

A SHARED WORLD OF CITIES

TERRENTRA

Game Design & Technical White Paper

Version 0.1 / October 21, 2026

PRE-PRODUCTION • OWNER DESIGN BASELINE

A scalable multiplayer city-building simulation built around trade, geography, governance and persistent regional economies.

Design record: accepted directions, open questions, and prototype validation gates.

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Document status: Pre-production design baseline. **TERRENTRA** is the chosen working game title; trademark and domain clearance are not asserted. This paper describes the intended product, distinguishes agreed decisions from experiments, and defines a first buildable proof of concept. It is **not** an implementation authorization or a claim that performance targets have been achieved.

Document owner: Project owner

Revision: v0.1 | **Audience:** Project owner, designers, engineering contributors, art contributors, future hosting partners

Change control: Accepted design decisions are normative for planning; proposed mechanics require explicit approval; performance hypotheses require measurement.

Executive summary

TERRENTRA is a fully 3D, persistent multiplayer city-building simulation centered on a continuous procedurally generated landscape. Players build and manage independent cities while participating in a shared world whose geography, resources, trade, infrastructure, environment, and politics connect their outcomes. Roads, bridges, rail lines, ports, aviation, utility systems, and commodity flows create useful dependencies between cities. Cooperation and legitimate economic or political competition, referred to in this paper as *PvPE*, are core parts of the experience.

Worlds are planned in four capacity classes: **2 players / 8 initially defined territories, 4 / 16, 8 / 32, and 16 / 64**. A player starts with one territory and may earn control of at most four. Territories need not be geographically connected. Geography includes mountains, coastlines, rivers, variable buildable land, winds, minerals, oil, coal, fertile ground, and pollution pathways. A world's economy and regional market are isolated from other player worlds. An external simulated market may provide constrained imports and exports; it is not a universal exchange between all worlds.

The experience prioritizes **city-building rather than micromanagement**. Regional governance should present a small set of consequential choices: broad taxes, emissions rules, shared infrastructure, and use of the regional treasury. Elections, recalls, and member expulsion can affect a world's history, but no complex formal coalition or industrial-policy bureaucracy is planned. Players can propose jointly funded infrastructure and commercial ventures with negotiated ownership, ongoing maintenance, and profit sharing. No pre-scripted Great Works mechanic is required.

The initial technical direction is **Unity, C#, a headless authoritative world process, a portable ASP.NET Core platform API, PostgreSQL, and Docker Compose on a dedicated Linux VM provided by the project owner**. The owner has capacity for the initial VM; no paid hosting provider or server purchase is a development prerequisite. Hosting, world identity, and saved state must remain portable across IP addresses, domains, physical hosts, and later service providers. A website supplies best-effort maps, statistics, trade replies, and governance; loss of the website must not disable core game functionality. Discord is the primary optional social channel, managed through a custom bot and existing moderation tooling.

The **single regional clock with bounded offline simulation** is a strong candidate, not an approved final implementation. The first engineering milestone must test its economic fairness and correctness under uneven player availability. This document identifies deliberately undecided values instead of manufacturing precise balancing rules.

1. Product vision and design pillars

1.1 Player promise

The player can establish a city in a living region where neighboring decisions matter. A productive mine may create opportunities for rail freight, manufacturing, construction, and trade. A river may create a bridge project or strategic bottleneck. A coal plant may supply affordable energy while pushing air pollution into a neighboring residential district, affecting health, happiness, taxes, and regional elections. The game's depth should emerge from a few connected systems rather than a long list of individually toggled policies.

1.2 Product pillars

1. **Build first.** Roads, zoning, buildings, utilities, landscapes, and growth form the primary play loop. Common management tasks are legible and automate where appropriate.

2. **One land, many cities.** Geography, climate, waterways, and transport networks are continuous across claim boundaries. City borders are governance and ownership constructs, not hard simulation walls.
3. **Regional interdependence.** Resource specialization, market prices, commuting, freight, and common infrastructure make other players relevant without forcing unanimous real-time attendance.
4. **Consequential competition.** Market dominance, tolls, emissions, project investment, elections, and lawful economic disruption can create advantages and conflict. Exploits and abuse are not legitimate PvPE.
5. **Persistent but humane.** Players who log in more frequently can make more decisions and earn progress; those with less time should not be arbitrarily devastated by an unattended simulation. Final balance requires experiments.
6. **Accessible governance.** The regional Governor has four broad control areas; the interface should not become a second full-time policy simulator.
7. **Portable, modest infrastructure.** Start with a small owned-server deployment, protect saves, and scale based on proven demand and performance.

1.3 Intended audience and boundaries

The core audience enjoys 3D city builders and simulation, but wants meaningful social trade, shared construction, and evolving regional stories. This is **not** an action MMO, a military conquest game, a player-controlled dedicated-server ecosystem, or a web-first city-management game. The primary client is a desktop Unity application with a freely rotating and zoomable 3D camera. Visual fidelity should be attractive and readable but need not be photorealistic.

2. Player experience and core loops

2.1 Session loop

Observe the city and world market; **decide** what to build, produce, tax locally, or trade; **construct or negotiate**; **run** services and industries; **inspect consequences** in money, traffic, pollution, wellbeing, and partner cities; **expand** the city or claim a new territory when progression permits.

Cities should automatically continue previously authorized routine operations. Players intervene for consequential choices such as expansion, utility capacity, economic specialization, major transit routes, negotiated contracts, and public projects. The design deliberately avoids requiring separate industrial-area micromanagement systems for every sector.

2.2 Progression and long-term engagement

Every governor account begins with **one** owned territory and can progressively unlock a maximum of **four** within the world's available supply. Progression criteria, land-purchase pricing, and map-scale dimensions are still to be designed and tested. The four-territory cap is an ownership limit, not permission to freely claim unlimited surrounding acreage. Multiple cities or satellite settlements may be established on disconnected holdings.

Long-term play comes from metropolitan growth, new production chains, transport efficiency, market adaptation, environmental improvement or exploitation, joint ventures, and political change. The end-game loop remains intentionally open; no prestige reset, final victory condition, or mandatory Great Works substitute is approved.

2.3 Interface simplicity

Prefer understandable summaries, actionable warnings, forecast ranges, and direct controls. Routine maintenance should be forecast and paid automatically when sufficient authorized funds exist. Players should not need to vote on every repair, adjust hundreds of individual tax levers, or manage a complex formal coalition UI to obtain cooperation. More technical simulation detail may be visible on demand but should not be necessary for ordinary play.

3. World generation, territory, and fairness

3.1 World capacity classes

World class	Governor slots	Initially defined territories	Max territories per governor
Small	2	8	4
Standard	4	16	4
Large	8	32	4
Grand	16	64	4

These are **design configurations, not verified concurrency benchmarks**. A partially populated world remains playable. A later **six territories generated per player slot** proposal (12, 24, 48, 96 overall) is **not ratified**; it would increase open competition and wilderness while retaining four owned territories per governor. The initial prototype should test the accepted baseline and gather data for the optional supply expansion.

3.2 Continuous procedural geography

Every world is generated from a reproducible seed and a **versioned generator configuration**. Terrain generation should combine landform and erosion-like structure; coastal and inland water bodies; connected river drainage; mountains and valleys; climate and wind; soil and groundwater; and geology-dependent resource deposits. Randomness creates differences, while validation rejects unplayable worlds. Random percentage sliders for mountains, water, and resource abundance are inputs to a constrained generator, not a guarantee that arbitrary combinations will yield sound maps.

The world persists both the seed and every player-caused change, such as excavations, roads, structures, ownership changes, pollution, and resource extraction. A new generator version must never silently recreate a live world with different geography. Terrain should stream in chunks and employ rendering/detail budgets independent of server simulation data.

3.3 Territory claims and newcomer viability

Players may own geographically separate territories and connect them by road, rail, bus, air, or ship. More distant holdings should incur meaningful transport, workforce, utility, and logistics costs. No fixed maximum radius from the founding city has been agreed; distance-based development costs, territorial area limits, and access protections remain proposals.

Accepted enrollment rule DR-53: A world can admit a new player regardless of world age until its player capacity is full, enrollment is explicitly closed, or no viable starting territory is available, subject to public/private/approval-required access policies. A starting territory must plausibly support habitation and economic participation even if other cities are already developed.

A strong proposed safeguard is to protect a viable founding territory for each unoccupied slot and preserve necessary public rights-of-way against strategic encirclement. The server should reserve membership slot and starting land atomically at admission. Exact viability thresholds (buildable area, accessibility, hazards, and economic opportunity) need calibration. Late arrivals need a viable opportunity, not equal wealth or identical mineral fields.

3.4 Environmental systems

Air emissions, wind direction, land relief, water flow, and pollutant concentrations should interact at regional scale. Pollution can cross city borders, affect healthcare costs, citizen wellbeing, environmental quality, land value, labor productivity, and politics. Industries have emissions profiles and may improve them through investment. Environmental simulation should use coarse environmental cells and bounded updates rather than millions of physical particles.

This is a designed causal system, not a promise of meteorological or ecological realism. Geographical asymmetry should produce strategic decisions while permitting all reserved starts to be viable.

4. City systems and simulation

The city simulation should support layered abstractions rather than one actively simulated object for every resident. Population is represented through households and demographic/economic aggregates; visible people and vehicles are generated or streamed at appropriate detail near the active camera. Transportation uses network flow and route capacity, with detailed agents only where gameplay benefits justify their cost.

Core city systems include: residential and commercial demand, industrial and resource production, employment and services, housing, local budgets, power/water/waste, construction and maintenance, roads and freight, transport accessibility, wellbeing, pollution exposure, and bounded disaster risks. Detailed formulas and balancing data remain unspecified.

Construction decisions are server-validated for land rights, funds, resources, terrain constraints, and world policy. Ordinary buildings can continue production and consumption under previously authorized operating rules when the owner is offline. Offline status should not grant immunity from legitimate economic consequences, nor cause avoidable catastrophic collapse merely because a player is at work or asleep.

5. Economy, world exchange, and logistics

5.1 Market boundaries

Every world has its own world-wide regional market. There is no single real-player commodity or money exchange spanning unrelated worlds at launch. Markets price resources using local output, inventories, demand, orders, transport costs, and external import/export opportunities. Aggregate wealth affects purchasing power and consumption patterns; prices should not simply multiply because a world has wealthy accounts.

Two channels coexist: (1) **direct negotiated contracts**, including recurring deliveries and counteroffers; and (2) a **World Exchange** that matches resource buy/sell orders. Trade can be initiated or answered through the Unity client or, when available, the companion website using the same authoritative command service.

5.2 Goods and physical delivery

At minimum, test a simple chain such as **ore → steel → construction materials** with transport capacity and delivery timing. Goods should not teleport between cities. Roads, bridges, rail, ports, and freight services constrain route availability, throughput, delays, fuel and operating costs. Passenger mobility (bus, rail, air) similarly affects workforce access and household budgets. A world may use a constrained external simulated market for missing essential goods, with cost disadvantages and safeguards against trivial arbitrage.

5.3 Currency, sinks, and stability

Transfers and sinks must be distinguished. A toll paid to another player redistributes wealth; it does not remove regional currency. Regional taxes also transfer money to the public treasury. Potential true money sinks include fees paid outside the modeled economy and constrained external purchases, depending on the accounting model. Sources of newly injected money must also be explicit. Physical consumption and decay are **resource** sinks, not automatically **currency** sinks.

The economy must be tested for runaway inflation, monopolization, permanent shortages, pricing loops, circular/wash trades, debt spirals, and idle-world exploitation. Starting grants or development loans may help late entrants, but must not be freely farmable by disposable alternate accounts. Exact intervention rules are **not ratified**.

5.4 Shared projects and ventures

No fixed Great Works menu is required. Players may propose supported projects including bridges, transit connections, utilities, public facilities, and commercial attractions. Each approved venture has a project ledger for agreed contributions (cash, materials, land rights, or verified labor), operating costs, maintenance, upgrades, environmental effects, and distributable proceeds. Ownership shares and revenue distribution are negotiable within enforceable contracts.

Projects built across territories require relevant land rights or negotiated easements. Tolling and access restrictions are legitimate competitive tools, but existing agreements and essential access rules must be honored. Community-controlled project land may be supplied through regional commons; exact spatial and voting requirements require further design.

6. Governance, PvPE, and moderation

6.1 Roles are intentionally separate

- **Creator** is the historical founder of a world, with no inherent extra political vote or right to seize another player's city.
- **Sponsor** is the account currently satisfying the world's paid hosting entitlement, where applicable. Sponsorship does not transfer land or political office.
- **Governor** is an in-game political role. The world initially operates under a system Governor and eligible worlds can elect a player Governor. Two-player worlds use a more lenient system Governor as the accepted direction.
- **Platform operator** is an out-of-game security/operations entitlement and is not an in-game political rank.
- **World member** has city ownership and governance rights subject to world rules.

There is **no in-world Administrator office**. Limited creator-origin membership responsibilities, if needed, are distinct from political authority and can pass to the eligible active player with the highest verified participation after applicable inactivity rules.

6.2 Four broad Governor control areas

Control	Expected decisions	Routine automation
Regional taxes	Rates within approved bounds and published notice	Collection and ledgering
Environmental standards	Emissions limits, pollution taxes, remediation priorities	Emissions measurement and compliance accounting
Infrastructure	Prioritize and propose shared connections and utilities	Approved operations and maintenance
Treasury	Allocate available public funds and reserves	Authorized payments and reporting

Player interactions and alliances may emerge organically through trade and Discord. There is no planned first-release feature for formal political parties, coalition membership management, or dozens of overlapping industrial-area policies. Governor absence must not suspend an already adopted tax, regulation, or authorized bridge maintenance payment. Citizen unhappiness may create political pressure and changes in voting behavior, but the exact unrest and recall triggering model requires tuning.

6.3 Voting and removal

For eligible public-development votes, the accepted default is a **48-hour real-time window**, approval by **simple majority of votes cast**, and participation by at least **half of occupied eligible player seats**, interpreted as one vote per governor-account holder, not a vote for each owned territory. Separate consent applies when a proposal would compel an individual player's own investment or alter guaranteed property rights. Two-player worlds require an explicit exception because a one-person quorum is not suitable for coercive votes; specific two-player financial and removal rules remain to be written.

A Governor can be replaced or recalled under the approved political process, including a 14-day inactivity intervention. A more-active neighbor may gain influence through legitimate economic and political behavior. Competition such as lawful toll increases, monopolistic strategies within market rules, campaigning, and refusal to trade can be legitimate PvPE. Cheating, exploits, technical sabotage, harassment, and abuse are governed separately.

Vote-kick is an accepted gameplay mechanic. Following an approved removal vote, the expelled player's territory enters a locked preservation state for a defined period, then may be cleared/destroyed and become eligible for future allocation (unclaimed pool, vote, random assignment, or newcomer claim). The following remain **undecided**: electorate and supermajority; notice, lock duration, appeal process; two-player special case; treatment of active trade contracts, debt, joint assets, and sponsorship; protections against coordinated asset-grabbing; and selection of the allocation method. No final numerical threshold is implied here.

6.4 Treasury

The regional treasury receives enacted public taxes and approved contributions and funds public projects, routine upkeep, reserves, and remediation. A private co-investment venture may maintain its own distinct ledger and cannot silently spend regional tax revenue. Maintenance should run automatically within authorized budgets, with player votes focused on meaningful new obligations, policy changes, or projects.

7. Time, persistence, and offline participation

7.1 Preferred but unproven model

The current candidate is **one authoritative clock per world with bounded offline economic reconciliation**. It avoids contradictory dates across connected cities, but its fairness and server cost are unproven. Individual fast-forward is not included in the current candidate because cross-city contracts and environmental events require a coherent shared chronology.

When active players are online, the region advances under a common configurable rate. When a world has no connected players, detailed Unity simulation may stop and a lightweight authoritative service can reconcile bounded scheduled events as needed. Inactive cities retain established production, budgets, maintenance, and contractual obligations at suitable aggregate detail; they do not autonomously establish new neighborhoods or seize extra land. Real-time votes and inactivity rules use wall-clock time, never accelerated game time.

Key experiments: 1 versus 8 hours of weekly play; economy equilibrium under extended absence; offline trade settlement; late-joiner access; emissions drift; maintenance reserves; sleeping-world commands from the website; clock-rate stress; deterministic resumption and no duplicate funds/resources. Acceptance needs economic and gameplay evaluation, not merely CPU performance.

7.2 World and individual lifecycle

Trigger	Intended outcome	Notes
No connected users for an idle interval	World may sleep	Interval TBD; checkpoint before stopping Unity process
At least one member accumulates 15 minutes meaningful gameplay within a rolling 30-day window	World remains active	Website-only activity does not qualify
30 days with no qualifying member gameplay	World is archived/retired	Existing eligible members can request restoration under a defined policy
Creator/sponsorship funding ends but other players remain	30-day sponsorship claim/grace window	New eligible sponsor may assume cost; no land or political power transfer
14 days absence in relevant role	Limited leadership/succession or recall process	Separate from territory ownership
60 days individual inactivity in an otherwise active world	Protected stewardship/reclamation process starts	Exact lock and reclaim mechanics need design

Trigger	Intended outcome	Notes
Successful vote-kick	Immediate access removal and land lock	Lock expiry, review, demolition, reassignment TBD

The **world retirement** timer, **paid sponsorship** grace, **individual stewardship** timer, and **political succession** timer are orthogonal. A Creator going inactive does **not** end a world while other members still qualify as active. A sponsor replacing a Creator does not inherit their parcels. Archived world saves remain independent of the Docker container's lifecycle.

7.3 World restoration and migration guarantees

World IDs, accounts, territory IDs, ownership records, and ledgers must survive host migration, world sleeping, restarts, and website outages. Restoration must verify saved snapshots against subsequent transactions and prevent two servers from concurrently becoming authoritative for the same world. A planned migration may have downtime; zero-downtime mobility is not an initial requirement.

8. Web, community, guests, and commercial model

8.1 Website: best effort, not required for play

The companion website may offer authenticated world directory and management, cached interactive 2D regional maps, public statistics, trade offers/replies/counteroffers, project contributions, voting, and optional world browsing. Essential member decisions must also be available through the Unity client or equivalent core service path. **Website downtime must not stop gameplay.** Website actions use the same validated state machine and economic ledger as the game; a separate web simulation is not permitted.

Read-only website map visitors should be served precomputed/cacheable snapshots rather than waking a sleeping world. Private world access and nonpublic market intelligence require authorization. Live 3D spectators are a **deferred, benchmark-dependent** feature; they would have separate connection caps, read-only permissions, rate limits, and a world-specific opt-in setting. They do not consume governor slots.

8.2 Discord as primary optional social layer

A custom bot may create and manage per-world Discord channels, reconcile membership permissions after authenticated Discord account linking, and post project/vote/trade notices. MEE6 may continue as the chosen moderation tool for supported functions. Discord channel/guild limits and provider outages require provisioning safeguards. Discord must not control or become the source of truth for trades, votes, player identities, or world ownership. Players may participate in gameplay without a linked Discord account, though Discord chat requires Discord access.

8.3 Accounts, entitlements, DLC

The current commercial direction is a **free participation class** that can join existing worlds but cannot create new ones. A paid base entitlement may permit one active created world, while further paid tiers may allow additional hosting capacity or more worlds. Intermediate tier definitions and prices are explicitly TBD; internal platform operator entitlements are separate from consumer benefits. Payment does **not** increase a player's four-territory cap, in-world votes, economic yield, or ability to win elections.

World-hosting entitlements must be checked at provisioning and sponsorship succession. Future higher-capacity hosting should follow measured infrastructure costs; approved members can continue gameplay during a sponsorship grace period as defined in Section 7.

Future DLC may offer **cosmetic building/vehicle appearances**, including commissioned human artist collections with contracted attribution and revenue participation. Base-game models may be created through AI-assisted workflows, then reviewed and repaired for scale, geometry, optimization, quality, compatibility, and intellectual-property rights. AI

assistants may support ideation and asset workflow; their use does not guarantee directly usable 3D meshes. Cosmetic purchase should not grant gameplay advantages.

9. Technical architecture and trust boundaries

9.1 Initial technology baseline

Domain	Baseline
Desktop client	Unity 6 family, C#; exact pinned version verified at project bootstrap
Simulation	C# authoritative model; ECS/Jobs/Burst only where profiling justifies them
Live world process	Unity Linux Dedicated Server or other validated authoritative .NET simulation host; choose by spike results
Platform/control plane	ASP.NET Core: identity, world directory, admission, trade commands, governance, lifecycle
Persistence	PostgreSQL for authoritative transactional records and indexed world metadata; versioned world snapshots
Initial orchestration	Docker Compose on a dedicated Linux VM using the owner's existing hardware
Optional interfaces	Lightweight website and separate Discord bot
Networking	Configurable discovery and world routing; authenticated commands; relevant state replication only

Unity Netcode for Entities is a candidate for live state replication, not a commitment to synchronize every vehicle and citizen. Rendering nodes and simulation entities should be decoupled. World services may share a host initially, but deployment and identity boundaries must allow later provider migration and additional hosts. An entire region need not be sharded into 64 different servers at launch.

9.2 Logical service layout

Unity desktop clients send authenticated commands to a **platform API / discovery service** and connect to the current authoritative **world simulation process** for relevant gameplay updates. **PostgreSQL and checkpoint storage** hold durable world state and economic records. A **best-effort web frontend** uses platform APIs and published map snapshots, never direct access to the game database. A **Discord worker** uses narrow service permissions for notifications and community access. Each world has stable identity independent of its current container ID or hostname.

A command path should validate authorization, land rights, available funds and inventory, current world revision, and idempotency key before applying economic changes. The platform must avoid two writers, duplicate settlement on retry, and inconsistent web/Unity transactions during sleep or migration. The eventual implementation must select a precise authority boundary for commands while the Unity world process is stopped; this is a first technical design task.

9.3 Deployment and migration

Start with a small, centrally operated Docker deployment in the dedicated game VM. Persist state outside disposable containers. Isolate the VM from personal LAN devices; expose only necessary game and HTTPS endpoints; keep databases and Docker APIs private; use non-root services where practical, secrets handling, backup encryption, and

recovery tests. Do not expose public game service traffic until network-isolation and DDoS exposure have been assessed. Inexpensive home hosting does not promise immunity from upstream bandwidth saturation.

The platform must support migrating all active world IDs, snapshots, transaction records, user accounts, and permissions to an external provider or different VM. No world save should contain a hardcoded public IP/domain. The client uses a configurable bootstrap/discovery endpoint with a documented contingency if every bootstrap address becomes invalid. The website is movable and disposable; authoritative game data is not.

9.4 Performance principles

Begin with small two-player workloads; progressively benchmark 4, 8, and 16 simultaneous players and the corresponding territory counts using developed cities, realistic trade routes, environmental updates, browser command traffic, and reconnect storms. Metrics include simulation tick budget and tail latency, CPU/memory, database transaction latency, network bandwidth, snapshot time, world resume time, and correctness under load. **No numerical hardware capacity is asserted by the existence of an engine feature.** Provider purchase or additional VM allocation is decided using actual results.

10. Prototype and validation plan

10.1 Prototype P0: playable technical slice

P0 is deliberately narrow. Build one **two-player / eight-territory** procedurally generated world with repeatable terrain seed, a 3D movable camera, basic terrain rendering, building/road placement, two independently owned cities, one mineral-to-material production chain, one trade contract, a bridge/freight connection, persistence across world restarts, and a minimally useful authoritative API. Placeholder assets are acceptable.

The point is to prove that independent city economies can produce, exchange, move, and consume goods within one authoritative world. P0 does not require final government elections, artist DLC, a polished website, Discord channel automation, 16-player production capacity, or guest 3D spectating.

10.2 Required validation gates

Gate	Demonstration / acceptance evidence
G1 Seed and state	Recreating a seed yields the expected baseline geography; player changes survive a stop/restart and generator-version changes cannot silently alter occupied land
G2 Authority	Invalid building placement, unauthorized claims, and duplicate trade commands are rejected without changing balances
G3 Delivery	Goods travel over valid capacity-limited routes; broken bridge alters time/cost/availability without duplicating inventory
G4 Persistence	Restart and database restoration preserve money, world IDs, ownership, contracts, and transaction sequence
G5 Offline simulation	Unequal weekly play (e.g., 1 hour versus 8 hours), 7/30-day absences, and sleeping-world resumption exhibit explainable economics without double settlement
G6 Environmental coupling	One industry emits pollution that affects another territory under a controlled wind/weather case; results are reproducible at chosen update resolution

Gate	Demonstration / acceptance evidence
G7 Load	Repeat developed-world simulations for 2/4/8/16 governor classes; record real CPU, memory, tick latency, bandwidth, and durability rather than invent player capacity
G8 Portability	Move a paused world to a second test environment, change its exposed endpoint, and resume with identical world identity and verified state

Every gate should have a repeatable test fixture and a recorded pass/fail threshold once the first measurements exist. The first spike explicitly compares (a) shared clock with bounded offline reconciliation and (b) alternative simpler pause/aggregate methods. A proposed architecture becomes approved only after this evidence is reviewed.

10.3 Scope stages after P0

- **P1, gameplay vertical slice:** Meaningful building categories; citizens and industry; trading UI; transport capacity; manageable governor controls; simplified treasury; test web trade replies; functioning two-player world.
- **P2, regional multiplayer:** Four-player concurrency; city progression and claims; agreements and shared investments; elections and environmental policy; life-cycle and sponsor handover.
- **P3, capacity validation:** Eight and sixteen-player tests, production authorization, cashflow and storage modeling; deeper world directory, optional visiting, cosmetic pack pipeline when financially appropriate.

These labels express sequencing, not release-date promises. Features can move based on risk and measured results.

11. Outstanding decisions and risk register

Priority	Topic	Current state	Decision or evidence required
Critical	Offline time model	Preferred, untested	Choose clock speed, catch-up cap, economic protections, transaction authority while sleeping, and pass fairness/performance tests
Critical	World economy	Defined conceptually	Decide supply/demand equations, sinks/sources, NPC demand, transport accounting, and market anti-abuse limits through simulations
High	Land supply	Baseline capacity accepted; six-territory proposal open	Four versus six generated territories per player slot, area budget, claim costs, viable-start constraints
High	Voting and expulsion	Vote-kick approved direction	Electorate, threshold, 2-player exception, lock time, appeal, demolition, debts/contracts, reassignment
High	Governor policy	Broad powers accepted	Tax/emission bounds, notice periods, tenure, citizen unrest, missing-Governor defaults

Priority	Topic	Current state	Decision or evidence required
High	Sponsorship and lifecycle	Main durations agreed	Define grace initiation, payment transfer consent, archival retention, restoration authorization
High	World admission	DR-53 accepted	What exactly counts as viable land, who may change enrollment settings, and how simultaneous admissions lock slots
High	Regional treasury	Purpose accepted	Separation of venture ledgers, public spending constraints, reserve triggers, and insolvency rules
Medium	Disaster model	Direction accepted	Hazard types, probabilities, upkeep and mitigation effects by difficulty
Medium	Guest 3D access	Deferred	Opt-in policy, spectator caps, authentication, DDoS-resistant ingress and load test
Medium	Hosting monetization	Direction accepted	Verify provider costs and entitlements for paid world sizes; no pay-to-win rules
Medium	Title/IP and AI assets	Working game title	Trademark/domain clearance, production licensing, artist contracts and AI-content review

Risk treatment: Unresolved items must not be silently converted to defaults in code. Engineering spikes may implement temporary values that are clearly labeled non-production and tracked for later ratification.

12. Decision register: consolidated governing baseline

The IDs below refer to the conversation's iterative decision history. Later decisions supersede contradictory earlier recommendations. This is a **consolidated register**, not a claim that every former numbered proposal was formally adopted.

Reference	Controlling position	Classification
DR-01, DR-02, DR-03, DR-37	Scalable worlds 2/8, 4/16, 8/32, 16/64; start with one territory, progress to four; disconnected holdings permitted	Accepted
DR-04, DR-07 to DR-10	60-day individual stewardship direction; rolling 30-day world activity with 15 minutes meaningful in-game play; no website reset; archival and bounded offline progression direction	Accepted direction / prototype for time

Reference	Controlling position	Classification
DR-05, DR-06, DR-33, DR-39, DR-40	One active world at base paid creation entitlement; free members may join; configurable visibility; other paid hosting entitlements TBD and no in-world paid advantage	Accepted direction; commercial specifics open
DR-11, DR-58, DR-59	Shared world timeline and bounded offline reconciliation, with speed and fairness subject to validation	Prototype required
DR-12 to DR-14, DR-21, DR-25 to DR-29	Simple majority with 48-hour window and $\geq 50\%$ occupied-seat quorum for eligible ordinary votes; governor policy; joint finance; political/management succession without special Creator power	Accepted with defined exceptions open
DR-15 to DR-20, DR-49, DR-50, DR-72 to DR-74	World-specific market, price/distribution drivers, transport, emissions, maintenance, outside market, website trade replies	Accepted direction; models require tests
DR-22, DR-41 to DR-44, DR-53 to DR-55	Procedural world profiles, viability of newcomer starts, no fixed join deadline; optional extra land and exact claims still open	DR-53 accepted; other safeguards proposed
DR-30 to DR-32, DR-36, DR-68 to DR-71	Discord-first optional community; bot permissions and MEE6 moderation; cached map visitors; deferred read-only live spectators	Direction accepted; live spectating deferred
DR-34, DR-35	Cosmetic human-artist packs and AI-assisted default assets, no pay-to-win	Direction accepted; legal/production validation
DR-46, DR-47, DR-52	Lenient system governor for two-player worlds; 30-day hosting succession; sponsor never inherits land	Accepted direction
DR-56, DR-57, DR-60, DR-62	Four broad Governor controls, no formal coalition management, routine policies and treasury operations continue during absence	Product principle / accepted direction
DR-61, DR-64 to DR-66	Player vote-kick; lock land then eventual clearance and potential reallocation; exact vote and land method not set	Mechanic accepted; rules open
DR-67, DR-63	Earlier names superseded by TERRENTRA as working title; clearance still required	Working title
DR-75 to DR-82	Owner-provided dedicated Linux VM and Docker initially, portable hosting, game independent from best-effort website, measured scale-up	Accepted architecture direction

13. Immediate next actions and handoff

1. **Approve this v0.1 as the design baseline**, not as a final economic specification. Keep proposed and test-required items visible.
 2. **Write Technical Architecture Specification v0.1** describing the authoritative command path, world state schema, snapshot/ledger mechanics, terrain generator contract, environment-grid resolution candidates, and host migration workflow.
 3. **Define reproducible P0 experiments** for the shared clock, world transaction consistency, two-city freight, and 2-player throughput. Pick tentative target values only as experiment settings.
 4. **Create project scaffolding** only after the technical specification: Unity project, C# core simulation and automated tests, headless server packaging, platform API, and persistence migrations. The owner-provided Linux VM is sufficient for initial work.
 5. **Return with measured evidence** to choose land supply, simulation rate, environmental costs, and player/world capacities. Public hosting, paid-tier packaging, and marketing follow after functional proof.
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Appendix A: Illustrative example, not approved balance

In a two-player world, City A mines ore and City B consumes ore to manufacture construction steel. The players negotiate a recurring contract via the Unity UI or website. Freight crosses a player-funded bridge that collects a toll and incurs maintenance expense. The Governor adjusts a broad emissions fee; City B weighs compliance investment against higher operating cost. Both city economies update under a shared simulation clock, while one player is offline. The ledger accounts for ore, steel, delivery, tolls, taxes, and bridge upkeep without duplicating money or resources. If the website fails, the Unity client remains capable of issuing all essential commands. If the game container sleeps, an authoritative event processor reconciles the contract when the world resumes. This single scenario cuts across most of the game's architectural risks and is therefore recommended as the first integrated test.

Appendix B: Reference technology documentation (verification starting points)

These references support technical feasibility research only. They do not establish specific benchmark capacities or approve paid vendor selection.

- Unity documentation, dedicated server builds: <https://docs.unity3d.com/6000.0/Documentation/Manual/dedicated-server-build.html>
- Unity documentation, Netcode for Entities: <https://docs.unity3d.com/6000.0/Documentation/Manual/com.unity.netcode.html>
- Docker documentation, Compose environment configuration: <https://docs.docker.com/compose/how-tos/environment-variables/set-environment-variables/>
- Docker documentation, resource limits: <https://docs.docker.com/reference/compose-file/deploy/>
- Discord developer documentation: <https://discord.com/developers/docs/>

End of White Paper v0.1