Supplementary Material S1

Supporting Data, Calculation Protocols and Evidence Boundaries

Supporting the manuscript

Obsolete Airports as Regenerative Urban Fields: Agroproductive Land, Circular Construction, and Intergenerational Housing in Lisbon

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Earlier supplementary deposit: 10.5281/zenodo.21622660 (see S9).

This supplement documents the quantitative inputs, derivations and interpretation boundaries used in the manuscript. It is intended to support transparent review of the territorial, programmatic, water-system and A1–A3 embodied-carbon evidence.

S1. Scope and evidentiary conventions

The manuscript reanalyses two complementary design-based cases developed within Studio Nexus: Hugo Gomes' territorial and agroproductive proposal [64] and Lawrence Booth's architectural, material and metabolic proposal [65]. The cases remain analytically distinct. This supplement records only the evidence necessary to reproduce or appropriately interpret the indicators reported in the article.

Table S1. Evidentiary conventions used in the supplementary material.

Evidence type	Definition	Examples
Reported project value	Value explicitly documented in a project drawing, schedule, matrix or verified project record.	Areas, GIA, housing units, cistern capacity.
Derived indicator	Arithmetic result calculated from reported values and stated assumptions.	FAR, population capacity, dwellings, $kgCO_2e/m^2$, percentage reduction.
Design-stage interpretation	Spatial or environmental proposition supported by design evidence but not presented as measured operational performance.	Agroproductive suitability, shared energy, passive-design strategy.
Drawing-based identification	A feature identified in an existing project drawing; a count or area only where unambiguous.	Proposed street articulation; individually identified potential reuse.

Unless otherwise stated, quantities are rounded for publication. Scenario calculations are not statutory planning targets, and environmental-system capacities are not presented as simulated operational performance.

S2. Territorial and capacity calculations

The territorial scenario is reported from Gomes' general urban plan [64] (Appendix E, Panels P1/P2), with the 6.21/2.35/3.86 km² values confirmed by the project author. Booth's July 2026 Panel 01, Plano Urbano [65] (P1(2).pdf), additionally documents the urban-development area (2,352,535.53 m²), gross building footprint (492,381.69 m²), five-floor assumption and resulting GFA (2,461,908.45 m²). The reference mixed-use capacity test applies an explicit 70% residential allocation to that GFA; this allocation is an analytical assumption, not a value taken from the panel.

Table S2. Territorial and mixed-use capacity indicators.

Indicator	Value	Basis	Interpretation boundary
Transformation field	≈6.21 km²	Reported project boundary	Project-defined analytical field; not an official cadastral or airport-operational boundary.
Urban development area	≈2.35 km² (37.9%)	Reported plan area	Urban component of the transformation field.
Predominantly agroproductive sector (including inhabited quintas)	≈3.86 km² (62.1%)	Reported plan area	Includes cultivated and built components; productive suitability remains a design interpretation
Gross building footprint	≈492,382 m²	Reported project quantity	Used in the reference capacity test.
Average number of floors	5	Scenario assumption	Reference intensity assumption.
Total GFA	≈2.462 million m²	Footprint × 5	Rounded scenario output.
FAR over urban-development area	≈1.05	GFA ÷ urban-development area	Reference gross intensity.
Reference mixed-use population	≈49,200 residents	(GFA × 70%) ÷ 35 m²/person	70% residential allocation; design-scenario capacity, not a forecast.
Reference dwelling capacity	≈19,100 dwellings	(GFA × 70%) ÷ 90 m²/dwelling	Reference dwelling-size assumption.

Reference formulas: GFA = gross building footprint × average floors; FAR = GFA ÷ urban development area; population = residential GFA ÷ 35 m²/person; dwellings = residential GFA ÷ 90 m²/dwelling. Panel 01 [65] prints 70,304 residents, but its stated inputs yield 2,461,908.45 ÷ 35 = 70,340.24 residents as an all-residential equivalent. The article uses the recalculated result. Applying the separate 70% residential assumption gives 49,238.17 residents and 19,148.18 dwellings. For the approximate sector shares, 2,352,535.53 ÷ 6,210,000 × 100 = 37.883%, reported as 37.9%; the complement is 62.1%. Sector areas are displayed separately as rounded descriptors of 2.35 and 3.86 km².

S3. Project-level programmatic indicators

The two cases [64,65] operate at different scales and should not be read as directly equivalent program schedules. The table is included to make their complementary emphases explicit.

Table S3. Comparative programmatic indicators.

Indicator	Gomes case	Booth case	Analytical note
Carbon-inventory denominator	Not applicable	10,412.13 m² GIA	Revised Appendix A [66], Table A.0; excludes external balconies and circulation galleries. No carbon inventory is calculated for Gomes.
Housing programme	42 base dwellings	Care-related, family and student accommodation	Gomes' base count is author-confirmed; Booth's programme is described through the documented housing types.
Adaptability	Adaptable base and double dwellings	Mixed residential arrangements	Adaptability interpreted through the documented housing arrangements.
Estimated residents	135	170	Gomes: project-author confirmation. Booth: occupancy assumption, thesis [65], p. 142.
Productive landscape	≈85,323 m² reported local allocation	Gardens integrated with the block	Gomes' developed portion only; not independently verified net cultivated area
Shared spaces	Common rooms and courtyards	Galleries, patios and community facilities	Spatial relationships identified in project drawings; corresponding area totals unquantified.
Agricultural workspaces	Workshops shown in Figure S2	Not separately quantified here	Programme description; no additional area schedule required.
Greenhouses	Shown in Figure S2	Not separately quantified here	Programme identified in the project drawing; area unquantified.

S4. Agroproductive-land and water-system evidence

The 3.86 km² predominantly agroproductive sector combines cultivation with inhabited agricultural clusters (quintas), integrating housing, shared facilities and productive land [64]. It is not net agricultural or permeable area. Initial hemp cultivation for intended soil recovery and construction feedstock precedes horticulture and orchards. Agronomic and contamination performance remains unverified.

Table S4. Water-system quantities and interpretation boundaries.

System / variable	Value	Basis	Interpretation boundary
Gomes reservoir — outer geometry	≈14 × 14 × 14 m	Documented design geometry	Geometric envelope.
Gomes reservoir — wall thickness	≈1 m	Documented design geometry	Used in the corrected internal dimensions.
Gomes reservoir — internal geometry	≈12 × 12 × 13 m	Documented design geometry	Basis of storage-capacity calculation.
Gomes reservoir — storage capacity	≈1,872 m³	12 × 12 × 13	Geometric capacity; not a rainfall–runoff result.

System / variable	Value	Basis	Interpretation boundary
Gomes local collection surface	144 m²	Project value	Collection surface is not a complete hydrological catchment model.
Booth local block collection area	Not quantified in this revision	Block-scale collection is a design proposition.	No effective catchment area or water-autonomy result is claimed.
Booth cistern storage capacity	8,282.70 m³ (≈8,283 m³)	Revised Appendix A, Table A.2: 21 × 259.62 + 4 × 707.67 m³ [66]	Geometric void volume of 21 straight and four corner modules; distinct from annual supply.
Booth principal cistern construction volume	5,893.00 m³	Revised Appendix A, Tables A.2–A.3 and Section A.3.3 [66]	1,878.44 + 3,343.27 + 671.29 m³; slab, brick shell and BTC supports, excluding linings, membrane and the separate 1,140 m³ retaining wall.

S5. Documented basement and retaining-wall quantities

Booth's revised Appendix A [66] (17 September 2026), Table A.1, quantifies a 4,427.29 m² basement slab at 0.30 m thickness and a retaining wall of 302.72 × 3.70 × 0.75 m. The final project section uses 3.70 m wall height. These quantities are included in both scenarios. The separate cistern retaining wall is quantified in Section A.2.2. Figure S1 illustrates the construction relationship; the revised schedules supply the numerical quantities.

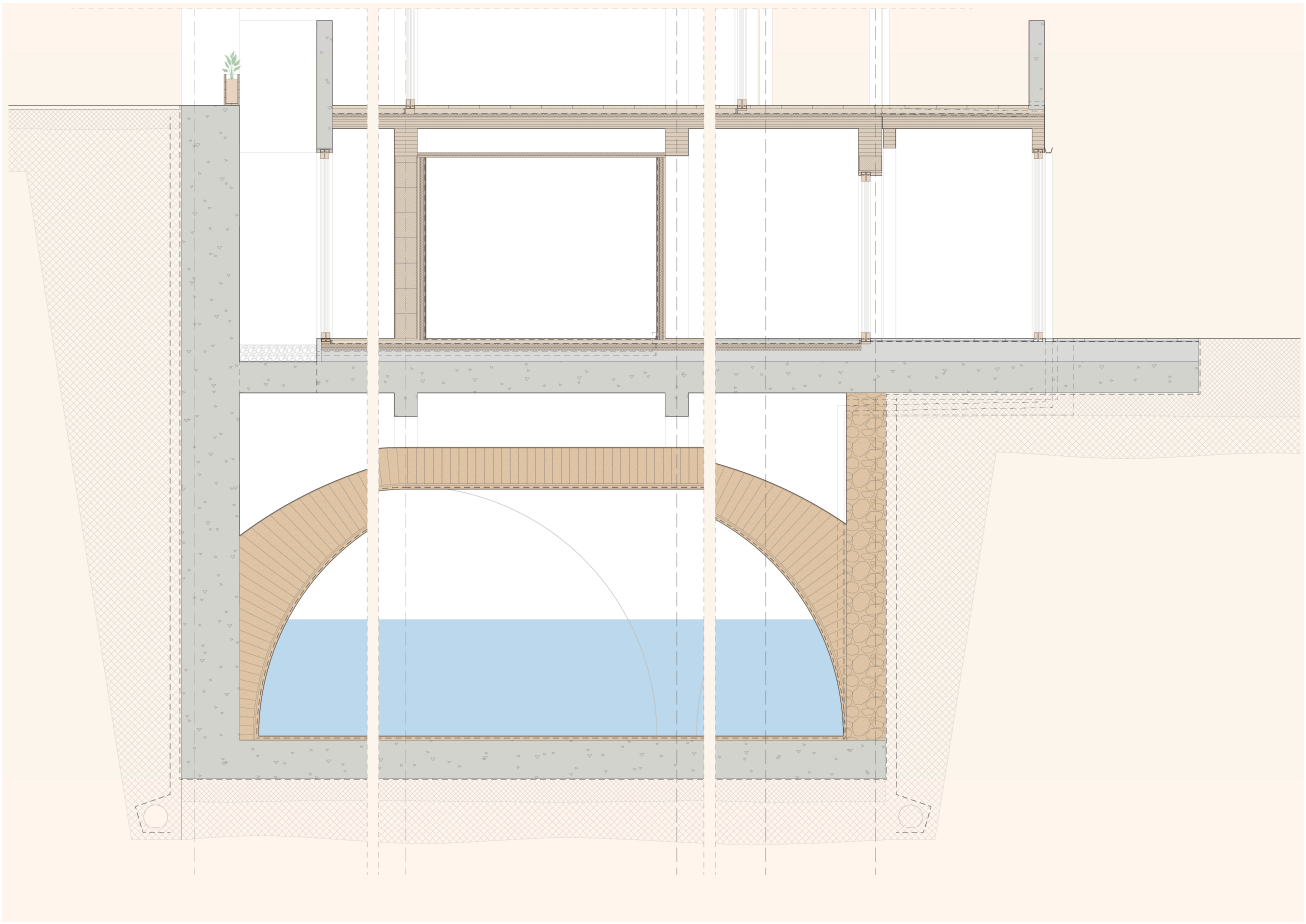


Figure S1. Project section showing the relationship between the underground cistern and adjacent retaining structure in Booth's proposal. The drawing illustrates the design arrangement; the carbon inventory uses the revised quantities in Appendix A [66] (17 September 2026). Water-storage capacity and construction-material volume are distinct. Source: Booth [65].

Table S5. Basement slab and its retaining wall included in both scenarios.

Quantity	Basement slab	Basement retaining wall	Combined entry	Basis
Documented geometry	4,427.29 m² × 0.30 m	302.72 × 3.70 × 0.75 m	Separate elements	Revised Appendix A, Table A.1 [66]
Concrete volume	1,328.19 m³	840.05 m³	2,168.24 m³	Stated geometry
Concrete mass	3,187,656 kg	2,016,120 kg	5,203,776 kg	2,400 kg/m³
Concrete A1–A3 carbon	378.4 tCO_2e	239.3 tCO_2e	617.7 tCO_2e	0.1187 $kgCO_2e/kg$; rounded combined entry 617,688 kg

Concrete volumes are rounded to 0.01 m³ before conversion to mass, following the revised source schedule. The combined concrete entry is 5,203,776 × 0.1187 = 617,688.21 $kgCO_2e$, reported as 617,688 kg. The separate cistern retaining wall is 304.00 × 5.00 × 0.75 = 1,140.00 m³ (2,736,000 kg), contributing 324,763 $kgCO_2e$ in both scenarios. It is included within each cistern entry in Table S16. Reinforcement is accounted for separately.

S6. Common A1–A3 carbon boundary and revised results

The comparison uses one common partial inventory within the A1–A3 product stage, drawing on Booth's revised Appendix A dated 17 September 2026 [66]. Biogenic storage and future lime carbonation are outside this comparison. S15 records the quantities, assumptions and corrections; Table S16 gives the component ledger. Rounded source component entries are retained unless an explicit correction is identified. The resulting estimates support a design-stage material comparison; benchmark compliance and whole-building carbon neutrality are outside its scope.

Table S6. Common A1–A3 comparison boundary.

Boundary item	Treatment	Rationale
System boundary	A1–A3 product stage	Selected documented material inventory; not a whole-life carbon assessment.
Denominator	10,412.13 m² GIA	ArchiCAD area schedule, revised Table A.0: 617.60 + 4,887.24 + 917.56 + 3,989.73 = 10,412.13 m²; excludes external balconies and galleries [66].
Hemp–lime non-load-bearing wall	Excluded from both scenarios	The hemp factor includes biogenic storage; its wall finish and the conventional wall substitute are removed together.
Lime mortar	Assumed 0.52 $kgCO_2e/kg$ where included	Source modelling assumption without future carbonation credit; product-specific verification remains a data-quality limitation.
Concrete and reinforcement	Concrete: 0.1187 (CEM I) or 0.0740 (CEM III/B); steel: 100 kg/m³ at 0.73 $kgCO_2e/kg$	Revised Appendix A [66]. Reinforcement rate and recycled-European-steel factor are scenario assumptions, not a structural bar schedule.
Retaining-wall concrete	Basement wall 840.05 m³ and cistern wall 1,140.00 m³ included in both scenarios	Separately documented elements; each enters the inventory once.
Conventional reference	Conventional material substitutions applied to the project geometry	Comparative design reference; not a claim of unique structural equivalence.

Boundary item	Treatment	Rationale
Exterior paving	Excluded from both scenarios	The proposed scenario's 1,200 $kgCO_2e$ exterior-paving entry is removed to apply the same inventory boundary to both scenarios.
Waterproofing membranes	Excluded from both inventories	The revised source quantifies 11,624.6 kg of HDPE but supplies no traceable emission factor; equivalent membrane scope is outside the comparison.
Acoustic assembly	Proposed assembly recalculated at 26.0 $kgCO_2e/m^2$ of treated floor	Proposed assembly uses the expanded-clay factor and corrected layer sum; revised conventional assembly totals 367,944 $kgCO_2e$. See S15.

Table S7. Revised common-boundary A1–A3 results.

Indicator	Proposed strategy	Conventional reference	Difference
Total A1–A3 embodied carbon	≈4,129 tCO_2e	≈5,991 tCO_2e	≈−1,861 tCO_2e
A1–A3 carbon per m^2 GIA	≈396.6 $kgCO_2e/m^2$	≈575.3 $kgCO_2e/m^2$	≈−178.7 $kgCO_2e/m^2$
Relative difference	—	Reference	31.1% lower

The revised source totals are 3,955,299 $kgCO_2e$ (A) and 6,242,896 $kgCO_2e$ (B), Appendix A (17 September 2026), Tables A.7–A.8 [66]. Although the source labels A as excluding biogenic carbon, it retains a negative hemp entry. Removing that entry adds 283,412 $kgCO_2e$; removing its lime finish subtracts 216,528. The corrected proposed acoustic assembly adds 371,228 − 262,715 = 108,513, and excluding exterior paving subtracts 1,200. Thus A = 3,955,299 + 283,412 − 216,528 + 108,513 − 1,200 = 4,129,496 $kgCO_2e$. Removing the conventional wall substitute gives B = 6,242,896 − 252,287 = 5,990,609 $kgCO_2e$. Both totals already include the revised concrete and separate steel entries; the source totals omit the geomembrane. Dividing by 10,412.13 m^2 gives 396.6043 and 575.3490 $kgCO_2e/m^2$ GIA. The reduction, (B − A) / B × 100, is 31.0672%, reported as 31.1%.

Table S8. Principal component contributions within the revised proposed inventory.

Component	A1–A3 carbon	Share	Note
Hybrid cistern construction	≈1,685 tCO_2e	40.8%	Includes cistern retaining wall and lime; reinforcement counted separately.
Basement slab and its retaining wall	≈618 tCO_2e	15.0%	Revised concrete quantities; reinforcement counted separately.
CLT / GLT structure	≈730 tCO_2e	17.7%	Reported source entries without biogenic-storage credit.
Remaining included materials	≈1,096 tCO_2e	26.6%	Includes 378,628 $kgCO_2e$ of reinforcement and the corrected acoustic assembly; Table S16. Shares are rounded independently.

S7. Building-scale environmental-system evidence

Table S9. Environmental-system evidence and analytical boundaries.

System	Design evidence	Analytical status	Boundary
Rainwater system	Block-scale catchment connected to large underground storage	Design evidence and annual screening estimate	Thesis [65], pp. 145–146 report an earlier rainfall–runoff and demand estimate. Storage is updated from revised Appendix A [66]; network and seasonal operation remain unvalidated.
Photovoltaic generation	Building-scale generation with potential shared operation	Design-stage estimate, thesis [65], pp. 148–149	Installed-power and annual-generation estimates support design-stage screening; operational performance remains unvalidated.
Battery storage	Technical-room storage for nighttime demand	Design-stage system proposition	No kWh capacity or dispatch simulation.
Renewable-energy community	Potential shared energy model across the development	Design-stage governance / network proposition	No grid, ownership or economic model.
Summer passive strategy	External shading and cross-ventilation	Sectional design evidence	No thermal-comfort simulation.
Winter passive strategy	Solar gains and thermal inertia	Sectional design evidence	No operational-energy simulation.
Envelope strategy	Hemp-based insulation within the architectural system	Material / passive-design proposition	Hemp–lime carbon remains outside the common A1–A3 comparison.
Productive gardens	Productive surfaces integrated with housing.	Spatial proposition; thesis area/yield scenarios exist.	Design-stage area and yield/demand scenarios provide qualitative context for the proposed food system.

S8. Interpretation boundaries

The following boundaries are integral to the interpretation of the supplementary indicators and the claims made in the main manuscript.

Table S10. Scientific interpretation boundaries.

Topic	Boundary
Transformation field	The ≈6.21 km² boundary is project-defined and should not be read as an official cadastral or airport-operational boundary.
Agroproductive suitability	The proposal is informed by territorial and geological reading; no verified soil, contamination or agronomic-performance assessment is reported.
Housing capacity	Population and dwelling values are scenario tests based on explicit allocation and area assumptions, not forecasts or statutory capacities.
Embodied carbon	The comparison is an early-stage selected-material A1–A3 inventory, not a certified whole-life carbon assessment.
Material completeness	Hemp–lime wall systems, exterior paving, waterproofing membranes and other undocumented components remain outside the common inventory. Concrete and an assumed reinforcement allowance are accounted for separately.
Water performance	The earlier thesis water balance is not adopted as a current performance result. The revised 8,282.70 m³ storage volume alone does not establish sustainable supply or network performance.
Energy performance	Thesis [65], pp. 148–149 contain photovoltaic estimates. Dispatch, shared-network operation and passive thermal performance are not validated.
Food production	Thesis [65], pp. 140–142 contain cultivable areas and yield/demand scenarios. They do not validate site-specific yields, labour requirements or self-sufficiency.
Governance and phasing	Collective and networked management models are design propositions rather than verified implementation or ownership arrangements.

S9. Reproducibility note

The calculations can be reproduced from the stated inputs, formulas and exclusions. Both scenarios use the same 10,412.13 m² GIA denominator and partial inventory scope. S15 identifies the revised Appendix A sections, original thesis passages used for the acoustic correction, adopted factors and component ledger. The underlying project drawings, models and material records are retained by the authors; the material reproduced here provides the basis for checking the reported calculations.

Booth's revised Appendix A dated 17 September 2026 [66] supersedes the earlier GIA, concrete, reinforcement and modular-cistern entries. S5, S6 and S15 reproduce the quantities and calculation decisions adopted in the article. Appendix B of the thesis [65] provides earlier design-stage food, water and photovoltaic screening estimates; these contextualize the resource systems, while their secondary inputs and autonomy percentages remain outside the article's quantitative results.

An earlier supplementary deposit is identified by https://doi.org/10.5281/zenodo.21622660. The revised S1 supplied with this manuscript contains updated territorial definitions, calculations and source records and constitutes a separate version from that earlier deposit.

S10. Supplementary source references

64. Gomes, H.M.D. Curar o Território, Semear a Comunidade: Um modelo de Co-housing Intergeracional e Circular para o antigo Aeroporto Humberto Delgado. Master's Thesis, Lisbon School of Architecture, University of Lisbon, 2026.

65. Booth, L.W.R. MoreWithLess: Arquitetura como Organização de Matéria, Energia, Espaço e Tempo. Master's Thesis, Lisbon School of Architecture, University of Lisbon, 2026.

66. Booth, L.W.R. Anexo A—Materiais. Author-supplied revision, 17 September 2026; unpublished supplementary project documentation accompanying MoreWithLess.

Reference numbers are shared with the main manuscript. References [64,65] identify the original project theses and drawings; reference [66] identifies the author-supplied material revision used for the updated quantities. Source pages, panels and calculation sections are specified in S13 and S15.

S11. Existing elements and proposed transformation

Gomes identifies ten existing buildings for planned retention or adaptive reuse, with reported footprints totalling 41,713 m². Buildings 1, 2, 6, 7 and 10 are retained and adapted for agricultural industry; their combined footprint is 22,009 m². The other five are preserved for the uses listed below. These are project intentions and reported footprints, not a condition survey, demolition inventory or whole-airport retention rate.

Source: Gomes [64], Appendix E, Panels P1/P2; numbered drawing Figura 5 - EDIFICOS A MANTER.pdf, p. 1, reproduced as main-text Figure 5. The project author confirms that all listed areas are building footprints and that "Replace" in the earlier register meant adaptation of use for buildings 1, 2, 6, 7 and 10.

Table S11. Identifiable existing elements and their proposed treatment.

Element / location	Treatment in the project	Reported footprint / source
Units and source	Planned physical retention; uses listed individually below.	m² of building footprint. Gomes [64], Appendix E, P1/P2; main-text Figure 5.
1	Retain and adapt for agricultural industry	3,184 m²; Appendix E, P1/P2; Figure 5, element 1.
2	Retain and adapt for agricultural industry	3,757 m²; Appendix E, P1/P2; Figure 5, element 2.
3	Preserve — museum / cultural use	2,090 m²; Appendix E, P1/P2; Figure 5, element 3.
4	Preserve — residential use	6,018 m²; Appendix E, P1/P2; Figure 5, element 4.
5	Preserve — educational / cultural use	2,900 m²; Appendix E, P1/P2; Figure 5, element 5.
6	Retain and adapt for agricultural industry	5,465 m²; Appendix E, P1/P2; Figure 5, element 6.
7	Retain and adapt for agricultural industry	5,308 m²; Appendix E, P1/P2; Figure 5, element 7.
8	Preserve — cooperative association	1,399 m²; Appendix E, P1/P2; Figure 5, element 8.
9	Preserve — parking	7,297 m²; Appendix E, P1/P2; Figure 5, element 9.
10	Retain and adapt for agricultural industry	4,295 m²; Appendix E, P1/P2; Figure 5, element 10.

Element / location	Treatment in the project	Reported footprint / source
Total: 10 identified buildings	Planned retention / adaptation	41,713 m²; combined reported footprint of the ten listed buildings.

S12. Productive landscape: functions and cultivation sequence

The functional classification below separates cultivation, inhabited quintas and water storage from ecological-restoration objectives. Within cultivation land, the proposed sequence begins with hemp for potential soil recovery and construction feedstock, followed by horticulture, orchards and complementary permaculture planting. These are successive phases, not additional parcels. Horticulture and orchards may occupy a mixed system and are reported jointly.

Table S12. Functional distinctions and evidence limits within the agroproductive sector.

Function or objective	Documented proposition	Quantitative status
Cultivation land	Horticulture, orchards and complementary permaculture planting following the proposed hemp phase.	85,323 m² reported local allocation; not independently verified net cultivated area. Whole-plan cultivated total unquantified.
Inhabited quintas and associated spaces	Housing, shared spaces and agricultural facilities integrated with cultivation land.	One developed unit; further territorial distribution remains conceptual. Buildings, patios and paths are not net cultivated area.
Water storage	Reservoir and associated landscape intentions.	Geometric capacities are reported where available; no independently delimited stormwater-landscape area or operating performance is established.
Ecological restoration as an objective	Intended soil recovery and ecological continuity alongside productive uses.	No separate restoration zone or verified restoration outcome is established in the available records.

Source and scope: Gomes [64], Appendix E, Panel P3, identified by the project author. The 85,323 m² value refers to the reported horticulture-and-orchard allocation in the developed portion; its net cultivated extent has not been independently verified. The whole-plan cultivated area remains unquantified. Buildings, patios and paths are distinct from cultivated land. The classification describes functions and successive cultivation phases. Parcel-level land-cover mapping and site-specific assessment of remediation, yield and material supply require further investigation.

S13. Identification of project sources

This register identifies each source and states what it supports. Thesis pages refer to printed pagination, not page numbers within the supplied PDF extracts. S15 records the revised carbon reconstruction and its adopted corrections; the original thesis totals are not presented as the final article results.

Table S13. Sources used for the revised figures and calculations.

Material	Source identification	Check and scope
Territorial plan and sector areas	Gomes [64], Appendix E, Panels P1/P2, Desenvolvimento Urbano (source of Figure 7c); sector values confirmed by the project author in the revised S13. Booth [65]: Panel 01, Plano Urbano, July 2026; P1(2).pdf, p. 1.	Gomes confirms 6.21 km² total, 2.35 km² urban and 3.86 km² agroproductive, including the inhabited-quinta sector. These are reported plan values, not an independent remeasurement. Booth's panel additionally records 2,352,535.53 m² urban area, 492,381.69 m² footprint and 2,461,908.45 m² GFA; see S2 for arithmetic and the separate 70% residential assumption.
Articulations and potential reuse	Gomes [64]: Appendix E, P1/P2; Figura 5 - EDIFICOS A MANTER.pdf, p. 1; physical-model photograph supplied in FIG 6 LIGAÇOES ENVOLVENTE.pdf, p. 1, with updated annotations reproduced in main-text Figure 6; revised S11/S14. Booth [65]: S14_LAWRENCE.docx and Panels 01–02, July 2026.	Ten buildings are identified for retention/adaptation, totalling 41,713 m² of reported footprint (S11). Four selected connection examples are recorded in S14. Figure 6 identifies all four selected connection examples, L1–L4. Booth's B1 is an internal block-context example.
Building drawings and programme	Gomes [64]: Appendix E, Panel P5 (Figure S2) and Panel P4. Booth [65]: Panel 02; thesis pp. 27–31 (housing and shared spaces), p. 142 (occupancy), and revised Appendix A [66], Table A.0 (GIA). Plans: thesis p. 28, Figure 18; p. 29, Figure 19; p. 30, two diagrams labelled Figure 21.	Gomes confirms 42 base dwellings and 135 residents; Figure S2 identifies the programme spatially. Booth's pp. 27–31 document care-related, family, student and temporary housing, shared kitchens, galleries and gardens. Page 29 reports 16 units for more dependent older residents and 12 for more autonomous residents, a subtotal for that floor. Revised Table A.0 supplies 10,412.13 m² GIA; thesis p. 142 supplies the 170-resident assumption.
Material and carbon calculation	Booth, revised Appendix A [66] (17 September 2026), Tables A.0–A.8 and Sections A.2–A.3. Original thesis [65], Appendix A, pp. 123–137, supplies retained component details, including the acoustic layers on p. 126 and expanded-clay factor on p. 135.	Revised GIA, concrete, reinforcement and material factors are adopted. S6 and S15 apply the common wall-system, paving and membrane exclusions and correct the proposed acoustic assembly. Table S16 gives the component ledger. Source estimates are distinguished from project-author quantity confirmations and independently reproducible arithmetic.

Material	Source identification	Check and scope
Cistern geometry and construction detail	Booth, revised Appendix A [66], Sections A.2.1–A.2.2 and A.3.3, Tables A.1–A.3; Rhino model levantamento_cisterna.3dm and project section pormenor_1.dwg. Corner-slab area and derivation confirmed by the project author.	The revised schedule contains 21 straight and four corner modules: 5,893.00 m³ of principal construction components and 8,282.70 m³ of water void. The corner slab uses Rhino Area = 320.977 m² × 0.50 m = 160.4885 m³, rounded to 160.49 m³. Basement and cistern retaining walls are separate entries (S5). These are source-model quantities with author-confirmed derivation, not an independent geometric survey.
Agroproductive, water and photovoltaic estimates	Booth [65], thesis pp. 140–142, 145–146, 148–149 and 153–155 (Appendix B).	Appendix B contains earlier food-production, annual water-balance and photovoltaic screening estimates. These design-stage calculations provide qualitative context. Their secondary area inputs and autonomy percentages remain outside the article's quantitative results; cistern storage instead follows revised Appendix A [66].
Gomes' developed productive landscape	Gomes [64], Appendix E, Panel P3; source and scope confirmed by the project author in revised S12.	85,323 m² is the reported horticulture-and-orchard allocation in the developed portion. Its net cultivated extent has not been independently verified; the whole-plan cultivated area remains unquantified.

Original CAD files PLANO.dwg and QUINTA.dwg were also supplied by Gomes and are retained as project-source records. The reported programme quantities derive from the sources and author confirmations identified above.

S14. Proposed articulations with the surrounding fabric

Gomes' register contains four selected connection examples, L1–L4, including a group of street extensions at L4. The updated annotations in main-text Figure 6 identify all four examples. Booth's B1 is a separate local interface within the proposed fabric. These examples document the location and form of intended spatial continuity.

Table S14. Drawing-based examples of proposed urban articulation.

Point / location	Surrounding fabric	Proposed relationship	Drawing / model
L1	Rotunda do Relógio–Quinta das Conchas; continuation of Avenida Marechal Gomes da Costa.	Connection between proposed blocks and surrounding neighbourhoods.	Gomes [64], annotated photograph of the physical model, Figure 6, original L1 label.
L2	Proposed main axis and Segunda Circular.	Proposed street extension / connection.	Gomes [64], annotated photograph of the physical model, revised main-text Figure 6, label L2.

Point / location	Surrounding fabric	Proposed relationship	Drawing / model
L3	Avenida Dr. Alfredo Bensaúde and Alta de Lisboa.	Connection between blocks / neighbourhoods.	Gomes [64], annotated photograph of the physical model, Figure 6, original L3 label.
L4	Existing streets in Alta de Lisboa and the proposed plan.	Group of street extensions; not a single junction.	Gomes [64], annotated photograph of the physical model, Figure 6, original L4 label.
B1 — Booth block (P1 in the author's register)	Proposed pedestrian paths, green/open spaces and adjacent blocks.	Local transition between the developed block and its proposed surroundings; not an identified connection across the existing airport boundary.	Booth [65], Panels 01–02, July 2026; P1(2).pdf and P2(1).pdf, p. 1 each. Panel 02 reproduced in Figure S3.

The four examples identified in Figure 6 form a partial selection, with several street extensions grouped under L4. B1 describes a separate internal interface in Booth's proposed urban fabric.

S15. Source reconciliation and reconstructed carbon inventory

This register records the calculation decisions implemented in the article using Booth's revised Appendix A [66] (17 September 2026). It distinguishes source quantities, explicit modelling assumptions and arithmetic corrections. The comparison remains a design-stage partial inventory; product selection and structural design would be needed to replace the generic or proxy factors.

Table S15. Source reconciliation for the revised comparison.

Item	Source basis	Treatment in this revision
GIA denominator	10,412.13 m²; revised Appendix A, Table A.0 [66]	Same internal-area denominator in both scenarios; excludes external balconies and circulation galleries.
Basement and retaining walls	Revised Appendix A, Tables A.1 and A.3: slab 1,328.19 m³; basement wall 840.05 m³; cistern wall 1,140.00 m³ [66]	All three elements included in both scenarios; basement and cistern walls are separately identified and counted once.
Concrete and steel factors	Revised Appendix A, A.1, A.2.12 and A.3.9: concrete 0.1187/0.0740; steel 0.73 $kgCO_2e/kg$ [66]	Concrete density 2,400 kg/m³ (reference lightweight slabs: 1,800). Reinforcement: 100 kg/m³ × 5,186.68 m³ (A) or 13,300.14 m³ (B). Steel masses: 518,668 / 1,330,014 kg. Rate and steel route are assumptions.
Scenario totals	Revised Tables A.7–A.8: A 3,955,299 kg; B 6,242,896 $kgCO_2e$ [66]	Common-boundary A: 4,129,496 kg; B: 5,990,609 $kgCO_2e$. Arithmetic bridge in S6; component ledger in Table S16.
Cistern quantities	Revised Table A.2: 21 straight + 4 corner modules; principal volumes 1,878.44 + 3,343.27 + 671.29 = 5,893.00 m³ [66]	Water void: 21 × 259.62 + 4 × 707.67 = 8,282.70 m³. Corner slab: measured 320.977 m² × 0.50 m ≈160.49 m³; separate retaining wall 1,140 m³.

Item	Source basis	Treatment in this revision
Symmetric scope	Revised Appendix A, A.2.2, A.2.5, A.2.11 and A.3.5 [66]	Exclude hemp–lime and its conventional substitute, exterior paving and waterproofing membranes. Other undocumented components are outside both inventories.
Material assumptions	Revised Appendix A, A.2.2–A.2.3 and A.5 [66]	Brick density 1,200 kg/m³; cistern lime finish 0.03 m, density 1,600 kg/m³ and assumed factor 0.52; BTC proxy 0.0410 $kgCO_2e$/kg. Product-specific verification remains a limitation.
Internal arithmetic	Original thesis [65], pp. 126 and 135; revised Appendix A [66], A.2.7, A.3.7 and A.2.10	Proposed acoustic entry recalculated below; conventional entry updated to 367,944 $kgCO_2e$. Zinc retained at 93,813 $kgCO_2e$ in both scenarios.

Acoustic correction: Table A.5 in the original thesis [65] (p. 126) lists eight contributions summing to 18.9 rather than the printed 18.4 $kgCO_2e/m^2$. Expanded clay at 30 kg/m² and 0.32 $kgCO_2e$/kg (p. 135; retained in revised Table A.11 [66]) gives 9.6 $kgCO_2e/m^2$, replacing 2.5. The corrected sum is 3.5 + 4.5 + 9.6 + 1.5 + 0.4 + 0.5 + 4.5 + 1.5 = 26.0 $kgCO_2e/m^2$. Multiplication by the retained source assembly quantity of 14,278 m² gives 371,228 $kgCO_2e$, replacing 262,715 in revised A.2.7. The assembly quantity is distinct from the GIA normalization area. The conventional assembly uses revised A.3.7: 314,830 + 27,414 + 25,700 = 367,944 $kgCO_2e$. These are explicit arithmetic and factor selections for the reanalysis.

Table S16. Reconstructed component ledger for the common partial A1–A3 inventory. Sources: revised material schedules [66] and the original thesis [65] for the acoustic correction.

Component	Proposed $kgCO_2e$	Reference $kgCO_2e$	Source and adopted treatment
Basement slab and its retaining wall	617,688	617,688	Revised Table A.1; 2,168.24 m³ concrete, common to A and B
Cistern assembly	1,685,376	2,003,561	Revised A.2.2/A.3.3; B includes 1,678,798 + common wall 324,763; steel separate
Upper-storey earth walls / reference walls	110,582	396,476	Revised A.2.3/A.3.1; BTC factor 0.0410 used as product proxy
CLT slabs / reinforced-concrete slabs	603,103	762,659	Revised A.2.4/A.3.2; source timber entry, updated concrete factor; steel separate
GLT beams and columns / concrete frame	126,892	150,815	Revised A.2.4/A.3.4; timber entry 95,880 + 31,012; steel separate
Roof insulation	1,195	4,355	Revised A.2.6/A.3.6; cork / XPS, without biogenic-storage credit
Floor and ceiling acoustic assembly	371,228	367,944	Proposed: corrected layers, 26.0 × 14,278; reference: revised A.3.7
Glazing	107,991	589,388	Revised A.2.8/A.3.8; timber / aluminium framing respectively
External slats	33,000	33,000	Revised A.2.9/A.3.8; common source entry
Zinc covering	93,813	93,813	Revised A.2.10/A.3.8; common source entry
Reinforcement allowance	378,628	970,910	Revised A.2.12/A.3.9: 518,668 / 1,330,014 kg steel × 0.73, rounded; assumed 100 kg/m³
Total	**4,129,496**	**5,990,609**	**Common partial inventory; same 10,412.13 m² GIA denominator**

S16. Housing plan evidence

The main manuscript includes project axonometrics and a programme comparison. Figure S2 reproduces Gomes' revised plan crop with the project author's functional key. Booth's thesis [65], pp. 28–30 provide a floor plan for older residents and functional diagrams; pp. 27–31 explain the shared facilities and circulation (source locations in S13). These drawings support the spatial interpretation without establishing observed social outcomes or a complete housing schedule.

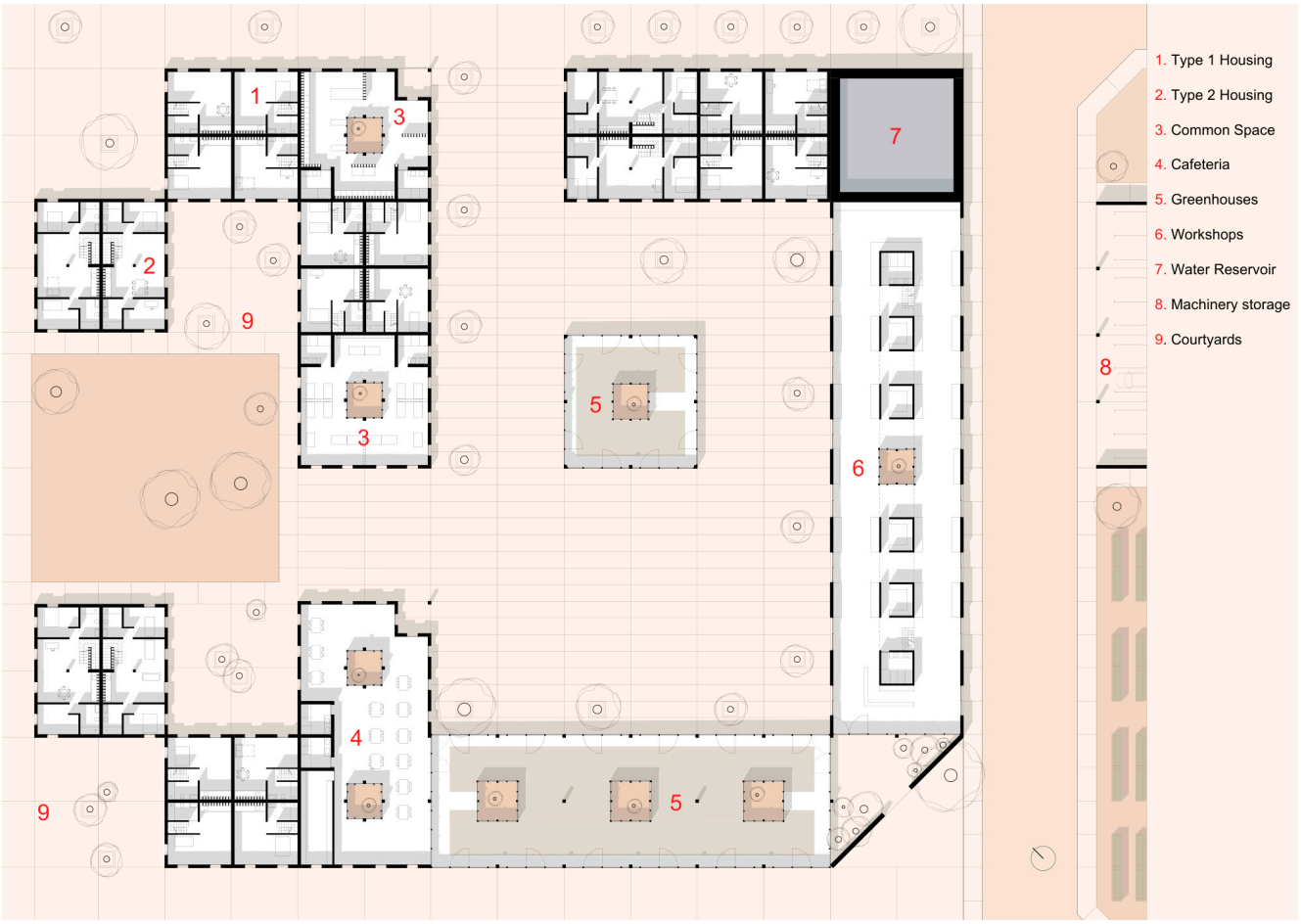


Figure S2. Annotated plan detail of Gomes' developed quinta. The key identifies Type 1 and Type 2 housing (1–2), common space (3), cafeteria (4), greenhouses (5), workshops (6), water reservoir (7), machinery storage (8) and courtyards (9). The crop illustrates the spatial organization of the identified functions.

Source: Hugo Gomes [64], Appendix E, Panel P5; revised crop and functional key supplied in Figura S2 - P5 recorte.pdf, p. 1. Author-prepared project drawing reproduced at reduced size.

S17. Source drawing for Booth's local articulation example

Figure S3. Booth's developed block and its proposed surroundings (example B1 in Table S14).



Source: Lawrence Booth [65], MoreWithLess, Panel 02, Envolvente Urbana, July 2026; supplied file P2(1).pdf, p. 1. Original plan and section scale 1:1000; reproduced here at reduced size.

The drawing documents the developed block within the proposed urban fabric. It supports the local spatial relationship recorded in S14, without establishing the number or performance of connections to existing neighbourhoods.