I/ General description and characterization of the NBS type

I.1 Definition and different variants existing

Definition	This NBS Type is about green tram tracks which are unsealed and greened with grasses or sedum species and thus achieve several valuable ecological, economic and urban design benefits.

Different variants existing

Two kinds can be distinguished, depending on the chosen community of plants:

=> Grass tram track

The grass tram track consists mostly of grasses and partially herbs, which have typical more than 15 cm substrate depth and following a high water and maintenance demand. The advantages are the high resilience for utilisation and the whole application area from sunny to shady conditions.



© Green4Cities



© Green4Cities



© Green4Cities

=> Sedum tram track

By a sedum tram track mainly Sedum species and partially herbs are used, which need a substrate depth from typically 4-8 cm. Compared to grasses, the applied plants have a lower water and maintenance demand and following a higher resilience for drought. It's not suitable for shady conditions but have a more valuable ecological benefit than grass tram track.



Sedum track Berlin
© Schreiter (2010)



Sedum track Berlin
© Schreiter (2010)



Sedum track Berlin
© Schreiter (2010)

I.2 Urban challenges and sub-challenges related + impacts		
Main challenges and sub-challenges targeted by the NBS	02| Urban water management and quality > 02-1 Urban water management 07| Public Health and wellbeing > 07-1 Acoustics > 07-2 Quality of Life	- Reduction of runoff water volumes, evapotranspiration - Aesthetic value - Noise/Acoustic buffer
Co-benefits and challenges foreseen	01| Climate issues > 01-2 Climate adaptation 02| Water management and quality > 02-1 flood management 04| Biodiversity and urban space > 04-1 Biodiversity > 04-2 Urban space development and regeneration > 04-3 Urban space management 09| Urban planning and governance > 09-1 Urban planning and form	- Temperature reduction, helps mitigating urban heat island - Water buffer - Provide nutrition sources for birds and insects - Increasing green areas
Possible negative effects	07| Public Health and well-being	- Presence of undesired insects

II/ More detailed information on the NBS types

II.1 Description and implication at different spatial scales	
Scale at which the NBS is implemented	Neighbourhood City
Impacted scales	Depending on the scales the actions can have wide-ranging impacts, reaching from the close neighbourhood to a throughout connected greened city track.
II.2 Temporal perspective (including management issues)	
Expected time for the NBS to become fully effective after its implementation	Immediately to 1-2 years, depending on the chosen seeding method. Usually, pre-cultivated turf or sedum are applied, which bring the full effect promptly.
Life time	By appropriate maintenance and conditions very persistent and basically self-adjusting – like lawns or extensive green roofs and have a longer life-time like the rails.
Sustainability and life cycle	Because of production method the use of turf is controversial discussed. By sedum track the substrate can be recycling material.
Management aspects (kind of interventions + intensity)	- Perhaps irrigation (only at extremely hot and dry periods) - Perhaps mowing (grass tram tracks)
II.3 Stakeholders involved/ social aspects	
Stakeholders involved in the decision process	- Municipality departments - traffic enterprise
Technical stakeholders & networks	- construction engineer - Landscape architects - Perhaps maintenance company, horticulturist and gardeners. - The technical stakeholders network varies from cities and countries.
Social aspects	- Tram tracks are anyhow a common and necessary urban infrastructure. Additional greening can be a selling point for the acceptance of a route by

	citizens.

II.4 Design / techniques/ strategy

Knowledge and how-know involved	- Selection of plant adapted to: • the local climate • the exposition • challenges targeted - Selection of substrate
Materials involved	- track systems - drainage material - substrate - turf and/or seeding/sprouts



Grass
© Green4Cities



Sedum
© Green4Cities

II.5 Legal aspects related

In Germany the acceptance of a route is a requirement to get the approval from authorities, wherefore greened tracks are target-aimed. Further information's are not available.

II.6 Funding Economical aspects

Range of cost	Actually, collecting general information about the costs for this NBS Type is quite difficult, due to different approaches, construction types and vegetation technics. Further traffic enterprises are often positioned in different ways by differences in placing of construction and maintenance tasks. Therefore credible figures concerning costs for green tram tracks installation and maintenance cannot be taken.
Origin of the funds (public, private, public-private, other)	- nA

II.7 Possible combinations with other kinds of solutions (other environmental friendly solutions or conventional ones)

nA

III/ Key elements and comparison with alternative solutions

III.1 Success and limiting factors	
Success factors	- site-specific adapted mixture of plant species - ensured maintenance
Limiting factors	- high(er) construction costs - regular maintenance costs
III.2 Comparison with alternative solutions	
Grey or conventional solutions counterpart	• Concrete track These other solutions target one or several challenges completed by this NBS, sometimes more efficiently, but none of them touches such a diversity of challenges. Moreover, solutions proposed are often more expansive. These solutions propose other aesthetics for the building.
Close NBS	• Flower fields • Lawns • Green strips • Unsealed car parks • Planted car parks • Extensive green roof This NBS Type is tailor-made for a specific application case by the hybrid-function of a green space by same time being an infrastructure for public transport. Nevertheless, NBS Types which use grasses or herbs on the ground and are designed for temporarily use have similar effects and needs.

IV/ References

IV.1 Scientific and more operational references (presented jointly)

KAPPIS Christel, SCHREITER Hendrikje, REICHENBACHER Karsten (2015): Green track – progress report and overview – A contribution to the green track network. Infrastruktur & Bau, Grünes Gleis. Eurailpress. Online: http://www.gleiswerkstatt.de/portfolio/artikel-gruenes-gleis.pdf

KAPPIS Christel, SCHREITER Hendrikje (2016): Handbook track greening – Design, Implementation, Maintenance. Grüngleisnetzwerk. Berlin.

SCHREITER Hendrikje (2010): Green Tram Tracks – The advantages of implementing vegetation systems in tram tracks. Institute for Agricultural and Urban Projects at the Humboldt-University, Berlin. Prague. Online: http://www.urbantrack.eu/images/site/publications/FinalConference/presentations/07_ASP_Grassed%20Track.pdf

SCHREITER Hendrikje, KAPPIS Christel (2013): Green Tram Tracks – Effect & Functions – Review and own research. Institute for Agricultural and Urban Projects at the Humboldt-University, Berlin. WGIC Nantes. Online: http://www.iasp.asp-berlin.de/Poster/poster1301.pdf

SCHREITER Hendrikje, KAPPIS Christel (nA): Effect and Function of Green Tracks. Grüngleisnetzwerk. Berlin. Online: http://www.gruengleisnetzwerk.de/images/downloads/effects.pdf

WEISS Christa (2016): Begrünte Bahntrassen – Mehr Grün im Gleis. Freiraumgestalter 03/2016. Online: https://www.torial.com/christa.weiss/portfolio/178112

IV.2 Sources used in this factsheet

Green4Cities – www.green4cities.com

SCHREITER Hendrikje (2010): Green Tram Tracks – The advantages of implementing vegetation systems in tram tracks. Institute for Agricultural and Urban Projects at the Humboldt-University, Berlin. Prague. Online: http://www.urbantrack.eu/images/site/publications/FinalConference/presentations/07_ASP_Grassed%20Track.pdf

V/ Author(s)

Name	Institution / company	Writer/ reviewer
Florian Kraus	Green4Cities	Writer
Johannes Anschober	Green4Cities	Writer
Barnabás Körmöndi	MUTK	Reviewer
Marjorie Musy	Cerema	Reviewer