"utilities"—useful temporary arrangements of matter and energy that serve our purposes. The throughput remains fundamental in both micro- and macroeconomics, even though it is not explicit in the accounts of firms and households or in the aggregate accounts of nations. And the throughput is governed by the First and Second Laws of Thermodynamics, not by circular flow accounting conventions.

GROSS NATIONAL PRODUCT

Because economic growth is the paramount goal of nations, it is important to know just how it is measured. Growth in *what*, exactly? Economic growth is measured as growth in gross national product (or GDP, gross domestic product).[3]

ss national product (GNP) is market value of final goods services purchased by seholds, by government, by foreigners (net of what purchase from them) in the ent year.

As previously discussed in terms of the circular flow diagram, we have two measures of the aggregate circular flow that give the same number: national product and national income. Sometimes they are called national product at consumer goods prices (lower loop in Figure 14.1) and national product at factor prices (upper loop in Figure 14.1), or national income. Let's focus first on the lower loop, national product at consumer goods prices.

In this measure, **gross national product (GNP)** is the market value of final goods and services purchased by households, by government, and by foreigners (net of what we purchase from them) in the current year. With a few exceptions, anything not purchased this year is not counted.[4] Household production for the household itself is not sold and thus not counted; cooking, cleaning, childcare, and so on are omitted unless done by a paid domestic helper. Intermediate transactions between firms are not counted. Only the sale of the final product to the household is counted. The wheat sold by the farmer to the miller is not counted, the flour sold by the miller to the baker is not counted; only the bread sold by the baker to the household for final consumption is counted. The value of the bread is the sum of the values added by the farmer, by the miller, and by the baker. Values added to what? To the basic natural resource: the wheat seed, the soil, the rain, the sunlight, and so on. The basic natural resources in most cases are considered to be free. Therefore, GNP is the sum of value added. It does not include any attribution of value to that to

[3]The difference, not significant for our purposes, is that GNP counts production by all U.S. citizens whether at home or abroad. GDP counts all production within the geographic borders of the U.S., whether by citizens or by foreigners.

[4]E.g., annual rent is imputed to measure the current service of owner-occupied houses. The owner is thought of as renting his house from himself in the current year. Yet the owners of automobiles are not thought of as renting their cars to themselves.

which the value was added. What is it that adds value to free natural resources? The transforming services of labor and capital funds.

Note that these accounting conventions are consistent with the neoclassical production function discussed in Chapter 9—namely, that production is a function of labor and capital only.[5] The exchange of existing assets is not counted because it is not current-year production. The value of a used car bought this year is not counted because it is a transfer of an existing asset. But the commission of the used car salesman will be counted as a service rendered this year. And of course the total value of a new car will be counted this year. The same holds for trading stocks on the stock market.

Total GNP is often divided by the population and stated as per-capita GNP. This is a simple mean and tells us nothing about the distribution of per-capita GNP of individuals about the mean. The mean may or may not reflect a representative central tendency in the distribution. Often modal or median per-capita income is a better measure of central tendency.[6]

GNP is measured in units of "dollar's worth." Dollar's worth of what? Of final goods and services traded in the market in the current year. It is the quantity of all such goods and services, times their price, all summed up. Changes in GNP over time can reflect price changes or quantity changes. To eliminate the effect of price level changes (inflation or deflation), economists correct the dollar figure by converting current dollars into dollars of constant purchasing power. This conversion is done by dividing nominal GNP by a price index that measures the rate of inflation. Suppose that there has been 20% inflation between 1990 and 2000. To convert year 2000 nominal GNP into real GNP, measured in dollars of 1990 purchasing power, we divide GNP in 2000 by 1.20; this is the price index that in the base year of 1990 would have been 1.00 but because of 20% inflation rose to 1.20 in 2000. This gives "real GNP," or rather GNP measured in dollars of constant purchasing power as of a base year.

[5]One might object that natural resources are not really free. A ton of coal does cost money on the market, but the money price is equal to the labor and capital cost of finding and extracting the coal. Coal in the ground, or in situ, as the resource economists say, is considered a free gift of nature. A particularly rich and accessible coal mine will require less labor and capital per ton of coal than a marginal mine. Will its coal sell for less than that of the marginal mine? No, and this gives rise to producer surplus or differential rent. The more accessible mine earns a rent, which results from saved labor and capital relative to the marginal mine. Coal in situ is still a free gift of nature, but some free gifts are nicer than others, and differential rent takes that into account. The rent is attributed to the value of labor and capital saved in extraction, not to any original value of the coal in the ground.

[6]The mode is the income category that has the most members. The median is the per-capita income number for which there are as many members above as below. As students of statistics will know, for a normal distribution, the mean, median, and mode will coincide, all giving the same measure of central tendency.

Changes in real GNP are due to changes in quantities, not price levels. So real GNP, although measured in value units, is an index of quantities of something physical and is therefore considered a better measure of economic growth than nominal GNP. Just as a dollar's worth of gasoline corresponds to a definite physical quantity of gasoline, so a dollar's worth of real GNP corresponds to some aggregate of physical goods and services. But because different goods and services have differing material and energy intensities, there is not a tight one-to-one relationship between real GNP and physical throughput, as there is in the case of dollar's worth of gasoline and the throughput it represents.[7]

The point to emphasize is that although GNP is measured in value terms and cannot be reduced to a simple physical magnitude, it is nevertheless an index of an aggregate of things that all have irreducible physical dimensions. The relationship between real GNP and throughput is not fixed, nor is its variability unlimited. And to the extent that one believes that GNP growth can be uncoupled from throughput growth, one must be willing to accept limits on throughput growth. If the environmental protection achieved by limiting throughput costs little or nothing in terms of reduced GNP growth, then no one should oppose it. If GNP could grow forever with a constant throughput, then ecological economists would have no objection.

GNP and Total Welfare

GNP is a measure of economic activity, not a measure of welfare. It tells us how fast the wheels are turning, not where the car is going. Economists all say that. Yet in the absence of a true measure of welfare, most policy makers look to the GNP as a trustworthy index of the general direction of change of welfare, based on the following:

Total welfare = economic welfare + noneconomic welfare

The faith-based assumption is that economic welfare and total welfare move in the same direction. But the increase in economic welfare could induce a more than offsetting decline in noneconomic welfare. For example, GNP goes up as labor becomes more mobile. But the welfare of being close to family and friends gets sacrificed as people have to move. Also, the extra income and job satisfaction of two-earner households raise economic welfare, but the stress of lost leisure and the extra financial burden and lost satisfactions resulting from external childcare reduce noneconomic welfare. Pollution-induced illnesses constitute an enormous loss of noneconomic welfare. Because the category "noneconomic welfare" is unmeasured while economic welfare has a numerical measure, we tend to overestimate the importance of the latter and underestimate the importance of the former. In Figure 14.2, the MDU curve, traditionally missing in economic analysis, represents the loss of "noneconomic welfare."

It's worth pointing out that much of the marginal disutility from growth is caused by negative impacts on global public goods, including critical ecosystem life support functions. This means that a country whose economy is growing gains most of the utility from growth but shares the costs with the rest of the world. Many of these costs, such as waste emissions, habitat degradation, and resource depletion, are cumulative, which means that the marginal costs of growth are likely to increase

[7]But even here, economists try to keep the aggregate mix constant in calculating the price index. They assume a given basket of goods and given relative prices of goods in the basket in order to calculate a weighted average price of the basket and its change over time. This average price is not supposed to reflect either changes in relative composition of the basket of goods or changes in *relative* prices of the goods in the basket. Since relative prices inexorably do change over time, as does the composition of the representative basket of goods consumed, price level indexes inevitably "wear out" over time and have to be recalculated. Therefore, real GNP figures lose comparability over longer time periods.

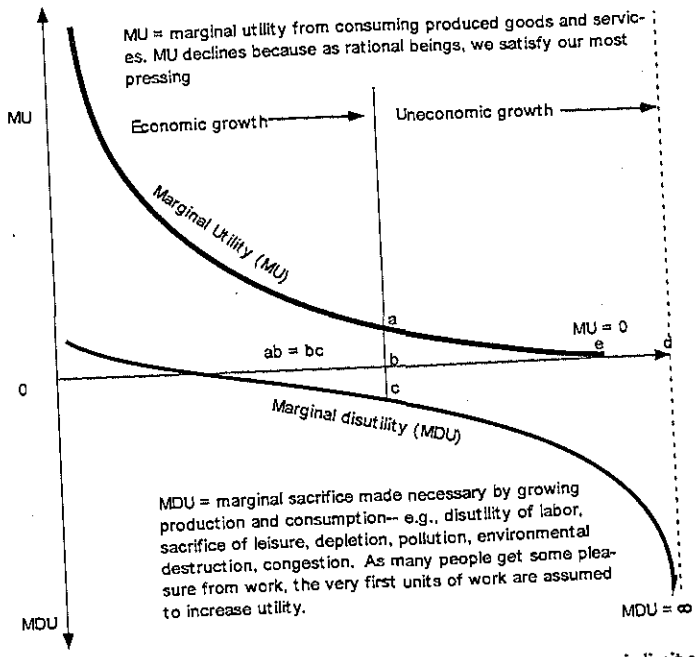

Figure 14.2 • Limits to growth of the macroeconomy. Point b = economic limit or optimal scale, where marginal utility (MU) = marginal disutility (MDU) (maximum net positive utility); e = futility limit, where MU = zero (consumer satiation), d = catastrophe limit, where MDU = infinity. At point d, we have gone beyond sustainable scale.

as we move from an empty world to a full world. In support of this conclusion, recent studies have found that the marginal costs of growth outweigh the benefits in *China* and *Thailand*, and benefits just barely outweigh costs in India and Vietnam, all countries exhibiting phenomenal rates of growth.[8] Furthermore, while Figure 14.1 suggests that economic growth in the U.S. is futile, as measured by increases in overall happiness, other studies have found that happiness levels in China actually exhibited a mild (not statistically significant) decline in recent decades.[9]

Defensive Expenditures and the Depletion of Natural Capital

Two other categories are problematic in national income and product accounts: regrettably necessary defensive expenditures and the depletion of natural capital. Let's have a look at each.

ly necessary defen-
nditures, or defensive
ures, are those that
o make to protect our-
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other people.

Regrettably necessary defensive expenditures, or defensive expenditures for short, are those that we have to make to protect ourselves from the unwanted consequences of the production and consumption of other goods by other people—for example, extra thick walls and windows to block out the sound of living near an airport or busy street or medical services resulting from pollution-induced asthma. In the sense of just measuring activity, these are freely chosen expenditures that people make in order to be better off in their concrete circumstances, and therefore they should be counted—they are if not "goods," at least "anti-bads." In another sense, they are really involuntary intermediate costs of production that should not count as welfare to the final consumer or as final consumption. This category could be broadly or narrowly defined. The examples just given reflect a narrow definition. Some would include all costs of global warming and the extra legal and law enforcement costs resulting from a general breakdown in trust and increases in complexity attributed to economic growth. Exactly where to draw the line is a matter of judgment.

The depletion of natural capital is a more clear-cut category. GNP is *gross* national product. It is gross of depreciation of capital. If we deduct depreciation of manmade capital, we get net national product (NNP), which is a closer approximation to what we can consume without eventual impoverishment. But even in calculating NNP, there is no deduction for the depreciation and depletion of natural capital. Even NNP is gross of natural capital consumption (as well as gross of defensive expenditures). What's more, manmade capital is not a perfect substitute for natural capital for the simple reason that the former cannot exist without the latter. The two are complements. Putting a dollar value on the depreciation of both manmade capital and natural capital implicitly assumes that both types of capital are perfect substitutes and that we can accept the loss of natural capital as long as manmade capital grows by a compensating amount. In reality, less natural capital makes our manmade capital less valuable as well. Of what use is a car if there is no gas to put in it?

[8] P. Lawn and M. Clarke, *Sustainable Welfare in the Asia-Pacific: Case Studies Using the Genuine Progress Indicator*, Cheltenham, UK: Edward Elgar, 2008.

[9] R. A. Easterlin and L. Angelescu, 2009, Happiness and Growth the World Over: Time Series Evidence on the Happiness–Income Paradox. IZA Discussion Paper No. 4060, Institute for the Study of Labor.

SUSTAINABLE INCOME

The true definition of **income**, implicitly stated above, is the maximum that a community can consume in a given time period without causing itself to have to consume less in future time periods.[10] In other words, income is the maximum you can consume this year without reducing your capacity to produce and consume the same amount next year, and the year after—without reducing future productive capacity, that is, without consuming capital. Strictly speaking, it is redundant to say "sustainable income" because income by definition is sustainable. Yet this feature of income has been so overlooked that a bit of redundancy for the sake of emphasis seems useful. If it's not sustainable it is, at least in part, capital consumption, not income.

The whole idea of income accounting is the prudent concern to avoid inadvertent impoverishment by consuming capital. Of course, there are times when we may choose to consume capital—for example, using a nest egg during retirement or liquidating the inventory of a store going out of business. Most of us, however, prefer not to run our national economy and ecosystem as if it were a business in liquidation. Certainly you may choose to consume capital and voluntarily become impoverished. The income accountant's job is to make sure you know what you're doing, not to tell you what to do. But if the accountant does not deduct the consumption of natural capital in calculating income, then she has failed at her professional duty.

To be concrete, if you cut only this year's net growth of a forest, that's income because you can do the same thing again next year. If you cut down the whole forest, you cannot do it again next year, and the value of the cut forest is mostly capital consumption, not income. Yet in GNP, we count the whole amount as this year's income. The same is true for overexploited fisheries, waste sinks and croplands, and depleted mines, wells, and aquifers.[11] Some neoclassical economists have come to realize that

[10] J. Hicks, *Value and Capital*, 2nd ed., Oxford, England: Clarendon, 1948.

[11] The running down of renewable stocks or funds of natural capital is *depreciation*, analogous to the depreciation of a machine. The running down of nonrenewable natural capital is *liquidation*, analogous to the liquidation of an inventory. Both represent capital consumption.

nature's services are a huge infrastructure to the economy, and we are failing to maintain that infrastructure.

Why do our national accountants fail to subtract natural capital consumption in calculating income? Neoclassical economics does not count natural capital consumption as a cost because in its preanalytic vision of the world, nature is not scarce. The reason natural funds and resource flows are absent from the usual neoclassical production function is also the reason there is no deduction for natural capital consumption in national income accounting.

GNP as Cost

Years ago, Kenneth Boulding suggested that GNP be relabeled GNC, for gross national cost. While Boulding's plea may have been tongue-in-cheek, it bears close examination. GNP is a measure of the final goods and services a society produces multiplied by the price at which they sell on the market. But demand for the most important resources such as food, energy, and life-saving medicines is inelastic. As you'll recall from Chapter 9, this means that large changes in price have little impact on how much people want to consume, and conversely, that a small change in quantity will lead to a large change in price. Imagine that one year the food and oil industries decided to work less and reduced output by 20% over previous years. Because people would not want to reduce their consumption of food and energy, they would bid up the prices for these commodities dramatically. In fact, something like this really did happen, in 2008, when a small drop in grain supplies relative to annual consumption led to a 200% increase in prices, and a drop in the rate of increase in oil production led to a similar increase in oil prices. If we multiplied 80% of 2007's output by 300% of 2007's price, GNP would show a 140% increase in economic activity in these sectors instead of a 20% decrease. Real GNP would be lower, due to inflation, but the share of these commodities in GNP would nonetheless soar.

Even when GNP reflects economic activity, it may not reflect well-being. For example, compared to the other developed countries, the United States ranks last on a wide variety of health care measures, ranging from infant mortality to life expectancy. It also has by far the highest percentage of uninsured individuals. By such measures, the U.S. health care system provides fewer benefits than the systems in other developed nations. However, in 2008 the United States spent 50% more per capita on health care than any other nation,[12] and these expenditures were rising rapidly. Aside from those who reap income from health care, no one claims this is a good thing. Yet if we measure well-being by the market value of health care goods and services, the United States has by far the best health care system in the world.

The fact is that one person's income is another person's expenditure, so GNP is also an explicit measure of costs. As long as costs and benefits are closely correlated, this does not matter, but we can't take such a correlation for granted. Striving to maximize expenditures on health care, food, energy, or anything else would obviously be crazy.

What should be done about GNP? One approach would be to disaggregate GNP into two separate accounts: a national benefits account and a national costs account (we'll explore the challenges to this below). As the scale of the economy grows, both benefits and costs will increase. We could compare those benefit and cost increases at the margin to find the optimal scale (see Figure 14.2).[13] It makes absolutely no sense to add them together.

Another option is to move beyond consumption-based measures of well-being altogether, as we discuss below. If the aim of economic activity is to maximize human well-being, then health, nutrition, literacy, family, friends, social networks, and so on are probably the most important indicators, perhaps best measured by overall levels of happiness and satisfaction with life (see Box 14.1).

Nonetheless, absent more rational measures of well-being, we can't help feeling a certain nostalgia for the good old days when newscasters regaled us with quarterly changes in the GNP. Now we are subjected to hammer-banging, gong-clanging reports of hourly changes in the Dow Jones and Nasdaq stock price indices—numbers that are an order of magnitude further removed from either welfare or income than GNP is. For example, in 2008, global stock markets lost trillions of dollars in value with virtually no change in real productive assets. This is because stock market values are forward-looking, based on expectations of future earnings (even on speculators' estimates of the expectations of others). By contrast, GNP is backward-looking, a historical record of what has already happened. Since the past is better known than the future, GNP is inherently a more trustworthy number than stock market values.

[12]OECD Health Data 2009: Frequently Requested Data. Online: http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html.

[13]For an effort in this direction for Australia, see P. A. Lawn, *Toward Sustainable Development: An Ecological Economics Approach*, Boca Raton, FL: Lewis Publishers, 2001.

BOX 14-1 GROSS NATIONAL HAPPINESS AND THE HAPPY PLANET INDEX

In the late 1980s, the country of Bhutan declared that it would strive to increase Gross National Happiness (GNH) rather than GNP, in an approach that "stresses not material rewards, but individual development, sanctity of life, compassion for others, respect for nature, social harmony and the importance of compromise."[a] Rather than attempting to measure happiness itself, Bhutan seeks to measure and improve the factors that contribute to happiness. The first global study on GNH included multicriteria measures of economic, environmental, physical, mental, social, workplace, and political wellness.[b] While initially seen as a quixotic goal, GNH is much less of a departure from economists' historical conceptions of utility than is GNP, and the idea has taken off, along with the study of happiness. A related measure is the Happy Planet Index, which divides a country's happy life years (life expectancy adjusted by subjective well-being) by its ecological footprint as an estimate of ecological economic efficiency or sustainable happiness. By this measure, Costa Rica is the world leader in sustainable development.[c]

[a]*Bhutan Planning Commsion*, Bhutan 2020: A Vision of Peace, Prosperity, and Happiness, *Thimphu: Royal Government of Bhutan Planning Commission, 1999, p. 19.*

[b]*International Institute of Management, Gross National Happiness (GNH) Survey. Online: http://www.iim-edu.org/polls/GrossNationalHappinessSurvey.htm.*

[c]*http://www.happyplanetindex.org.*

ALTERNATIVE MEASURES OF WELFARE: MEW, ISEW, AND GPI

In the early 1970s, there was considerable criticism of GNP growth as an adequate national goal—so much so that economists felt obliged to reply. The best reply came from William Nordhaus and James Tobin.[14] They questioned whether growth was obsolete as a measure of welfare and thus as a proper guiding objective of policy. To answer their question, they developed a direct index of welfare, called Measured Economic Welfare (MEW), and tested its correlation with GNP over the period 1929–1965. They found that, for the period as a whole, GNP and MEW were indeed positively correlated; for every six units of increase in GNP, there was, on average, a four-unit increase in MEW. Economists breathed a sigh of relief, forgot about MEW, and concentrated again on GNP. Although GNP was not designed as a measure of welfare, it was, and still is, thought to be sufficiently well correlated with welfare to serve as a practical guide for policy.

Some 20 years later, Daly and Cobb revisited the issue and began to develop an Index of Sustainable Economic Welfare (ISEW) with a review of the Nordhaus and Tobin MEW. They discovered that if one takes only the latter half of the Nordhaus-Tobin time series (i.e., the 18 years from 1947 to 1965), the positive correlation between GNP and MEW *falls* dramatically. In this most recent half of the total period—surely the more relevant half for projections into the future—a six-unit increase in GNP yielded on average only a one-unit increase in MEW. This suggests that GNP growth at this stage in U.S. history may be quite an inefficient way of improving economic welfare—certainly less efficient than in the past.

The ISEW was then developed to replace MEW, since the latter omitted any correction for environmental costs, did not correct for distributional changes, and included leisure, which both dominated the MEW and introduced many arbitrary valuations.[15] The Genuine Progress Indicator (GPI) is a widely used, updated version of the ISEW that does account for the loss of leisure time. The ISEW and GPI, like the MEW, though less so, were positively correlated with GNP up to a point (around 1980), beyond which the correlation turned slightly negative.[16] Figure 14.3 shows estimates of GNP and ISEW for seven different countries.

Measures of welfare are difficult and subject to many arbitrary judgments, so sweeping conclusions should be resisted. However, it seems fair to say that for the United States since 1947, the empirical evidence that GNP growth has increased welfare is weak and since 1980 probably nonexistent (see also Figure 14.1 for further support of this claim). Consequently, any impact on welfare via policies that increase GNP growth

[14]W. Nordhaus and J. Tobin, "Is Growth Obsolete?" In *Economic Growth*, National Bureau of Economic Research, New York: Columbia University Press, 1972.

[15]The concept of leisure is an important part of welfare, but the problems of valuing leisure are difficult. Is the leisure chosen or unchosen? Should sleep time count as leisure? Is commuting time leisure or "time cost of working"? Should we use the wage rate? The minimum wage? Should the "leisure" of mom taking care of children be valued at her opportunity cost if she's a doctor, or at the cost of avoided daycare? Such difficult choices have a big effect on the index.

[16]Neither the MEW nor the ISEW considered the effect of individual country GNP growth on the *global* environment, and consequently on welfare at geographic levels other than the nation. Nor was there any deduction for legal harmful products, such as tobacco or alcohol, or illegal harmful products, such as drugs. No deduction was made for overall diminishing marginal utility of income resulting from GNP growth over time (although a distributional correction for lower marginal utility of extra income to the rich was included). Such considerations would further weaken the correlation between GNP and welfare. Also, GNP, MEW, GPI, and ISEW all begin with personal consumption. Since all four measures have in common their largest single category, there is a significant autocorrelation bias, which makes the poor correlations between GNP and the three welfare measures all the more surprising.

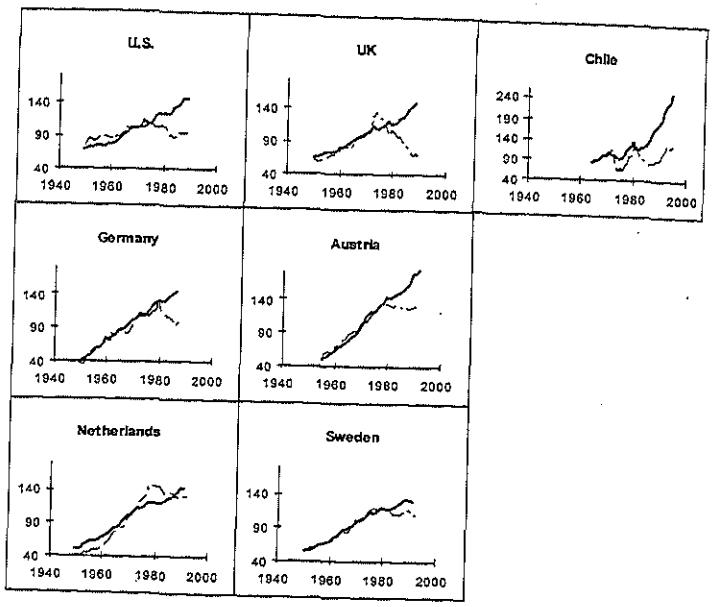

Figure 14.3 • Indices of GNP (solid) and ISEW (dashed) for seven countries. 1970 = 100 in all cases. (Source: R. Costanza, J. Farley, and P. Templet, "Quality of Life and the Distribution of Wealth and Resources." In R. Costanza and S. E. Jørgensen, eds., *Understanding and Solving Environmental Problems in the 21st Century: Toward a New, Integrated Hard Problem Science*, Amsterdam: Elsevier, 2002.)

would also be weak or nonexistent. In other words, the "great benefit," habitually used to justify sacrifices of the environment, community standards, and industrial peace, appears, on closer inspection, not even likely to exist.[17] Certainly if economic growth is to be the number-one goal of nations and the central organizing principle of society, then citizens have a right to expect that the index by which we measure growth, GNP, would reflect general welfare more accurately than it does. Continued use of GNP as a proxy for welfare reminds us of the quote often attributed to Yogi Berra: "We may be lost, but we're making great time."

The objective, accurate scientific measurement of national costs and national benefits is not a realistic goal. Both costs and benefits of economic growth are spread out over time, and how we treat costs and benefits that affect future generations is an ethical issue, not a scientific one.

[17]For further evidence from other countries, see M. Max-Neef, Economic Growth and Quality of Life: A Threshold Hypothesis, *Ecological Economics* 15:115–118 (1995).

The use of a particular discount rate to address intertemporal distribution, for example, is clearly a value-laden decision. Ecosystem change and evolution are not predictable, and how we treat the resulting uncertainty is also an ethical issue. Even using monetary measures of market goods is not objective; markets will yield different monetary values depending on the initial distribution of the wealth, and what constitutes a desirable initial distribution is an ethical judgment. Monetary values for a given resource also vary depending on the amount of the resource society is using; for example, the price of oil depends primarily on current rates of extraction of oil. Oil is such an important input into so many economic processes that all prices are affected by how much oil we are using. Using prices determined by resource use in this period to decide the appropriate amount of a resource to use is therefore a case of circular reasoning; you can't do it on a computer spreadsheet, and you can't do it in real life. Efforts to put monetary values on nonmarket goods such as ecosystem services not only compound these ethical issues with serious methodological problems but also imply that natural capital and manmade capital are perfect substitutes, a position that most ecological economists strongly reject.

Beyond Consumption-Based Indicators of Welfare

Personal consumption is not an end in itself but merely one means toward achieving the end of enhancing human welfare. GNP is inadequate as a proxy for income, and income is only one element among many that provide human welfare. For example, the ecosystem services that increasing GNP inevitably encroaches upon are at least as important as GNP in providing welfare.[18]

Human Needs and Welfare

Do other factors not yet discussed contribute to our welfare? It is reasonable to assume that welfare is determined by the ability to satisfy one's needs and wants. What are our needs? Absolute needs are those required for survival and are biologically determined. Some 1.4 billion individuals globally and 26% of the population in the Third World currently live in extreme poverty (less than $1.25 per day), and 2.6 billion earn less than

[18]See R. Costanza et al., The Value of the World's Ecosystem Services and Natural Capital, *Nature* 6630:253–260 (1997), in which the value of global ecosystem goods and services is found to outweigh global GNP. While this article does put monetary values on natural capital for purposes of comparison with manmade capital, it also explicitly discusses many of the problems with this approach.

$2.00 per day. These people have difficulty meeting even these absolute needs.[19] For this group, greater consumption is probably very closely correlated to greater welfare.

Once absolute needs have been met, as is the case for the remaining three-fifths of the world's population, then welfare is determined by the satisfaction of a whole suite of primary human needs. Numerous researchers have proposed a variety of human needs, typically claiming that they are pursued in hierarchical order, with Maslow's hierarchy (1954) (in which consumption is the lowest rung on the needs ladder) being the most famous. The hierarchical ordering, though generally not seen as rigid by these researchers, still leaves something to be desired. Even the 1.2 billion people living in absolute poverty seek to fulfill needs other than mere subsistence.

Manfred Max-Neef[20] has summarized and organized human needs into nonhierarchical axiological[21] and existential categories (Table 14.1). In this **matrix of human needs**, needs are interrelated and interactive—many needs are complementary, and different needs can be pursued simultaneously. This is a better reflection of reality than a strict hierarchy in which we pursue higher needs only after lower ones have been fulfilled. Also important in Max-Neef's conception, needs are both few and finite. This stands in stark contrast to the assumption of infinite wants, or the nonsatiety axiom in standard economics.

If we are to evaluate the success of economic policies both now and in the future (assuming that providing a high level of welfare for humans for the indefinite future is our economic goal), then we must develop measurable indicators that serve as suitable proxies for needs fulfillment and welfare.

To state the obvious, we cannot precisely measure welfare, which in the present context is equivalent to quality of life (QOL). In the words of Clifford Cobb,[22]

> *The most important fact to understand about QOL indicators is that all measures of quality are proxies—indirect measures of the true condition we are seeking to judge. If quality could be quantified, it would cease to be quality. Instead, it would be quantity. Quantitative measures should not be judged as true or false, but only in terms of their adequacy in bringing us closer to an unattainable goal. They can never directly ascertain quality. (p. 5)*

[19]M. Ravallion and S. Chen, "The Developing World Is Poorer Than We Thought but No Less Successful in the Fight Against Poverty." Policy Research Working Paper Series 4211, The World Bank. 2008.

[20]M. Max-Neef, "Development and Human Needs." In P. Ekins and M. Max-Neef, *Real-Life Economics: Understanding Wealth Creation*, London: Routledge, 1992, pp. 197–213.

[21]Axiology is the study of the nature of values and value judgments.

[22]C. W. Cobb, *Measurement Tools and the Quality of Life: Redefining Progress*, Oakland, CA. Online: http://www.rprogress.org/pubs/pdf/measure_qol.pdf.

Table 14.1

MAX-NEEF'S MATRIX OF HUMAN NEEDS

Axiological Categories	Existential Categories			
	Being	Having	Doing	Interacting
Subsistence	Physical health, mental health, equilibrium, sense of humor, adaptability	Food, shelter, work	Feed, procreate, rest, work	Living environment, social setting
Protection	Care, adaptability, autonomy, equilibrium, solidarity	Insurance systems, savings, social security, health systems, rights, family, work	Cooperate, prevent, plan take care of, cure, help	Living space, social environment, dwelling
Affection	Self-esteem, solidarity, respect, tolerance, generosity, receptiveness, passion, determination, sensuality, sense of humor	Friendships, family, partnerships with nature	Make love, caress, express, emotions, share, take care of, cultivate, appreciate	Privacy, intimacy, home, space of togetherness
Understanding	Critical conscience, receptiveness, curiosity, astonishment, discipline, intuition, rationality	Literature, teachers, method, educational policies, communication policies	Investigate, study, experiment, educate, analyze, meditate	Settings of formative interaction, schools, universities, academies, groups, communities, family
Participation	Adaptability, receptiveness, solidarity, willingness, determination, dedication, respect, passion, sense of humor	Rights, responsibilities, duties, privileges, work	Become affiliated, cooperate, propose, share, dissent, obey, interact, agree on, express opinions	Setting of participative interaction, parties, associations, churches, communities, neighborhoods, family
Idleness	Curiosity, receptiveness, imagination, recklessness, sense of humor, tranquility, sensuality	Games, spectacles, clubs, parties, peace of mind	Daydream, brood, dream, recall old times, give way to fantasies, remember, relax, have fun, play	Privacy, intimacy, space of closeness, free time, surroundings, landscapes
Creation	Passion, determination, intuition, imagination, boldness, rationality, autonomy, inventiveness, curiosity	Abilities, skills, method, work	Work, invent, build, design, interpret	Productive and feedback settings, workshops, cultural groups, audiences, spaces for expressions, temporal freedom

Continued

4.1

MATRIX OF HUMAN NEEDS (CONTINUED)

	Existential Categories		
Being	**Having**	**Doing**	**Interacting**
Sense of belonging, consistency, differentiation, self-esteem, assertiveness	Symbols, language, religion, habits, customs, reference groups, sexuality, values, norms, historical memory, work	Commit oneself, integrate oneself, confront, decide on, get to know oneself, recognize oneself, actualize oneself, grow	Social rhythms, everyday settings, settings in which one belongs, maturation stages
Autonomy, self-esteem, determination, passion, assertiveness, open-mindedness, boldness, rebelliousness, tolerance	Equal rights	Dissent, choose, be different, run risks, develop awareness, commit oneself, disobey	Ability to come in contact with different people at different times in different places

Being registers attributes, personal or collective, that are expressed as nouns. The column of Having registers institu-nechanisms, tools (not in moteriol sense), laws, etc. that can be expressed in one or few words. The column of Doing ons and milieus (as time and spoces). It stands for the Spanish estar or the Germon befinden, In the sense of time and e is no corresponding word in English, Interacting was chosen for lack of something better.

x-Neef, "Development and Human Needs." In P. Ekins and M. Max-Neef, Real-Life Economics: Understanding Wealth *on: Routledge, 1992, pp. 197–213.*

Objective Measures

Numerous efforts have been made to objectively measure welfare. The problem is that these studies have found only weak relationships between objective measures of welfare and the subjective assessments of the same by the subjects concerned.[23] However, both these studies and the various types of national accounts seem to include a narrow range of objective indicators, often placing what we consider to be an excessive emphasis on consumption. Quite possibly the problem is that welfare is too rich a gumbo for us to recapture its flavor with so few ingredients. An important research agenda in economics is to develop a methodology for measuring access to "satisfiers" (the means by which we satisfy a given need) for Max-Neef's axiological and existential categories of human needs as indicators of welfare. With sufficient ingredients, we can produce something reasonably close to the flavor of welfare.

[23]B. Haas, A Multidisciplinary Concept Analysis of Quality of Life, *Western Journal of Nursing Research* 21(6):728–743 (1999).

Max-Neef's human needs matrix as the basis of a welfare measure is a dramatic departure from existing national accounts, as well as from most of the proposed alternatives, differing even in its theoretical underpinnings. Neoclassical economics and GNP are explicitly utilitarian. Within utilitarian philosophy, individual welfare is determined by the degree to which individuals can satisfy their desires, and it is generally accepted that the goal of society is to provide the maximum amount of utility for its citizens. As utilitarian philosophy has been operationalized by NCE, citizens are the best able to determine what provides utility. Because it is extremely difficult to measure utility directly, economists have taken to using revealed preferences as a proxy. Preferences are revealed by people's objectively measurable choices in the market. In the market economy, preferences are revealed through market decisions, and market decisions can be made only with money. Under this conception of utilitarianism, the philosophy values only end-states and requires only "having" such things as possessions and experiences. Sustainable income accounting and measurements of economic welfare are basically just extensions of this philosophy, and they similarly value only having.[24]

In Max-Neef's framework, having things is important, but it is just one of the elements required to meet our needs. Thus, a benevolent dictator with the resources to provide us with all the physical things we need for happiness would fail to meet our existential needs for being, doing, and interacting, as well as our axiological needs for creation, participation, and freedom. Also, within Max-Neef's conception, people are not always best able to determine what contributes to their quality of life; for example, advertising may falsely convince people that consumption satisfies their need for affection, freedom, or participation.

This approach, which values human actions independently of their outcomes, has been dubbed the "human development" approach to welfare. Its main proponents include Nobel Prize–winning economist Amartya Sen and philosopher Martha Nussbaum. In a similar tone to Max-Neef, they argue that "capabilities" and "functionings" are critical to welfare.[25] Roughly speaking, "functionings" correspond to human needs, while "capabilities" include both states of being and opportunities for doing and are therefore analogous to access to satisfiers for these needs in Max-Neef's matrix (see Table 14.1). In utilitarian theory, we might have several different options, of which we choose one. If all options but that one were

[24]C. W. Cobb, *Measurement Tools and the Quality of Life* (San Francisco, CA: Redefining Progress, 2000). Online: http://www.rprogress.org/pubs/pdf/measure_qol.pdf.

[25]Ibid.; M. Nussbaum, "Aristotelian Social Democracy," in R. B. Douglass, G. M. Mara, and H. S. Richardson, eds., *Liberalism and the Good*, New York: Routledge, 1990, pp. 203–252; R. Sugden, "Welfare, Resources, and Capabilities: A Review of *Inequality Reexamined* by Amartya Sen," *Journal of Economic Literature* 31 (December, 1993): 1947–1962.

eliminated, it would not affect our welfare. In the human development approach, losing options restricts our capabilities and would therefore affect our welfare. The human development approach is less concerned with the actual choices that people make than with the options they are free to choose from, and the marketplace is only one of many spheres in which choice is important.

Operationalizing Human Needs Assessment as a Measure of Welfare

Measuring the extent to which human needs are satisfied is, of course, an exceptionally difficult task and highly subjective. Following the lead of Sen and Nussbaum, it would be most useful to measure capabilities, that is, the extent to which individuals have access to satisfiers. However, as noted by Max-Neef, specific satisfiers may vary by culture, and the difference in satisfiers required to meet a human need may indeed be one of the key elements that defines a culture. This means that objective "welfare accounts" must be very culture-specific. Second, some satisfiers might help fulfill several human needs, while other needs require several satisfiers. Further complicating matters, satisfiers may change through time. And humans are social creatures who inhabit a complex environment; needs are satisfied not only in regard to the individual but also in regard to the social group and environment.[26] Furthermore, while needs are different and distinct, they are also interactive and may complement each other, and therefore may not be additive. Abundant access to satisfiers for one set of needs does not compensate for a lack of satisfiers for another set of needs. This suggests that separate "accounts" should be kept for access to satisfiers to different needs.

In developing welfare accounts based on **human needs assessment** (HNA), it would be useful to test measurements of satisfiers empirically in studies comparing these objective measures against subjective assessments of welfare to determine their effectiveness. These empirical tests, as well as efforts to operationalize HNA accounts, must involve people in dialogues to confirm or refute the validity of the needs Max-Neef specifies, as well as the validity of the satisfiers we use to assess the degree to which needs are met. Such dialogues would almost certainly elicit additions and alternatives to the generic satisfiers, the entries in the columns of Table 14.1.[27] While the average person may not always know exactly what satisfiers will best meet their needs, interactive discussion with people is nonetheless essential to select and test appropriate indicators. We would also need to develop group-based methodologies to determine the effectiveness of our indicators in a social setting.

[26]Max-Neef, op. cit., 1992.

[27]E.g., food and shelter are specific dimensions of "having" that are satisfiers of the need for "subsistence." How we actually meet our needs for food and shelter are culture-specific. A traditional Inuit might be satisfied with walrus blubber and an igloo, while a New Yorker would require hamburgers and a high-rise apartment.

It is clear that Max-Neef's approach is very difficult to operationalize, even if his concept is theoretically more compelling than GNP or even ISEW. The debate over which approach to take to national accounting—theoretically sound measures or ease of accounting—is old. As Irving Fisher argued back in 1906, the appropriate measure, even of income, is one that captures the psychic flux of service (i.e., satisfaction of needs and wants) and not simply the final costs of goods and services.[28] And at the time Fisher wrote, the absence of suitable data for calculating either psychic flux of service or final costs no doubt led many to ignore the debate as entirely academic. The widespread use of GNP indicates that in practice, Fisher lost this earlier debate. However, measures such as the ISEW suggest that the GNP is becoming increasingly incapable of measuring economic welfare, much less general human welfare. Even if we can never quantify access to satisfiers as precisely as we currently quantify GNP, as Sen suggests, perhaps it is better to be vaguely right than precisely wrong.[29]

Accepting Max-Neef's human needs matrix as a framework for the specific elements of human welfare, and access to satisfiers as potentially the best objective indicator of welfare, has profound implications with respect to scale, distribution, and allocation. First, most of the possible indicators suggested by Max-Neef require few, if any, material resources beyond those needed to sustain human life and hence are less subject to physical exhaustion. Thus, for most elements of human welfare, increases for one person or one generation do not leave less for others. Second, explicitly accepting that there is a limit to material needs implies that we can limit consumption greatly with little, if any, sacrifice of welfare. This result is critical, because the laws of thermodynamics make it impossible to uncouple physical consumption from resource use and waste production. Abundant evidence suggests that current levels of consumption could not be sustainably met with renewable resources alone, and we must therefore limit consumption or else threaten the welfare of future generations.

The difficulty of operationalizing Max-Neef's framework may actually be a point in its favor. Why do we want to measure welfare in the first place? It's not just to track its rise or fall but to help us create policies to

[28]H. Daly and J. Cobb, *For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future*, Boston: Beacon Press, 1989.

[29]D. Crocker, "Functioning and Capability: The Foundations of Sen's and Nussbaum's Development Ethic, Part 2." In M. Nussbaum and J. Glober, eds., *Women, Culture, and Development: A Study in Human Capabilities*, Oxford, England: Oxford University Press, 1995.

improve it. Simply providing statistical data on welfare doesn't help us achieve this end. However, applying Max-Neef's framework would require extensive surveys asking people to think deeply about what their needs really are and how they can satisfy them. Ultimately, improving welfare falls to decisions by political, cultural, and religious groups about what they want and how they want to achieve their goals, and making the correct decisions will require people to think deeply about what it is they ultimately desire.

BIG IDEAS to remember

- Fallacy of composition
- General equilibrium model versus aggregate macroeconomics
- Optimal scale of macroeconomy
- Gross national (or domestic) product
- Total welfare = economic welfare + noneconomic welfare
- Defensive expenditures or "anti-bads"
- Natural capital consumption
- Sustainable income
- MEW and ISEW
- Gross national cost
- Relative wealth and welfare
- Human needs and welfare
- Matrix of human needs (Max-Neef)
- Human needs assessment (HNA)