Ecosystem services auctions systematic review codebook

General notes

Coding should concentrate on topics of article focus: avoid coding background information, introductions, literature reviews (in primary research articles) unless relevant to clarifying a specific question or issue. When the article itself is a literature review, try to focus on conclusions, or areas where multiple studies are being compared to keep the corpus from ballooning.

Similarly, limit coding of experimental design discussions and quantitative results that may be difficult to interpret when the highlighted passage is viewed in isolation. Instead, try to code authors' summaries of results and their implications.

Codes

Abstract: Dummy code used to collect all abstracts. Only abstracts of auction-focused articles received full coding coverage.

AdverseMoral (Parent: **Information**)**:** Sections discussing adverse selection or moral hazard.

Additionality: Includes specific usage of the term *additionality*, as well as passages communicating the concept that an intervention should achieve some benefit or gain relative to a given baseline. *Example:* Ferguson et al. (2016) refer to "equivalence or gains" in abstract and discuss additionality explicitly in body. Both are coded at this node.
   Heritage: Performance / PES / Additionality
   Children: Leakage

Compliance: Indicates sections on the topic of making some assessment of auction outcomes (either economic or environmental) in the post-contract phase.
   Heritage: Performance / PES / Compliance
   Children: Conditionality, Standards

Context: Indicates factors which have direct relevance to auction design and performance, but which are typically omitted from laboratory experiments.
   Examples: Variables like cultural factors, institutional capacity, civic trust, social factors, identity, etc.
   Children: Development, InstPol, Niche, Social

Communication: Indicates variables relating to either communication between bidders, or between bidders and principal. In the article, nodes at this code are split between **Design** and **Context** at author's discretion depending on emphasis.
   Heritage: Design / Communication

Collusion (parent: **Information**): Applied to discussions of collusion (where bidders coordinate in order to get a better price, by implication outside the rules or intentions of the auction).

Conditionality: Indicates sections discussing making payments contingent either on compliance with a management prescription or on producing an environmental outcome. Can include negatively sanctioning non-compliance (rather than just terminating or recovering payments). Should focus specifically on auctions.
> *Heritage:* Performance / Compliance / Conditionality

CostReveal (parent: **Information**): Discussions of auctions focused primarily on opportunity cost revelation/price discovery, rather than directly attempting to achieve efficient procurement or generate a desired outcome.

Crowdsource: Indicates cases where decentralized voluntary contributions (presumably of ES beneficiaries) constitute a source of PES revenue, or that feature decentralized decisionmaking, ideally with the language of *crowdsourcing* specifically. *Legacy code – merged with Forward general.*
> *Heritage:* Design / Forward / Crowdsource

Design: Codes belonging to this theme deal mainly with mechanism design issues, but may extend to other aspects of designing the auction process.
> *Children: Advanced, forward, pricing, reverse, scale*

Development: Indicates how variables associated with developed/high-income countries vs developing/low-income countries influence auction design/outcomes/considerations.
> *Heritage:* Context / Development

Discriminatory: Forward or reverse auctions using discriminatory pricing rule.
> *Heritage:* Design / Pricing / Discriminatory

Economic: Codes in this subtheme highlight economic criteria for evaluating auctions
> *Parent:* Performance
> *Children:* Efficiency, Effectiveness

Effectiveness: Indicates sections discussing the degree to which auctions produce the desired effects (typically environmental), with or without regard to cost. May overlap with **Efficiency** where cost-effectiveness is considered. No *a priori* definition of "effectiveness" is imposed: this code can be used wherever the author discusses effectiveness (even if it is operationalized differently between articles).
> *Heritage:* Performance / Economic / Effectiveness
> *children:* Effects

Effects (parent: **Effectiveness**): General references to the effects/outcomes of auctions. Organized as a child of **Effectiveness** but the overlap is not perfect, because **Effects** is not limited to intentions/objectives.
> *Heritage:* Performance / Economic / Effectiveness

Efficiency: Indicates discussions about efficiency (generally, total welfare maximization, implying least cost). May overlap with **Effectiveness** in the case of cost-effectiveness. No *a priori* definition of "efficiency" is imposed: this code can be used wherever the author discusses effectiveness (even if it is operationalized differently between articles).

> *Heritage:* Performance / Economic
> *Children:* Transaction costs

Equity: Sections where the text uses words like *equity* or *fairness*, or sections that are clearly concerned with these issues as generally understood. May refer to either process or distributional equity. Includes normative concerns about vulnerable populations, power asymmetries, preferential treatment, exacerbating unequal labor burdens, etc.

> *Heritage:* Performance / Normative/

Ethics: Sections that either explicitly invoke ethical frameworks or obligations, or alternatively evaluate auctions from a normative perspective. May overlap with **Equity** in some cases. Can refer to research ethics, ethical obligations of auction designers, or ethical expectations of participants.

> *Heritage:* Performance / Normative /
> *Children:* Justice

Forward auctions: Sections that consider scenarios which do not conform to the traditional reverse procurement auction model. This code is used when there are many buyers interacting in ways that are designed make a sale at the highest price. Not limited to "auctions" as a technical term: includes provision point mechanisms, Lindahl pricing, etc.

> *Heritage:* Design /
> *Children:* fExperimental, fGap, fGuidance, fPayment case, fReference, fSecondary, fSubtype, fTheoretical

fExperimental (parent: **Forward auctions**): Report primary results of experimental work coded as **Forward auctions.**

fGap (parent: **Forward auctions**): Suggests a gap in current knowledge regarding work coded as **Forward auctions.**

fGuidance (parent: **Forward auctions**): Offers explicit guidance/suggestions/best practices/other prescriptive information about methods coded as **Forward auctions.**

fPayment case (parent: **Forward auctions**): Describes a case in which actual monetary payments were made using a mechanism coded as a **Forward auction.** In the case of field trials, may overlap with **fExperimental.**

fReference (parent: **Forward auctions**): A passing reference to an idea coded as a **Forward auction**. *Note:* Code created as a corollary to **rReference**.

fSecondary (parent: **Forward auctions**): A discussion of a mechanism coded as a **Forward auction** based on secondary research rather than primary results. *Note:* Code created as a corollary to **rSecondary.**

fSubtype (parent: **Forward auctions**): A description of a specific approach to a mechanism that fits under the general **Forward auction** code.

fTheoretical (parent: **Forward auctions**): A description of an approach coded as a **Forward auction** that has been analyzed theoretically or through simulations, not experimentally.

FreeRide (parent: **Information**): Section describing entities that benefit from a contract without contributing to it. Generally more relevant to forward auctions.

Gender: Section considering the relationship between auctions and gender.
    Heritage: Context / Social

Information: Both a theme and a code. Indicates passages discussing the implications of information asymmetries. There is some overlap between the general Information code and its subcodes that requires coder judgement: generally, discussions of things like rent seeking that imply e.g. AdverseMoral are maintained under the general Information code, whereas AdverseMoral is used when this is more explicit.
    Children: AdverseMoral, Collusion, CostRev, FreeRide, Indicators, RiskUncert

Indicators (parent: **Information**): Sections discussing how ecological/biophysical assessments can inform auction design or evaluation, such as through the use of indicators. Often overlaps with **Transaction costs** and closely related to evaluating performance.

Leakage (parent: **Additionality**): Sections discussing how a transaction to increase ES provision in one location may displace the disturbance to another one, so additionality is zero or negative when both locations are considered.

MultiObj: Sections discussing how auctions might be designed or implemented with multiple objectives in mind.
    Heritage: Design / Advanced /

Nonspecific reference (parent: **Z Not Auction Focused**): A section referring generally to "auctions" without specifying any further design information (e.g., forward, reverse, etc.)

Normative: Codes in this subtheme indicate text evaluating auctions from a normative perspective.
    Parent: Performance
    Children: Equity, Ethics

Participation: Sections discussing how participants (buyers, sellers, bidders) are or should be selected/recruited, and/or the effects this has for auction design or outcomes.

Performance: Codes in this theme identify sections that discuss how auctions are evaluated.
> *Children:* Economic, Normative, PES

PES: Codes in this subtheme identify text evaluating auctions from using criteria typical of the PES literature.
> *Parent:* Performance
> *Children:* Additionality, compliance

InstPol (parent: **Context**): Sections considering the institutional and policy contexts of auctions, including regulatory regimes or threats. May have overlap with **Relation to other tools** and be used to clarify auction niche.

Standards: Sections establishing whether compliance is evaluated by conformity with certain management practices (process-based) or achievement of physical outcomes (performance-based).
> *Heritage:* Performance / PES / Compliance /

Niche (parent: **Context**)**:** Indicates sections that frame or examine auctions with reference to other tools and approaches, like water quality trading or externality-correcting taxes.

Reverse (parent: **Design**)**:** Treatments of auctions featuring one central buyer and many sellers designed to make sales at the lowest possible price or serve a price discovery function.

rExperimental (parent: **Reverse auctions**): Report primary results of experimental work coded as **Reverse auctions.**

rGap (parent: **Reverse auctions**): Suggests a gap in current knowledge regarding work coded as **Reverse auctions.**

rGuidance (parent: **Reverse auctions**): Offers explicit guidance/suggestions/best practices/other prescriptive information about methods coded as **Reverse auctions.**

rPayment case (parent: **Reverse auctions**): Describes a case in which actual monetary payments were made using a mechanism coded as a **Reverse auction.** In the case of field trials, may overlap with **rExperimental.**

rReference (parent: **Reverse auctions**): A passing reference to an idea coded as a **Reverse auction**.

rSecondary (parent: **Reverse auctions**): A discussion of a mechanism coded as a **Reverse auction** based on secondary research rather than primary results.

rSubtype (parent: **Reverse auctions**): A description of a specific approach to a mechanism that fits under the general **Reverse auction** code (e.g. uniform vs. discriminatory pricing, etc.).

rTheoretical (parent: **Reverse auctions**): A description of an approach coded as a **Reverse auction** that has been analyzed theoretically or through simulations, not experimentally.

RiskUncert (parent: **Information**)**:** Sections discussing auctions in relation to risk and uncertainty (typically related to mechanism design) Significant overlaps with **Information**, **Effectiveness, Efficiency** and **Multi objective.**

Scale (parent: **Design**): Sections considering how scale (in terms of geographic space, number of participants, budget, etc.) influences auction design/dynamics/outcomes. Includes duration.

Social (parent: **Context**): Relationship between values and expectations of communities/stakeholders influence auction design/dynamics/outcomes. Overlaps with **Ethics, Equity, Tradition, Trust.**
    Children: Gender, Tradition, Trust, Understanding

Tradition (parent: **Social**)**:** Related to **Social factors,** but with more emphasis on historical practices and how they inform participants' expectations or interpretations of the process or its outcomes. In practice, this code is mainly used when an article uses the word *tradition.*

Trust (parent: **Social**): How trust (between participants, participants and principal, institutions, compliance monitors, etc) relates to auction design/dynamics/outcomes.

Transaction costs (parent: **Efficiency**): Indicates sections discussing transaction costs (generally referring to the set of costs that are incurred by either party to make the exchange possible, like information gathering, risk premiums, compliance monitoring, etc.).

Uniform: Auctions using uniform pricing rules.
    Heritage: Design / Pricing /

Spatial: Auctions for either targeting contracts to high-value, low-cost, high-threat plots, or for producing spatially coordinated outcomes to access benefits only achievable at scales higher than individual parcels. Significant overlap with **Multi objective,** some overlap with **Communication.**
    Heritage: Design / Advanced /

Understanding (parent: **Social**): How participants/administrators/other stakeholders' understanding of the process influences its design/dynamics/outcomes. Includes learning effects from repeated rounds/auctions.

W Auction Focused Article: Indicates an article that has an explicit and substantial (though not necessary exclusive) focus on some aspect of auction methods.

X Key passage: Legacy code used to highlight passages expected to be especially important for the analysis

Z Not Auction Focused: articles that mention auctions in passing in the context of, e.g., more general PES allocation discussions