this ***guide for sustainable construction and renovation of metro stations.***

This guide for sustainable construction and renovation of metro stations aims to integrate environmental sustainable development considerations at all phases of stations construction and renovation. These considerations must be at the heart of the processes of construction, renovation, but also in the management of the stations. This includes for example the first studies, projects phases but also the maintenance and operational management of the stations.

These standards are developed jointly by the STIB and DITP and will be regularly updated to incorporate new elements relevant to the stations renovation. It is a living tool that will have to evolve regularly to stick as close as possible to both the reality of the construction and renovation of stations, but also of eco-construction and technical standards. It is an agile tool, incorporating changes in technology, regulations, but also in working methods and of STIB and Brussels Mobility.

This document presents a summary of the actions described in the construction and renovation guide. This format should allow all stakeholders to have a good overview of these actions.

Two other documents complete this synthesis:

- The assessment tool for sustainable constructions and renovations of stations
- The complete guide for sustainable construction and renovation of metro stations detailing the actions outlined in this document

A. MAN – MANAGEMENT

1. DEVELOPMENT

MAN C **Consultation/ participation** Engage and identify the needs of the community and target groups	**MAN C.1 Community involvement in the planning and design** Actively encourage the participation of the local community and stakeholders during the project. Allow local users to put forward their own ideas and incorporate them into the consultation process whilst taking into account all opinions and responding to questions. **Result:** Includes of the community in the station through engaging the local community and stakeholders.
	MAN C.2 Inclusion of community needs in the design Inclusion of needs identified in the local community and stakeholders throughout the design of the station. **Result:** Stations adapted to the needs of the community and stakeholders.
MAN EV **Spaces reserved for local businesses and other local uses** Consider integrating local services and facilities into non-paying areas of the station and/or near the station	**MAN EV.1 Spaces reserved for local businesses and services** Provide enough space for community businesses and services and include in the design plans for access to these services from outside the payment zone. **Result:** User satisfaction and improvement in the productivity of businesses.
MAN BC **Benefits for the local community**	**MAN BC.1 Inclusion of works of art** Invite local users to put forward their own suggestions and ideas for a public art exhibition in the metro through consultations. **Result:** Improves the image and identity of the station.
MAN.L **Life Cycle Cost - LCC**	**MAN L.1 Conducting a Life Cycle Cost study** Conduct a Life Cycle Cost (LCC) for the project. **Result**: Improvement in the design and specification of the project by identifying the cost of assets or parts throughout its lifecycle, whilst meeting performance requirements.

MAN ES **Prevention** Integrate crime prevention into the initial design of spaces in the station.	**MAN ES.1 CPTED principles** Incorporate the principles of CPTED (crime prevention through environmental design) into the design of spaces in the station. Encourage passive surveillance by planning for additional active spaces (cafés…) and by optimising the location of kiosks and other manned areas in the station. **Result**: Increases station security.

2. A SUSTAINABLE CONSTRUCTION SITE

MAN V **A green construction site** A responsible contractor.	**MAN V.1 Establishing the construction site** Managing the site in an ecologically and socially responsible manner. **Result**: Ensuring good site performance in terms of sustainable development.
	MAN V.2 Access adapted to the site The contractor must manage the site in a way that ensures safe and appropriate access to the site and its surroundings for both staff and station users. **Result:** Reduces the risk of accidents caused by the works.
	MAN V.3 Limiting the impact on neighbours and station users Whilst the station will remain open during the works, the contractor will be present on site and will take into the account the impact on neighbours and station users. **Result:** Limits the impact on regional staff, on the STIB, outside stakeholders and station users.
	MAN V.4 Limiting the impact on the environment The contractor will consider the impact of the site on the environment and will implement measures to reduce this impact, especially light pollution, water and energy usage. **Result**: Reduces the use of natural resources and pollution caused by the site.
	MAN V.5 Ensuring a safe working environment The contractor shall operate the site in a safe and secure manner, ensuring the well-being of workers whilst minimising risks to their health and safety. **Result**: Reduces the risk of accidents and illness linked to the site.

WST M **Green Construction** Waste Management	**WST M.1 Identifying potential waste** Before beginning work, identify any waste that will be generated in order to allow efficient and appropriate management of any waste during the construction works. **Result**: Potential site waste will be evaluated and classified according to waste classification regulations. **WST M.2 Waste Management Plan** Preparation of a waste management plan covering both the construction and demolition. **Result**: Three key groups of waste will be subject to benchmarking with target objectives, as well as monitoring procedures. A training and awareness programme for workers will accompany the waste management plan. **WST M.3 Sorting of Waste** Ensure the separation of construction waste to improve the recycling potential of waste generated during the works. **Result**: Recycling collection and sorting centres with sufficient size and clear signage are planned. It is advised that access to these areas is adapted to facilitate removals during the works. Clearly labelled bins are planned for recyclable waste. **WST M.4 Re-use of construction materials** Maximising the re-use of materials and encouraging recovery of site waste for recycling or re-use. **Result**: The majority of non-dangerous construction waste generated by the site will be diverted from landfill and reused on site instead.

3. COMMISSIONING

MAN E **Commissioning/** **Adjustments**	**MAN E.1 Site opening** Guarantee optimal performance under actual real usage conditions through fine-tuning and upkeep of techniques carried out in a coordinated and understandable manner. Ensure training of staff and adequate maintenance. **Result**: Optimises energy usage, reduces operating costs and improves the documentation of systems in place.

MAN G **Information and training**	**MAN G.1 Guides to metro station users** Allows station service staff to understand and use the infrastructure efficiently. **Result**: Optimal use of building management.
	MAN G.2 Information Use information tools to allow good and thorough transmission of messages to customers. **Result**: Ensures good use of the station.
	MAN G.3 Public announcements Ensure that public announcement systems in the station work efficiently. Comprised of a system of speakers widely distributed throughout the station to ensure that announcements are clear and audible. Broadcast announcements on screens for people who are hard of hearing. **Result**: Ensures the efficiency of station announcement systems.
	MAN G.4 Public Wi-Fi Make wireless access points available in the station and under cover for Wi-Fi users in open-air stations. **Result**: Increases the benefit for the local community.
MAN D **Demonstration and Promotion**	**MAN D.1 Promoting the renovation project** Inform users on aspects of the design and planning process that will reduce the global environmental impact of the station renovation. **Result:** Encourages the broadcasting and public display of information regarding the aspects and schemes contributing to reducing the station's global environmental impact.
MAN B **Commercial Green Lease**	**MAN B.1 Commissioning and monitoring of green lease** Involve traders in the drafting of a commercial Green Lease in order to make it achievable. Ensure traders in the station comply with the Green Lease by encouraging them to monitor their consumption. **Result**: Improves the ecological footprint of station traders and landlords.

B. HEA – HEALTH AND WELL-BEING

1. VISUAL RESULT

HEA HF **High Frequency Lighting**	**HEA HF.1 Equipment** Plan for high frequency lighting with high frequency ballasts. **Result**: Reduces health problems linked to the flickering of fluorescent tubes and compact fluorescent lamps.
HEA EN **Natural lighting** Minimise the need for artificial light in the station.	**HEA EN.1 Daylight – Light wells and windows** Ensure sufficient natural lighting. Install bay windows, glass or polycarbonate, in the ceilings and walls (for surface stations) to improve natural lighting. **Result:** Ensures sufficient natural lighting. Limits energy consumption for lighting and improves the Result of station users whilst integrating the light of day into an enclosed space.
	HEA EN.3 Light colour finishes Using light colours on ceilings, walls and floors to help reflect ambient light. **Result**: Minimises the need for artificial light.
	HEA EN.4 Façade treatments Guide station users with use of lighting at the centre of the building and appropriate treatment of façades (reflectors). **Result**: Improving the use of daylight.
HEA CE **Lighting controls** Install lighting controls to minimise the length of time lighting is in use.	**HEA CE.1 Photoelectric interrupters** Installation of lighting control systems to ensure the minimum level of lighting (for example, a system that would introduce artificial lighting when natural light is insufficient). These systems must take into account issues linked with security and surveillance, particularly CCTV, which require a certain level of lighting to function efficiently. **Result:** More efficient lighting controls and a reduction in operating costs.
	HEA CE.2 Motion detectors Installation of motion detection systems. This system is appropriate for areas that are rarely in use, such as storage areas. **Result:** More efficient lighting control and a reduction in operating costs.

	HEA CE.3 Time delay switches Install time delay switches for lighting that will switch on and off for certain times where the usage level is known, such as station offices, kiosks and shops. **Result**: More efficient lighting control and a reduction in operating costs.
HEA IE **Interior lighting**	**HEA IE.1 Following good practice (NBN standards) for interior lighting** Plan for sufficient interior lighting following best practices, to ensure performance and visual comfort. **Result:** Internal and external lighting equal to or better than the NBN standard. In Belgium the standards are NBN EN 12464-1, Light and lighting – Lighting of work places, and NBN EN 12464-2 External lighting of work places.
	HEA IE.2 Quality Ensure the comfort of users through the installation of quality lighting. **Result:** Improvement in the visual comfort (responding to user demands) and energy saving.
HEA ZE **Zoning and lighting control**	**HEA ZE.1 Zoning** Create artificially lit areas that are controllable according to station usage. **Result:** Encourages lighting energy savings through good management of artificially lit spaces.
	HEA ZE.2 Malfunctions Ensure the quality of the lighting systems installed. **Result:** On-site inspection to verify the lighting system has been installed correctly.

2. RESULT AND AIR QUALITY

HEA AM **Construction without asbestos** Materials including asbestos are not included in the Design Brief and will not be used in the station.	**HEA AM.1 Removal of asbestos** Any materials containing asbestos must be removed if they are present in the station. **Result**: Ensures air quality and the health of service users.
	HEA AM.2 Exclusion of asbestos The use of any asbestos in the construction or renovation is banned. **Result**: Ensures air quality and the health of service users.

HEA PQ **Plan for interior air quality** Identify potential pollutants and promote good interior air quality.	**HEA PQ.1 Ventilation conforming to PEB** Plan stations in such a way as to ensure the circulation of fresh air, conforming to the current national standard for ventilation NBN EN 13779. **Result:** Reduction in internal pollutants.
	HEA PQ.2 Plan for interior air quality Produce a plan for interior air quality for the station, including the removal of sources of contamination, solutions and controls for contaminants, procedures for flushing out fresh air, tests and analyses by an independent consultant. **Result:** Reduces interior pollutants.
HEA PolA **Air pollution** Reducing the pollutants in the air inside the station.	**HEA PolA.1 Regulation and CO2 alert sensors** Install a system that directly measures the air quality inside the building using CO2 detectors. Direct regulation could be carried out by staff to avoid poor air quality. **Result:** Reduces air pollution in inside environments and the associated health risks.
	HEA PolA.2 Location of air intakes Comply with provisions for the positioning of air intakes: to be situated away from loading docks, parking areas and from storage areas for waste and other points of contamination that could generate odours, particles or moisture. **Result**: A reduction in health risks associated with bad air quality for station users and staff.
	HEA PolA.3 HVAC filtration Provide high performance filtration for mechanical ventilation systems. **Result**: Provides not only pure, clean air, but also prevents the HVAC system becoming contaminated by dirt or dust.
HEA VOC **Volatile Organic Compounds - VOC**	**HEA VOC.1 Design** To ensure a healthy environment by using finishing materials with low Volatile Organic Compounds emissions. **Result**: Reduces air pollution in indoor environments.
HEA VN	**HEA VN.1 Natural ventilation**

Natural ventilation

A ventilation strategy can provide a sufficient transversal flux of air to maintain a comfortable temperature and the required level of ventilation.

Promote adequate air circulation through natural ventilation of occupied spaces within the station. If air conditioning is present, prioritise future conversion to natural ventilation. Take prevailing winds into account.

Result: Platforms and busy areas of the station will be ventilated naturally.

HEA VN.2 Demand controlled ventilation

Design demand controlled ventilation system with surveillance of CO2 levels and the ability to vary ventilation levels as needed.

Result: The ventilation system only activates when necessary. This limits ventilation loss.

HEA VN.3 Opening windows

If the station in question has windows, they should be able to open to the exterior to allow mixed ventilation and to let natural light into the space. The surface area of the windows should be equal to at least 5% of the floor space.

Result: Creation of sufficient natural ventilation and an improvement in the work space.

HEA VN.4 Different methods of ventilation

Incorporate mixed ventilation to ventilate closed areas. This involves using natural ventilation when ambient conditions permit, and to use air conditioning only during periods of high temperature.

Result: The ventilation system works only when necessary, limiting losses through ventilation.

3. THERMAL PERFORMANCE

HEA CT

Thermal Performance

Energy efficiency is a priority in the planning and installation of the HVAC system.

HEA TP.1 Specification for areas subject to thermal performance criteria

Develop a building design with notes specifying areas subject to thermal performance conditions, but excluding areas such as atriums, entry ways and areas of circulation.

Result: Provision of control systems for controlling heating and air conditioning by area.

HEA TP.2 Simple evaluation of thermal performance

Define the “operating” temperature of areas identified through air temperature and wall temperature.

Result: Ensures that the building design takes into account levels of thermal Result.

HEA TP.3 In-depth evaluation of thermal performance through PMV and PPD

Evaluate thermal performance according to the methods developed in NBN X 10-005 or conforming to the ISO 7730:20051 standard. To this effect, the index of predicted mean vote (PMV) is used and the percentage of persons dissatisfied (PPD) is calculated.

Result: Determines a range of comfortable temperatures.

HEA TP.4 A complete thermal performance strategy

Determine a strategy to ensure thermal performance based on the results of the thermal modelling.

Result: Establishes temperature indicators for the building and users.

4. ACOUSTIC PERFORMANCE

HEA AP **Acoustic performance (internal)** To ensure acoustic Result for passengers and staff.	**HEA AP.1 Consult with an acoustics expert** Identify and determine the acoustic performance of the various zones by consulting an acoustics expert. These recommendations will then be incorporated into the Design Brief. **Result**: An acoustics expert will provide hypotheses and results that will be incorporated into the Design Brief.
	HEA AP.2 Respect noise requirements Following the recommendations of the acoustics expert and good practice for ambient noise levels in certain areas. **Result**: Follows current acoustic standards.
HEA Pol Aq **Noise pollution (external)** Minimise the impact of noise on the surrounding environment.	**HEA Pol Aq.1 Identifying any noise that may cause nuisance** Determine if there are any buildings located in areas likely to have a large amount of noise (within an 800m radius). **Result**: Implementation of a noise impact study.
	HEA Pol Aq.2 Noise impact study If buildings are nearby, a noise impact study will be necessary, and must be carried out by a consultant qualified to the 1996 ISO standard. **Result**: Demonstrate the levels of ambient noise, the level of noise coming from the source, and the level of noise specific to the source.

HEA Pol Aq.3 Modify systems to reduce noise

Avoid disagreements over noise pollution and decrease the level of noise generated in the station by modifying the systems installed.

Result: Improves acoustic conditions in the station so that announcements from the PA system can be heard.

HEA Pol Aq.4 External screens

Include external screens or panels in the design plans (for example, overhangs or barriers) to dampen noise.

Result: Controls the noise generated by the station when it is in operation.

HEA Pol Aq.5 Positioning of the ventilation system

Where necessary, locate ventilation shafts in places where noise from the station is reduced.

Result: Reduces noise pollution and nuisance to the surrounding area.

HEA Pol Aq.6 Controlling noise from mechanical devices

Optimise the efficiency of the station's technical systems.

Result: Control the noise produced by the technical systems in the station: the HVAC system, mechanisms for travelling between floors (lifts, escalators) and other mechanical equipment.

HEA Pol Aq.7 Avoid reducers and slatted air outlets

Avoid these types of devices and prioritise smooth, curved ducts (avoiding sharp angles) and locate ventilation outlets far from sensitive receiving areas.

Result: Reduces nuisance from noise resulting from operations within the station to surrounding buildings.

5. WATER QUALITY

HEA S	**HEA S.1 Limit the risk of Legionnaires' disease**
Water quality	Ensure high quality, clean hot water. Ensure that measures are taken to limit the risk of Legionnaires' disease. **Result**: Controls the risk of Legionnaires' as well as avoiding humidifying or dehumidifying with water vapour.

HEA S.2 Equipment

Encourage the use of equipment to ensure good water quality.

Result: Ensures a high level of comfort for users.

HEA S.3 Potable water

Provide point with drink water throughout the station.

Result: Provides fresh potable water free to station users.

6. CUSTOMER COMFORT OUTDOORS

HEA CP **Passenger comfort** Provide a comfortable microclimate at the entrances to the station, in open-air halls and on the platforms.	**HEA CP.1 Protection from the wind** Install structures to protect customers against the prevailing wind at station entrances. **Result**: Ensures the comfort of users.

HEA CP.2 Shade

Provide shade by using vegetation or structures in pedestrian areas.

Result: Ensures the comfort of users.

HEA CP.3 Wind

Design and locate park and ride on several different levels to avoid creating wind tunnels.

Result: Ensures the comfort of users.

HEA CP.4 Planting vegetation in park and ride areas

Plant vegetation in parking areas to reduce heat retention and improve the visual impact of this type of space.

Result: Improves the thermic and visual comfort of these spaces.

C. ENE - ENERGY

1. ENERGY EFFICIENCY

ENE O

Orientation and thermal mass

Revert to passive design techniques where possible.

ENE O.1 Orientation and thermal mass

Take steps toward passive design with regard to the orientation and thermal mass of station structures.

Result: Improves the energy efficiency of the whole station.

ENE R

Energy efficiency

Energy associated with the construction and use of lighting, heating, air conditioning, ventilation etc. generally represents the largest proportion of energy consumption over the life cycle of the station. Reducing energy consumption related to station operations is potentially one of the most critical aspects in the performance of sustainable buildings.

ENE R.1 Energy management

Design the building in such a way as to reduce energy consumption.

Result: Reduces primary energy use in order to limit greenhouse gas emissions that have a direct impact on global warming.

ENE R.2 Insulation

Effectively insulate enclosed interior areas. Techniques for this include adequate thermal mass and insulation in the walls and floor.

Result: Improves the energy efficiency of enclosed areas and the station as a whole.

ENE R.3 "Night flushing" of enclosed interior spaces

Implement appropriate techniques to allow “night flushing” (air from outdoors is circulated through internal areas overnight to cool the building)

Result: Reduces primary energy use.

ENE R.4 Double skin façade

Include double skinned façades to provide an efficient thermal barrier between internal and external spaces.

Result: Improves the energy efficiency of the station as a whole.

ENE R.5 Insulation of pipes

Insulate air conditioning ducts (if present) to ensure that they function efficiently with regard to heat.

Result: Avoids heat loss through distribution and the risk of condensation.

ENE R.6 Double/Triple glazing

Ensure that all external windows and skylights are double (or triple) glazed, if applicable.

Result: Reduces energy loss.

ENE ReEn **Renewable energy** Reduce CO2 emissions, atmospheric pollution and the energy footprint by encouraging local energy production through renewable energy sources, providing for a large part of energy requirements.	**ENE ReEn.1 Renewable energy integrated into design** Reduce energy demands. **Result**: Reduces the energy footprint by using other sources of energy in place of traditional energy sources.
	ENE ReEn.2 Types of ReEn systems Encourage the installation of different types of ReEn systems: **Solar water heaters**: Install solar water heating systems for hot water and heating for ventilation systems. If installation on the roof is not possible, integrating the solar water system with shelters for passengers and station staff should be considered. **Photovoltaic systems**: Install PV systems on the roof and façades. If installation is not possible, integrating the solar water system with shelters for passengers should be considered. **Geothermal heat pumps**: Install geothermal heat pumps to provide hot water for both heating and the ventilation system if solar panels cannot be used. This solution is more efficient if businesses and traders are close together. **Biomass**: Install a tri-generation system powered by biomass (i.e. vegetable matter) to provide electricity, heating and air conditioning. The quantity of primary material necessary to power a 300kW generator for a year is 3,000t, generating more than 2GWh/year. (This solution is most appropriate for large stations and stations with access to freight lines). **Combined heat and power** (CHP): Install a cogeneration power plant based on fossil fuels, or a tri-generation system to provide electricity, heating and air conditioning. This option is recommended for stations with greater heating and air conditioning requirements (for example, metro stations) or stations situated in urban areas prone to heating and cooling. Average carbon emissions are cut to approximately 0.4tCO2e/MWh over 30 years.

2. MONITORING

ENE S **Energy monitoring** An efficient system for monitoring energy consumption data for all energy used in the station.	**ENE S.1 Energy management** Encourage efficient monitoring of energy consumption. **Result**: Analysis of energy consumption and detection of excess energy consumption.
	ENE S.2 Energy monitoring using sub-meters Install separate energy meters or sub-meters to identify energy consumption per area.

Result: Establishes energy monitoring that keeps an eye on systems within the station that have high energy consumption, whilst also avoiding excess consumption. Improves energy management and billing for businesses.

ENE S.3 Real-time monitoring

Monitor and record data concerning the types of energy usage in the station in real time. This will allow staff to track energy consumption according to the time of day.

Result: Establishes initiatives based on behaviour in order to reduce energy consumption.

3. EQUIPMENT

ENE CVC **Energy efficient HVAC system** Energy efficiency is a priority in the design and provision of HVAC systems.	**ENE CVC.1 Energy efficient HVAC system** Prioritise energy efficiency when choosing and using HVAC systems. **Result**: Improves the potential energy savings through the use of energy efficient equipment.

ENE IL **Interior lighting** For office areas the brightness of the lighting should be no greater than 100 lux per 1.5/m^2.	**ENE IL.1 Light efficiency** Incorporate energy efficient lighting technologies (for example, T5 fluorescent, LED, metal halide lamps). **Result**: Reduces energy consumption through the use of efficient lighting and increases the lifespan of lights.

ENE IL.2 Lighting system

The lighting system should be designed by a qualified lighting designer.

Attention should be paid to zoning regulations for lighting requirements in different areas and lights should be placed strategically to maximise their coverage.

Result: Improves lighting efficiency.

ENE IL.3 Lighting compatibly with insulation

Ensure that the lighting is compatible with insulation in order to avoid problems in the ceilings of the station.

Result: Reduces damage caused to infrastructure.

ENE EE

Energy efficient equipment

Energy efficiency is a priority when purchasing equipment that uses energy.

ENE EE.1 Appliances

The station and the shops within it should be equipped with appliances possessing at least an A label for refrigerators, air conditioning units etc. or an ENERGY STAR accreditation for IT equipment.

Result: Improves the potential energy savings through the use of energy efficient appliances.

ENE EE.2 High-performance motors

Prioritise the installation of energy efficient motors in all ventilation and pumping systems. For example, speed controls for fans, and recovering waste heat.

Result: Improves potential energy savings through the use of efficient motors.

ENE X

External lighting

ENE X.1 Design

Encourage the use of high-performance, energy efficient lights in outside areas in order to avoid light pollution and excessive energy consumption.

Result: Reduces energy consumption through the use of efficient lighting and improves the lifespan of the lights.

ENE E

Permeability

ENE E.1 Permeability

Plan measures to minimise heat loss and air infiltration throughout the building structure.

Result: Reduces energy consumption.

ENE A

Lifts

ENE A.1 Design

Encourage the installation energy efficient lifts.

Result: Reduces energy consumption and improves the safety and speed of transport, comfort and space whilst reducing noise nuisance.

ENE A.2 Awareness

Make passengers aware of the energy savings that are made through appropriate use of the lifts.

Result: Reduces energy consumption.

ENE ES	**ENE ES.1 Design**
Escalators	Encourage the installation of energy efficient escalators and moving walkways. **Result**: Optimises energy consumption during operation, in stand-by mode and frequency of use i.e. the number of hours the device is used.

ENE ES.2 Locating escalators to encourage their use

Encourage the use of stairs by ensuring that the stairs are located along the routes taken by passengers, rather than according to the structures already available.

Result: Reduces energy consumption by reducing the use of mechanical devices.

D. TRA - TRANSPORT

1. TRANSPORT REQUIREMENTS

Tra MP	**Tra MP.1 Mobility plan**
Mobility plan	Define transport options in a transport plan developed for each station (and oriented towards station staff) to reduce users' dependence on modes of transport that have the most impact on the environment. **Result**: Facilitate and optimise the use of alternative transport in the initial design.
	Tra MP.2 Example mobility plan Define an example mobility plan for spaces and areas linked throughout the station, identify individuals, visual and intuitive points of references to reinforce the image of the station and ensure the well-being of users. **Result**: Brings metro and pre-metro stations into the ranks of the top stations by offering users measures to facilitate mobility.

Tra IP	**TRA IP.1 Information devices**
Information points	Plan mobility information points exclusively for the use of customers. **Result**: Advises and informs station users of the services on offer to them to optimise their route and the use of other associated services.

2. PLANNING

Tra TP	**TRA TP.1 Accessibility**
Public transport service	Plan for equipment that will ensure the station is well adapted and accessible to other modes of public transport. **Result**: Facilitates and improves the use of alternative transport at the station.

Tra AT	**Tra AT.1 Transport hub**
Alternative modes of transport	Design infrastructure adapted to provide for transfers to other types of transport (private, public). **Result**: Develop metro stations that will become transport hubs by planning measures to facilitate transfer between different modes of transport: bicycle, taxi, walking, car-sharing,

	others.
	Tra AT.2 Information Develop a plan to inform users of all the available public and private transport methods in the immediate surroundings. **Result**: Raises users' awareness of the alternative modes of transport and mixed-mode travel.
	Tra AT.3 Preferential parking for energy efficient vehicles Make preferential parking spaces available for energy efficient vehicles, e.g. hybrid, electric. **Result**: Raises users' awareness of alternatives modes of transport.
Tra PS **Proximity of services**	**Tra PS.1 Services** Provide efficient core services for customers located in or near the station. **Result**: Limits unnecessary movement of station users.
	Tra PS.3 Information Provide information points to provide customers with simple, understandable service information. This allows the creation of links with other services and business within the station. **Result**: Services offered at the station are communicated to inform users.

3. LAYOUT

Tra DH **Delivery and handling**	**TRA DH.1 Access for deliveries** Provide access for deliveries separate from that for passengers. **Result**: Facilitates and optimises delivery and handling.
Tra CP **Accessibility for cyclists and pedestrians**	**Tra CP.1 Bicycle parking** Make provisions for the infrastructure and equipment necessary to provide adequate parking for bicycles. **Result**: Promotes transfer between different modes of transport to both passengers and

	STIB staff.
	Tra CP.2 Bicycle hire Allocate spaces for bicycle hire. **Result**: Promotes transfer between different modes of transport to both passengers and STIB staff.
	Tra CP.3 Car pooling Allocate parking spaces reserved for car-pooling outside of the paid parking area. **Result**: Promotes transfer between different modes of transport to both passengers and STIB staff.
Tra AP **Accessibility** PRM > 15% of the total number of parking spaces are designed for preferential parking.	**Tra AP.1 Accessibility for Persons with Reduced Mobility** Take adequate steps to increase station accessibility for PRMs. **Result**: Design a station that is accessible to all regardless of age, ability or circumstance.
	Tra AP.2 Orient and inform PRMs Equip the station with adequate measures to inform and guide PRMs. **Result**: Ensures that PRMs are properly catered for in stations.
	Tra AP.4 Evacuation Evacuation procedures are adapted for PRMs. **Result**: Ensures that PRMs have a good understanding of evacuation procedures.

E. MAT - MATERIALS

1. RECYCLING

Mat S	**Mat S.1 Design**
Reuse of the existing structure Material from the structure is used and construction is kept to a minimum.	Existing materials in the station will be reused in the construction/renovation. **Result**: Reduces the environmental impact by reusing materials.

2. CHOICE OF MATERIALS

Mat D	**Mat D.1 Sustainable materials**
Choice of Materials	Define a global purchasing policy for materials that takes into account the impact of the lifecycle of construction materials. **Result**: Maintains the performance expected for materials for a defined period and reduces the need for maintenance.
	Mat D.2 Materials from responsible sources Encourage the use of materials from responsible sources, giving priority to ecological brands. **Result**: Gives priority to the use of construction materials with minimal environmental impact during the life cycle of the infrastructure.
	Mat D.3 Quantity of materials The use of new materials in the structure and construction is kept to a minimum. **Result**: Reduces the environmental impact through the reuse of materials.
	Mat D.4 Sustainable materials for outside areas Use sustainable materials for outside spaces. **Result**: Maintains the performance expected for materials for a defined period and reduces the need for maintenance.
	Mat D.5 Robust design Encourage adequate protection of the exposed parts of the building and associated areas. **Result**: Limits how often construction materials need replacing.

Mat M	**Mat M.1 Sustainable furnishings**
Sustainable furnishings	Provide high quality, solid, sustainable furniture, prioritising recycled materials.
Choose quality, sustainable furnishings.	**Result**: Reduces the environmental impact through the choice of furnishings.

F. LEA - ECOLOGY

1. SITES

LEA S Reuse of sites	**LEA S.1 Design** The use of brownfield sites for new stations is encouraged. **Result**: Limits the use of areas not yet built upon for construction projects in order to limit the environmental impact of the project.
LEA P Soil contamination	**LEA P.1 Identification** Identify polluted areas at new station sites and implement a clean-up strategy. **Result**: Uses contaminated sites that would otherwise not be cleaned up or redeveloped.
	LEA P.2 Clean-up strategy Clean up of sites with measures to prevent, minimise, correct or reduce the risks caused by the source of contamination. **Result**: Cleans up areas to ensure the implementation of the project begins on a sound basis.

2. ECOLOGICAL VALUE

LEA V **Ecological value and protection during and after the works**	**LEA V.1 Design** Protect against substantial damage to existing ecological features throughout the preparation of the site and after the construction work is complete. **Result**: Ensures the conservation of the local ecology on the site.
LEA E **Limiting the ecological impact**	**LEA E.1 Design** Encourage measures to limit the environmental impact of the station. **Result**: Ensures the conservation of the local ecology and improves the ecology of the site.
	LEA E.2 Implementation Improve the ecology of the construction site through the reuse of spaces and infrastructure through the planting of vegetation at the station.

Result: Ensures the conservation of the local ecology and improves the ecology of the site.

LEA B	**LEA B.1 Biodiversity action plan**
Long-term biodiversity	Encourage measures to maintain and improve the ecological value of the construction site/renovation over the long term by implementing a biodiversity action plan. **Result**: Minimises the long term impact of the station on urban biodiversity.

3. CLIMATE CHANGE

LEA C **Natural risks** The increased risk of storms and other extreme meteorological phenomena should be taken into consideration when designing the station.	**LEA C.1 Climate change impact evaluation** Carry out an evaluation of the impact of climate change by using current scientific hypotheses and determine the increased risk of extreme meteorological events for the renovation/construction project. **Result**: Identifies and limits risks related to climate change.
	LEA C.2 Station design following the climate change impact evaluation Take the results of the climate change impact evaluation into account when designing the stations. **Result**: Creates metro stations that are prepared for climate change.

G. WAT - WATER

1. EVALUATION OF WATER CONSUMPTION

WAT B	**WAT B.1 Establish reference water consumption**
Reference water consumption	Identify water consumption data for existing stations and determine the water consumption profile for the station to be renovated or constructed. Where possible, differentiate water usage by staff and passengers, and also differentiate the usage of potable and non-potable water. **Result**: Survey and evaluate water consumption at the station.

2. WATER SAVING EQUIPMENT

WAT C	**WAT C.1 Design**
Water-saving equipment The choice of good water-saving equipment allows for greater savings.	Develop strategic objectives to reduce the consumption of drinkable water in the station. **Result**: Monitor and compare the evolution of water consumption to verify the performance of the established objectives.
	WAT C.2 Plan Implementation based on defined objectives and use of equipment with low water consumption. **Result**: Minimises the consumption of potable water by sanitary facilities.
	WAT C.3 Public toilets Installation of public toilets.
	WAT C.4 Controlling consumption Implement measures to ensure the effective management of consumption by sanitary facilities. **Result**: The impact of leaks in the water distribution system that could pass unnoticed is reduced by the management methods put in place.
	WAT C.5 Raising users' awareness Measures to raise users' awareness and influence the water usage of different users. **Result**: Proper implementation of the low water consumption measures that have been put in place.

3. MONITORING

WAT CP	**WAT CP.1 Design**
Water meters	Ensure that water consumption can be controlled and managed by installing water meters. Develop CTM measures for monitoring. **Result**: Monitors and controls the consumption of potable water whilst the station is in operation.

WAT D	**WAT D.1 Design**
Controlling consumption	Reduce the impact of large water leaks that could otherwise pass unnoticed by installing water detection and control devices. **Result**: Limits water losses over the long term, lowers operating costs as well as eventual damage to the infrastructure.

4. COLLECTING WATER

WAT R	**WAT R.1 Collecting rainwater**
Collecting rainwater Collecting rainwater for use in equipment where potable water is not required.	Encourage the reuse of rain water in toilets and elsewhere. **Result**: Reduces the demand for potable water.
	WAT R.2 Treatment of grey water Encourage the use of grey water from any potential sources in the station for non-potable use (for use in toilets or for watering). **Result**: Minimises the consumption of potable water.

5. IRRIGATION

WAT I	**WAT I.1 Flower beds**
Irrigation Avoid planting vegetation that will need irrigation after	Choose plant species that won't require irrigation after planting. **Result**: Reduces the demand for potable water.

planting. Minimise water consumption by vegetation in flower beds and in park and ride areas.	**WAT I.2 Drip irrigation** Use drip irrigation or a similarly efficient water technology for a non-potable water source. **Result**: Minimises the consumption of potable water.

6. SUSTAINABLE CONSTRUCTION SITE: Water Management

WAT M **Work site: water management**	**WAT M.1 Survey and record water consumption during station construction** Measure water consumption through all outlets available on-site during construction. **Result**: Monitor and make a report on the consumption of potable water during construction.

7. POLLUTION

WAT E **Water pollution**	**WAT E.1 Oil pollution** Encourage the use of biodegradable oils where appropriate, prevent, reduce and delay the discharge of rain water into public sewers and water courses by using sustainable urban drainage systems or source control systems. **Result**: Reduces oil pollution into flowing water.

8. FLOODING

WAT RF **Risk of flooding**	**WAT RF.1 Design** Encourage the development of the project in areas with a low risk of flooding. **Result**: Limits the risk of the station being flooded.
	WAT RF.2 Drainage system Encourage the installation of sustainable urban drainage systems or source control systems to reduce overloading in the drainage network. **Result**: Helps to prevent and/or delay flooding and reduce damage caused to infrastructure.

H. WST - WASTE

1. CONSTRUCTION SITE

WST A **Recycled aggregates**	**WST A.1 Recycling** Ensure that construction waste is recycled as much as possible in order to reduce the quantity of new materials used. **Result**: Reduces the need for new materials and optimises the efficiency of materials used in the construction.

2. USE

WST R **Storage of recyclable waste** Ensure the recycling of waste from the building.	**WST R.1 Management** Design an area that meets legal standards, dedicated to storing recyclable waste from the building. **Result**: Ensures good waste management in order to increase the amount of waste recycled instead of sent to landfill or to be incinerated.

WST B **Public waste bins**	**WST B.1 Public waste bins** A sufficient number of waste bins should be provided for customers, allowing sorting of waste. Bins should be clearly identifiable and should follow STIB regulations (type, location,…). The system allows easy waste management and safety monitoring. **Result**: Encourages users to sort their waste and put it into the appropriate bins.
	WST B.2 Customer awareness Plan measures aimed at educating users and encouraging users to sort their rubbish in accordance with STIB. **Result**: Encourages users to sort their waste and to deposit it in the appropriate bins.

I. POL - POLLUTION

1. POLLUTANTS

Pol R	**Pol R.1 Detection of different types of refrigerants**
Refrigerants	Limit the use of refrigerants that have the potential to weaken the ozone layer (PAO). Coolants used in technical installations within the building must have a PAO equal to 0. **Result**: Choose HFC for existing installations; refrigerants containing CFC/HCFC are illegal in new installations.
	Pol R.2 Global warming potential (GWP) Avoid using coolants with high global warming potential (GWP). **Result**: Reduces the production of greenhouse gases and the effect on the ozone layer of refrigerant fluids.
	Pol R.3 Waste management Ensure good monitoring of potential refrigerant waste. **Result**: Reduces the environmental impact.
	Pol R.4 Detection of leaks Avoid pollution from this type of product by detecting refrigerant leaks. **Result**: Limits the risk of pollution due to refrigerant leaks.
Pol N	**Pol N.1 Design**
Atmospheric pollution (including NOx)	Encourage heating and hot water systems that produce the lowest possible emissions of NOx and other pollutants. **Result**: Reduces pollution in the local environment.

2. LIGHT POLLUTION

Pol L **Light pollution**	**Pol L.1 Light pollution** Ensure that external lighting is concentrated and functional in the appropriate areas and that vertical lighting and over illumination are kept to a minimum. **Result**: Reduces needless light pollution and energy consumption.

Pol S **Light pollution in the surroundings** The undesirable effects of light pollution on the surrounding area are avoided.	**Pol S.1 Safety and security lights** Install safety and security lights so that they are not directed towards the surroundings or neighbouring properties. **Result:** Reduces nuisance for neighbouring properties.
	Pol S.2 Avoid dazzle and light pollution Develop lighting strategies that accentuate the station buildings and reduce the level of ambient lighting and dazzle for neighbouring properties. **Result**: Reduces needless light pollution and nuisance for neighbouring properties.