🗺️ GeoNFTs — Hierarchical NFTs for Geodata

GeoNFTs are a modular, layered NFT standard designed to map ownership, governance, and interaction to geospatial areas. They form the territorial backbone of Web3MAP — representing everything from countries to parks to houses.

They are:

Polygon-based: built on defined shapes or boundaries

Nested: a country contains a region, which contains a city...

Tokenized: each unit is an NFT, tradable, programmable, and interactive

Permissioned: with tiered access and governance logic

🧭 1. Structural Hierarchy

Each GeoNFT is part of a nested hierarchy, using geospatial logic:

```
World (Root NFT)
 └── Continent
    └── Country
       └── Region
          └── City
             └── District
                └── Parcel
```

Each level can:

Be minted or fractionalized

Carry its own metadata, governance, and functions

Inherit logic from parent (e.g., voting rules, map layers, mission eligibility)

> Like a spatial DAO tree rooted in reality.

🗂️ 2. Smart Contract Logic

Built using:

ERC-721 or ERC-1155 (for fractional ownership)

GeoJSON coordinates or Mapbox tile IDs

Parent/child relationships embedded in metadata

Example metadata:

```
{
  "name": "Berlin - Mitte District",
  "type": "district",
  "parent": "Berlin",
  "geometry": {
    "type": "Polygon",
    "coordinates": [...]
  },
  "permissions": {
    "can_mint_subareas": true,
    "governance": "GeoDAO #10932"
  },
  "use_cases": ["token_gating", "planning_votes", "tourism_missions"]
}
```

🧩 3. Inheritance & Override Logic

Like CSS for maps:

Parameter	Inheritable?	Overridable?
Voting rules	✅ Yes	✅ Yes
Token-gating	✅ Yes	✅ Yes

Base layers ✅ Yes ✅ Yes
rNFT missions ✅ Yes ✅ Yes
PoP zones ✅ Yes ❌ No

> Lower-level NFTs follow parent logic unless customized.

📌 4. Minting Logic (Dynamic Polygon Registry)

1. User selects a zone on the map (e.g., draw or click)

2. System checks:

If area is free or already owned

If parent NFT allows sub-minting

3. NFT is minted with unique area ID

4. Metadata is generated (area, owner, allowed logic)

> Think Google Maps meets ENS minting.

🌍 5. Example Use Cases

Level	NFT Name	Use Case
Country	germany.web3map	National mission coordination

Region	bavaria.web3map	Tourism campaigns, regional DAO
City	berlin.web3map	City votes, event drops
District	mitte.berlin.web3map	Neighborhood PoP + token gates
Street	torstrasse.mitte...	AR art mintstations, shops affiliate
Parcel	parcel_301.torstrasse	Smart property docs or rNFT actions

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🔄 6. Interactions with Other NFTs

rNFTs: Only usable in zones where you hold GeoNFT

Drop.me: Messages can be gated by GeoNFT level

POSI: Missions reward based on GeoNFT-verified actions

Governance: Voting weight tied to GeoNFT ownership or stake

📍 7. Location Anchoring Methods

Supports:

Polygon-based ownership (GeoJSON, Shapefile, etc.)

Point-based drops (latitude/longitude)

Radius areas (e.g., 500m around a mintstation)

ZK-Proofs of Location for anonymous validation

🧠 8. GeoDAOs as Governance Layers

Each GeoNFT can activate or join a GeoDAO:

DAO rules scoped to area (voting, funding, proposals)

Token holders = citizens

Missions, votes, rewards locked to that area

Layered governance:

e.g., City DAO > District SubDAO > Street DAO

> GeoDAOs bring civic structure to spatial NFTs.

🎯 9. Economic Flows & Monetization

Function	Revenue Model
GeoNFT Minting	Pay per area or subdomain
Mission Hosting	Pay to post SDG-missions to local DAO
Affiliate Zones	Shops/tourism drop vouchers on maps
NFT Leasing	Temporarily assign rights (e.g. events)
Data-as-a-Service (DaaS)	Open-data or private map layers sales

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🔐 10. Security & Validity

Mintguard: prevents overlapping or duplicate zones

Verifiers: approve minting in sensitive areas (e.g., landmarks)

Ownership Locks: some NFTs are soulbound or require staking

ZK Layer: Proof of real-world action without leaking location

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📦 11. Storage & Indexing

Polygons = stored in IPFS/Arweave + onchain hash

Boundaries = retrieved via Web3MAP indexer (Mapbox-compatible)

Metadata = nested & queryable for apps (search, filters)

🧨 Summary: Why Hierarchical GeoNFTs?

Benefit	Description
🗺️ Real-World Logic	NFTs mirror real spatial divisions (cities, regions)
🔁 Programmable Space	Rules, drops, and missions by area & governance
💥 Composable Stack	Linked with rNFTs, PoP, Drop.me, GeoDAOs
💸 Revenue + Utility	Unlock monetization + civic impact in one system

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🔧 Tech Stack Suggestions

ERC-721/1155

GeoJSON & turf.js for geometry validation

Mapbox or Leaflet.js frontends

IPFS + The Graph for data queries

ZK-Proofs via Semaphore or ZK-Geo