**Blue Economies in the Shadows: The Role of Small-Scale Fisheries in Coastal Megacities**

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**Abstract:** Coastal megacities—Lagos, Jakarta, Mumbai, Manila—depend on small-scale fisheries (SSF) and intertwined informal blue-food markets to supply affordable wild fish to tens of millions, yet these flows remain largely invisible to official statistics and urban planning. This review synthesizes evidence on their contributions to urban food security—availability, access, affordability, stability, and safe utilization—alongside livelihoods and gendered post-harvest labor, while documenting mounting pressures from pollution, land reclamation, overfishing, and climate extremes. For the agricultural statistics community, we propose a pragmatic agenda to make these coastal food economies count: (i) city-scale blue-food satellite accounts that integrate nearshore catches, artisanal processing, and street-level retail into Supply–Use Tables; (ii) routine, gender-disaggregated market microdata (prices, volumes, perishability losses) from mobile vendor and wet-market surveys; (iii) empirical fish-flow mapping that links landing sites to low-income neighborhoods using vendor diaries and rapid lot-trace methods; (iv) coupled indicators that track catch and effort alongside water quality, habitat loss, heat stress, and flood risk; and (v) rights-aware metrics on access, tenure security, and displacement for waterfront communities. Embedding these measures in national accounts and urban dashboards would reveal how coastal fishing economies stabilize city diets during shocks, identify bottlenecks (cold chains, clean water, landing sites), and guide investments for just blue transitions. As seas warm and cities expand, counting wild foods—and the people who move them from shore to street—is urgent to safeguard urban food sovereignty and steer blue economies toward resilience, equity, and environmental integrity.

## 1. Introduction

In the early hours before coastal megacities fully wake, urban food systems begin at the water's edge. Along the lagoons of Lagos, the bays of Jakarta, the docks of Mumbai, and the estuaries of Manila, small-scale fishers set out in wooden boats and return with catches that move quickly through dense, informal distribution networks. Within hours, fish are sorted, smoked, carried, and sold through wet markets, roadside stalls, and mobile vendors, reaching low-income neighborhoods that formal supply chains often bypass. These decentralized systems—linking shore to street—supply affordable animal-source foods to tens of millions of urban residents each day.

Despite their scale and significance, these "blue food" economies remain largely invisible in official statistics and urban planning. National accounts capture industrial fisheries, imports, and formal retail, but rarely the nearshore catches, informal processing, and street-level distribution that sustain everyday diets in rapidly growing cities. As a result, a substantial share of urban food provisioning—particularly for the working poor—is systematically undercounted, poorly understood, and absent from policy design. This invisibility is not merely a data gap; it has material consequences for how cities plan infrastructure, allocate resources, and respond to food system shocks.

Across climate-stressed coastal megacities—including Lagos, Jakarta, Mumbai, Dhaka and Manila—small-scale fisheries (SSF) occupy a critical but precarious position within urban food systems. On the one hand, they provide essential contributions to food security: increasing availability of nutrient-dense foods, improving access through localized distribution, and stabilizing diets during periods of price volatility or supply disruption. On the other, these systems are under mounting pressure from environmental degradation, urban expansion, and governance frameworks that fail to recognize their role. Pollution, overfishing, and habitat loss are reshaping aquatic ecosystems, while land reclamation, coastal infrastructure projects, and eviction pressures are displacing the communities that depend on them. These dynamics are further intensified by climate change, which is altering fish stocks, increasing extreme weather events, and introducing new forms of uncertainty into already fragile livelihoods.

At the same time, the functioning of these food systems depends heavily on informal labor and gendered value chains that remain largely outside formal measurement. While men typically dominate harvesting, women play central roles in processing, preservation, and market distribution—particularly in smoked and dried fish economies that extend the shelf life and reach of perishable products. These post-harvest activities are not peripheral; they are foundational to how fish circulates within cities. Yet they are rarely captured in food system indicators, labor statistics, or urban policy frameworks. This results in a double invisibility: both the flows of fish and the labor that moves them remain obscured.

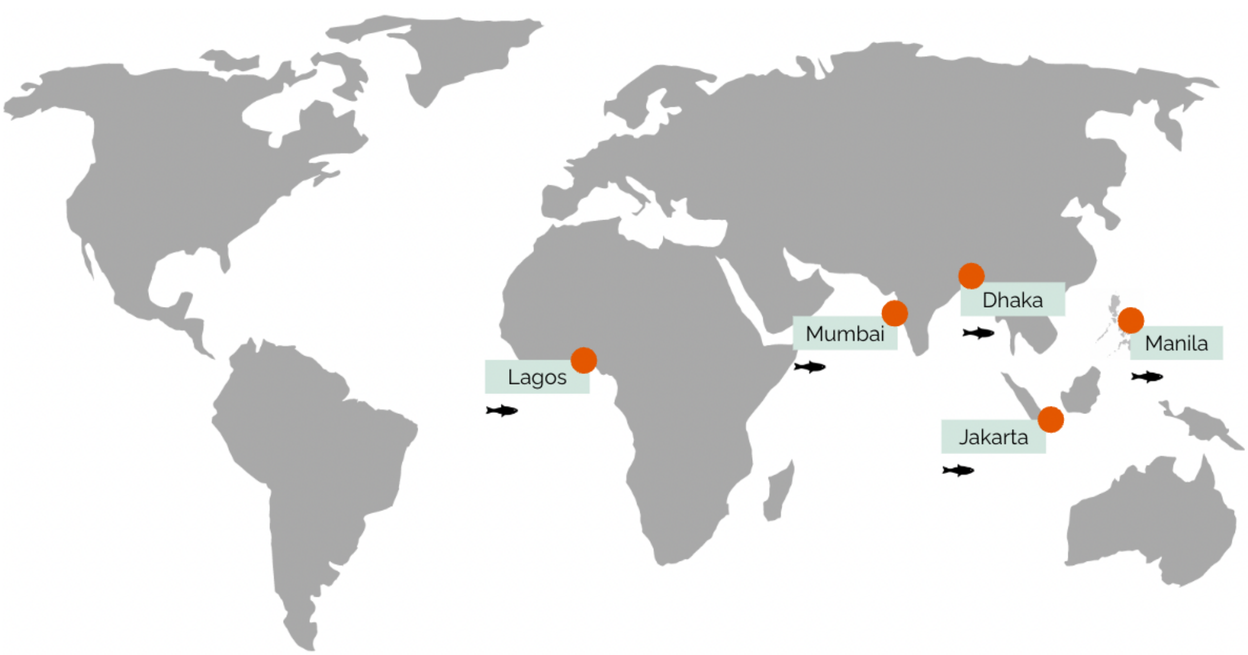
This paper situates small-scale fisheries within the broader context of urban food systems, informality, and statistical visibility in coastal megacities. It brings together evidence from multiple regions to examine how SSF contribute to urban food security across its key dimensions—availability, access, affordability, stability, and utilization—while also supporting livelihoods and social reproduction in low-income communities. At the same time, it documents the intersecting environmental and socio-political pressures that threaten the sustainability of these systems.

For the agricultural statistics community, the central challenge is not only to better describe these dynamics, but to make them measurable. Existing data systems are not well equipped to capture decentralized, informal, and highly mobile food economies. This paper therefore proposes a pragmatic agenda for integrating small-scale fisheries into urban and national statistical frameworks. This includes: (i) developing city-scale blue-food satellite accounts that extend beyond industrial production to include artisanal catch, processing, and informal retail; (ii) collecting routine, gender-disaggregated microdata on fish markets, including prices, volumes, and post-harvest losses; (iii) mapping fish flows from landing sites to urban consumption zones using vendor-based and rapid traceability methods; (iv) linking fisheries data with environmental indicators such as water quality, habitat change, and climate exposure; and (v) incorporating rights-based metrics on access, tenure security, and displacement for waterfront communities.

By embedding these dimensions into statistical systems, it becomes possible to better understand how small-scale fisheries function as stabilizing forces within urban food systems—particularly during periods of disruption. More importantly, it allows policymakers to identify critical bottlenecks, from cold chain gaps to degraded landing sites, and to design interventions that support both food security and livelihoods.

As coastal cities continue to expand and climate pressures intensify, the question is not whether these systems matter, but whether they will be counted. Recognizing and measuring the contributions of small-scale fisheries—and the people who move fish from shore to street—is a necessary step toward building more resilient, equitable, and sustainable urban food systems.

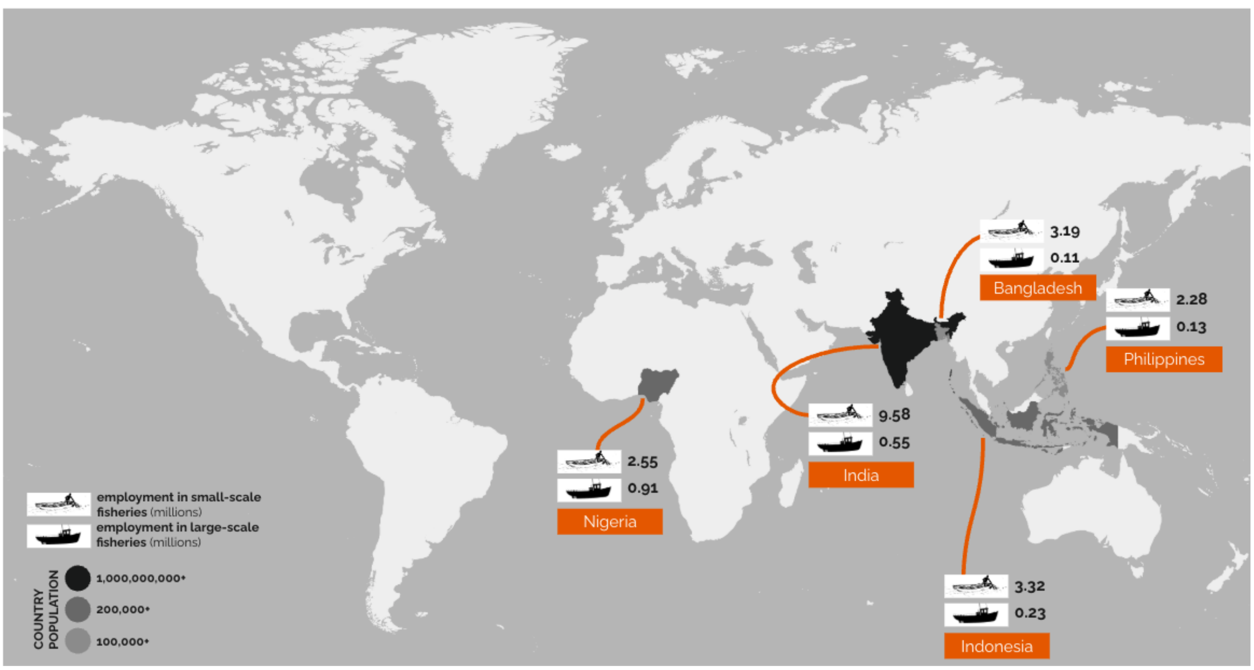
**Figure 1**. Coastal megacities included in our analysis, where small-scale fisheries contribute to urban food systems.



## 2. Urban Fisheries Across Megacities

Across the world's fastest-growing cities (see Figure 1), fishing persists in places where the city is least settled—along edges of water, in floodplains, in mangroves, in spaces not fully claimed by concrete. These zones are not incidental; they constitute the primary spatial interface through which aquatic resources enter urban food systems. The cities are representative nodes within a broader global pattern: rapidly expanding urban centers where small-scale fisheries remain embedded in everyday food provisioning despite being largely absent from formal statistical systems. Lagos, Jakarta, Mumbai, Manila, and Dhaka—alongside smaller but comparable port cities such as Guayaquil and Abidjan—share a defining feature: large populations of urban poor whose livelihoods and diets are directly or indirectly tied to aquatic food systems. In these contexts, SSFs function as a first-order distribution mechanism rather than a residual or supplementary sector. These cities also sit at the intersection of intense demographic growth and ecological pressure, making them critical sites for examining how food systems function under conditions of constraint. Together, they allow for a comparative lens that captures variation in geography and governance while maintaining a focus on informality, coastal or riparian dependence, and food system vulnerability. Evidence from global syntheses, including the FAO and the *Illuminating Hidden Harvests* initiative, underscores that small-scale fisheries supply a substantial share of aquatic foods and livelihoods worldwide, particularly in low- and middle-income contexts where urbanization is accelerating.[1]

**Figure 2**. Livelihoods in small-scale and large-scale fisheries across countries.




[1] FAO, 2022

Across these cities, several shared structural characteristics emerge. First, small-scale fisheries operate in close proximity to dense urban populations, often within marginal or environmentally exposed zones—lagoons, estuaries, wetlands, and tidal flats—that remain outside formal planning regimes. This spatial configuration reduces transport frictions and enables high-frequency, low-volume flows that are not easily substitutable by formal supply chains. These spaces enable low-capital entry into fishing and related activities, making them accessible to migrant and low-income populations. Second, fisheries are embedded within highly informal value chains, where fish moves rapidly through decentralized networks of processors, traders, and vendors, many of whom operate without formal recognition or protection. These networks function as distributed logistics systems, coordinating supply without centralized infrastructure. This informality is not incidental but functional: it allows systems to remain flexible, responsive, and capable of supplying affordable food in contexts where formal infrastructure is limited or exclusionary. Third, these cities are characterized by rapid urban growth and environmental degradation occurring simultaneously—pollution, habitat loss, and climate-related stressors are reshaping aquatic ecosystems even as demand for affordable food increases. (Seto et al. 2012) The co-location of ecological decline and urban expansion concentrates risk within the same production–distribution nodes. Studies of coastal urbanization in the Global South consistently show that these pressures converge most acutely in informal waterfront settlements, where food provisioning, livelihoods, and environmental risk are tightly coupled. (Seto et al. 2012; Béné et al. 2003) These conditions define the operational environment within which SSF systems must maintain supply.

The contexts explored in this paper reveal a recurring configuration of urban food systems operating beyond the scope of conventional measurement. In the five megacities we explore, small-scale fisheries contribute to food security through localized, labor-intensive, and temporally rapid supply chains that differ fundamentally from industrial or import-based systems; and characterized by decentralized production, rapid circulation, and dependence on informal coordination mechanisms. These supply chains are organized around throughput rather than storage, with minimal buffering capacity but high turnover. At the same time, these contributions are systematically undercounted: official statistics tend to capture aggregate production or formal market flows, but rarely the informal distribution networks, gendered labor, and intra-urban movements that define how fish actually reaches consumers. (FAO 2023) As a result, a significant share of urban food provisioning remains outside observable statistical units. This gap reflects a broader challenge in agricultural and urban statistics—namely, how to measure systems that are mobile, informal, and embedded in social relations rather than formal institutions. The implication is not simply missing data, but mis-specified units of analysis. By placing these cities in comparison, the analysis identifies recurring features of how small-scale fisheries are organized within urban food systems and where existing statistical approaches fail to capture them. This supports the development of measurement approaches better aligned with how these systems operate.

## 3. SSFs and Cities: Form and Function

Small-scale fisheries in coastal megacities function as distributed urban food systems rather than discrete extractive activities at the urban fringe. They link aquatic production to urban consumption through interconnected nodes of capture, processing, transport, and retail, operating largely outside formal supply chain infrastructures. As summarized in Figure 2, fish enters urban markets through multiple pathways—nearshore catch, artisanal landing sites, processing sites, and decentralized retail channels—rather than through a single coordinated distribution system. These pathways differ structurally from industrial and import-based supply chains. They are characterized by high-frequency, small-volume transactions, minimal storage, and reliance on labor-intensive coordination across informal actors. As a result, supply is organized around rapid circulation rather than centralized aggregation or cold-chain logistics. This configuration is rarely captured in conventional statistical systems, which are typically designed to measure production at source or transactions within formal market channels.

**Figure 3**. Contextualizing Urban Fisheries: Roles, Risks, and Gendered Dimensions

| Context | **SSF Contributions to Food Systems** | **Key Livelihood Groups** | **Primary Threats** |
|---|---|---|---|
| **Lagos, Nigeria** | Supply of fresh and processed (smoked) fish through informal and formal market channels; key source of affordable animal-source protein for low- and middle-income urban populations | Artisanal fishing households (including Egun communities); women fish processors and market vendors; informal market associations | Coastal eviction and displacement; water pollution (industrial and domestic); flooding and climate exposure; land reclamation and urban development pressures |
| **Jakarta, Indonesia** | Supply of fresh fish from coastal and nearshore fisheries to urban markets; contribution to food access for low-income coastal and urban populations | Artisanal fishers in kampungs (Muara Angke, Penjaringan); Traditional Fisherfolk Union (KNTI) | Coastal infrastructure development (sea walls, land reclamation); marine pollution; flooding and subsidence; declining nearshore fish stocks |
| **Mumbai, India** | Supply of fresh marine fish to urban wholesale and retail markets; central role in urban protein provisioning through dock-based distribution systems | Koli fishing communities; women fish vendors and traders; dock-based labor and market intermediaries | Declining fish stocks; coastal pollution; infrastructure development (coastal road projects); climate-related stressors (heat, cyclones); displacement pressures |
| **Manila, Philippines** | Supply of fish, shellfish, and aquatic products from coastal and bay fisheries to urban wet markets; significant contribution to urban dietary protein intake | Small-scale fishers in coastal settlements (Navotas, Baseco); wet market vendors; gleaners and informal harvesters; fisher associations; | Land reclamation and port expansion; coastal and marine pollution; habitat degradation (mangroves, nearshore ecosystems); urban encroachment |
| **Dhaka, Bangladesh** | Supply of fish from riverine, wetland, and aquaculture systems to urban markets; supplementation of diets for low-income populations through small-scale production and trade | Small-scale inland fishers; peri-urban aquaculture producers; informal traders; low-income migrant households engaged in fisheries-related activities | Water contamination; wetland loss and urban encroachment; habitat degradation; hydrological changes affecting inland fisheries |

At a global scale, the importance of small-scale fisheries is well established. They account for approximately 40% of total fisheries catch and contribute significantly to micronutrient intake for an estimated 2.3 billion people, particularly in low- and middle-income contexts. (Basurto et al. 2025) However, these aggregate estimates obscure how fish is distributed and accessed within urban systems, where the organization of post-harvest flows and market structures plays a decisive role in determining food availability and affordability.

*3.1 Fisheries contributions*

The contribution of SSF to urban food systems is not uniform, but it is consistently substantial. In Lagos, Mumbai, and Manila, small-scale fisheries supply fresh and processed fish that constitute a routine source of animal protein for low- and middle-income households; in Dhaka, capture fisheries are complemented by peri-urban aquaculture, but distribution remains similarly decentralized. In many countries, the majority of domestic fish supply is derived from small-scale fisheries—in Nigeria, estimates suggest that artisanal fisheries account for roughly 80% of domestic fish production in. (FMMBE 2024)

What distinguishes these systems is not only volume, but form. Processing methods such as smoking, drying, and small-scale fresh distribution extend shelf life and enable circulation beyond landing sites without reliance on cold-chain infrastructure. These practices are particularly important for small pelagic and low-trophic species, which dominate many small-scale fisheries and are typically consumed whole. Such species are consistently shown to be dense in bioavailable micronutrients—including calcium, iron, zinc, and vitamin A—making them nutritionally significant relative to larger, filleted fish products. (Thilsted et al., 2016; Hicks et al., 2019)

These contributions operate through high-frequency, short-distance flows linking landing sites to urban markets and neighborhoods. Fish often moves from capture to retail within a single day, with minimal storage and rapid turnover; SSF systems shape availability through continuous supply, access through proximity and decentralized retail, and affordability through flexible product forms and pricing. The contributions to food security are also well documented, particularly where imported or industrial supply chains are volatile or price-sensitive. (Béné et al. 2016)

Seen this way, SSF contributions are not just about food production in the narrow sense. They matter because they shape availability through daily landings, access through localized retail, and affordability through flexible sale forms and low-barrier distribution. They also contribute to stability, especially when global supply chains are disrupted or when imported products become more expensive. Across diverse contexts (Figure 3), SSFs continue to function as a distributed urban provisioning system rather than a niche heritage sector. Emerging work on small-scale fisheries and local food systems shows that fish access is mediated not just by catch levels but by the organization of post-harvest flows, local market structures, and who controls distribution. (Arthur et al. 2022)

### *3.2 Livelihood groups*

SSF systems are organized through socially specific livelihood groups rather than undifferentiated labor pools. These include territorially embedded communities such as Egun fishers in Lagos, Koli communities in Mumbai, and kampung-based artisanal fishers in Jakarta, alongside vendors, processors, and gleaners operating across urban markets. In most cases, fishing is one component of a broader occupational structure that combines capture, processing, transport, vending, and informal finance. (FAO, 2015; Béné et al., 2016) This layering distributes risk across activities and sustains participation even where returns from capture alone are unstable. These systems are therefore not well described as discrete sectors. They are organized around access to water, landing space, and markets, with labor, capital, and product circulating through locally coordinated networks. Informal credit arrangements, advance purchase agreements, and trader–fisher linkages are central to this organization, enabling continuity of supply in the absence of formal financing or storage infrastructure. (Johnson, 2010; Coulthard, 2008) In Lagos, fisheries are embedded within waterfront settlements where access to the lagoon structures both livelihood and settlement patterns. In Mumbai, Koli communities maintain fishing and distribution networks despite extensive coastal redevelopment, while in Jakarta, organizations such as KNTI demonstrate that small-scale fisheries operate through collective as well as individual strategies. Across cases, these configurations determine how shocks are absorbed and who bears their costs when access is constrained, environmental conditions deteriorate, or urban development alters coastal space.

### *3.3 Threat convergence*

Pressures on small-scale fisheries in coastal megacities are cumulative rather than discrete. Across cases, three categories recur: ecological degradation (pollution, habitat loss, declining stocks), urban development pressures (land reclamation, port expansion, eviction), and climate-related stressors (flooding, heat, and changing marine conditions). These processes are well documented across coastal urban regions, where environmental change and urban expansion are tightly coupled. (Seto et al., 2012; Béné et al., 2016) Empirically, these pressures co-occur in the same production and distribution zones. In Jakarta Bay and Manila, land reclamation and coastal infrastructure reduce access to fishing grounds while degrading nearshore ecosystems. (Baum et al., 2016; Breckwoldt et al. 2016; Sta. Maria et al., 2009) In Mumbai, coastal development interacts with warming seas, extreme heat, and pollution to constrain both catch and market supply. (Makwana & Patnaik 2021) In Lagos, water contamination, flooding, and forced evictions overlap in lagoon-adjacent settlements where fishing and processing are concentrated. These are not independent shocks; they accumulate on the same populations and spatial nodes within the food system. This convergence helps explain the dual character of SSF systems. Their decentralized organization allows for short-term adjustment through shifts in species, practices, or market channels, but these responses occur within narrowing ecological and spatial constraints. Informality enables flexibility, but also limits protection: access to land, water, and markets remains contingent and often unsecured. As a result, adaptation can obscure underlying decline, with system function maintained until key thresholds—ecological or spatial—are crossed. (Coulthard, 2008; FAO, 2015)

### *3.4 Gendered value chains*

Small-scale fisheries are structurally gendered systems. Across contexts, men are primarily engaged in capture, while women are concentrated in post-harvest activities including processing, preservation, transport, and retail. (FAO 2022) This division is consistent across the five cities examined, though its specific expression varies: women anchor smoked-fish processing in Lagos, dominate retail distribution in Mumbai, and are central to wet-market trade and processing in Manila and Jakarta, while in Dhaka they are heavily involved in aquaculture management and post-harvest labor, often within household-based production systems.

This pattern is reflected in global employment data. Recent estimates indicate that small-scale fisheries support over 120 million livelihoods worldwide, with the majority of post-harvest roles occupied by women. (FAO 2023) Country-level data reinforce this structure. In Bangladesh, women account for approximately 3.4 million workers in small-scale fisheries, with the largest shares concentrated in processing (0.74 million) and trading (0.83 million). In Indonesia and Nigeria, women's participation is similarly concentrated in post-harvest nodes, particularly trading and processing, even where their direct involvement in capture remains limited. These figures indicate that a substantial share of fisheries employment—and especially the segments that connect production to consumption—operates through female labor.

These roles are not ancillary. They determine whether fish can circulate within urban systems at all. Processing techniques such as drying and smoking extend shelf life; trading networks move products across neighborhoods; and vendor systems translate bulk catch into affordable, divisible units. Without these functions, fish remains perishable and spatially constrained. In this sense, post-harvest labor constitutes the operational core of urban fish distribution.

Despite this, women's labor remains only partially visible in official statistics. Much of it is informal, seasonal, or embedded within household production, and is therefore underrepresented in labor force surveys and national accounts. (FAO, 2015; Harper et al., 2020) This has direct implications for measurement and policy. Under-counting post-harvest work obscures where value is added, where losses occur, and where constraints are most binding. It also limits the ability of statistical systems to capture key bottlenecks in urban food distribution, including inadequate market infrastructure, lack of cold storage, and exposure to health risks in processing environments.

In practical terms, this creates a mismatch between how SSF systems function and how they are measured. The segments of the value chain most critical for urban food access—processing, distribution, and retail—are also those least systematically observed. Addressing this gap requires routine, gender-disaggregated data collection at post-harvest nodes, including market surveys, trader registries, and infrastructure mapping. Without such data, the labor that enables fish to move from landing sites to urban consumers remains analytically and institutionally invisible.

## 4. Measurement and Policy Framework for Urban Small-Scale Fisheries

### *4.1 Why current statistical systems fail*

Urban SSF are missed for three technical reasons: invisibility in national accounts compilation, informality in production and labor arrangements, and spatial mismatch between statistical frames and city-relevant coastal/riparian geographies. First, national accounts rely on coherent accounting identities (2008 SNA) and are commonly enforced through Supply–Use Table (SUT) balancing; micro-scale, mobile, or unregistered units are therefore undercovered unless compilers explicitly treat them as part of the non-observed economy and make exhaustiveness adjustments. (United Nations, 2018; UNECE, 2003)

Second, informality is not only a "missing data" issue; it is a classification problem. International labor-statistical guidance distinguishes the informal sector (enterprises as observation units) from informal employment (jobs as observation units), implying that surveys must be designed to capture both enterprise characteristics and job relationships. (ILO, 2003) In SSF, this matters because women's participation is concentrated in post-harvest processing and trade; sex-disaggregated reporting is therefore not optional if the measurement goal is value-chain completeness. (ILO, 2018; FAO, 2024)

Third, routine fisheries statistical systems are typically organized around national totals, major fishing areas, and landing-site sampling, while city decisions operate through municipal boundaries, market catchments, transport corridors, and hazard zones—units that are not routinely joined in official data products. (FAO, 1999) The measurement agenda below therefore emphasizes city-scale integration products that stitch together fisheries, markets, environment, and land/access metrics within harmonized spatial units. (FAO, 2023; FAO, 2015)

### *4.2 A measurement agenda for making SSF visible*

Addressing this gap requires extending, rather than replacing, existing statistical systems. The objective is not to fully formalize SSF, but to develop tools that can capture their dynamics while preserving their flexibility. Figure 3 outlines five complementary measurement priorities.

**City-scale blue-food satellite accounts.** The core output is an extended city SUT that explicitly represents: (i) SSF landings (supply) feeding the city; (ii) post-harvest transformation (e.g., smoking/drying) via product-specific conversion coefficients; and (iii) informal distribution margins (wholesale/retail), producing balanced estimates of household consumption at purchasers' prices. (United Nations, 2018) Methodologically, this is feasible because (a) SUT compilation already tolerates mixed data sources and balancing adjustments, and (b) there is dedicated fisheries accounting guidance for integrating physical and monetary information in ways consistent with the national accounts and environmental accounting standards. (United Nations & FAO, 2004; FAO et al., 2016) A practical implementation sequence is: pilot the city "blue-food" product breakdown; compile a supply module from landing-site samples and market inflow data; then calibrate/balance the use side to household consumption using standard SUT reconciliation procedures. (United Nations, 2018)

**Routine, gender-disaggregated market microdata.** Implement weekly–monthly sentinel surveys in wet markets and vendor corridors, recording (i) prices and quantities by species and product form (fresh/smoked/dried), (ii) origin/destination, (iii) basic quality and loss grading, and (iv) trader sex and employment status consistent with informal-employment measures. (ILO, 2003; FAO, 2024) The feasibility case is strong because high-frequency market microdata directly support SUT balancing and inflation/affordability monitoring while allowing explicit coverage of women-dominated post-harvest segments. (Lentisco & Lee, 2015; ILO, 2018) To quantify perishability losses (a key urban bottleneck), embed validated FAO post-harvest loss instruments—Informal Fish Loss Assessment Method, Load Tracking, and Questionnaire Loss Assessment Method—within the market/route surveys. (FAO, 2011)

**Empirical fish-flow mapping.** Produce an origin–destination (OD) fish-flow matrix linking (i) landing and peri-urban production nodes to (ii) wholesale/retail nodes and (iii) neighborhood catchments. The recommended workflow combines participatory mapping of fishing effort and landing points (to define origins, seasonality, and route constraints) with trader/vendor diaries that capture routings, intermediation, and points of product-form change (e.g., smoking before sale). (Chambers 1994; Deguit et al. 2004; Grati et al. 2022) Network-analytic approaches used in SSF trade research can then identify chokepoints (high centrality nodes), redundancy (alternative routes), and exposure to disruptions, making it possible to target subsequent measurement densification at the most informative nodes. (Robert et al. 2021; FAO 2015)

**Coupled socio-ecological indicators.** Link fisheries performance proxies (catch by species, effort, CPUE proxies, prices, post-harvest loss rates) with ecosystem condition and hazard exposure for the same spatial units used in fish-flow mapping. The SEEA Central Framework and SEEA Ecosystem Accounting provide a standards-based route to integrate ecosystem extent/condition accounts and ecosystem services with economic activity and to support geospatially enabled subnational statistics. (United Nations, 2014; United Nations et al., 2021) The operational implication is that city SSF indicators can be compiled as linked accounts rather than a disconnected set of environmental and economic statistics—an approach increasingly emphasized in SEEA implementation literature. (Inacio et al. 2025) For fisheries-specific design, the ecosystem approach to fisheries articulates the need for integrated information spanning biotic, abiotic, and human components, providing a well-aligned conceptual basis for coupling catch/effort series to water quality, habitat loss, flooding, and heat stress indicators. (FAO, 2003)

**Rights- and access-based metrics.** Treat access as a measurable production constraint: geocode landing/market sites; track documented and perceived tenure/access security; record displacement or closure events; and measure travel time from landing nodes to retail nodes. The SDG 1.4.2 metadata provides a tested measurement architecture for tenure security (documentation plus perceived security) that can be adapted to SSF-relevant "working spaces" (landing corridors, processing yards, market stalls). (FAO, 2012) The SSF Guidelines and IHH framework provide an official precedent for treating governance and inclusion as measurable dimensions, while peer-reviewed governance work highlights the importance of "space" and access in SSF outcomes. (FAO, 2015; FAO, 2022; Cohen et al., 2019)

### *4.3 From measurement to policy: integrating SSF into urban governance*

A practical integration pathway is to treat SSF measurement outputs as inputs to existing monitoring infrastructures, rather than parallel reporting. The minimum viable architecture begins with a geocoded register of landing sites, processing clusters, and market nodes (a "blue-food statistical frame"), enabling consistent spatial linkage between fisheries statistics, market microdata, environmental monitoring, and land/tenure records. The Global Statistical Geospatial Framework describes this as the mechanism for achieving data integration by anchoring statistics to consistent geospatial references and interoperable units of analysis. Once a frame exists, two recurring production streams can be institutionalized: (i) sentinel market microdata (prices, volumes, product forms, loss proxies, trader characteristics) aligned with established manuals for post-harvest loss assessment in small-scale fisheries,  and (ii) sample-based landing/effort data compiled using FAO/CWP statistical standards so that city series remain comparable to national capture-fisheries reporting. These recurring series can then be integrated annually into a city "blue-food" satellite account (extended SUT), using SUT-based balancing to reconcile supply (landings, conversions via processing) and use (household consumption and intermediate demand), which is precisely the role Supply–Use compilation plays in producing coherent GDP-consistent totals. In parallel, coupled socio-ecological indicators can be compiled as linked accounts consistent with SEEA standards—connecting fisheries performance proxies with water quality, habitat condition, and hazard exposure within the same spatial units.

Embedding these outputs in urban governance—rather than leaving them as sectoral fisheries statistics—requires connecting them to the monitoring toolkits and planning cycles cities already use. FAO's City Region Food System indicator framework explicitly positions cities to "develop, implement and monitor" food policies across production, processing, distribution, and retail, including the informal market interfaces where fish commonly moves. Likewise, the New Urban Agenda recognizes food security and nutrition as a planning concern across urban–rural systems, creating an institutional rationale for integrating "blue foods" into city dashboards rather than treating them as rural-sector residuals. Operationally, this means the SSF measurement products should be published as (a) high-frequency market bulletins (affordability, volatility, losses), (b) quarterly risk briefs that overlay fish-flow dependence with flooding/heat events, and (c) annual integrated accounts that support budget choices on market infrastructure, landing-site services, and environmental remediation—each mapped to a named decision forum (city planning, port/market authorities, disaster-risk units, and national accounts compilers).

The case cities make this integration problem concrete without requiring bespoke approaches. In Lagos, where waterfront redevelopment creates acute measurement gaps around displacement, a tenure-security module aligned to SDG 1.4.2—paired with a landing/market register—turns "eviction risk" into a monitorable constraint on food supply nodes.  In Jakarta, where large coastal defense and reclamation projects restructure access, fish-flow OD matrices and geocoded access corridors provide an empirical basis for assessing whether engineered shoreline interventions sever the functional link between fishing grounds, landings, and market catchments.  In Mumbai, where access claims and coastal infrastructure are contested, mapping landing sites and market linkages makes it possible to specify enforceable "no-net-loss of access" conditions and monitor disruption pathways through market microdata during extreme events.  In Manila, where nearshore degradation and spatial reconfiguration coincide with dense market circulation, coupling bay-condition indicators (e.g., sedimentation/water-quality proxies) with market inflow series supports attribution of supply instability to environmental change rather than only to "price shocks."  In Dhaka, integrating peri-urban aquaculture and wetland-dependent capture fisheries into the city SUT and linked environmental accounts makes inland "blue foods" legible within urban food planning and wetland trade-off decisions.

The payoff of this design is not rhetorical "visibility," but decision-grade uncertainty reduction: it improves the auditability of food-supply claims, identifies where post-harvest losses concentrate (and whether infrastructure investments reduce them), and enables comparable tracking of SSF contributions within standard economic and environmental accounting systems. The main constraints are also clear: building frames for mobile/informal actors, maintaining response rates without increasing regulatory risk for respondents, coordinating data ownership across city and national institutions, and sustaining geospatial integration capacity. These constraints argue for phased implementation—starting with registers and sentinel markets, then scaling to integrated accounts—rather than attempting city-wide exhaustiveness in a single cycle.

**Figure 4**. Integrating small-scale fisheries into urban monitoring and governance

| Context | **Governance Risks** | **Institutional Interfaces** |
|---|---|---|
| **Lagos, Nigeria** | Loss of access to fishing grounds, landing corridors, and settlement space through eviction, reclamation, and environmental degradation. | Federal Ministry of Marine and Blue Economy<br>Lagos State Ministry of Waterfront Infrastructure Development<br>Lagos State Ministry of Agriculture & Food Systems Lagos<br>State Environmental Protection Agency<br>National Bureau of Statistics<br>Nigerian Institute for Oceanography and Marine Research<br>Nigerian Slum / Informal Settlement Federation |
| **Jakarta, Indonesia** | Functional disconnection between fishing grounds, landing sites, and urban markets as shoreline engineering and coastal restructuring alter access. | Ministry of Marine Affairs and Fisheries<br>Dinas Kelautan, Pertanian dan Ketahanan Pangan<br>BAPPEDA DKI Jakarta<br>Jakarta Coastal Management units<br>Kesatuan Nelayan Tradisional Indonesia (KNTI)<br>Kampung-based fisher groups and cooperatives<br>KIARA (People's Coalition for Fisheries Justice) |
| **Mumbai, India** | Erosion of traditional access routes and landing–market linkages through coastal infrastructure, environmental decline, and episodic climate shocks | Department of Fisheries, Government of Maharashtra<br>Municipal Corporation of Greater Mumbai<br>Maharashtra Coastal Zone Management Authority<br>Mumbai Port Trust<br>Sassoon Dock authorities<br>Koli community organizations (e.g., Koli Mahasangh)<br>National Fishworkers Forum<br>Local fish market committees and cooperatives<br>Women fish vendors' associations |
| **Manila, Philippines** | Instability in supply and livelihoods associated with cumulative coastal transformation and degradation of nearshore production environments. | Bureau of Fisheries and Aquatic Resources<br>Department of Environment and Natural Resources<br>Metro Manila Development Authority<br>Local Government Units (LGUs) along Manila Bay<br>Philippine Ports Authority<br>Fisheries and Aquatic Resources Management Councils<br>Fishers' associations and cooperatives<br>Wet market vendor associations |
| **Dhaka, Bangladesh** | Encroachment on wetlands and water bodies, declining water quality, and the marginalization of inland blue foods within urban land-use decisions. | Department of Fisheries (DoF), Bangladesh<br>Dhaka North & South City Corporations<br>Bangladesh Water Development Board<br>Ministry of Fisheries and Livestock<br>RAJUK (Capital Development Authority)<br>Local fish market committees (arotdar networks)<br>Small-scale aquaculture producer groups<br>Community-based fisheries management groups |

## 5. Conclusion

Small-scale fisheries in coastal megacities are not peripheral food activities but embedded urban systems that operate through distributed, time-sensitive, and labor-intensive pathways. What distinguishes them is not only their contribution to supply, but the way that supply is organized: through dense networks of landing sites, processors, traders, and vendors that connect aquatic environments directly to urban consumption. These systems function alongside, and often in place of, formal supply chains, yet they remain weakly represented in the statistical infrastructures that underpin planning and policy. This mismatch limits the ability of cities to fully account for how food reaches large segments of their populations.

The analysis presented here suggests that this limitation is less a question of data scarcity than of measurement design. Existing statistical frameworks already contain the tools needed to capture these systems, but they are rarely applied at the scales and through the units of observation that urban fisheries require. Extending these frameworks to include informal market activity, intra-urban food flows, and access to production spaces allows small-scale fisheries to be incorporated into standard economic and environmental accounts without compromising comparability. Doing so shifts the analytical focus from aggregate production toward system function, making it possible to observe how supply is maintained, where losses occur, and how risks propagate through urban food networks.

Integrating these approaches into routine monitoring systems would strengthen the empirical basis for decisions that already affect these sectors, including coastal development, market regulation, and environmental management. It would also enable more consistent tracking of how aquatic food systems respond to environmental change and urban expansion. As coastal cities continue to grow, the question is not whether these systems can be replaced by formal alternatives, but whether they can be measured with sufficient precision to be understood, managed, and sustained within evolving urban economies.

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