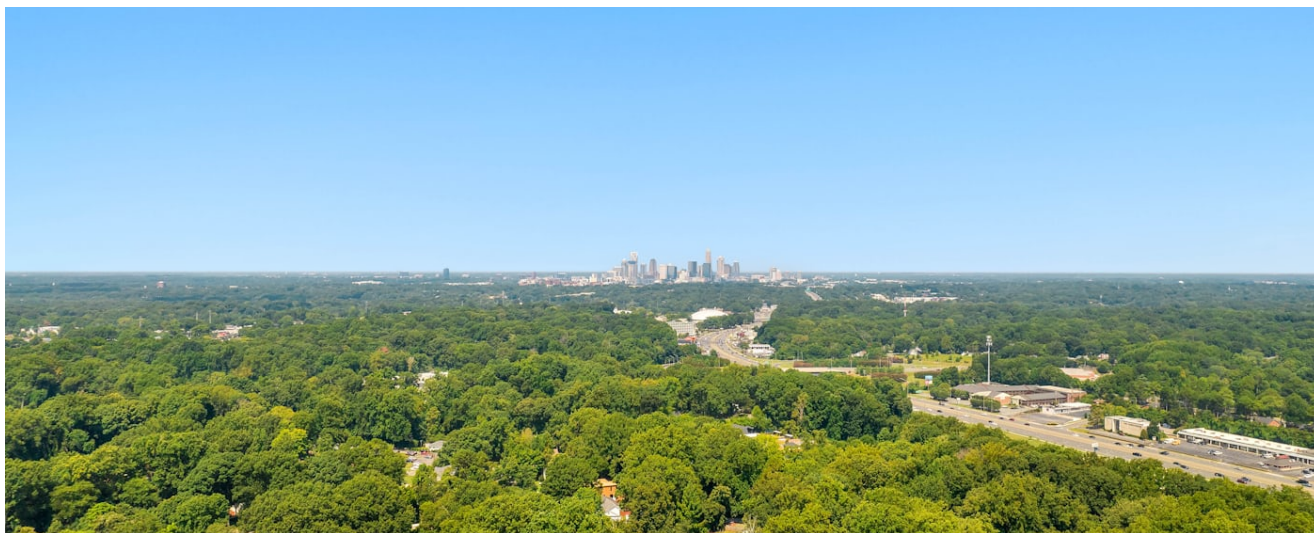


ANALYTICAL MEMORANDUM · WORKING DRAFT

BIOPHILIC CITIES

Nature as load-bearing urban infrastructure,
not as decorative landscaping



Principles, engineering functions, economics and verifiable metrics

3–30–300 · blue-green network · eco-corridors · urban microclimate

Analytical platform **gosplan2.ru**

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On the status of this document. This is an analytical memorandum: a review of principles, practice and ways of measuring. It is not design documentation, a regulatory document or investment advice. The quantitative relationships cited come from international practice and research and indicate orders of magnitude; for any specific city they must be re-verified by local measurement, since they depend on climate, species composition, development density and the condition of existing networks.

On the photographs. Every illustration is a real photograph of an existing place, not a visualisation. The caption under each states what it shows. Source: Unsplash, Unsplash licence.

1. Executive summary: one page for the city

The substance. Biophilic urbanism proposes treating nature in the city not as landscaping but as engineering infrastructure with measurable function: it cools, retains stormwater, filters air, attenuates noise, and directly affects residents’ health and property values. From this follows a practical change: trees, water bodies and soils enter the same calculations and the same standards as pipes, cables and roads.



A residential street under a closed canopy. Shade lowers both the surface temperature of the pavement and the air temperature at pedestrian level — an effect achieved in design by planting rather than by equipment.

What changes in approach

Parameter	Conventional landscaping	Biophilic approach
Status in the design	Landscaping, the final package	Infrastructure, designed together with networks
What is counted	Total lawn area	Distance to greenery, canopy cover, connectivity
Who is responsible	The landscaping contractor	The engineering section of the design
When the effect is visible	Visually — immediately	Measurably — in temperature, runoff, footfall
Fate under cost cutting	The first thing cut	Protected by standard, like any utility

Three conclusions for a city

- 1. The key indicator is not area but access.** One large park on the outskirts delivers less than the same area of greenery distributed across neighbourhoods. What must be measured is the distance from a front door.
- 2. Connectivity matters more than size.** An isolated square is ecologically almost useless: biodiversity is sustained by a continuous network along which birds, insects and small animals can move.

3. **Greenery is cheaper than utilities exactly where it replaces them.** Rain gardens and permeable surfaces take part of the peak load off the storm sewer; the saving is measured in the pipe that did not have to be laid.

AN HONEST CAVEAT

The biophilic approach does not replace engineering infrastructure and abolishes neither storm drainage nor cooling systems. It removes part of the load and part of the peaks — and it is in exactly that part that it can be costed. Promises of the “greenery will replace the networks” kind are not borne out in practice and damage the idea itself.

2. The problem: an environment humans designed themselves

More than half of humanity lives in cities and the share is growing. The city is the only environment humans designed entirely by themselves, and that is precisely why it became an environment to which humans are biologically unsuited.

2.1. Four consequences

Factor	Mechanism	What amplifies it
Overheating	Dark impermeable surfaces store heat by day and release it at night; night-time cooling never arrives	Asphalt, roofs, absence of shade, narrow unventilated courtyards
Stormwater peaks	Water does not infiltrate; the entire volume of rainfall enters the sewer within minutes	Continuous hard surfaces, compacted soils, culverted rivers
Pollution and noise	No barriers to trap dust or absorb sound	Through traffic, absence of dense planting along streets
No living nature in view	Continuous attentional load with no recovery	Blank façades, treeless courtyards, a window facing a car park



An asphalt lot without a single tree. Such a surface heats far more than a shaded one during the day and admits practically no water: the whole volume of rainfall reaches the storm sewer within minutes, forming the very peak the sewer must then be sized for.

2.2. Why “adding greenery” does not work

The standard response to these problems is to increase the area of landscaping. In practice this yields weak results, for three reasons.

- **The greenery ends up where people do not live.** It is easier to create one large park on vacant land than to fit trees into a dense street. The indicator “green area per resident” rises while actual access does not.
- **Lawn instead of trees.** Lawn is cheaper to install and immediately visible, but delivers incomparably less shade, evapotranspiration and biodiversity, and needs watering in dry periods.
- **Planting without soil or care.** A tree in a constrained soil volume, without watering in its first years and without maintenance, never reaches the size at which it begins to work. A formally planted tree and a functioning tree are different objects.

Biophilic urbanism proposes not to “add greenery” but to redesign the city so that natural systems work as engineering infrastructure — cooling, filtering, retaining water and restoring people.

3. What a biophilic city is, and what it is not

A biophilic city is a city in which access to living nature is treated as a basic utility, on a par with water, electricity and transport. Trees, water bodies, soils and biodiversity here are not “landscaping” but infrastructure with measurable function.

3.1. Origin of the term

The concept goes back to the biophilia hypothesis of the biologist Edward Wilson (1984): humans have an innate affinity for living things and natural forms. From that hypothesis grew a design discipline — first at the level of buildings and interiors, then of neighbourhoods and cities. Since 2013 the international Biophilic Cities network has united partner cities from Singapore and Wellington to Birmingham and Oslo.



The scale of the individual building: daylight, timber in the structure, plants in view. This is the scale at which biophilia began as a design discipline before moving to the neighbourhood and the city.

3.2. What a biophilic city is not

Common conflation	Where the difference lies
“Eco-city”	The ecological agenda is broader and covers energy, waste and emissions. Biophilia concerns specifically the presence of living nature in everyday surroundings and its functions
“Garden city”	A historic early-twentieth-century planning model with low-rise development. Biophilia applies to the dense city too — and there it delivers the greatest effect
“Vertical greenery”	One instrument among many, and an expensive one to maintain. It replaces neither street trees nor permeable soils
“Sustainable development”	A framework of goals. Biophilia is a set of concrete design decisions with a measurable result

3.3. Three scales

1. **The building.** Daylight, a view of nature from the window, natural ventilation, natural materials, plants indoors.
2. **The neighbourhood and the street.** Canopy cover, rain gardens, permeable surfaces, courtyards without continuous asphalt, community gardens.
3. **The city.** A continuous blue-green network, daylighted rivers, eco-corridors, green access standards, open reporting on metrics.

The mistake of most programmes is working only at the first or only at the third scale. The effect for a resident arises at the second: it is the neighbourhood that determines whether there is shade on the way to the bus stop and whether a tree is visible from the window.

4. Six principles

4.1. Nature within walking distance

Greenery is distributed across the whole city rather than concentrated in a few showcase parks. The key indicator is not total green area but the distance from a front door to it. This principle moves the task from “how many hectares” to “how many minutes on foot”, which makes it verifiable for every address.

4.2. Green roofs and façades

The building becomes part of the ecosystem: a planted roof retains stormwater, reduces heat gain and extends the life of the waterproofing, while vertical greenery works as a filter and as thermal insulation. An important caveat: this is the most maintenance-intensive of the six instruments, and it should be used where there is no room for trees at ground level, not instead of them.



Bosco Verticale, Milan. Two residential towers with hundreds of trees and thousands of plants on the balconies. The project demonstrated both the potential of a vertical forest and its price: such a system requires constant professional maintenance — climbing gardeners, automated irrigation and plant replacement.

4.3. River daylighting and blue infrastructure

Rivers and streams previously put into culverts are brought back to the surface. Rain gardens, permeable surfaces and retention ponds replace part of the storm drainage and remove peak loads. This is the only principle that yields a direct and easily calculated saving: the cost of the collector that was not built is known in advance.



Cheonggyecheon, Seoul. Where an elevated highway was dismantled, a culverted river was brought back to the surface — nearly 6 km of public space in the city centre. The riverside is noticeably cooler than neighbouring streets; birds and fish have returned.

4.4. Biodiversity and eco-corridors

Green areas are linked into a continuous network along which birds, insects and small animals can move. An isolated square is ecologically almost useless — it is connectivity that works. The practical implication for a designer: two strips of planting along a street connecting two parks are worth more than a third square of the same area.



A heron in an urban park. The return of species is one of the few signs that landscaping cannot imitate: birds and fish appear only where water, a food base and connectivity between green areas have actually been restored.

4.5. Natural light, forms and materials

Daylight, a view of nature from the window, natural ventilation, timber and stone in the finishes. This is the scale of the individual building, where biophilia affects wellbeing directly and where the effect is measured in specific rooms: patient recovery rates, attention in classrooms, productivity in offices.

4.6. Urban agriculture

Community gardens, school gardens, edible landscapes. Beyond food they provide what an ordinary lawn cannot — participation by residents and hands-on care for the place. The practical

significance of this principle is higher than it appears: land looked after by residents themselves needs no security and is almost never vandalised.



Street beds in timber planters. The simplest form of urban agriculture: it requires no change to the paving, can be deployed in a single season, and creates a standing group of residents with an interest in the state of that stretch of street.

5. The engineering functions of nature

This is the central section of the memorandum. If nature in the city is treated as infrastructure, it must be described through functions, units of measurement and operating conditions — exactly as a pump or a heat exchanger would be.

Function	Mechanism	Unit of measurement	Operating condition
Cooling	Canopy shade plus evapotranspiration from leaf surface; lower surface and air temperature at pedestrian level	°C relative to an open site; shaded area at midday	Large canopies, sufficient soil volume, watering in drought
Runoff retention	Interception by canopies, infiltration into soil, storage in rain gardens and depressions	Share of runoff retained on site; peak flow reduction	Permeable soils, falls towards depressions, storage volume
Air cleaning	Deposition of particulates on leaf surfaces, later washed off by rain	Particulate concentration before and after the barrier	Dense multi-tier planting, not isolated trees
Noise attenuation	Scattering and absorption of sound by dense vegetation and landform	dB at the development boundary	Planting depth of several metres, an evergreen tier
Wind shelter	Reduced wind speed within the development, important in cold climates	m/s at pedestrian level	Placement across the prevailing direction
Biodiversity	Food sources and shelter linked into a continuous network	Number of bird and pollinator species; network connectivity	Species diversity, no blanket mowing, water
Restoration	Reduced attentional load in the presence of natural forms	Footfall, care-seeking, self-reported health	Reachable on foot, perceived safety

PRACTICAL CONCLUSION

Each of these functions has an operating condition, and failing to meet it nullifies the function without removing the cost. A tree in a constrained soil volume produces no canopy, and therefore no shade. A rain garden with no fall towards it receives no runoff. A single-row planting strip does not attenuate noise. This is precisely why biophilic solutions belong in the engineering section of a design, not in the landscaping package.

5.1. What nature does not do

An honest list of limitations matters as much as the list of functions:

- **It does not replace storm drainage.** It removes part of the peak and part of the volume, but an extreme downpour requires an engineered system.
- **It does not work immediately.** A tree begins to cast meaningful shade after 7–15 years depending on species and conditions. The effect must be calculated for a mature canopy, and the commitment made for the duration of care.
- **It is not free to operate.** Watering in the early years, pruning, replacing losses, maintaining rain gardens. The absence of a maintenance budget is the main reason planted does not become working.
- **It does not improve everything at once.** Dense planting in a narrow street can impede ventilation and trap polluted air at street level. Solutions depend on street geometry.

6. Effects: health, climate, water, air, value



A park within dense development. The main effect comes not from the size of the site but from its position: a park embedded in a residential district works every day, whereas an equal area on the periphery is visited at weekends.

6.1. Health

The most robustly evidenced group of effects. Regular contact with green environments is associated with lower stress, better sleep, higher physical activity and reduced social isolation. For a city administration this converts into measurable quantities: care-seeking rates, the share of residents with sufficient physical activity, child health indicators across districts with differing levels of greenery.

6.2. Urban microclimate

A street shaded by large canopies is noticeably cooler than an open one, and the difference between a green district and a dense treeless one on a hot day is measured in several degrees. During heatwaves this is not a matter of comfort but of mortality among older residents — and that is exactly how the task is framed in European climate plans.

6.3. Water

Permeable surfaces, rain gardens and retention depressions hold part of the rainfall where it falls, cutting the peak flow and reducing flood risk. The economic effect here is the most transparent of all: it equals the cost of the portion of the storm network that did not have to be enlarged.

6.4. Air and noise

Dense multi-tier planting along transport corridors deposits part of the particulate load and lowers noise levels behind the barrier. The effect depends on the depth and density of planting: isolated trees along a road deliver a mainly visual result.

6.5. Property values and the district economy

Proximity to quality green space is consistently reflected in housing prices. That creates both an opportunity and a risk: rising values can displace existing residents — the effect known as “green gentrification”. It is treated separately in section 11.

HOW TO READ QUANTITATIVE ESTIMATES

Specific values — how many degrees, what share of runoff, how much prices rose — depend heavily on climate, species composition, the age of the plantings and development density. Transferring figures from foreign studies directly into a Russian city is not sound. The correct order is: take the mechanism and the metric from practice, and obtain the magnitude from your own measurements on a pilot neighbourhood.

7. The 3–30–300 standard and other verifiable metrics

The main weakness of most green programmes is the absence of a verifiable criterion. The 3–30–300 rule, formulated by Cecil Konijnendijk (Nature Based Solutions Institute), closes that gap with a simple and checkable formula.

3 trees visible from every home · **30 %** canopy cover in the neighbourhood · **300** metres to quality green space

7.1. Why it works as a standard

- **It is verified by address.** Each of the three parameters is measured for a specific building rather than as a city average. This rules out manipulation by averaging.
- **It covers three scales.** Three trees is the window scale, 30 % the neighbourhood scale, 300 metres the district scale.
- **It requires no complex instruments.** Canopy cover is computed from aerial imagery, distance from a map, the view from a window by survey.
- **It sets priorities.** Where the standard is not met, it is clear which of the three parameters needs improving in that particular place.

7.2. Additional metrics

Metric	What it shows	How it is computed
Canopy cover	The main integrated indicator of cooling and rainfall retention	Share of area under canopy from aerial imagery
Green access	Share of residents within a given distance of quality green space	Walking isochrone along the actual street network
Network connectivity	The degree to which green areas form a continuous network	Gap analysis; length of continuous corridors
Share of impermeable surfaces	Runoff retention potential of the site	Survey of surfaces across the neighbourhood
Species diversity	Whether the ecosystem works, not just how it looks	Bird and pollinator counts on a fixed method
Planting survival	The difference between “planted” and “working”	Share of living specimens at years 3 and 5

THE METRIC MOST OFTEN FORGOTTEN

Survival at years three and five is the single indicator that separates reporting from result. A programme that reports the number of trees planted without measuring survival provides no information about the state of the urban forest. This indicator should be introduced at the same time as any planting programme.

8. World cases: what actually worked

8.1. Singapore: “City in Nature”

A state landscape replacement policy: a developer must return to the building an amount of greenery equivalent to the land it occupies. What matters here is not the set of technologies but the fact that the green standard is embedded in planning regulation rather than in a developer’s goodwill. The result is a dense tropical metropolis with high canopy cover and a system of connected park corridors.



Singapore: greenery embedded in dense high-rise development by standard, not as an afterthought.



Copenhagen: a city with a consistent policy towards water and public space along the water.

8.2. Seoul: the Cheonggyecheon river

Where an elevated highway was dismantled in the city centre, a culverted river was brought back to the surface — nearly 6 km of public space. The riverside is noticeably cooler than neighbouring streets, and birds and fish have returned. A substantial detail usually omitted: the project required the traffic scheme of the centre to be rebuilt, and it was that, rather than the earthworks, which was its hardest part.

8.3. Milan: Bosco Verticale

Two residential towers with hundreds of trees and thousands of plants on the balconies. The project demonstrated both the potential of a vertical forest and its price: such a system requires constant professional maintenance. The lesson for replication is not an architectural device but the necessity of budgeting an operating model decades ahead.

8.4. Copenhagen: cloudburst plans

After the devastating downpour of 2011 the city shifted to blue-green infrastructure: streets acting as channels, parks acting as reservoirs, squares that become basins during a flood. This is the most “engineered” of the cases: decisions were taken on the basis of damage calculations, and the green outcome was a consequence rather than the goal.

8.5. The Biophilic Cities network

An international partnership of cities that maintain open nature metrics — canopy cover, park accessibility, biodiversity. It is precisely open reporting that separates a working programme from a declaration: a city publishing its indicators annually cannot quietly stop.



Wellington is one of the member cities of the Biophilic Cities network. Its natural capital and urban eco-corridor programmes rest on published metrics, which makes the result verifiable from the outside.

WHAT ALL FIVE HAVE IN COMMON

None of these cases began with landscaping. Singapore began with regulation, Seoul with a transport decision, Copenhagen with a calculation of flood damage, Milan with a development product, the Biophilic Cities network with a measurement method. Nature arrived as a consequence of a correctly posed task, not as a goal in itself.

9. Economics: green infrastructure versus grey

STATUS OF THIS SECTION

What follows is the structure of the comparison, not ready figures. The ratio of costs depends on climate, land values, the condition of existing networks and the design storm. Quoting universal values would be unsound; setting the frame within which a specific city computes its own ratio is sound.

9.1. Where green is cheaper than grey

Task	Grey solution	Green solution and the nature of the saving
Stormwater peak	Larger collector diameter, storage tanks	Rain gardens, permeable surfaces, depressions. The saving equals the pipe not laid
Street overheating	Building air conditioning, light-coloured surfaces	Canopy cover. The saving lies in reduced summer peak electrical load
Traffic noise	Acoustic barriers	Multi-tier planting of sufficient depth — where there is room
Roof service life	Regular replacement of waterproofing	A planted roof shields the membrane from UV and temperature swings

9.2. Where green is more expensive, and that is normal

- **Vertical greenery.** High installation cost and a permanent maintenance cost. Justified where there is no ground for trees, and as a demonstration object.
- **River daylighting.** Large capital costs and almost always a rebuilt traffic scheme. Justified by the scale of the effect, but never cheap.
- **Maintenance.** A permanent line item that the grey solution does not carry in the same form. It is most often the one left out of the budget.

9.3. The correct structure of the calculation

1. Compute **total cost of ownership** over 20–30 years, not the cost of installation. A tree grows more expensive to maintain but cheaper in function as it matures; a pipe changes in neither respect.
2. Count **avoided costs**: the collector not enlarged, the barrier not built, the roof repair not needed, the reduction in peak load.
3. Account separately for **effects that never enter the cost estimate**: health, footfall, property values, attractiveness of the district to business. They should not be inflated, but

ignoring them is not sound either.

4. Provide the **maintenance budget for the full term** at the moment of decision. A project without one should be regarded as incomplete.

10. KPIs and the measurement system

A programme without measurement turns into a report on planting. Below is the minimum set of indicators that makes the result verifiable, and the order in which they are taken.

Indicator	What it confirms	Frequency
Canopy cover, %	The integrated result for cooling and runoff	Every 2–3 years, aerial imagery
Share of residents within 300 m of quality green space	Access rather than area	Annually, by map
Compliance with 3–30–300 by address	Evenness; absence of “green deserts”	Annually, on a sample
Planting survival at years 3 and 5	The difference between planted and working	Annually
Runoff retention on pilot sites	The engineering effect in measurable units	Per rainy season
Temperature difference: green versus open site	The cooling effect	During heatwaves
Number of bird and pollinator species	Connectivity and viability of the network	Annually, fixed method
Footfall in green spaces	Whether residents need this particular place	Seasonally, counters or observation
Maintenance budget per unit area	Realism of the operating model	Annually

THE PUBLICITY PRINCIPLE

Indicators must be published. This is not openness for its own sake: publication is precisely what makes a quiet halt to the programme impossible, and it is what distinguishes working practice from declaration. The cities of the Biophilic Cities network rest on this mechanism, not on international status.

10.1. The baseline measurement

The “before” measurement is taken prior to any works and cannot be reconstructed afterwards. The minimum set: canopy cover from aerial imagery, share of impermeable surfaces, surface temperature on a hot day at representative sites, green access by address, species counts. Without that set, any later claim about effect will be unprovable.

11. Risks and standard mistakes

No.	Risk	What it consists of	How it is removed
1	Landscaping instead of infrastructure	Greenery is designed last and cut at the first sign of cost pressure	Move it into the engineering section of the design and protect it by standard, as with any utility
2	Planted and forgotten	No budget for watering in the early years, pruning or replacing losses; after five years half the planting is gone	The maintenance budget for the full term is committed at the moment of decision; survival at years 3 and 5 is a mandatory KPI
3	Green gentrification	Improvement raises housing costs and displaces the very residents it was done for	Parallel housing policy measures; distribution of improvements across all districts, not only central ones
4	Showpiece instead of system	One spectacular object instead of an even network; success in the report, nothing in the district	Measurement by address (the 3–30–300 rule) rather than by aggregate area
5	Unsuitable species	Fast-growing but short-lived and allergenic species; a monoculture vulnerable to disease	Species diversity, native species, a cap on the share of any one species
6	Conflict with utilities	No room is left for a tree because of underground services; it ends up in a constrained volume where it never grows	Coordinate planting with networks at master-plan stage, not at landscaping stage
7	Impeded ventilation	Dense planting in a narrow street traps polluted air at pedestrian level	Decide by street geometry: low vegetation in narrow canyons, large canopies in wide ones
8	Vertical greenery as a symbol	An expensive façade system with no trees at all on the ground nearby	Priority to ground-level planting; vertical greenery where there genuinely is no ground

THE MOST FREQUENT MISTAKE

The absence of a maintenance budget. It does not look like a mistake at the moment of decision: the planting is done, the report is closed, the money is spent. It surfaces three to five years later, when it is too late to count and when the cost of restoration exceeds the cost of the original planting. Of all eight risks, this one occurs more often than the rest combined.

12. The Russian context: climate, norms, rural territories

Transplanting Singaporean or Copenhagen solutions directly into a Russian city is impossible. But what transfers is not the solutions — it is the logic: function, metric, standard, measurement.

12.1. What the climate changes

Factor	Design implication
Long winter	For a large part of the year deciduous planting provides neither shade nor filtration. The role of evergreen species, landform and wind shelter grows
Snow clearance and de-icing salts	Soil salinisation along streets is one of the main causes of street tree death. Root zone protection and revised clearance technology are required
Short growing season	Longer time for a tree to reach its design canopy; the effect must be calculated over a longer horizon
Ground freezing	Constraints on rain gardens and permeable surfaces; performance in shoulder seasons requires separate calculation
Heatwaves	Growing in frequency in temperate climates too; the cooling function of canopies becomes significant in central Russia as well

12.2. What already exists in regulation

Russian planning tradition contains its own foundation for a biophilic approach: standards for green territories, requirements to relate public institutions to housing and walking distance, and the concept of the community centre as the leading structural element of a settlement. The task is not to build a new framework from scratch but to add three missing indicators to the existing area-based ones: access by address, canopy cover and network connectivity.

12.3. Rural territories: where the effect is greatest

A paradox: the biophilic approach is usually discussed in relation to major cities, whereas in Russia's small settlements it produces results faster and more cheaply. The reasons are availability of land, absence of conflict with dense underground infrastructure, and the presence of a natural setting to which one need only connect.



A street with closed canopies — a solution available to a small settlement without major capital expenditure. The principal requirements here are organisational rather than financial: soil volume, watering in the early years and protection from de-icing salts.

The main mistake of new rural construction is turning the territory into asphalt, blank fences and parking. The Russian rural landscape is best treated as a national asset: the task is not to build cottages over it but to place life inside it. A practical programme for rural territory is set out separately — in the SELO 2.0 memorandum, where the biophilic framework enters the settlement master plan on equal terms with energy and housing.

HOW THE TWO DOCUMENTS CONNECT

“Biophilic cities” sets out **principles and metrics**. “SELO 2.0” sets out the **delivery mechanism** on a specific type of territory: the 500-metre rule, the blue-green network, 3–30–300 and “street instead of fence” are mandatory parts of the settlement master plan there.

13. Implementation roadmap

Stage 1. Measurement and diagnosis (3–6 months)

- Canopy cover from aerial imagery, share of impermeable surfaces
- Green access by address; identification of “green deserts”
- Temperature survey on a hot day at representative sites
- A map of gaps in the blue-green network
- Inventory of street trees and assessment of their condition

Stage 2. Standard and priorities (3–6 months)

- Adoption of the 3–30–300 rule as a city standard with a schedule for achieving it
- Transfer of green solutions into the engineering section of design documentation
- Identification of priority neighbourhoods — those furthest from meeting the standard
- Approval of the maintenance budget as a separate protected line

Stage 3. Pilot neighbourhood (12–18 months)

- A full set of solutions in one neighbourhood: canopy cover, rain gardens, permeable surfaces, links to adjoining green areas
- Before-and-after measurement on every indicator in section 10
- Publication of the result, including what did not work

Stage 4. The network (ongoing)

- Connecting scattered green areas into a continuous network
- Daylighting watercourses where justified by calculation
- Annual publication of metrics
- Revision of priorities on the basis of measurements

WHY TO START WITH MEASUREMENT

Measurement costs orders of magnitude less than works and is useful in its own right: it shows exactly where in the city people live without access to greenery. It is the only stage that pays for itself regardless of whether the programme continues.

14. Conclusion

Biophilic urbanism is neither ecological rhetoric nor an architectural style. It is a way of counting: nature is given a function, a unit of measurement, a standard and an operating budget — and after that it stops being the thing that gets cut first.



A continuous green framework with development embedded in it. It is connectivity, not total area, that separates a working system from a collection of separate parks.

A city in which nature is load-bearing infrastructure rather than leftover landscaping requires neither a special climate nor a special budget. It requires that a tree be counted as rigorously as a pipe.

Three things to do before anything else: take the baseline measurement, adopt a verifiable standard by address, and protect the maintenance budget. Everything else follows from those three decisions.

This document has been prepared as an analytical memorandum. Quantitative relationships indicate orders of magnitude and are subject to verification by local measurement. The current version, the catalogue of primary sources and the related SELO 2.0 memorandum are available on the analytical platform gosplan2.ru.

Appendix A. Biophilic neighbourhood checklist

A.1. The street

- Canopy cover of at least 30 % across the neighbourhood
- Soil volume per tree sufficient for the design canopy
- Root zone protected from de-icing salts and compaction
- Watering for the first three years secured and funded
- Species diversity; a cap on the share of any single species
- No continuous blank fencing along the street

A.2. Water

- Share of impermeable surfaces minimised
- Falls arranged towards rain gardens and depressions
- Storage volume sized for the design storm
- Performance in shoulder seasons and during ground freezing calculated

A.3. Connectivity

- The neighbourhood is linked by green corridors to at least two adjoining areas
- Gaps in the network identified and entered into a remediation plan
- Barriers to animal movement removed or bypassed

A.4. The building

- At least three trees visible from the windows of living rooms
- Daylight and natural ventilation provided
- Roof planted where justified by structure and maintenance capacity

A.5. People

- No more than 300 m on foot to quality green space along the actual street network
- Plots allocated for community gardens
- A named party responsible for maintenance and a funding source for the full term

Appendix B. Metrics matrix

Metric	Unit	Data source	Frequency
Canopy cover	%	Aerial imagery	Every 2–3 years
Green access	% of residents within 300 m	GIS, street network	Annually
3–30–300 rule	% of addresses	Survey + GIS	Annually, sample
Impermeable surfaces	%	Neighbourhood survey	Every 2–3 years
Runoff retention	% of volume, peak reduction	Pilot measurement	Rainy season
Temperature difference	°C	Field measurement, thermal imaging	Heatwave
Species diversity	species count	Standardised survey	Annually
Survival	% at years 3 and 5	Inventory	Annually
Footfall	people/day	Counters, observation	Seasonally
Maintenance budget	currency per unit area	City budget	Annually

Appendix C. Glossary

Biophilia	The hypothesis of an innate human affinity for living things and natural forms (E. Wilson, 1984)
Biophilic city	A city where access to living nature is treated as a basic utility and green infrastructure has a measurable function
Blue-green network	A continuous network of water and green areas performing engineering functions
The 3–30–300 rule	Three trees visible from the window, 30 % canopy cover in the neighbourhood, 300 metres to quality green space
Canopy cover	The share of an area lying under the projection of tree canopies
Eco-corridor	A linear element of the network connecting green areas and enabling species movement
Rain garden	A depression with selected soil and plants that receives and filters stormwater runoff
River daylighting	Returning a culverted watercourse to the surface
Urban heat island	The excess of temperature within development over the surrounding area
Green gentrification	Displacement of residents by rising housing costs following environmental improvement

Appendix D. Catalogue of primary sources

1. **Biophilic Cities Network** — the network founded by Timothy Beatley (University of Virginia). Member cities maintain open nature metrics and publish reports.
2. **CitiesWithNature** — a global platform run by ICLEI and partners: cities register urban nature commitments and report publicly on progress.
3. **The Nature of Cities** — an international forum of researchers, designers and practitioners in urban nature.
4. **C40 Cities** — a climate network of major cities; its adaptation and green infrastructure sections contain calculations and planning material.
5. **NParks, Singapore** — the national agency responsible for the “City in Nature” policy and landscape replacement rules for new development.
6. **Gardens by the Bay, Singapore** — the flagship park and a showcase of biophilic engineering: biomes, supertrees, closed energy and water loops.
7. **The Cheonggyecheon project, Seoul** — city portal material on restoring the river where an elevated highway was dismantled.
8. **Bosco Verticale, Milan** — the authors’ page (Stefano Boeri Architetti): planting composition, engineering, subsequent projects.
9. **State of Green, Denmark** — the official green solutions portal: Copenhagen’s blue-green infrastructure and cloudburst plans.
10. **Wellington, New Zealand** — a member city; natural capital and urban eco-corridor programmes.
11. **Birmingham, United Kingdom** — a partner city; greening and urban forest programmes in a large industrial city.
12. **Nature Based Solutions Institute** — publication and substantiation of the 3–30–300 rule (Cecil Konijnendijk).
13. **14 Patterns of Biophilic Design (Terrapin Bright Green)** — the foundational method at architectural and interior scale.
14. **Living Building Challenge (ILFI)** — one of the strictest “living building” standards, including requirements for connection to nature.

Active links are provided in the “World projects” section on gosplan2.ru. The list is for reference and does not constitute endorsement of the organisations named.