

Presentation
of
Robert Solow's
"An Almost Practical Step
Toward Sustainability"

Feb. 11, 2004

This paper was first presented at
the 40th Anniversary of
Resources for the Future
on October 8, 1992

Brief Bio on Robert Solow

- Born in Brooklyn, 1924
- 1987 Nobel Laureate in Economics
- Prof. Of Economics Emeritus at MIT
- Trustee of Woods Hole Oceanographic Institute
- Fellow at Center for Advanced Study in the Behavioral Sciences

Solow's quote to approaching sustainability:

“Yes-or-no lends itself to
statement and confrontation;
more-or-less lends itself to
trade-offs”

Solow Starts:

When trying to measure an economy's contribution to the well-being of a country's population, conventional means, such as GDP and GNP, are incomplete.

What is missing is the
depreciation of fixed capital
assets.

The Net National Product (NNP)
takes this into account.

Solow argues that:

This principle should be applied
to nonrenewable resources, and
environmental assets such as
clean air and water.

Solow further acknowledges both William D. Nordhaus and James Tobin for contributing to this thinking during the early 70's.

Brief Bio on James Tobin

- 1918-2002
- 1955, awarded John Bates Clark Medal
- 1961-62, member of Kennedy's Council of Economic Advisors
- 1981, received Stockholm Prize in Economic Science
- Research included macroeconomics, monetary theory and policy, fiscal policy and public finance, consumption and saving, unemployment and inflation, portfolio theory and asset markets and econometrics

Brief Bio on William D. Norhaus

- A. Whitney Griswold Professor of Economics at Yale University
- Cowles Foundation for Research in Economics
- 1977-79, member of Carter's Council of Economic Advisors
- Author of *Managing the Global Commons*
- Research includes price measurement, energy, technological change, economic growth and trends in profits and productivity

Solow insists that a proper measurement of stocks and flows needs to be high on the agenda if *intelligent* policy decisions are going to be made.

“Sustainability” according to
Solow, must be:

*the ability to preserve productive
capacity for the indefinite future*

Solow's Next Step:

Calculating The True Net Product (or NNP) of an Economy

Solow's First Assumption:

**Production cannot take place
without some use of natural
resources.**

Solow's second assumption:

It will always be possible to
substitute greater inputs of labor,
reproducible capital, and
renewable resources

for smaller direct inputs of the
fixed resource.

It is starting to become clear that
Solow is a
“weak sustainabilist”

Solow's third assumption: Intergenerational Trade-off

Each generation is allowed to favor itself over the next future generation, but not too much.

Each generation will apply the same discount rate to the welfare of its successor.

Solow's Next Step:

**Properly Charging the Economy
for the Consumption of Its
Resource Endowment**

Step 1:

**Develop a corrected version of
Net National Product (NNP)**

**Add a deduction for net depletion
of exhaustible resources.**

Step Two: Corrected Charge for Depletion

$$\begin{aligned} &\text{Real Value of Depletion} \\ &= \\ &\text{input to production} - \\ &\text{marginal cost of extraction} \\ & \\ &(\text{as applied for minerals}) \end{aligned}$$

Social Accounting Prices would value that as:

**The sum of Hotelling rents for
the mining industry.**

In other words, or Solow's to be precise:

**“The year's withdrawal from the
original endowment of
nonrenewable resources.”**

The Basis of Hotelling Rents

- Developed by Harold Hotelling during 1930s
- Based out of *Hotelling's Rule* – the optimal rate of depletion of a non-renewable resource
- Profits or “*Rents*” can also be viewed as the surpluses above extraction costs (again where minerals are the example)

Further to the calculation:

There is a need to treat
environmental quality as a stock:
a capital in which

inputs such as pollutants are “depreciated”

abatement activities are “investments”

Solow's further definition of sustainability:

A generalized capacity to
produce economic well-being

A key principle to embrace the idea of substitutions and trade-offs:

“Natural resources are desirable for what they do, not for what they are. It is their capacity to provide usable goods and services that we value”

Solow's belief of sustainability is:

To allow the next generation to,

no matter what,

maintain the same standard of
living as the current generation,
and propagate that ability to its
subsequent generation.

The Big Closer:

Net National Product (NNP) is also a measure for the maximum current level of consumer satisfaction that can be sustained forever.

Huge Assumption:

In order to now accurately calculate
NNP accounting for natural resource use,

It requires “*forward-looking and far-seeing*” participants to accurately price
investment goods and their price for
future productivity.

Bob's take:

In other words, we need to be
paying the true costs for use of
our natural resources, I.e. gas,
water, etc!!!

Solow's view continued:

“Trade-offs and substitutions are not only permissible, they are essential.”

Solow's Wrap-up:

A matter of reality:

“Every generation uses up some part of the earth's original endowment of nonrenewable resources.”

Can't get around it.

Solow's Substitution Principle:

Each generation should replace
used-up resources with other
assets of equal value.

Solow ties-in Hartwicks Rule:

A society that invests its
“Hotelling Rents” into
reproducible capital is ensuring
its ability to maintain the same
level of consumption for
subsequent generations.

Solow stresses that:

“A commitment to sustainability is translated into a commitment to a specifiable amount of productive investment.”