# Example name: Integrated photo-bioreactor

Template completed by:
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**For installations**

BISTS Location: Hamburg, Germany
Climate Type: Cfb
Building Use: residential,

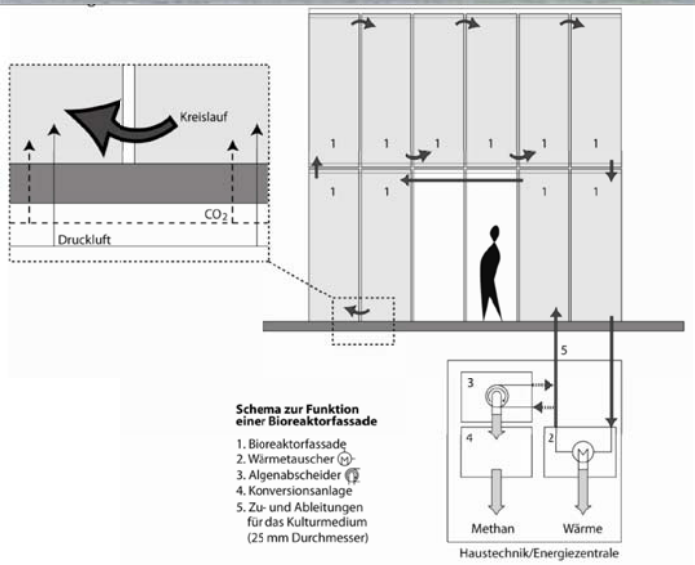
Level of BISTS integration
Reijenga level 4-5

OX New Build
O Refurbishment
O Other:
……
*tick all that apply*

**Type of BISTS**:

Active/Hybrid

Function(s):
O Air heating
O Water heating
O Combi-system
OX Cooling/ventilation/shading
O PV/T
O linked to another system (e.g., heat pump)
OX Other: Photosynthesis……..




**Building element:**

OX Facade
O Roof
O Other:
……..

**BISTS characteristics**:

*For example…..Collection area….$m^2$, Orientation/inclination, Energy output, Contribution to building load, Material/colour/texture, Pre-fabricated off-site? Structural load, Other*

**Stage of Development:**

| | | |
|---|---|---|
| OX | Idea/Patent | Strategic Science Consult GmbH |
| OX | Prototype | …… |
| OX | Demonstration | …… |
| O | Integral building element | …… |
| O | Commercially available | …… |

*tick all that apply*

**Responsible:** *Research institute, Company, etc.*

**BISTS description and context**

*For example….Building size, form and function, project motivation, particular features, architectural attributes*

**System viability**

*For example….Economic viability (capital and running costs), maintenance, embodied energy, environmental impact and sustainability, wider social contexts*

**Modelling and simulation tools developed/used**

*For example….new modules/types created for established simulation programs, stand-alone modelling, use of generalised codes, model outcomes, validation and accuracy. Design tools developed*

| | |
|---|---|
| **BISTS Performance data**<br><br>Based on:<br>O Estimation<br>O Detailed simulation<br>*Specify software(s) used*<br>O Measurement/testing<br>O Long-term monitoring<br>*tick all that apply*<br><br>**Performance parameters**<br><br>For integrated systems:<br>key performance indicators -<br><br>*Solar savings fraction: %*<br>*Light transmittance: %*<br>*Solar transmittance: %*<br>*Total solar energy transmittance: %:*<br>*Solar heat gain factor: %*<br>*Building fabric U-values: W/m$^2$K*<br>*Noise, fire, etc ratings*<br>*Other:*<br><br>For separate collectors:<br>performance rating coefficients -<br>(EN12975, a0,a1,a2), ASHRAE, etc<br><br>Other: | *Graphs for collector efficiency, seasonal energy gains, diurnal/seasonal solar fraction, etc.* |

**Additional information:**

**Sources and references:**

*http://www.archdaily.com/339451/worlds-first-algae-bioreactor-facade-nears-completion/*

**INSTRUCTIONS**

Please fill in as much information as possible.

Tick where appropriate.

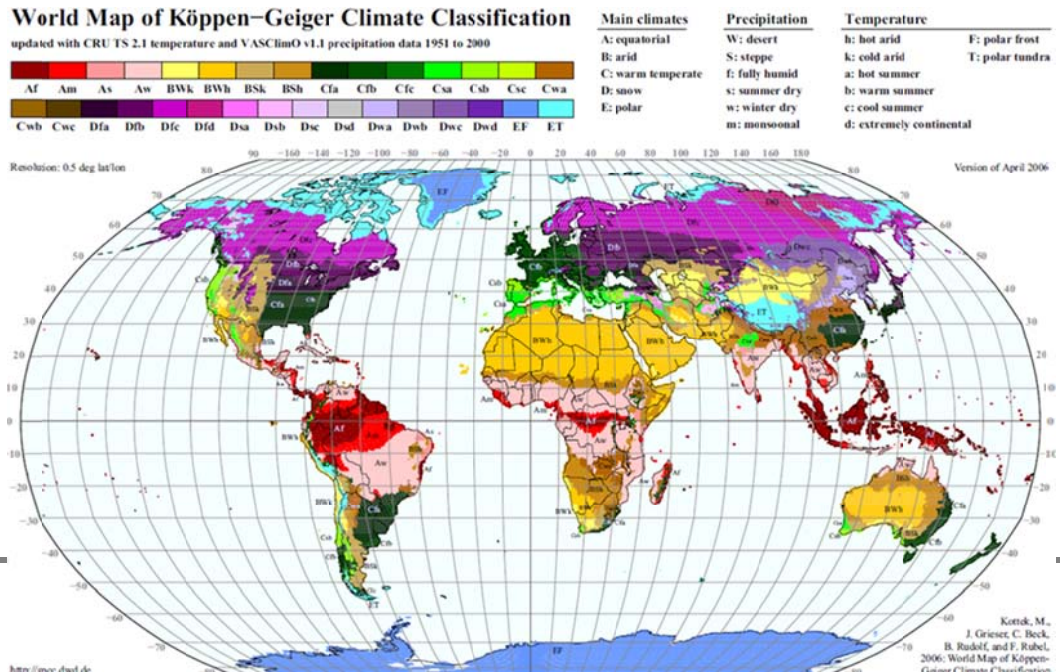
Text in red is suggested guidance. Insert information in provided space, removing red text as appropriate

If possible, use metric values.

If necessary, supply additional information on separate sheets

Reference listing

## Köppen climate classification



(Kottek, M., J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of Köppen-Geiger Climate Classification updated. Meteorol. Z., 15, 259-263.)

**Reijenga classification**
The integration of PV systems in architecture can be divided into five categories:

1. Applied invisibly
2. Added to the design
3. Adding to the architectural image
4. Determining architectural image
5. Leading to new architectural concepts.

(Reijenga, TH and Kaan, HF. (2011) PV in Architecture, in Handbook of Photovoltaic Science and Engineering, Second Edition (eds A. Luque and S. Hegedus), John Wiley & Sons Ltd, Chichester, UK)

**Rush classification**
The architectural/visual expression of building services systems are identified as:

Level 1. Not visible, no change
Level 2. Visible, no change
Level 3. Visible, surface change
Level 4. Visible, with size or shape change
Level 5. Visible, with location or orientation change

(Rush, RD. (1986) The Building systems integration handbook Wiley, New York, USA)

**Collector test standards**

BS EN 12975-2 2006 ‘Thermal solar systems and components solar collectors - Part 2 test methods’
ASHRAE Standard 93-2010 ‘Methods of Testing to Determine the Thermal Performance of Solar Collectors’
ASHRAE Standard 95-1987 ‘Methods of Testing to Determine the Thermal Performance of Solar Domestic Water Heating Systems’