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Beyond valuation. Monetary aggregates for the SEEA-EA. The Italian proposal.

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Abstract

After years of experimentation, documents, meetings, consultations and negotiations, the SEEA EA reignited the debate on the monetary quantification of the value of nature. Now more than ever, there is a need for an original approach, able to align the SEEA EA to the principles of national accounting, to the relevant economic theory and to 'strong sustainability'. In this article, we outline a technically sound alternative to the currently dominant approach, namely "valuation" of ecosystem services (ESs). The basic idea is to recognize the specific meaning and usefulness of each of the numerous monetary estimates proposed for valuation, starting with those included in the SEEA EA, without forcing national accounting principles: we promote the transition from the narrow concept of "monetary value of ecosystem service" to the wider one of “monetary values connected to/ dependent on ESs”. Nothing new in terms of evaluation techniques; only a simple, but rich in implications, innovation in terms of interpretation and conceptualization of the values generated by existing monetary values estimation methods.

Keywords

ecosystem accounting, ecosystem service, monetary valuation, official statistics, SEEA-EA

Introduction and summary: motivation and basic ideas of the Italian approach

After years of experimentation, documents, meetings, consultations and negotiations, the SEEA EA (United Nations 2021) reignited the debate on the monetary quantification of the value of nature. Now more than ever, there is a need for an original approach, able to align the SEEA-EA to the principles of national accounting, to the relevant economic theory and to 'strong sustainability'. In this article, we outline a technically sound alternative to the currently dominant approach, namely to "valuation" of ecosystem services (ESs). We

define valuation as *the determination of the monetary exchange value (EV) of ecosystems and their services*. After quickly retracing relevant reasoning and literature (§2), the salient features of the approach proposed by Italy are exposed. At its heart, we place the relevant monetary values that are able to capture the economic importance of ecosystems without forcing national accounting principles (§3). The basic idea is to recognize the specific meaning and usefulness of each of the numerous monetary estimates proposed for valuation, starting with those included in the SEEA-EA, as opposed to assuming them all as “EVs of” ESs. We promote the transition from the narrow concept of "monetary value of ESs" to the wider one of “monetary values connected to ESs”. Nothing new in terms of evaluation techniques; only a simple, but rich in implications, innovation in terms of interpretation and conceptualization of the values generated by existing monetary values estimation methods. The starting point of this approach is the observation - in line with the SNA and the general approach of the SEEA EA itself - that a correct assessment of the EV of ESs*[1] can only be based on the concept of resource rent (RR). However, on the one hand, this value appears useful only from the point of view of income allocation analysis and in particular as a measure of the distributional implications of economic ownership (direct use or appropriation in the context of productive activities) of ESs and of existing market structures, and much less for a representation of the dependence of economic values on ES. To this purpose, it is instead important to have information on the whole value of the products and produced assets that *depend* on ESs, as such a value is able to provide a more adequate understanding of the economic values at risk in case of loss or degradation of ESs. On the other hand, many of the methods put forward in the SEEA EA to cope, through the attribution of proxy values (imputation), with the absence of observable prices for ESs, and of products derived from them, provide results that do not respond to the RR concept and are therefore inappropriate for SNA-consistent valuation. Yet, the estimates provided by these methods have very interesting (though inhomogeneous and non-additive) specific meanings (§4). So, while imputation in these cases introduces an arbitrary twist in the meaning of the estimates, the visualization of the rich set of actually existing monetary EVs connected to or dependent upon living Nature, brought about by these methods, can inspire greater consideration for ecosystems in public decision-making without the need for these values to be confused with that of ESs themselves (§5).

Theoretical premises

Pluralism of values versus mono-dimensionality in well-being and sustainability measurement

Although not designed for this purpose, the main indicator of the national accounting system, Gross Domestic Product (GDP), is widely misused to represent societal progress on a mono-dimensional and monetary scale. Awareness of the major constraints of GDP in this respect, and of their policy consequences, has given rise to a wide range of approaches, many of which are based on the idea of ‘correcting’ GDP: “genuine” income

(in the sense of well-being or sustainability) and inclusive wealth, able to include the monetary expression of values not considered in the aggregates of national accounts, among which the ecological ones. Ecological economics, on the other hand, has placed the pluralism of values among its conceptual foundations (Martinez-Alier et al. 1998), and states that it is not possible to trace back the erosion of the natural, non-produced physical basis of production (and of life) to a single and all-encompassing monetary measure. Although not necessarily linked to the tradition of ecological economics*[2], numerous initiatives, more and less recent, adopt a substantially multidimensional vision (Kumar 2012 ,de Groot et al. 2006,Farley 2012, Kosoy and Corbera 2010) and go in the direction of expanding the sets of indicators for measuring well-being and sustainability. Among the most significant ones, the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015, the Stiglitz-Sen-Fitoussi Report (Stiglitz et al. 2010) and, in the Italian context, the 'Equitable and Sustainable Well-being' (BES) system, regularly implemented by Istat since 2013.

Monetary valuation and consumption of nature as capital

The fact that nature, artificial capital and other forms of wealth (social, human, institutional, cultural, spiritual) are all called "capital" does not necessarily make them substitutes, and obviously they are not in the real world even when they are all valued according to the same monetary meter. The assumption of substitutability, on the other hand, is rooted in neoclassical economics (Solow 1974, Hartwick 1977, Solow 1986, Pezzey and Toman 2002, Arrow et al. 2004), for which other forms of 'capital' can be substituted for 'natural capital'. This reduces the sustainable management of environmental resources to that of aseptic financial investments, in the context of models that lead to decisions regarding the extraction and consumption of resources on the sole basis of economic convenience. Although formally extended to a wide time horizon, they assume the perspective of a given moment in time (the present). These models do not contemplate decision-making processes similar to the real ones, which are based on the consideration of a plurality of values, but apply the exclusive criterion of maximizing utility, regardless of the actual ecological status and the specific future consistency of the residual stock of natural capital. Therefore, such abstract models cannot provide correct guidelines for environmental policies concerning the future or large-scale ecosystem changes. It is more useful and robust for the sustainability of the economic process and long-term social well-being, to constrain the objective of maximizing economic convenience in the use of nature and its services to the invariance over time of the stock and ecological quality of nature.

Market or institutional failure?

Failure to recognize the benefits deriving from ecosystems, and the costs deriving from their loss, is not simply a market failure, whether this is strictly understood as the inexistence of markets for natural public goods accessible to all and free of charge or as imperfection of existing markets: it is also a broader institutional failure. Many of our institutions have proved unsuitable for managing the social costs of economic activity, and unable to rationalize access to natural public goods to the necessary extent. Policies often

aggravate the problem by subsidizing people and businesses more to exploit nature than to protect it, by not limiting access to essential resources that should not be compromised, and by giving priority in the allocation of public resources to unsustainable economic activities. A conservative estimate of the global total cost (Dasgupta 2021) of subsidies that harm nature is around $ 4-6 trillion annually. Institutional arrangements (IAs) fit to protect global public goods are lacking. Nature needs to enter into economic and financial decision making, and to do so it is useful to broaden economic measurements in a multidimensional direction. In fact, in the face of significant risks and uncertainties about the consequences of ecosystem degradation, economic rationality itself suggests to prefer quantitative restrictions in use rather than mechanisms of pricing the use of nature itself. After all, it is almost obvious that it is cheaper to preserve nature than to restore it once it has been damaged or degraded, assuming that this is possible. By relying exclusively on the results of price formation dynamics that reflect the scarcity of the resource, there is no a priori guarantee that goods essential to survival are not consumed beyond their natural regeneration capacity anyway, nor that access to essential resources does not occur mainly on the basis of wealth (i.e. with scarce ESs becoming luxury goods). In this regard, it should be remembered that politics and institutions can decide - as in fact they often do - to artificially create the scarcity of the resources to be protected by establishing appropriate IAs. This can be done not just by creating markets, but also by regulating access to resources with quota mechanisms, which seems appropriate especially for ESs essential to human existence.

National accounting and ecosystem services (ESs)

Centrality and meaning of exchange value (EV)

The SEEA EA aims at consistency with SNA principles and concepts. The SNA is all built around actual EVs, i.e. the “values at which goods, services, labour or assets are in fact exchanged or else could be exchanged for cash” (SNA, 3.118) *under the current (and not some hypothetical alternative) IAs* (SNA 3.119; SEEA EA 8.15, 9.30). EVs, evidently, can only arise in voluntary transactions, i.e. between willing parties interested in money (SNA 3.199). Therefore, when ESs are concerned, reference cannot be made to something that nature and humans exchange, i.e. to ESs properly said, but necessarily to something that may circulate within the economy, i.e. between economic agents, namely the *right to use* ESs. Recognizing the social relationship nature of this exchange, whether actual or hypothetical, is crucial to properly understanding the meaning of valuation and of its results.

Benefits and valuation

“ESs are the contributions of ecosystems to the benefits that are used in economic and other human activity” (6.9 SEEA EA). “Benefits are classified as either SNA benefits or non-SNA benefits.” (6.17).

SNA Benefits

According to SEEA EA 6.17, ESs are “inputs into an existing […] joint production process”, from which SNA benefits stem. The EVs of these partial contributions of ESs to output are already included in the NAs, hidden in produced goods and services’ EVs. They can only be highlighted as the share of these EVs that is appropriated by their economic owners (see SNA 3.26), that is, as rents corresponding to these resources’ control. Valuation methods that do not provide estimates of this share do not lead to the quantification of the EV of ESs but to something else, depending on the method applied. This will be dealt with further in chapter 4. Although the EV of ESs’ SNA benefits can be identified as *income* descending from the mere economic property of ESs, it is not an additive nor otherwise separable component of *output*. Indeed, no output would even exist without ESs, as ESs are indispensable ingredients or preconditions of any productive effort. The implications, in terms of actual transactions and market prices, of the relevant IAs – such as the existence or inexistence of ESs markets, of subsidies for their provision, or of taxes on their use – are already embodied within NAs, and only need highlighting. It should be noted, moreover, that SNA benefits are much more diffused than suggested by the distinction. In particular, SNA benefit are everywhere in real estate services markets: as the hedonic cost method suggests, a nice view or proximity to amenities or higher protection thanks to flood control and soil retention usually result in higher renting prices. Of course this contribution to monetizable benefits cannot be always easily estimated, but this does not mean it does not exist.

Non-SNA benefits

Non-SNA benefits, defined in SEEA EA 6.18, arise where there is no produced contribution to the benefits. No joint production happens here. ESs are “used and enjoyed by people and society” directly, with no mediation of production activity. These ESs generate no monetary rent for those who enjoy them. This can be because they are not perceived as scarce, or because they simply cannot be exchanged and the current IAs do not allow appropriation of the preconditions of their enjoyment, so that the consumer surplus remains all with the user of the ES (as in the case of cultural services). Therefore, it is not possible to highlight their EV in NAs, as there is none. Nevertheless, the SEEA aims at finding *their* EV. This requires that some *other* values are imputed *as if* they were the ESs’ EVs. These are found in produced assets and economic activities and products that would emerge or disappear in case the availability of the ES changed in either direction. All are hypothetical valuations: value of the activity that would be necessary in order to restore the lost ES, or to substitute it, for certain regulation ESs; value of the trips that would not have been made if the recreation in nature opportunity was not there; value that an ES marketing activity would have, i.e. consumer surplus that could be extracted by enforcing property rights on the conditions of access to an ES (this is the simulated exchange value case; Caparrós et al. 2017). Finally, the SEEA EA typically assumes, for non-SNA benefits, that they are “extracted” and implicitly exchanged by users with themselves, and often by governments

as trustees on behalf of society at large. This is a self-justifying assumption, giving rise to self-balanced accounting items.

Policies determine institutional arrangements (IAs), and these determine prices

It is important to recognise that the prevailing IAs (property right regimes, laws and regulations, cultural approaches and customs, etc.) determine both the EVs that can be observed in actual transactions and those that can be estimated for imputation purposes. ESs scarcity, on which their prices depend, may itself be ‘natural’ or ‘artificial’. In the latter case it is due to restrictions to access imposed by public or private control. The rent that can be derived by controlling ES is in general not connected to their real economic importance, nor to their natural scarcity, but to the “institutional arrangements surrounding the use of the ecosystem” (SEEA EA 9.37). NAs take the current IA, 'as-is', as the reference IA , from a neutral perspective, refraining from all judgement on it or on the ideal context for the measurement of EVs. The prices used in NAs reflect the current IAs, regardless of all possible bias given by externalities, legal and regulatory dispositions and market imperfections, including rents from dominant position. If it were not so, the NAs would be a normative instrument, and not a cognitive one. Such ‘agnosticism’ extends from the existence of markets to their competitive structure (perfect competition, monopoly, oligopoly, protected or contestable, subsidized or taxed,…) and price formation mechanisms (SNA, 3.119). This absence of preference raises the issue, for any valuation diverging from the rent calculation, of which market structure is implicit in the choice of the method, or should be adopted when expressly required (as in the SEV method).

The EV of ESs as a distributional issue

SNA-consistent valuation, i.e. assessment of the rent commanded through ESs control, does not allow to capture ESs' economic importance from a social point of view, nor the dependence of economies from them, but only their ‘particular’ EV. This is determined – beyond usefulness – by the perceptions that able-to-pay economic agents have about scarcity, and therefore ultimately by IAs, market structure, demand elasticity. Rent is the accounting reflection of a social relationship established by property rights on ESs, which contributes to the wider income distribution situation. Its measure only provides information about the allocation of income among economic agents, namely on the EV that can be subtracted to other production factors, thanks to the negotiating power provided by exclusive access to, and ‘extraction’ of, ESs[*3]. The dependence of the measure of nature’s contribution from the almost arbitrary appropriation of a share of added value by ‘landlords’, poses problems that trespass into the ethical field.

From monetary values connected to ecosystems and their services to the value of ESs, and back

After recognising the concept of (*resource*) *rent* as the reference one for an SNA-consistent valuation of non-produced resources such as ESs, its inapplicability in the case

of non-SNA benefits, the fact that many of the techniques proposed in the SEEA EA are not fit for SNA-consistent valuation, that SNA-consistent values crucially depend on IAs and only inform about income allocation, we need an alternative for properly highlighting not just the EVs of ESs, but also their wider economic importance. To this end, we put at the centre of the stage the specific meaning, information value and usefulness for decision-making of each of the numerous estimates, offered by the different methods put forward for valuation.This only requires resisting to the 'imputation' temptation, i.e. to the arbitrary assumption that all of these values express a generic, homogeneous, additive and direct measure of ESs value. Indeed, decision-makers need a range of information on the potential effects of the different policies, including on how changing the institutional context may influence the nature (monetary/non) and entity of the values at stake.

ESs' own EVs and other connected EVs

The pivotal role in the Italian proposal is played by the difference between the concept of "monetary value **of** ecosystems and their services" and that of "monetary values **connected to** (or relevant for) ecosystems and their services". The former expression points to "the EV that ES *x* has or would have if it was on the market". The latter expression refers – besides obviously to resource rents as actual EVs of ESs – to all the observed or estimated values of actual or potential transactions, that somehow depend upon, or are linked to, that particular service. For instance, expenses for nature tourism crucially depend on nature's ability to provide valuable outdoor recreation services, but they do not represent the exchange value of the ES deriving from this ability. These expenses are determined by tourists' spending ability (income) and preferences, and by the prevailing conditions in markets such as travel and lodging, which in turn depend on external factors. Changes in the used quantities and their monetary values may reflect changes in any of the involved markets, having nothing to do with the quality of, and ecosystems' ability to provide, the ES in question. Similarly, flood protection services' use may depend primarily on human presence in the area at flooding risk, so that their increase is usually not good news, as it mostly depends on increased demand – land consumption and soil sealing – rather than on increased availability of this ES where it is needed and lacking.

A key concept: dependency

Understanding "the relationship between ecosystems and standard measures of economic activity" (SEEA EA 14.63), namely the dependence of specific activities from well identified ES, is the best that satellite accounts can do, as for what concerns elements not recognisable, nor implicit, in the core NAs. Physical Supply-use tables for ESs show – like the corresponding tables for natural inputs in the SEEA Central Framework) – which activities or sectors depend from which ESs, how much of them they use, and which ecosystems make them available. Monetary data cannot be accommodated in the same tables, as such data can only measure internal flows of the economy, that are exchanged between economic agents. However, the EVs connected to ESs are present in SNA aggregates and tables, and can be highlighted within them (as an example, see Driver *et*

al., 2021*[4]). Such monetary measures may concern the direct expected impact – e.g. agricultural output at risk in the absence of pollination – but also the indirect ones, by measuring the multiplicative economic effects of any given hypothetical change in ES provision. No matter how low the total EV of ESs may appear according to SNA-consistent valuation, economy's dependence upon them – the existing EVs at risk – will always be very high. And this also provides a possible explanation of the significantly different orders of magnitude between the estimates given by the various methods. The following hypothetical situations provide some examples of dependency (or "connection"): the estimated value may be that of actually existing economic flows or stocks, recognised in the NAs, which would disappear if the ES disappeared, e.g. ESs embodied in products such as crops, or that would disappear if the ES was to appear, e.g. when trees newly planted in an urban area start providing air filtration services, so that the demand for health care services diminishes. In both these cases, the ES lost or coming into existence is connected to economic activity and value by the fact that ESs are necessary inputs for specific economic activities, or their presence or absence influences the value of existing economic activities.

Monetary values connected to ESs provided by SEEA EA valuation methods

Monetary aggregates connected to ecosystems and their services that are **actual flows** are always included in NAs, and often made explicit in monetary environmental activity accounts (SEEA CF chapter IV). Other *monetary aggregates connected to ecosystems and their services* are **hypothetical flows**, e.g. losses, or additional costs if the service is replaceable, which would derive from losing ESs or from having more of them. We will now examine the main estimation methods put forward in SEEA EA chapter, looking for a correct interpretation of the information they provide. It is important to bear in mind that this information is significant in relation to decision-making, although we will not dwell on this here.

Actual EVs of ESs

One important distinction here is between: a) ESs properly said (non-produced physical contributions to benefits); b) the right to use "a)" (to which transactions may refer); c) ES as (part of) a product, i.e. good and services incorporating "a)". The latter embraces a range that covers all products, going from those in which the human contribution is hardly identifiable, the name of the product is that of the ES itself and the difference with "b)" is doubtful, to those where the presence of "a)" is so thin that it is usually not recognised and is hardly quantifiable.

Specific observable EVs of ESs

In the SEEA EA, this method – considered "the most direct method for measuring prices and estimating values for the accounts" – is introduced by way of examples. Let us take

the first one: “for example, if a wetland provides services of water purification and the owners or managers of that wetland are able to charge the water company that abstracts the water for municipal uses, there is transaction in ESs provided by the ecosystem that can be recorded” (9.28). We are here near the first end of type “c)” casuistry. The transaction is between two economic units. Owners or managers of that wetland – not the ecosystem – provide the action or inaction that is necessary to keep an essential feature (purity) of the water used by the company. The observed price is that of a derived product – “water purification services of ecosystems” – which does not yet feature in official product classifications, but may soon. From this price, to get one representing the specific EV of this ES, i.e. of “b)”, all other input costs, such as transaction costs (e.g. services of lawyers for writing and enforcing contracts) or protection costs (e.g. to avoid that the wetland is used as a dump by third parties or that it goes into eutrophication) have to be subtracted. A case responding to type “b)” is that of “observed prices from emission trading systems which may be used to estimate prices for global climate regulation services based on carbon retention” (SEEA EA 9.32). Prices in this case are observed only for the ‘retained carbon’ quantities for which a corresponding emission right is actually sold (as it supposed to *offsets* those emissions), while if applied to quantities not sold, the case is that of 'EVs of similar ESs', dealt with in the following section.

EVs of similar ESs that are traded

This method is foreseen, for products, in SNA 3.123, and it can be applied in cases where for a same ES, in different locations, situations coexist where prices are observable and where no market/no price exist. Clearly, we have two different institutional contexts here, and the prices will reflect – as the SEEA EA itself states – “the existing institutional context” (9.34). Of course, this means 'existing in the other context, where the market is the societally chosen regulation mechanism for access to the ES'. This applies also to the implications for income distribution. The method provides figures that represent the *income shift* in favour of the owners, should the latter be able to impose the same market conditions as those prevailing for similar services elsewhere. Such estimates are reliable, as the SEEA itself again acknowledges, if “the flows of (non-marketed) ecosystem services […] are not significant enough such that they would alter the observed price of, and demand for, the good or service”. A case where flows are surely significant enough is that of carbon retention services, where the method is widely applied by transferring observed prices from emission trading schemes to non-traded quantities of this service.

EVs of ESs embodied in market transactions

The methods “residual value and resource rent”, “productivity change” and “hedonic pricing” represent different ways to isolate the part of EVs of goods or services embodying ESs that is specifically attributable to the control of ESs, as a differential income going to the seller of those goods and services. The RR, in particular, is obtained by "deducting the cost of all other inputs, including labour, produced assets and intermediate inputs”. The concept at the basis of all these methods refers to a quite general situation: no marketed good could ever be realised without some ES, and, vice versa, all ESs are inputs in the

production of some marketed product. These valuations, consistent with the SNA, provide, as discussed, a poor measure of what is at stake, as they are related neither to the ecological value of ESs, nor to their social value, but represent only the income appropriated by ESs' economic owners, i.e. by those who use them in production or benefit in asset property. Of the three methods under the present heading, the first two are especially fit for the valuation of services such as those of water and other ecosystem inputs – e.g. pollination – in agriculture (Capriolo et al. 2020), while the third one can be used to know how much of the real estate income can be considered an economic benefit for the owner deriving from the presence of ESs.

Connected goods and services' EVs

Cost of averting behaviour

This method, also called "defensive expenditure", considers expenditure directed to prevent or mitigate the subsequent retroactions ("negative effects and damages") *on the social system*, "for example, in relation to incurring costs associated with extra filtration for purifying polluted water, air conditioning for avoiding polluted air, and so forth" (SEEA EA 9.45). The specific meaning of the aggregates provided by these estimates is clear enough as they measure the economic value of activities connected to the absence of ESs, i.e. costs to society, perhaps avoidable through ESs restoration. When applied to determine hypothetical prices of existing ESs, they inform about the additional economic cost of copying with their possible loss.

Travel expenditures

The expenditures incurred by households or individuals to reach and access a recreational area has by itself the meaning of how much the economy depends on certain ESs, i.e. what would be lost in economic terms if the ES was lost (or if it was impossible to use it, such as e.g. due to restrictions during the current pandemic). Therefore "associated expenses", and not "ES's EV". The existence and enjoyment of ecosystems is the very reason of the production and consumption activities involved in travelling, not an input to production, nor can enjoyment be equated to production. If the recreation activity was to be dealt as a production activity, all travel costs should be considered as production costs (intermediate inputs). The value added of the activity would be the consumer's "net enjoyment" and this surplus would still have to be quantified independently from the costs. Such an objective quantification, however, is prevented by the fact that personal experiences lack the *exchangeability for cash* prerequisite of EV.

Expected expenditures

The methods presented in the SEEA EA under this title include those "based on estimating the expenditures that would be expected to be made if the ES was no longer provided or was, in fact, sold on a market" (9.49). The relation to our framing of monetary values connected to ESs is direct and explicit.

Replacement cost

Knowing “the cost of replacing the ES by something that provides the same contribution to benefits” (SEEA EA 9.50), is *per se* surely useful for policy. In this perspective, it is crucial to understand the term “same” as referred to the qualitative dimension of ecological functions, including their localization, and not to a generic contribution to benefits. It is also important to highlight the distinction between costs for final consumption, for intermediate inputs (such as “sorghum substituting for non-priced forage in the case of a rangeland grazing ecosystem services”, 9.50), and for fixed capital (as in the water treatment example)*[5].

Avoided damage

Also knowing “the costs of the damages that would occur due to the loss of these services” (9.52) has obvious utility for decisions, independently from the identification of these costs as the EV of ESs. In this case we have no emerging activity, but only loss on both the ecological and the economic side. The quantification in EV terms, “particularly useful for regulating services such as soil erosion control and flood control, air filtration, and global climate regulation services” (9.52), does not concern directly ESs, but what they protect. The connection to the social dimension is particularly important and interesting here. The quantification of the avoided damages (losses of assets and incomes) is, in fact, based on information on the physical damages expected in case of ESs’ disappearance: additional dead, wounded and homeless people, destroyed buildings… Such physical information, together with that on *not* avoided damages, is surely not of secondary importance for policies.

Simulated EV (SEV) method

This method “estimates the price and the quantity that would prevail if the ES were to be traded in a hypothetical market”. It “requires combining the information on the demand function with a supply function and an appropriate market structure (institutional context)” (SEEA EA 9.55). The arbitrariness of the hypothetical institutional context is evident, in the very simulation of the existence of a market – a quite specific institutional context itself – and then in the assumptions on the market structure (how competitive it is, i.e. how distributed are assumed to be the hypothetical ownership rights). The latter influences the estimates in a crucial way, as e.g. perfect competition would mean EV=costs=null, i.e. the current situation. The simulated market may be, for instance, that of the fresh and purified air of a public park. The information provided by the method in this example would be about the expected reduction in visitors’ number and the income from an entry fee that could be imposed, through which part of the currently existing consumer surplus would be extracted. If applied to ESs which supply SNA benefits, it should in principle give the actual rent of the current economic owner.

Restoration cost

Besides the methods discussed so far, the SEEA EA introduces “a range of valuation methods that are found in the environmental economics and ESs valuation literature” (9.56). We will not discuss them here, as the SEEA EA itself gives no certainty about the methodological status of their results with respect to NA principles, or – as in the case of stated preferences – they give welfare values, which are incompatible with the SNA. We will here only hint to an approach that is particularly interesting in a non-valuation, policy-oriented perspective on economic values connected to ESs, namely “restoration cost-based” approach (SEEA section 12.3.2). Information about the economic resources necessary “to re-establish pre-existing structure and function, including biotic integrity” (10.18) surely is important. The SEEA EA itself considers this approach an attempt to “measure the cost of degradation directly”, rather than the value of ESs, “since there is no particular reason that the estimated restoration costs will align with the estimated loss of future flows of ESs” (12.41). It is important to point out that empirical evidences have shown that restoration costs are usually higher than maintenance costs (Dasgupta 2021).

Conclusions and way forward

The need to extend the boundaries of economic analysis and accounting to ecosystems and their services should not lead to a cognitive distortion of the meaning of monetary values calculated through the various estimation methods. As argued, the correct measurement of the EV of ESs from an SNA perspective, based on the RR concept, is reductive. The only information useful for decision-making processes it provides, concerns the appropriation of income by the economic owners of the services themselves. Where imputation is based on hypothetical markets' simulations, the assumptions on the market structure and the degree of competitiveness on the simulated markets are able to affect the virtual price to the point of making the final result arbitrary and potentially misleading. The conceptual non-homogeneity of the various estimation methods, and therefore in the estimated values, has also repercussions on the possibility to add up the different values of the ESs provided by the same ecosystem asset, and therefore of determining a value for the asset itself through the net present value (NPV) method. The additivity of monetary values is preserved only within a homogeneous conceptual perimeter, whether based on EVs, or on costs, or on potential damages avoided - and in the latter cases only for the purpose of policy analysis and not for calculating the NPV of an EA. We acknowledge that data on the economic values at stake, beyond the mere EV of ES, represent an important complement to information on the extent, conditions of ecosystems and the bio-physical use of ES by economic sectors and households. They help understand how we depend on nature and what ecosystem resources we need to protect, in order to protect ourselves and our economic values. The Italian proposal for resolving the “outstanding methodological aspects” of the SEEA EA (UNSC, 2021)[*6] is that of a novel approach providing more solid accounting and statistical support to the economic assessment of the role of ES and policy. This approach is based, as discussed in this paper, on the dependencies of

produced EVs (products and assets) on ESs, and more generally on the connections between ESs and values, as well as on a correct identification of the relevant stocks and flows within NAs. Politics and decision-making processes should be – and mostly are – interested in the economic (and non-economic!) values at risk, and the costs of protecting and maintaining nature in order to prevent and reduce these risks. These are not the same as the specific EVs of ES. Contrary to valuation, pluralistic information on the economic values at stake does not allow conceptualizing nature as capital, but allows choosing the best policy options and does not oblige to figure out what nature would be worth on markets whose inexistence is an expression of societal choice. Policy-relevant official statistics concerning income, sustainability, well-being, etc. should not be biased in favour of market-like scenarios, but rather represent the current situation as truly as possible, leaving simulations to academic research and policy analysis.

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Endnotes

*1 More precisely, of the *right to use* ESs.

*2 Among the most important authors, we can mention Nicholas Geourgescu Roegen, Kenneth Boulding, K. William Kapp.

*3 On this also see IMF 2017, “Guide to Analyse Natural Resources in the National Accounts”, https://www.imf.org/external/pubs/ft/qna/pdf/na.pdf

*4 https://seea.un.org/sites/seea.un.org/files/driver_defining-the-biodiversity-economy-satellite-account-progress-from-south-africa_paper.pdf

*5 It must be noted that the distinction between “replacement” and “averting behaviour” is not always straightforward, as the use of the same examples for the two cases in the SEEA EA shows.

*6 https://unstats.un.org/unsd/statcom/52nd-session/documents/decisions/Draft-Decisions-Final-10March2021.pdf