

Executive Summary

National accounts are descriptors. They describe the state of an economy and form the raw material for both *assessing performance* and *prescribing policy*. National accounts are meant to contain the kinds of information that are essential for economic evaluation.

The system of national accounts currently in use throughout the world, however, suffers from extreme narrowness. Vast quantities of information relevant for economic evaluation do not appear in them. Some don't because the appropriate data are hard, even impossible, to collect; but others don't because until recently the theory and practice of economic evaluation didn't ask for them. The demand for *green national accounts* has arisen because of a growing recognition that contemporary national accounts are an unsatisfactory basis for economic evaluation. The qualifier "green" signals that we should be especially concerned about the absence of information on society's use of the natural environment.

In this study - henceforth, the *Report* - we provide an outline of what would ideally be needed for a comprehensive set of national accounts. We show that national governments and international agencies ought to go beyond even green national accounts, by reclassifying certain classes of goods and services and adding others that are currently missing. For the present the ideal can be approximated at best very crudely. Data on many items that ought to be included will of necessity appear only in physical terms for some time, while many other items of significance will continue to remain missing. If the recommendations of the *Report* were accepted, economic evaluation would continue to involve cutting corners. But it is essential for good practice to know where the corners that are being cut happen to be. That is why in this *Report* we dive extensively into the conceptual foundations of economic evaluation. In any event, data are collected only when there is demand for them, and the point remains that improvements to the framework for national accounts can be made even now. The ideal, which is what we construct here, should not be an enemy of good practice. Such improvements as are feasible today would be partial but would nevertheless be an advance. The *Report* suggests a number of ways in which that can be achieved.

The system of *national accounts (SNA)* that are still being developed by the United Nations and their affiliated international agencies contain very few of the

additions and reclassifications we suggest here. A number of our recommendations do appear in the satellite system of *environmental and economic accounts (SEEA)*. There are, however, serious shortcomings with the classification scheme favoured even in the *SEEA*. The *Report* suggests ways in which the *SEEA* can more readily serve the purposes of economic evaluation. Given our remit, we say little on the income side of the ledger. The focus of the *Report* is instead on (the parallel) systems of production and expenditure accounts. We will see though that several of the Propositions that are derived in Chapter 2 and its Appendices are best expressed as a mixture of aspects of production and expenditure accounts.

1.1 National Accounts and the Idea of the Good

It wouldn't do to suggest improvements to national accounts on an *ad hoc* basis. Readers of the *Report* would expect us to offer reasons in support of our recommendations. Fortunately, it isn't hard to provide those reasons. It isn't hard, because as we go about our daily lives, we citizens carry with us a conception of the good that includes not only ourselves and our contemporaries, but also the well-being of future generations. We approve of some aspects of our society but deplore others, and at times we even subscribe to the idea of the "common good". National accounts should ideally be so constructed that they permit citizens in their private capacity and as government officials to sift evidence in ways that inform their ethical perspectives. Economic evaluation requires data, to be sure, but it also requires a conception of the good. More tellingly, without a conception of the good we wouldn't know what data we should seek to study. The conceptual foundations of national accounts are constructed in Chapter 2 of the *Report*. The Appendix to Chapter 2 contains proofs of propositions that form the foundations. Chapter 3 provides outlines of the production and expenditure systems currently in place in the system of national accounts (*SNA*) and their satellites (*SEEA*) in India.

Readers will wish to compare and contrast the recommendations of this *Report* with the way data are collated in India's *SNA* and *SEEA*. They will confirm that it isn't self-evident how the recommendations are to be framed in ways consistent with contemporary national accounts.

Chapter 4 is transitional. It identifies the moves that will need to be undertaken if the existing system of national accounts in India is to adapt to the ideas developed in Chapter 2. Chapter 5 illustrates the problems, and the possibilities that exist, with the help

of a partial set of data from the Indian states, pertaining to forests, minerals, and various categories of land. Finally, Chapter 6 provides a map of the steps that will be required if the *Report's* recommendations are to be adapted to India's national accounts.

1.2 Economic Growth as Growth in Wealth

The *Report's* central conclusion is that adjusting for population, the coin on the basis of which economic evaluation should be conducted is a comprehensive notion of *wealth* (adjusted for the distribution of wealth in the economy), not gross domestic product (*GDP*)¹, nor the many other *ad hoc* indicators of human well-being that have been advanced in recent years, such as the United Nations' *Human Development Index (HDI)*. By wealth we mean the social value of an economy's stock of capital assets, comprising (i) *reproducible capital* (commonly known as "manufactured capital": roads, ports, cables, buildings, machinery, equipment, and so forth), (ii) *human capital* (population size and composition, education, health), and (iii) *natural capital* (ecosystems, land, sub-soil resources, and so on). We show in particular that *changes* in the circumstances of an economy should be judged on the basis of their effect on the economy's wealth *per capita*, adjusted for the distribution of wealth.² We are able to so argue because we show that wealth *per capita* is the mirror image of intergenerational well-being averaged across the generations. To put it in other words, wealth *per capita* tracks intergenerational well-being averaged across the generations exactly: the former increases over a period of time *if and only if* the latter increases over that same period of time. This equivalence forms the basis for what may be called *sustainability analysis*.

The *Report* also shows that the coin on the basis of which we should judge policy changes - such as changes in taxes, trade, and the undertaking of investment projects - is also wealth. It is well known of course that the criterion that ought ideally to be used to evaluate, say, an investment project is the present discounted value (*PDV*) of the flow of social profits arising from it. What is perhaps not commonly known is that the *PDV* in question is the change in wealth brought about by the project. That means the *PDV* of the flow of social profits arising from an investment project is positive *if and only if* the project gives rise to an increase in wealth.

The *Report* argues that the pair of equivalence ("if and only if") relationships just

1 Here we do not distinguish between gross domestic product and gross national product, because the distinction has no bearing on the points we wish to highlight here.

2 For ease of exposition we drop the qualifier "corrected for the distribution of wealth" in what follows.

mentioned should serve as the conceptual foundation of national accounts and influence the way data are collected and arranged. The equivalence relationships do *not* presuppose any particular conception of intergenerational well-being; they are valid under as general a set of circumstances as can be. What the ethical conception adopted by a government or the citizen does influence are the (social) values to be imputed to capital assets. So, although the centrality of wealth in economic evaluation is value-neutral, estimates of wealth are inevitably value-laden. If the latter feature should seem overly unpractical for the purposes of hard-headed national accounting, we should remind ourselves that to rely on market prices in economic evaluation, as is the norm when the *SNA* is put to use, is to adopt the viewpoint that market prices reflect the social values of goods and services.

The *Report* shows that by "economic growth" we should mean growth in wealth *per capita*, not growth in *per capita GDP*; and by "inclusive economic growth" we should mean "inclusive growth in wealth". It can easily be that a society enjoys growth in *GDP per capita* and/or an improvement in its *HDI* even while experiencing a decline in its *per capita* wealth. Of course, the reverse can happen too. That said, the aim of a society should not be to maximize the rate of growth of wealth *per capita*, but rather to identify a desirable rate.³

1.3 The Idea of Investment

Wealth is a stock, whereas the rate of change in wealth over time is a flow. Changes in wealth are brought about by *investment*. Wealth increases *if and only if* aggregate net investment is positive. So investment is a flow. That much is obvious. In common parlance though, the word "investment" has a remarkably limited range. The concept embodies a sense of robust activism. When the government invests in roads, for example, the picture that's drawn is one of bulldozers levelling the ground and tarmac being laid. But that is because national income statisticians have traditionally limited the term's use to the accumulation of reproducible capital.⁴ As the *Report* finds it necessary to extend the notion of capital beyond reproducible assets to include human capital and natural capital, it recommends that we stretch the notion of "investment". To leave a

3 An early, incisive treatise on the idea of *optimum* economic development was Chakravarty (1969). Understandably, he didn't characterise that development in terms of wealth. The two equivalence relationships just mentioned in the text were discovered many years later.

4 The term "gross capital formation" is even more restrictive. It doesn't reflect the depreciation of reproducible capital.

forest unmolested so as to enable it to grow would be to invest in it. To allow a fishery to restock under natural conditions would be to invest in the fishery. And so on. That suggests investment amounts to deferred consumption. But the matter is subtler. To provide food to the undernourished not only increases their current well-being, but also enables them to be more productive in the future. The latter feature makes even consumption among the poorest of people, at least in part, an investment. Estimating aggregate investment is a formidable, even an impossible task. Corners will have to be cut ruthlessly. In this *Report* we explain why and offer leads on how.

By investment we mean *net* investment. Formally, *net investment in an asset is any increase in the flow of services it can provide over its lifetime*. Net investment is therefore the value of the rate at which the asset's stock changes. Aggregate net investment over a brief period of time (e.g., a year) *equals* the change in the economy's wealth over the period.

What about institutions, knowledge, culture, religion, and norms and practices. In common parlance today the notion of "capital assets" extends even to those durable objects. And yet we have not included them on the list of assets that comprise wealth. The *Report* explains why and argues that it is more appropriate to view them rather as the social infrastructure within which the more grounded assets (categories (i)-(iii), listed above) get allocated and are put to use. What we are calling an economy's "social infrastructure" should be seen as comprising *enabling assets*.

All this has further implications.

1.4 Green GDP is a Misnomer

Define *net domestic product (NDP)* as *GDP* minus the depreciation of capital assets. By "depreciation" we mean not only the wear and tear of buildings and equipment, we mean also the loss of human capital (the onset of physical and mental disabilities; death) and physical depletion and quality degradation of natural capital. The *Report* shows that aggregate net investment, as defined above, would be positive *if and only if* aggregate consumption was not to exceed *NDP*. Making use of the finding that the coin with which economic evaluation should be conducted is wealth *per capita*, we obtain an operational notion of "sustainable development": *Development would be sustained over a period of time if and only if aggregate net investment per capita was positive*. We should stress that by "aggregate net investment *per capita*" we don't mean aggregate net investment divided by population size, we mean instead the social value of the change in

per capita stocks of assets. Estimating stocks is no doubt hard work, but the *Report* insists it should not be avoided. The term "green *GDP*" is thus an utter misnomer.

To illustrate, consider a closed economy with constant population. Suppose in a given year it invests 40 billion dollars in reproducible capital, spends 20 billion dollars on education, and depletes and degrades its natural capital by 70 billion dollars. The economy's *SNA* would record the 40 billion dollars as investment ("gross capital formation"), the 20 billion dollars as a component of aggregate consumption, and remain silent on the 70 billion dollars of loss in stocks of natural capital. The accounting methods advocated by our *Report*, in contrast, would reclassify the 20 billion dollars as expenditure in the formation of human capital ("investing in the young", as the saying goes) and the 70 billion dollars as disinvestment in natural capital. Aggregating over them and assuming that expenditure on education is a reasonable approximation of gross human-capital formation (which would be to cut a corner in every economy we know!), the methods advocated here would conclude that owing to the disinvestment, the economy's wealth will have declined over the year by 10 billion dollars (and that's before taking note of the depreciation of reproducible and human capital). Aggregate consumption during the year would, equivalently, be found to have exceeded *NDP*. We should conclude that development was unsustainable that year.

1.5 Pollution is the Reverse of Conservation

Because the *Report* is on "greening" national accounts, much attention is paid here to discussing ways of measuring the value of environmental resources (Annexe to Chapter 2). The *Report* offers a unified view of "conservation" and "pollution". We argue that "pollutants" are best seen as the reverse side of "natural capital". The way to conceptualise "pollution" is to turn one's mind to the depreciation of capital assets pollution brings in its wake. Acid rains damage forests; industrial seepage and discharge reduce water quality in streams and underground reservoirs, killing fisheries and damaging human health; sulfur emissions corrode buildings and structures and harm human health; and so on. The damage inflicted on each type of asset (forests, fisheries, human health, and buildings, respectively) should be interpreted as a depreciation of that asset. The *Report* advances practical methods for estimating depreciation (Appendices 7-10 to Chapter 2).

1.6 The Salience of GDP

GDP routinely gets a bad press these days. But it has a tenacious hold on our

economic sensibilities. It isn't hard to see why. Among the reasons for studying the economic performance in terms of *GDP* is that the index serves to estimate the gap between potential and actual outputs. Moreover time series of *GDP* enable one to study household and corporate behaviour. A further reason is that Finance Ministers need to know their respective economies' tax base, and *GDP* provides a foot-hold for that. At the international sphere, a growing *GDP* wins a country prestige and possibly leverage in negotiations over economic and political matters. Each is a compelling reason. But we should note that the race to improve one's position in the *GDP* league table resembles the proverbial "problem of the commons" (in the present example, a "rat race"), so all countries lose.

Our *Report* is on national accounts and we assume that the international race in question will continue in the foreseeable future. In any event, we don't recommend that national accountants should abandon *GDP*. We argue nevertheless that to ignore depreciation of reproducible capital and the degradation of natural capital is indefensible practice in economic evaluation concerning the long run. As noted above, it can be that *GDP per capita* grows for a while even as wealth *per capita* declines. What would be impossible is for wealth *per capita* to decline indefinitely while *GDP per capita* increases ceaselessly. That's impossible because in due course the *productive base* of the economy, which is what wealth measures, would have little left to further degrade and depreciate.

The simplest illustration of that truth is a small economy of constant population whose income is based solely on the export of an exhaustible resource. Imagine that the export price is expected to remain constant, say, because the rest of the world is able to manufacture a perfect substitute for the resource at a constant unit price. Imagine also that owing to bad governance all export revenues are consumed. It would follow that the country's *GDP* equals aggregate consumption. *NDP*, however, would be zero at all times because consumption would always equal depreciation of the economy's sole asset. Wealth meanwhile would be declining, at a rate equal to the export revenue. So, intergenerational well-being would be declining. Imagine now that the national policy is to raise exports annually. In that case *GDP* (aggregate consumption) would increase annually. But it would not be possible to persist with the policy indefinitely. In due course *GDP* would have to decline because of the ever dwindling resource stock.

Measuring depreciation is hard. So it is frequently suggested that to estimate depreciation and obsolescence, as would be required if aggregate net investment is to be

estimated, would be to introduce errors. It should be borne in mind though that 60 years ago estimates of national incomes were subject to uncertainties of a magnitude people are minded to think no longer exists in current estimates. In any event, contemporary estimates of national income are taken too much at face value. Official estimates are silent on the proportion of incomes that are unrecorded. National accountants may have suspicions of how much goes unrecorded, but those very suspicions would be subject to substantial errors.

1.7 Shadow Prices as Social Values

To estimate wealth one needs *ideally* to impute a social value to every capital asset, multiply each asset's stock (measured in terms of either quantity or quality) by its social value, and add across all the assets. The social value of an asset is called its *shadow price*. Shadow prices are the link between a society's well-being and its capital assets.

That ideal can't be expected to be attained. One should doubt that it is possible to put a price on natural capital of cultural or religious significance such as sacred groves. Societies usually "ring fence" them against encroachment. They are taken to be of unbounded value and are not to be defiled. The use of shadow prices in national accounts would be perfectly consistent with that practice.

Shadow prices assumed prominence in the 1970s in a literature that codified methods for evaluating public investment projects. But the concept proved to be controversial. The reason is that market prices are out there and can be observed, which makes them "hard" objects. In contrast shadow prices have to be estimated, involving both value judgments and an all too uncertain knowledge of socio-economic processes that are needed to be uncovered if we are to peer into the economy's future. That makes shadow prices "soft". There is then an understandable temptation to identify shadow prices with market prices and avoid talking about the former altogether. But to justify that particular move requires of us to imagine that markets on their own are able to implement the allocation of resources on the basis of an exercise in economic evaluation that concerned citizens and public officials would subscribe to. Among other things it would require of us to imagine that markets are able to aggregate current uncertainties about future possibilities in an adequate manner.

To someone interested in greening national accounts, the assumption doesn't make the cut. Market prices of environmental resources are usually very poor approximations of their shadow prices. The reason lies in the ubiquity of *externalities*, which are the

unaccounted for consequences for other (including future generations) of decisions made by each of us on consumption, production, and use of the natural environment. Consider that in the case of resources to which there is open access, such as the oceans and the atmosphere as sinks for waste products, the market price is zero even while the shadow price is significantly positive. That's known as the "tragedy of the commons." To be sure, it is an extreme case, but in humanity's use of the natural environment, externalities are the rule, not the exception. More generally, externalities reflect institutional weakness, involving weak property rights, ambiguous rules of engagement, the exercise of raw power, and so forth.

A resource's shadow price is the sum of its market price and the externalities that are associated with its use. The Annex to Chapter 2 reviews techniques that have been developed for estimating shadow prices. Most such techniques are confined to what may be called consumption "amenities", such as recreation. The problem is, the bulk of what comprise natural capital are factors of production; they are not amenities. Natural capital enables humanity to obtain food, fibres, and clean water; protects us against natural hazards such as storms; and is crucial in such processes as the nutrient, water, and carbon cycles, and soil formation. Appendices 7-10 to Chapter 2 provide outlines of ways to estimate the shadow price of non-amenities.

There is unfortunately a dearth of good empirical work on shadow prices of natural capital as factors of production. The *Report* finds, for example, that there have been woefully few empirical estimates of the value of natural ecosystems in India. The lacuna is in urgent need of repair. For the foreseeable future we expect stocks and flows of ecological resources to continue to appear in *SEEA* without their attendant shadow prices (Chapters 3-4 and 6). In Chapter 5 we describe how that can be done, by constructing a framework for presenting assets accounts for forests and for various categories of land.

There is a further problem in estimating the shadow price of natural capital:

The physicist Steven Weinberg once wrote that when you have seen one electron, you have seen them all. The same cannot be said of natural capital, which is inevitably site specific. A village pond in West Bengal isn't the same as a seemingly identical pond in Kerala. The collection and maintenance of micro-level data is of the utmost importance. The lives of people are tied to their *local* environmental resource-base, which means shadow prices of natural capital are site specific. No doubt aggregation is a

necessity in the preparation of national accounts, but the spatial heterogeneity of ecosystems should always be kept in mind. We noted earlier that "inclusive growth" should mean inclusive growth in wealth. The *Report* argues that to implement inclusive growth requires that policy makers pay particular attention to the processes that connect rural poverty to the state of the local environmental resource-base.

1.8 Illustrative Rules

As wealth is a stock, particular attention is paid in this *Report* to capital accounts. Under ideal circumstances (viz, an optimizing economy) the (shadow) value of expenditure on the accumulation of an asset would equal the (shadow) value of the resulting accumulation. That way the accumulation of one type of asset would exactly match the prevention of the accumulation of another (the expenditure) - which is the classic rule for asset management. In those circumstances the expenditure in terms of one asset could be used to estimate the accumulation of the other. But in the world as we know it the discrepancy between the two can be so large that the correct procedure would be to estimate what the definition of net investment in an asset tells us to estimate, which is the (shadow) value of the change in the quantity (or quality) of that asset. This is proved in Appendix 7 of Chapter 2. In the foreseeable future though, using expenditures to reflect the value of the resulting accumulation may be a necessary compromise.

In income-expenditure accounts, *GDP* as customarily defined is often called *final demand*. *NDP* is *GDP* minus depreciation of capital assets, which is a familiar enough notion; but the *Report* shows that it is a lot less straightforward than is generally assumed. Complications arise because of the extended sense in which the term "asset" ought to be used. Thus, our analysis has implications for the way national accounts should interpret certain types of expenditures. We illustrate with six examples here, involving the conversion of natural capital into reproducible capital, defensive expenditure, exploration for sub-soil deposits, and expenditures on education and health.

1. If a wetland is drained so as to make way for a shopping mall, the *SNA* would record the latter as an investment and remain silent on the former. The *Report* shows that draining the wetland would be a disinvestment and should be so recorded.⁵

2. By "defensive expenditure" we mean resources devoted to reducing the impact of environmental damage on health, machinery and structures, and natural capital. The

⁵ In an optimally managed economy the two would cancel each other and wealth would remain unaffected.

Report argues that such expenditure should be deducted from final demand. Not to do so would be to record final demand as rising even while wealth remains constant, possibly even declining.

3. Costs of exploration (for sub-soil resources) are the mirror image of defensive expenditures, in that the costs are incurred so as to augment the resource base. We show that exploration costs should be deducted from final demand, but that the value of new discoveries should be included. The two are typically not the same.

4. Depletion of exhaustible resources amounts to depreciation of natural capital and should be so recorded.

5. It is customary to regard private expenditure on education as consumption and to speak of government expenditure on education as "investment in the young". This is an awkward practice. We show that the appropriate procedure would be to regard education as the formation of human capital and to estimate the shadow value of changes in the quantity of that asset (Appendix 9 of Chapter 2). Education expenditure in turn should be seen as an expense that prevents the accumulation of other forms of capital.

6. It is customary to regard private expenditure on health as consumption and government expenditure on health as the supply of a merit good. We show that the appropriate procedure would be to regard health as a form of human capital and estimate the shadow value of changes in the quantity of that asset (Appendix 10 of Chapter 2). The *Report* develops methods for estimating the value of health. As with in case of education, expenditure on health in turn should be seen as an expense that prevents the accumulation of other forms of capital.

1.9 Transition to an Improved System of National Accounts

Readers will wish to contrast the data requirements in the national accounts espoused in Chapters 2 and 4 with the codification in Chapter 3 of the data that are sought and collated in India's *SNA* and *SEEA*. Chapter 4 provides an outline of the contrasts. The chapters show that it isn't self-evident how the recommendations of our *Report* are to be framed in ways that are consistent with contemporary national accounts. Even the restricted enlargement of assets in the illustrations in Chapter 5 reveals that several reclassifications will need to be undertaken within the *SNA*.

But the required enlargements and reclassifications in question cannot be achieved overnight. In Chapter 6 we provide a map of the steps that will be required to be taken if the *Report's* recommendations are to be adapted to India's national accounts. The

chapter provides a brief account of the initiatives that are being undertaken in India toward the development of green accounting. The *Report* asserts that the adaptation process needs to be informed by three considerations, namely, (a) the reclassifications and extensions should conform to the internal logic of the *SNA*, (b) they reflect a continued improvement in our understanding of socio-ecological processes, and (c) they are based on data that exist or are obtainable with a reasonable degree of accuracy.

1.10 A Word of Caution

Our strategy in this *Report* has been to begin by providing an outline of an ideal system of accounts (an "ideal *SNA*", so to speak) and from there to show step by step how very far the current system is from the ideal and how far it can be expected to remain from it. We present a feasible transition path to an ever-improving system, but caution that even if figures for physical stocks were available, the deep problem of estimating shadow prices would remain. The issue isn't merely one of uncertainty about the role environmental resources play in production and consumption possibilities, it is also a matter of differences among people in their ethical values. Wealth estimates should be presented as bands, not exact figures. That people may never agree on the wealth of nations is however no reason for abandoning wealth as the object of interest in policy and sustainability analyses.