**Supplementary Material S4:** Overview of multifunctional impacts of UPA including ecosystem services (co-benefits) and multifunctional benefits, threats derived from UPA as well as actors affected by the impacts of UPA

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| --- | --- | --- | --- |
| **Ecosystem services (co-benefits) provided by UPA** | | |  |
| **Categories** | **Ecosystem services** | **References (see S2)** | **Frequency** |
| **Provisioning ecosystem services** | food supply - quantity | 1.3; 1.5; 1.6; 2.3; 2.4; 2.6; 2.7; 2.8; 2.9; 2.13; 2.14; 2.17; 2.18; 2.22; 3.1; 3.4; 3.7; 3.8; 3.9; 3.10; 3.11; 3.13; 3.14; 3.16; 3.17; 3.18; 3.19; 3.20; 3.25; 3.26; 5.1; 5.6; 5.8; 5.10; 5.14; 6.7; 6.11; 6.14; 7.1; 7.7; 7.8; 7.9; 7.12; 7.14; 7.25; 8.19; 9.6; 9.8; 9.10; 9.12; 9.13; 9.14; 9.15; 9.16; 9.17; 10.2; 10.8 | 57 |
| food supply - quality | 1.1; 1.2; 2.10; 3.7; 4.1; 4.2; 5.4; 6.1; 6.6; 6.9; 6.10; 7.8; 7.11; 7.13; 7.23; 7.25; 8.5; 8.16; 9.1; 9.2; 9.3;9.4; 9.7; 9.9; 9.14; 9.19; 9.21; 10.3; 10.4; 10.6; 10.7; 10.9; 10.10; 10.12 | 34 |
| medicinal resources | 1.3; 3.7; 3.13; 3.14; 3.16; 3.17 | 6 |
| **Regulating ecosystem services** | regulation of local climate and air quality | 1.1; 1.2; 1.3; 1.5; 2.2; 2.18; 3.1; 3.2; 3.7; 3.13; 3.16; 5.4; 6.11; 7.1; 7.14; 7.24; 8.16; 9.6; 10.8 | 19 |
| run-off mitigation | 3.1; 3.5; 3.13; 3.19; 3.26; 5.9; 6.8; 6.11; 7.1; 7.11; 9.1; 9.4 | 12 |
| maintenance of soil fertility | 3.1; 3.5; 3.7; 3.10; 3.23; 6.3; 6.14; 7.1; 9.7; 9.13; 9.17 | 11 |
| pollination | 3.3; 3.7; 3.8; 3.11; 3.13; 3.15; 3.21; 9.7; 9.13 | 9 |
| carbon sequestration and storage | 1.4; 3.20; 5.7; 5.10; 7.1 | 5 |
| biological control | 3.10; 3.14; 3.21; 3.24; 3.25 | 5 |
| erosion prevention | 7.23; 9.4, 9.7 | 3 |
| waste-water treatment | 5.10 | 1 |
| noise reduction | 8.16 | 1 |
| **Cultural ecosystem services** | recreation and mental and physical health | 1.2; 2.17; 3.2; 3.7; 3.10; 3.13; 3.17; 4.1; 5.5; 6.2; 6.3; 6.6; 6.10; 6.11; 7.9; 7.12; 7.14; 7.25; 8.2; 8.4; 8.5; 8.6; 8.11; 8.16; 8.17; 8.19; 9.1; 9.3; 9.4; 9.6; 9.9; 9.16; 9.20; 10.2; 10.3; 10.4; 10.6 | 37 |
| education and learning | 9.16; 3.2; 3.7; 3.13; 5.5; 5.11; 5.12; 6.2; 6.3; 6.4; 6.10; 7.2; 7.6; 7.7; 7.8; 7.25; 8.1; 8.11; 8.16; 8.17 9.1; 9.3; 9.6; 9.7; 9.8; 9.10; 9.15; 9.19; 9.20; 9.21 | 30 |
| nature experience | 1.2; 9.16; 3.4; 3.7; 3.8; 3.17; 4.3; 6.8; 6.10; 7.1; 7.9; 7.23; 7.25; 8.2; 9.3; 9.6; 9.9; 9.13; 10.1 | 19 |
| aesthetic appreciation and inspiration | 2.18; 3.4; 3.7; 3.8; 3.18; 6.5; 6.6; 7.14; 7.23; 8.6; 8.16; 9.3; 9.4; 9.10 | 14 |
| spiritual experience | 3.7; 3.14; 8.16; 8.19: 9.10; 9.16 | 6 |
| sense of place | 3.7; 8.4 | 2 |
| sense of historic information | 9.3; 9.6 | 2 |
| tourism | 6.2 | 1 |
| **Multifunctional co-benefits of UPA** | | |  |
| **Categories** | **Benefits** | **References (see S2)** | **Frequency** |
| **Social benefits** | community-building and participation | 2.1; 2.3; 2.5; 2.15; 2.17; 2.18; 2.19; 3.7; 3.17; 3.18; 3.19; 3.20; 4.1; 4.2; 5.5; 6.2; 6.3; 6.8; 6.11; 6.12; 7.6; 7.7; 7.8; 7.10; 7.11; 7.17; 7.23; 7.25; 8.1; 8.4; 8.5; 8.6; 8.16; 8.17; 8.19; 9.1; 9.2; 9.3; 9.4; 9.6; 9.7; 9.8; 9.9; 9.10; 9.11; 9.14; 9.15; 9.17; 9.18; 9.19; 9.20; 9.21; 10.1; 10.4; 10.5; 10.6; 10.9; 10.10; 10.11 | 59 |
| environmental awareness-raising and education | 2.5; 2.9; 2.15; 2.19; 6.2; 6.3; 7.2; 7.6; 7.7; 7.8; 8.1; 8.5; 8.17; 9.1; 9.2; 9.3; 9.6; 9.10; 9.12; 9.13; 9.14; 9.15; 9.20; 10.4; 10.6; 10.7; 10.10; 10.11 | 28 |
| public health | 2.1; 2.3; 2.6; 2.17; 2.19; 2.20; 7.2; 7.7; 7.8; 7.9; 8.1; 8.5; 8.6; 8.11; 8.15; 8.16; 8.17; 9.1; 9.2; 9.6; 9.9; 9.12; 9.14; 9.20; 10.7; 10.9, 10.11, 10.12 | 28 |
| food security and food self sufficiency | 2.3; 2.5, 2.12; 2.14; 2.16; 2.17; 2.20; 5.1; 5.4; 5.5; 5.8; 5.14; 5.16; 6.3; 7.7; 7.8; 7.14; 8.1; 8.4; 9.7; 9.8; 9.17; 10.6; 10.10; 10.11; 10.12 | 26 |
| empowerment and practical knowledge gain | 2.3; 2.5; 2.15; 5.5; 6.3; 7.6; 7.8; 7.17; 7.25; 8.4; 8.5; 8.19; 9.7; 9.8; 10.5; 10.7; 10.12 | 17 |
| contribution to energy and water security | 5.1; 5.9 | 2 |
| positive media attention | 2.15; 7.8 | 2 |
| **Economic benefits** | resource savings (costs, energy, waste) | 1.5; 1.6; 2.3; 2.6; 2.11; 2.13; 2.14; 2.15; 2.16; 2.18; 3.10; 5.1; 5.4; 5.5; 5.7; 5.10; 5.14; 5.16; 6.2; 6.3; 7.6; 7.7; 7.9; 7.11; 7.25; 8.19; 9.3; 9.6; 10.2; 10.10 | 30 |
| income and job generation | 2.3; 2.9; 2.19; 5.1; 5.4; 5.7; 6.2; 6.4; 6.7; 7.6; 7.7; 7.8; 7.11; 9.1; 9.2; 9.3; 9.8; 9.12; 9.17; 9.20; 10.4; 10.6; 10.7;10.8; 10.9 | 25 |
| local market benefits | 1.1; 2.3; 2.15; 6.2; 6.8; 7.6; 7.7; 7.8; 7.11; 7.21; 8.5; 8.19; 10.6; 10.7; 10.9; 10.10; 10.11 | 17 |
| **Ecological benefits** | habitat provision and biodiversity | 3.1; 3.2; 3.5, 3.6; 3.7; 3.10; 3.11; 3.12; 3.13; 3.14; 3.19; 3.21; 3.22; 5.4; 6.8; 7.14; 7.25; 9.4; 9.6; 9.7; 9.8; 9.13; 19.17 | 23 |
| reduction of environmental pollution | 1.4; 1.5; 1.6; 2.18; 3.26; 4.2; 5.4; 5.5; 5.6; 5.7; 5.8; 5.10; 5.11; 5.12; 5.16; 6.3; 6.10; 6.12; 7.6; 7.25; 9.6; 9.13; 10.4 | 23 |
| reduction of resource depletion | 1.4; 3.26; 5.6; 5.7; 5.8; 5.9; 5.10; 5.14; 9.6; 10.6; 10.10; 10.11; 10.12 | 13 |
| residents’ good environmental behaviour | 9.16, 2.17, 2.19, 5.4; 9.3 | 5 |
| improved soil quality | 5.1; 5.4; 6.6; 6.14; 7.15 | 5 |
| avoided land transformation | 5.7; 5.10; 9.6 | 3 |
| **Threats by UPA** | | |  |
| **Categories** | **Threats** | **References (see S2)** | **Frequency** |
| **Social threats** | social injustice | 2.16; 7.11; 9.6; 9.11; 9.12; 9.16; 10.3; 10.6; 10.11 | 9 |
| health risks of urban food provision | 6.3; 6.4; 7.6; 9.8; 10.4; 10.6; 10.11; 10.12 | 8 |
| gentrification | 7.11; 10.11 | 2 |
| lacking food security | 3.10; 10.8 | 2 |
| community disempowerment | 6.3; 7.17 | 2 |
| unreliable participation in UPA | 7.8 | 1 |
| **Economic threats** | low efficiency of food self-production | 2.6; 5.6; 9.8 | 3 |
| insecure employment opportunities | 5.6; 7.9; 7.11 | 3 |
| high costs related to UPA | 3.19; 5.8 | 2 |
| low economic value of UPA areas | 7.22 | 1 |
| **Ecological threats** | threats on soil through UPA activities | 2.17; 3.10; 3.18; 3.19; 3.24; 5.10; 5.11; 6.6; 6.9; 6.13; 7.4; 7.13; 7.22; 9.9 | 14 |
| threats on biodiversity through UPA activities | 3.4; 3.9; 3.11; 6.14; 7.23; 9.8; 9.17 | 7 |
| threats on water through UPA activities | 2.19; 3.26; 5.5; 5.9 | 4 |
| threats on landscapes through UPA activities | 2.22; 3.18; 5.5 | 3 |
| increasing GHG emissions | 2.22; 5.6; 5.8 | 3 |
| high electricity demand related to UPA | 5.5; 5.14 | 2 |
| **Actors affected by UPA** | | |  |
| **Categories** |  | **References (see S2)** |  |
| Macro scale | N.A. | N.A. | N.A. |
| Meso scale | local government | 2.1; 2.16; 2.18; 2.19; 2.20; 6.2; 6.3; 6.12; 7.7; 7.8; 7.10; 7.11; 7.17; 9.1; 9.8; 9.12; 10.1; 10.9 | 18 |
| Micro scale | residents | 2.7; 2.8; 2.13; 2.14; 2.15; 2.18; 2.19; 2.20; 3.4; 3.5; 3.7; 3.9; 3.19; 4.2; 4.3; 5.4; 6.2; 6.3; 6.12; 7.5; 7.6; 7.7; 7.10; 7.11; 7.17; 7.20; 7.21; 7.25; 8.1; 8.5; 8.17; 9.2; 9.4; 9.6; 9.8; 9.9; 9.10; 9.12; 9.13; 9.16; 9.17; 9.18; 10.1; 10.2; 10.3; 10.5; 10.9; 10.12 | 48 |
| vulnerable population groups (including children and youth, pensioners, immigrants, people of low income, unemployed people, homeless people, handicapped people, clinic patients | 3.7; 3.8; 3.9; 3.17; 6.3; 6.6; 7.1; 7.6; 7.20; 7.25; 8.1; 8.5; 8.11; 8.17; 8.19; 9.3; 9.6; 9.7; 9.13; 9.15; 9.17; 9.19; 9.21; 10.7: 10.8; 10.9; 10.10; 10.12 | 28 |
| (urban) farmers | 2.2; 2.9; 2.16; 2.20; 3.18; 4.2; 4.3; 6.3; 6.12; 6.13; 7.5; 7.9; 7.10; 9.1; 9.2; 9.12; 9.14; 9.15: 10.2; 10.8; 10.10 | 21 |
| gardeners | 1.3; 2.5; 2.6; 2.11; 2.17; 3.1; 3.7; 3.10; 3.17; 6.9; 7.8; 8.2; 8.4; 8.15; 8.16 | 15 |
| consumers | 2.9; 2.26, 9.14; 10.4; 10.6; 10.8; 10.10; 10.12 | 7 |
| NGOs | 6.12; 7.8; 7.10; 9.13 | 4 |
| researchers | 7.1; 9.10; 9.13; 9.15 | 4 |
| volunteers | 8.1; 8.5; 9.1; 9.15 | 4 |
| activists | 7.10; 9.13; 9.15 | 3 |
| (local/ social) companies | 10.6; 10.10; 10.12 | 3 |
| tourists | 7.11; 9.13; 9.15 | 3 |
| real estate agencies | 3.18; 9.20 | 2 |
| investors | 6.2; 7.11 | 2 |
| artists | 9.13 | 1 |
| journalists | 9.13 | 1 |