

Supplementary Materials

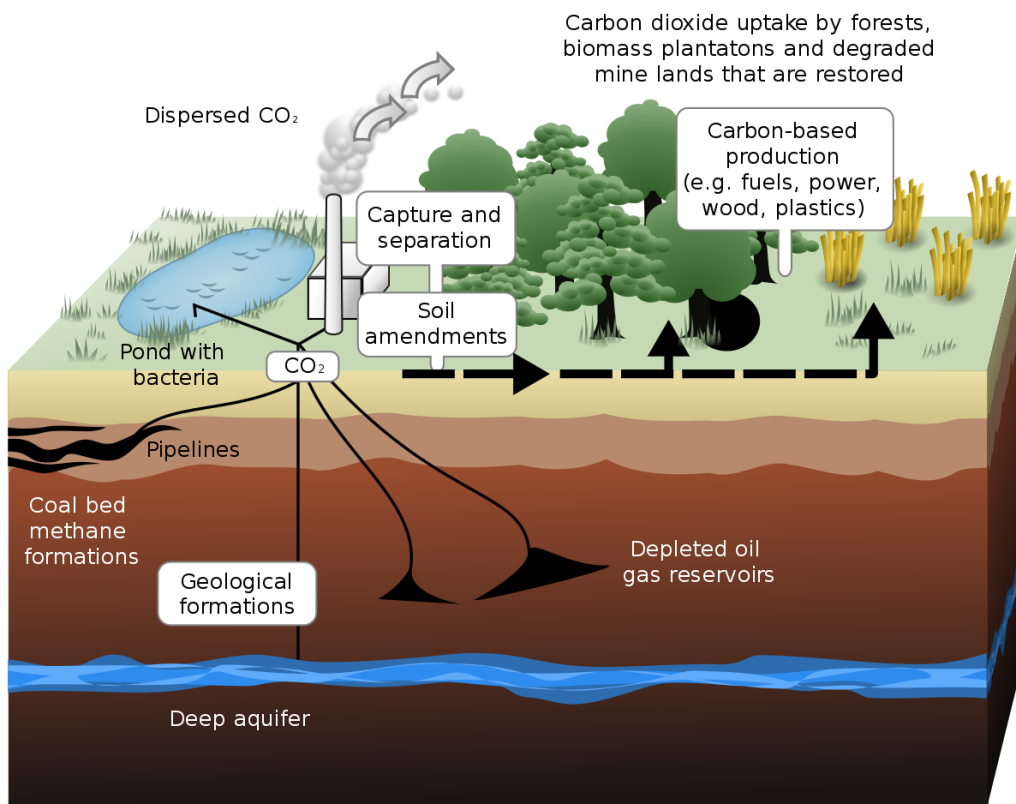


Fig. S1. Biotic methods for adsorbing carbon dioxide [13].

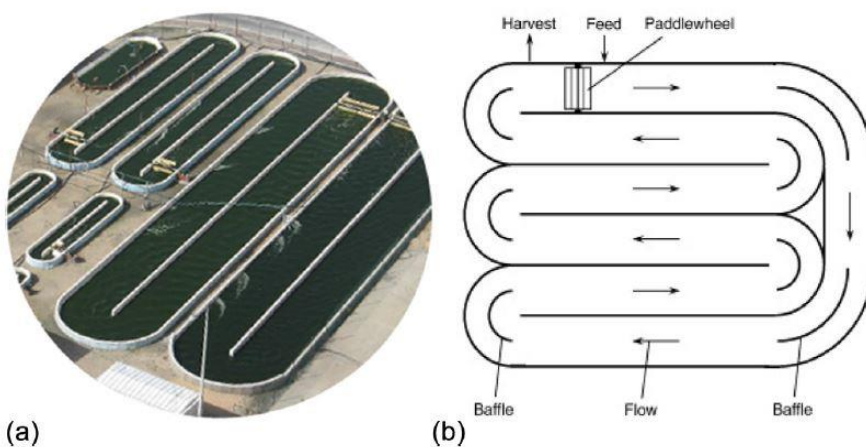


Fig. S2. Open pond system. A: A sample made by the Seabiotic Institute. B: Schematic and aerial view of the pond [48].

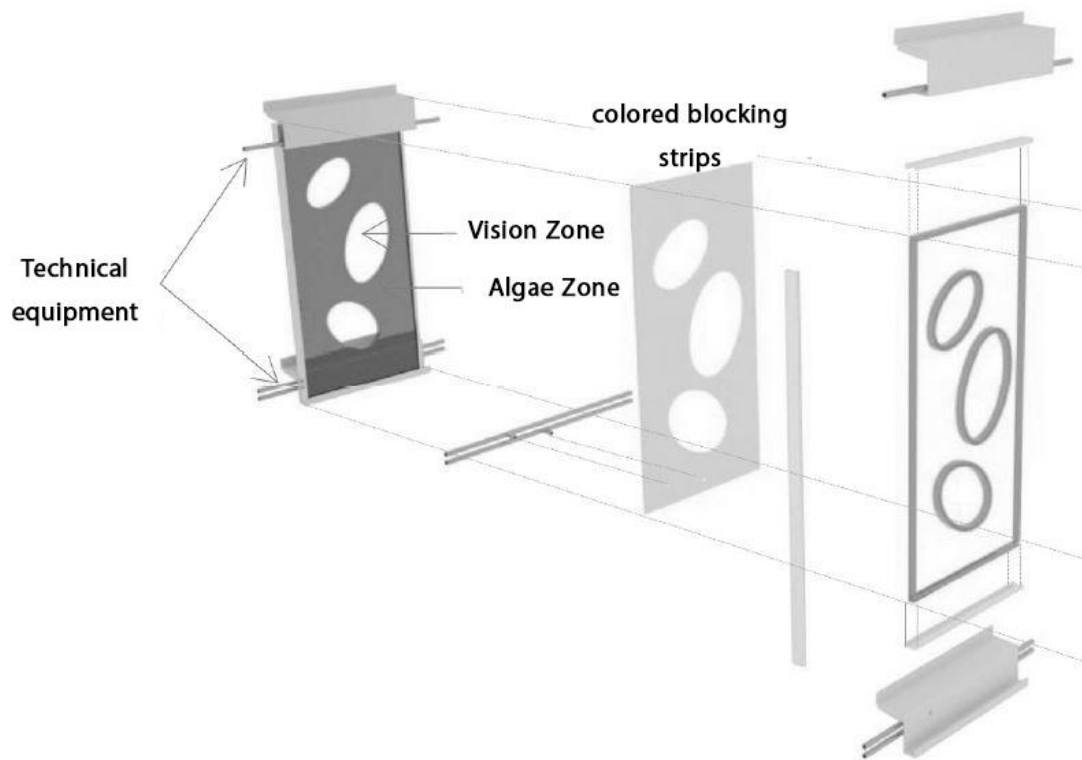


Fig. S3. Designed panel with vision and microalgae zones [60].



Fig. S4. The combination of engineering and spectacular design to produce an attractive and dynamic bioreactor [50].



Fig. S5. Using a bioreactor as urban furniture [50].

Table S1. Pairwise Comparison Matrix Describing Relative Preferences among Identified Criteria

Criteria	Climate	Economy	Architecture	Environment	Structure	Weigh	CI	CR
Climate	1	2	1	0.2	1	0.133		
Economy	0.5	1	1	0.33	1	0.111		
Architecture	1	1	1	0.2	1	0.115	0.029	0.026
Environment	5	3	5	1	5	0.523		
Structure	1	1	1	0.2	1	0.115		

Table S2. Pairwise Comparison Matrix Describing Relative Preferences among Sub-Criteria Respect to Criteria

Climate											
Sub-criteria	Capability of using in most climates			Applicable in all building's fronts			Weigh	CI	CR		
Capability of using in most climates	1			2			0.666	0	0		
Applicable in all building's fronts	0.5			1			0.333				
Economy											
Sub-criteria	Service life of façade		Construction cost		Repair and maintenance		Value added		Weigh	CI	CR
Service life of façade	1		3		0.14		1		0.155	0.078	0.087
Construction cost	0.33		1		0.2		0.33		0.074		
Repair and maintenance	7		5		1		2		0.556		
Value added	1		3		0.5		1		0.213		
Architecture											
Sub-criteria	Aesthetics	Light transmission	Indoor-outdoor visibility	Light reflection	Impact on thermal comfort	Adaptive potential of façade to climate change	Thermal performance of façade	Sound insulation performance of façade	Weigh	CI	CR
Aesthetics	1	0.11	0.33	5	0.33	3	0.33	0.33	0.055	0.119	0.085
Light transmission	9	1	7	9	1	5	7	3	0.354		
Indoor-outdoor visibility	3	0.14	1	5	1	3	3	1	0.129		
Light reflection	0.20	0.11	0.2	1	0.14	0.5	0.2	0.2	0.021		
Impact on thermal comfort	3	1	1	7	1	7	1	1	0.167		
Adaptive potential of façade to climate change	0.33	0.2	0.33	2	0.142	1	0.2	0.33	0.034		
Thermal performance of façade	3	0.14	0.33	5	1	5	1	0.33	0.091		
Sound	3	0.33	1	5	1	3	3	1	0.144		

insulation performance of façade							
Environment							
Sub-criteria	Urban heat island reduction	Improvement of outdoor air quality	Impact on outdoor air moisture content	Rain water management	Weigh	CI	CR
Urban heat island reduction	1	0.2	5	1	0.175	0.067	0.076
Improvement of outdoor air quality	5	1	7	3	0.562		
Impact on outdoor air moisture content	0.2	0.14	1	0.14	0.044		
Rain water management	1	0.33	7	1	0.217		
Structure							
Sub-criteria	Wind resistance performance	Structural behavior of integrated façade subjected to different external loads		Contribution to building weight	Weigh	CI	CR
Wind resistance performance	1	5		3	0.648	0.001	0.003
Structural behavior of integrated façade subjected to different external loads	0.2	1		0.5	0.122		
Contribution to building weight	0.33	2		1	0.229		

Table S3. Pairwise Comparison Matrix Describing Relative Preferences among Available Alternatives with Respect to Sub-criteria

	Microalgae fa çades	Green façad es	Water façad es	Weigh	CI	CR
Capability of using in most climates						
Microalgae façades	1	0.33	5	0.279	0.032	0.062
Green façades	3	1	7	0.649		
Water façades	0.2	0.14	1	0.072		
Applicable in all building's fronts						
Microalgae façades	1	0.33	0.1	0.065	0.040	0.077
Green façades	3	1	0.14	0.148		
Water façades	9	7	1	0.785		
Service life of façade						
Microalgae façades	1	0.5	0.2	0.112	0.026	0.051
Green façades	2	1	0.2	0.178		
Water façades	5	5	1	0.708		
Construction cost						
Microalgae façades	1	0.2	0.2	0.088	0.026	0.051
Green façades	5	1	0.5	0.352		
Water façades	5	2	1	0.559		
Repair and maintenance						
Microalgae façades	1	0.5	0.33	0.157	0.026	0.051
Green façades	2	1	0.33	0.249		
Water façades	3	3	3	0.593		
Value added						
Microalgae façades	1	3	5	0.639	0.019	0.037
Green façades	0.33	1	3	0.258		
Water façades	0.2	0.33	1	0.104		
Aesthetics						
Microalgae façades	1	1	2	0.387	0.009	0.017
Green façades	1	1	3	0.443		
Water façades	0.5	0.33	1	0.169		
Light transmission						
Microalgae façades	1	5	7	0.730	0.032	0.062
Green façades	0.2	1	3	0.188		
Water façades	0.14	0.33	1	0.080		
Indoor-outdoor visibility						
Microalgae façades	1	0.5	5	0.357	0.026	0.051
Green façades	2	1	5	0.559		
Water façades	0.2	0.2	1	0.088		
Light reflection						
Microalgae façades	1	9	7	0.798	0.003	0.006
Green façades	0.11	1	1	0.096		
Water façades	0.14	1	1	0.104		
Impact on thermal comfort						
Microalgae façades	1	5	7	0.747	0.006	0.012
Green façades	0.2	1	1	0.133		
Water façades	0.14	1	1	0.119		
Adaptive potential of façade to climate change						
Microalgae façades	1	1	0	0.156	0.014	0.027
Green façades	1	1	0.33	0.185		

Water façades	5	3	1	0.658		
Thermal performance of façade						
Microalgae façades	1	0.5	1	0.259		
Green façades	2	1	1	0.412	0.026	0.051
Water façades	1	1	1	0.327		
Sound insulation performance of façade						
Microalgae façades	1	5	7	0.730		
Green façades	0.2	1	3	0.188	0.032	0.062
Water façades	0.14	0.33	1	0.080		
Urban heat island reduction						
Microalgae façades	1	1	5	0.480		
Green façades	1	1	3	0.405	0.014	0.027
Water façades	0.2	0.33	1	0.113		
Improvement of outdoor air quality						
Microalgae façades	1	5	7	0.730		
Green façades	0.2	1	3	0.188	0.032	0.062
Water façades	0.14	0.33	1	0.080		
Impact on outdoor air moisture content						
Microalgae façades	1	0.33	0.33	0.087		
Green façades	3	1	0.33	0.242	0.003	0.006
Water façades	7	3	1	0.669		
Rain water management						
Microalgae façades	1	0.14	1	0.131		
Green façades	7	1	3	0.694	0.040	0.077
Water façades	1	0.33	1	0.174		
Wind resistance performance						
Microalgae façades	1	1	5	0.435		
Green façades	1	1	7	0.486	0.006	0.012
Water façades	0.2	0.14	1	0.077		
Structural behavior of integrated façade subjected to different external loads						
Microalgae façades	1	0.5	1	0.198		
Green façades	2	1	2	0.493	0.026	0.051
Water façades	2	0.5	1	0.310		
Contribution to building weight						
Microalgae façades	1	0.2	1	0.122		
Green façades	5	1	3	0.648	0.001	0.003
Water façades	2	0.33	1	0.229		